A

A/C SWITCH . . 55-16-II
A/T CONTROL COMPONENT
Check . . 23A-56-I
Location . . 23A-54-I
ABS
ECU . . 35B-41 II
MOTOR, Operation Check . . 35B-30-II
MOTOR RELAY, Continuity Check . . 35B-30-II
VALVE RELAY, Continuity Check . . 35B-30-II
ACCELERATOR
CABLE . . 17-5-I
CABLE, Check and Adjustment . . 17-4-I
PEDAL . . 17-5-I
ADJUSTER, Lash, Check 11A-16, 11C-13
AERO PARTS . . 51-13-II
AIR CLEANER ELEMENT, Maintenance . . 00-32-I
AIR CONDITIONING SWITCH, Check . . 17-40-I
AIR BAG MODULE . . 52B-27-II
Deployed Disposal Procedures . . 52B-39-II
Disposal Procedures . . 52B-34-II
Undeployed, Disposal . . 52B-34-II
AIR FILTER . . 17-48-I
ANTENNA . . 54-67-II
AUTO-CRUISE CONTROL . . 17-27-I
COMPONENT, Check . . 17-25-I
SYSTEM, Operation Check . . 17-23-I
AUTOMATIC TRANSAXLE
Maintenance . . 00-41-I
KEY INTERLOCK & SHIFT LOCK MECHANISMS 23A-76-I
AXLE HUB
Front . . 26-7-II
Rear . . 27-5 II

B

BALL JOINT, Tie Rod End, Breakaway Torque Check . . 37A-7-II
BALL JOINT SEALS, Maintenance . . 00-46-I
BASIC IDLE SPEED, Adjustment <1.5L Engine> . 13A-143-I
<1.8L Engine> . 13B-144-I
BATTERY . . 54-3-II
Charging . . 54-3-II
Check . . 54-3-II, 35B-31-II
Testing Procedure . . 54-4-II
BLOWER . . 55-20-II
BODY, Valve . . 23B-69-I
BOOSTER, Brake . . 35B-31-II
Operating Test . . 35A-9-II
BOOTS, Drive Shaft, Maintenance . . 00-46-I
BRAKE
Low-reverse . . 23B-60-I
Rear Drum . . 35B-33-II
Second . . 23B-61-I
BOOSTER . . 35B-31-II
Operating Test . . 35A-9-II
DISC, Front . . 35A-22-II
Run-out Correction . . 35A-15-II
Run-out Check . . 35A-15-II
Thickness Check 35A-14-II
DRUM
Inside Diameter Check
<Vehicles with Rear Drum Brake> . 35A-16-II, 35B-27-II
FLUID LEVEL SENSOR, Check . . 35A-11-II
HOSES, Maintenance . . 00-46-I
LINING, Thickness Check . . 35A-16-II, 35B-26-II
LINING AND BRAKE DRUM, Contact Check 35A 17-II, 35B-27-II
PAD, Disc, Front, Check and Replacement 35A-12 II
PEDAL . . 35A-18-II
Check and Adjustment . . 35A-8-II
ROTOR, Disc, Front, Check . . 35A-14-II
BREAKAWAY TORQUE, Tie Rod End Ball Joint, Check . . 37A-7-II
BUMPER
Front . . 51-4 II
Rear . . 51 7-II

C

CAMSHAFT <1 5L Engine> . . 11A-23-I, 11B-22-I
<1 8L Engine> . . 11C-20-I, 11D-24-I
OIL SEALS <1 5L Engine> . . 11A-23-I
<1 8L Engine> . . 11C 20 I
POSITION SENSOR, Check . . 16-38-I
CANISTER, Evaporative Emission . . 17-48-I
CAP, Distributor, Maintenance . . 00-34-I
CATALYTIC CONVERTER . . 17-46 I
CENTERMEMBER . . 32-7-II
CHARGING SYSTEM . . 16-2-I
CHARGING . . 55-9-II
CHECK VALVE, Operation Check . . 35A-10-II
CIGARETTE LIGHTER . . 54 50 II
CIRCUIT DIAGRAM . . 52B-8-II
CLOCK SPRING . . 52B-27-II
CLOCK . . 54-51-II
CLOSED THROTTLE POSITION SWITCH
Adjustment <1 5L Engine> . . 13A-141-I
<1 8L Engine> . . 13B-142-I
Check <1 5L Engine> . . 13A-153-I
<1 8L Engine> . . 13A-149-I
CLUTCH HOUSING . . 22B-54-I
CLUTCH . . 21B-3-I
Overdrive . . 23B-55-I
Reverse . . 23B-55-I
Underdrive . . 23B-52-I
CONTROL . . 21A-9-I
PEDAL . . 21A-8-I
Check and Adjustment . . 21A-5-I
RELEASE CYLINDER . . 21B 7-I
COIL, Ignition, Check <1 5L Engine> . . 16 35-I
<1 8L Engine> . . 16 36-I
COMBINATION METERS . . 54-21-II
COMPONENT LOCATION . . 52B-10-II
COMPRESSION PRESSURE, Check
<1.5L Engine> . . 11A-14-I
<1.8L Engine> . . 11C-11-I
COMPRESSOR . . 55-24-II
DRIVE BELT, Adjustment . . 55-8-II
NOISE, Check . . 55-14 II
CONDENSER . . 55-31-II
FAN MOTOR . . 55-31-II
CONFIGURATION DIAGRAMS . . 52B-7-II
CONNECTING ROD <1 5L Engine> . . 11B-38-I
<1 8L Engine> . . 11D-42-I
CONSOLE, Floor . . 52A-11-II
CONSTRUCTION DIAGRAM . . 52B-3-II
CONTROL HOUSING . . 22B-51-I
CONTROL LINK . . 34 6-II
CONTROL SYSTEM
Evaporative Emission . . 17-37-I
Purge, Check . . 17-38-I
CONTROL UNIT SRS AIR BAG (SRS ECU) 52B-26 II
COOLANT, Engine
Concentration Test . . 14-5-I
Replacement . . 14-5-I
Maintenance . . 00-44-I
Leak Check . . 14-5-I
CRANKCASE VENTILATION SYSTEM, Check . . 17-36-I

CRANKSHAFT <1 5L Engine> 11B-46-I
<1 8L Engine> 11D-50-I
OIL SEAL <1 5L Engine> 11A-26-I
<1.8L Engine> 11C-24-I
POSITION SENSOR 16-50-I
Check . . . . . 16-38 I
PULLEY <1 5L Engine> 11A-22-I
<1 8L Engine> 11C-19-I
CROSSMEMBER 32-8-II
CURB IDLE SPEED, Check <1 5L Engine> 11A-12-I
<1 8L Engine> 11C-9-I
CYLINDER BLOCK <1 5L Engine> 11B-46-I
<1.8L Engine> 11D-50-I
CYLINDER HEAD <1 5L Engine> 11B 27-I
<1 8L Engine> 11D-30-I
GASKET <1 5L Engine> 11A-28-I
<1 8L Engine> 11C-27-I
CYLINDER VALVES <1 5L Engine> 11B-27-I
<1 8L Engine> 11D-30-I

D

DEFOGGER, Rear Window 54-68-II
DIFFERENTIAL 23B-66-I
DIFFERENTIAL 22B-59-I
DISC BRAKE
Front 35A-22-II
Front, Thickness Check 35A-14-II
Front, Run-out Correction 35A-15-II
PADS, Maintenance 00-45-I
DISTRIBUTOR
<1 5L Engine> 16-49-I
CAP, Maintenance 00-34-I
ROTOR, Maintenance 00-34-I
DOOR OPENING WEATHERSTRIP 42-41-II
DOOR 42-30-II
GLASS 42-34-II
HANDLE 42-37-II
LATCH 42-37-II
MIRROR 51-20-II
REGULATOR 42-34-II
TRIM 42-32-II
DRIVE BELT
Maintenance 00-35-I
TENSION
Adjustment <1 5L Engine> 11A-8-I
<1 8L Engine> 11C-6-I
Check <1.5L Engine> 11A-8-I
<1.8L Engine> 11C-6-I
Compressor, Adjustment 55-8-II
Power Steering, Check 37A-8-II
OIL SEAL 23B-74-I
DRIVE GEAR, Transfer 23B-64-I
DRIVE SHAFT 26-12-II
BOOTS, Maintenance 00-46-I
DRUM AND LINING, Brake, Contact Check
<Basic Brakes> 35A-17-II
<ABS> 35B-27-II
DRUM BRAKE, Rear <Basic Brakes> 35A-29-II
<ABS> 35B-33-II
DUAL PRESSURE SWITCH, Check 55-8-II

E

EGR
PORT VACUUM, Check 17-44-I
SOLENOID, Check 17-44-I
<1 5L Engine> 13A-157-I
<1 8L Engine> 13A-152-I
SYSTEM, Check 17-42-I
VALVE, Check 17-43-I
ELEMENT, Air Cleaner, Maintenance 00-32-I
ENGINE <1.5L Engine> 11A-18-I
<1.8L Engine> 11C-15-I
COOLANT
Concentration Test 14-5-I
Leak Check 14-5-I
Maintenance 00-44-I
Replacement 14-5-I
COOLANT TEMPERATURE GAUGE SIMPLE, Check 54-19-II
COOLANT TEMPERATURE GAUGE UNIT, Check . 54-20-II
COOLANT TEMPERATURE SENSOR 17-40-I
Check <1 5L Engine> . . . . . 13A-152 I
<1 8L Engine> 13B-148-I
MOUNTING 32-4-II
OIL
Inspection 12-3-I
Maintenance 00-39-I
Replacement 12-3-I
OIL FILTER, Maintenance 00-40-I
ROLL STOPPER 32-7-II
EVAPORATIVE EMISSION
CANISTER 17-48-I
CONTROL SYSTEM 17-37-I
Maintenance 00-33-I
PURGE SOLENOID, Check 17-39-I
<1 5L Engine> 13A-157-I
<1 8L Engine> 13B-152-I
VENTILATION SOLENOID 17-48-I
EVAPORATOR 55-22-II
EXHAUST
GAS RECIRCULATION (EGR) SYSTEM 17-41-I
MANIFOLD 15-6-I
<1 5L Engine> 11B-21-I
<1 8L Engine> 11D-19-I
PIPE 15-8-I
SYSTEM, Maintenance 00-51-I

F

FAN MOTOR, Condenser 55-31-II
FENDER 42-8-II
FILLER DOOR, Fuel 42-9-II
FILTER, Engine Oil, Maintenance 00-40-I
FIXED SAS, Adjustment <1 5L Engine> 13A-143-I
<1 8L Engine> 13B-143-I
FLOOR CONSOLE 52A-11-II
FOG LIGHT 54-39-II
Aiming 54-36-II
LIGHT BULB, Replacement 54-38-II
FRONT AXLE HUB 26-7-II
FRONT BUMPER 51-4-II
FRONT DISC BRAKE 35A-22-II
Thickness Check 35A-14-II
PAD, Check and Replacement 35A-12-II
ROTOR, Check 35A-14-II
RUN-OUT Check 35A-15-II
RUN-OUT Correction 35A-15-II
FRONT SEAT 52A-20-II
FRONT SEAT BELT 52A-25-II
FRONT TURN-SIGNAL LIGHT 54-33-II
FRONT WHEEL ALIGNMENT, Check and Adjustment . . 33A-4-II
FUEL
FILLER DOOR 42-9-II
GAUGE SIMPLE, Check 54-18-II
GAUGE UNIT, Check 54-18-II
HOSES 00-32-I
PRESSURE TEST <1.5L Engine> 13A-144-I

<1 8L Engine> 13B-144-I
PUMP CONNECTOR, Disconnection <1 5L Engine> 13A 147-I
<1 8L Engine> 13B-144-I
PUMP, Operation Check <1 5L Engine> 13A 147-I
<1 8L Engine> 13B-144-I
PUMP RELAY, Continuity Check <1 5L Engine> 13A-152-I
<1 8L Engine> 13B-148-I
SYSTEM Maintenance 00-32-I
TANK 13C-3-I
FUEL AND EMISSION CONTROL SYSTEM
<1 5L Engine> 11B-17-I
<1 8L Engine> 11D-17-I

G

GARNISHES 51-10-II
GEAR BOX, Manual Steering 37A-15 II
GENERATOR 16-13-I
<1 5L Engine> 11B-10-I
<1 8L Engine> 11D-10-I
OUTPUT LINE VOLTAGE DROP, Test 16-6-I
GLASS
Door 42-34-II
Window 42-11-II
GUARD, Stone 51-12-II

H

HANDLE, Door 42 37-II
HAZARD WARNING LIGHT SWITCH 54-48 II
HEADLIGHT 54-33-II
Aiming with Gauges 54-28-II
Aiming with Screen 54-30-II
BULB, Replacement 54-32 II
HEADLINING 52A-17-II
HEATED OXYGEN SENSOR, Check <1 5L Engine> 13A-154-I
<1 8L Engine> 13B-150-I
HEATER
CONTROL 55-16-II
CORE 55-19-II
UNIT 55-19-II
HIGH MOUNTED STOP LIGHT 54-44-II
HOOD 42-3-II
HORN 54 49-II
HOUSING
Control 22B 51 I
Clutch 22B-54-I
HUB BOLT, Replacement <Front Axle> 26-5-II
<Rear Axle> 27-4-II
HUB END PLAY, Check 26 5-II
HYDRAULIC CIRCUIT 23A 64-I
HYDRAULIC PRESSURE, Test 23A-59-I
HYDRAULIC UNIT 35B-37-II
Check 35B-28-II

I

IDLE AIR CONTROL MOTOR (Stepper Motor), Check
<1 5L Engine> 13A-156-I
<1 8L Engine> 13B-152-I
IDLE MIXTURE, Check <1 5L Engine> 11A-13-I
<1 8L Engine> 11C-10-I
IDLE SPEED, Curb, Check <1 5L Engine> 11A-12-I
<1 8L Engine> 11C-9-I
IDLE-UP OPERATION, Check 55-15-II
IGNITION
CABLES, Maintenance 00-33-I
COIL, Check <1 5L Engine> 16-35-I
<1 8L Engine> 16-36-I
FAILURE SENSOR, Check <1 8L Engine> 16-37-I
POWER TRANSISTOR CONTINUITY, Check
<1 5L Engine> 16 36-I
PRIMARY VOLTAGE WAVEFORM Check 16-43-I
SECONDARY VOLTAGE WAVEFORM, Check 16-38-I
SWITCH 54-10-II
SYSTEM <1 5L Engine> 11B-10-I, 16-47-I
<1 8L Engine> 11D-10-I, 16-48-I
TIMING, Check <1 5L Engine> 11A-12-I
<1 8L Engine> 11C-9-I
INJECTOR <1 5L Engine> 13A-158-I
<1 8L Engine> 13B 153-I
Check <1 5L Engine> 13A-155-I
<1 8L Engine> 13B-152-I
INPUT SHAFT <A/T> 23B-52-I
<M/T> 22B-26-I
INSIDE REAR VIEW MIRROR 52A-19-II
INSTRUMENT PANEL 52A-8-II
INTAKE
AIR TEMPERATURE SENSOR 17 40-I
Check <1 5L Engine> 13A-152-I
<1 8L Engine> 13B-148-I
MANIFOLD 15-3-I
<1 5L Engine> 11B-21-I
<1 8L Engine> 11D-19-I
Vacuum Check 15 2-I
INTERIOR LIGHT 54-46-II
INTERLOCK SWITCH
Check and Adjustment 21A-7-I
Operating Check 21A-6-I

K

KEY INTERLOCK MECHANISM, Check 23A-71-I

L

LASH ADJUSTER, Check 11A-16-I, 11C-13-I
LATCH, Door 42-37-II
LID, Trunk 42 5 II
LIGHT
Fog 54 39-II
Front Turn-signal 54-33-II
High Mounted Stop 54-44-II
Interior 54-46-II
Rear Combination 54-43-II
LINE PRESSURE, Adjustment 23A-70-I
LINING AND DRUM, Brake, Contact Check
<Basic Brakes> 35A-17-II
<ABS> 35B-27-II
LOW-REVERSE BRAKE 23B-60-I
LOWER ARM
<Front Suspension> 33A-9-II
<Rear Suspension> 34-6-II
LUMINOUS INTENSITY, Measurement 54-32 II

M

MAGNETIC CLUTCH, Test 55-7-II
MAIN MUFFLER 15-8-I
MAINTENANCE, SRS 52B-22-II
MANUAL TRANSAXLE, Maintenance 00-41-I
MANUAL STEERING GEAR BOX 37A-15-II
MARKS 51-19-II
MASTER CYLINDER <Basic Brakes> 35A 19-II
<ABS> 35B 31-II
METERS Combination 54-21-II
MIRROR

Door 51-20-II
Rear View, Inside 52A-19-II
MOLDINGS 51 11-II
MUFFLER, Main 15-8-I
MULTIPORT FUEL INJECTION RELAY, Continuity Check
<1 5L Engine> 13A-152-I
<1 8L Engine> 13B-148-I

O

OIL FILTER
Engine, Maintenance 00-40-I
Replacement 12-4-I
OIL LEVEL, Transmission, Check 22A-7-I
OIL PAN <1 5L Engine> 11A-25-I, 11B-34-I
<1 8L Engine> 11C-22-I, 11D-37-I
OIL PUMP <1 5L Engine> 11B-34-I
<1 8L Engine> 11D-37-I
<A/T> 23B-51-I
Power Steering 37A-33-II
Pressure Test 37A-10-II
OUTPUT SHAFT <M/T> 22B-36-I
<A/T> ..... 23B 62 I
OUTPUT CURRENT Test 16-7-I
OVERDRIVE CLUTCH 23B-55-I
OVERDRIVE PLANETARY CARRIER ..... 23B-59 I

P

PARKING BRAKE
CABLE 36-6-II
LEVER 36 5-II
SWITCH, Check 36-4-II
LEVER, Stroke Check 36 3-II
PISTON <1 5L Engine> 11B 38-I
<1 8L Engine> 11D-42-I
POSITIVE CRANKCASE VENTILATION
SYSTEM 17 35-I
VALVE, Check 17-36-I
POST-COLLISION DIAGNOSIS 52B-22-II
POWER STEERING
FLUID, Level Check 37A-8-II
FLUID, Replacement 37A-8-II
GEAR BOX 37A-22-II
HOSES 37A-38-II
OIL PUMP ..... 37A 33 II
PRESSURE SWITCH, Check ..... 37A-11 II
POWER RELAY, A/C, Check 55-15-II
PRINTED-HEATER LINE, Check 54-68-II
PROPORTIONING VALVE <ABS> 35B-36-II
<Basic Brakes> 35A-32-II
Function Test 35A-10-II
PURGE CONTROL SYSTEM, Check 17-38-I
PURGE PORT VACUUM, Check 17-39-I

Q

QUARTER WINDOW GLASS <2-door Models> 42-17-II

R

RADIATOR 14-6-I
CAP VALVE, Opening Pressure Check 14 5-I
GRILLE 51-9-II
RADIO 54 65-II
REAR AXLE HUB 27-5-II
REAR BUMPER 51-7-II
REAR COMBINATION LIGHT 54-43-II
REAR DRUM BRAKE <Basic Brakes> 35A 29-II
<ABS> 35B-33-II
LININGS, Maintenance 00-45-I
WHEEL CYLINDER 35A-31-II
REAR HUB, Rotary Sliding Resistance Check 27-3-II
REAR SEAT 52A-22-II
REAR SEAT BELT 52A-26-II
REAR VIEW MIRROR, Inside 52A-19-II
REAR WHEEL ALIGNMENT, Check and Adjustment 34-4-II
REAR WHEEL CYLINDERS, Maintenance ..... 00 45 I
REAR WINDOW DEFOGGER 54-68-II
SWITCH 54-69-II
REAR WINDOW GLASS 42 19-II
RECEIVER DRIER, Test 55-7-II
REFRIGERANT
Leak Repair 55-14-II
LINE 55-29-II
REGULATED VOLTAGE, Test 16-9-I
REGULATOR, Door 42-34-II
RELAY
ABS Motor Continuity Check 35B-30-II
ABS Valve Continuity Check 35B-30-II
Fuel Pump, Continuity Check ..... Refer to F
Multiport Fuel Injection, Continuity Check ..... Refer to M
Power, Check 55 15-II
Starter, Continuity Check 16-21-I
RESISTOR 55-20-II
REVERSE CLUTCH 23B-55-I
REVERSE IDLER GEAR <F5M42> 22B-48-I
RHEOSTAT 54-47-II
ROCKER ARMS <1 5L Engine> 11B-22-I
<1 8L Engine> ..... 11D-24 I
ROLL STOPPER, Engine 32-7-II
ROTARY-SLIDING RESISTANCE, Rear Hub, Check 27-3-II
ROTOR
Disc Brake, Front Check 35A 14-II
Distributor, Maintenance 00-34-I
RUNCHANNEL, Window Glass 42-41-II

S

SCHEMATIC, SRS 52B-6-II
SEAT
Front 52A-20-II
Rear 52A-22-II
SEAT BELT
Front 52A-25-II
Rear ..... 52A 26 II
SECOND BRAKE 23B 61-I
SELECT LEVER 22B-50-I
SELECTOR LEVER, Operation Check 23A-70-I
SENSOR
Brake Fluid Level, Check 35A-11-II
Camshaft Position Check ..... 16-38 I
Crankshaft Position 16-50-I
Crankshaft Position, Check 16-38-I
Engine Coolant Temperature ..... 17-40 I
Engine Coolant Temperature, Check ..... Refer to E
Heated Oxygen, Check ..... Refer to H
Ignition Failure, Check <1 8L Engine> 16-37-I
Intake Air Temperature ..... 17-40 I
Intake Air Temperature, Check ..... Refer to I
Throttle Position, Adjustment ..... Refer to T
Throttle Position, Check ..... Refer to T
Volume Air Flow 17-40-I
Wheel Speed, Output Voltage Check 35B-27-II
WHEEL SPEED 35B 38-II
SHIFT LOCK MECHANISM, Check 23A-71-I
SHIFT LEVER 22A-10-I
SIGHT GLASS REFRIGERANT, Level Test 55-7-II

SOLENOID
EGR, Check . . . . Refer to E
Evaporative Emission Purge, Check Refer to E
VALVE, Check . . . 35B-30-II
SPARK PLUG
Check and Cleaning 16-37 I
Maintenance . . . 00-33-I
Test . . . 16 35-I
CABLE
Resistance Check 16-37-I
Test 16-35-I
SPEAKER 54-66-II
SPEEDOMETER
Check 54-17-II
<M/T> 22B-49-I
<A/T> . . 23B-73-I
SRS
Maintenance 00-47-I
AIR BAG CONTROL UNIT (SRS-ECU) 52B-26-II
MAINTENANCE 52B-22-II
SERVICE PRECAUTIONS . . 52B 10-II
TEST EQUIPMENT . . 52B 12-II
STABILIZER BAR . 33A-12-II
STARTER
MOTOR 16-22-I
RELAY, Continuity Check . . 16-21-I
STARTING SYSTEM . 16-19-I
STATIONARY STEERING EFFORT, Check . . 37A 7-II
STEERING
Stationary Effort Check 37A 7-II
ANGLE, Check 37A-6-II
SHAFT . 37A-12 II
LINKAGE SEALS, Maintenance . 00-46-I
WHEEL 37A-12-II
Angle Check . . 37A-6-II
Free Play Check . 37A-6-II
Return to Center Check 37A-7-II
STONE GUARD 51-12-II
STOP LIGHT SWITCH, Check . . . 35A 9-II
STRUT <Front Suspension> 33A-6-II
<Rear Suspension> . 34-11-II
SUNROOF 42 48-II
SWITCH
A/C 55-16-II
Air Conditioning, Check . . 17-40-I
Closed Throttle Position, Adjustment . Refer to C
Closed Throttle Position, Check . . . . Refer to C
Defogger, Rear Window . . . 54-68-II
Dual Pressure, Check . 55-8 II
Hazard Warning Light . . 54-48 II
Ignition 54-10-II
Parking Brake, Check . . 36-4-II
Power Steering Pressure, Check 37A-11-II
Stop Light, Check 35A-9-II

T

TACHOMETER Check 54-17-II
TAPE PLAYER 54 65-II
TENSION PULLEY 55-24 II
THERMOSTAT . 14-9-I
THROTTLE POSITION SENSOR
Adjustment <1 5L Engine> . 13A-141-I
<1 8L Engine> 13B-142 I
Check <1 5L Engine> 13A 153-I
<1 8L Engine> . 13B-148 I
THROTTLE BODY
<1 5L Engine> 13A-160-I
<1 8L Engine> 13B-155-I
THROTTLE BODY (THROTTLE VALVE AREA), Cleaning
<1 5L Engine> . 13A 141-I
<1 8L Engine> 13B-142-I
TIE ROD END BALL JOINT, Breakaway Torque Check 37A-7-II
TIMING BELT <1 5L Engine> 11A 32-I, 11B-12-I
<1 8L Engine> 11C-31-I, 11D-12-I
Maintenance . 00 34 I
TENSION, Adjustment <1 5L Engine> . 11A-15-I
<1 8L Engine> 11C-12-I
TIRE 31 5 II
Wear Check . . 31-5-II
INFLATION PRESSURE, Check 31-5-II
TORQUE CONVERTER, Stall Test 23A-58-I
TRAILING ARM . . 34-8-II
TRANSAXLE
Manual, Maintenance . . 00-41-I
Automatic, Maintenance 00 41-I
<M/T> 22A-11-I, 22B-11-I
<A/T> 23A-78-I, 23B-16-I
CASE . . . 22B-57-I
CONTROL <M/T> . 22A-8-I
<A/T> . 23A-73-I
MOUNTING 32-5-II
TRANSFER
DRIVE GEAR . . . . . 23B-64 I
TRANSMISSION OIL
Replacement . . 22A-7-I
LEVEL, Check 22A-7-I
TRIM, Door 42-32-II
TRIMS . . . 52A-13-II
TRUNK LID . . . 42-5-II

U

UNDER COVER . . 42-55-II
UNDERDRIVE CLUTCH . . 23B 52-I
UPPER LINK 34-6-II

V

VACUUM
EGR Port Check . 17 44-I
Manifold, Check <1 5L Engine> 11A-15 I
<1 8L Engine> 11C-12-I
Purge Port, Check . . 17-39-I
CIRCUIT DIAGRAM . 17-33-I
CONTROL VALVE, Check . . 17-43-I
HOSES 17-31-I
Check . . 17-35 I
Installation 17-35-I
Routing . . 17-31-I
VALVE BODY 23B 69 I
VENTILATORS 55-33-II
VOLUME AIR FLOW SENSOR 17 40-I

W

WARNING/CAUTION LABELS 52B-4-II
WASHER, Windshield . . 51-16-II
WATER HOSE <1 5L Engine> . . . 11B-19-I, 14-13-I
<1 8L Engine> 11D-21-I, 14-15-I
WATER PIPE <1 5L Engine> 14-13-I
<1 8L Engine> 14-15-I
WATER PUMP <1 5L Engine> 11B-19-I, 14-11-I
<1 8L Engine> . . 11D-21-I, 14-12-I
WATERPROOF FILM 42-32-II
WAVEFORM
Check using analyzer . . . 16-11-I
Ignition Primary Voltage, Check 16-43-I

Ignition Secondary Voltage, Check .. 16-38-I
WEATHERSTRIP, Door Opening .. 42-41-II
WHEEL .. 31-5-II
Runout Check 31 5 II
ALIGNMENT
Front Check and Adjustment 33A-4-II
Rear, Check and Adjustment 34-4-II
BEARING, End Play Check 27-3-II
CYLINDER 35B-35-II
Drum Brake, Rear 35A-31-II
SPEED SENSOR 35B-38 II
Output Voltage Check 35B-27-II
WINDOW GLASS 42 11 II
RUNCHANNEL 42-41-II
WINDSHIELD 42-13-II
WASHER 51-16-II
WIPER 51-16-II
WIPER, Windshield 51-16-II

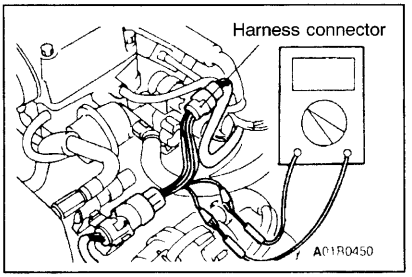
GENERAL <ELECTRICAL>

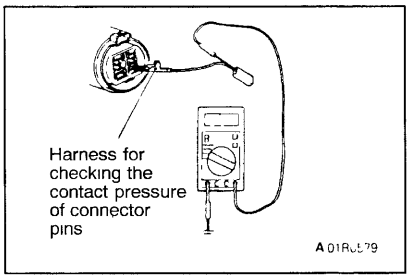
CONTENTS

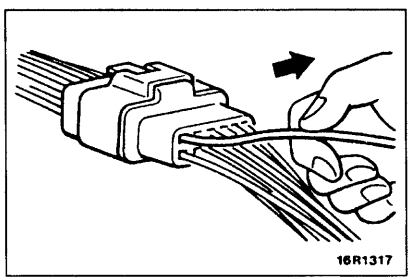
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HARNESS CONNECTOR INSPECTION 2

HOW TO DIAGNOSE 5







HARNESS CONNECTOR INSPECTION

00100390048

CONNECTOR CONTINUITY AND VOLTAGE TEST

Follow the steps below to avoid causing poor connector contact and/or reduced waterproof performance of connectors when checking continuity and/or voltage at connectors of waterproof connectors.

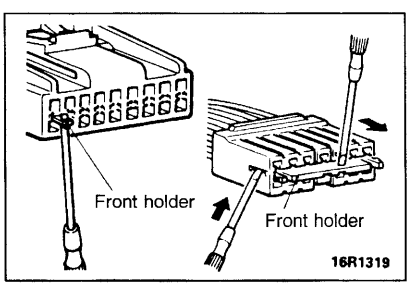
(1) If checking is performed with the circuit in the state of continuity, be sure to use the special tool (harness connector). Never insert a test bar from the harness side, because to do so will reduce the waterproof performance and result in corrosion.
(2) If the connector is disconnected for checking and the facing part is the female pin side, the harness for checking the contact pressure of connector pins should be used. Never force the insertion of a test bar, because to do so will cause poor or improper contact.
(3) If the facing part is the male pin side, contact the test bar directly to the pins. Care must be taken not to short-circuit the connector pins.

IMPROPER TERMINAL ENGAGEMENT CHECK

When the terminal stopper of the connector is out of order, engagement of the male and female terminals becomes improper even when the connector itself is engaged perfectly and terminal sometimes slips out to rear side of connector. Make sure, that each terminal does not come off the connector by pulling each harness wire.

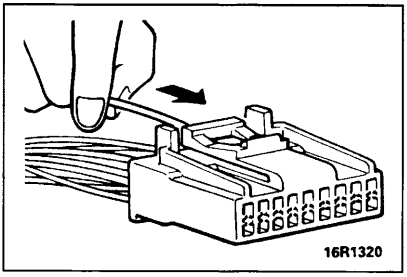
CONNECTOR TERMINAL ENGAGEMENT AND DISENGAGEMENT

A connector that engages loosely can be repaired by removing the female terminal from the connector housing and raising its lance to establish securer engagement. Removal of the connector terminal used for MFI and ELC-4 A/T control circuit can be done in the following manner.

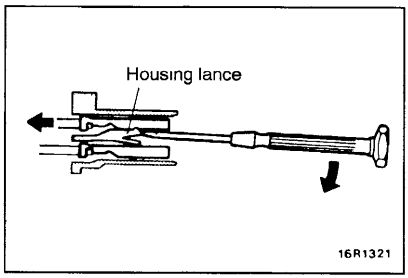


COMPUTER CONNECTOR

(1) Insert a screwdriver [1.4 mm (.06 in.) width] as shown in the figure, disengage front holder, and remove it.

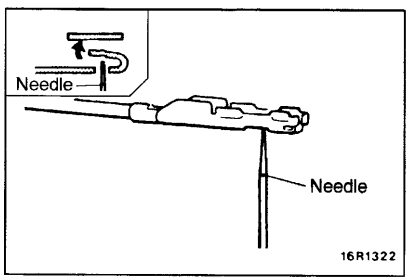


(2) Insert the harness terminal to be repaired deep into the connector from harness side and hold it there.



(3) Insert the tip of the screwdriver [1.4 mm (.06 in.) width] into the connector as shown in the figure, raise the housing lance slightly with it, and pull out the harness.

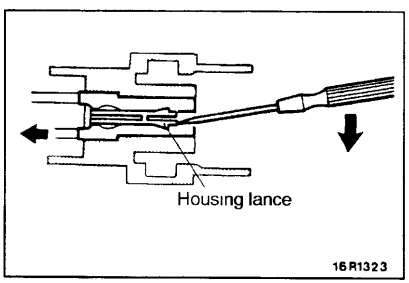
Caution
Tool No. 753787-1 supplied by AMP can be used instead of screwdriver.

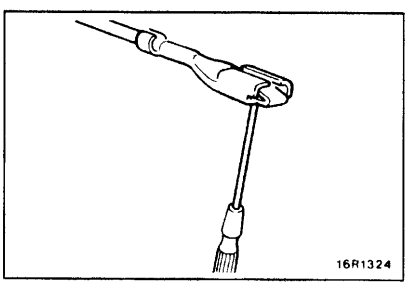


(4) Insert a needle through the hole provided on the terminal and raise the contact point of the male terminal.

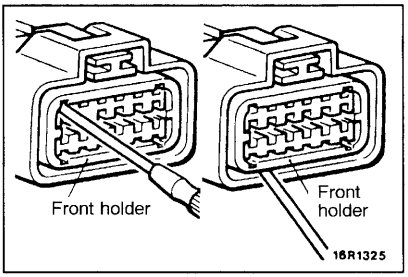
ROUND WATERPROOF CONNECTOR

(1) Remove the waterproof cap by using a screwdriver.
(2) Insert the tip of the screwdriver [1.4 mm (.06 in.) or 2.0 mm (.08 in.) width] into the connector as shown in the figure, raise the housing lance slightly with it, and pull out harness.



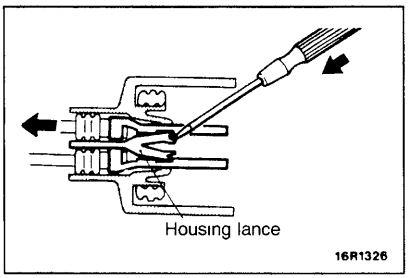


(3) Insert a screwdriver through the hole provided on the terminal and raise the contact point of the male terminal.

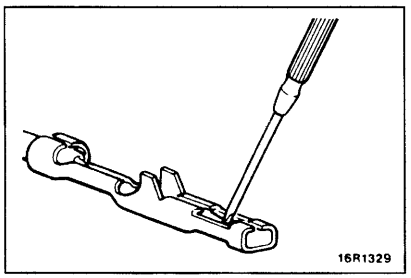


RECTANGULAR WATERPROOF CONNECTOR

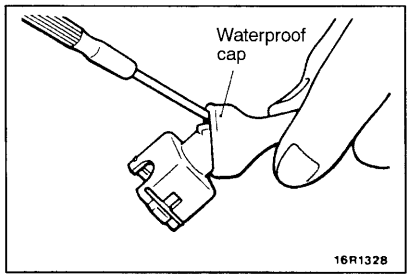
(1) Disengage the front holder by using a screwdriver and remove it.



(2) Insert the tip of a screwdriver [*0.8 mm (.03 in.) width] into the connector as shown in the figure, push it lightly to raise the housing lance, and pull out the harness.
*If the right size screwdriver is not available, convert a conventional driver to the proper size.

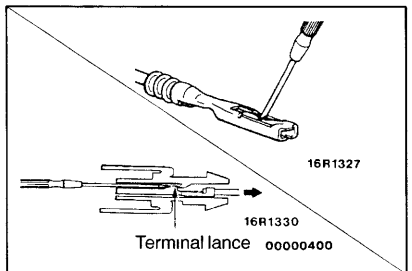


(3) Press the contact point of the male terminal down by holding a screwdriver [1.4 mm (.06 in.) width] as shown in the figure.



INJECTOR CONNECTOR

(1) Remove the waterproof cap.



(2) Insert the tip of a screwdriver [1.4 mm (.06 in.) width] into the connector as shown in the figure, press in the terminal lance, and pull out the harness.
(3) Press the contact point of the male terminal down by holding a screwdriver [1.4 mm (.06 in.) width] as shown in the figure.

Caution
Make sure the lance is in the proper condition before the terminal is inserted into the connector.

HOW TO DIAGNOSE

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The most important point in troubleshooting is to determine "Probable Causes". Once the probable causes are determined, parts to be checked can be limited to those associated with such probable causes. Therefore, unnecessary checks can be eliminated The determination of the probable causes must be based on a theory and be supported by facts and must not be based on intuition only.

TROUBLESHOOTING STEPS

If an attempt is made to solve a problem without going through correct steps for troubleshooting, the problem symptoms could become more complicated, resulting in failure to determine the causes correctly and making incorrect repairs. The four steps below should be followed in troubleshooting.

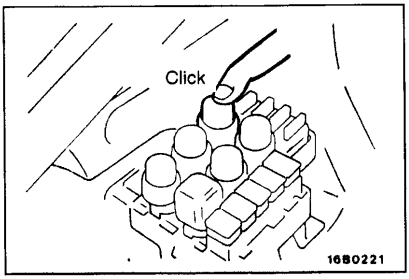
1	**Observation of Problem Symptoms**	Observe the symptom carefully. Check if there are also other problems.
2	**Determination of Probable Causes**	In determining the probable causes, it is necessary to check the wiring diagram to understand the circuit as a system. Knowledge of switches, relays and other parts is necessary for accurate determination. The causes of similar problems in the past must be taken into account.
3	**Checking of Parts Associated with Probable Causes and Determination of Faulty Parts**	Troubleshooting is carried out by making step by step checks until the true cause is found. Always go through the procedures considering what check is to be made where for the best results.
4	**Repair and Confirmation**	After the problems are corrected, be sure to check that the system operates correctly. Also check that new problems have not been caused by the repair.

INFORMATION FOR DIAGNOSIS

This manual contains the cable diagrams as well as the individual circuit drawings, operational explanations, and troubleshooting hints for each component required to facilitate the task of troubleshooting. The information is complied in the following manner:

(1) Cable diagrams show the connector positions, etc., on the actual vehicle as well as the harness path.
(2) Circuit drawings show the configuration of the circuit with all switches in their normal positions.
(3) Operational explanations include circuit drawings of voltage flow when the switch is operated and how the component operates in reaction.
(4) Troubleshooting hints include numerous examples of problems which might occur, traced backward in a common-sense manner to the origin of the trouble. Problems whose origins may not be found in this manner are pursued through the various system circuits.

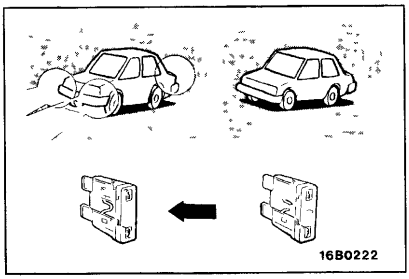
NOTE
Components of ECI, ETACS, ECS, etc. with ECU do not include 3 and 4 above. For this information, refer to a manual which includes details of these components



INSPECTION

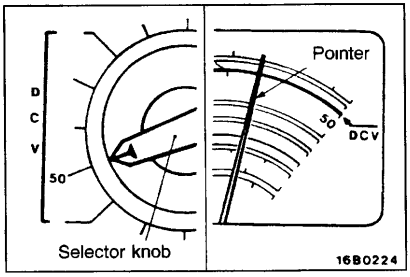
1. Visual and aural checks

Check relay operation, blower motor rotation, light illumination, etc. visually or aurally. The flow of current is invisible but can be checked by the operation of the parts.



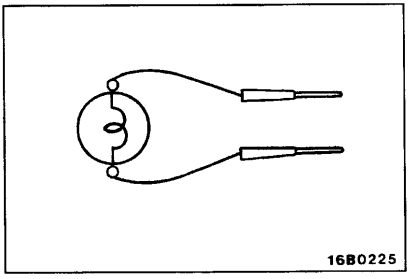
2. Simple checks

For example, if a headlight does not come on and a faulty fuse or poor grounding is suspected, replace the fuse with a new one or ground the light to the body by a jumper wire to determine which part is responsible for the problem.



3. Checking with instruments

Use an appropriate instrument in an adequate range and read the indication correctly. You must have sufficient knowledge and experience to handle instruments correctly.

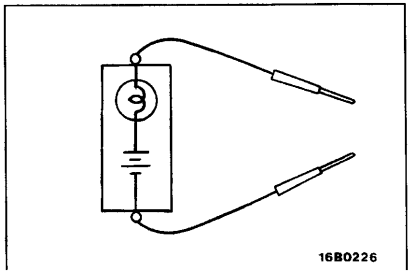


INSPECTION INSTRUMENTS

For inspection, use the following instruments:

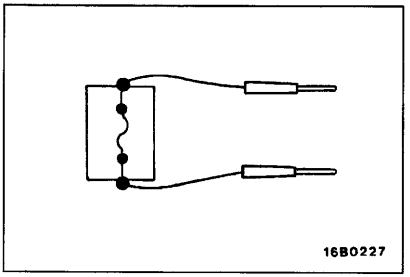
1. Test lights

A test light consists of a 12V bulb and lead wires. It is used to check voltages or shortcircuits.



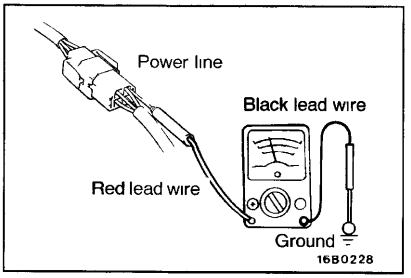
2. Self-power test light

A self-power test light consists of a bulb, battery and lead wires connected in series. It is used to check continuity or grounding.



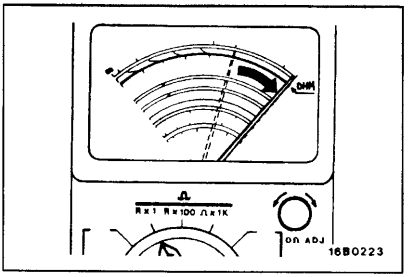
3. Jumper wire

A jumper wire is used to close an open circuit. Never use one to connect a power supply directly to a load.



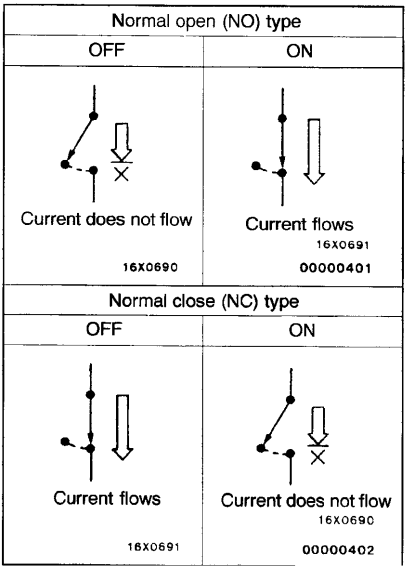
4. Voltmeter

A voltmeter is used to measure the circuit voltage. Normally, the positive (red lead) probe is applied to the point of voltage measurement and the negative (black lead) probe to the body ground.



5. Ohmmeter

An ohmmeter is used to check continuity or measure resistance of a switch or coil. If the measuring range has been changed, the zero point must be adjusted before measurement.

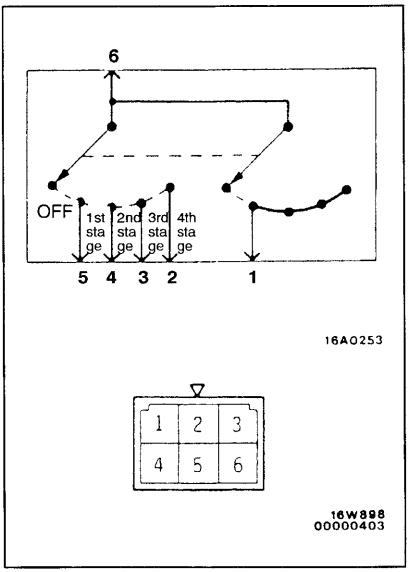


CHECKING SWITCHES

In a circuit diagram, a switch is represented by a symbol and in the idle state.

1. Normal open or normal close switch

Switches are classified into those which make the circuit open and those which make the circuit closed when off.

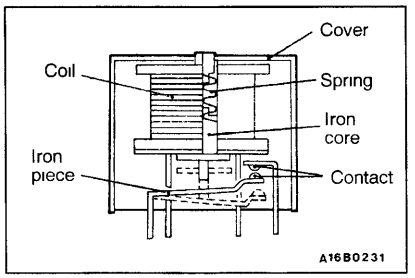


2. Switch connection

This figure illustrates a complex switch. The continuity between terminals at each position is as indicated in the table below.

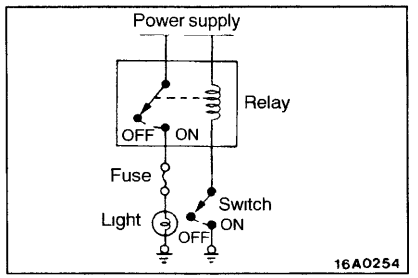
Position	Terminal No.					
	1	2	3	4	5	6
OFF						
1st stage	○				○	○
2nd stage	○			○		○
3rd stage	○		○			○
4th stage	○	○				○

NOTE
○—○ denotes continuity between terminals.

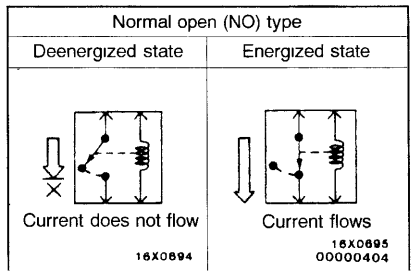


CHECKING RELAYS

1. When current flows through the coil of a relay, its core is magnetized to attract the iron piece, closing (ON) the contact at the tip of the iron piece. When the coil current is turned off, the iron piece returns to its original position by a spring, opening the contact (OFF).

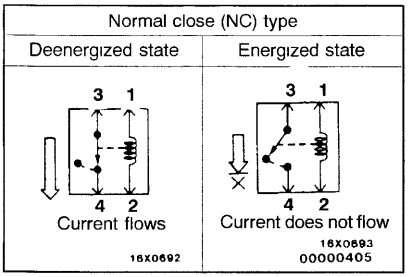


2. By using a relay, a heavy current can be turned on and off by a switch of small capacity. For example, in the circuit shown here, when the switch is turned on (closed), current flows to the coil of the relay. Then, its contact is turned on (closed) and the light comes on. The current flowing at this time to the switch is the relay coil current only, and is very small.

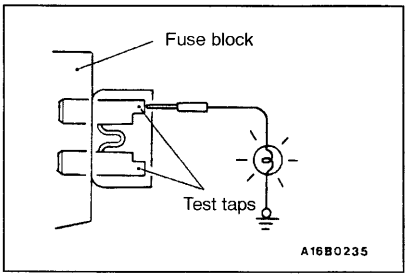


3. The relays may be classified into the normal open-type and the normal close-type by their contact construction.

NOTE
The deenergized state means that no current is flowing through the coil and the energized state means that current is flowing through the coil.

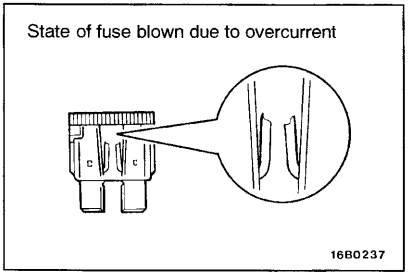


When a normal close-type relay as illustrated here is checked, there should be continuity between terminals 1 and 2 and between terminals 3 and 4 when the relay is deenergized, and the continuity should be lost between terminals 3 and 4 when the battery voltage is applied to the terminals 1 and 2. A relay can be checked in this manner. It cannot be determine if a relay is okay or faulty by checking its state only when it is deenergized (or energized).



CHECKING FUSES

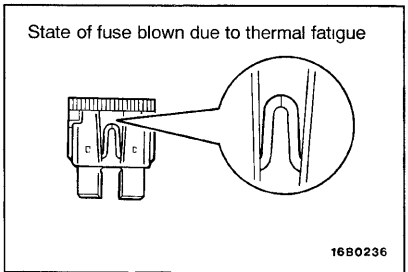
A blade type fuse has test taps provided to allow checking of the fuse itself without removing it from the fuse block. The fuse is okay if the test light comes on when its one lead is connected to the test taps (one at a time) and the other lead is grounded. (Change the ignition switch position so that the fuse circuit becomes live.)



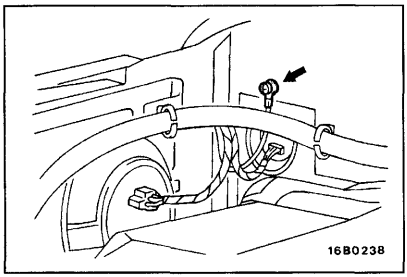
CAUTIONS IN EVENT OF BLOWN FUSE

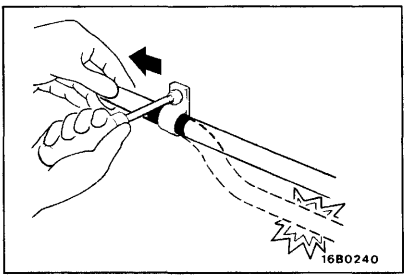
When a fuse is blown, there are two probable causes as follows: One is that it is blown due to flow of current exceeding its rating. The other is that it is blown due to repeated on/off current flowing through it. Which of the two causes is responsible can be easily determined by visual check as described below.

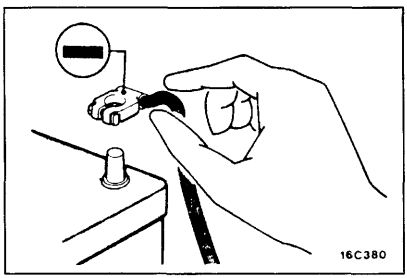
(1) Fuse blown due to current exceeding rating
The illustration shows the state of a fuse blown due to this cause. In this case, do not replace the fuse with a new one hastily since a current heavy enough to blow the fuse has flowed through it. First, check the circuit use only a fase of the for shorts and check for abnormal electric parts. After correcting shorts or replacing parts, use only a fuse of the same capacity as a replacement. Never use a fuse of larger capacity than the one that has blown. If such a fuse is used, electric parts or wirings could be damaged before the fuse blows in the event an overcurrent occurs again.

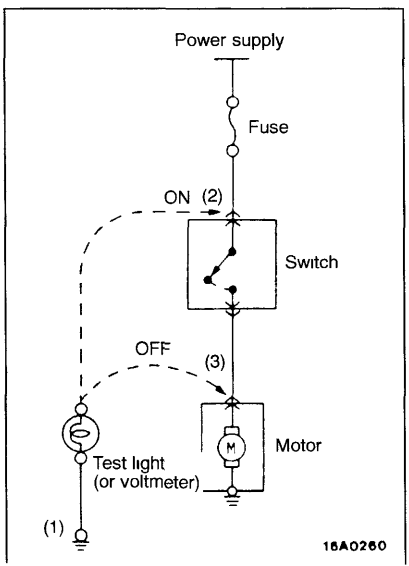


(2) Fuse blown due to repeated current on/off
The illustration shows the state of a fuse blown due to repeated current on/off. Normally, this type of problem occurs after a fairly long period of use and is less frequent than the above type. In this case, simply replace with a new fuse of the same capacity.









CABLES AND WIRES CHECK

1. Check connections for looseness, rust and stains.
2. Check terminals and wires for corrosion by battery electrolyte, etc.
3. Check terminals and wires for open circuit or impending open circuit.
4. Check wire insulation and coating for damage, cracks and degrading.
5. Check conductive parts of terminals for contact with other metallic parts (vehicle body and other parts).
6. Check grounding parts to verify that there is complete continuity between attaching bolt(s) and vehicle body
7. Check for incorrect wiring.
8. Check that wirings are clamped to prevent contact with sharp corners of the vehicle body, etc. or hot parts (exhaust manifold, pipe, etc.).
9. Check that wirings are clamped firmly to secure enough clearance from the fan pulley, fan belt, and other rotating or moving parts.
10. Check that the wirings between the fixed parts such as the vehicle body and the vibrating parts such as the engine are made with adequate allowance for vibrations.

BATTERY HANDLING

When checking or servicing does not require power from the on-vehicle battery, be sure to disconnect the cable from the battery (-) terminal. This is to prevent problems that could be caused by a short circuit. Disconnect the (-) terminal first and reconnect it last.

GENERAL ELECTRICAL SYSTEM CHECK

A circuit consists of the power supply, switch, relay, load, ground, etc. There are various methods to check a circuit including an overall check, voltage check, short-circuit check, and continuity check. Each of # these methods is briefly described in the following:

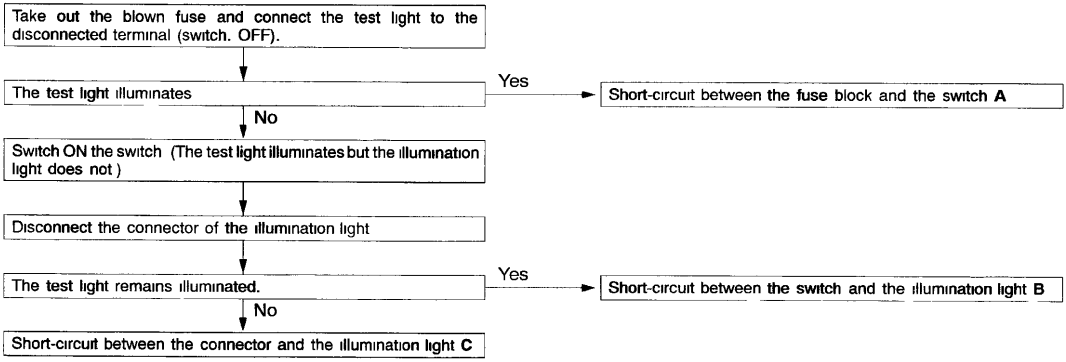
1. VOLTAGE CHECK

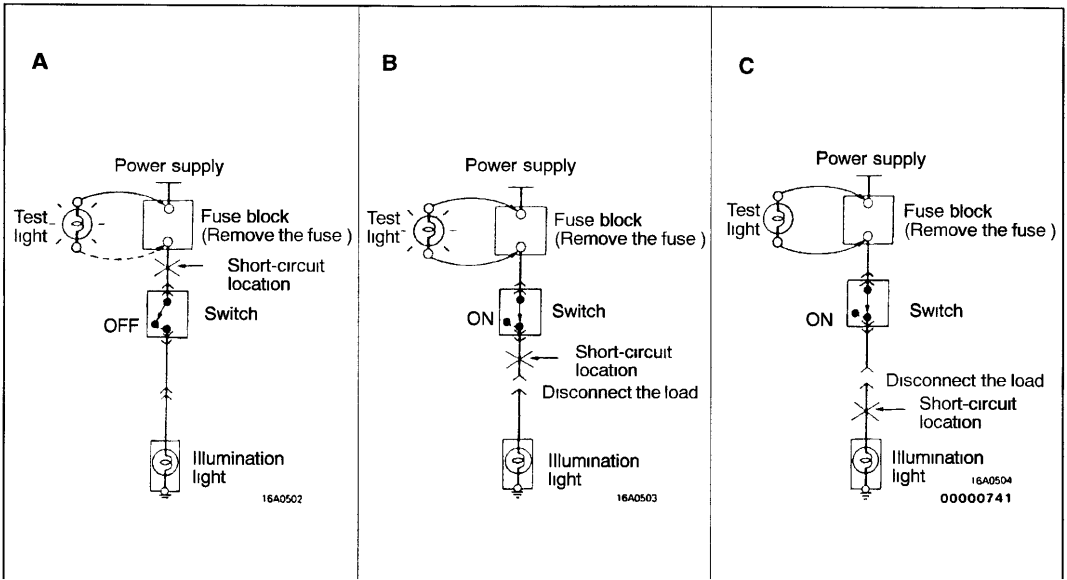
(1) Ground one lead wire of the test light. If a voltmeter is used instead of the test light, ground the grounding side lead wire.
(2) Connect the other lead wire of the test light to the power side terminal of the switch connector. The test light should come on or the voltmeter should indicate a voltage.
(3) Then, connect the test light or voltmeter to the motor connector. The test light should not come on, or the voltmeter should indicate no voltage. When the switch is turned on in this state, the test light should come on, or the voltmeter should indicate a voltage, with motor starting to run.

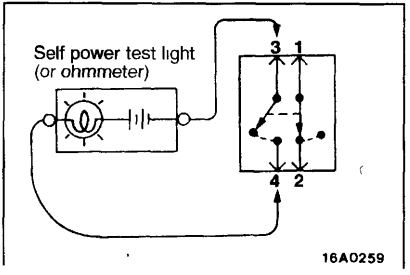
(4) The circuit illustrated here is normal. If there is any problem, such as the motor failing to run, check voltages beginning at the connector nearest to the motor until the faulty part is identified.

2. SHORT-CIRCUIT CHECK

Because the fuse has blown, it is probable that there is a short circuit. Follow the procedures below to narrow down the short-circuit location.







3. CONTINUITY CHECK

(1) When the switch is in the OFF position, the self power test light must illuminate or the ohmmeter should read 0 ohm, only when the terminals 1 and 2 are interconnected.

(2) When the switch is the ON position, the self power test light should come on or the ohmmeter should read 0 ohm, only when the terminals 3 and 4 are interconnected.

GENERAL

CONTENTS

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GENERAL <BODY AND CHASSIS> 00

GENERAL <ELECTRICAL> 00E

GENERAL <BODY AND CHASSIS>

CONTENTS

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GENERAL DATA AND SPECIFICATIONS .. 24

HOW TO USE THIS MANUAL 3
- Definition of Terms 3
- Explanation of Manual Contents 4
- Model Indications 3
- Maintenance, Repair and Servicing Explanations 3
- Special Tool Note 3
- Tightening Torque Indication 3

HOW TO USE TROUBLESHOOTING/ INSPECTION SERVICE POINTS 6
- Connector Inspection Service Points 10
- Connector Measurement Service Points 9
- How to Cope with Intermittent Malfunctions ... 11
- How to Use the Inspection Procedures 8
- Inspection Service Points for a Blown Fuse ... 12
- Troubleshooting Contents 6

LUBRICATION AND MAINTENANCE 27

MAIN SEALANT AND ADHESIVE TABLE .. 52

MAINTENANCE SERVICE 32
- Air Cleaner Element 32
- Automatic Transaxle 41
- Ball Joint and Steering Linkage Seals 46
- Brake Hoses 46
- Disc Brake Pads 45
- Distributor Cap and Rotor 34
- Drive Belt 35
- Drive Shaft Boots 46
- Engine Coolant 44
- Engine Oil 39
- Engine Oil Filter 40
- Evaporative Emission Control System 33
- Exhaust System 51
- Fuel Hoses 32
- Fuel System 32
- Ignition Cables 33
- Manual Transaxle 41
- Rear Drum Brake Linings and Rear Wheel Cylinders 45
- Spark Plugs 33
- SRS Air Bag System 47
- Timing Belt 34

PRECAUTIONS BEFORE SERVICE 19

RECOMMENDED LUBRICANT AND LUBRICANT CAPACITY TABLE 28

SCHEDULED MAINTENANCE TABLE 31

TIGHTENING TORQUE 26

TOWING AND HOISTING 21

VEHICLE IDENTIFICATION 13
- Engine Model Stamping 16
- Theft Protection 16
- Vehicle Identification Code Chart Plate 13
- Vehicle Identification Number List 14
- Vehicle Identification Number Location 13
- Vehicle Information Code Plate 15
- Vehicle Safety Certification Label 15

HOW TO USE THIS MANUAL

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MAINTENANCE, REPAIR AND SERVICING EXPLANATIONS

This manual provides explanations, etc. concerning procedures for the inspection, maintenance, repair and servicing of the subject model. Unless otherwise specified, each service procedure covers all models. Procedures covering specific models are identified by the model codes, or similar designation (engine type, transaxle type, etc.). A description of these designations is covered in this manual under "VEHICLE IDENTIFICATION".

ON-VEHICLE SERVICE

"On-vehicle Service" are procedures for performing inspections and adjustments of particularly important locations with regard to the construction and for maintenance and servicing, but other inspections (for looseness, play, cracking, damage, etc.) must also be performed.

SERVICE PROCEDURES

The service steps are arranged in numerical order. Attention must to be paid in performing vehicle service are described in detail in SERVICE POINTS.

DEFINITION OF TERMS

STANDARD VALUE

Indicates the value used as the standard for judging the quality of a part or assembly on inspection or the value to which the part or assembly is corrected and adjusted. It is given by tolerance.

LIMIT

Shows the standard for judging the quality of a part or assembly on inspection and means the maximum or minimum value within which the part or assembly must be kept functionally or in strength. It is a value established outside the range of standard value.

REFERENCE VALUE

Indicates the adjustment value prior to starting the work (presented in order to facilitate assembly and adjustment procedures, and so they can be completed in a shorter time).

CAUTION

Indicates the presentation of information particularly vital to the worker during the performance of maintenance and servicing procedures in order to avoid the possibility of injury to the worker, or damage to component parts, or a reduction of component or vehicle function or performance, etc.

TIGHTENING TORQUE INDICATION

The tightening torque shown in this manual is a basic value with a tolerance of ± 10% except the following cases when the upper and lower limits of tightening torque are given.

(1) The tolerance of the basic value is within ± 10%.
(2) Special bolts or the like are in use.
(3) Special tightening methods are used.

SPECIAL TOOL NOTE

Only MMC special tool part numbers are called out in the repair sections of this manual. Please refer to the special tool cross reference chart, which is located in the service manual at the beginning of each group, for a cross reference from the MMC special tool number to the special tool number that is available in your market.

MODEL INDICATIONS

The following abbreviations are used in this manual for classification of model types.

M/T : Indicates the manual transaxle, or models equipped with the manual transaxle.
A/T : Indicates the automatic transaxle, or models equipped with the automatic transaxle.

EXPLANATION OF MANUAL CONTENTS

Indicates procedures to be performed before the work in that section is started, and procedures to be performed after the work in that section is finished

Component Diagram

A diagram of the component parts is provided near the front of each section in order to give the reader a better understanding of the installed condition of component parts

Indicates (by symbols) where lubrication is necessary

Maintenance and Servicing Procedures

The numbers provided within the diagram indicate the sequence for maintenance and servicing procedures

- Removal steps
  The part designation number corresponds to the number in the illustration to indicate removal steps
- Disassembly steps
  The part designation number corresponds to the number in the illustration to indicate disassembly steps
- Installation steps :
  Specified in case installation is impossible in reverse order of removal steps Omitted if installation is possible in reverse order of removal steps
- Reassembly steps
  Specified in case reassembly is impossible in reverse order of disassembly steps Omitted if reassembly is possible in reverse order of disassembly steps

Classifications of Major Maintenance / Service points

When there are major points relative to maintenance and servicing procedures (such as essential maintenance and service points, maintenance and service standard values, information regarding the use of special tools, etc), these are arranged together as major maintenance and service points and explained in detail

◀A▶ Indicates that there are essential points for removal or disassembly.

▶A◀ . Indicates that there are essential points for installation or reassembly

Symbols for Lubrication, Sealants and Adhesives

Information concerning the locations for lubrication and for application of sealants and adhesives is provided, by using symbols, in the diagram of component parts or on the page following the component parts page, and explained

- Grease (multipurpose grease unless there is a brand or type specified)
- Sealant or adhesive
- Brake fluid or automatic transmission fluid
- Engine oil, gear oil or air conditioning compressor oil
- Adhesive tape or butyl rubber tape

Indicates the group title

Indicates the section title

Indicates the group number

Indicates the page number

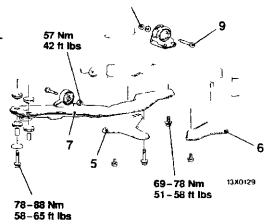
STEERING - Power Steering Gear Box 37A-23

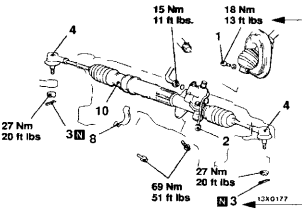
POWER STEERING GEAR BOX

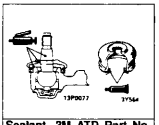
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REMOVAL AND INSTALLATION

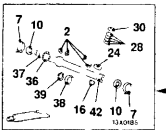
Pre-removal Operation
- Power Steering Fluid Draining (Refer to P.37A-15.)
- Stabilizer Bar Removal (Refer to GROUP 33A - Stabilizer Bar)





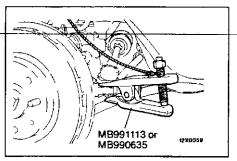


Sealant 3M ATD Part No 8663 or equivalent



Steering gear seal kit

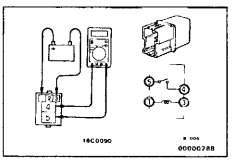
Removal steps
1. Joint assembly and gear box connecting bolt
2. Solenoid valve connector <Vehicles with EPS>
3. Cotter pin
- ◀A▶ ▶A◀ 4. Connection for tie rod end and knuckle
5. Stay (L.H.)
6. Stay (R.H.)
7. Center member assembly
8. Clamp
- ◀B▶ 9. Bolt
- ◀C▶ 10. Gear box assembly



REMOVAL SERVICE POINTS

◀A▶ TIE-ROD END DISCONNECTION

Caution
1. Be sure to tie the cord of the special tool to the nearby part
2. Loosen the nut but do not remove it

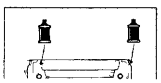


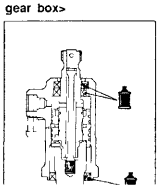
FOG LIGHT RELAY CONTINUITY CHECK

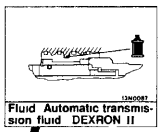
Battery voltage	Terminal			
	1	3	4	5
Power is not supplied	○	○		
Power is supplied	⊕	○	○	○

LUBRICATION AND SEALING POINTS

<Conventional power steering gear box>







Fluid Automatic transmission fluid DEXRON II

Denotes tightening torque If there is no indication of tightening torque, refer to TIGHTENING TORQUE

N denotes a non-reusable part

Repair kit or set parts are shown (Only very frequently used parts are shown)

Operating procedures, cautions, etc on removal, installation, disassembly and reassembly are described

○—○ indicates that there is continuity between the terminals
⊕—⊖ indicates terminals to which battery voltage is applied

The title of the page (following the page on which the diagram of Component parts is presented) indicating the locations of lubrication and sealing procedures

HOW TO USE TROUBLESHOOTING/INSPECTION SERVICE POINTS

00100020121

Troubleshooting of electronic control systems for which the scan tool can be used follows the basic outline described below. Furthermore, even in systems for which the scan tool cannot be used, part of these systems still follow this outline.

TROUBLESHOOTING CONTENTS

1. STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING

The main procedures for diagnostic troubleshooting are shown.

2. SYSTEM OPERATION AND SYMPTOM VERIFICATION TESTS

If verification of the trouble symptoms is difficult, procedures for checking operation and verifying trouble symptoms are shown.

3. DIAGNOSTIC FUNCTION

The following diagnostic functions are shown.
- Method of reading diagnostic trouble codes
- Method of erasing diagnostic trouble codes
- Input inspection service points

4. INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES

5. INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES

Indicates the inspection procedures corresponding to each diagnostic trouble code. (Refer to the next page on how to read the inspection procedures.)

6. INSPECTION CHART FOR TROUBLE SYMPTOMS

If there are trouble symptoms, even though the results of inspection using the scan tool show that all diagnostic trouble codes are normal, inspection procedures for each trouble symptom will be found by means of this chart.

7. INSPECTION PROCEDURE FOR DIAGNOSTIC SYMPTOM

Indicates the inspection procedures corresponding to each trouble symptoms classified in the Inspection Chart for Trouble Symptoms. (Refer to the next page on how to read the inspection procedures.)

8. SERVICE DATA REFERENCE TABLE

Inspection items and normal judgement values have been provided in this chart as reference information.

9. CHECK AT ECU TERMINALS

Terminal numbers for the ECU connectors, inspection items and standard values have been provided in this chart as reference information.

Terminal Voltage Checks

1. Connect a needle-nosed wire probe or paper clip to a voltmeter probe.
2. Insert the needle-nosed wire probe into each of the ECU connector terminals from the wire side, and measure the voltage while referring to the check chart.

NOTE
1. Measure voltage with the ECU connectors connected.
2. You may find it convenient to pull out the ECU to make it easier to reach the connector terminals.
3. Checks don't have to be carried out in the order given in the chart.

Caution
Short-circuiting the positive (+) probe between a connector terminal and ground could damage the vehicle wiring, the sensor, the ECU, or all three.
Use care to prevent this !

3. If voltage readings differ from Normal Condition values, check related sensors, actuators, and wiring, then replace or repair.

4. After repair or replacement, recheck with the voltmeter to confirm that the repair has corrected the problem.

Terminal Resistance and Continuity Checks

1. Turn the ignition switch to "OFF".
2. Disconnect the ECU connector.
3. Measure the resistance and check for continuity between the terminals of the ECU harness-side connector while referring to the check chart.

NOTE
Checks don't have to be carried out in the order given in the chart.

Caution
If resistance and continuity checks are performed on the wrong terminals, damage to the vehicle wiring, sensors, ECU, and/or ohmmeter may occur.
Use care to prevent this!

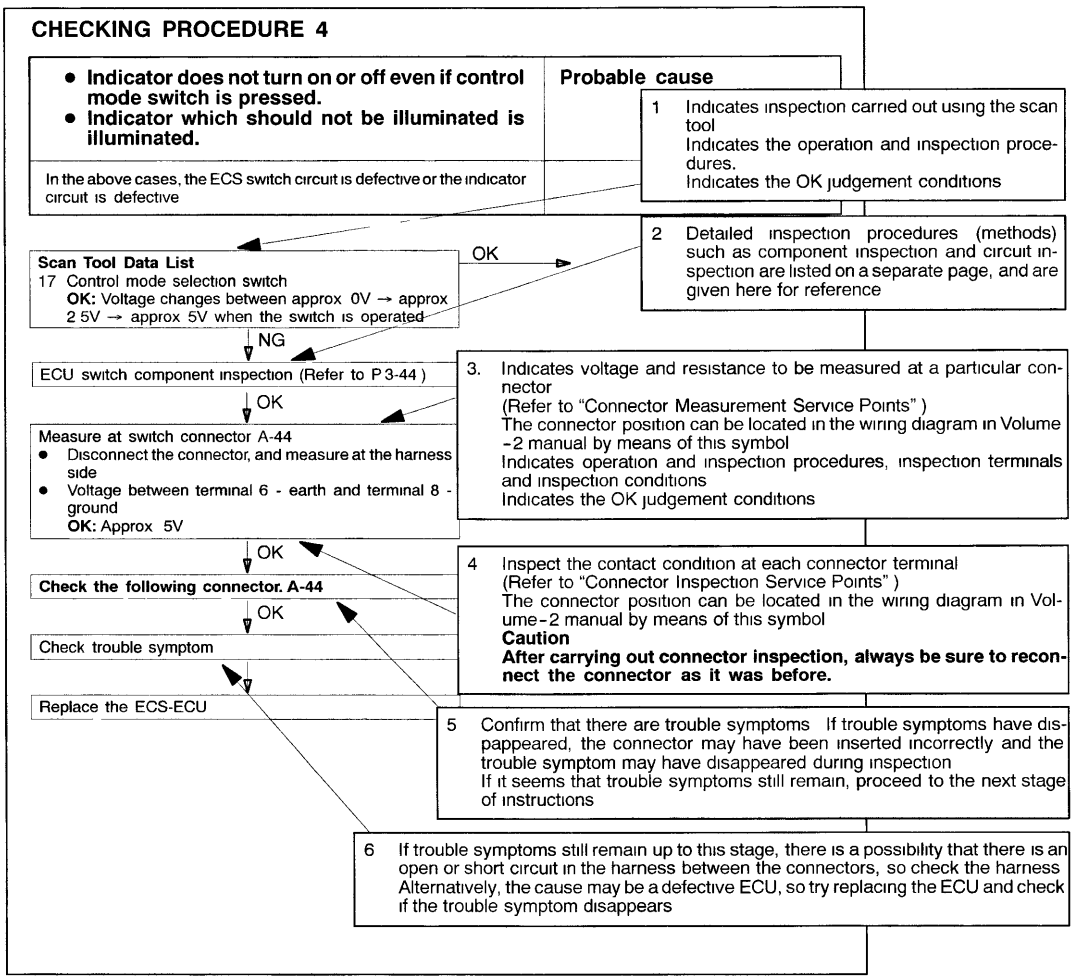
4. If the ohmmeter shows any deviation from the Normal Condition value, check the corresponding sensor, actuator and related electrical wiring, then repair or replace.
5. After repair or replacement, recheck with the ohmmeter to confirm that the repair has corrected the problem.

10. INSPECTION PROCEDURES USING AN OSCILLOSCOPE

When there are inspection procedures using an oscilloscope, these are listed here.

HOW TO USE THE INSPECTION PROCEDURES

The causes of many problems occurring in electronic circuitry are generally the connectors, components, the ECU and the harnesses between connectors, in that order. These inspection procedures follow this order. They first try to discover a problem with a connector or a defective component.



HARNESS INSPECTION

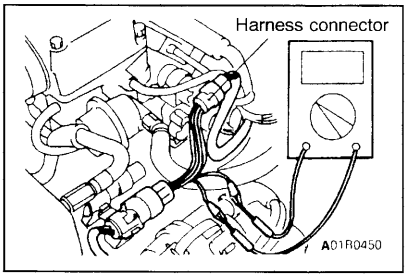
Check for an open or short circuit in the harness between the terminals which were defective according to the connector measurements. Carry out this inspection while referring to Volume 2 Electrical manual. Here, "Check harness between power supply and terminal xx" also includes checking for blown fuses. For inspection service points when there is a blown fuse, refer to "Inspection Service Points for a Blown Fuse".

MEASURES TO TAKE AFTER REPLACING THE ECU

If the trouble symptoms have not disappeared even after replacing the ECU, repeat the inspection procedure from the beginning.

CONNECTOR MEASUREMENT SERVICE POINTS

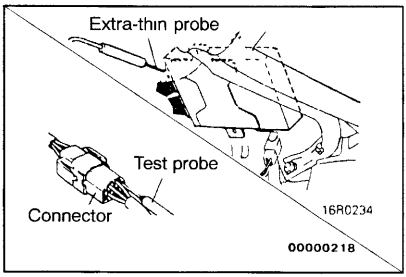
Turn the ignition switch to OFF when connecting and disconnecting the connectors. Turn the ignition switch to ON when measuring if there are no instructions to the contrary.



IF INSPECTING WITH THE CONNECTOR CONNECTED (WITH CIRCUIT IN A CONDITION OF CONTINUITY)

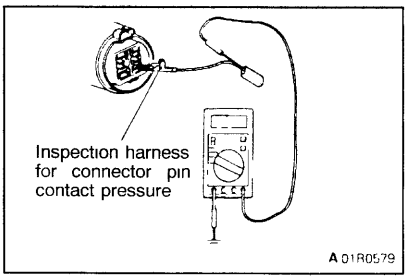
Waterproof Connectors

Be sure to use the special tool (harness connector). Never insert a test probe from the harness side, as this will reduce the waterproof performance and result in corrosion.



Ordinary (non-waterproof) Connectors

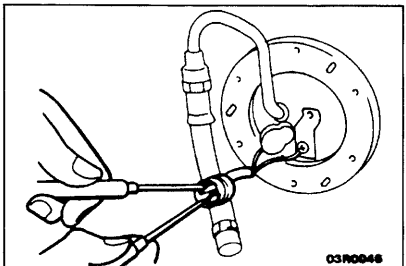
Check by inserting the test probe from the harness side. Note that if the connector (control unit, etc.) is too small to permit insertion of the test probe, it should not be forced; use a special tool (the extra-thin probe in the harness set for checking) for this purpose.



IF INSPECTING WITH THE CONNECTOR DISCONNECTED

<When Inspecting a Female Pin>

Use the special tool (inspection harness for connector pin contact pressure in the harness set for inspection).
The inspection harness for connector pin contact pressure should be used. The test probe should never be forcibly inserted, as it may cause a defective contact



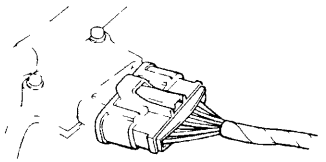
<When Inspecting a Male Pin>

Touch the pin directly with the test bar.

Caution

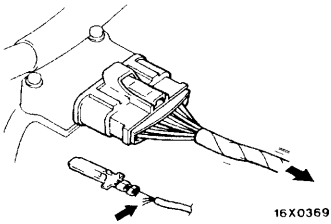
At this time, be careful not to short the connector pins with the test probes. To do so may damage the circuits inside the ECU.

Connector disconnected or improperly connected



16S0256

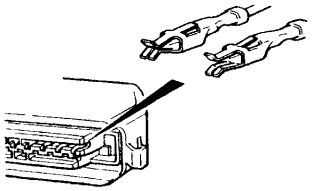
Defective connector contact



16X0369

Harness wire breakage at terminal section

Low contact pressure

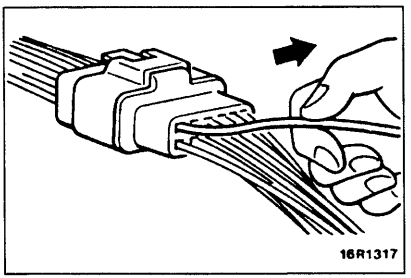


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CONNECTOR INSPECTION SERVICE POINTS

VISUAL INSPECTION

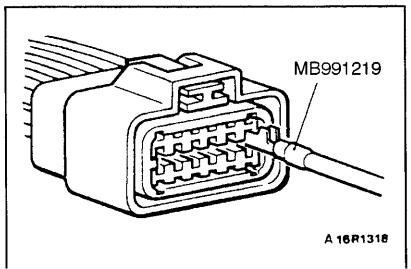
- Connector is disconnected or improperly connected
- Connector pins are pulled out
- Due to harness tension at terminal section
- Low contact pressure between male and female terminals
- Low connection pressure due to rusted terminals or foreign matter lodged in terminals



16R1317

CONNECTOR PIN INSPECTION

If the connector pin stopper is damaged, the terminal connections (male and female pins) will not be perfect even when the connector body is connected, because the pins may pull out of the back side of the connector. Therefore, gently pull the wires one by one to make sure that no pins pull out of the connector.



A 16R1318

CONNECTOR ENGAGEMENT INSPECTION

Use the special tool (connector pin connection pressure inspection harness of the inspection harness set) to inspect the engagement of the male pins and female pins. [Pin drawing force : 1 N (.2 lbs.) or more]

HOW TO COPE WITH INTERMITTENT MALFUNCTIONS

Most intermittent malfunctions occur under certain conditions. If those conditions can be identified, the cause will be easier to find.

TO COPE WITH INTERMITTENT MALFUNCTION;

1. **Ask the customer about the malfunction**

   Ask what it feels like, what it sounds like, etc. Then ask about driving conditions, weather, frequency of occurrence, and so on.

2. **Determine the conditions from the customer's responses**

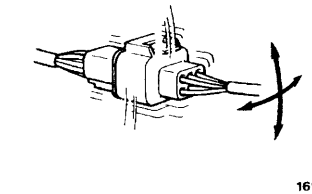
   Typically, almost all intermittent malfunctions occur from conditions like vibration, temperature and/or moisture change, poor connections. From the customer's replies, it should be reasoned which condition is influenced.

3. **Use simulation test**

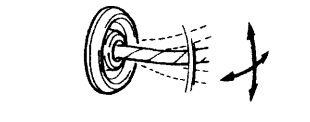
   In the cases of vibration or poor connections, use the simulation tests below to attempt to duplicate the customer's complaint. Determine the most likely circuit(s) and perform the simulation tests on the connectors and parts of that circuit(s). Be sure to use the inspection procedures provided for diagnostic trouble codes and trouble symptoms.
   For temperature and/or moisture conditions related intermittent malfunctions, using common sense, try to change the conditions of the suspected circuit components, then use the simulation tests below.

4. **Verify the intermittent malfunction is eliminated**

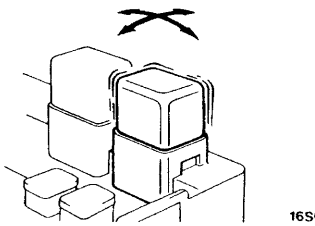
   Repair the malfunctioning part and try to duplicate the condition(s) again to verify the intermittent malfunction has been eliminated.



16S0253



16S0250



16S0252

00000220

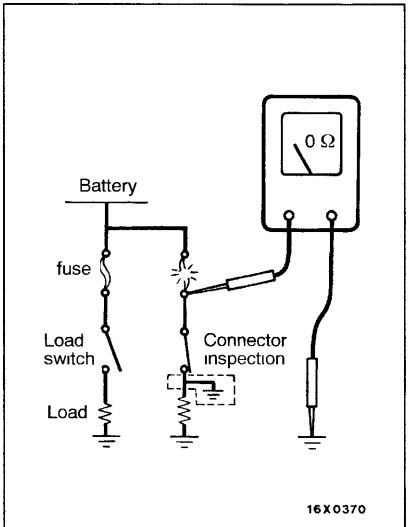
SIMULATION TESTS

For these simulation tests, shake, then gently bend, pull, and twist the wiring of each of these examples to duplicate the intermittent malfunction.

- Shake the connector up-and-down, and right-and-left.
- Shake the wiring harness up-and-down, and right-and-left.
- Vibrate the part or sensor.

NOTE

In case of difficulty in finding the cause of the intermittent malfunction, the data recorder function in the scan tool is effective.

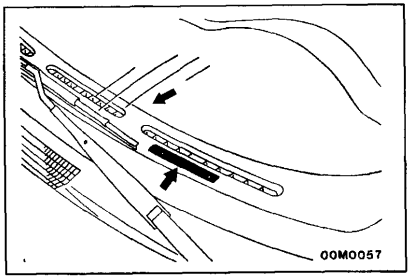


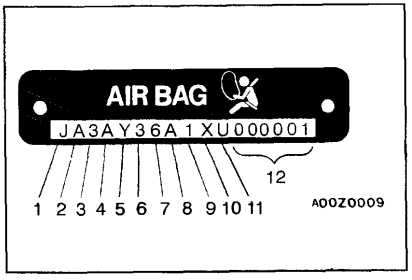
INSPECTION SERVICE POINTS FOR A BLOWN FUSE

Remove the fuse and measure the resistance between the load side of the fuse and ground. Set the switches of all circuits which are connected to this fuse to a condition of continuity. If the resistance is almost 0 Ω at this time, there is a short somewhere between these switches and the load. If the resistance is not 0 Ω, there is no short at the present time, but a momentary short has probably caused the fuse to blow.

The main causes of a short circuit are the following.

- Harness being clamped by the vehicle body
- Damage to the outer casing of the harness due to wear or heat
- Water getting into the connector or circuitry
- Human error (mistakenly shorting a circuit, etc.)





VEHICLE IDENTIFICATION

00100040387

VEHICLE IDENTIFICATION NUMBER LOCATION

The vehicle identification number (V.I.N.) is located on a plate attached to the left top side of the instrument panel.

VEHICLE IDENTIFICATION CODE CHART PLATE

All vehicle identification numbers contain 17 digits. The vehicle number is a code which tells country, make, vehicle type, etc.

No.	Items	Contents
1	Country	J: JAPAN
2	Make	A: Mitsubishi
3	Vehicle type	3: Passenger car
4	Others	A: Driver and passenger air bags
5	Line	Y: MIRAGE
6	Price class	1: Economy
		2: Low
		3: Medium
		4: High
7	Body	1: 2-door sedan
		6: 4-door sedan
8	Engine	A: 1.5L
		C: 1.8L
9	Check digits*	1 2 3 4 5 6 7 8 9 X
10	Model year	X: 1999
11	Plant	U: Mizushima
12	Serial number	000001 to 999999

NOTE

* "Check digit" means a single number or letter X used to verify the accuracy of transcription of vehicle identification number.

VEHICLE IDENTIFICATION NUMBER LIST

2-DOOR MODELS FOR FEDERAL

V.I.N. (except sequence number)	Brand	Engine Displacement	Model Code
JA3AY11A_XU	Mitsubishi Mirage	1.5L [SOHC-MFI]	CJ2ADNSEL2M CJ2ADRSEL2M
JA3AY21A_XU			CJ2ADNMEL2M CJ2ADRMEL2M
JA3AY31C_XU		1 8L [SOHC-MFI]	CJ5ADNDEL2M CJ5ADRDEL2M

2-DOOR MODELS FOR CALIFORNIA

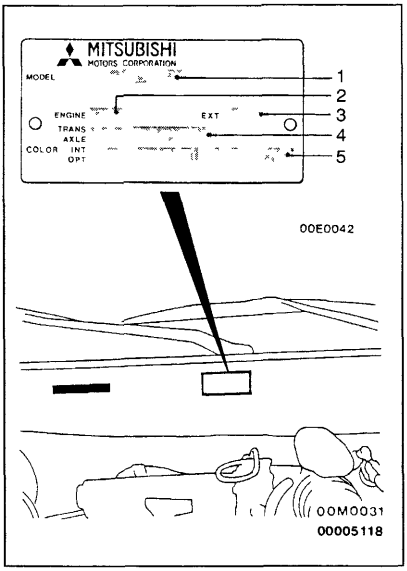
V.I.N. (except sequence number)	Brand	Engine Displacement	Model Code
JA3AY11A_XU	Mitsubishi Mirage	1.5L [SOHC-MFI]	CJ2ADNSEL7M CJ2ADRSEL7M
JA3AY31C_XU		1.8L [SOHC-MFI]	CJ5ADNDEL7M CJ5ADRDEL7M

4-DOOR MODELS FOR FEDERAL

V I N (except sequence number)	Brand	Engine Displacement	Model Code
JA3AY26A_XU	Mitsubishi Mirage	1 5L [SOHC-MFI]	CK2ASNMEL2M CK2ASRMEL2M
JA3AY36A_XU			CK2ASRDEL2M
JA3AY36C_XU		1 8L [SOHC-MFI]	CK5ASNDEL2M CK5ASRDEL2M
JA3AY46C_XU			CK5ASRJEL2M

4-DOOR MODELS FOR CALIFORNIA

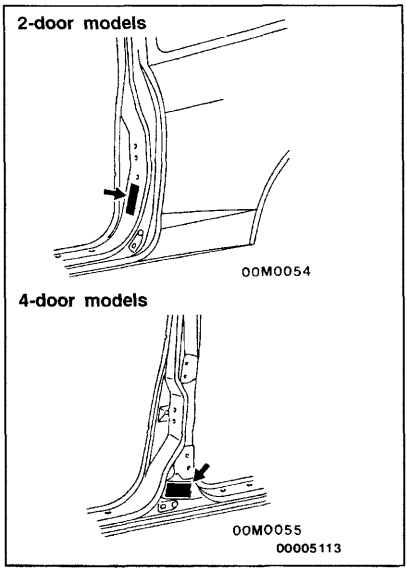
V.I N (except sequence number)	Brand	Engine Displacement	Model Code
JA3AY26A_XU	Mitsubishi Mirage	1 5L [SOHC-MFI]	CK2ASNMEL7M CK2ASRMEL7M
JA3AY36C_XU		1.8L [SOHC-MFI]	CK5ASNDEL7M CK5ASRDEL7M



VEHICLE INFORMATION CODE PLATE

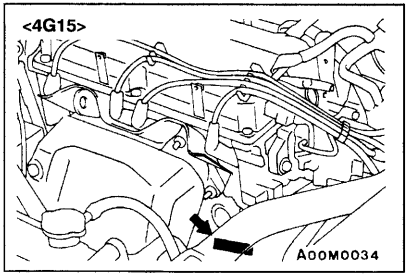
Vehicle information code plate is riveted onto the bulkhead in the engine compartment.
The place shows model code, engine model, transaxle model, and body color code.

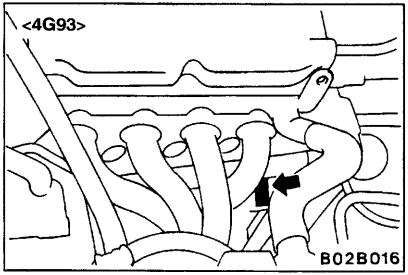
No.	Item	Contents	
1	MODEL	CJ2A DNSEL2M	CJ2A: Vehicle model
			DNSEL2M. Model series
2	ENGINE	4G15	Engine model
3	EXT	B60B	Exterior code
4	TRANS	F5M41	Transaxle code
5	COLOR TRIM OPT	G84 41H 03V	G84: Body color code
			41H: Interior code
			03V: Equipment code



VEHICLE SAFETY CERTIFICATION LABEL

1. The vehicle safety certification label is attached to face of left door pillar.
2. This label indicates Gross Vehicle Weight Rating (G.V.W.R.), Gross Axle Weight Rating (G.A.W.R.) front, rear and Vehicle Identification Number (V.I.N.).





ENGINE MODEL STAMPING

1. The engine model number is stamped at the front side on the top edge of the cylinder block as shown in the following.

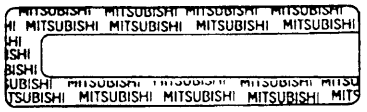
Engine model	Engine displacement
4G15	1.5L
4G93	1.8L

2. The engine serial number is stamped near the engine model number.

Engine serial number	AA0201 to YY9999

Theft protection label

For original parts



00K619

For replacement parts



00K621
00005114

THEFT PROTECTION

In order to protect against theft, a Vehicle Identification Number (VIN) is stamped in, or attached as a label to, the following major parts of the engine and transaxle, as well as main outer panels:

Engine cylinder block, Transaxle housing. Fender, Door, Quarter panel, Hood, Trunk lid, Bumpers

In addition, a theft-protection label is attached to replacement parts for the body outer panel main components, and the same data are stamped into replacement parts for the engine and the transaxle.

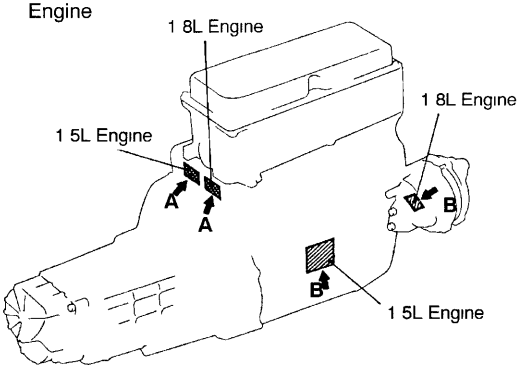
Cautions regarding panel repairs:

1. **When repainting original parts, do so after first masking the theft-protection label, and, after painting, be sure to peel off the masking tape.**
2. **The theft-protection label for replacement parts is covered by masking tape, so such parts can be painted as is. The masking tape should be removed after painting is finished.**
3. **The theft-protection label should not be removed from original parts or replacement parts.**

LOCATIONS

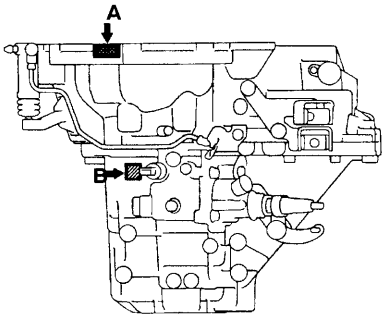
Target area (A: for original equipment parts, B: for replacement parts)

Engine



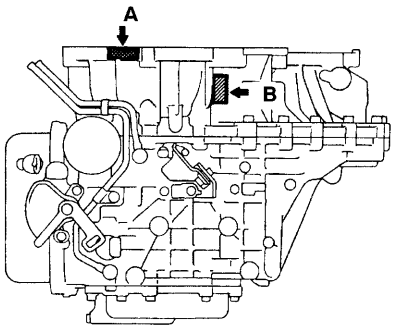
A00M0065

Manual transaxle



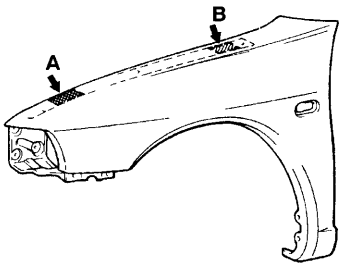
A00M0066

Automatic transaxle



A00M0067

Fender

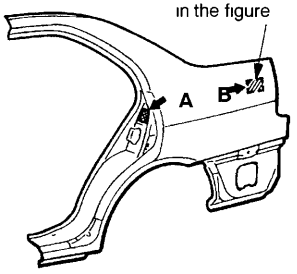


A00M0063

The illustration indicates left hand side, outer. Right hand side is symmetrically opposite

Quarter panel

The label is attached at the inner side of the parts shown in the figure

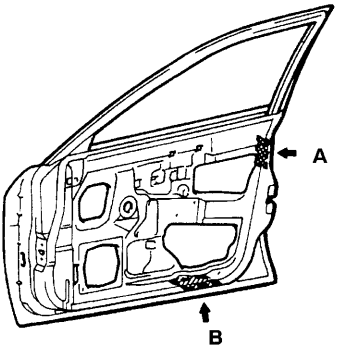


A00M0064

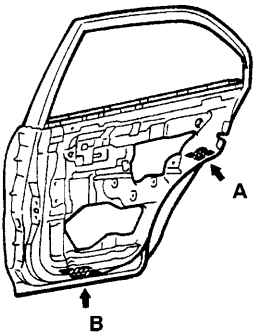
The illustration indicates left hand side, outer. Right hand side is symmetrically opposite.

Target area (A. for original equipment parts, B for replacement parts)

Front door



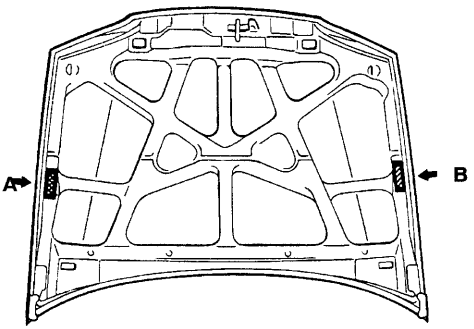
Rear door



A00M0062

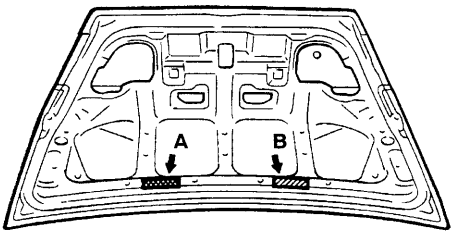
The illustration indicates right hand side, outer.
Left hand side is symmetrically opposite.

Hood



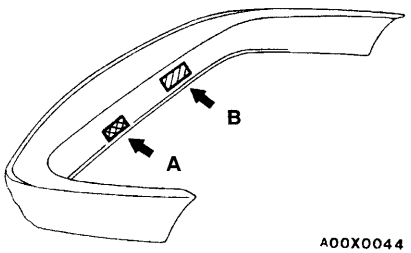
A00M0060

Trunk lid



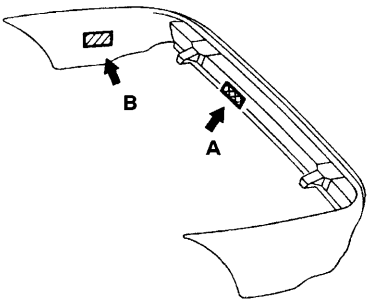
A00M0061

Front bumper



A00X0044

Rear bumper



A00X0045

PRECAUTIONS BEFORE SERVICE

00100050182

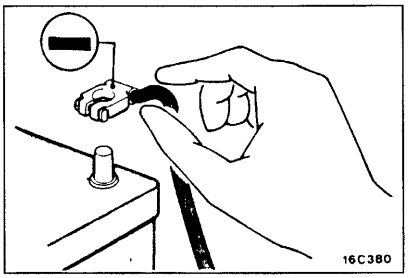
SUPPLEMENTAL RESTRAINT SYSTEM (SRS)

1. Items to follow when servicing SRS
   (1) Be sure to read GROUP 52B - Supplemental Restraint System (SRS).
   For safe operations, please follow the directions and observe all warnings.
   (2) Always use the designated special tools and test equipment.
   (3) Wait at least 60 seconds after disconnecting the battery cable before doing any further work. The SRS system is designed to retain enough voltage to deploy the air bag even after the battery has been disconnected. Serious injury may result from unintended air bag deployment if work is done on the SRS system immediately after the battery cable is disconnected.
   (4) Never attempt to disassemble or repair the SRS components (SRS-ECU air bag module and clock spring). If faulty, replace it.
   (5) Warning labels must be observe when servicing or handling SRS components. Warning labels are located in the following locations.
   - Sun visor
   - Glove box
   - SRS-ECU
   - Steering wheel
   - Air bag module
   - Clock spring
   - Steering gear box

   (6) Store components removed from the SRS in a clean and dry place.
   The air bag module should be stored on a flat surface and placed so that the pad surface is facing upward.
   Do not place anything on top of it.
   (7) Be sure to deploy the air bag before disposing of the air bag module or disposing of a vehicle equipped with an air bag. (Refer to GROUP 52B - Air Bag Module Disposal Procedures.)
   (8) Whenever you finish servicing the SRS, check the SRS warning light operation to make sure that the system functions properly.
2. Observe the following when carrying out operations on places where SRS components are installed, including operations not directly related to the SRS air bag.
   (1) When removing or installing parts do not allow any impact or shock to the SRS components.
   (2) SRS components should not be subjected to heat over 93°C (200°F), so remove the SRS components before drying or baking the vehicle after painting.
   After re-installing them, check the SRS warning light operation to make sure that the system functions properly.

SERVICING THE ELECTRICAL SYSTEM

1. Note the following before proceeding with work on the electrical system.
   Note that the following must never be done:
   Unauthorized modifications of any electrical device or wiring, because such modifications might lead to a vehicle malfunction, over-capacity or short-circuit that could result in a fire in the vehicle.

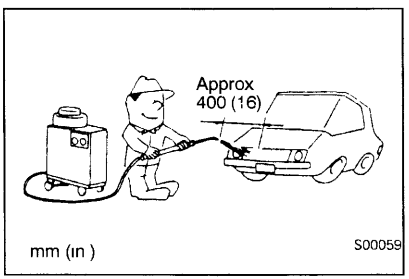


2. When servicing the electrical system, disconnect the negative cable terminal from the battery.

Caution

1. **Before connecting or disconnecting the negative cable, be sure to turn off the ignition switch and the lighting switch.**
   (If this is not done, there is the possibility of semiconductor parts being damaged.)
2. **After completion of the work steps [when the battery's negative (-) terminal is connected], warm up the engine and allow it to idle for approximately ten minutes under the conditions described below, in order to stabilize the engine control conditions, and then check to be sure that idling is satisfactory.**

   Engine coolant temperature: 80-95°C (176-203°F)
   Lights, electric fans, accessories: OFF
   Transaxle: Neutral position
   (A/T models: "N" or "P")
   Steering wheel: neutral (center) position

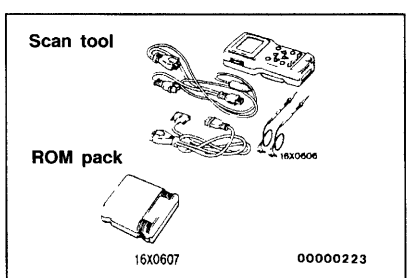


VEHICLE WASHING

If high-pressure car-washing equipment or steam car-washing equipment is used to wash the vehicle, be sure to maintain the spray nozzle at a distance of at least Approx. 400 mm (16 in.) from any plastic parts and all opening parts (doors, luggage compartment, etc.).

APPLYING RUST PREVENTIVES, UNDERCOAT, ETC.

Heated oxygen sensors have their functional efficiency decreased if they are smeared with oil or grease. when applying rust preventives, undercoat, etc. ,be sure to protect the heated oxygen sensor with a protective cover or the like.



SCAN TOOL

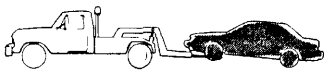
To operate the scan tool, refer to the "MUT-II OPERATING INSTRUCTIONS".

Caution
Turn off the ignition switch before disconnecting or connecting the scan tool.

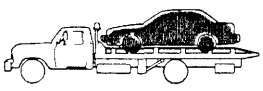
Sling type



Wheel lift type



Flat bed type



00F0027

TOWING AND HOISTING

00100080105

WRECKER TOWING RECOMMENDATION

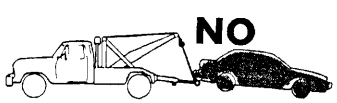
FRONT TOWING PICKUP

Caution

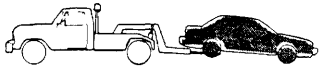
This vehicle cannot be towed by a wrecker using sling-type equipment to prevent the bumper from deformation. If this vehicle is towed, use wheel lift or flat bed equipment.

The vehicle may be towed on its rear wheels for extended distances provided the parking brake is released. It is recommended that vehicles be towed using the front pickup whenever possible.

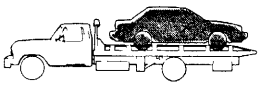
Sling type



Wheel lift type



Flat bet type



00F0026

REAR TOWING PICKUP

Caution

1. **This vehicle cannot be towed by a wrecker using sling-type equipment to prevent the lower arm from deformation.**
   If this vehicle is towed, use wheel lift of flat bed equipment.
2. **Do not use steering column lock to secure front wheel position for towing.**
3. **Make sure the transaxle is in Neutral if vehicle will be with drive wheels on the ground.**

Automatic transaxle vehicle may be towed on the front wheels at speeds not to exceed 50 km/h (30 mph) for distances not to exceed 30 km (18 miles).

Caution

If these limits cannot be met, the front wheels must be placed on a tow dolly.

TOWING WHEN KEYS ARE NOT AVAILABLE

When a locked vehicle must be towed and keys are not available, the vehicle may be lifted and towed from the front, provided the parking brake is released. If not released, the rear wheels should be placed on a tow dolly.

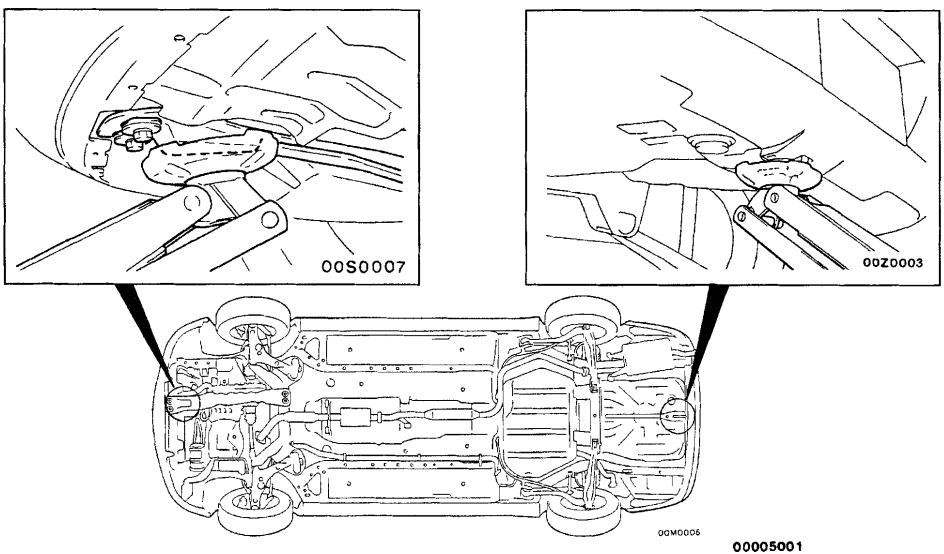
SAFETY PRECAUTIONS

The following precautions should be taken when towing the vehicle.

1. DO NOT LIFT OR TOW THE VEHICLE BY ATTACHING TO OR WRAPPING AROUND THE BUMPER.
2. Any loose or protruding parts of damaged vehicle such as hoods, doors, fenders, trim, etc., should be secured or removed prior to moving the vehicle.
3. Operator should refrain from going under a vehicle while it is lifted by the towing equipment, unless the vehicle is adequately supported by safety stands.
4. Never allow passengers to ride in a towed vehicle.
5. State and local rules and regulations must be followed when towing a vehicle.

LIFTING, JACKING SUPPORT LOCATION

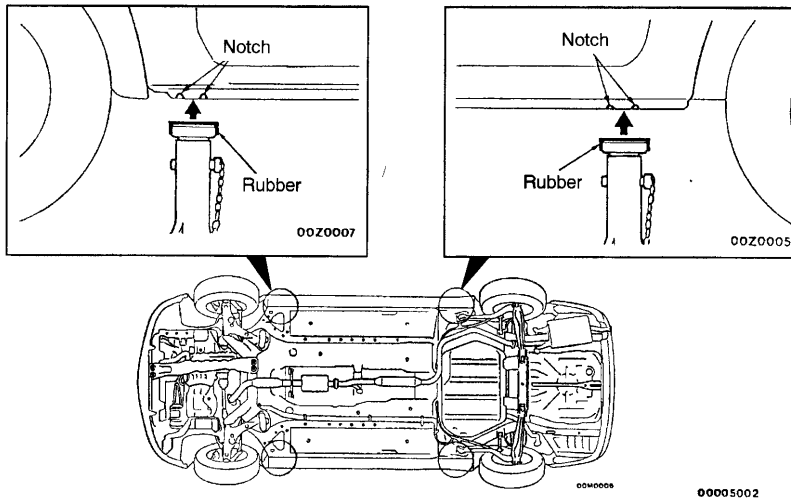
FLOOR JACK



00005001

Caution
Never support any point other than the specified one, or it will be deformed.

RIGID RACK

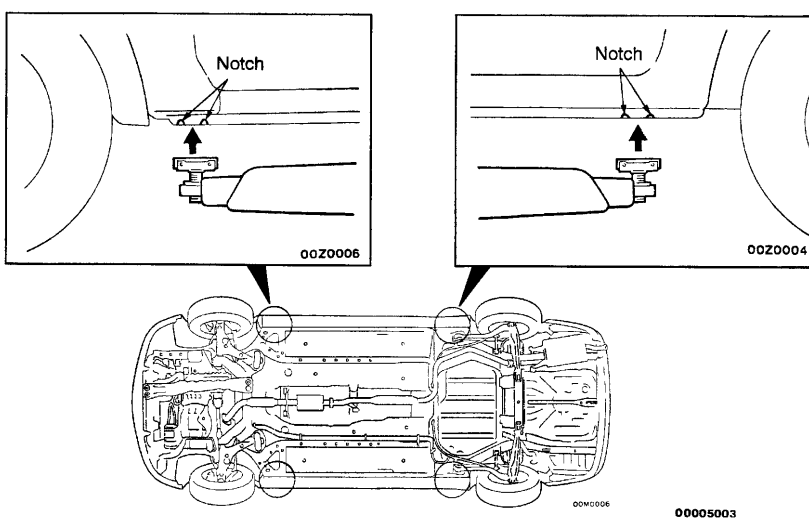


Caution
For lifting, put rubber or similar between the side sill and rigid rack, or the side sill area will be damaged.

POST TYPE

Special care should be taken when raising the vehicle on a frame contact type hoist. The hoist must be equipped with the proper adapters in order to support the vehicle at the proper locations.

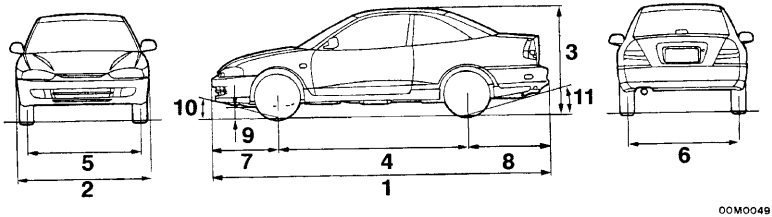
Caution
When service procedures require removing rear suspension, fuel tank and spare tire, place additional weight on rear end of vehicle or anchor vehicle to hoist to prevent tipping of center of gravity changes.



GENERAL DATA AND SPECIFICATIONS

00100090351

2-DOOR MODELS

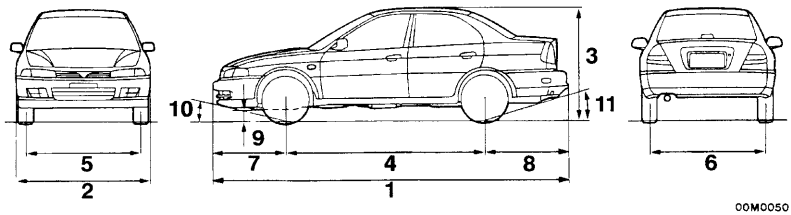


00M0049

GENERAL SPECIFICATIONS

Items			CJ2A DNSEL2M DNSEL7M	CJ2A DRSEL2M DRSEL7M	CJ2A DNMEL2M	CJ2A DRMEL2M	CJ5A DNDEL2M DNDEL7M	CJ5A DRDEL2M DRDEL7M
Vehicle dimensions	Overall length mm (in.)	1	4,270 (168.1)	4,270 (168.1)	4,270 (168.1)	4,270 (168.1)	4,270 (168.1)	4,270 (168 1)
	Overall width mm (in)	2	1,690 (66.5)	1,690 (66.5)	1,690 (66.5)	1,690 (66.5)	1,690 (66 5)	1,690 (66 5)
	Overall height (Unladen) mm (in)	3	1,360 (53.5)	1,360 (53 5)	1,360 (53.5)	1,360 (53 5)	1,360 (53 5)	1,360 (53 5)
	Wheel base mm (in)	4	2,415 (95.1)	2,415 (95.1)	2,415 (95.1)	2,415 (95 1)	2,415 (95.1)	2,415 (95.1)
	Tread-front mm (in.)	5	1,450 (57.1)	1,450 (57.1)	1,450 (57 1)	1,450 (57.1)	1,450 (57.1)	1,450 (57.1)
	Tread-rear mm (in)	6	1,460 (57.4)	1,460 (57.4)	1,460 (57 4)	1,460 (57 4)	1,460 (57.4)	1,460 (57.4)
	Overhang-front mm (in.)	7	845 (33.3)	845 (33 3)	845 (33 3)	845 (33 3)	845 (33.3)	845 (33.3)
	Overhang-rear mm (in.)	8	1,010 (39 8)	1,010 (39 8)	1,010 (39 8)	1,010 (39 8)	1,010 (39.8)	1,010 (39.8)
	Minimum running ground clearance mm (in)	9	150 (5.9)	150 (5 9)	150 (5.9)	150 (5 9)	150 (5.9)	150 (5.9)
	Angle of approach degrees	10	15.8	15.8	15 8	15.8	15.8	15.8
	Angle of departure degrees	11	17.8	17.8	17.8	17.8	17.8	17.8
Vehicle weight kg (lbs.)	Curb weight		965 (2,127)	985 (2,172)	970 (2,138)	990 (2,183)	1,025 (2,260)	1,045 (2,304)
	Gross vehicle weight rating		1,495 (3,296)	1,495 (3,296)	1,495 (3,296)	1,495 (3,296)	1,495 (3,296)	1,495 (3,296)
	Gross axle weight rating-front		830 (1,830)	830 (1,830)	830 (1,830)	830 (1,830)	830 (1,830)	830 (1,830)
	Gross axle weight rating-rear		735 (1,621)	735 (1,621)	735 (1,621)	735 (1,621)	735 (1,621)	735 (1,621)
Seating capacity			5					
Engine	Model No Piston displacement		4G15 1.5L				4G93 1 8L	
Trans-axle	Model No. Type		F5M41 5-speed manual	F4A41 4-speed automatic	F5M41 5-speed manual	F4A41 4-speed automatic	F5M42 5-speed automatic	F4A42 4-speed automatic
Fuel system	Fuel supply system		Electronically-controlled multiport fuel injection					

4-DOOR MODELS



GENERAL SPECIFICATIONS

Items			CK2A SNMEL2M SNMEL7M	CK2A SRMEL2M SRMEL7M	CK2A SRDEL2M	CK5A SNDEL2M SNDEL7M	CK5A SRDEL2M SRDEL7M	CK5A SRJEL2M
Vehicle dimensions	Overall length mm (in.)	1	4,410 (173.6)	4,410 (173.6)	4,410 (173.6)	4,410 (173 6)	4,410 (173.6)	4,410 (173.6)
	Overall width mm (in.)	2	1,690 (66 5)	1,690 (66 5)	1,690 (66.5)	1,690 (66.5)	1,690 (66.5)	1,690 (66.5)
	Overall height (Unladen) mm (in.)	3	1,390 (54 7)	1,390 (54.7)	1,390 (54.7)	1,390 (54.7)	1,390 (54.7)	1,390 (54 7)
	Wheel base mm (in)	4	2,500 (98.4)	2,500 (98 4)	2,500 (98.4)	2,500 (98.4)	2,500 (98.4)	2,500 (98 4)
	Tread-front mm (in.)	5	1,450 (57.1)	1,450 (57.1)	1,450 (57 1)	1,450 (57.1)	1,450 (57.1)	1,450 (57.1)
	Tread-rear mm (in.)	6	1,460 (57.4)	1,460 (57.4)	1,460 (57.4)	1,460 (57.4)	1,460 (57.4)	1,460 (57.4)
	Overhang-front mm (in.)	7	900 (35 4)	900 (35.4)	900 (35 4)	900 (35.4)	900 (35.4)	900 (35.4)
	Overhang-rear mm (in.)	8	1,010 (39 8)	1,010 (39.8)	1,010 (39.8)	1,010 (39 8)	1,010 (39.8)	1,010 (39.8)
	Minimum running ground clearance mm (in)	9	150 (5.9)	150 (5.9)	150 (5.9)	150 (5.9)	150 (5.9)	150 (5.9)
	Angle of approach degrees	10	15 8	15.8	15 8	15.8	15.8	15.8
	Angle of departure degrees	11	17.8	17.8	17.8	17.8	17.8	17.8
Vehicle weight kg (lbs.)	Curb weight		1,010 (2,227)	1,030 (2,271)	1,030 (2,271)	1,065 (2,348)	1,085 (2,392)	1,090 (2,403)
	Gross vehicle weight rating		1,550 (3,418)	1,550 (3,418)	1,550 (3,418)	1,550 (3,418)	1,550 (3,418)	1,550 (3,418)
	Gross axle weight rating-front		830 (1,830)	830 (1,830)	830 (1,830)	830 (1,830)	830 (1,830)	830 (1,830)
	Gross axle weight rating-rear		790 (1,742)	790 (1,742)	790 (1,742)	790 (1,742)	790 (1,742)	790 (1,742)
Seating capacity			5					
Engine	Model No.		4G15			4G93		
	Piston displacement		1.5L			1 8L		
Transaxle	Model No.		F5M41	F4A41		F5M42	F4A42	
	Type		5-speed manual	4-speed automatic		5-speed automatic	4-speed automatic	
Fuel system	Fuel supply system		Electronically-controlled multiport fuel injection					

TIGHTENING TORQUE

00100110026

Each torque value in the table is a standard value for tightening under the following conditions.
(1) Bolts, nuts and washers are all made of steel and plated with zinc.
(2) The threads and bearing surface of bolts and nuts are all in dry condition.

The values in the table are not applicable:
(1) If toothed washers are inserted.
(2) If plastic parts are fastened.
(3) If bolts are tightened to plastic or die-cast inserted nuts.
(4) If self-tapping screws or self-locking nuts are used.

Standard bolt and nut tightening torque

Thread size		Torque Nm (ft.lbs.)		
Bolt nominal diameter (mm)	Pitch (mm)	Head mark "4"	Head mark "7"	Head mark "8"
M5	0 8	2.5 (1.8)	5 (3.6)	6 (4.3)
M6	1 0	5 (3.6)	9 (6.5)	10 (7.2)
M8	1 25	12(8 7)	22 (16)	25 (18)
M10	1 25	24 (17)	44 (33)	52 (38)
M12	1 25	41 (30)	81 (60)	96 (71)
M14	1.5	72 (53)	137 (101)	157 (116)
M16	1 5	111 (82)	206 (152)	235 (174)
M18	1 5	167 (123)	304 (224)	343 (253)
M20	1.5	226 (166)	412 (304)	481 (354)
M22	1 5	304 (224)	559 (412)	647 (477)
M24	1 5	392 (289)	735 (542)	853 (629)

Flange bolt and nut tightening torque

Thread size		Torque Nm (ft lbs.)		
Bolt nominal diameter (mm)	Pitch (mm)	Head mark "4"	Head mark "7"	Head mark "8"
M6	1 0	5 (3 6)	10 (7.2)	12 (8.7)
M8	1.25	13 (9.4)	24 (17)	28 (20)
M10	1.25	26 (19)	49 (36)	57 (42)
M10	1 5	24 (17)	44 (33)	54 (40)
M12	1.25	46 (34)	93 (69)	103 (76)
M12	1 75	42 (31)	81 (60)	96 (71)

LUBRICATION AND MAINTENANCE

00100120234

Maintenance and lubrication service recommendations have been compiled to provide maximum protection for the vehicle owner's investment against all reasonable types of driving conditions. Since these conditions vary with the individual vehicle owner's driving habits, the area in which the vehicle is operated and the type of driving to which the vehicle is subjected, it is necessary to prescribe lubrication and maintenance service on a time frequency as well as mileage interval basis.
Oils, lubricants and greases are classified and graded according to standards recommended by the Society of Automotive Engineers (SAE), the American Petroleum Institute (API) and the National Lubricating Grease Institute (NLGI).

MAINTENANCE SCHEDULES

Information for service maintenace is provided under "SCHEDULED MAINTENANCE TABLE".
Three schedules are provided; one for "Required Maintenance", one for "General Maintenance" and one for "Severe Usage Service".
Item numbers in the "SCHEDULED MAINTENANCE TABLE" correspond to the item numbers in the "MAINTENANCE SERVICE" section.

SEVERE SERVICE

Vehicles operating under severe service conditions will require more frequent service.
Component service information is included in appropriate units for vehicles operating under one or more of the following conditions:

1. Police, taxi, or commercial type operation
2. Operation of Vehicle
   (1) Short-trip operation at freezing temperature (engine not thoroughly warmed up)
   (2) More than 50% operation in heavy city traffic during hot weather above 32°C (90°F)
   (3) Extensive idling
   (4) Driving in sandy areas
   (5) Driving in salty areas
   (6) Driving in dusty conditions

ENGINE OIL

Either of the following engine oils should be used:
(1) Engine oil displaying EOLCS certification mark
(2) Engine oil conforming to the API classification SJ EC or SJ/CD EC.

For further details, refer to "LUBRICANTS SELECTION". section.

Caution
Test results submitted to EPA have shown that laboratory animals develop skin cancer after prolonged contact with used engine oil. Accordingly, the potential exists for humans to develop a number of skin disorders, including cancer, from such exposure to used engine oil.
Care should be taken, therefore, when changing engine oil, to minimize the amount and length of exposure time to used engine oil on your skin. Protective clothing and gloves, that cannot be penetrated by oil, should be worn. The skin should be thoroughly washed with soap and water, or use waterless hand cleaner, to remove any used engine oil. Do not use gasoline, thinners, or solvents.

LUBRICANTS - GREASES

Semi-solid lubricants bear the NLGI designation and are further classified as grades 0, 1, 2, 3 etc. Whenever "Chassis Lubricant" is speicified, Multi-Purpose Grease, NLGI grade 2, should be used.

FUEL USAGE STATEMENT

Your car must use unleaded gasoline only.
This car has a fuel filler tube especially designed to accept only the smaller-diameter unleaded gasoline dispensing nozzle.

Caution
Using leaded gasoline in your car will damage the catalytic converter and the oxygen sensor, and affect the warranty coverage validity.

Your car is designed to operate on premium unleaded gasoline having a minimum octane rating of 87, or 91 RON (Research Octane Number).

Gasolines Containing Alcohol

Some gasolines sold at service stations contain alcohol, although they may not be so identified. Use of fuels containing alcohol is not recommended unless the nature of the blend can be determined as being satisfactory.

Gasohol - A mixture of 10% ethanol (grain alcohol) and 90% unleaded gasoline may be used in your car.
If driveability problems are experienced as a result of using gasohol, it is recommended that the car be operated on gasoline.
Methanol - **Do not use gasolines containing methanol** (wood alcohol). Use of this type of alcohol can result in vehicle performance deterioration and damage critical parts in the fuel system components. Fuel system damage and performance problems, resulting from the use of gasolines containing methanol, may not be covered by the new car warranty.

Gasolines containing MTBE (Methyl Tertiary Butyl Ether)

Unleaded gasoline containing 15% or less MTBE may be used in your car. Fuel containing MTBE over 15% vol. may cause reduced engine performance and produce vapor lock or hard starting.

MATERIALS ADDED TO FUEL

Indiscriminate use of fuel system cleaning agents should be avoided. Many of these materials intended for gum and varnish removal may contain highly active solvents or similar ingredients that can be harmful to gasket and diaphragm materials used in fuel system component parts.

RECOMMENDED LUBRICANT AND LUBRICANT CAPACITY TABLE

00100130305

RECOMMENDED LUBRICANTS

Items	Recommended lubricants
Engine	Engine oil displaying EOLCS certification mark or conforming to the API classification SJ EC or SJ/CD EC (For further details, refer to "LUBRICANTS SELECTION" section)
Manual transaxle	API classification GL-4, SAE 75W-90 OR 75W-85
Automatic transaxle	DIAMOND ATF SP II, DIAMOND ATF SP II M or equivalent
Power steering	Automatic transmission fluid "DEXRON II"
Brake and clutch	Conforming to DOT3 or DOT4
Engine coolant	DIA-QUEEN LONG-LIFE COOLANT (Part No.0103044) or high quality ethylene-glycol antifreeze coolant

LUBRICANT CAPACITY TABLE

Description			Metric measure	U.S. measure
Engine oil	Crankcase (excluding oil filter)	1.5L Engine	3.0 dm^3	3.2 qts.
		1.8L Engine	3.5 dm^3	3.7 qts.
	Oil filter		0.3 dm^3	.32 qts.
Cooling system (including heater and coolant reserve system)		1.5L Engine	5 dm^3	5.3 qts.
		1.8L Engine	6 dm^3	6.3 qts.
Manual transaxle		F5M41	2.1 dm^3	2.2 qts.
		F5M42	2.2 dm^3	2.3 qts.
Automatic transaxle			7.8 dm^3	8.2 qts.
Power steering			0.9 dm^3	.95 qt.
Fuel tank			50 dm^3	13.2 gals.

EOLCS certification mark



M03A015

LUBRICANTS SELECTION

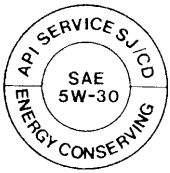
ENGINE OIL

Caution

Never use nondetergent or straight mineral oil.

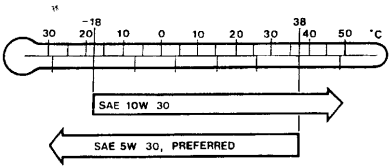
Oil Identification Symbol

Use only engine oils displaying the EOLCS certification mark on the container.



M03A041A

If these oils are not available, an API classification SJ EC or SJ/CD EC can be used.



M03B007

Oil Viscosity

The SAE grade number indicates the viscosity of the oil. A proper SAE grade number should be selected according to ambient temperature.

SELECTION OF COOLANT

COOLANT

Relation between Antifreeze Concentration and Specific Gravity

Engine coolant temperature °C (°F) and specific gravity					Freezing temperature	Safe operating temperature	Engine coolant concentration (Specific volume)
10 (50)	20 (68)	30 (86)	40 (104)	50 (122)	°C (°F)	°C (°F)	%
1.054	1.050	1.046	1.042	1.036	-16 (3.2)	-11 (12.2)	30
1.063	1 058	1 054	1.049	1.044	-20 (-4)	-15 (5)	35
1.071	1.067	1.062	1.057	1.052	-25 (-13)	-20 (-4)	40
1.079	1.074	1 069	1.064	1.058	-30 (-13)	-25 (-13)	45
1.087	1.082	1.076	1.070	1.064	-36 (-32.8)	-31 (-23.8)	50
1.095	1.090	1.084	1.077	1.070	-42 (-44)	-37 (-35)	55
1 103	1.098	1 092	1.084	1.076	-50 (-58)	-45 (-49)	60

Example
The safe operating temperature is -15°C (5°F) when the measured specific gravity is 1.058 at the coolant temperature of 20°C (68°F).

Caution

1. **If the concentration of the coolant is below 30%, the anti-corrosion property will be adversely affected. In addition, if the concentration is above 60%, both the anti-freeze and engine cooling properties will decrease, affecting the engine adversely. For these reasons, be sure to maintain the concentration level within the specified range.**
2. **Do not use a mixture of different brands of anti-freeze.**

SCHEDULED MAINTENANCE TABLE

00100140230

SCHEDULED MAINTENANCE SERVICES FOR EMISSION CONTROL AND PROPER VEHICLE PERFORMANCE

Inspection and services should be performed any time a malfunction is observed or suspected. Retain receipts for all vehicle emission services to protect your emission warranty.

No	Emission control system maintenance	Service to be performed	Kilometers in thousands	24	48	72	96	120	144	168
			Mileage in thousands	15	30	45	60	75	90	105
1	Fuel system (Tank pipe line and connection and fuel tank filler tube cap)	Check for leaks Every 5 years or					×			
2	Fuel hoses	Check condition Every 2 years or			×		×		×	
3	Air cleaner element	Replace at			×		×		×	
4	Evaporative emission control system (except evaporative emission canister)	Check for leaks and clogging Every 5 years or					×			
5	Spark plugs	Replace at			×		×		×	
6	Ignition cables	Replace Every 5 years or					×			
7	Distributor cap and rotor	Check Every 5 years or					×			

GENERAL MAINTENANCE SERVICE FOR PROPER VEHICLE PERFORMANCE

No	General maintenance	Service to be performed	Kilometers in thousands	24	48	72	96	120	144	168
			Mileage in thousands	15	30	45	60	75	90	105
8	Timing belts	Replace at					×*1		160 000Km*2 (100 000 miles)	
9	Drive belt (for generator, water pump, power steering pump)	Check condition at			×		×		×	
10	Engine oil	Change Every year or		Every 12 000 km (7 500 miles)						
11	Engine oil filter	Replace Every Year or*3		×	×	×	×	×	×	×
12	Manual transaxle oil	Check oil level at			×		×		×	
13	Automatic transaxle fluid	Check fluid level Every year or		×	×	×	×	×	×	×
14	Engine coolant	Change Every 2 years or			×		×		×	
15	Disc brake pads	Inspect for wear Every year or		×	×	×	×	×	×	×
16	Rear drum brake linings and rear wheel cylinders	Inspect for wear and leaks Every 2 years or			×		×		×	
17	Brake hoses	Check for deterioration or leaks Every year or		×	×	×	×	×	×	×
18	Ball joint and steering linkage seals	Inspect for grease leaks and damage Every 2 years or			×		×		×	
19	Drive shaft boots	Inspect for grease leaks and damage Every year or		×	×	×	×	×	×	×
20	SRS *4 air bag system	Inspect system		At 10 years						
21	Exhaust system (connection portion of muffler pipings and converter heat shields)	Check and service as required Every 2 years or			×		×		×	

NOTE
*1 For California Masachusetts and Connecticut this maintenance is recommended but not required
*2 Not erquired if belt was previously changed
*3 If the mileage is less than 12,000 km (7,500 miles) each year the oil filter should be replaced at oil change
*4 Supplemental Restraint System

SCHEDULED MAINTENANCE UNDER SEVERE USAGE CONDITIONS

The maintenance items should be performed according to the following table:

No	Maintenance item	Service to be performed	Kilometers in thousands	24	48	72	96	120	144	168	Severe usage conditions
			Mileage in Thousands	15	30	45	60	75	90	105	
3	Air cleaner element	Replace		×	×	×	×	×	×	×	A and E
5	Spark plugs	Replace		×	×	×	×	×	×	×	B and D
10	Engine oil	Change Every 3 months or		Every 4 800 km (3 000 miles)							A B C D and G
11	Engine oil filter	Replace Every 6 months or		Every 9 600 km (6 000 miles)							A B C D and G
12	Manual transaxle oil	Change oil			×		×		×		B,G and H
13	Automatic transaxle fluid	Change fluid at			×		×		×		B G and H
	Automatic transaxle external fluid filter	Change fluid filter at			×		×		×		B G and H
15	Disc brake pads	Inspect for wear and leaks Every 6 months or		Every 9 600 km (6 000 miles)							A and F
16	Rear drum brake linings and rear wheel cylinders	Inspect for wear and leaks Every year or		×	×	×	×	×	×	×	A and F

Severe usage conditions

- A: Driving in dusty conditions
- B: Trailer towing or police, taxi, or commercial type operation
- C: Extensive idling, driving in stop and go traffic
- D: Short-trip operation at freezing temperatures (engine not throughly warmed up)
- E: Driving in sandy areas
- F: Driving in salty areas
- G More than 50% operation in heavy city traffic or at sustained high speeds driving hot weather above 32°C (90°F)
- H· Driving off-road

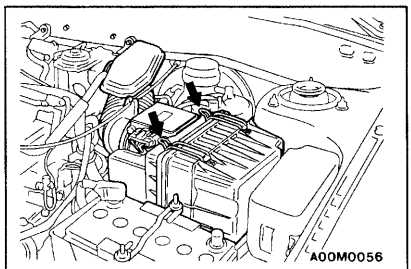
MAINTENANCE SERVICE

00100780029

1. FUEL SYSTEM (Tank, Pipe Lines, Connections and Fuel Tank Filler Tube Cap) (Check for leaks)/2. FUEL HOSES (Check condition)

00100160106

1. Check for damage or leakage in the fuel lines and connections and looseness of the fuel tank filler tube cap.
2. Inspect the surface of fuel hoses for heat and mechanical damage. Hard and brittle rubber, cracking, checking, tears, cuts, abrasions and excessive swelling indicate deterioration of the rubber.
3. If the fabric casing of the rubber hose is exposed by cracks and abrasions in the fuel system, the hoses should be replaced.



3. AIR CLEANER ELEMENT (Replace)

00100180157

The air cleaner element will become dirty and loaded with dust during use, and the filtering effect will be substantially reduced.

Replace it with a new one.

(1) Unclamp the air cleaner cover.
(2) Take out the air cleaner element, install a new one.
(3) Be sure when clamping the air cleaner cover in place that the cover is completed closed.

4. EVAPORATIVE EMISSION CONTROL SYSTEM (Check for leaks and clogging) - except evaporative emission canister 00100190129

1. If the fuel-vapor vent line is clogged or damaged, a fuel vapor mixture escapes into the atmosphere causing excessive emissions. Disconnect the line at both ends, and blow it clean with compressed air. Remove the fuel tank filler tube cap from the fuel tank filler tube and check to see if there is evidence that the packing makes improper contact to the fuel tank filler tube.
2. The fuel tank pressure control valve installed on the vapor line should be checked for correct operation.

5. SPARK PLUGS (Replace) 00100200204

1. Spark plugs must spark properly to assure proper engine performance and reduce exhaust emission level. Therefore, they should be replaced periodically with new ones.

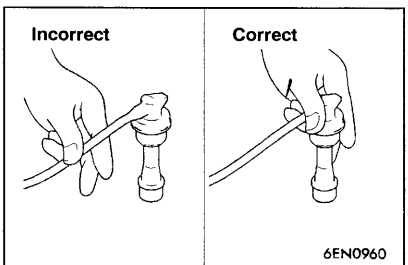
   Spark plug type

Maker	1.5L Engine	1.8L Engine
NGK	BPR5ES-11	BKR5E-11
DENSO	W16EPR11	K16PR-U11
CHAMPION	RN11YC4	RC10YC4

2. The new plugs should be checked for the proper gap.

   Spark plug gap: 1.0-1.1 mm (.039-.043 in.)

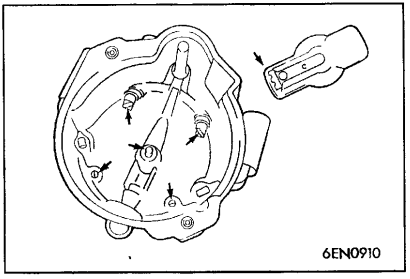
3. Install the spark plug and tighten to 25 Nm (18 ft.lbs.)



6. IGNITION CABLES (Replace) 00100210115

The ignition cables should be replaced periodically with new ones. After replacing, make sure that the ignition cables are routed properly and fully seated.

NOTE
When disconnecting an ignition cable, be sure to hold the cable boot. If the cable is disconnected by pulling on the cable alone, an open circuit might result.



7. DISTRIBUTOR CAP AND ROTOR (Check)

00100220101

Check the distributor cap and rotor to maintain driveability and reduce exhaust emissions.

DISTRIBUTOR CAP AND ROTOR INSPECTION

Inspect in accordance with the following procedure. Repair or replace as necessary.

- Check the cap for cracks.
- Check the cap and rotor electrodes for damage.
- Wipe clean the cap and rotor.
- Clean the corrosion off the terminals inside the distributor cap.

8. TIMING BELT (Replace)

00100230166

Replace the belt with a new one periodically to assure proper engine performance.

For disassembly and assembly procedures, refer to GROUP 11A - Timing Belt or GROUP 11C - Timing Belt.

9. DRIVE BELT

00100250261

For Generator, Water Pump, Power Steering Pump (Check condition)

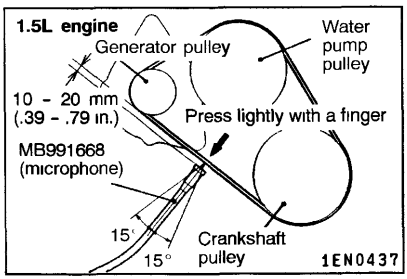
Check the tension of the drive belt. Inspect the drive belt for evidence of cuts and cracks and replace it if defective.

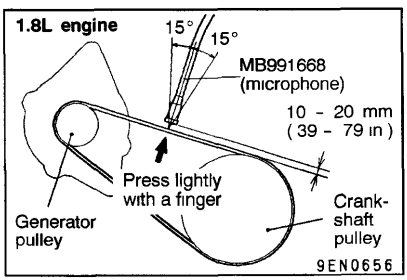
WATER PUMP AND GENERATOR

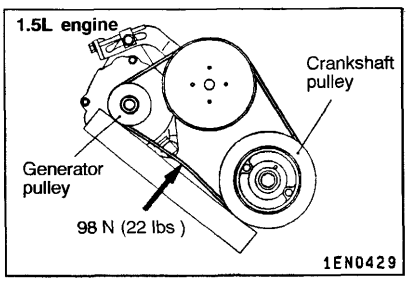
1. Check the drive belt tension with one of the following methods.

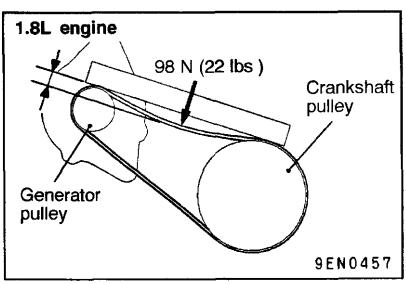
Standard value:

Items	1.5L engine	1.8L engine
Vibration frequency Hz	150 - 184	151 - 195
Tension N (lbs.)	392 - 588 (88 - 132)	294 - 490 (66 - 110)
Deflection (Reference value) mm (in.)	8.7 - 11 4 (.34 - .45)	8 0 - 10.5 (.31 - .41)









When using the scan tool (MUT-II)

1. Connect the special tool (belt tension meter set) to the scan tool (MUT-II).
2. Connect the scan tool (MUT-II) to the diagnosis connector.
3. Set the ignition switch to the ON position, and select "Belt Tension Measurement" on the menu screen.
4. Place the microphone approx. 10 to 20 mm (.39 to .79 in.) from the rear center (arrow section) of the pulleys shown in the illustration.
5. With a finger, lightly press the center (arrow section) of the pulleys shown in the illustration, and check that the vibration frequency of the belt is at the standard value.

Caution

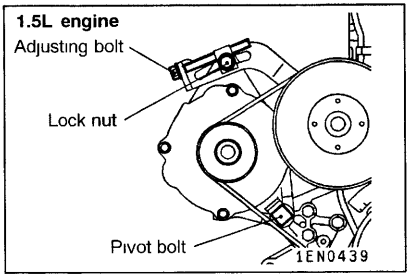
1. **Measure the belt surface temperature when it is close to the room temperature.**
2. **Make sure that water and oil, etc., do not come in contact with the microphone.**
3. **When measuring, if the microphone is subject to strong winds, or if there is noise in the near area, a value differing from the actual value may be indicated.**
4. **If the measurement is carried out when the microphone is contacting the belt, a value differing from the actual value may be indicated.**
5. **Do not measure while the engine is running.**

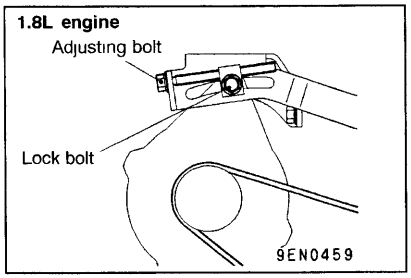
When using belt tension gauge

Use a belt tension gauge to check that the belt tension is at the standard value.

When checking the deflection amount

Apply a pressing force of 98 N (22 lbs.) at the center (arrow section) of the pulleys shown in the illustration, and check that the amount of belt deflection is at the standard value.





2. When deviated from standard value, adjust with the following procedure.
   (1) Loosen the nut of the generator pivot bolt.
   (2) Loosen the lock bolt.
   (3) Turn the adjusting bolt to adjust the belt tension's vibration frequency, belt tension or deflection to the standard value.
   (4) Tighten the nut of the generator pivot bolt.

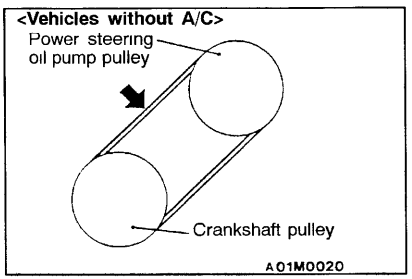
   Tightening torque: 44 Nm (33 ft.lbs.)

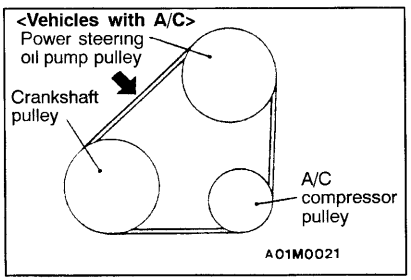
   (5) Tighten the lock bolt.

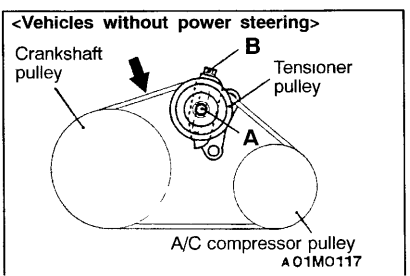
   Tightening torque: 23 Nm (17 ft.lbs.)

   (6) Tighten the adjusting bolt.

   Tightening torque: 9.8 Nm (7.2 ft.lbs.)







POWER STEERING OIL PUMP AND AIR CONDITIONING COMPRESSOR DRIVE BELT TENSION CHECK AND ADJUSTMENT

<Vehicles with 1.5L Engine>

1. Check the drive belt tension with one of the following methods

Standard value:

Items	When checked	When a used belt is installed	When a new belt is installed
Vibration frequency Hz	137 - 168	145 - 160	174 - 199
Tension N (lbs.)	392 - 588 (88 - 132)	441 - 539 (99 - 121)	637 - 833 (143 - 187)
Deflection (Reference value) mm (in.)	9.6 - 12.4 (.38 - .49)	10.2 - 11.6 (.40 - .46)	7.2 - 9.0 (.28 - .35)

When using the scan tool (MUT-II)

With a finger, press the center (arrow section) of the pulleys shown in the illustration, and check that the vibration frequency of the belt is at the standard value.

NOTE
To measure the vibration frequency with the scan tool (MUT-II), use the same procedure as the WATER PUMP AND GENERATOR drive belt.

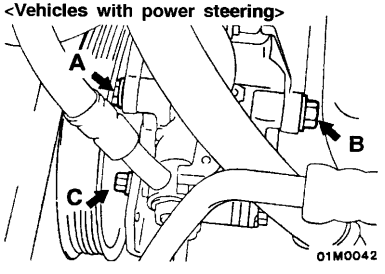
When using belt tension gauge

Use a belt tension gauge to check that the belt tension is at the standard value at a point half-way between the two pulleys (indicated by an arrow in the illustration).

When checking the deflection amount

Apply a pressing force of 98N (22 lbs.) at the center (arrow section) of the pulleys shown in the illustration, and check that the amount of belt deflection is at the standard value.

<Vehicles with power steering>



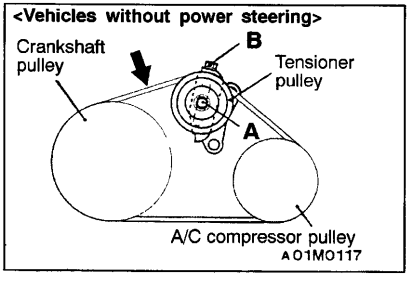
2. If the tension or deflection is outside the standard value, adjust by the following procedure.
<Vehicles with power steering>
(1) Loosen power steering oil pump fixing bolts A, B and C.
(2) Adjust the amount of belt deflection using adjusting bolt D.
(3) Tighten fixing bolts A, B and C.

Tightening torque:
Bolts A and B: 39 Nm (29 ft.lbs.)
Bolt C: 49 Nm (36 ft.lbs.)

(4) Check the belt deflection amount and tension, and readjust if necessary.

Caution
Check after turning the crankshaft once or more clockwise (right turn).

<Vehicles without power steering>

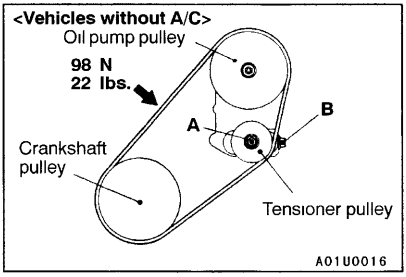


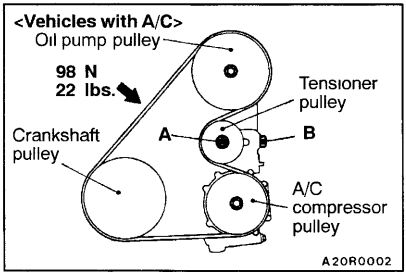
<Vehicles without power steering>
(1) Loosen tension pulley fixing nut A.
(2) Adjust the amount of belt deflection using adjusting bolt B.
(3) Tighten fixing nut A.

Tightening torque: 25 Nm (19 ft.lbs.)

(4) Check the belt deflection amount and tension, and readjust if necessary.

Caution
Check after turning the crankshaft once or more clockwise (right turn).





<Vehicles with 1.8L Engine>

1. Check the drive belt tension with one of the following methods.

Standard value:

Items	When checked	When a used belt is installed	When a new belt is installed
Vibration frequency Hz	114 - 139	121 - 133	145 - 166
Tension N (lbs.)	392- 588 (88 - 132)	441- 539 (99 - 121)	637- 833 (143 -187)
Deflection (Reference value) mm (in.)	10.0-12.0 (.39 - .47)	10.0-11.0 (.39 - .43)	7.2-9.0 (.28 - .35)

When using the scan tool (MUT-II)

With a finger, press the center (arrow section) of the pulleys shown in the illustration, and check that the vibration frequency of the belt is at the standard value.

NOTE
To measure the vibration frequency with the scan tool (MUT-II), use the same procedure as the WATER PUMP AND GENERATOR drive belt.

When using belt tension gauge

Use a belt tension gauge to check that the belt tension is at the standard value at a point half-way between the two pulleys (indicated by an arrow in the illustration).

When checking the deflection amount

Apply a pressing force of 98 N (22 lbs.) at the center (arrow section) of the pulleys shown in the illustration, and check that the amount of belt deflection is at the standard value.

2. If the tension or deflection is outside the standard value, adjust by the following procedure.
   (1) Loosen tensioner pulley fixing nut A.
   (2) Adjust the amount of belt deflection using adjusting bolt B.
   (3) Tighten fixing nut A.

   Tightening torque: 25 Nm (19 ft.lbs.)

   (4) Check the belt deflection amount and tension, and readjust if necessary.

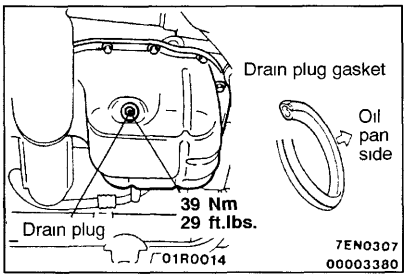
   Caution
   Check after turning the crankshaft once or more clockwise (right turn).

10. ENGINE OIL (Change)

00100260264

Use the specified oil. (Refer to P.00-29.)

Caution
Never use nondetergent or straight mineral oil.

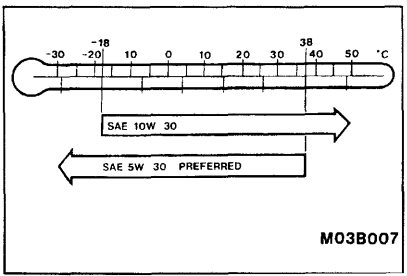


1. Start the engine and allow it to warm up until the temperature of the coolant reaches 80°C (176°F) to 90°C (194°F).
2. Remove the engine oil filler cap.
3. Remove the drain plug to drain oil.

   Caution
   Use care as oil could be hot.

4. Install a new drain plug gasket so that it faces in the direction shown in the illustration, and then tighten the drain plug to the specified torque.

   NOTE
   Install the drain plug gasket so it faces in the direction shown in the illustration.



5. Refill with specified quantity of oil.

   Specified Engine Oil (API classification): SJ or higher

   Total quantity (Includes volume inside oil filter):
   <1.5L Engine> 3.3 dm^3 (3.5 qts.)
   <1.8L Engine> 3.8 dm^3 (4.0 qts.)

6. Install the engine oil filler cap.
7. Check oil level.

11. ENGINE OIL FILTER (Change) 00100270205

The quality of replacement filters varies considerably. Only high quality filters should be used to assure most efficient service.
Genuine oil filters are capable of withstanding a pressure of 256 psi. These high quality filters are highly recommended. The following parts are available as follows:

Oil Filter Part No.
Mitsubishi Genuine Parts:
MD135737, MD325714 or equivalent

ENGINE OIL FILTER SELECTION

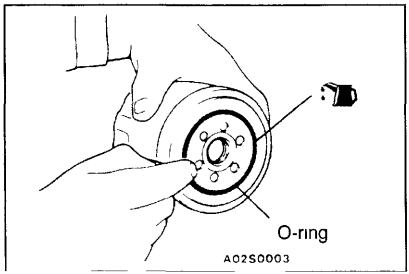
This vehicle is equipped with a full-flow, throw-away oil filter. The same type of replacement filter is recommended as a replacement filter for this vehicle. It is possible, particularly in cold weather, that this vehicle may develop high oil pressure for a short duration. You should be sure that any replacement filter used on this vehicle is a high-quality filter and is capable of withstanding a pressure of 1,765 kPa (256 psi) (manufacturer's specifications) to avoid filter and engine damage. The following is a high-quality filter and is strongly recommended for use on this vehicle : Mitsubishi Engine Oil Filter Part No. MD135737 or MD325714.

Any replacement oil filter should be installed in accordance with the oil filter manufacturer's installation instructions.

1. Start the engine and allow it to warm up until the temperature of the coolant reaches 80°C (176°F) to 90°C (194°F).
2. Remove the engine oil filler cap.
3. Remove the drain plug to drain oil.

   Caution
   Use care as oil could be hot.

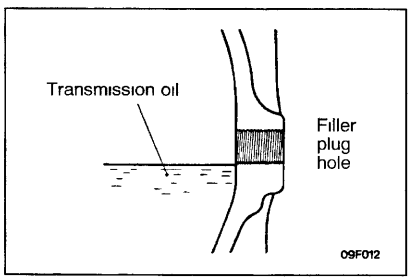
4. Use the following tools to remove the engine oil filter from the underside of the vehicle.
   - MB991396 or equivalent (When using the oil filter of MD135737)
   - Commercial tool (When using the oil filter of MD325714)
5. Clean the filter bracket side mounting surface, and make sure the O-ring is not left on the mounting surface.



6. Apply a small amount of new engine oil to the O-ring of the new oil filter.
7. Install the engine oil filter.

   NOTE
   Tightening torque:
   When using the oil filter of MD135737: 14 Nm (10 ft.lbs.)
   When using the oil filter of MD325714: 16 Nm (12 ft.lbs.)

8. Install the drain plug and refill engine oil. (Refer to Engine Oil Replacement on P.00-38.)
9. Race the engine 2-3 times, and check to be sure that no engine oil leaks from installation section of the oil filter.



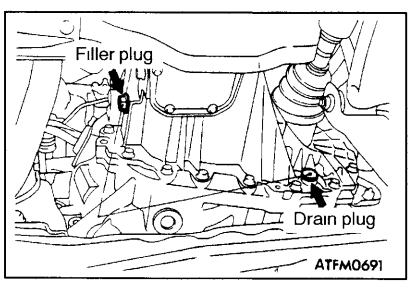
12. MANUAL TRANSAXLE

00100280161

Inspect oil level

Inspect each component for evidence of leakage, and check the oil level by removing the filler plug. If the oil is contaminated, it is necessary to replace it with new oil.

1. With the vehicle parked at a level place, remove the filler plug and check to be sure that the oil level is up to the lower edge of the filler plug hole.
2. Check to be sure that the transmission oil is not noticeably dirty, and that it has a suitable viscosity.



Change oil

1. Remove transaxle drain plug.
2. Drain oil.
3. Tighten drain plug to specified torque.

   Tightening torque: 32 Nm (24 ft.lbs.)

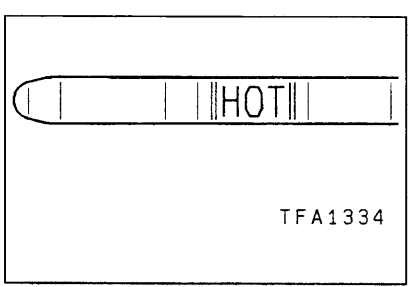
4. Remove filler plug and fill with specified oil till the level comes to the lower portion of filler plug hole.

   Specified oil:
   Hypoid gear oil SAE 75W-90 or 75W-85W conforming to API classification GL-4

   Quantity:
   <F5M41> 2.1 dm^3 (2.2 qts.)
   <F5M42> 2.2 dm^3 (2.3 qts.)

5. Tighten filler plug to specified torque.

   Tightening torque: 32 Nm (24 ft.lbs.)



13. AUTOMATIC TRANSAXLE

00100290225

Check fluid level

1. Drive the vehicle until the fluid temperature rises to the normal temperature [70 - 80°C (158 - 176°F)].
2. Park the vehicle on a level surface.
3. Move the selector lever through all positions to fill the torque converter and the hydraulic circuits with fluid, and then move the selector lever to the N position.
4. After wiping off any dirt around the dipstick, remove the dipstick and check the condition of the fluid.

NOTE
If the fluid smells as if it is burning, it means that the fluid has been contaminated by fine particles from the bushes and friction materials, a transaxle overhaul and flashing the cooler line may be necessary.

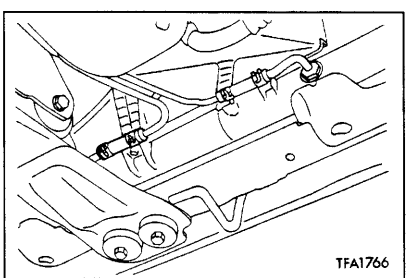
5. Check that the fluid level is at the HOT mark on the dipstick. If the fluid level is lower than this, pour in more fluid until the level reaches the HOT mark.

   Automatic transmission fluid:
   Dia Queen ATF SP II, Dia Queen ATF SP II M or equivalent

   NOTE
   If the fluid level is low, the oil pump will draw in air along with the fluid, which will cause bubbles to form inside the hydraulic circuit. This will in turn cause the hydraulic pressure to drop, which will result in late shifting and slipping of the clutches and brakes.
   If there is too much fluid, the gears can churn it up into foam and cause the same conditions that can occur with low fluid levels.
   In either case, air bubbles can cause overheating and oxidation of the fluid which can interfere with normal valve, clutch, and brake operation. Foaming can also result in fluid escaping from the transaxle vent, in which case it may be mistaken for a leak.

6. Securely insert the dipstick.

   NOTE
   The fluid and oil filters should always be replaced under the following conditions.
   When trouble shooting the transaxle
   When overhauling the transaxle
   When the oil is noticeably dirty or deteriorates (driving under the severe condition)
   Furthermore, the oil filters are special filters which are only to be used for the automatic transaxle.


TFA1766

Change fluid

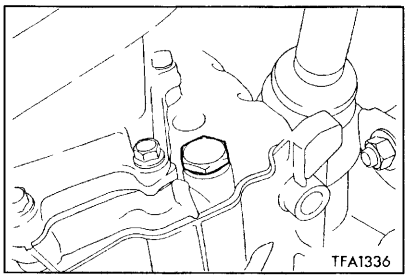
Drain the fluid and check whether there is any evidence of contamination.
Refill with new fluid after the cause of any contamination has been corrected.
Again, place vehicle at a level place.
If you have a fluid changer, use it to replace the fluid. If you do not have a fluid changer, replace the fluid by the following procedure.

1. Disconnect the hose shown in the illustration which connects the transaxle and the oil cooler (inside the radiator).
2. Start the engine and let the fluid drain out.

   Running conditions: N range with engine idling

   Caution
   The engine should be stopped within one minute after it is started. If the fluid has all drained out before then, the engine should be stopped at that point.

   Discharge volume: Approx. 3.5 dm^3 (3.7 qts.)


TFA1336

3. Remove the drain plug from the bottom of the transaxle case to drain the fluid.

   Discharge volume: Approx. 2.0 dm^3 (2.1 qts.)

4. Replace the oil filters.
5. Install the drain plug via the new gasket, and tighten it to the specified torque.

   Tightening torque: 32 Nm (24 ft.lbs.)

6. Pour the new fluid in through the oil filler tube.

   Adding volume: Approx. 5.5 dm^3 (5.8 qts.)

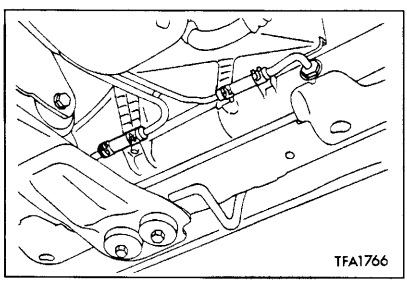
   Caution
   Stop pouring if the specified volume of fluid cannot be poured in.

7. Repeat the procedure in step 2.

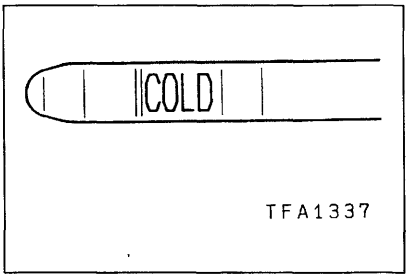
   NOTE
   Drain the fluid of at least 7.0 dm^3 (7.4 qts.) from the cooler hose (during the work in both steps 2 and 7). Then drain the fluid a little and check the fluid for dirt. If it has been contaminated, repeat the steps 6 and 7.

8. Pour the new fluid in through the oil filler tube.

   Adding volume: Approx. 3.5 dm^3 (3.7 qts.)


TFA1766

9. Reconnect the hose which has been disconnected in step 1 above, and firmly replace the dipstick.
10. Start the engine and run it at idle for 1 - 2 minutes.
11. Move the selector lever through all positions, and then move it to the N position.



12. Check that the fluid level is at the COLD mark on the dipstick. If the level is lower than this, pour in more fluid.
13. Drive the vehicle until the fluid temperature rises to the normal temperature [70 - 80°C (158 - 176°F)], and then check the fluid level again.
    The fluid level must be at the HOT mark.

    NOTE
    The COLD level is for reference only; the HOT level should be regarded as the standard level.
14. Firmly insert the dipstick into the oil filler tube.

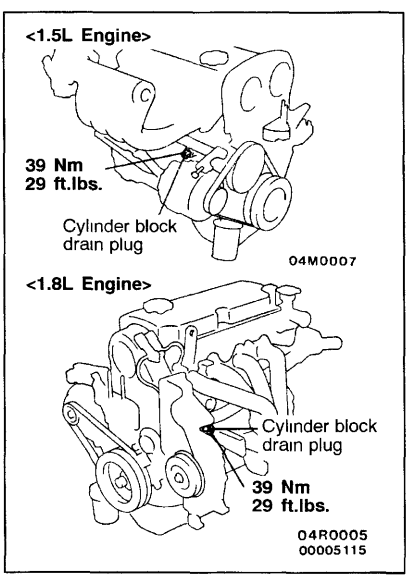
14. ENGINE COOLANT (Change) 00100310181

Check the cooling system parts, such as the radiator, heater, and oil cooler hoses, thermostat and connections for leakage and damage.

Change coolant

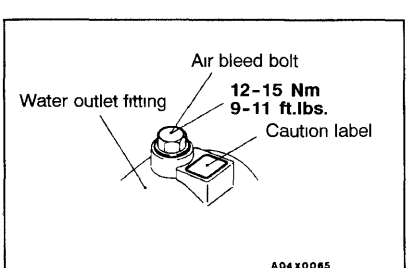
1. Drain the engine coolant by removing the drain plug and then the radiator cap.

   Caution
   After the engine coolant temperature falls to 20°C (68°F), the engine coolant should be drained.



2. Remove the drain plug from the cylinder block to drain the engine coolant.
3. Open the air bleed bolt.
4. Remove the reserve tank to drain the engine coolant.
5. When the engine coolant has drained, pour in water, through the radiator cap to clean the engine coolant line.
6. Coat the thread of the cylinder block drain plug with the specified sealant and tighten to the specified torque.

   Specified sealant:
   3M Nut Locking Part No. 4171 or equivalent
7. Securely tighten the radiator drain plug.
8. Install the reserve tank.

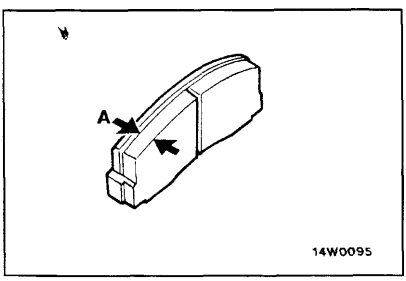


9. Fill the radiator until the engine coolant flows from the air bleed bolt section, and then close the air bleed bolt.
10. Slowly pour the engine coolant into the mouth of the radiator until the radiator is full, and pour also into the reserve tank up to the FULL line.

    Recommended antifreeze:
    DIA-QUEEN LONG-LIFE COOLANT (Part No. 0103044) or High quality ethylene-glycol autifreeze coolant

Quantity:
<1.5L Engine> 5 dm³ (5.3 qts.)
<1.8L Engine> 6 dm³ (6.3 qts.)

11. Install the radiator cap securely.
12. Start the engine and warm the engine until the thermostat opens. (Touch the radiator hose with your hand to check that warm water is flowing.)
13. After the thermostat opens, race the engine at 3,000 rpm 3 times.
14. After the engine is stopped, wait until the engine has cooled down, and then remove the radiator cap to check the level of the liquid. If the level is low, repeat the operation from step 11.
    Lastly, if the level does not drop, fill the reserve tank with coolant up to the FULL line.



15. DISC BRAKE PADS (Inspect for wear) 00100320146

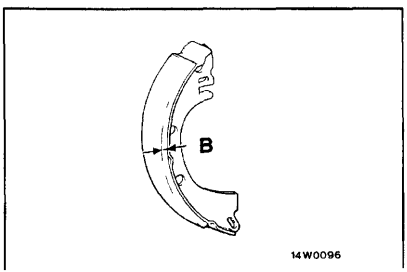
Check for fluid contamination and wear. Replace complete set of pads if defective.

Caution
The pads for the right and left wheels should always be replaced at the same time. Never "split" or intermix brake pad sets.
All four pads must be replaced as a complete set.

Thickness of lining (A)
Minimum limit: 2.0 mm (.08 in.)

16. REAR DRUM BRAKE LININGS AND REAR WHEEL CYLINDERS (Inspect for wear and leaks) 00100330088

1. Remove the brake drum and check the thickness of brake shoe lining for wear. Check the automatic brake adjusting system by hand to see if it operates smoothly.
   Also see if the gears are in proper mesh with each other.
   To assure smooth operation, apply a very thin coat of multipurpose grease to the friction surface of adjuster and link shaft.



2. Inspect the wheel cylinder boots for evidence of a brake fluid leak. Visually check the boots for cuts, tears or heat cracks. (A slight amount of fluid on the boot may not be a leak, but may be preservative fluid used at assembly.)

   Checking the Brake Shoes for Wear.

   Caution
   Never split or intermix brake shoe sets.
   All four shoes must be replaced as a complete set.

Thickness of lining (B)
Minimum limit: 1.0 mm (.04 in.)

17. BRAKE HOSES (Check for deterioration or leaks)

00100340135

Inspection of brake hoses and tubing should be included in all brake service operations.

The hoses should be checked for:

1. Correct length, severe surface cracking, pulling, scuffing or worn spots. (If the fabric casing of the hoses is exposed by cracks of abrasion in the rubber hose cover, the hoses should be replaced. Eventual deterioration of hose may occur with possible bursting failure.)
2. Faulty installation, casing twisting or interference with wheel, tire or chassis.

18. BALL JOINT AND STEERING LINKAGE SEALS (Inspect for grease leaks and damage)

00100350138

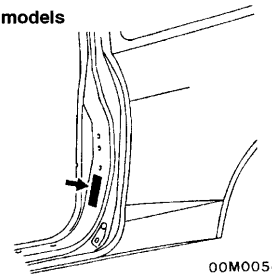
1. These components, which are permanently lubricated at the factory, do not require periodic lubrication. Damaged seals and boots should be replaced to prevent leakage or contamination of the grease.
2. Inspect the dust cover and boots for proper sealing, leakage and damage. Replace them if defective.

19. DRIVE SHAFT BOOTS (Inspect for grease leaks and damage)

00100360131

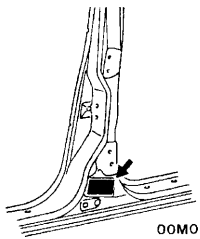
1. These components, which are permanently lubricated at the factory, do not require periodic lubrication. Damaged boots should be replaced to prevent leakage or contamination of the grease.
2. Inspect the boots for proper sealing, leakage and damage. Replace it if defective.

2-door models

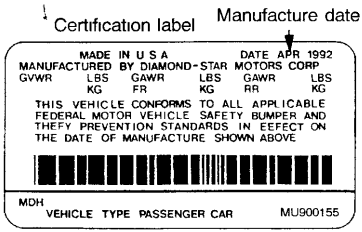


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4-door models



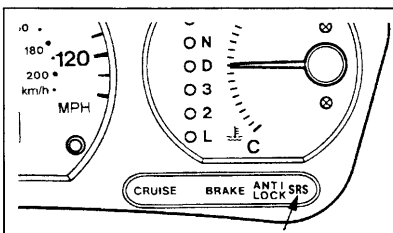
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20. SRS AIR BAG SYSTEM (SRS component check: damage, function, connection to wiring harness, etc.) 00100370172

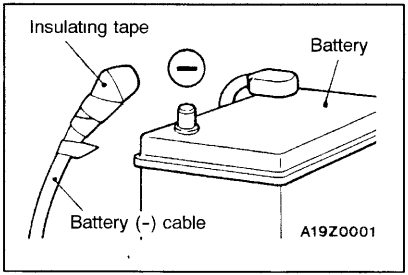
The SRS must be inspected by an authorized dealer 10 years after the car manufacture date shown on the certificaiton label located on left center pillar.



B16M0359

"SRS" WARNING LIGHT CHECK

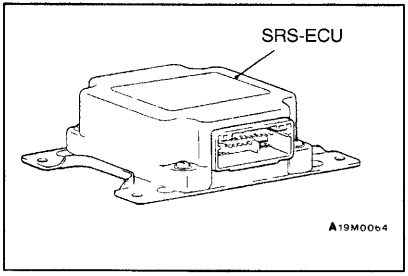
Turn the ignition key to the "ON" position. Does the "SRS" warning light illuminate for about 7 seconds, and then remain extinguished for at least 5 seconds after turning OFF? If yes, SRS system is functioning properly. If no, refer to GROUP 52B - Troubleshooting.



SRS COMPONENT VISUAL CHECK

Turn the ignition key to the "LOCK" position, disconnect the negative battery cable and tape the terminal.

Caution
Wait at least 60 seconds after disconnecting the battery cable before doing any further work.
The SRS system is designed to retain enough voltage to develoy the air bag for a short time even after the battery has been disconnected, so serious injury may result from unintended air bag deployment if work is done on the SRS system immediately after the battery cable is disconnected.

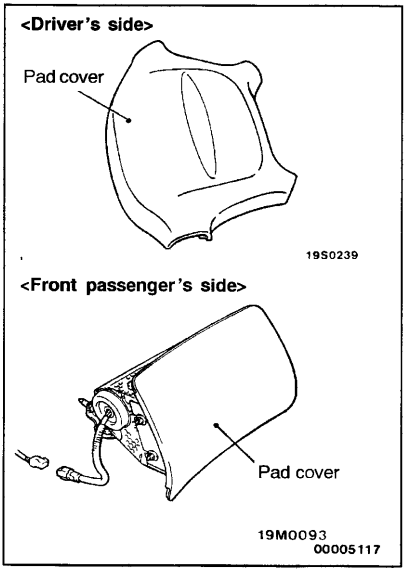


SRS AIR BAG CONTROL UNIT (SRS-ECU)

1. Check SRS-ECU case and brackets for dents, cracks, deformation or rust.

   Caution
   The SRS may not activate if the SRS-ECU is not installed properly, which could result in serious injury or death to the vehicle's driver or front passenger.

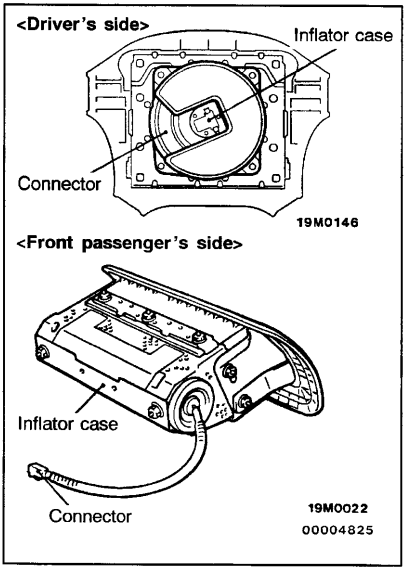
2. Check connector for damage, and terminals for deformation or rust.
   Replace SRS-ECU if it fails visual check.
   (Refer to GROUP 52B - SRS Air Bag Control Unit.)



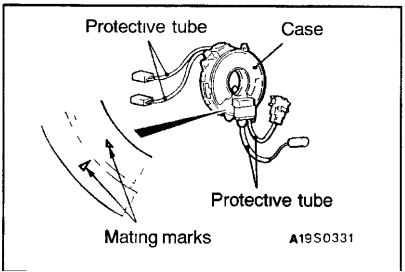
AIR BAG MODULES, STEERING WHEEL AND CLOCK SPRING

1. Remove the air bag modules, steering wheel and clock spring. (Refer to GROUP 52B - SRS Air Bag Modules and Clock Spring.)

   Caution
   The removed air bag modules should be stored in a clean, dry place with the pad cover facing up.
2. Check pad cover for dents, cracks or deformation.



3. Check connector for damage, terminals for deformation, and harness for binds.
4. Check air bag inflator case for dents, cracks or deformation.
5. Check harness (built into steering wheel) and connectors for damage, and terminals for deformation.



6. Check clock spring connectors and protective tube for damage, and terminals for deformation.
7. Visually check the clock spring case for damage.
8. Align the mating marks of the clock spring and, after turning the vehicle's front wheels to straight-ahead position, install the clock spring to the column switch.

   Mating Mark Alignment

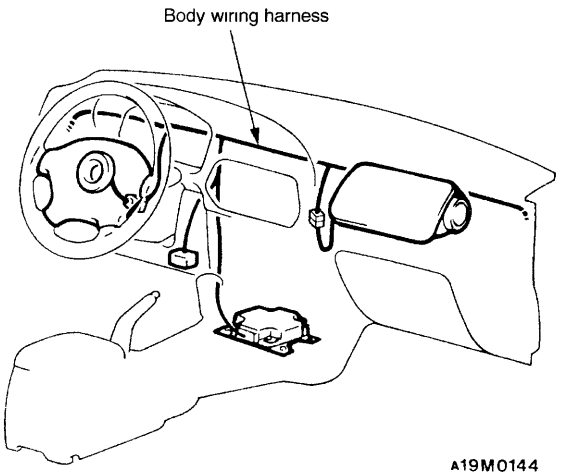
   Turn the clock spring clockwise fully, and then turn back it approx. 3 4/5 turns counterclockwise to align the mating marks.

Caution
If the clock spring's mating mark is not properly aligned, the steering wheel may not be completely rotational during a turn, or the flat cable within the clock spring may be severed, obstructing normal operation of the SRS and possibly leading to serious injury to the vehicle's driver or front passenger.

9. Install the steering column covers, steering wheel and the air bag module.
10. Check steering wheel for noise, binds of difficult operation.
11. Check steering wheel for excessive free play.
    REPLACE ANY VISUALLY INSPECTED PART IF IT FAILS THAT INSPECTION. (Refer to GROUP 52B - SRS Air Bag Modules and Clock Spring.)

Caution
The SRS may not activate if any of the above components is not installed properly, which could result in serious injury or death to the vehicle's driver or front passenger.

BODY WIRING HARNESS



1. Check connector for poor connection.
2. Check harnesses for binds, connectors for damage, and terminals for deformation.
   REPLACE ANY CONNECTORS OR HARNESS THAT FAIL THE VISUAL INSPECTION. (Refer to GROUP 52B - SRS Service Precautions.)

Caution
The SRS may not activate if SRS harnesses or connectors are damaged or improperly connected, which could result in serious injury or death to the vehicle's driver or front passenger.

21. EXHAUST SYSTEM (CONNECTION PORTION OF MUFFLER, PIPINGS AND CONVERTER HEAT SHIELDS) (Check and service as required)

00100580124

1. Check for holes and gas leaks due to damage, corrosion, etc.
2. Check the joints and connections for looseness and gas leaks.
3. Check the hanger rubber and brackets for damage.

MAIN SEALANT AND ADHESIVE TABLE

00100380021

SEALANTS FOR ENGINE ACCESSORIES

Application	Recommended brand
Sealing between rocker cover and camshaft bearing cap (4G6 DOHC and 6G7 engines only)	3M ATD Part No. 8660 or equivalent
Sealing between semi-circular packing and rocker cover and between semi-circular packing and cylinder head	
Oil pressure switch (except 4G1 and 6G7 engines)	
Engine coolant temperature switch, Engine coolant temperature sensor, Thermo valve, Thermo switch, Joints, Engine coolant temperature gauge unit (large size)	3M Nut Locking Part No 4171 or equivalent
Engine coolant temperature gauge unit (small size, MD091056 only)	3M ATD Part No. 8660 or equivalent
Oil pan (except 4G5 engine)	MITSUBISHI GENUINE Part No. MD997110 or equivalent

SEALING BETWEEN GLASS AND WEATHERSTRIP

Application	Recommended brand
Sealing between tempered glass and weatherstrip	3M ATD Part No 8513 or equivalent
Sealing between body flange and weatherstrip	3M ATD Part No. 8509 or equivalent
Sealing between laminated glass and weatherstrip	

ADHESION WITH RIBBON SEALER

Application	Recommended brand
Waterproof film for door, Fender panel, Splash shield, Mud guard, Rear combination light	3M ATD Part No. 8625 or equivalent

ADHESIVES FOR INTERIOR TRIM

Application	Recommended brand
Adhesion of polyvinyl chloride sheet	3M Part No. EC-1368 or equivalent
Adhesion of door weatherstrip to body	3M ATD Part No. 8001 or 3M ATD Part No. 8011 or equivalent
Sealing between grommet or packing, and metal seal	3M ATD Part No. 8513 or equivalent
Adhesion of headlining and other interior trim materials	3M Part No. EC-1368 or 3M ATD Part No 8080 or equivalent
Adhesion of fuel tank to pad	

BODY SEALANT

Application	Recommended brand
Sealing of sheet metal, drip rail, floor, body side panel, trunk, front panel and the like joints	3M ATD Part No 8531 or 3M ATD Part No 8646 or equivalent
Sealing of liftgate hinges	

CHASSIS SEALANT

Application	Recommended brand
Sealing of flange surfaces and threaded portions	3M ATD Part No. 8659 or equivalent
Fuel gauge unit packing	
Sealing of flange surfaces, threaded portions, packing and dust cover • Differential carrier packing • Dust covers for ball joint and linkage • Steering gear box packing and shims • Steering gear housing rack support cover and top cover • Mating surface of knuckle arm flange	3M ATD Part No. 8663 or equivalent
Sealing between accelerator arm bracket and firewall	Drying sealant
Sealant for drum brake shoe hold-down pin and wheel cylinder	3M ATD Part No. 8513 or equivalent

FAST BONDING ADHESIVE

Application	Recommended brand
Adhesion of all materials except polyethylene, polypropylene, fluorocarbon resin or other materials with highly absorbent surface	3M ATD Part No. 8155 or equivalent

ANAEROBIC FAST BONDING ADHESIVE

Application	Recommended brand
Fixing of bolts and screws • Tightening of drive gear to differential case • Bolts for coupling tilt steering upper column with lower column	3M Stud locking Part No. 4170 or equivalent
Fixing of bearing, fan, pulley and gear connections	
Sealing of small recess or flange surface	
Steering angle stopper bolt	3M Nut locking Part No.4171 or equivalent

UNDERCOAT

Application	Recommended brand
Undercoat	3M ATD Part No 8864 or equivalent

ENGINE

CONTENTS

11109000313

ENGINE <1.5L> 11A

ENGINE OVERHAUL <1.5L> 11B

ENGINE <1.8L> 11C

ENGINE OVERHAUL <1.8L> 11D

ENGINE <1.5L>

CONTENTS

11109000726

CAMSHAFT AND CAMSHAFT OIL SEAL .. 23

CRANKSHAFT OIL SEAL 26

CRANKSHAFT PULLEY 22

CYLINDER HEAD GASKET 28

ENGINE ASSEMBLY 18

GENERAL INFORMATION 3

OIL PAN 25

ON-VEHICLE SERVICE 8

Basic Idle Speed Adjustment
..... Refer to GROUP 13A

Compression Pressure Check 14

Curb Idle Speed Check 12

Drive Belt Tension Check and Adjustment 8

Idle Mixture Check 13

Ignition Timing Check 12

Lash Adjuster Check 16

Manifold Vacuum Check 15

Timing Belt Tension Adjustment 15

SEALANT 4

SERVICE SPECIFICATIONS 3

SPECIAL TOOLS 5

TIMING BELT 32

TROUBLESHOOTING 7

GENERAL INFORMATION

11100010537

Items			Specifications
Type			In-line, Overhead Camshaft
Number of cylinders			4
Bore mm (in)			75.5 (2 97)
Stroke mm (in)			82.0 (3 23)
Piston displacement cm^3 (cu in.)			1,468 (86 6)
Compression ratio			9 0
Firing order			1-3-4-2
Valve timing	Intake valve	Opens	BTDC 14°
		Closes	ABDC 48°
	Exhaust valve	Opens	BBDC 54°
		Closes	ATDC 10°
Lubrication			Pressurized feed-full filtration

SERVICE SPECIFICATIONS

11100030625

Items		Standard value	Limit
Generator drive belt vibration frequency Hz	When checked	150 - 184	-
	When a used belt is installed	159 - 176	-
	When a new belt is installed	191 - 218	-
Generator drive belt tension N (lbs)	When checked	392 - 588 (88 - 132)	-
	When a used belt is installed	441 - 539 (99 - 121)	-
	When a new belt is installed	637 - 833 (143 - 187)	-
Generator drive belt deflection (Reference value) mm (in)	When checked	8.7 - 11.4 (.34 - .45)	-
	When a used belt is installed	9.2 - 10 6 (.36 - .42)	-
	When a new belt is installed	6.6 - 8.3 (.26 - 33)	-
Power steering oil pump and A/C compressor drive belt vibration frequency Hz	When checked	137 - 168	-
	When a used belt is installed	145 - 160	-
	When a new belt is installed	174 - 199	-
Power steering oil pump and A/C compressor drive belt tension N (lbs.)	When checked	392 - 588 (88 - 132)	-
	When a used belt is installed	441 - 539 (99 - 121)	-
	When a new belt is installed	637 - 833 (143 - 187)	-

Items		Standard value	Limit
Power steering oil pump and A/C compressor drive belt deflection (Reference value) mm (in.)	When checked	9.6 - 12.4 (.38 - 49)	-
	When a used belt is installed	10.2 - 11.6 (.40 - .46)	-
	When a new belt is installed	7.2 - 9.0 (.28 - .36)	-
A/C compressor drive belt tension N (lbs.)	When checked	392 - 588 (88 - 132)	-
	When a used belt is installed	441 - 539 (99 - 121)	-
	When a new belt is installed	637 - 833 (143 - 187)	-
A/C compressor drive belt deflection (Reference value) mm (in.)	When checked	4.6 - 6.2 (.18 - .24)	-
	When a used belt is installed	5.0 - 5.7 (.20 - .22)	-
	When a new belt is installed	3.4 - 4.3 (.13 - .17)	-
Basic ignition timing at idle		5°BTDC ± 3°	-
Actual ignition timing at curb idle		Approx. 10°BTDC	-
CO contents %		0.5 or less	-
HC contents ppm		100 or less	-
Curb idle speed r/min		700 ± 100	-
Compression pressure (at 300 r/min) kPa (psi)		1290 (188)	min. 920 (133)
Compression pressure difference of all cylinders kPa (psi)		-	max. 100 (14)
Intake manifold vacuum at curb idle kPa (in.Hg)		-	min. 60 (18)
Cylinder head bolt shank length mm (in.)		-	103.2 (4.06)

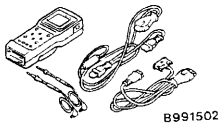
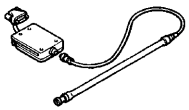
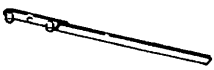
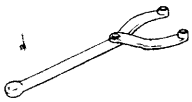
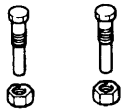
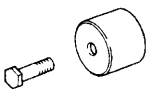
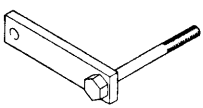
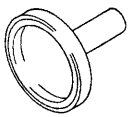
SEALANT

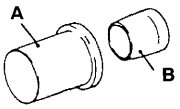
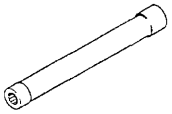
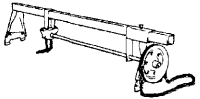
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Item	Specified sealant
Oil pan	MITSUBISHI GENUINE PART MD970389 or equivalent

SPECIAL TOOLS

11100060631

Tool	Tool number and name	Supersession	Application
 B991502	MB991502 Scan tool (MUT-II)	MB991496-OD	Checking the ignition timing Checking the idle speed
	MB991668 Belt tension meter set	Tool not available	Drive belt tension measurement
	MD998747 Crankshaft pulley holder	General service tool	Holding the crankshaft pulley
	MB990767 End yoke holder	MB990767-01	Holding the camshaft sprocket
	MD998719 or MD998754 Crankshaft pulley holder pin	MIT308239	Holding the camshaft sprocket
	MD998713 Camshaft oil seal installer	MD998713-01	Press-in of the camshaft oil seal
	MD998727 Oil pan remover	MD998727-01	Removal of oil pan
	MD998781 Flywheel stopper	General service tool	Securing the flywheel <M/T> or drive plate <A/T>
	MD998718 Crankshaft rear oil seal installer	MD998718-01	Press-in of the crankshaft rear oil seal

Tool	Tool number and name	Supersession	Application
	A: MD998304 Crankshaft front oil seal installer B: MD998305 Crankshaft front oil seal guide	A: MD998304-01 B: MD998305-01	Press-in of the crankshaft front oil seal
	MB991653 Cylinder head bolt wrench	General service tool	Removal and installation of the cylinder head bolt
	GENERAL SERVICE TOOL MZ203827 Engine lifter	MZ203827-01	Supporting the engine assembly during removal and installation of the tranaxle
	MB991453 Engine hanger assembly	MZ203827-01	

TROUBLESHOOTING

11100070252

Symptom	Probable cause	Remedy
Compression too low	Cylinder head gasket blown	Replace gasket
	Piston ring worn or damage	Replace rings
	Piston or cylinder worn	Repair or replace piston and/or cylinder block
	Valve seat worn or damage	Repair or replace valve and/or seat ring
	Valve guide worn or damage	Replace valve guide
Oil pressure drop	Engine oil level too low	Check engine oil level
	Oil pressure switch faulty	Replace oil pressure switch
	Oil filter clogged	Install new filter
	Oil pump gears or cover worn	Replace gears and/or cover
	Thin or diluted engine oil	Change engine oil to correct viscosity
	Oil relief valve stuck (opened)	Repair relief valve
	Excessive bearing clearance	Replace bearings
Oil pressure too high	Oil relief valve stuck (closed)	Repair relief valve
Noisy valves	Malfunction of lash adjuster (Entry of air into the high pressure chamber, etc.)	Check the lash adjuster
	Thin or diluted engine oil (low oil pressure)	Change engine oil
	Valve stem or valve guide worn or damage	Replace valve and/or guide
Connecting rod noise/ main bearing noise	Insufficient oil supply	Check engine oil level
	Low oil pressure	Refer to"Oil pressure drop"
	Thin or diluted engine oil	Change engine oil
	Excessive bearing clearance	Replace bearings
Timing belt noise	Incorrect belt tension	Adjust belt tension and/or replace timing belt
Excessive engine rolling and vibration	Loose engine roll stopper (Front, Rear) Loose transaxle mount bracket Loose engine mount bracket Loose center member	Retighten
	Broken transaxle mount insulator Broken engine mount insulator Broken engine roll stopper insulator	Replace

ON-VEHICLE SERVICE

11100090562

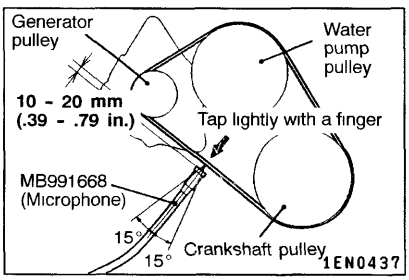
DRIVE BELT TENSION CHECK AND ADJUSTMENT

GENERATOR DRIVE BELT TENSION CHECK

Check drive belt tension in one of the following procedures.

Standard value:

Vibration frequency Hz	150 - 184
Tension N (lbs.)	392 - 588 (88 - 132)
Deflection (Reference value) mm (in.)	8.7 - 11.4 (.34 - .45)

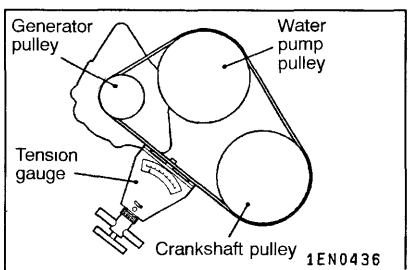


<When using the scan tool (MUT-II)>

1. Connect the belt tension meter set (special tool) to the scan tool (MUT-II).
2. Connect the scan tool (MUT-II) to the diagnosis connector.
3. Turn the ignition switch to "ON" and select "Belt Tension Measurement" on the menu screen.
4. Hold the microphone to the middle of the drive belt between the pulleys (at the place indicated by an arrow) about 10 - 20 mm (0.39 - 0.79 in.) away from the rear surface of the belt and so that it is perpendicular to the belt (within an angle of ±15°).
5. Lightly tap the middle of the belt between the pulleys (the place indicated by the arrow) with your finger as shown in the illustration. Check that the vibration frequency of the belt is within the standard value.

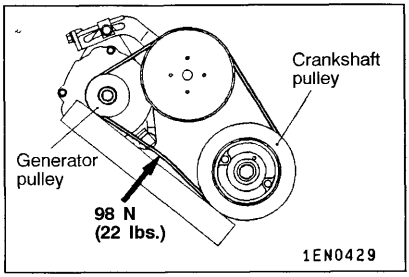
Caution

1. **The temperature of the surface of the belt should be as close as possible to normal temperature.**
2. **Do not allow any contaminant such as water or oil to get onto the microphone.**
3. **If strong gusts of wind blow against the microphone or if there is any source of loud noise nearby, the values measured by the microphone may not correspond to actual values.**
4. **If the microphone is touching the belt during the measurement, the values measured by the microphone may not correspond to actual values.**
5. **Do not take the measurement while the vehicle's engine is running.**



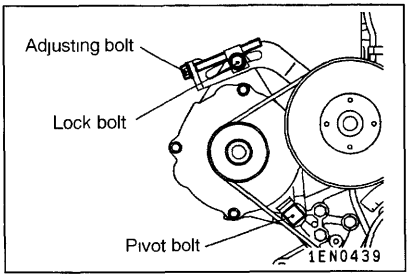
<When using a tension gauge>

Use a belt tension gauge to check that the belt tension is within the standard value range.



<Belt deflection check>

Apply 98 N (22 lbs.) of force to the middle of the drive belt between the pulleys (at the place indicated by the arrow) and check that the amount of deflection is within the standard value range.



GENERATOR DRIVE BELT TENSION ADJUSTMENT

1. Loosen the nut of the generator pivot bolt.
2. Loosen the lock bolt.
3. Turn the adjusting bolt to adjust the belt tension vibration frequency, belt tension or deflection to the standard value.

Standard value:

Items	When a used belt is installed	When a new belt is installed
Vibration frequency Hz	159 - 176	191 - 218
Tension N (lbs)	441 - 539 (99 - 121)	637 - 833 (143 - 187)
Deflection (Reference value) mm (in.)	9.2 - 10.6 (.36 - 42)	6.6 - 8.3 (.26 - .33)

4. Tighten the nut of the generator pivot bolt.

   Tightening torque: 44 Nm (33 ft.lbs.)
5. Tighten the lock bolt.

   Tightening torque: 23 Nm (17 ft.lbs.)
6. Tighten the adjusting bolt.

   Tightening torque: 9.8 Nm (7.2 ft.lbs.)

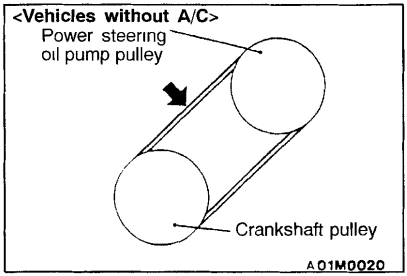
POWER STEERING OIL PUMP AND AIR CONDITIONING COMPRESSOR DRIVE BELT TENSION CHECK AND ADJUSTMENT

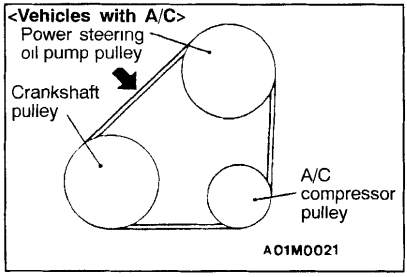
<Vehicles with power steering> 11100130196

1. Check drive belt tension in one of the following procedures.

Standard value:

Items	When checked	When a used belt is intalled	When a new belt is installed
Vibration frequency Hz	137 - 168	145 - 160	174 - 199
Tension N (lbs)	392 - 588 (88 - 132)	441 - 539 (99 - 121)	637 - 833 (143 - 187)
Deflection (Reference value) mm (in.)	9.6 - 12.4 (.38 - .49)	10.2 - 11.6 (.40 - 46)	7.2 - 9.0 (.28 - .35)



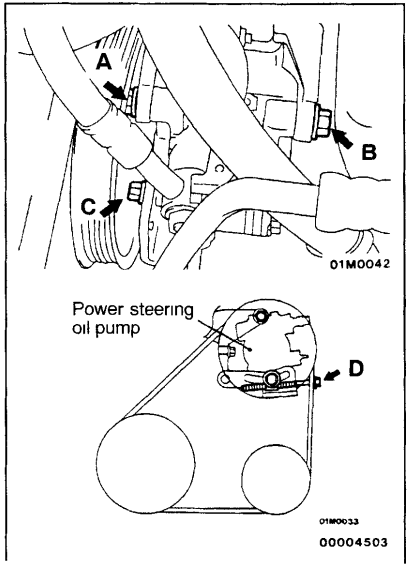


<When using the scan tool (MUT-II)>
Lightly tap the middle of the belt between the pulleys (the place indicated by the arrow) with your finger as shown in the illustration. Check that the vibration frequency of the belt is within the standard value.

NOTE
Check drive belt vibration frequency with the scan tool (MUT-II) in the same procedure in WATER PUMP AND GENERATOR. (Refer to P.00-35.)

<When using a tension gauge>
Use a belt tension gauge to check that the belt tension is at the standard value at a point half-way between the two pulleys (indicated by an arrow in the illustration).

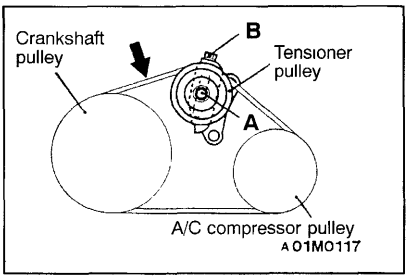
<Belt deflection check>
Apply 98 N (22 lbs.) of force to the middle of the drive belt between the pulleys (at the place indicated by the arrow) and check that the amount of deflection is within the standard value range.



2. If the tension or deflection is outside the standard value, adjust by the following procedure.
   (1) Loosen power steering oil pump fixing bolts A, B and C.
   (2) Adjust the amount of belt deflection using adjusting bolt D.
   (3) Tighten fixing bolts A, B and C.

   Tightening torque:
   Bolts A and B: 39 Nm (29 ft.lbs.)
   Bolt C: 49 Nm (36 ft.lbs.)
   (4) Check the belt deflection amount and tension, and readjust if necessary.

   Caution
   Check after turning the crankshaft once or more clockwise (right turn).



AIR CONDITIONING COMPRESSOR DRIVE BELT TENSION CHECK AND ADJUSTMENT

<Vehicles without power steering> 11100100210

1. Check drive belt tension in one of the following procedures.

Standard value:

Items	When checked	When a used belt is installed	When a new belt is installed
Vibration frequency Hz	137 - 168	145 - 160	174 - 199
Tension N (lbs.)	392 - 588 (88 - 132)	441 - 539 (99 - 121)	637 - 833 (143 - 187)
Deflection (Reference value) mm (in)	9.6 - 12.4 (.38 - .49)	10.2 - 11.6 (.40 - .46)	7.2 - 9.0 (.28 - .35)

<When using the scan tool (MUT-II)>
Lightly tap the middle of the belt between the pulleys (the place indicated by the arrow) with your finger as shown in the illustration. Check that the vibration frequency of the belt is within the standard value.

NOTE
Check drive belt vibration frequency with the scan tool (MUT-II) in the same procedure in WATER PUMP AND GENERATOR. (Refer to P.00-35.)

<When using a tension gauge>
Use a belt tension gauge to check that the belt tension is at the standard value at a point half-way between the two pulleys (indicated by an arrow in the illustration).

<Belt deflection check>
Apply 98 N (22 lbs.) of force to the middle of the drive belt between the pulleys (at the place indicated by the arrow) and check that the amount of deflection is within the standard value range.

2. If the tension or deflection is outside the standard value, adjust by the following procedure.
   (1) Loosen tension pulley fixing nut A.
   (2) Adjust the amount of belt deflection using adjusting bolt B.
   (3) Tighten fixing nut A.

   Tightening torque: 25 Nm (19 ft.lbs.)

   (4) Check the belt deflection amount and tension, and readjust if necessary.

   Caution
   Check after turning the crankshaft once or more clockwise (right turn).

IGNITION TIMING CHECK

11100170143

1. Before inspection, set the vehicles in the following condition.
   - Engine coolant temperature: 80 - 95°C (176 - 203°F)
   - Lights, electric cooling fan and all accessories: OFF
   - Transaxle: Neutral (P range on vehicles with A/T)
2. Connect the scan tool to the date link connector.
3. Set up a timing light.
4. Start the engine and run at idle.
5. Check that the idle speed is at approx. 700 r/min.
6. Select the "item No.17" of the actuator test on the scan tool.
7. Check that basic ignition timing is within the standard value.

   Standard value: 5° BTDC ± 3°

8. If the basic ignition timing is outside the standard value, check the MFI components by referring to GROUP 13A - Troubleshooting.
9. Press the clear key of the scan tool (select force-activating cancel mode), and cancel the actuator test.

   NOTE
   If it is not cancelled, force-activation continues for 27 minutes. Do not drive the vehicle in this condition, or the engine could be damaged.

10. Check the actual ignition timing is at the standard value.

    Standard value: Approx. 10° BTDC

    NOTE
    Ignition timing is variable within about ±7°, even under normal operating.

CURB IDLE SPEED CHECK

11100190538

1. Before inspection, set the vehicles in the following condition.
   - Engine coolant temperature: 80 - 95°C (176 - 203°F)
   - Lights, electric cooling fan and all accessories: OFF
   - Transaxle: Neutral (P range on vehicles with A/T)
2. Turn the ignition switch off and connect the scan tool to the data link connector.
3. Check that the basic ignition timing is within the standard value.

   Standard value: 5° BTDC ± 3°

4. Run the engine at idle for 2 minutes.
5. Check the curb idle speed. Select item No.22 and take a reading of the idle speed.

   Standard value: 700 ± 100 r/min

   NOTE
   The idle speed is controlled automatically by the idle air control system.

6. If the idle speed is not within the standard value, check the MFI components by referring to GROUP 13A - Troubleshooting.

IDLE MIXTURE CHECK

11100210241

1. Before inspection, set the vehicles in the following condition.
   - Engine coolant temperature: 80 - 95°C (176 - 203°F)
   - Lights, electric cooling fan and all accessories: OFF
   - Transaxle: Neutral (P range on vehicles with A/T)
2. Turn the ignition switch off and connect the scan tool to the data link connector.
3. Check that the basic ignition timing is within the standard value.

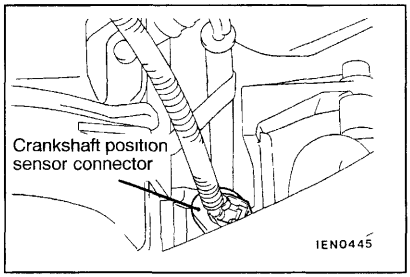
   Standard value: 5°BTDC ± 3°

4. Run the engine at 2,500 r/min for 2 minutes.
5. Set the CO/HC tester.
6. Check the CO contents and the HC contents at idle.

   Standard value:
   CO contents: 0.5% or less
   HC contents: 100 ppm or less

7. If the idle speed is not within the standard value, check the following items:
   - Diagnostic output
   - Closed-loop control (When the closed-loop control is carried out normally, the output signal of the heated oxygen sensor repeats between 0 - 400 mV and 600 - 1,000 mV at idle.)
   - Fuel pressure
   - Injector
   - Ignition coil, spark plug cable, spark plug
   - EGR system and the EGR valve leak
   - Evaporative emission control system
   - Compression pressure

   NOTE
   Replace the three-way catalyst whenever the CO and HC contents do not remain inside the standard value. (even though the result of the inspection is normal on all items).



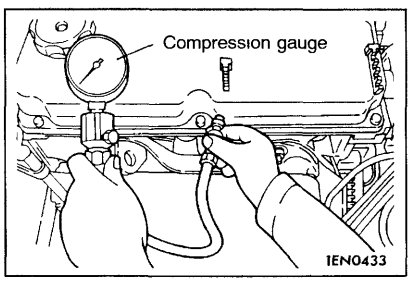
COMPRESSION PRESSURE CHECK

11100260673

1. Before inspection, check that the engine oil, starter and battery are normal. Also, set the vehicle to the following condition:
   - Engine coolant temperature: 80 - 95°C (176 - 203°F)
   - Lights, electric cooling fan and all accessories: OFF
   - Transaxle: Neutral (P range on vehicles with A/T)
2. Disconnect the spark plug cables.
3. Remove all of the spark plugs.
4. Disconnect the crankshaft position sensor connector.

   NOTE
   Doing this will prevent the engine control unit from carrying out ignition and fuel injection.
5. Cover the spark plug hole with a shop towel etc., and after the engine has been cranked, check that no foreign material is adhering to the shop towel.

   Caution
   1. Keep away from the spark plug hole when cranking.
   2. If compression is measured with water, oil, fuel, etc., that has come from cracks inside the cylinder, these materials will become heated and will gush out from the spark plug hole, which is dangerous.



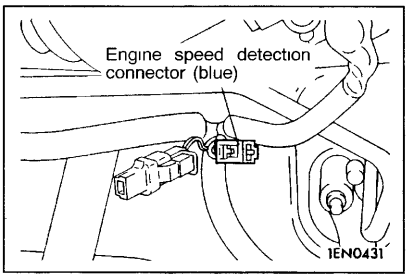
6. Set compression gauge to one of the spark plug holes.
7. Crank the engine with the throttle valve fully open and measure the compression pressure.

   Standard value (at engine speed of 300 r/min): 1,290 kPa (188 psi)
   Limit (at engine speed of 300 r/min): min. 920 kPa (133 psi)
8. Measure the compression pressure for all the cylinders, and check that the pressure differences of the cylinders are below the limit.

   Limit: max. 100 kPa (14 psi)
9. If there is a cylinder with compression or a compression difference that is outside the limit, pour a small amount of engine oil through the spark plug hole, and repeat the operations in steps 7 and 8.
   (1) If the compression increases after oil is added, the cause of the malfunction is a worn or damaged piston ring and/or cylinder inner surface.
   (2) If the compression does not rise after oil is added, the cause is a burnt or defective valve seat, or pressure is leaking from the gasket.

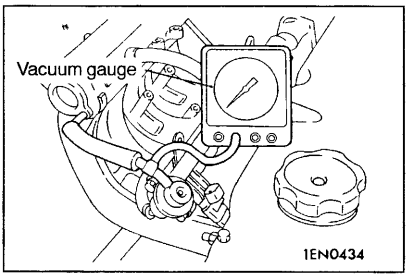
10. Connect the crankshaft position sensor connector.
11. Install the spark plugs and spark plug cables.
12. Use the scan tool to erase the diagnostic trouble codes, or disconnect the negative battery cable for more than 10 seconds and reconnect it.

NOTE
This will erase the diagnostic trouble code resulting from the crankshaft position sensor connector being disconnected.



MANIFOLD VACUUM CHECK 11100270256

1. Before inspection, set the vehicle in the following condition.
   - Engine coolant temperature: 80 - 95°C (176 - 203°F)
   - Lights, electric cooling fan and all accessories: OFF
   - Transaxle: Neutral (P range on vehicles with A/T)
2. Connect the scan tool to the data link connector, or connect a primary voltage detection type tachometer to the connector through a paper clip.

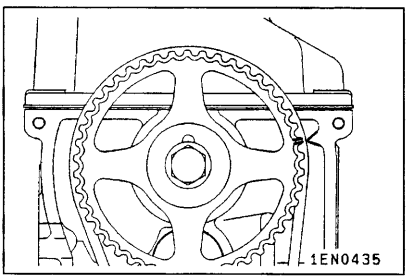


3. Attach a three-way joint to the vacuum hose connected between the intake manifold plenum and the fuel pressure regulator and connect a vacuum gauge.
4. Start the engine, and check that the curb idle speed is within the standard value range.

   Standard value: 700 ± 100 r/min

5. Check the manifold vacuum.

   Limit: min. 60 kPa (18 in.Hg)



TIMING BELT TENSION ADJUSTMENT 11100280112

1. Remove the timing belt upper cover.
2. Turn the crankshaft clockwise to set the No.1 cylinder to the top dead center.

   Caution
   As the purpose of this procedure is to apply the proper amount of tension to the timing belt by means of the cam drive torque, be sure not to rotate the crankshaft counterclockwise.

3. Remove the access cover.
4. Loosen the timing belt tensioner fixing bolt to apply tension to the belt by means of the force of the tensioner spring.

   Caution
   The bolt can be loosened 90° - 180°. If the belt is loosened more than necessary, the bolt may fall inside the cover.

5. Tighten the timing belt tensioner fixing bolt.
6. Install the access cover.
7. Install the timing belt upper cover.

LASH ADJUSTER CHECK

11100290665

If an abnormal noise (clicking) assumed to be caused by a fault in the lash adjuster is heard and does not stop after the engine is started, inspect the following items.

NOTE

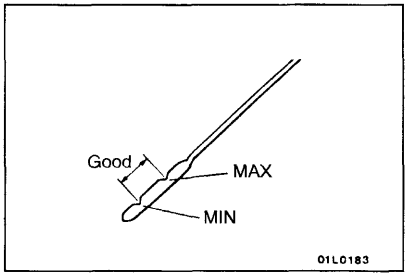
(1) The abnormal noise caused by the lash adjuster occurs just after starting and fluctuates according to the engine speed, but is not related to the engine load.
Thus, if the abnormal noise does not occur just after the engine speed, if it does not fluctuate according to the engine speed, or if it fluctuates according to the engine load, the lash adjuster is not the cause of the abnormal noise.

(2) If the lash adjuster is defective, often the abnormal noise will not stop even if warmup operation is continued in the idling state.
Note that the abnormal noise may stop only if the noise is caused by fixing of oil sludge in an engine where the oil control is poor.

1. Start the engine.
2. Check whether the abnormal noise starts immediately after starting, and whether it fluctuates according to the engine speed when the engine speed is varied.
If the abnormal noise does not occur immediately after starting, or if it does not fluctuate according to the engine speed, the cause is not with the lash adjuster, so investigate for other causes of the abnormal noise. If the abnormal noise does not fluctuate according to the engine speed, it is assumed that the cause is not the engine unit. (In this case, the lash adjuster is normal.)
3. Check whether the abnormal noise level does not change when the engine load is fluctuated (ex., shift from N to D range) in the idling state.
If the abnormal noise level fluctuates, this may be a hitting sound caused by wear of the crankshaft bearings or connecting rod bearings. (In this case, the lash adjuster is normal.)
4. Check for abnormal noise in the idling state after warmup operation is completed.
If the abnormal noise is quieter or has stopped, it is assumed that the noise was caused by fixing of the lash adjuster due to oil sludge, etc., so wash the lash adjuster. (Refer to GROUP 11B - Rocker Arms and Camshaft.)
If the abnormal noise level does not fluctuate, go to step 5.
5. Bleed the air from the lash adjuster. (Refer to GROUP 11A-17.)
6. If the abnormal noise does not stop even after purging the air, wash the lash adjuster. (Refer to GROUP 11B - Rocker Arms and Camshaft.)

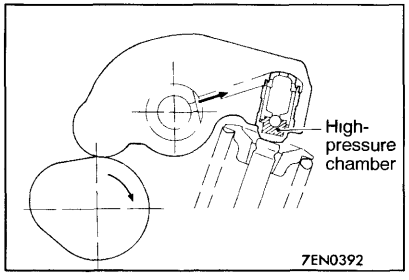
PURGING OF THE LASH ADJUSTER

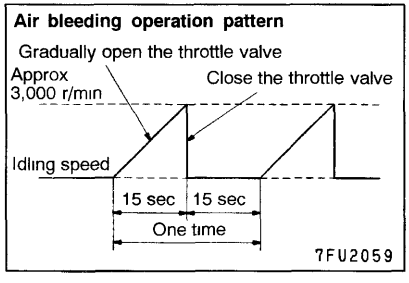
NOTE
(1) If the vehicle is parked for a long time on a slope, the oil in the lash adjuster will decrease, and air may enter the high pressure chamber when starting.
(2) When the vehicle is parked for a long time, there will be no oil in the oil passage, and it will take time for the oil to be supplied to the lash adjuster. Thus, air may enter the high pressure chamber.
(3) In the above cases, the abnormal noise can be stopped by purging the lash adjuster.



1. Check the engine oil, and replenish or replace it if necessary.

   NOTE
   (1) If the engine oil level is low, air will be sucked in from the oil screen and will enter the oil passage.
   (2) If the engine oil level is higher than the specified amount, the oil will be mixed by the crankshaft and a large amount of air may enter the oil.
   (3) If the oil is deteriorated, the air and oil will not separate easily, and the amount of air in the oil will increase.
   (4) If due to the above types of cases, air enters the oil and into the high pressure chamber of the lash adjuster, the air in the high pressure chamber will be compressed too much when the valve is opened, so abnormal noise will occur when the valve is shut. This is the same phenomenon as when the valve clearance is excessive. In this case, the lash adjuster functions will return to normal if the air in the lash adjuster is bled out.





2. Carry out warmup operation for one to three minutes in the idling state.
3. Repeat the operation pattern shown on the left in a no-load state, and check for abnormal noise. (Normally, the abnormal noise will stop after the pattern is repeated for 10 to 30 times, but if the abnormal noise level does not change even when the pattern is repeated for 30 or more times, the cause may be other than the entry of air.
4. After the abnormal noise stops, repeat the operation pattern shown on the left for another five times.
5. For one to three minutes in the idling state, check that the abnormal noise has stopped.

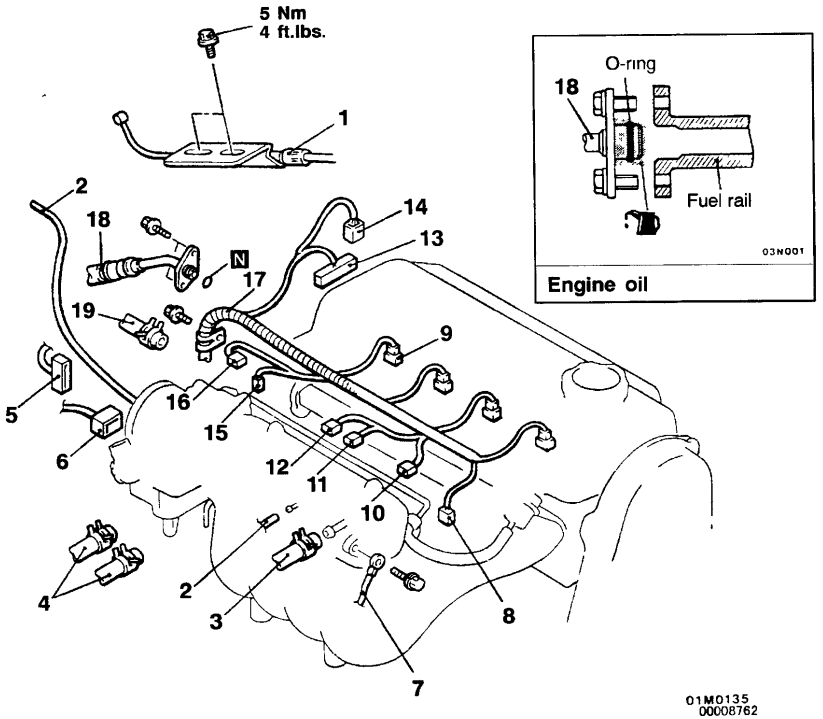
ENGINE ASSEMBLY

11200100787

REMOVAL AND INSTALLATION

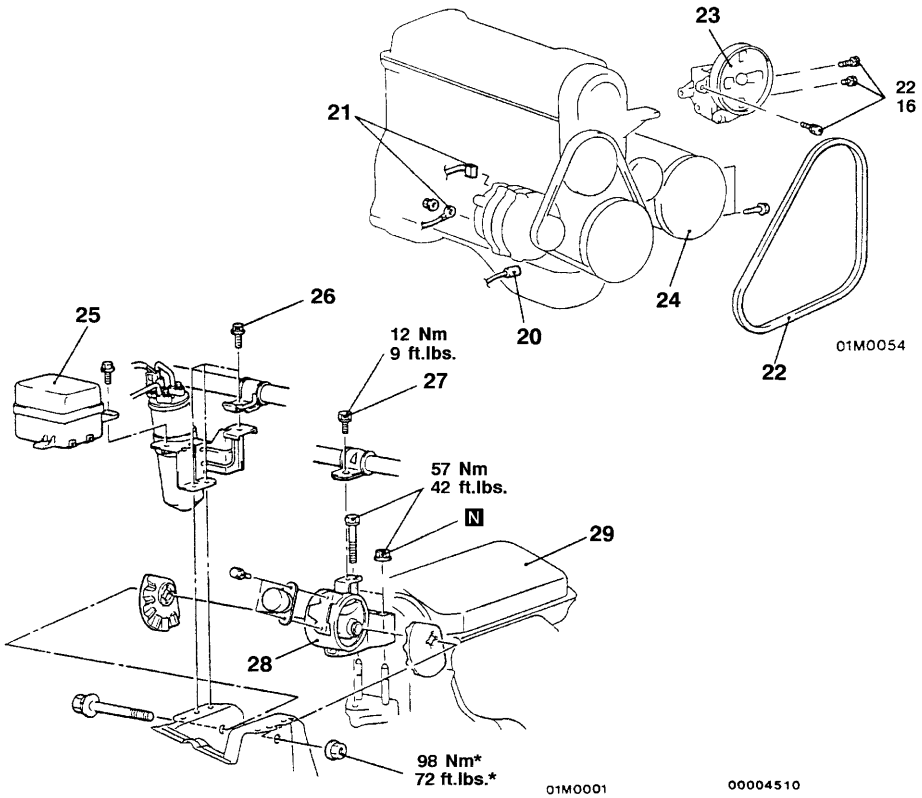
Pre-removal Operation
(1) Fuel Discharge Prevention
(Refer to GROUP 13A - On-vehicle Service)
(2) Under Cover Removal
(3) Hood Removal (Refer to GROUP 42)
(4) Air Cleaner Removal
(5) Radiator Removal (Refer to GROUP 14)
(6) Front Exhaust Pipe Removal (Refer to GROUP 15.)

Post-installation Operation
(1) Front Exhaust Pipe Installation
(Refer to GROUP 15)
(2) Radiator Installation (Refer to GROUP 14.)
(3) Air Cleaner Installation
(4) Hood Installation (Refer to GROUP 42)
(5) Under Cover Installation
(6) Drive Belt Tension Adjustment
(7) Accelerator Cable Adjustment
(Refer to GROUP 17 - On-vehicle Service.)



Removal steps

1 Accelerator cable connection
2. Vacuum hose connection
3. Brake booster vacuum hose connection
4. Heater hose connection
5 Throttle position sensor connector
6 Idle speed control connector
7. Ground cable connection
8. Heated oxygen sensor connector
9 Injector connector
10. Intake air temperature sensor connector
11 Evaporative emission purge solenoid connector
12. EGR solenoid connector
13. Distributor connector
14. Heated oxygen sensor connector <Vehicles for California>
15. Engine coolant temperature gauge unit connector
16 Engine coolant temperature sensor connector
17. Control wiring harness
▶C◀ 18. High-pressure fuel hose connection
19. Fuel return hose connection



20. Oil pressure switch connector
21. Generator connector
22. Drive belt
(Power steering and A/C)
◀A▶ 23. Power steering oil pump and bracket assembly
◀B▶ 24. Air conditioning compressor
◀C▶ • Transaxle assembly
25 Air conditioning relay box
26. Air conditioning receiver bracket mounting bolts
27. Power steering hose mounting bolt
◀D▶ ▶B◀ 28 Engine mount bracket
◀E▶ ▶A◀ 29 Engine assembly

Caution
Mounting locations marked by * should be provisionally tightened, and then fully tightened when the body is supporting the full weight of the engine.

REMOVAL SERVICE POINTS

◀A▶ POWER STEERING OIL PUMP AND BRACKET ASSEMBLY REMOVAL

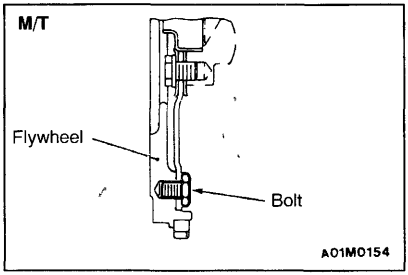
Remove the power steering oil pump and bracket assembly from the engine with the hose attached.

NOTE
Place the removed power steering oil pump in a place where it will not be a hindrance when removing and installing the engine assembly, and tie it with a cord.

◀B▶ A/C COMPRESSOR REMOVAL

Disconnect the A/C compressor connector and remove the compressor from the compressor bracket with the hose still attached.

NOTE
Place the removed A/C compressor where it will not be a hindrance when removing and installing the engine assembly, and tie it with a cord.

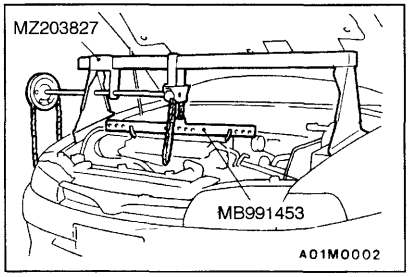


◀C▶ TRANSAXLE ASSEMBLY REMOVAL

<M/T>:
Refer to GROUP 22A.

Caution
Do not remove the flywheel mounting bolt shown by the arrow. If this bolt is removed, the flywheel will become out of balance and damaged.

<A/T>:
Refer to GROUP 23A.



◀D▶ ENGINE MOUNT BRACKET REMOVAL

1. Support the engine with a garage jack.
2. Remove the special tool which was attached when the transaxle assembly was removed.
3. Hold the engine assembly with a chain block or similar tool.
4. Place a garage jack against the engine oil pan with a piece of wood in between, jack up the engine so that the weight of the engine is no longer being applied to the engine mount bracket, and then remove the engine mount bracket.

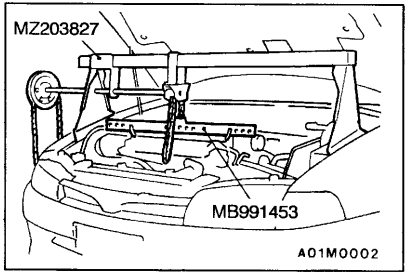
◀E▶ ENGINE ASSEMBLY REMOVAL

After checking that all cables, hoses and harness connectors, etc, are disconnected from the engine, lift the chain block slowly to remove the engine assembly upward from the engine compartment.

INSTALLATION SERVICE POINTS

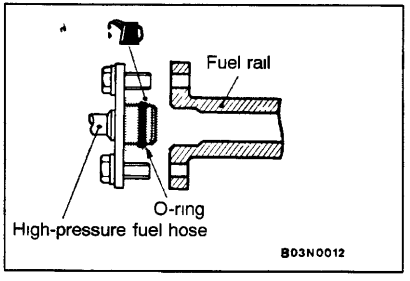
▶A◀ ENGINE ASSEMBLY INSTALLATION

Install the engine assembly, checking that the cables, hoses, and harness connectors are not pinched.



▶B◀ ENGINE MOUNT BRACKET INSTALLATION

1. Place a garage jack against the engine oil pan with a piece of wood in between, and install the engine mount bracket while adjusting the position of the engine.
2. Support the engine with the garage jack.
3. Remove the chain block and support the engine assembly with the special tool.



▶C◀ HIGH-PRESSURE FUEL HOSE INSTALLATION

1. Apply a small amount of new engine oil to the O-ring.

   Caution
   Do not let any engine oil get into the fuel rail.

2. While turning the fuel high-pressure hose to the right and left, install it to the fuel rail, while being careful not to damage the O-ring. After installing, check that the hose turns smoothly.
3. If the hose does not turn smoothly, the O-ring is probably being pinched. Disconnect the high-pressure fuel hose and check the O-ring for damage. After this, re-insert the fuel rail and check that the hose turns smoothly.

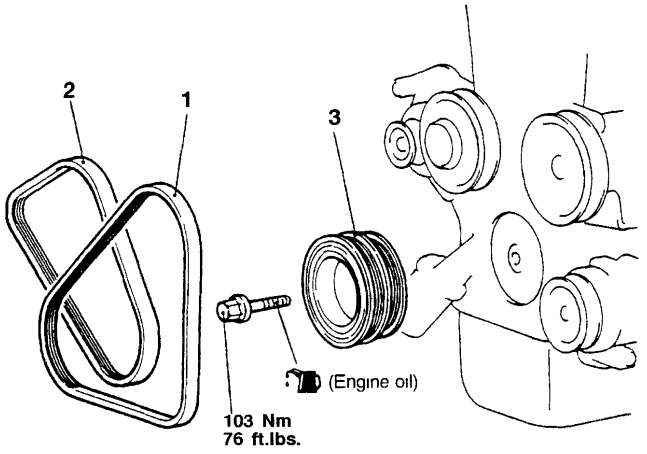
CRANKSHAFT PULLEY

11200160204

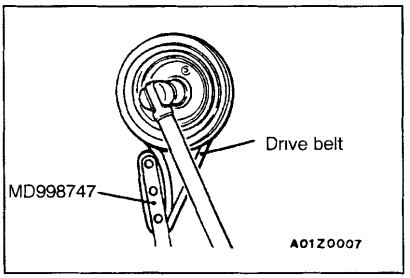
REMOVAL AND INSTALLATION

Pre-removal Operation
- Under Cover Removal

Post-installation Operation
(1) Drive Belt Tension Adjustment
(2) Under Cover Installation



Removal steps
1. Drive belt (Power steering and A/C)
2. Drive belt (Generator)
◀A▶ ▶A◀ 3. Crankshaft pulley



REMOVAL SERVICE POINT

◀A▶ CRANKSHAFT PULLEY REMOVAL

Use a drive belt, other than the engine's drive belt and special tool MD998747 to hold the rolling while removing the puller bolt.

Caution
1. **This drive belt will get damaged. Do not use the engine's drive belt.**
2. **Never use a damaged drive belt.**

INSTALLATION SERVICE POINT

▶A◀ CRANKSHAFT PULLEY INSTALLATION

When installing the crankshaft bolt, apply a minimal amount of engine oil to the bearing surface and thread of the bolt.

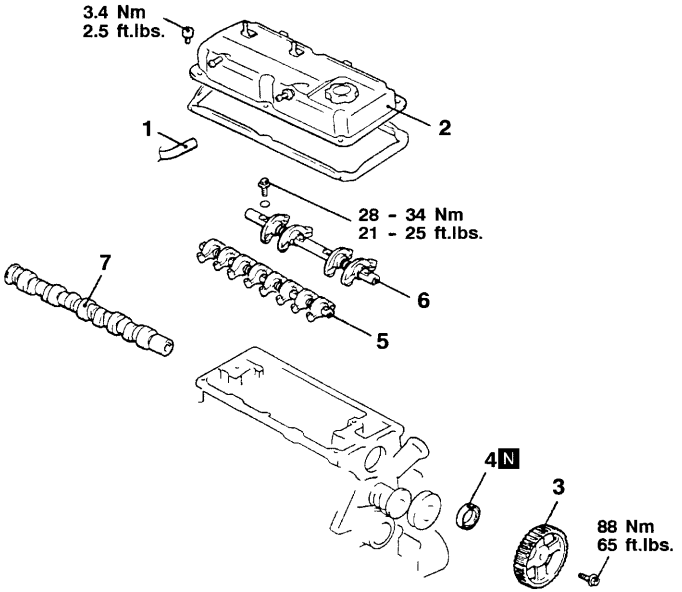
Caution
1. **This drive belt will get damaged. Do not use the engine's drive belt.**
2. **Never use a damaged drive belt.**

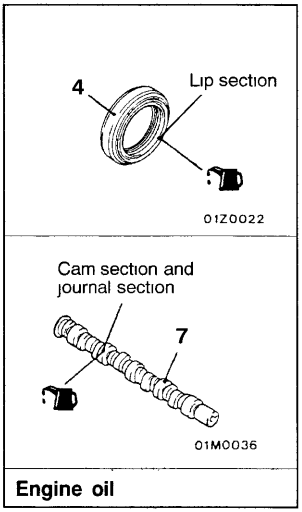
CAMSHAFT AND CAMSHAFT OIL SEAL

11200190494

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
(1) Air Cleaner Removal and Installation
(2) Distributor Removal and Installation (Refer to GROUP 16)
(3) Timing Belt Removal and Installation (Refer to P 11A-32)

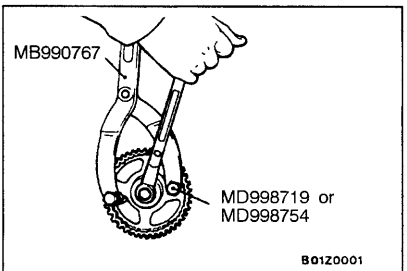




00004505

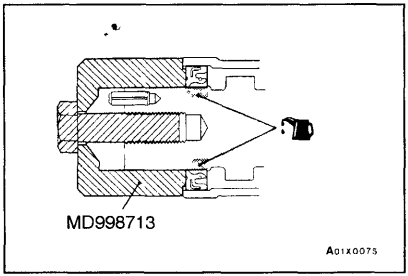
Removal steps

1. PCV hose connection
2. Rocker cover
◀A▶ ▶B◀ 3. Camshaft sprocket
▶A◀ 4. Camshaft oil seal
5. Rocker arm and shaft assembly (intake side)
6. Rocker arm and shaft assembly (exhaust side)
7. Camshaft



REMOVAL SERVICE POINT

◀A▶ CAMSHAFT SPROCKET REMOVAL



INSTALLATION SERVICE POINTS

▶A◀ CAMSHAFT OIL SEAL INSTALLATION

1. Apply engine oil to the camshaft oil seal lip.
2. Use the special tool to press-fit the camshaft oil seal.

▶B◀ CAMSHAFT SPROCKET INSTALLATION

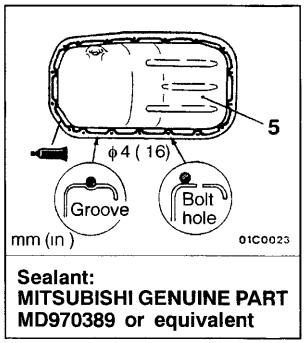
Use the special tool to stop the camshaft sprocket from turning in the same way as was done during removal, and then tighten the bolts to the specified torque.

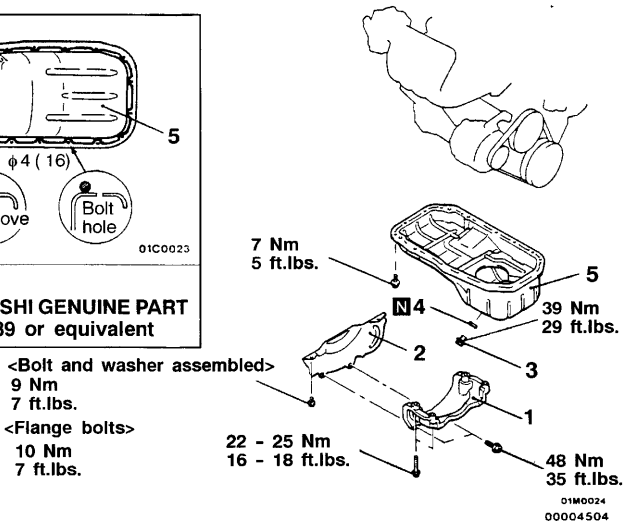
OIL PAN

11200280306

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
(1) Engine Oil Draining and Supplying (Refer to GROUP 00 - Maintenance Service)
(2) Oil Dipstick Removal and Installation
(3) Front Exhaust Pipe Removal and Installation (Refer to GROUP 15)

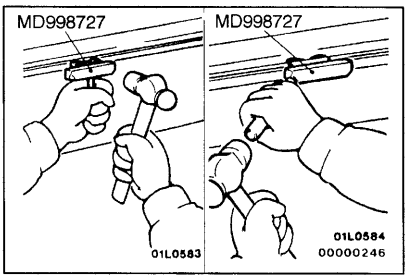




Removal steps

1. Transaxle stay
2. Bell housing cover
3. Drain plug

◀A▶ ▶A◀ 4 Drain plug gasket
5 Oil pan

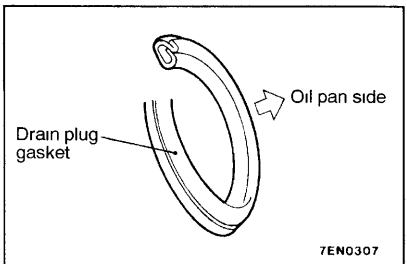


REMOVAL SERVICE POINT

◀A▶ OIL PAN REMOVAL

After removing the oil pan mounting bolts, remove the oil pan with the special tool and a brass bar.

Caution
Perform this slowly to avoid deformation of the oil pan flange.



INSTALLATION SERVICE POINT

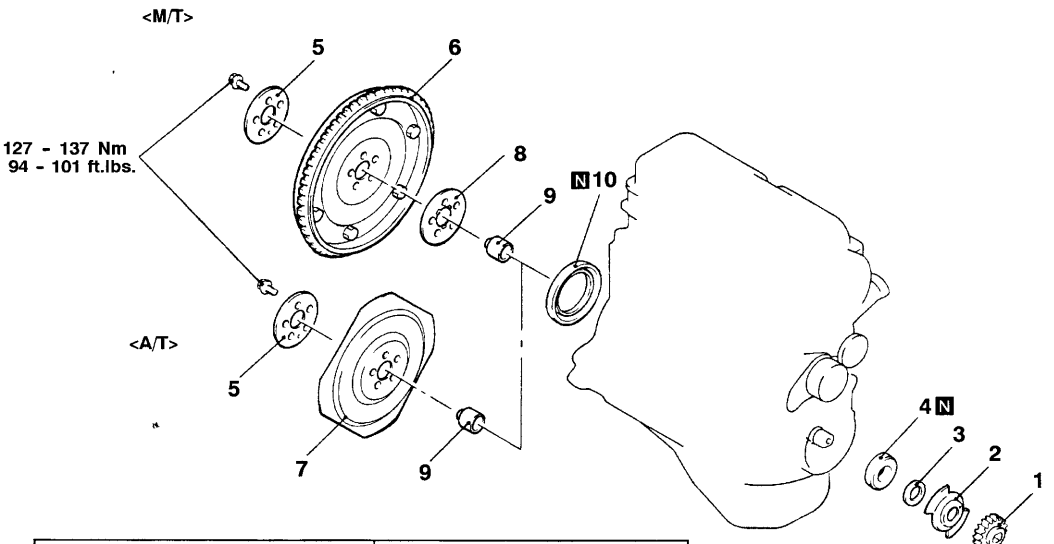
▶A◀ DRAIN PLUG GASKET INSTALLATION

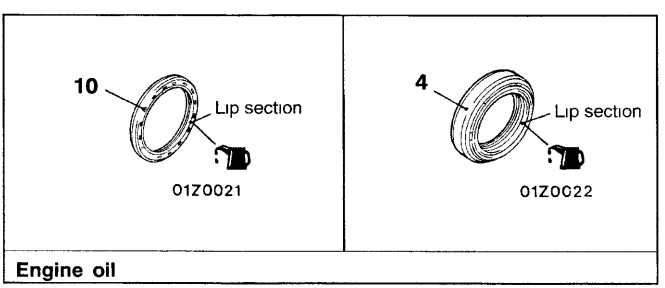
Install the drain plug gasket so it faces in the direction shown in the illustration.

CRANKSHAFT OIL SEAL

11200310227

REMOVAL AND INSTALLATION





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Crankshaft front oil seal removal steps

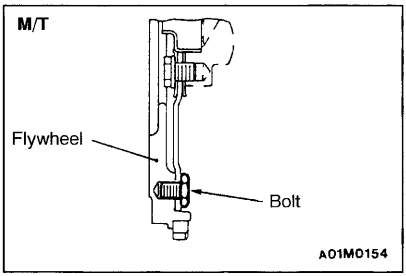
- Timing belt (Refer to P.11A-32.)
1. Crankshaft sprocket
2. Crankshaft sensing blade
3. Crankshaft spacer
▶C◀ 4. Crankshaft front oil seal

Crankshaft rear oil seal removal steps

◀A▶
- Transaxle assembly
- Clutch cover and disc <M/T>

◀B▶ ▶B◀ 5. Adapter plate
◀B▶ ▶B◀ 6. Flywheel <M/T>
◀B▶ ▶B◀ 7. Drive plate <A/T>
◀B▶ ▶B◀ 8. Adapter plate <M/T>
9. Crankshaft bushing
▶A◀ 10. Crankshaft rear oil seal

Caution
Do not disassemble the flywheel, as its runout is adjusted as an assembly. If it is disassembled, the flywheel may lose the balance and get damage.

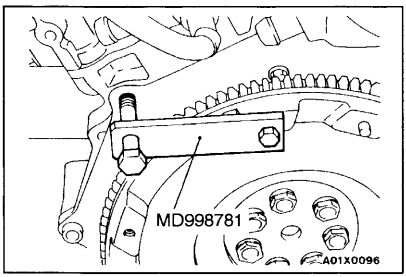


REMOVAL SERVICE POINT

◀A▶ TRANSAXLE ASSEMBLY REMOVAL

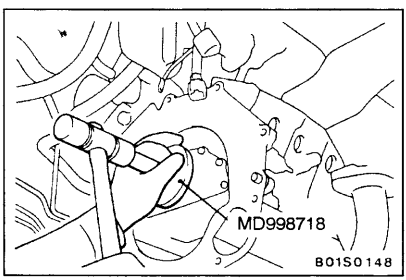
<M/T>:
Refer to GROUP 22A.

Caution
Do not remove the flywheel mounting bolt shown by the arrow. If this bolt is removed, the flywheel will become out of balance and damaged.
<A/T>:
Refer to GROUP 23A.



◀B▶ ADAPTER PLATE/FLYWHEEL <M/T>/DRIVE PLATE <A/T> REMOVAL

Use the special tool to secure the flywheel or drive plate, and remove the bolts.



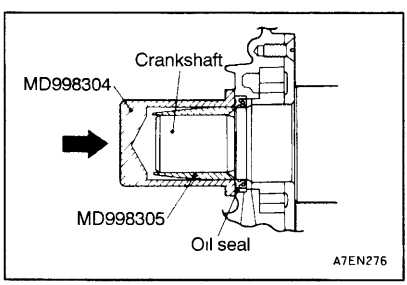
INSTALLATION SERVICE POINTS

▶A◀ CRANKSHAFT REAR OIL SEAL INSTALLATION

1. Apply a small amount of engine oil to the entire circumference of the oil seal lip.
2. Tap in the oil seal as show in the illustration.

▶B◀ DRIVE PLATE <A/T>/FLYWHEEL <M/T>/ADAPTER PLATE INSTALLATION

Use the special tool to hold the flywheel or drive plate in the same manner as removal, and install the bolt.



▶C◀ CRANKSHAFT FRONT OIL SEAL INSTALLATION

1. Apply a small amount of engine oil to the entire circumference of the oil seal lip.
2. Tap the oil seal until it is flush with the oil seal case.

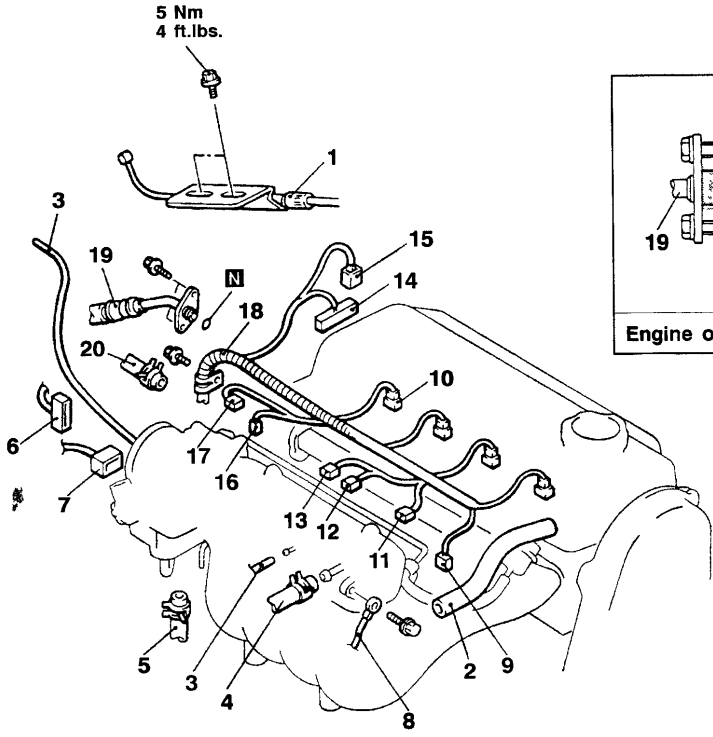
CYLINDER HEAD GASKET

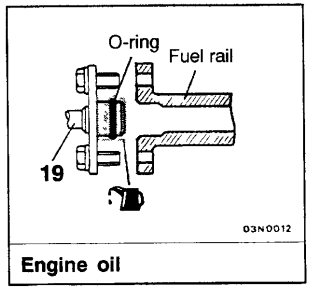
11200400771

REMOVAL AND INSTALLATION

Pre-removal Operation
(1) Fuel Discharge Prevention
(Refer to GROUP 13A - On-vehicle Service)
(2) Engine Oil Draining
(Refer to GROUP 00 - Maintenance Service)
(3) Thermostat Case Assembly Removal
(Refer to GROUP 14 - Water Hose and Water Pipe.)

Post-installation Operation
(1) Thermostat Case Assembly Installation
(Refer to GROUP 14 - Water Hose and Water Pipe.)
(2) Engine Oil Supplying
(Refer to GROUP 00 - Maintenance Service.)
(3) Accelerator Cable Adjustment
(Refer to GROUP 17 - On-vehicle Service)

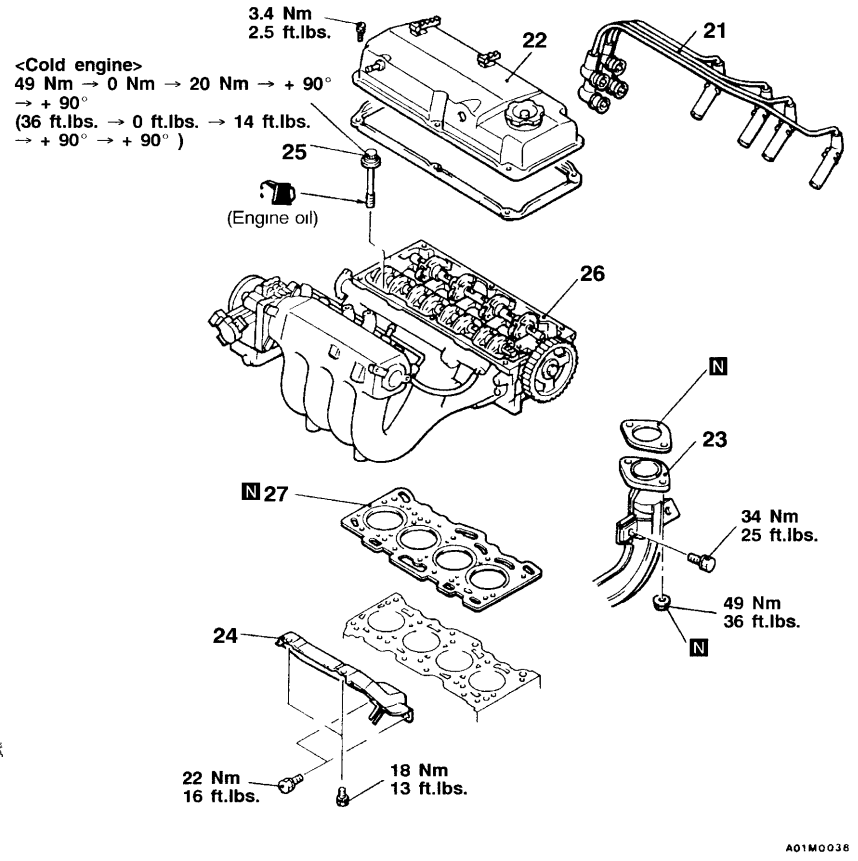




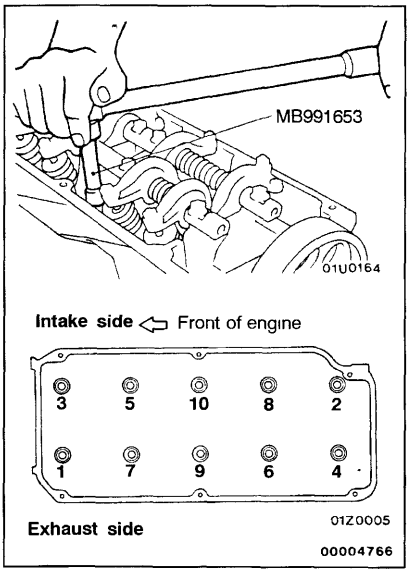
01M0134
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Removal steps

1. Accelerator cable connection
2. PCV hose
3. Vacuum hose connection
4. Brake booster vacuum hose connection
5. Water hose connection
6. Throttle position sensor connector
7. Idle speed control connector
8. Ground cable connection
9. Heated oxygen sensor connector
10. Injector connector
11. Intake air temperature sensor connector
12. Evaporative emission purge solenoid connector
13. EGR solenoid connector
14. Distributor connector
15. Heated oxygen sensor connector <Vehicle for California>
16. Engine coolant temperature gauge unit connector
17. Engine coolant temperature sensor connector
18. Control wiring harness
- ▶C◀ 19. High-pressure fuel hose connection
20. Fuel return hose connection



21. Spark plug cables
22. Rocker cover
    - Timing belt (Refer to P.11A-32.)
23. Front exhaust pipe connection
24. Intake manifold stay
◀A▶ ▶B◀ 25. Cylinder head bolts
26. Cylinder head
▶A◀ 27. Cylinder head gasket



REMOVAL SERVICE POINT

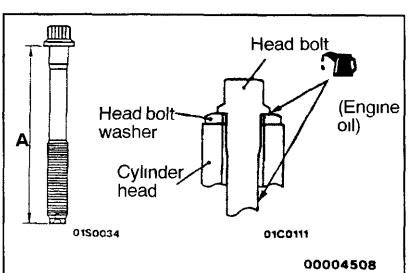
◀A▶ CYLINDER HEAD BOLT REMOVAL

Using the special tool, loosen the bolts in 2 or 3 steps in order of the numbers shown in the illustration, and remove the cylinder head assembly.

INSTALLATION SERVICE POINTS

▶A◀ CYLINDER HEAD GASKET INSTALLATION

1. Wipe off all oil and grease from the gasket mounting surface.
2. Install so that the cylinder head holes match the respective cylinder head gasket holes.

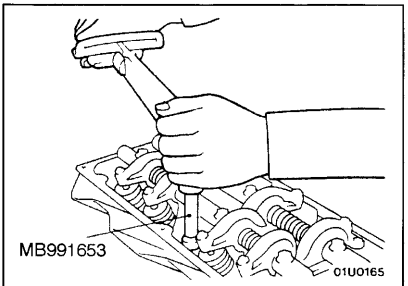


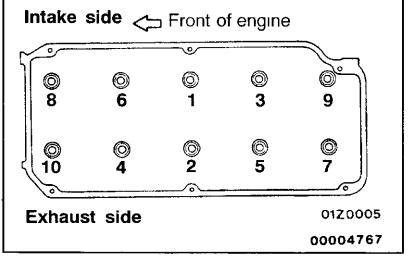
▶B◀ CYLINDER HEAD BOLT INSTALLATION

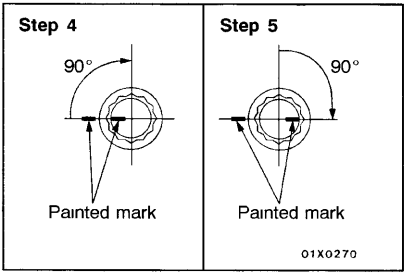
1. When installing the cylinder head bolts, the length below the head of the bolts should be within the limit. If it is outside the limit, replace the bolts.

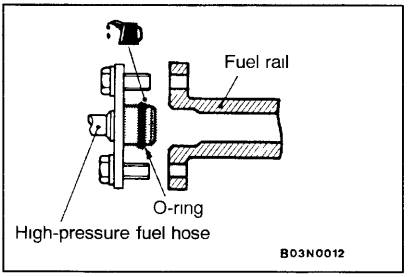
   Limit (A): 103.2 mm (4.06 in.)

2. The head bolt washer should be installed with the burred side, caused by tapping out, facing upward.









3. Using the special tool, tighten the bolts by the following procedure.

Step	Operation	Remarks
1	Tighten to 49 Nm (36 ft lbs)	Tighten in the order shown in the illustration.
2	Fully loosen.	Loosen in the reverse order of that shown in the illustration.
3	Tighten to 20 Nm (14 ft.lbs)	Tighten in the order shown in the illustration.
4	Tighten 90° of a turn.	In the order shown in the illustration. Mark the head of the cylinder head bolt and cylinder head by paint.
5	Tighten 90° of a turn.	In the order shown in the illustration Check that the painted mark of the head bolt is lined up with that of the cylinder head

Caution
1. **Always make a tightening angle of just 90°. If it is less than 90°, the head bolt will loosen.**
2. **If it is more than 90°, remove the head bolt and repeat the procedure from step 1.**

▶C◀ HIGH-PRESSURE FUEL HOSE INSTALLATION

1. Apply a small amount of new engine oil to the O-ring.

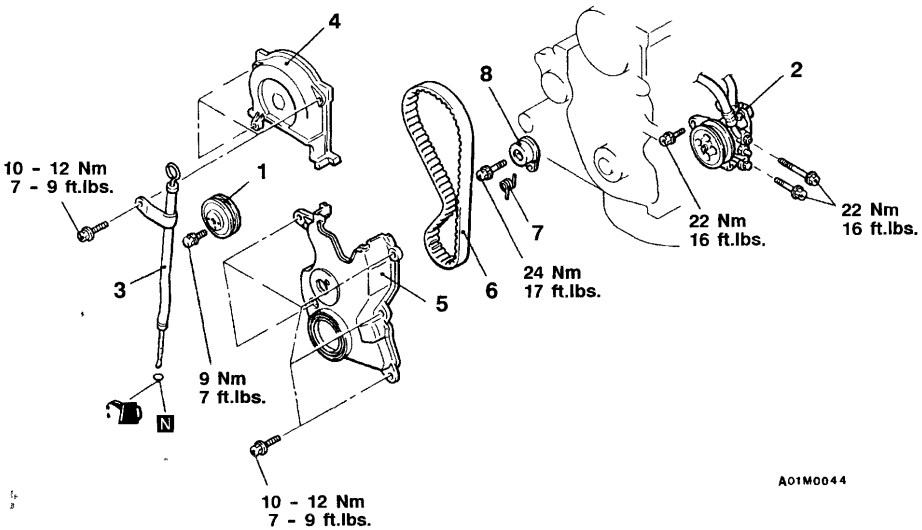
   Caution
   Do not let any engine oil get into the fuel rail.
2. While turning the high-pressure fuel hose clockwise and counterclockwise, install fuel rail. Be careful not to damage the O-ring. After installing, check that the hose turns smoothly.
3. If the hose does not turn smoothly, the O-ring is probably being clamped. Disconnect the high-pressure fuel hose and check the O-ring for damage. After this, re-insert the fuel rail and check that the hose turns smoothly.

TIMING BELT

11200430282

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
(1) Crankshaft Pulley Removal and Installation (Refer to P11A-22)
(2) Engine Mount Bracket Removal and Installation (Refer to GROUP 32 - Engine Mounting)



Removal steps

◀A▶
1. Water pump pulley
2. Power steering oil pump and bracket assembly
3. Oil dipstick guide assembly
4. Timing belt upper cover

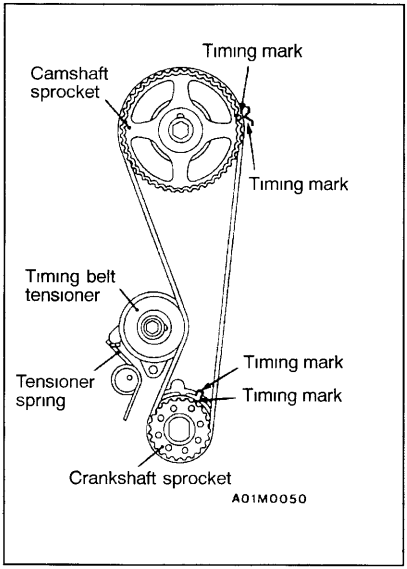
◀B▶
5. Timing belt lower cover
▶B◀ ● Timing belt tension adjustment
▶A◀ 6. Timing belt
▶A◀ 7. Tensioner spring
▶A◀ 8. Timing belt tensioner

REMOVAL SERVICE POINTS

◀A▶ POWER STEERING OIL PUMP AND BRACKET ASSEMBLY REMOVAL

Remove the power steering oil pump and bracket assembly from the engine with the hose attached.

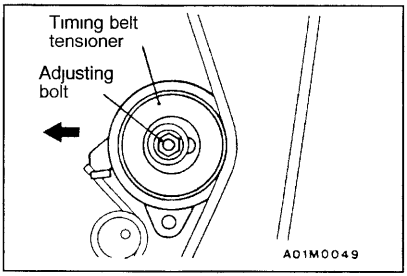
NOTE
Place the removed power steering oil pump in a place where it will not be a hindrance when removing and installing the timing belt, and tie it with a cord.



◀B▶ TIMING BELT REMOVAL

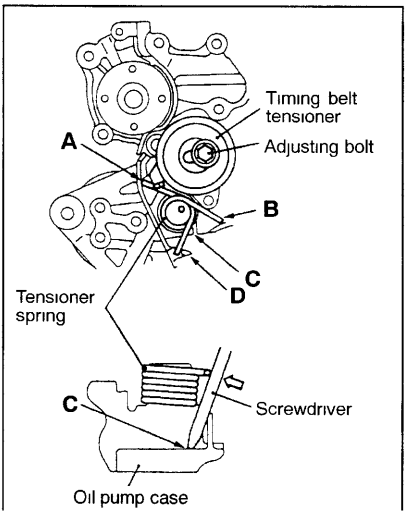
1. Turn the crankshaft clockwise to align each timing mark and to set the No. 1 cylinder at compression top dead center.

Caution
The crankshaft should always be turned only clockwise.



2. Loosen the adjusting bolt.
3. Move the timing belt tensioner to the water pump side and temporarily tighten the adjusting bolt so that the tensioner does not return.
4. Remove the timing belt.

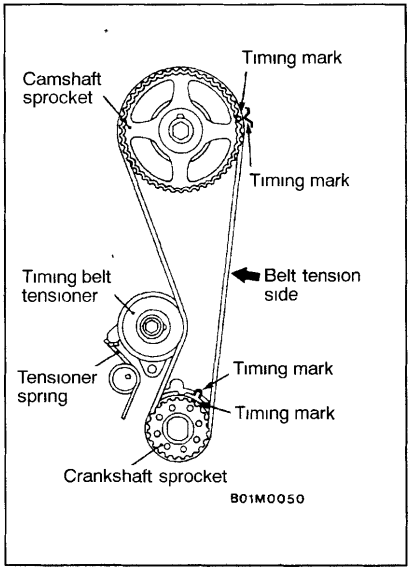
Caution
If the timing belt is to be re-used, use chalk to mark the flat side of the belt with an arrow indicating the direction of rotation (rigth turn).



INSTALLATION SERVICE POINTS

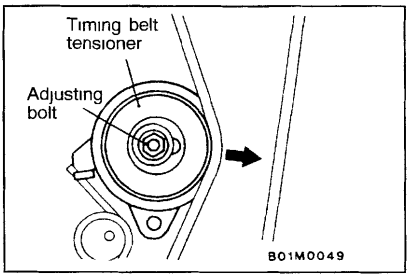
▶A◀ TIMING BELT TENSIONER/TENSIONER SPRING/TIMING BELT INSTALLATION

1. Put the protrusion of the timing belt tensioner on the end (A) of the tensioner spring as shown.
2. Move the timing belt tensioner close to the water pump, and temporarily tighten the adjusting bolt.
3. Put a screwdriver in (C), push the protrusion (B) of the tensioner spring in the shown direction, and place it on the stopper (D) of the oil pump case.



4. Align each of the camshaft sprocket and the crankshaft sprocket timing marks.
5. Install the timing belt in the following order, while making sure that the tension side of the belt is not slackened.
   (1) Crankshaft sprocket
   (2) Camshaft sprocket
   (3) Tensioner pulley

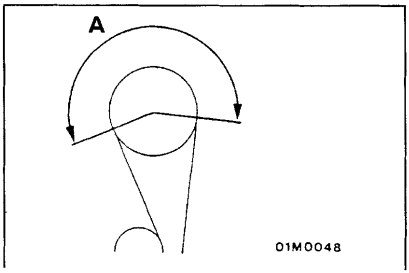
Caution
After installing the timing belt, apply force to turn the camshaft sprocket in the reverse direction, and recheck to be sure that the belt is fully tensioned and that each timing mark is in the proper position.



▶B◀ TIMING BELT TENSION ADJUSTMENT

1. Initially loosen the adjusting bolt of the timing belt tensioner fixed to the water pump side by 1/2 - 1/4 turn, and use the force of the tensioner spring to apply tension to the belt.
2. Turn the crankshaft in the proper rotation direction (right turn) for two rotations, and recheck to be sure that the timing marks on each sprocket are aligned.

Caution
As the purpose of this procedure is to apply the proper amount of tension to the tension side of the timing belt by using the cam driving torque, turn the crankshaft only by the amount given above. Be sure not to turn the crankshaft in the opposite direction (left turn).



3. After checking to be sure that no belt teeth in the section marked with A are lifted up and that the teeth in each sprocket are engaged, secure the tensioner pulley.

ENGINE OVERHAUL <1.5L>

CONTENTS

11309000388

CRANKSHAFT AND CYLINDER BLOCK 46

CYLINDER HEAD AND VALVES 27

FUEL AND EMISSION CONTROL SYSTEM 17

GENERAL INFORMATION 2

- General Specification 2

GENERATOR AND IGNITION SYSTEM 10

INTAKE AND EXHAUST MANIFOLDS ... 21

OIL PUMP AND OIL PAN 34

PISTON AND CONNECTING RODS 38

ROCKER ARMS AND CAMSHAFTS 22

SPECIAL TOOLS 8

SPECIFICATIONS 3

- Rework Dimensions 4
- Sealants 7
- Service Specifications 3
- Torque Specifications 5

TIMING BELT 12

WATER PUMP AND WATER HOSE 19

GENERAL INFORMATION

11300010298

GENERAL SPECIFICATION

Description		Specifications
Type		In-line OHV, SOHC
Number of cylinders		4
Combustion chamber		Hemispherical type
Total displacement dm^3 (cu, in)		1,468 (89.6)
Cylinder bore mm (in)		75.5 (2.97)
Piston stroke mm (in.)		82.0 (3.23)
Compression ratio		9.0
Number of valve	Intake	8
	Exhaust	4
Valve timing	Intake opening	BTDC 14°
	Intake closing	ABDC 48°
	Exhaust opening	BBDC 54°
	Exhaust closing	ATDC 10°
Lubrication system		Pressure feed, full-flow filtration
Oil pump type		Trochoid type
Cooling system		Water-cooled forced circulation
Water pump type		Centrifugal impeller type

SPECIFICATIONS

11300030461

SERVICE SPECIFICATIONS

Item		Standard	Limit
Rocker arms, rocker shafts, and camshaft			
Camshaft cam height mm (in.)	Intake-primary	38 78 (1.53)	38.28 (1.51)
	Intake-secondary	38 78 (1.53)	38.28 (1.51)
	Exhaust	39 10 (1 54)	38.60 (1.52)
Cylinder head and valves			
Cylinder head gasket surface flatness mm (in.)		Less than 0.05 (002)	0.2 (008)
Cylinder head gasket surface grinding limit (including grinding of cylinder block gasket surface) mm (in.)		-	0.2 (.008)
Cylinder head overall height mm (in.)		106.9 - 107.1 (4.209 - 4.217)	-
Cylinder head bolt shank length mm (in)		-	103 2 (40 63)
Valve margin mm (in.)	Intake	1.0 (.039)	0.5 (.020)
	Exhaust	1.5 (.059)	1.0 (.039)
Valve stem diameter mm (in.)		6.6 (.260)	-
Valve stem-to-guide clearance mm (in.)	Intake	0 02 - 0.050 (.0008 - .0020)	0.10 (.0039)
	Exhaust	0.050 - 0.085 (0020 - .0035)	0 15 (.0059)
Valve face angle mm (in.)		45° - 45.5°	-
Valve stem projection mm (in)	Intake	43.70 (1.720)	44.20 (1.740)
	Exhaust	43.30 (1.705)	43 80 (1.724)
Overall valve length mm (in)	Intake	100.75 (3.967)	100.25 (3.947)
	Exhaust	101.05 (3.978)	100.55 (3.957)
Valve spring free height mm (in)	Intake	46 1 (1 815)	45.6 (1 795)
	Exhaust	46.8 (1.843)	46.3 (1 823)
Valve spring load/installed height N/mm (lbs /in.)	Intake	226/40.0 (51/1.57)	-
	Exhaust	284/39.6 (64/1.57)	-
Valve spring squareness		2° or less	4°
Valve seat contact width mm (in.)		0.9 - 1 3 (.035 - .051)	-
Valve guide internal diameter mm (in.)		6.6 (.260)	-
Valve guide projection mm (in.)		17.0 (.670)	-
Oil pump and oil pan			
Oil pump tip clearance mm (in.)		0 06 - 0.18 (0024 - .0071)	-
Oil pump side clearance mm (in.)		0.04 - 0.10 (.0016 - .0039)	-
Oil pump body clearance mm (in.)		0.10 - 0.18 (0039 - .0071)	0.35 (.0138)
Piston and connecting rods			
Piston outside diameter mm (in)		75.5 (2 97)	-
Piston ring side clearance mm (in.)	No.1 ring	0.03 - 0.07 (.0012 - .0028)	0.1 (.0039)
	No.2 ring	0.02 - 0.06 (.0008 - .0024)	0.1 (.0039)
Piston ring end gap mm (in.)	No 1 ring	0 20 - 0.35 (.0079 - .0138)	0.8 (.031)
	No 2 ring	0 35 - 0 50 (.0138 - .0197)	0.8 (.031)
	Oil ring	0.20 - 0.50 (.0079 - .0197)	1.0 (.039)

Item	Standard	Limit
Piston pin outside diameter mm (in.)	18.0 (0.71)	-
Piston pin press-in load (at room temperature) N (lbs.)	4900 - 14700 (1100 - 3300)	-
Crankshaft pin oil clearance mm (in.)	0 01 - 0.04 (.0008 - .0016)	0 1 (.004)
Connecting rod big end side clearance mm (in)	0 10 - 0.25 (0039 - .0098)	0 4 (016)
Crankshaft and cylinder block		
Crankshaft end play mm (in.)	0 05 - 0.18 (0020 - .0071)	0.25 (.010)
Crankshaft journal diameter mm (in.)	48.0 (1.89)	-
Crankshaft pin diameter mm (in)	42.0 (1.65)	-
Crankshaft journal oil clearance mm (in.)	0 02 - 0.04 (.0008 - .0016)	0.1 (004)
Cylinder block gasket surface flatness mm (in.)	0 05 (.020)	0.1 (.004)
Cylinder block gasket surface grinding limit (including grinding of cylinder head gasket surface) mm (in)	-	0.2 (.008)
Cylinder block overall height mm (in.)	256 (10 1)	-
Cylinder bore cylindricity mm (in.)	0 01 (.0004) or less	-
Cylinder bore mm (in.)	75.5 (2.79)	-
Piston-to-cylinder clearance mm (in.)	0.02 - 0.04 (.0008 - .0016)	-

REWORK DIMENSIONS

Item			Standard
Cylinder head and valves			
Oversize valve guide hole diameter mm (in)		0.05 O S	12 050 - 12.068 (.4744 - .4752)
		0.25 O S.	12.250 - 12.268 (.4823 - .4831)
		0 50 O S.	12.500 - 12.518 (4921 - .4929)
Oversize intake valve seat ring hole diameter mm (in)	Primary	0.3 O.S.	27.300 - 27.325 (1 0748 - 1.0758)
		0 6 O.S.	27.600 - 27.625 (1 0866 - 1.0876)
	Secondary	0 3 O.S.	32.300 - 32.325 (1.2717 - 1.2726)
		0 6 O.S.	32.600 - 32 625 (1.2835 - 1.2845)
Oversize exhaust valve seat ring hole diameter mm (in)		0 3 O S.	35.300 - 35 325 (1.3898 - 1.3907)
		0 6 O S.	35.600 - 35.625 (1.4016 - 1.4026)

TORQUE SPECIFICATIONS

Item		Nm	ft.lbs
Generator and ignition system			
Water pump pulley bolt		9	7
Generator brace bolt (generator side)		22	16
Generator brace bolt (tightened with water pump)		23	17
Generator pivot bolt nut		44	32
Oil dipstick guide bolt		23	17
Crankshaft pulley bolt		125	93
Spark plug		25	18
Distributor bolt		12	9
Timing belt			
Timing belt cover bolt		11	8
Timing belt tensioner bolt		23	17
Engine support bracket bolt		35	25
Camshaft sprocket bolt		88	64
Fuel and emission control system			
Fuel rail bolt		11	8
Fuel pressure regulator bolt		9	7
Throttle body bolt		18	13
Air temperature sensor		13	9
EGR valve bolt		21	15
Water pump			
Water inlet fitting bolt		22	16
Water inlet pipe bolt		12	9
Thermostat case bolt		23	17
Engine coolant temperature gauge unit		11	8
Engine coolant temperature sensor		29	21
Water pump		13	9
Intake and exhaust manifolds			
Intake manifold bolt and nut		17	12
Intake manifold stay bolt	M8	17	12
	M10	21	15
Exhaust manifold cover bolt		29	21

Item	Nm	ft.lbs.
Exhaust manifold nut	17	12
Rocker arms and camshaft		
Rocker cover bolt	4	3
Rocker shaft bolt	31	22
Cylinder head and valves		
Cylinder head bolt [Tighten to 49 Nm (35 ft.lbs.), then completely loosen and retighten as described.]	20 + 90° + 90°	15 + 90° + 90°
Oil pump and oil pan		
Oil pan bolt	7	5
Drain plug	39	28
Oil screen bolt	18	13
Front case bolt	13	9
Relief plug	44	32
Oil pump cover bolt	10	7
Pistons and connecting rods		
Connecting rod nut	17 + 90° to 100°	12 + 90° to 100°
Crankshaft and cylinder block		
Flywheel bolt <M/T>	132	95
Drive plate bolt <A/T>	132	95
Rear plate bolt	10	7
Bell housing cover bolt	10	7
Rear oil seal case bolt	11	8
Bearing cap bolt	51	37
Oil pressure switch	18	13

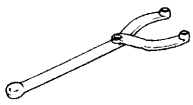
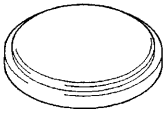
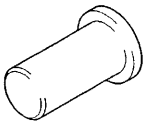
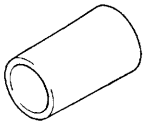
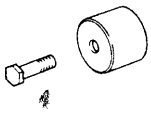
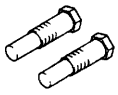
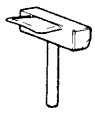
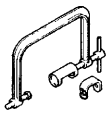
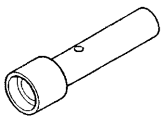
SEALANTS

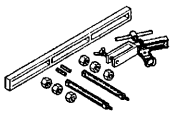
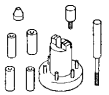
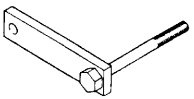
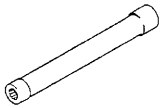
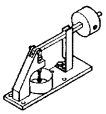
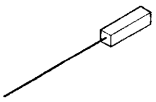
11300050160

Item	Specified sealant	Quantity
Water pump	Mitsubishi Genuine Part No.MD970389 or equivalent	As required
Engine coolant temperature sensor	3M Nut Locking Part No 4171 or equivalent	As required
Engine coolant temperature gauge unit	3M ATD Part No.8660 or equivalent	As required
Front case	Mitsubishi Genuine Part No.MD970389 or equivalent	As required
Oil pan	Mitsubishi Genuine Part No.MD970389 or equivalent	As required
Oil pressure switch	3M ATD Part No.8660 or equivalent	As required

SPECIAL TOOLS

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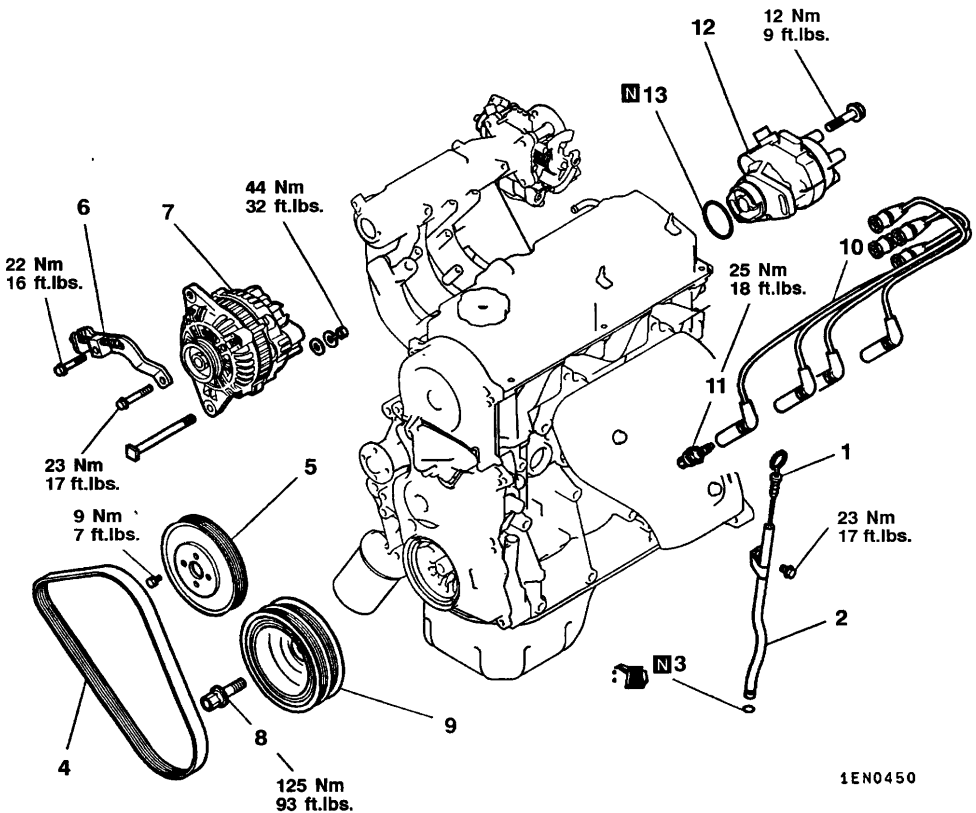
Tool	Tool number and name	Supersession	Application
	MB990767 End yoke holder Use with MD998715	MB990767-01 Use with MIT308239	Holding camshaft sprocket when loosening or torquing bolt
	MD998011 Crankshaft rear oil seal installer	MD998011-01 Use with MB990938-01	Installation of crankshaft rear oil seal
	MD998304 Crankshaft front oil seal installer	MD998304-01	Installation of crankshaft front oil seal
	MD998305 Crankshaft front oil seal guide	MD998305-01	Installation of crankshaft front oil seal.
	MD998713 Camshaft oil seal installer	MD998713-01	Installation of camshaft oil seal
	MD998715 Pulley holding pins (2)	MIT308239	Holding camshaft sprocket when loosening or torquing bolt
	MD998727 Oil pan remover	General service tool	Removal of oil pan
	MD998735 Valve spring compressor	MD998735-01	Compression of valve spring
	MD998760 Valve stem seal installer	MD998760-01	Installation of valve stem seal.

Tool	Tool number and name	Supersession	Application
	MD998772 Valve spring compressor	General service tool	Compressing valve spring
	MD998780 Piston pin setting tool	MIT216941	Removal and installation of piston pin
	MD998781 Flywheel stopper	General service tool	Holding flywheel
	MB991659 Guide-D	-	Guide for removal and Press-fitting of piston pins
	MB991653 Cylinder head bolt wrench	General service tool	Loosening and torquing of cylinder head bolt
	MD998440 Leak down tester	-	Leak down test of lash adjuster
	MD998441 Lash adjuster retainer	-	Air bleeding of lash adjuster
	MD998442 Air bleed wire		Air bleeding of lash adjuster
	MD998443 Lash adjuster holder (8)	MD998443-01	Supporting lash adjuster to prevent it from falling when rocker arm shaft assembly is removed or installed.

GENERATOR AND IGNITION SYSTEM

11300100230

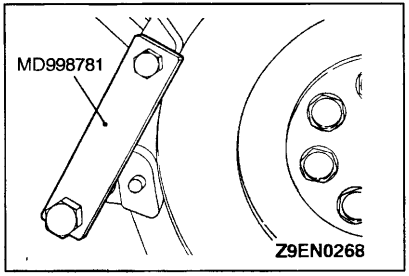
REMOVAL AND INSTALLATION



Removal steps

1. Oil dipstick
2. Oil dipstick guide
3. O-ring
4. Drive belt
5. Water pump pulley
6. Generator brace
7. Generator

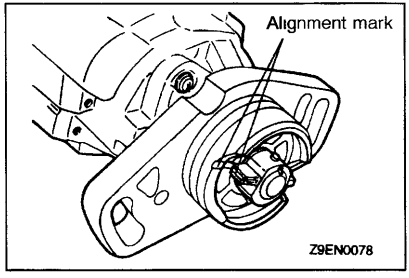
◀A▶ ▶B◀ 8. Crankshaft pulley bolt
9. Crankshaft pulley
10. Spark plug cables
11. Spark plugs
▶A◀ 12. Distributor
13. O-ring



REMOVAL SERVICE POINT

◀A▶ CRANKSHAFT BOLT REMOVAL

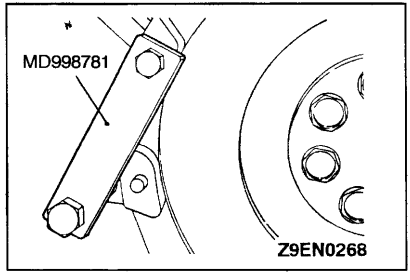
(1) Lock the flywheel or drive plate in position using the special tool shown in the illustration, then loosen the crankshaft bolt.



INSTALLATION SERVICE POINTS

▶A◀ DISTRIBUTOR INSTALLATION

(1) Turn the crankshaft clockwise until cylinder No.1 is at top dead center on its compression stroke.
(2) Align the alignment marks on the distributor housing and coupling.
(3) Install the distributor onto the engine, and tighten the mounting bolts to the specified torque.



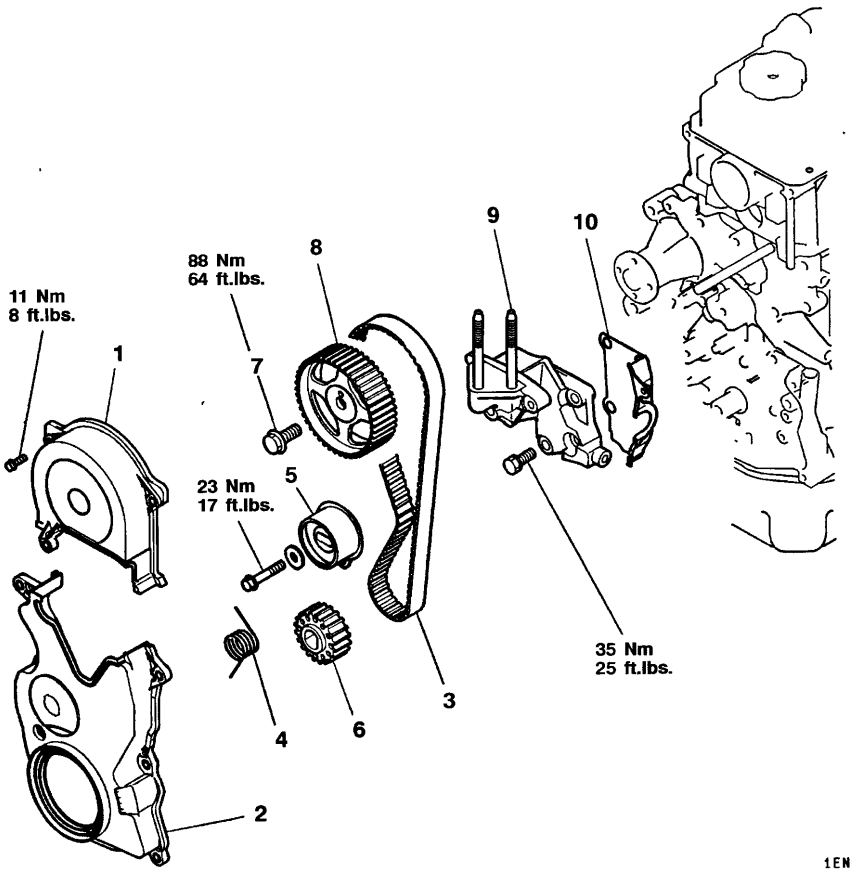
▶B◀ CRANKSHAFT BOLT INSTALLATION

(1) Lock the flywheel or drive plate in position using the special tool shown in the illustration, then tighten the crankshaft bolt.

TIMING BELT

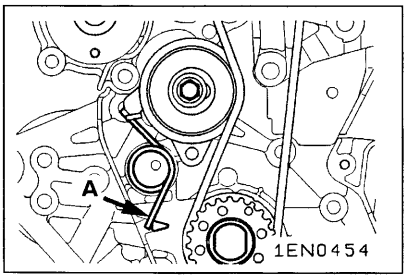
11300190329

REMOVAL AND INSTALLATION



Removal steps

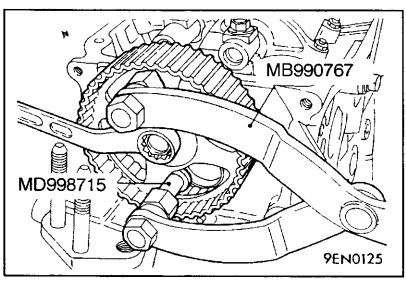
1. Timing belt upper cover
2. Timing belt lower cover
3. Timing belt ◀A▶ ▶C◀
4. Tensioner spring ◀A▶ ▶B◀
5. Timing belt tensioner ◀A▶ ▶B◀
6. Crankshaft sprocket
7. Camshaft sprocket bolt ◀B▶ ▶A◀
8. Camshaft sprocket
9. Engine support bracket
10. Timing belt rear cover



REMOVAL SERVICE POINTS

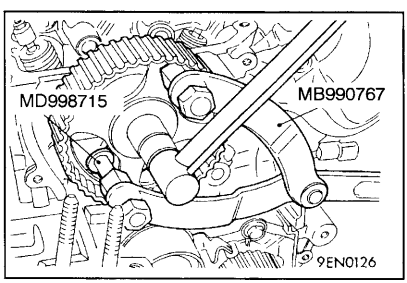
◀A▶ TIMING BELT/TENSIONER SPRING/TIMING BELT TENSIONER REMOVAL

(1) Using pliers, grip the tensioner spring end (marked "A" in the illustration) and remove it from the oil pump case lug. Then, remove the tensioner spring.
(2) Remove the timing belt tensioner, and then remove the timing belt.
(3) If the timing belt is to be reused, chalk an arrow on the belt to indicate the direction of rotation before removing it. This will ensure the timing belt is fitted correctly when reused.



◀B▶ CAMSHAFT SPROCKET BOLT REMOVAL

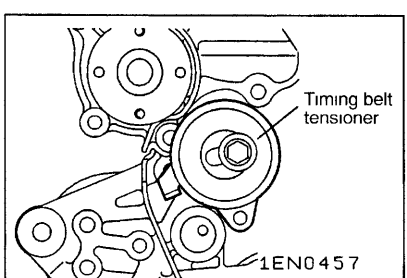
(1) Using the special tools shown in the illustration, lock the camshaft sprocket in position.
(2) Loosen the camshaft sprocket bolt.



INSTALLATION SERVICE POINTS

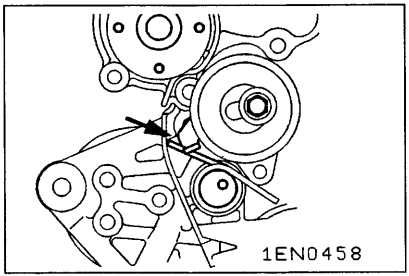
▶A◀ CAMSHAFT SPROCKET BOLT INSTALLATION

(1) Using the special tools shown in the illustration, lock the camshaft sprocket in the position.
(2) Tighten the camshaft sprocket bolt to the specified torque.

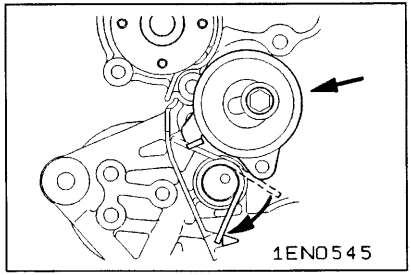


▶B◀ TIMING BELT TENSIONER/TENSIONER SPRING INSTALLATION

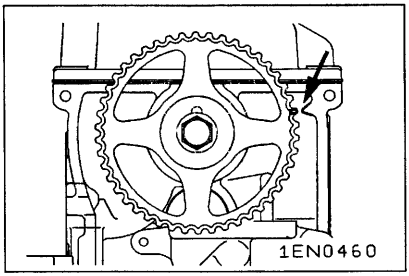
(1) Install the timing belt tensioner in the illustrated position, and then tighten the tensioner mounting bolt.



(2) Install the tensioner spring onto the boss of the front case, and then hook the spring end to the tensioner arm.

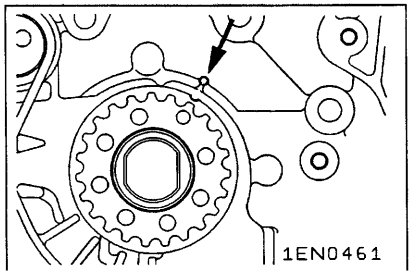


(3) Grip the other end of the tensioner spring projection and then hook it onto the front case lug as shown in the illustration.
(4) Move the timing belt tensioner in the direction shown and temporarily tighten the bolt.

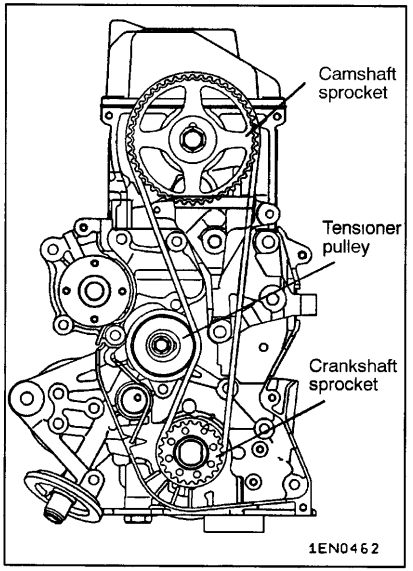


▶C◀ TIMING BELT INSTALLATION

(1) Align the camshaft sprocket timing mark with the timing mark on the cylinder head.



(2) Align the crankshaft sprocket timing mark with the timing mark on the front case.



(3) Keeping the tension side of the timing belt tight, fit the timing belt onto the crankshaft sprocket, camshaft sprocket, and tensioner pulley in that order.
(4) Loosen the timing belt tensioner pulley mounting bolts by 1/4 to 1/2 of a turn and allow the tensioner spring to apply tension to the timing belt.
(5) Turn the crankshaft twice clockwise and check that the all timing marks are correctly aligned.

Caution
This procedure utilizes the camshaft's driving torque to apply tension evenly to the timing belt. Be sure to turn the crankshaft as described above. Do not turn the crankshaft counter-clockwise.

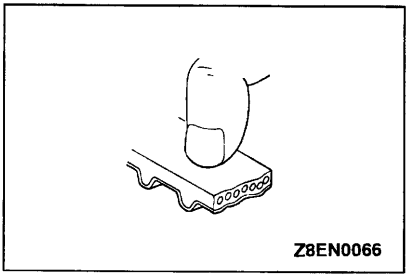
(6) Tighten the timing belt tensioner mounting bolt to the specified torque.

INSPECTION

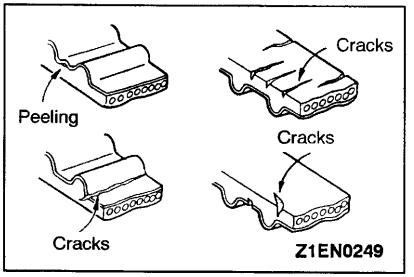
11300200145

TIMING BELT

Check the timing belt closely. Replace the belt with a new one if any of the following defects are evident:
(1) Hardened backing rubber (the backing rubber is glossy, non-elastic, and so hard that scratching with fingernails leaves no mark).

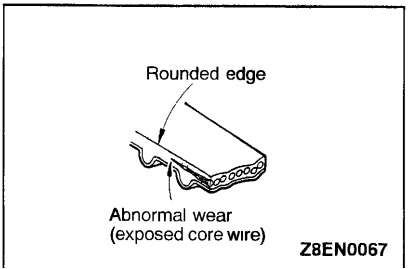


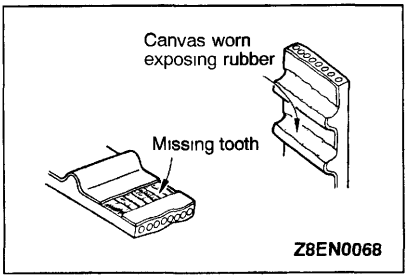
(2) Surface cracks on the backing rubber.
(3) Cracks or peeling of the canvas.
(4) Cracks on the tooth bottom.
(5) Cracks on the belt sides.



(6) Abnormal wear on the belt sides.

NOTE
The sides of the belt are normal if they are sharp as if cut by a knife.

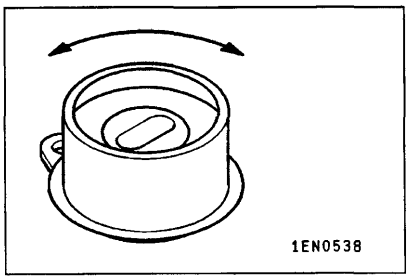




(7) Abnormal wear on teeth.

Initial stage:Canvas worn (fluffy canvas fibers, rubbery texture gone, white discoloration, canvas texture indistinct)
Final stage:Canvas worn, exposing rubber (tooth width reduced)

(8) Missing teeth.



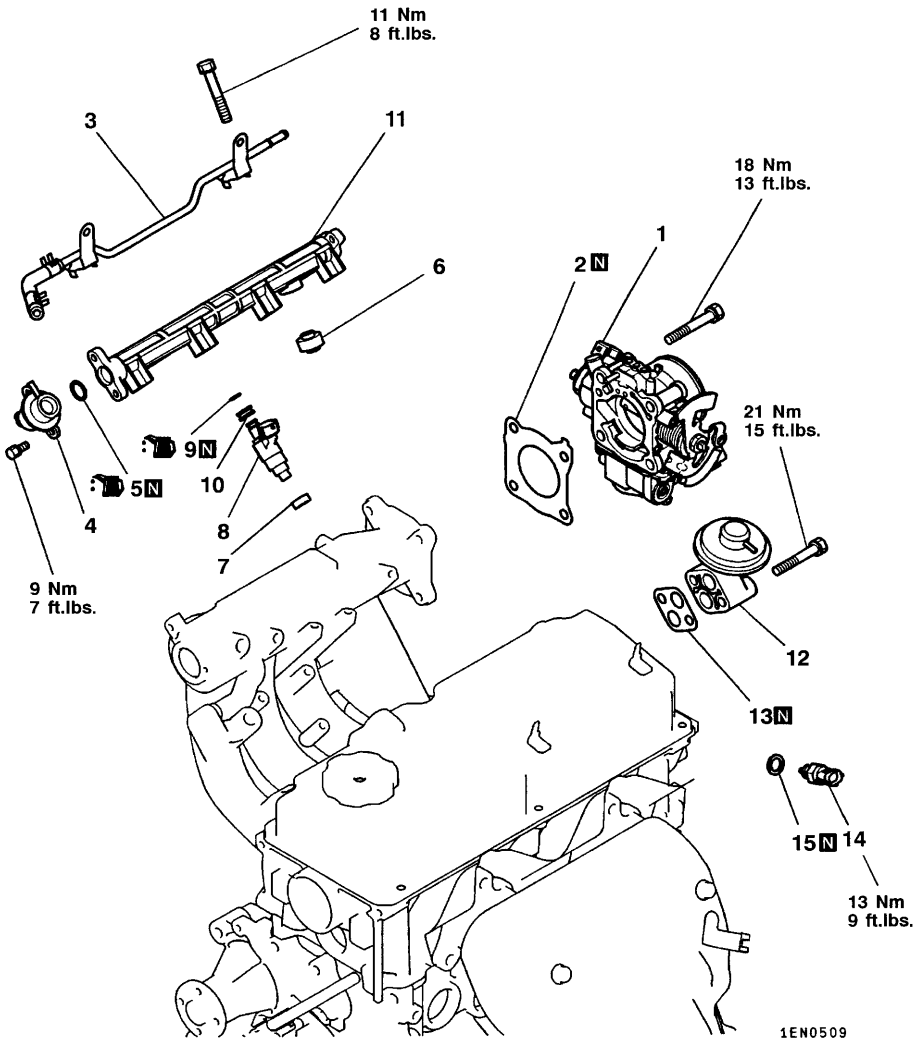
TENSIONER PULLEY

(1) Check the pulley for smooth rotation without play and are not noisy.

FUEL AND EMISSION CONTROL SYSTEM

11300220097

REMOVAL AND INSTALLATION



Removal steps

1. Throttle body assembly
2. Gasket
3. Fuel return pipe
▶B◀ 4. Fuel pressure regulator
5. O-ring
6. Insulator
7. Insulator
▶A◀ 8. Injector
9. O-ring
10. Grommet
11. Fuel rail
12. EGR valve
13. Gasket
14. Air temperature sensor
15. Gasket

INSTALLATION SERVICE POINTS

▶A◀ INJECTOR INSTALLATION

(1) Fit a new O-ring and grommet onto the injector.
(2) Apply clean engine oil or gasoline to the injector O-ring.
(3) Fit the injector onto the fuel rail, turning it to the left and right as it goes in.
(4) Check that the injector rotates smoothly.

Caution
If the injector does not rotate smoothly, its O-ring may be binding. If this occurs, remove the injector from the fuel rail, check the O-ring, and re-insert the injector.

▶B◀ FUEL PRESSURE REGULATOR INSTALLATION

(1) Apply a drop of clean engine oil to the O-ring, then insert the fuel pressure regulator into the fuel rail, being careful not to damage the O-ring.

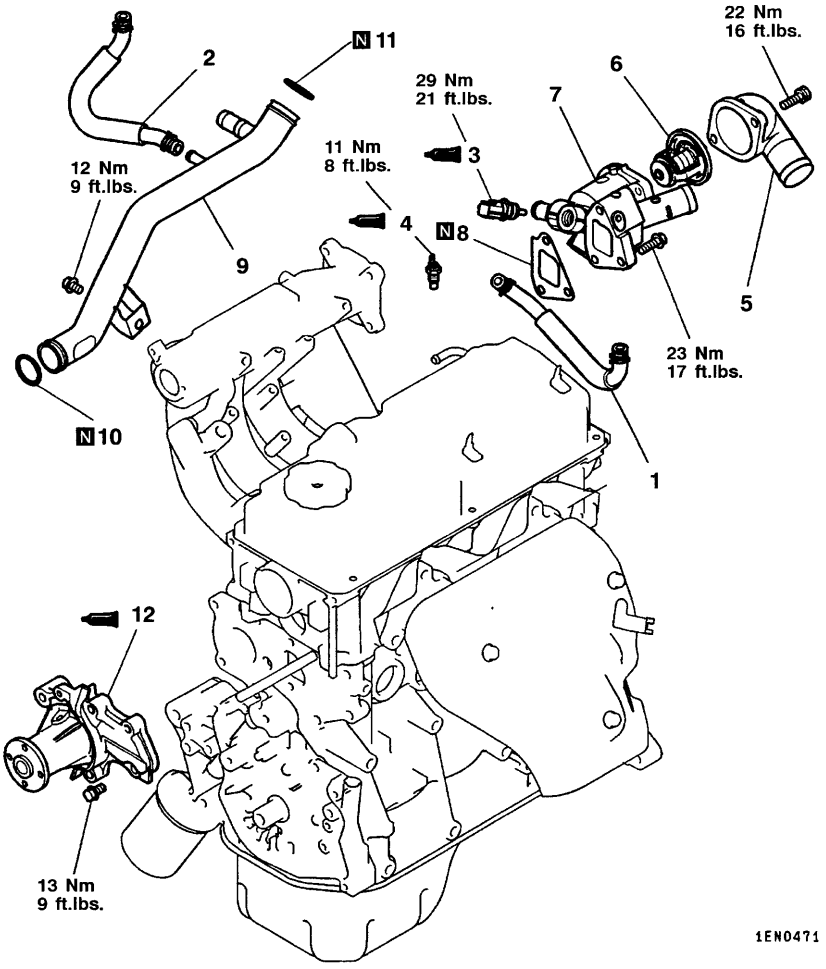
Caution
Do not let engine oil get into the fuel rail.

(2) Check that the fuel pressure regulator rotates smoothly. If it does not rotate smoothly, the O-ring may be binding. If this occurs, remove the fuel pressure regulator, check the O-ring for damage, then re-insert the regulator into the fuel rail.

WATER PUMP AND WATER HOSE

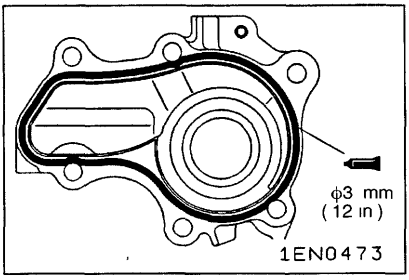
11301790023

REMOVAL AND INSTALLATION



Removal steps

1. Water hose
2. Water hose
- ▶E◀ 3. Engine coolant temperature sensor
- ▶D◀ 4. Engine coolant temperature gauge unit
5. Water inlet fitting
- ▶C◀ 6. Thermostat
7. Thermostat case
8. Gasket
- ▶B◀ 9. Water inlet pipe
- ▶B◀ 10. O-ring
- ▶B◀ 11. O-ring
- ▶A◀ 12. Water pump



INSTALLATION SERVICE POINTS

▶A◀ WATER PUMP INSTALLATION

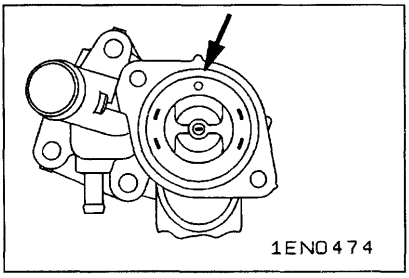
(1) Clean the sealant application surfaces of water pump case and cylinder block.
(2) Apply a 3 mm (.12 in.) diameter bead of sealant to the area shown in the illustration. Be sure to install water pump within 15 minutes after applying the sealant.
(3) After installation, wait at least one hour. Never start the engine or let coolant touch the adhesion surface during that time.

Specified sealant:
Mitsubishi Genuine Part No.MD970389 or equivalent.

▶B◀ O-RING/WATER PIPE INSTALLATION

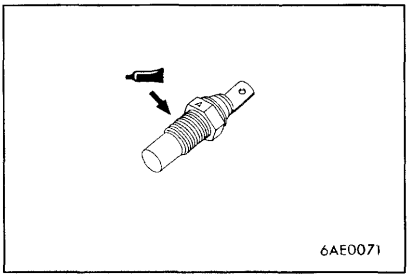
(1) Replace the water inlet pipe O-ring with new ones, then apply water to the O-rings so that they can be inserted easily into the cylinder block and thermostat case.

Caution
1. Never apply any oil or grease to the O-rings.
2. Secure the water pipe after the thermostat case has been installed.



▶C◀ THERMOSTAT INSTALLATION

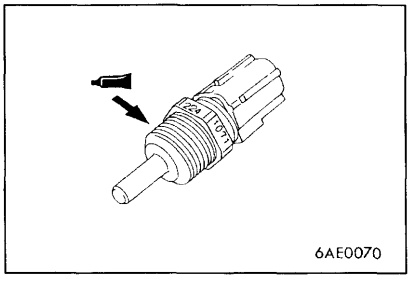
(1) Install the thermostat so that the jiggle valve is at the top.



▶D◀ ENGINE COOLANT TEMPERATURE GAUGE UNIT INSTALLATION

(1) When reusing the gauge unit, clean its thread.
(2) Apply the specified sealant to the thread.

Specified sealant:
3M ATD Part No.8660 or equivalent.



▶E◀ ENGINE COOLANT TEMPERATURE SENSOR INSTALLATION

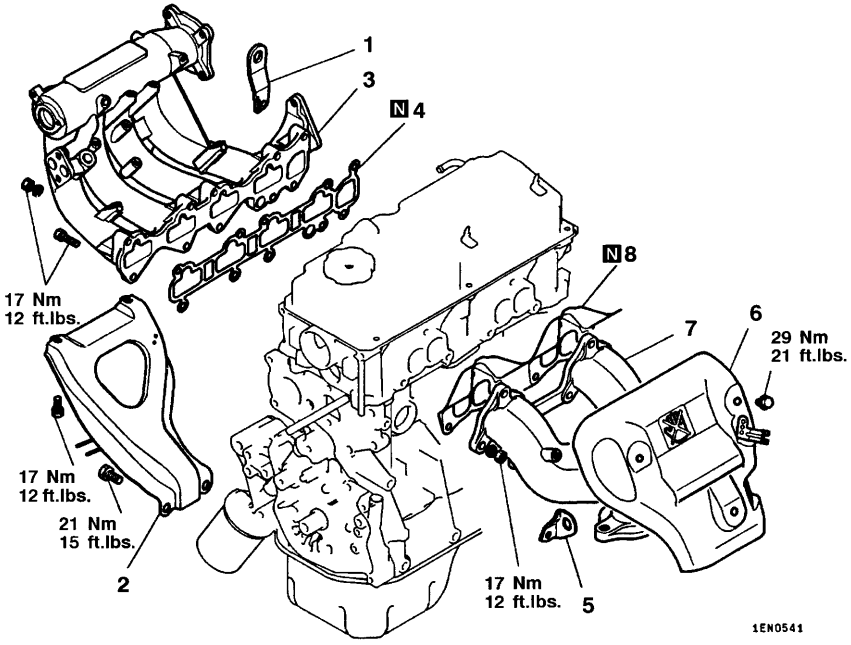
(1) When reusing the sensor, clean its thread.
(2) Apply the specified sealant to the thread.

Specified sealant:
3M Nut Locking Part No.4171 or equivalent.

INTAKE AND EXHAUST MANIFOLDS

11301750045

REMOVAL AND INSTALLATION



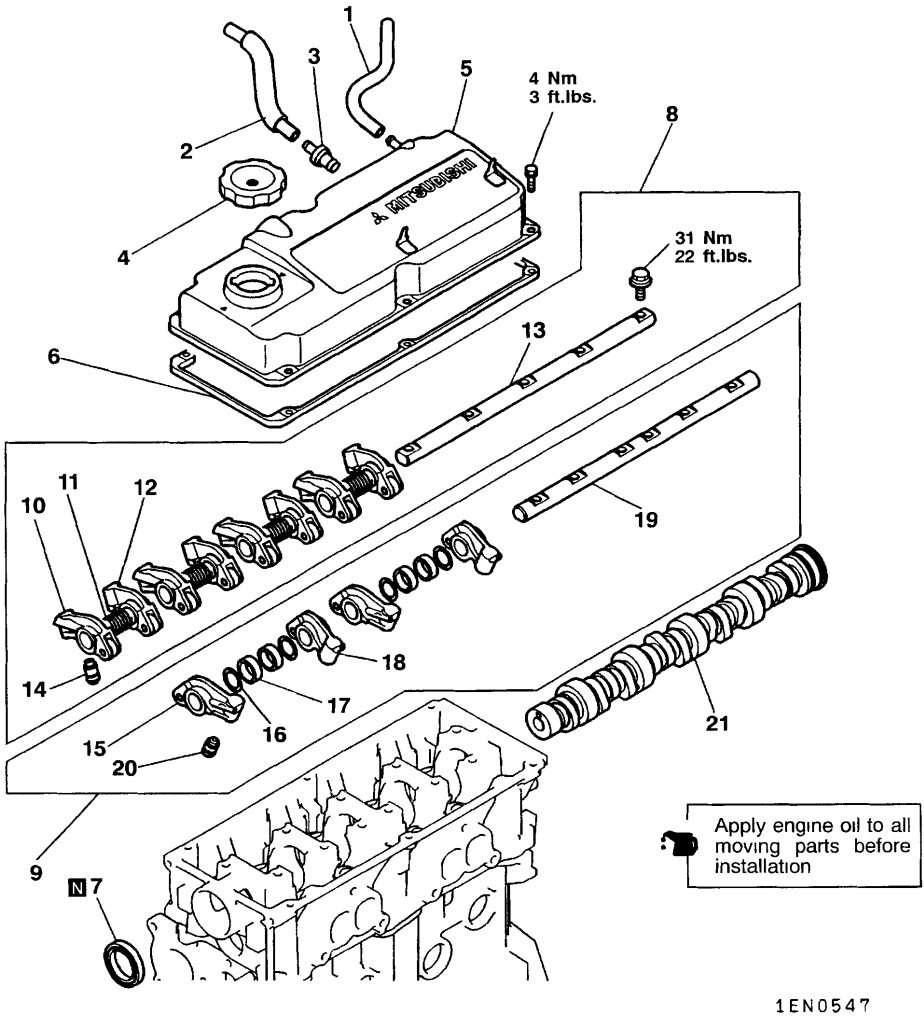
Removal steps

1. Engine hanger
2. Intake manifold stay
3. Intake manifold
4. Intake manifold gasket
5. Engine hanger
6. Exhaust manifold cover
7. Exhaust manifold
8. Exhaust manifold gasket

ROCKER ARMS AND CAMSHAFT

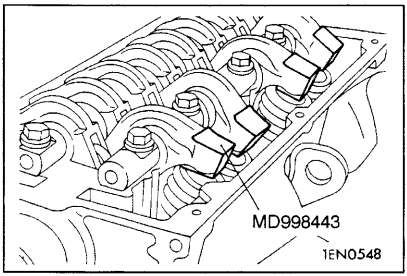
11300540438

REMOVAL AND INSTALLATION



Removal steps

1 Breather hose
2. PCV hose
3 PCV valve
4 Oil filler cap
5 Rocker cover
6 Rocker cover gasket
▶C◀ 7. Camshaft oil seal
◀A▶ 8. Rocker arm and shaft assembly (intake)
◀A▶ 9. Rocker arm and shaft assembly (exhaust)
10. Rocker arm A
11. Rocker arm spring
12 Rocker arm B
▶B◀ 13. Rocker arm shaft
▶A◀ 14. Lash adjuster
15. Rocker arm C
16. Wave washer
17. Spacer
18. Rocker arm D
▶B◀ 19. Rocker arm shaft
▶A◀ 20. Lash adjuster
21. Camshaft

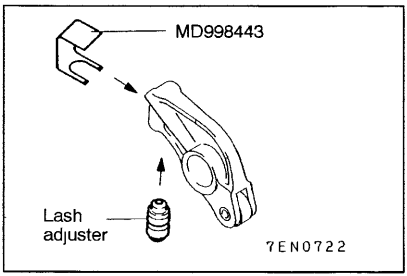


REMOVAL SERVICE POINTS

◀A▶ ROCKER ARM AND ROCKER ARM SHAFT REMOVAL

Caution
If the lash adjuster is re-used, clean the lash adjuster. (Refer to 11B-24.)

Set special tool MD998443 to prevent the lash adjuster coming free and falling to the floor.

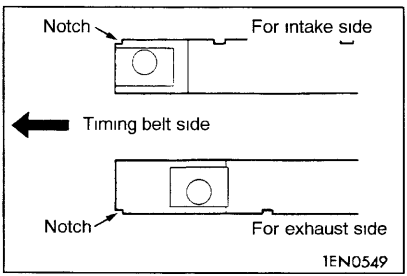


INSTALLATION SERVICE POINT

▶A◀ LASH ADJUSTER INSTALLATION

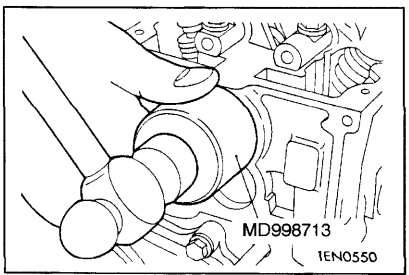
Caution
If the lash adjuster is re-used, clean the lash adjuster. (Refer to 11B-24.)

Fit the lash adjuster onto the rocker arm without allowing diesel fuel to spill out. Fit special tool MD998443 to prevent the lash adjuster coming free and falling to the floor.

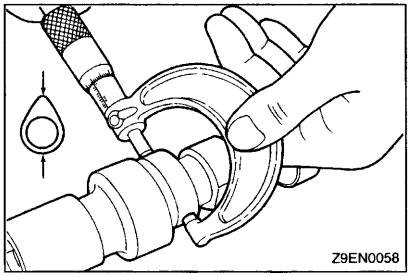


▶B◀ ROCKER ARM SHAFT INSTALLATION

Install the rocker arm shafts, place the end with notched side toward the timing belt side as shown.



▶C◀ CAMSHAFT OIL SEAL INSTALLATION



INSPECTION

11300550417

CAMSHAFT

(1) Measure the cam height and replace the camshaft if any height exceeds the specified limit.

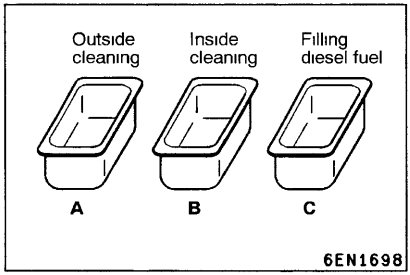
Standard value:
Intake: 38.78 mm (1.53 in.)
Exhaust: 39.10 mm (1.54 in.)

Limit:
Intake: 38.28 mm (1.51 in.)
Exhaust: 38.60 mm (1.52 in.)

LASH ADJUSTERS

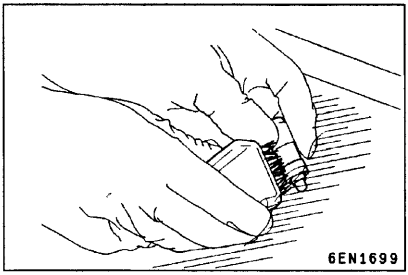
Caution
1. **The lash adjusters are precision-engineered mechanisms. Do not allow them to become contaminated by dirt or other foreign substances.**
2. **Do not attempt to disassemble the lash adjusters.**
3. **Use only fresh diesel fuel to clean the lash adjusters.**

(1) Prepare three containers and approximately five liters of diesel fuel. Into each container, pour enough diesel fuel to completely cover a lash adjuster when it is standing upright. Then, perform the following steps with each lash adjuster.



(2) Place the lash adjuster in container A and clean its outside surface.

NOTE
Use a nylon brush if deposits are hard to remove.

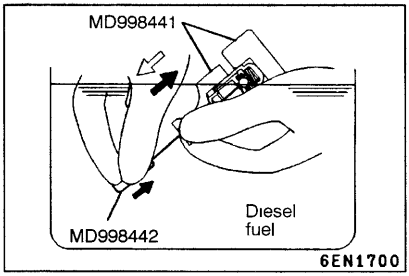


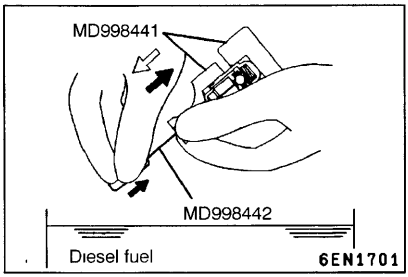
(3) Fit special tool MD998441 onto the lash adjuster.

(4) While gently pushing down the internal steel ball using special tool MD998442, move the plunger through 5 to 10 strokes until it slides smoothly. In addition to eliminating stiffness in the plunger, this operation will remove dirty oil.

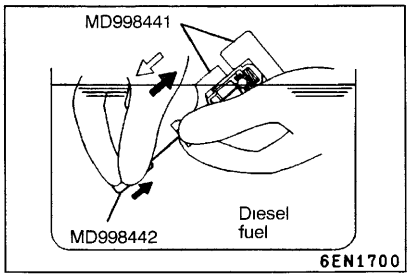
Caution
The steel ball spring is extremely weak, so the lash adjuster's functionality may be lost if the air bleed wire is pushed in hard.

NOTE
If the plunger remains stiff or the mechanism appears otherwise abnormal, replace the lash adjuster.



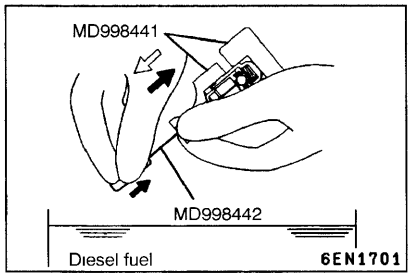


(5) Remove the lash adjuster from the container. Then, push down the steel ball gently and push the plunger to eliminate diesel fuel from the pressure chamber.

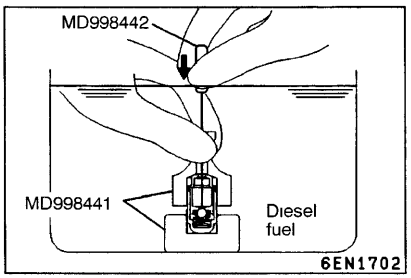


(6) Fit special tool MD998441 onto the lash adjuster.
(7) Place the lash adjuster in container B. Then, gently push down the internal steel ball using special tool MD998442 and move the plunger through 5 to 10 strokes until it slides smoothly. This operation will clean the lash adjuster's pressure chamber.

Caution
The steel ball spring is extremely weak, so the lash adjuster's functionality may be lost if the air bleed wire is pushed in hard.

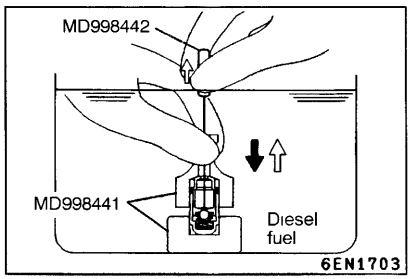


(8) Remove the lash adjuster from the container. Then, push down the steel ball gently and push the plunger to eliminate diesel fuel from the pressure chamber.

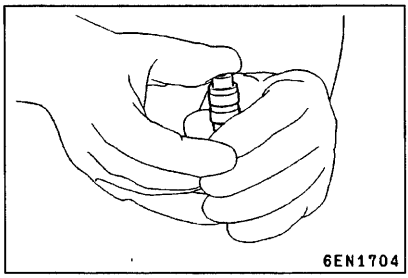


(9) Place the lash adjuster in container C. Then, gently push down the internal steel ball using special tool MD998442.

Caution
Do not use container C for cleaning. If cleaning is performed in container C, foreign matter could enter the pressure chamber when the chamber is filled with diesel fuel.

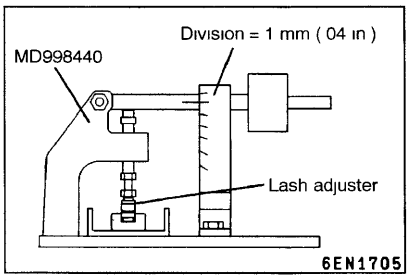


(10) Stand the lash adjuster with its plunger at the top, then push the plunger downward firmly until it moves through its greatest possible stroke. Return the plunger slowly, then release the steel ball and allow the pressure chamber to fill with diesel fuel.
(11) Remove special tool MD998441.



(12) Remove the lash adjuster from the container, then stand the lash adjuster with its plunger at the top. Push the plunger firmly and check that it does not move. Also, check that the lash adjuster's height matches that of a new lash adjuster.

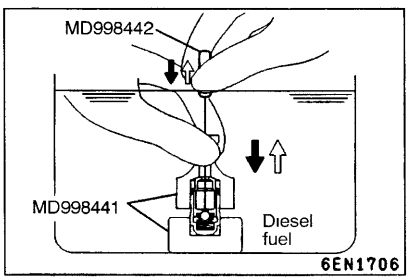
NOTE
If lash adjuster contracts, perform the operations (9) through (12) again to fill it with diesel fuel completely. Replace the lash adjuster if it still contracts after performing these steps.



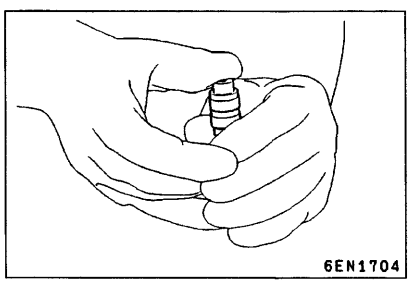
(13) Set the lash adjuster on the special tool MD998440 (leak down tester).
(14) After the plunger has moved downward slightly [0.2 to 0.5 mm (.008 - .019 in)], measure the time taken for it to move downward by a further 1 mm (.04 in.).

Standard value:
3 - 20 seconds/1 mm (.04 in.)
[with diesel fuel at 15 to 20°C (50 - 68°F)]

NOTE
Replace the lash adjuster if the time measurement is out of specification.



(15) Fit special tool MD998441 onto the lash adjuster.
(16) Place the lash adjuster in container C again, then gently push down the internal steel ball using special tool MD998442.
(17) Stand the lash adjuster with its plunger at the top, then push the plunger downward firmly until it moves through its greatest possible stroke. Return the plunger slowly, then release the steel ball and allow the pressure chamber to fill with diesel fuel.
(18) Remove special tool MD998441.



(19) Remove the lash adjuster from the container, then stand the lash adjuster with its plunger at the top. Push the plunger firmly and check that it does not move. Also, check that the lash adjuster's height matches that of a new lash adjuster.

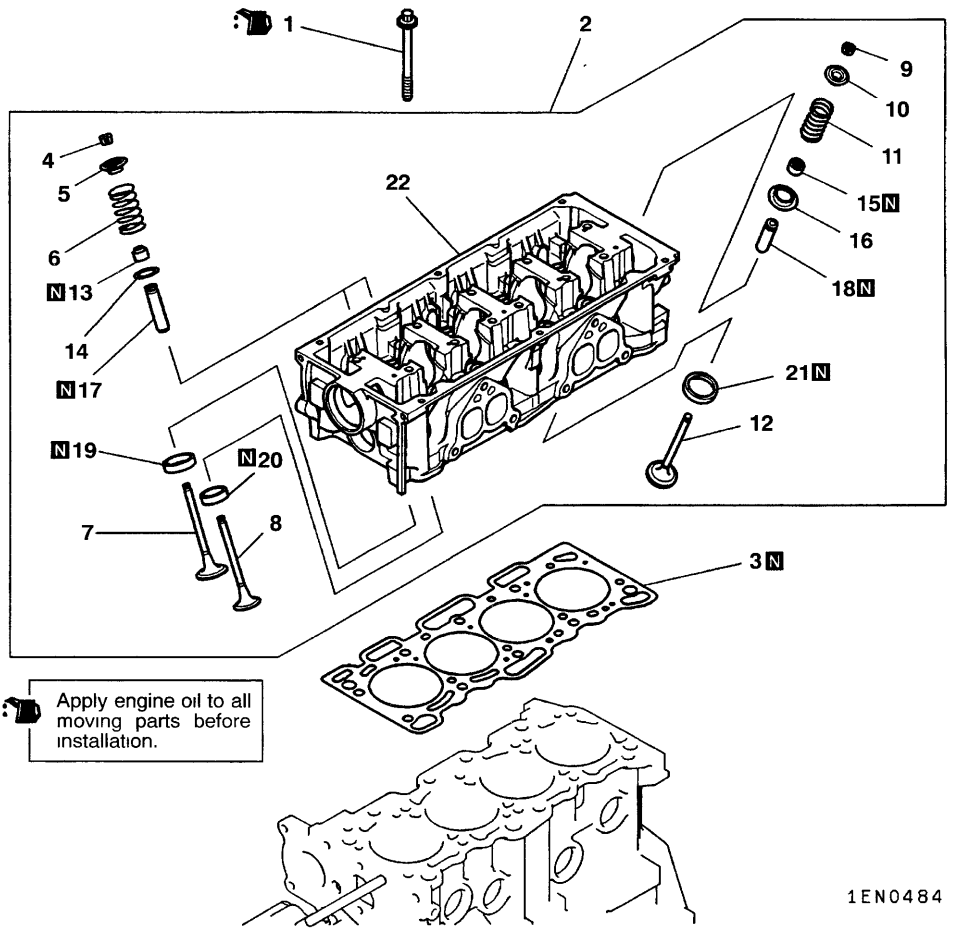
NOTE
If lash adjuster contracts, perform the operations (15) through (19) again to fill it with diesel fuel completely. Replace the lash adjuster if it still contracts after performing these steps.

(20) Stand the lash adjuster upright to prevent diesel fuel spilling out. Do not allow the lash adjuster to become contaminated by dirt or other foreign matter. Fit the lash adjuster onto the engine as soon as possible.

CYLINDER HEAD AND VALVES

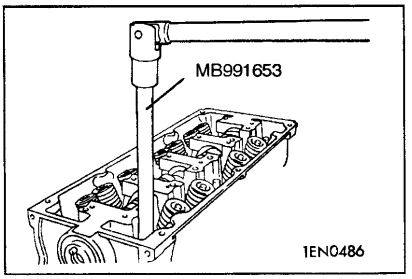
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REMOVAL AND INSTALLATION



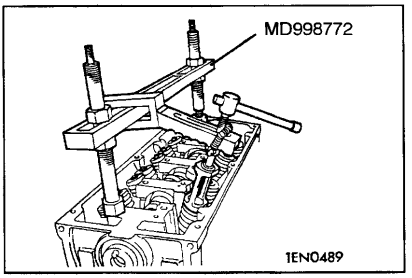
Removal steps

◀A▶ ▶D◀ 1. Cylinder head bolt
2. Cylinder head assembly
3 Cylinder head gasket
◀B▶ ▶C◀ 4. Retainer lock
5 Valve spring retainer
▶B◀ 6. Valve spring
7. Intake valve (primary)
8. Intake valve (secondary)
◀B▶ ▶C◀ 9 Retainer lock
10. Valve spring retainer
▶B◀ 11. Valve spring
12. Exhaust valve
◀C▶ ▶A◀ 13. Valve stem seal
14. Valve spring seat
◀C▶ ▶A◀ 15. Valve stem seal
16. Valve spring seat
17 Intake valve guide
18. Exhaust valve guide
19. Intake valve seat (primary)
20. Intake valve seat (secondary)
21. Exhaust valve seat
22. Cylinder head



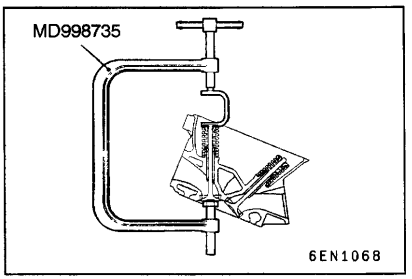
REMOVAL SERVICE POINTS

◀A▶ CYLINDER HEAD BOLT REMOVAL

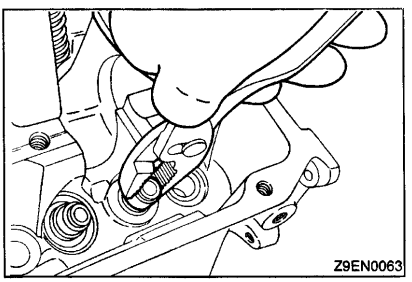


◀B▶ RETAINER LOCK REMOVAL

(1) Tag removed valves, springs, and other components, noting their cylinder numbers and locations to facilitate reassembly. Store these components safely.



◀C▶ VALVE STEM SEAL REMOVAL



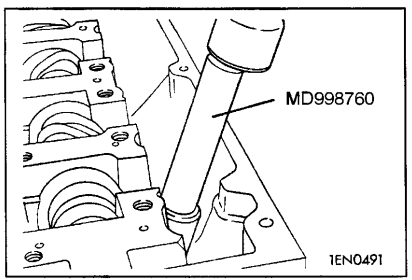
INSTALLATION SERVICE POINTS

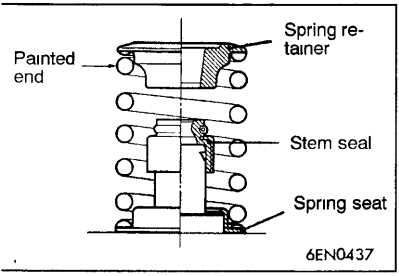
▶A◀ VALVE STEM SEAL INSTALLATION

(1) Install the valve spring seat.
(2) Install a new valve stem seal using the special tool shown in the illustration.

Caution

1. **Do not reuse the removed valve stem seals.**
2. **The valve stem seal must be installed using the correct special tool. Incorrect installation could result in oil leaking past the valve guide.**

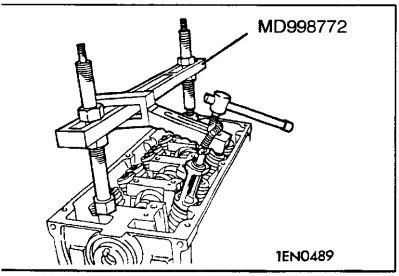




▶B◀ VALVE SPRING INSTALLATION

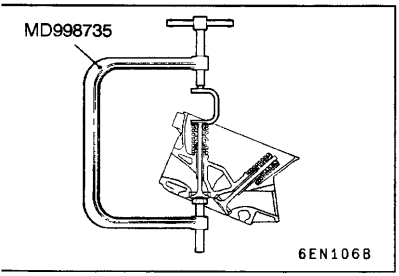
(1) Install the valve spring so that the painted end is on the rocker arm side.

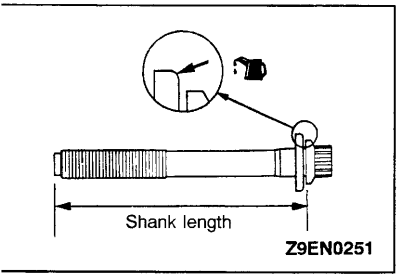
Paint colors:
Intake: Orange
Exhaust: Yellow



▶C◀ RETAINER LOCK INSTALLATION

(1) The valve spring, if excessively compressed, causes the bottom end of the retainer to be in contact with the stem seal, and damage it.



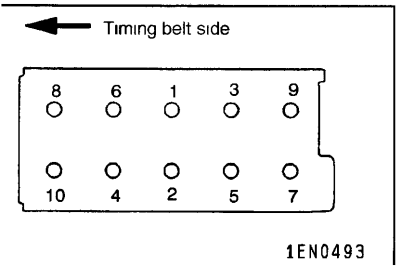


▶D◀ CYLINDER HEAD BOLT INSTALLATION

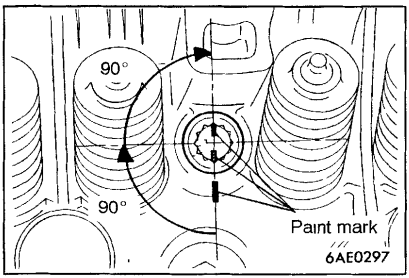
(1) When reusing the cylinder head bolt, measure that its shank length does not exceed the specified limit. Replace the bolt if this measurement exceeds the limit.

Limit: Max. 103.2 mm (40.63 in.)

(2) Fit the washer as shown.
(3) Apply engine oil to the bolt thread and washer.

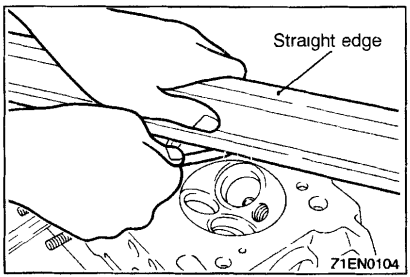


(4) Tighten the bolts in the sequence shown until each is torqued to 49 Nm (35 ft.lbs.) using the special tool (MB991653).
(5) Loosen all bolts fully.
(6) Retighten the bolts in the sequence shown until each is torqued to 20 Nm (15 ft.lbs.)



(7) Make paint marks on the cylinder head bolt heads and cylinder head as shown.
(8) In accordance with the tightening sequence, tighten each bolt by 90°(1/4 turn).
(9) Tighten each bolt by a further 90°(1/4 turn) and check that the paint marks on the bolt head and cylinder head are aligned.

Caution
If the bolts are tightened by an angle of less than 90°(1/4 turn), they may not hold the cylinder head with sufficient strength.
If the bolts are tightened by an angle exceeding 90°, completely remove them and carry out the installation procedure again.



INSPECTION

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CYLINDER HEAD

(1) Before cleaning the cylinder head, check it for water leaks, gas leaks, cracks, and other damage.
(2) Remove all oil, water scale, sealant, and carbon. After cleaning the oil passages, blow air through them to verify that they are not blocked.
(3) Check the cylinder head gasket surface for flatness by using a straight edge and feeler gauge.

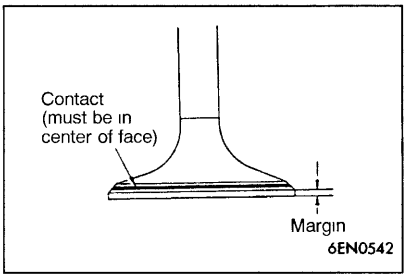
Standard value: 0.05 mm (.002 in.) or less

Limit: 0.2 mm (.008 in.)

(4) If flatness exceeds the specified limit, grind the gasket surface to specification.

Grinding limit: *0.2 mm (.008 in.)
***Includes/combined with cylinder block grinding.**

Cylinder head height (specification when new): 106.9 - 107.1 mm (4.209 - 4.217 in.)



VALVES

(1) Check the valve face for correct contact. If contact is uneven or incomplete, reface the valve seat.
(2) If the margin is less than specified, replace the valve.

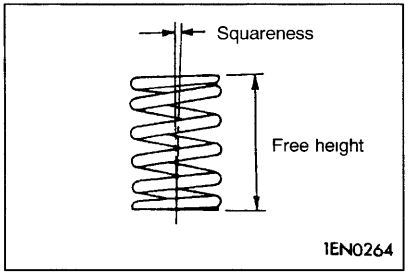
Standard value:
Intake: 1.0 mm (.039 in.)
Exhaust: 1.5 mm (.059 in.)

Limit:
Intake: 0.5 mm (.020 in.)
Exhaust: 1.0 mm (.039 in.)

(3) Measure the valve length. If the measurement is less than specified, replace the valve.

Standard value:
Intake: 100.75 mm (3.967 in.)
Exhaust: 101.05 mm (3.978 in.)

Limit:
Intake: 100.25 mm (3.947 in.)
Exhaust: 100.55 mm (3.955 in.)



VALVE SPRING

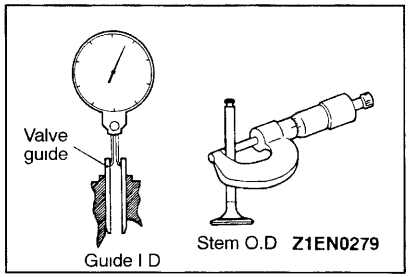
(1) Measure the valve spring free height. If the measurement is less than specified, replace spring.

Standard value:
Intake: 46.1 mm (1.815 in.)
Exhaust: 46.8 mm (1.843 in.)

Limit:
Intake: 45.6 mm (1.795 in.)
Exhaust: 46.3 mm (1.823 in.)

(2)Measure the squareness of the spring. If the measurement is less than specified, replace the spring.

Standard value: 2° or less
Limit: 4°

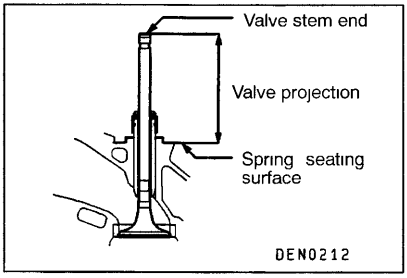


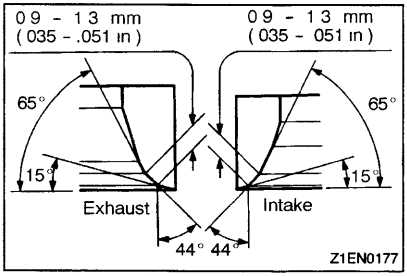
VALVE GUIDES

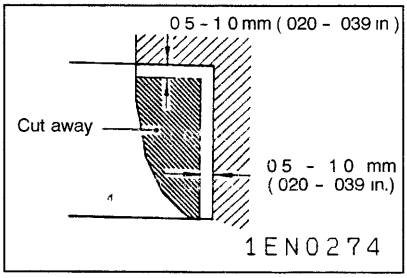
(1) Measure the clearance between the valve guide and valve stem. If the clearance exceeds the specified limit, replace the valve guide and/or valve.

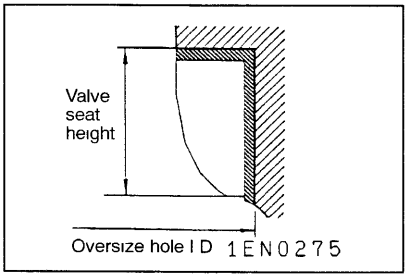
Standard value:
Intake: 0.020 - 0.050 mm (.0008 - .0020 in.)
Exhaust: 0.050 - 0.085 mm (.0020 - .0035 in.)

Limit:
Intake: 0.10 mm (.0039 in.)
Exhaust: 0.15 mm (.0059 in.)









VALVE SEATS

(1) Assemble the valve, then measure the valve stem projection between the end of the valve stem and the spring seating surface. If the measurement exceeds the specified limit, replace the valve seat.

Standard value:
Intake: 43.70 mm (1.720 in.)
Exhaust: 43.30 mm (1.705 in.)

Limit:
Intake: 44.20 mm (1.740 in.)
Exhaust: 43.80 mm (1.724 in.)

VALVE SEAT RECONDITIONING PROCEDURE

(1) Before correcting the valve seat, check the clearance between the valve guide and valve. If necessary, replace the valve guide.
(2) Using the appropriate special tool or seat grinder, correct the valve seat to achieve the specified seat width and angle.
(3) After correcting the valve seat, lap the valve and valve seat using lapping compound. Then, check the valve stem projection (refer to VALVE SEAT in INSPECTION).

VALVE SEAT REPLACEMENT PROCEDURE

(1) Cut the valve seat to be replaced from the inside to reduce the wall thickness. Then, remove the valve seat.
(2) Rebore the valve seat hole in the cylinder head to match the selected oversize valve seat diameter.

Intake valve seat hole diameters (0.3 O.S.)
Primary: 27.300 - 27.325 mm
(1.0748 - 1.0758 in.)
Secondary: 32.300 - 32.325 mm
(1.2717 - 1.2726 in.)

Intake valve seat hole diameters (0.6 O.S.)
Primary: 27.600 - 27.625 mm
(1.0866 - 1.0876 in.)
Secondary: 32.600 - 32.625 mm
(1.2835 - 1.2845 in.)

Exhaust valve seat hole diameters (0.3 O.S.)
35.300 - 35.325 mm (1.3898 - 1.3907 in.)

Exhaust valve seat hole diameters (0.6 O.S.)
35.600 - 35.625 mm (1.4016 - 1.4026 in.)

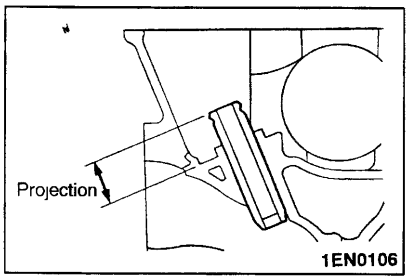
(3) Prevent galling of the cylinder head bore by cooling the valve seat with liquid nitrogen before press-fitting it.
(4) Correct the valve seat to achieve the specified width and angle (refer to VALVE SEAT RECONDITIONING PROCEDURE).

VALVE GUIDE REPLACEMENT PROCEDURE

(1) Using a press, push the valve guide out toward the cylinder block side.
(2) Rebore the valve guide hole in the cylinder head to match the oversize valve guide that is to be fitted.

Caution
Do not install a valve guide of the same size again.

Valve guide hole diameters
0.05 O.S.: 12.050 - 12.068 mm (.4744 - .4752 in.)
0.25 O.S.: 12.250 - 12.268 mm (.4823 - .4831 in.)
0.50 O.S.: 12.500 - 12.518 mm (.4921 - .4929 in.)



(3) Press-fit the valve guide until it projects by the specified amount.

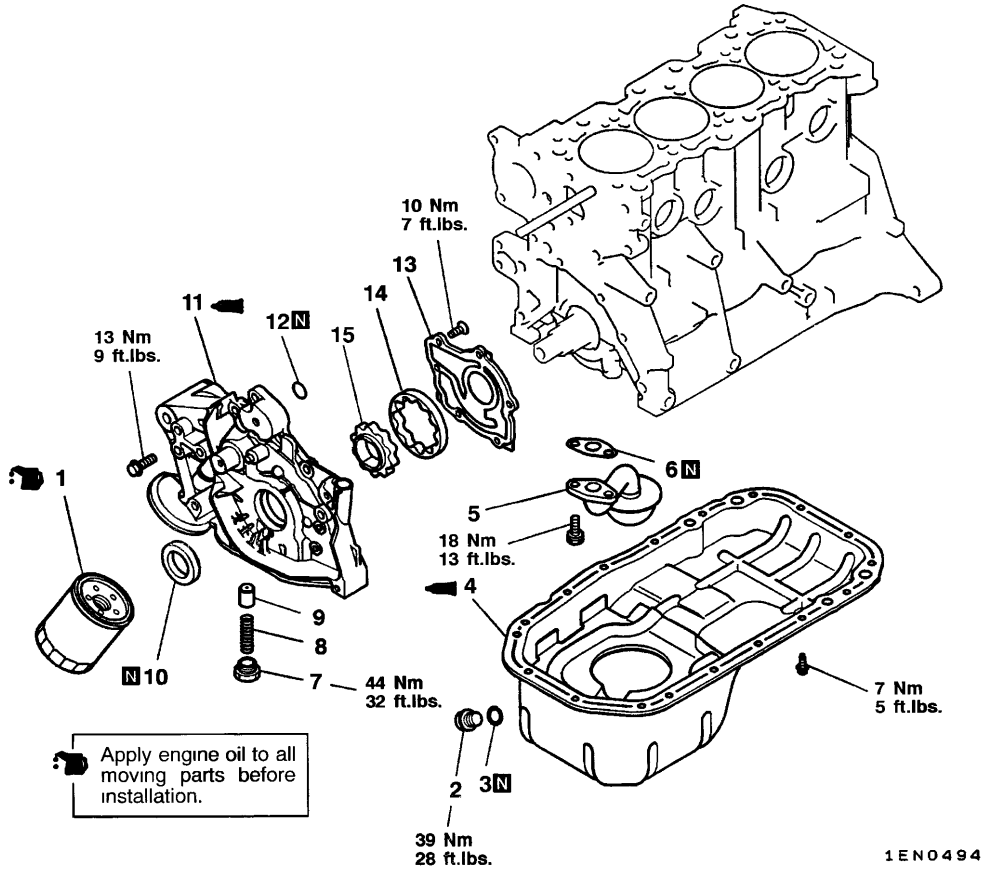
Standard value: 17 mm (.670 in.)

Caution
1. **The valve guide must be installed from the upper side of the cylinder head.**
2. **The valve guides differ in length on the intake and exhaust sides.**
3. **VALVE GUIDE LENGTH**
   INTAKE: 44.0 mm (1.732 in.)
   EXHAUST: 49.5 mm (1.949 in.)
4. **After press-fitting the valve guide, insert a new valve and check that it slides smoothly.**

OIL PUMP AND OIL PAN

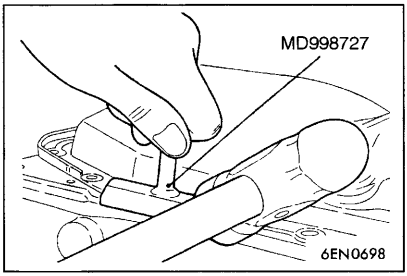
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REMOVAL AND INSTALLATION



Removal steps

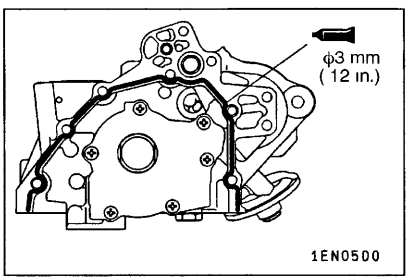
- ▶E◀ 1. Oil filter
- 2. Drain plug
- ▶D◀ 3. Gasket
- ◀A▶ ▶C◀ 4. Oil pan
- 5. Oil screen
- 6. Gasket
- 7. Relief valve
- 8. Relief valve spring
- 9. Relief plunger
- ▶B◀ 10 Front oil seal
- ▶A◀ 11. Front case
- 12. O-ring
- 13. Oil pump cover
- 14. Oil pump outer rotor
- 15. Oil pump inner rotor



REMOVAL SERVICE POINTS

◀A▶ OIL PAN REMOVAL

(1) Remove the oil pan mounting bolts.
(2) Knock the special tool between the oil pan and cylinder block as shown in the illustration.
(3) Tapping the side of the special tool, slide the tool along the oil pan/cylinder block seal and thus remove the oil pan.



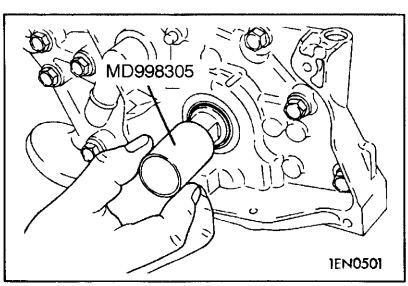
INSTALLATION SERVICE POINTS

▶A◀ FRONT CASE INSTALLATION

(1) Clean the sealant application surfaces on the cylinder block and front case.
(2) Apply a 3 mm (.12 in.) diameter bead of sealant to the area shown. Be sure to install the front case within 15 minutes after apply the sealant.

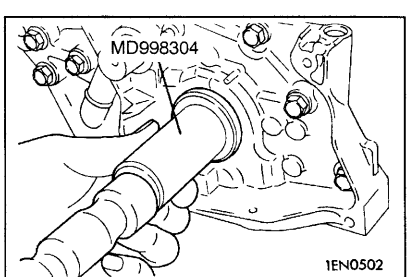
Specified sealant:
Mitsubishi Genuine Part No.MD970389 or equivalent.

(3) Tighten the front case bolts to the specified torque.
(4) After installation, wait at least one hour. Never start the engine or let engine oil touch the adhesion surface during that time.

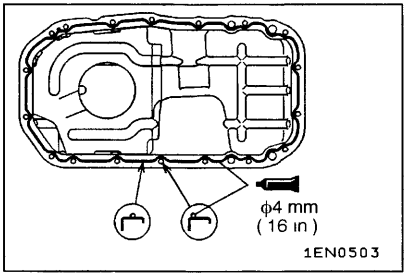


▶B◀ FRONT OIL SEAL INSTALLATION

(1) Place the special tool on the crankshaft front end and apply engine oil to the its outer diameter.



(2) Apply engine oil to the oil seal lip, then push the oil seal along the guide by hand until it touches the front case. Tap the oil seal into place using the special tool.

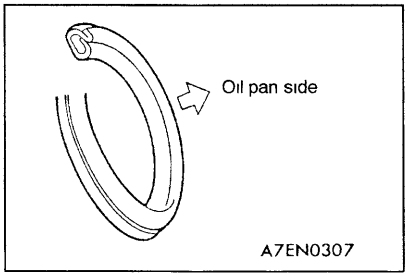


▶C◀ OIL PAN INSTALLATION

(1) Clean the mating surfaces of the oil pan and cylinder block.
(2) Apply a 4 mm (.16 in.) diameter bead of sealant to the oil pan flange. Be sure to install the oil pan within 15 minutes after applying the sealant

Specified sealant:
Mitsubishi Genuine Part No.MD970389 or equivalent.

(3) Tighten the oil pan bolts to specified torque.
(4) After installation, wait at least one hour. Never start the engine or let engine oil touch the adhesion surface during that time.



▶D◀ DRAIN PLUG GASKET INSTALLATION

(1) Replace the drain plug gasket with a new one. Fit the new gasket as shown.

▶E◀ OIL FILTER INSTALLATION

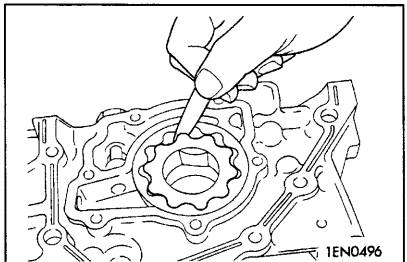
(1) Clean the filter mounting surface on the front case.
(2) Apply clean engine oil to the O-ring of the oil filter.
(3) Screw on the oil filter until the O-ring is seated on the mounting surface. Then, give the oil filter one further turn.

Caution
The oil filter must be tightened using a commercially available filter wrench. If the filter is tightened by hand only, it will be insufficiently torqued, resulting in oil leaks.

INSPECTION

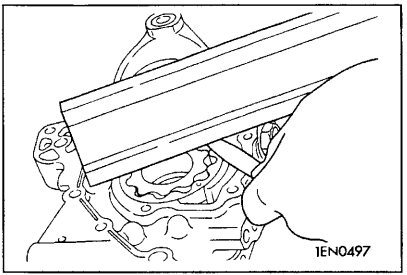
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OIL PUMP

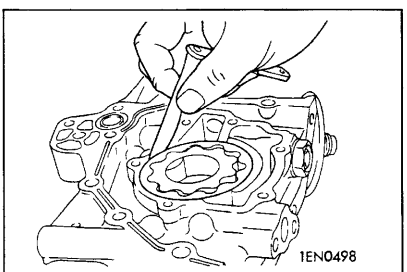


(1) Fit the rotors into the front case.
(2) Check the tip clearance using a feeler gauge.

Standard value: 0.06 - 0.18 mm (.0024 - .0071 in.)



(3) Check the side clearance using a straight edge and feeler gauge.
Standard value: 0.04 - 0.10 mm (.0016 - .0039 in.)

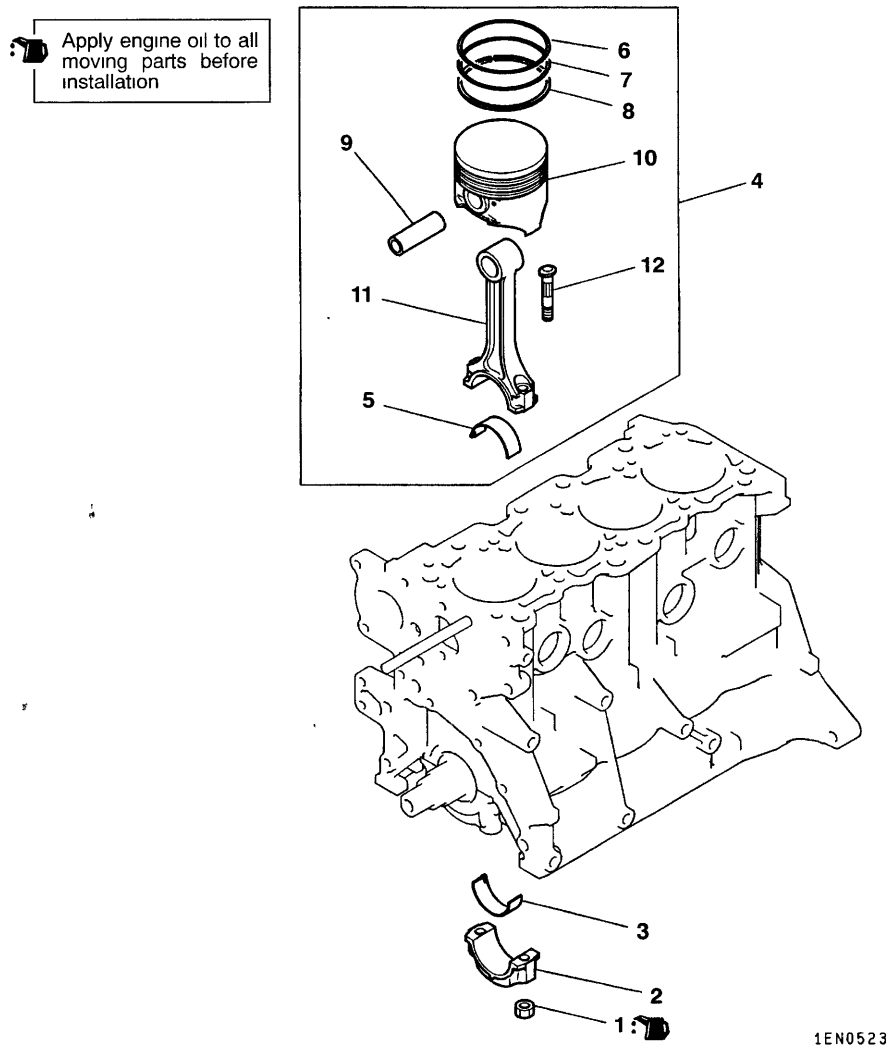


(4) Check the body clearance using a feeler gauge.
Standard value: 0.04 - 0.10 mm (.0016 - .0039 in.)
Limit: 0.35 mm (.0138 in.)

PISTONS AND CONNECTING RODS

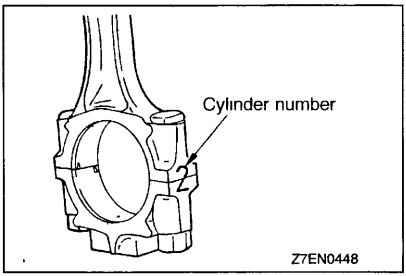
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REMOVAL AND INSTALLATION



Removal steps

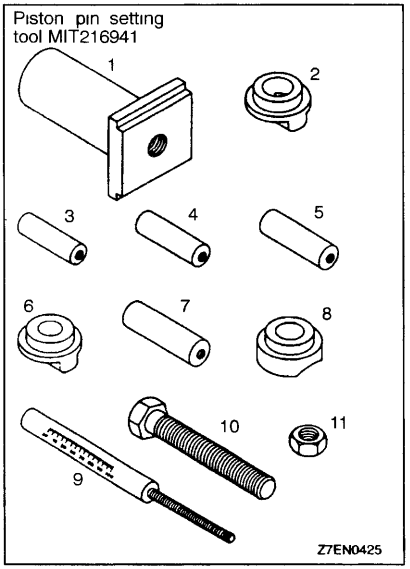
◀A▶ ▶G◀ 1. Connecting rod nut
◀A▶ ▶F◀ 2. Connecting rod cap
▶E◀ 3. Connecting rod bearing
▶D◀ 4. Piston and connecting rod assembly
▶E◀ 5. Connecting rod bearing
▶C◀ 6. Piston ring No.1
▶C◀ 7. Piston ring No.2
▶B◀ 8. Oil ring
◀B▶ ▶A◀ 9. Piston pin
10. Piston
11. Connecting rod
12. Bolt



REMOVAL SERVICE POINTS

◀A▶ CONNECTING ROD CAP REMOVAL

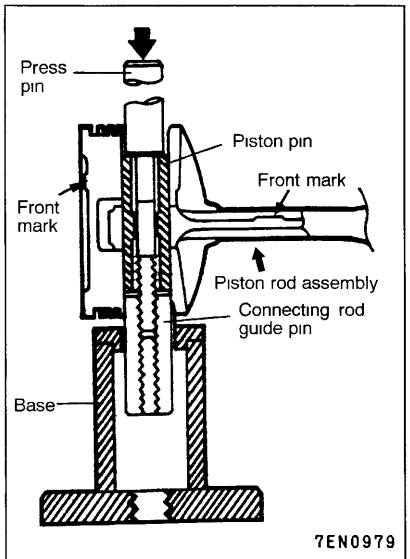
(1) Mark the cylinder number on the side of the connecting rod big end for correct reassembly.
(2) Keep the removed connecting rods, caps, and bearings in order according to the cylinder number.



◀B▶ PISTON PIN REMOVAL

Item No.	Part No.	Description
1	MIT310134	Base
2	MIT310136	Piston Support
3	MIT310137	Connecting Rod Guide Pin
4	MIT310138	Connecting Rod Guide Pin
5	MIT310139	Connecting Rod Guide Pin
6	MIT310140	Piston Support
7	MIT310141	Connecting Rod Guide Pin
8	MIT310142	Piston Support
9	MIT48143	Press Pin
10	216943	Stop Screw
11	10396	Nut

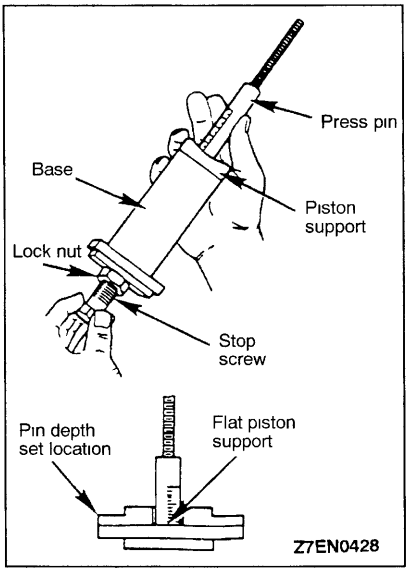
(1) Remove the stop screw from the base.
(2) Select the correct piston support for your application (See above). Fit the piston support onto the base. Place the base on press support blocks.



(3) Insert the press pin through the piston pin hole. Select the correct connecting rod guide pin (See above). Thread the guide pin onto the threaded portion of the press pin.
(4) Position the piston assembly on the piston support in the press. With the press pin up as shown in Figure 4, insert the guide pin through the hole in the piston and through the hole in the piston support.
(5) Press the piston pin out of the assembly.

IMPORTANT: To avoid piston damage,
- THE PISTON SUPPORT MUST SEAT SQUARELY AGAINST THE PISTON.
- VERIFY THAT THE PISTON PIN WILL SLIDE THROUGH THE HOLE IN THE PISTON SUPPORT

(6) Remove the piston pin from the press pin.

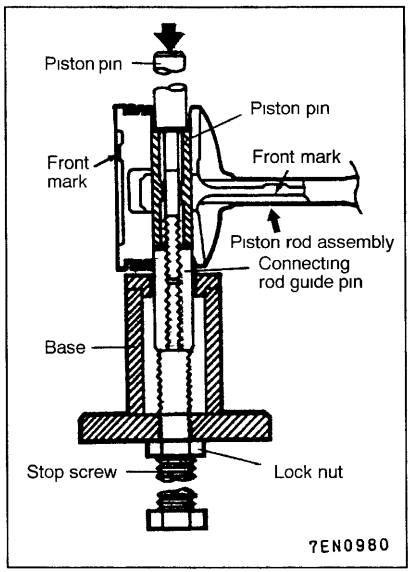


INSTALLATION SERVICE POINTS

▶A◀ PISTON PIN INSTALLATION

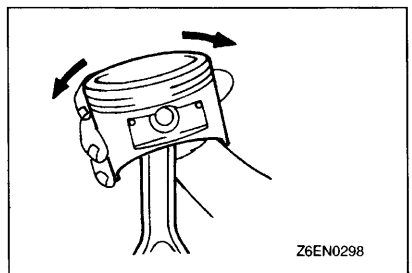
(1) Thread the stop screw and lock nut assembly into the base. Fit the correct piston support on top of the base. Insert the press pin, threaded end up, into the hole in the piston support until the press pin touches the stop screw.
(2) Using the markings on the press pin, adjust the stop screw to the depth as shown below.

Depth: Refer to the operating instructions on the special tool.

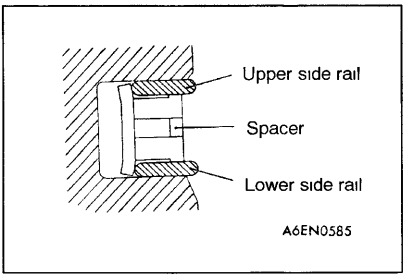


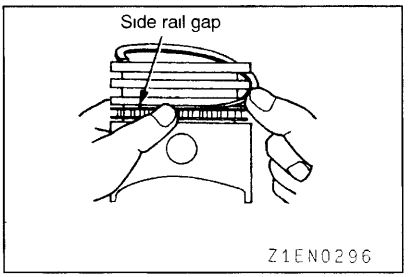
(3) Place the base on press support blocks.
(4) Slide the piston pin over the threaded end of the press pin, and thread the correct guide pin up against it.
(5) Coat the piston pin with oil, and with the connecting rod held in position, slide the guide pin through the piston and connecting rod.
(6) Press the piston pin through the connecting rod until the guide pin contacts the stop screw.
(7) Remove the piston assembly from the base. Remove the guide pin and press pin from the assembly.

IMPORTANT: Due to production tolerance variations, it is necessary to visually inspect the piston pin depth after installation to verify that the piston pin is centered. Adjust if necessary.



(8) Check that the piston moves smoothly.





▶B◀ OIL RING INSTALLATION

(1) Fit the oil ring spacer into the piston ring groove. Then, fit the upper and lower side rails.

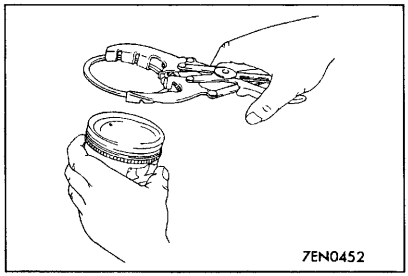
NOTE
(1) The spacer and side rails may be fitted in either direction. No distinction is made between top and bottom.
(2) Spacer and side rail sizes are color-coded as follows:

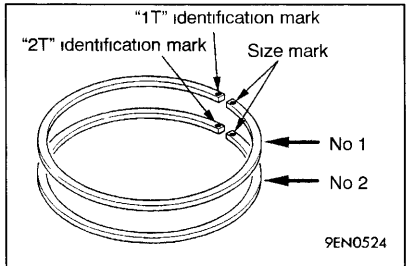
Size	Color
STD	None
0.50 mm O.S	Blue
1.00 mm O.S.	Yellow

To install a side rail, fit one end of the rail into the groove then press the rest of the rail into position by hand as shown.

Caution
Do not fit side rails using a piston ring expander since they may break.

(2) After installing the side rails, check that they move smoothly in both directions.





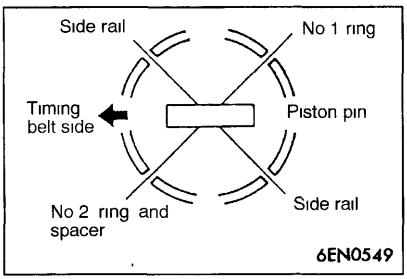
▶C◀ PISTON RING No.2/PISTON RING No.1 INSTALLATION

(1) Using a ring expander, fit ring No.2 and ring No.1 with their identification marks facing upward (on the piston crown side).

Identification marks:
No.1 ring: 1T
No.2 ring: 2T

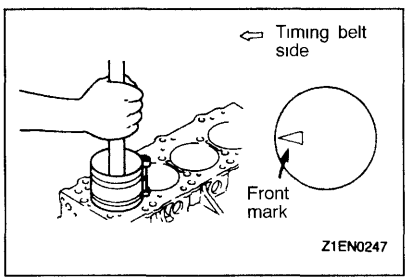
NOTE
Piston rings are stamped with size marks as follows:

Size	Size mark
STD	None
0 50 mm O S	50
1.00 mm O.S.	100

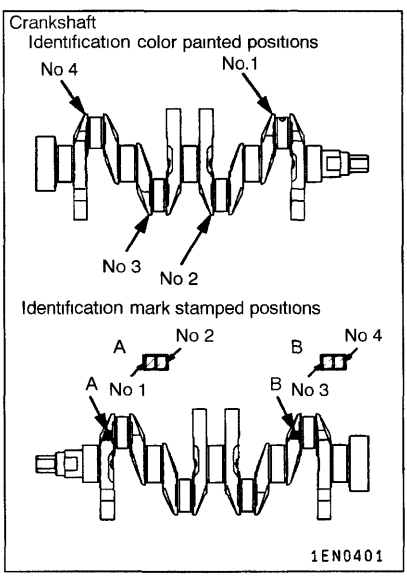


▶D◀ PISTON AND CONNECTING ROD ASSEMBLY INSTALLATION

(1) Apply oil to the piston, piston rings, and oil ring.
(2) Align the gaps of the piston rings and oil ring (side rails and spacer) as shown.
(3) With the piston crown's front arrow mark pointing toward the timing belt side, press the piston and connecting rod assembly into the cylinder from the top of the cylinder.



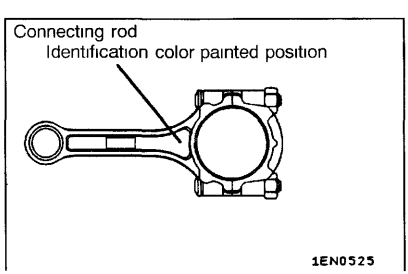
(4) Compress the piston rings tightly with a suitable ring compression tool, then press the piston and connecting rod fully into the cylinder. Do not strike the piston hard since the piston rings may break and the crank pin may be nicked.

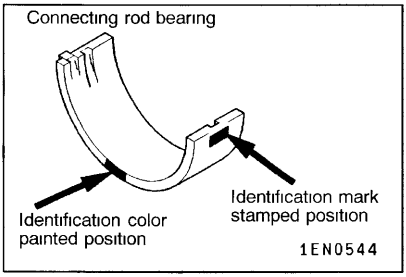


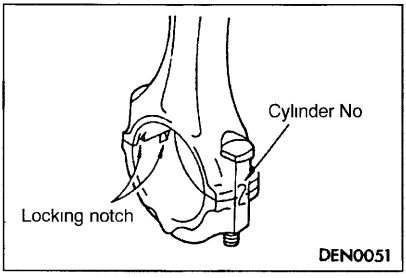
▶E◀ CONNECTING ROD BEARING INSTALLATION

(1) When replacing the bearings, crankshaft and/or connecting rod, read off the identification mark and color on the crankshaft and connecting rod (as illustrated), and select a bearing according to the following table.

Crankshaft pin O.D.		Connecting rod big end I.D.	Connecting rod bearing	
Identification color	Identification mark	Identification color	Identification mark	Identification color
Yellow	I	White	1	Yellow
		None	1	Yellow
		Yellow	2	None
None	II	White	1	Yellow
		None	2	None
		Yellow	3	Blue
White	III	White	2	None
		None	3	Blue
		Yellow	3	Blue

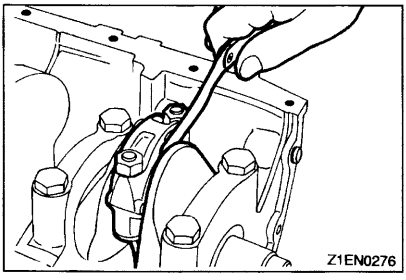






▶F◀ CONNECTING ROD CAP INSTALLATION

(1) Aligning the marks made during disassembly, fit the bearing cap onto the connecting rod. If the connecting rod is new and has no index mark, ensure that the bearing locking notches are both on the same side.



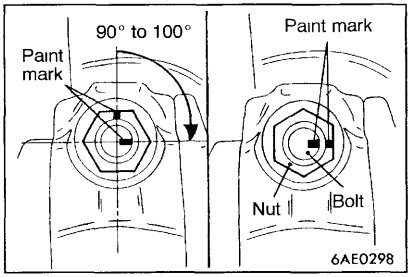
(2) Check that the connecting rod big end side clearance confirms with specifications.

Standard value: 0.10 - 0.25 mm (.0039 - .0098 in.)

Limit: 0.4 mm (.016 in.)

▶G◀ CONNECTING ROD CAP NUT TIGHTENING

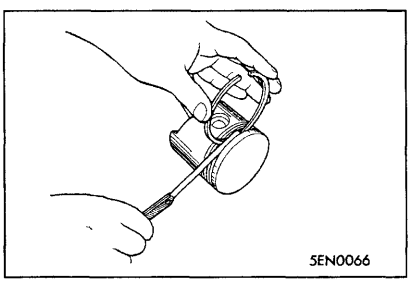
(1) Since the connecting rod cap bolts and nuts are torqued using the plastic area tightening method, the bolts should be examined BEFORE reuse. If the bolt threads are "necked down", the bolt should be replaced.
Necking can be checked by running a nut with your fingers the full length of the bolt threads. If the nut does not run down smoothly, the bolt should be replaced.
(2) Before installation of each nut, apply engine oil to the nut.
(3) Install each nut to the bolt and finger-tighten it. Then tighten the nuts alternately to install the cap properly.
(4) Tighten the nuts to 17 Nm (12 ft.lbs.)



(5) Make a paint mark on the head of each nut.
(6) Make a paint mark on the bolt end at the position 90° to 100° from the paint mark made on the nut in the direction of tightening the nut.
(7) Give a 90° to 100° turn to the nut and make sure that the paint mark on the nut and that on the bolt are in alignment.

Caution

1. **If the nut is turned less than 90°, proper fastening performance may not be expected. When tightening the nuts, therefore, be careful to give a sufficient turn to it.**
2. **If the nut is overtightened (exceeding 100°), loosen the nut completely and then retighten it by repeating the tightening procedure from step (1).**



INSPECTION

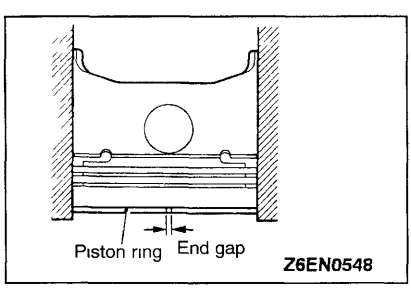
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PISTON RING

(1) Check for side clearance.
If the limit is exceeded, replace the ring or piston, or both.

Standard value:
No.1 0.03 - 0.07 mm (.0012 - .0028 in.)
No.2 0.02 - 0.06 mm (.0008 - .0024 in.)

Limit: 0.1 mm (.004 in.)



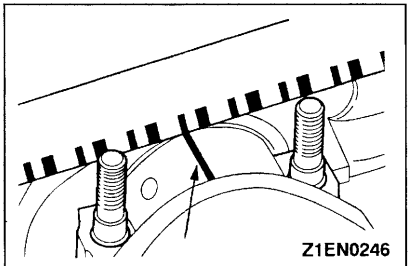
(2) Insert the piston ring into the cylinder bore. Force the ring down with a piston, the piston crown being in contact with the ring, to correctly position it at right angles to the cylinder wall. Then, measure the end gap with a feeler gauge. If the end gap is excessive, replace the piston ring.

Standard value:
No.1 ring: 0.20 - 0.35 mm (.0079 - .0138 in.)
No.2 ring: 0.35 - 0.50 mm (.0138 - .0197 in.)
Oil ring: 0.20 - 0.50 mm (.079 - .0197 in.)

Limit:
No.1, No.2 0.8 mm (.031 in.)
Oil 1.0 mm (.039 in.)

CRANKSHAFT PIN OIL CLEARANCE (PLASTIC GAUGING MATERIAL METHOD)

(1) Remove oil from crankshaft pin and connecting rod bearing.
(2) Cut the plastic gauging material to the same length as the width of bearing and place it on a crankshaft pin in parallel with its axis.


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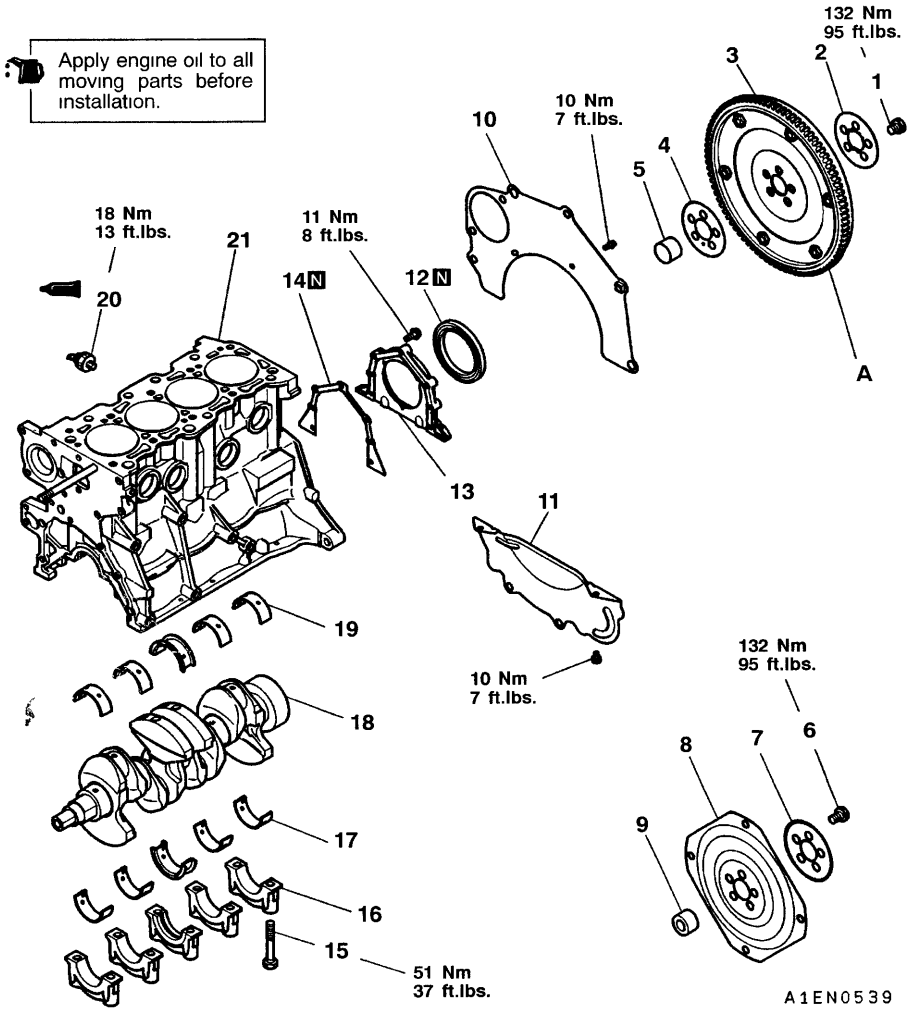
(3) Install the connecting rod cap carefully and tighten the nuts to the specified torque. (See "Connecting rod cap nut tightening" procedure.)
(4) Carefully remove the connecting rod cap.
(5) Measure the width of the plastic gauging material at its widest part by using a scale printed on the plastic gauging material package.

Standard value: 0.02 - 0.05 mm (.0008 - .0020 in.)
Limit: 0.1 mm (.004 in.)

CRANKSHAFT AND CYLINDER BLOCK

11300870162

REMOVAL AND INSPECTION



Removal steps

1. Flywheel bolt <M/T>
2. Adapter plate <M/T>
3. Flywheel (Non-disassemblable part) <M/T>
4. Adapter plate <M/T>
5. Crankshaft bushing <M/T>
6. Drive plate bolt <A/T>
7. Adapter plate <A/T>
8. Drive plate <A/T>
9. Crankshaft bushing <A/T>
10. Rear plate
11. Bell housing cover

▶D◀ 12. Rear oil seal

13. Rear oil seal case
14. Rear oil seal case gasket

▶C◀ 15. Bearing cap bolt

▶C◀ 16. Bearing cap

▶B◀ 17. Crankshaft bearing (lower)

18. Crankshaft

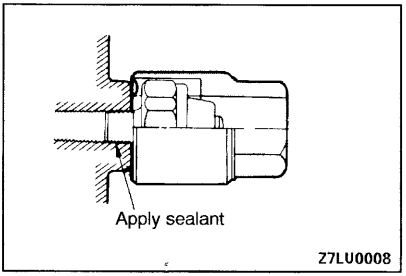
▶B◀ 19. Crankshaft bearing (upper)

▶A◀ 20. Oil pressure switch

21. Cylinder block

Caution

Do not remove any of the bolts "A" of the flywheel shown in the illustration. The balance of the flexible type flywheel is adjusted in an assembled condition. Removing the bolt, therefore, can cause the flexible type flywheel to be out of balance, giving damage to the flywheel.



INSTALLATION SERVICE POINTS

▶A◀ OIL PRESSURE SWITCH INSTALLATION

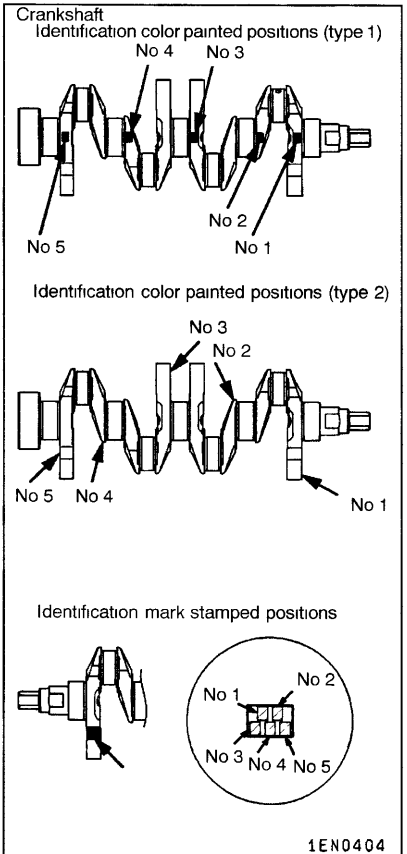
(1) Apply the specified sealant to the thread of the switch.

Specified sealant:
3M ATD Part No.8660 or equivalent.

Caution
Use care to allow the sealant to plug the oil passage.

(2) Install and tighten the switch to the specified torque by using the socket wrench and torque wrench.

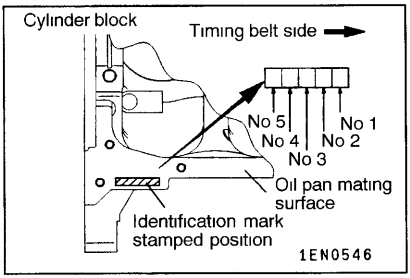
Caution
If the switch is tightened with a spanner or offset wrench, an over-torque may be applied and the switch to be damaged.

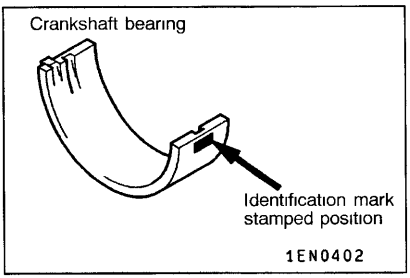


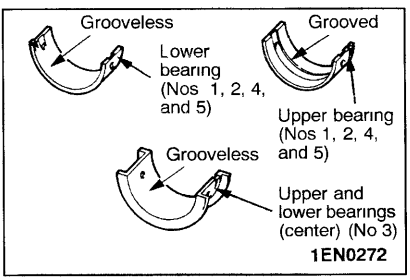
▶B◀ CRANKSHAFT BEARING INSTALLATION

(1) When replacing the bearings, crankshaft and/or cylinder block, read off the identification color or mark on the crankshaft and cylinder block (as illustrated), and select a bearing according to the following table.

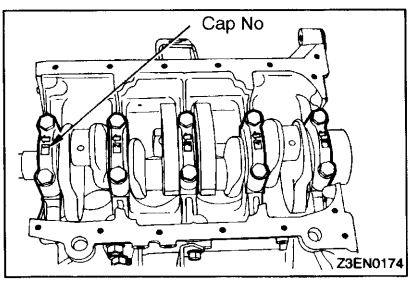
Crankshaft journal O D.		Cylinder block bearing bore I.D.	Crankshaft bearing
Identification color	Identification mark	Identification mark	Identification mark
Yellow	1	0	1
		1	2
		2	3
None	2	0	2
		1	3
		2	4
White	3	0	3
		1	4
		2	5





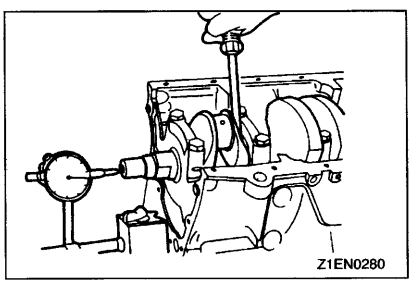


(2) Install the crankshaft bearings to the cylinder block and bearing caps as shown illustration.



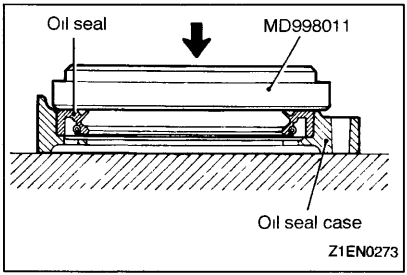
▶C◀ BEARING CAP INSTALLATION

(1) On the bottom surface of each bearing cap is the cap's number and an arrow. Starting at the timing belt side, install the bearing caps in numerical order. Ensure that the arrows point toward the timing belt side.
(2) Check that the crankshaft rotates smoothly.

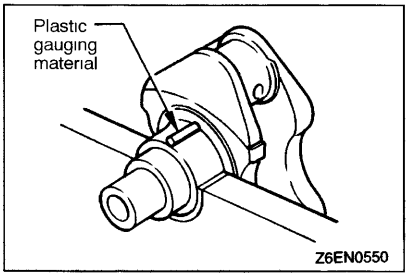


(3) Measure the end play in the crankshaft. If the measurement exceeds the specified limit, replace the crankshaft bearings.

Standard value: 0.05 - 0.18 mm (.0020 - .0071 in.)
Limit: 0.25 mm (.010 in.)



▶D◀ REAR OIL SEAL INSTALLATION



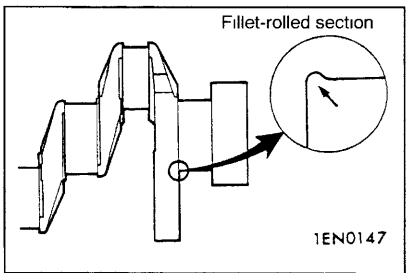
INSPECTION

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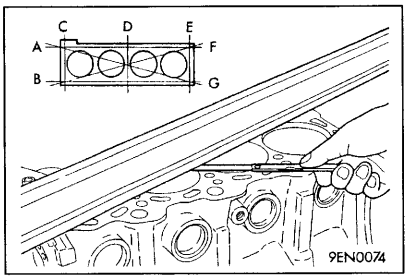
CRANKSHAFT JOURNAL OIL CLEARANCE (PLASTIC GAUGING MATERIAL METHOD)

(1) Remove all oil from crankshaft journal and the crankshaft bearing.
(2) Install the crankshaft.
(3) Cut the plastic gauging material to the same length as the width of the bearing, and place it on the journal in parallel with its axis
(4) Install the crankshaft bearing cap carefully and tighten the bolts to the specified torque.
(5) Carefully remove the crankshaft bearing cap.
(6) Measure the width of the plastic gauging material at its widest part by using a scale printed on plastic gauging material package.

Standard value: 0.02 - 0.04 mm (.0008 - .0016 in.)
Limit: 0.1 mm (.0039 in.)



NOTE
The crankshaft pins and journals are fillet-rolled and must not be machined to undersize dimensions.



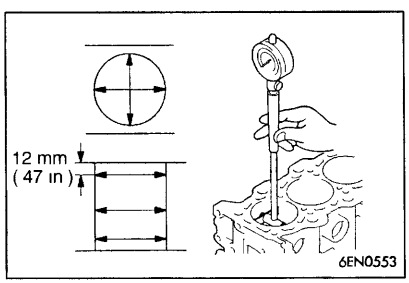
CYLINDER BLOCK

(1) Visually check for cracks, rust, and corrosion, and inspect the cylinder block using a flaw detecting agent. Rectify defects where possible or replace the cylinder block.

(2) Ensure that the top surface is free of gasket chips and other foreign material. Check the cylinder block top surface for distortion using a straight edge and feeler gauge.

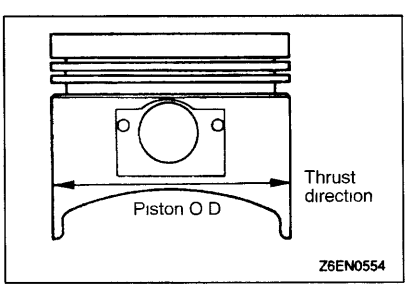
Standard value: 0.05 mm (.0020 in.) or less
Limit: 0.1 mm (.0039 in.)

(3) Check the cylinder walls for cracks and seizure marks. If defects are evident, bore all the cylinders to oversize or replace the cylinder block.



(4) Using a cylinder gauge, measure each cylinder bore and cylindricity. If any cylinder is severely worn, bore all the cylinders to oversize and replace the piston and piston rings accordingly. Take measurements at the points shown.

Standard value:
Cylinder bore: I.D. 75.5 mm (2.79 in.)
Cylindricity: 0.01 mm (.0004 in.) or less



BORING CYLINDERS

(1) Oversize pistons should be based on the largest bore cylinder.

Piston side identification

Size	Identification mark
0.50 mm O.S.	0 50
1.00 mm O S.	1.00

NOTE
The size mark is stamped on the piston top.

(2) Measure the outside diameter of the piston to be used. Measure it in the thrust direction as shown.

(3) Based on the measured piston O.D., calculate the boring finish dimension.

Boring finish dimension = Piston O.D. + (Clearance between piston O.D. and cylinder) - 0.02 mm (.0008 in.) (honing margin)

(4) Bore each cylinder to the calculated boring finish dimension.

Caution
To prevent distortion caused by heat increased during boring, bore the cylinders in the following order: No.2, No.4, No.1, No.3.

(5) Hone the cylinders to the final finish dimension (piston O.D. + piston-to-cylinder clearance).

(6) Check the clearance between the pistons and cylinders.

Standard value: 0.02 - 0.04 mm (.0008 - .0016 in.)

NOTE
When boring cylinders, finish all of four cylinders to the same oversize. Do not bore only one cylinder to an oversize.

ENGINE <1.8L>

CONTENTS

11109000733

CAMSHAFT AND CAMSHAFT OIL SEAL 20

CRANKSHAFT OIL SEAL 23

CRANKSHAFT PULLEY 19

CYLINDER HEAD GASKET 26

ENGINE ASSEMBLY 15

GENERAL INFORMATION 2

OIL PAN 22

ON-VEHICLE SERVICE 6

Basic Idle Speed Adjustment ..... Refer to GROUP 13A

Compression Pressure Check 11

Curb Idle Speed Check 9

Drive Belt Tension Check and Adjustment 6

Idle Mixture Check 10

Ignition Timing Check 9

Lash Adjuster Check 13

Manifold Vacuum Check 12

Timing Belt Tension Adjustment 12

SEALANTS 3

SERVICE SPECIFICATIONS 2

SPECIAL TOOLS 3

TIMING BELT 30

TROUBLESHOOTING 5

GENERAL INFORMATION

11100010520

GENERAL SPECIFICATIONS

Items			Specifications
Type			In-line, Overhead Camshaft
Number of cylinders			4
Bore mm (in.)			81.0 (3.19)
Stroke mm (in.)			89 0 (3 50)
Piston displacement cm^3 (cu.in.)			1,834 (111.9)
Compression ratio			9.5
Firing order			1 - 3 - 4 - 2
Valve timing	Intake valve	Opens	BTDC 6°
		Closes	ABDC 54°
	Exhaust valve	Opens	BBDC 54°
		Closes	ATDC 6°
Lubrication			Pressurized feed-full filtration

SERVICE SPECIFICATIONS

11100030632

Items		Standard value	Limit
Generator drive belt vibration frequency Hz	When checked	151 - 195	-
	When a used belt is installed	163 - 185	-
	When a new belt is installed	195 - 230	-
Generator drive belt tension N (lbs.)	When checked	294 - 490 (66 - 110)	-
	When a used belt is installed	343 - 441 (77 - 99)	-
	When a new belt is installed	490 - 686 (110 - 154)	-
Generator drive belt deflection (Reference value) mm (in.)	When checked	8.0 - 10.5 (.31 - .41)	-
	When a used belt is installed	8.5 - 10.0 (33 - .39)	-
	When a new belt is installed	7 0 - 8.0 (.28 - .31)	-
Power steering oil pump and A/C compressor drive belt vibration frequency Hz	When checked	114 - 139	-
	When a used belt is installed	121 - 133	-
	When a new belt is installed	145 - 166	-
Power steering oil pump and A/C compressor drive belt tension N (lbs.)	When checked	392 - 588 (88 - 132)	-
	When a used belt is installed	441 - 539 (99 - 121)	-
	When a new belt is installed	637 - 833 (143 - 187)	-

Items		Standard value	Limit
Power steering oil pump and A/C compressor drive belt deflection (Reference value) mm (in.)	When checked	10.0 - 12.0 (39 - 47)	-
	When a used belt is installed	10.0 - 11.0 (.39 - .43)	-
	When a new belt is installed	7.2 - 9.0 (.28 - .36)	-
Basic ignition timing at idle		5°BTDC ± 3°	-
Actual ignition timing at curb idle		Approx. 5°BTDC	-
CO contents %		0.5 or less	-
HC contents ppm		100 or less	-
Curb idle speed r/min		700 ± 100	-
Compression pressure (at 300 r/min) kPa (psi)		1,370 (199)	min. 1,040 (151)
Compression pressure difference of all cylinders kPa (psi)		-	max. 100 (14)
Intake manifold vacuum at curb idle kPa (in Hg)		-	min 60 (18)
Cylinder head bolt shank length mm (in.)		-	96.4 (3.80)

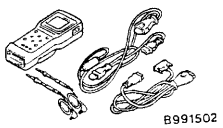
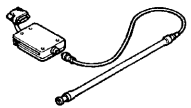
SEALANTS

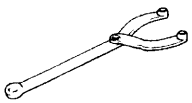
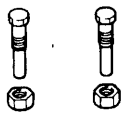
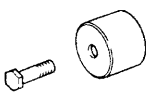
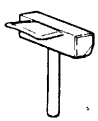
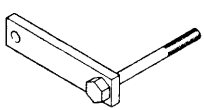
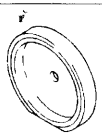
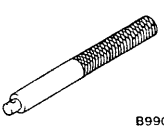
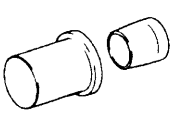
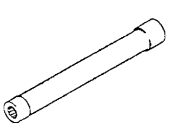
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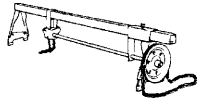
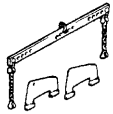
Items	Specified sealants
Oil pan Camshaft position sensor support	MITSUBISHI GENUINE PART MD970389 or equivalent
Flywheel bolt <M/T> or drive plate bolt <A/T>	3M Stud Locking 4170 or equivalent

SPECIAL TOOLS

11100060648

Tool	Tool number and name	Supersession	Application
	MB991502 Scan tool (MUT-II)	MB991496-OD	• Checking the ignition timing • Checking the idle speed
	MB991668 Belt tension meter set	Tool not available	Drive belt tension measurement

Tool	Tool number and name	Supersession	Application
	MB990767 End yoke holder	MB990767-01	• Holding the camshaft sprocket • Holding the crankshaft pulley
	MD998719 or MD998754 Crankshaft pulley holder	MIT308239	
	MD998713 Camshaft oil seal installer	MD998713-01	Press-in of the camshaft oil seal
	MD998727 Oil pan remover	MD998727-01	Removal of oil pan
	MD998781 Flywheel stopper	General service tool	Securing the flywheel <M/T> or drive plate <A/T>
	MD998776 Crankshaft rear oil seal installer	MD998776-01	Press-in of the crankshaft rear oil seal
	MB990938 Handle	MB990938-01	
	MD998717 Crankshaft front oil seal installer	MD998717-01	Press-in of the crankshaft front oil seal
	MB991653 Cylinder head bolt wrench	General service tool	Removal and installation of the cylinder head bolt

Tool	Tool number and name	Supersession	Application
 Z203827	GENERAL SERVICE TOOL MZ203827 Engine lifter	MZ203827-01	Supporting the engine assembly during removal and installation of the transaxle
 B991453	MB991453 Engine hanger assembly	MZ203827-01	

TROUBLESHOOTING

11100070245

Refer to GROUP 11A - Troubleshooting.

ON-VEHICLE SERVICE

11100090586

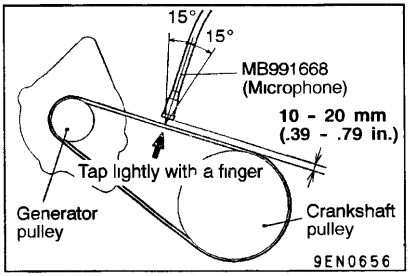
DRIVE BELT TENSION CHECK AND ADJUSTMENT

GENERATOR DRIVE BELT TENSION CHECK

Check drive belt tension in one of the following procedures.

Standard value:

Vibration frequency Hz	151 - 195
Tension N (lbs.)	294 - 490 (66 - 110)
Deflection (Reference value) mm (in.)	8.0 - 10.5 (.31 - .41)

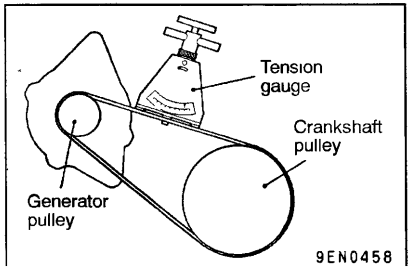


<When using the scan tool (MUT-II)>

1. Connect the belt tension meter set (special tool) to the scan tool (MUT-II).
2. Connect the scan tool (MUT-II) to the diagnosis connector.
3. Turn the ignition switch to "ON" and select "Belt Tension Measurement" on the menu screen.
4. Hold the microphone to the middle of the drive belt between the pulleys (at the place indicated by an arrow) about 10 - 20 mm (0.39 - 0.79 in.) away from the rear surface of the belt and so that it is perpendicular to the belt (within an angle of ±15°).
5. Lightly tap the middle of the belt between the pulleys (the place indicated by the arrow) with your finger as shown in the illustration. Check that the vibration frequency of the belt is within the standard value.

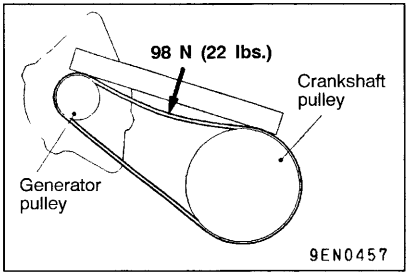
Caution

1. **The temperature of the surface of the belt should be as close as possible to normal temperature.**
2. **Do not allow any contaminant such as water or oil to get onto the microphone.**
3. **If strong gusts of wind blow against the microphone or if there is any source of loud noise nearby, the values measured by the microphone may not correspond to actual values.**
4. **If the microphone is touching the belt during the measurement, the values measured by the microphone may not correspond to actual values.**
5. **Do not take the measurement while the vehicle's engine is running.**



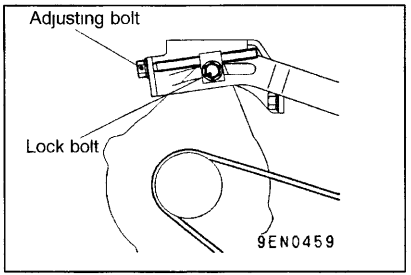
<When using a tension gauge>

Use a belt tension gauge to check that the belt tension is within the standard value range.



<Belt deflection check>

Apply 98 N (22 lbs.) of force to the middle of the drive belt between the pulleys (at the place indicated by the arrow) and check that the amount of deflection is within the standard value range.



GENERATOR DRIVE BELT TENSION ADJUSTMENT

1. Loosen the nut of the generator pivot bolt.
2. Loosen the lock bolt.
3. Turn the adjusting bolt to adjust the belt tension vibration frequency, belt tension or deflection to the standard value.

Standard value:

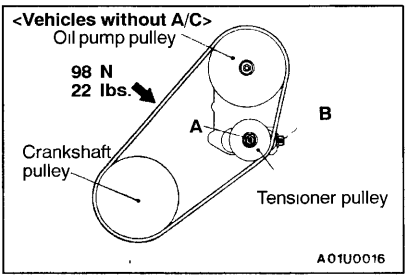
Items	When a used belt is installed	When a new belt is installed
Vibration frequency Hz	163 - 185	195 - 230
Tension N (lbs.)	343 - 441 (77 - 99)	490 - 686 (110 - 154)
Deflection (Reference value) mm (in.)	8.5 - 10 0 (33 - .39)	7.0 - 8.0 (28 - .31)

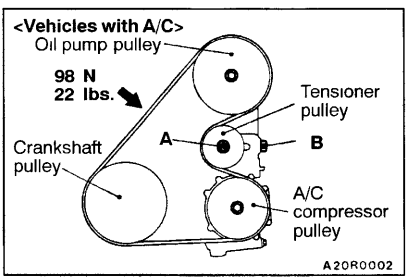
4. Tighten the nut of the generator pivot bolt.

   Tightening torque: 44 Nm (33 ft.lbs.)
5. Tighten the lock bolt.

   Tightening torque: 23 Nm (17 ft.lbs.)
6. Tighten the adjusting bolt.

   Tightening torque: 9.8 Nm (7.2 ft.lbs.)





POWER STEERING OIL PUMP AND AIR CONDITIONING COMPRESSOR DRIVE BELT TENSION CHECK AND ADJUSTMENT

11100130202

1. Check drive belt tension in one of the following procedures.

Standard value:

Items	When checked	When a used belt is intalled	When a new belt is installed
Vibration frequency Hz	114 - 139	121 - 133	145 - 166
Tension N (lbs.)	392 - 588 (88 - 132)	441 - 539 (99 - 121)	637 - 833 (143 - 187)
Deflection (Reference value) mm (in.)	10.0 - 12.0 (.39 - .47)	10.0 - 11.0 (.39 - .43)	7.2 - 9.0 (.28 - .35)

<When using the scan tool (MUT-II)>
Lightly tap the middle of the belt between the pulleys (the place indicated by the arrow) with your finger as shown in the illustration. Check that the vibration frequency of the belt is within the standard value.

NOTE
Check drive belt vibration frequency with the scan tool (MUT-II) in the same procedure in WATER PUMP AND GENERATOR. (Refer to page 11C-6.)

<When using a tension gauge>
Use a belt tension gauge to check that the belt tension is at the standard value at a point half-way between the two pulleys (indicated by an arrow in the illustration).

<Belt deflection check>
Apply 98 N (22 lbs.) of force to the middle of the drive belt between the pulleys (at the place indicated by the arrow) and check that the amount of deflection is within the standard value range.

2. If the tension or deflection is outside the standard value, adjust by the following procedure.
   (1) Loosen tensioner pulley fixing nut A.
   (2) Adjust the amount of belt deflection using adjusting bolt B.
   (3) Tighten fixing nut A.

   Tightening torque: 25 Nm (19 ft.lbs.)

   (4) Check the belt deflection amount and tension, and readjust if necessary.

   Caution
   Check after turning the crankshaft once or more clockwise (right turn).

IGNITION TIMING CHECK

11100170150

1. Before inspection, set the vehicle in the following condition:
   - Engine coolant temperature: 80 - 95°C (176 - 203°F)
   - Lights, electric cooling fan and all accessories: OFF
   - Transaxle: Neutral (P range on vehicles with A/T)
2. Connect the scan tool to the data link connector.
3. Set up a timing light.
4. Start the engine and run at idle.
5. Check that the idle speed is at approx. 700 r/min.
6. Select the 'item No.17' of the actuator test on the scan tool.
7. Check that basic ignition timing is within the standard value.

   Standard value: 5° BTDC ± 3°

8. If the basic ignition timing is outside the standard value, check the MFI components by referring to GROUP 13A - Troubleshooting.
9. Press the clear key of the scan tool (select force-activating cancel mode), and cancel the actuator test.

   NOTE
   If it is not cancelled, force-activation continues for 27 minutes. Do not drive the vehicle in this condition, or the engine could be damaged.

10. Check the actual ignition timing is at the standard value.

    Standard value: Approx. 5° BTDC

    NOTE
    1. Ignition timing is variable within about ±7°, even under normal operating.
    2. The timing is automatically further advanced by approx. 5° from 5°BTDC at higher altitude.

CURB IDLE SPEED CHECK

11100190545

1. Before inspection, set the vehicle in the following condition.
   - Engine coolant temperature: 80 - 95°C (176 - 203°F)
   - Lights, electric cooling fan and all accessories: OFF
   - Transaxle: Neutral (P range on vehicles with A/T)
2. Turn the ignition switch off and connect the scan tool to the data link connector.
3. Check that the basic ignition timing is within the standard value.

   Standard value: 5° BTDC ± 3°

4. Run the engine at idle for 2 minutes.
5. Check the curb idle speed. Select item No.22 and take a reading of the idle speed.

   Standard value: 700 ± 100 r/min

   NOTE
   The idle speed is controlled automatically by the idle air control system.

6. If the idle speed is not within the standard value, check the MFI components by referring to GROUP 13A - Troubleshooting.

IDLE MIXTURE CHECK

11100210258

1. Before inspection, set the vehicle in the following condition.
   - Engine coolant temperature: 80 - 95°C (176 - 203°F)
   - Lights, electric cooling fan and all accessories: OFF
   - Transaxle: Neutral (P range on vehicles with A/T)
2. Turn the ignition switch off and connect the scan tool to the data link connector.
3. Check that the basic ignition timing is within the standard value.

   Standard value: 5°BTDC ± 3°

4. Run the engine at 2,500 r/min for 2 minutes.
5. Set the CO/HC tester.
6. Check the CO contents and the HC contents at idle.

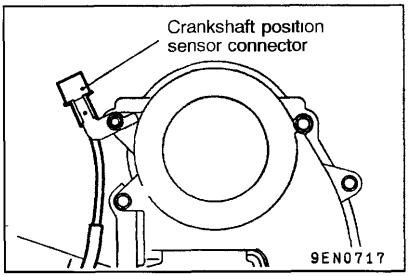
   Standard value:
   CO contents: 0.5% or less
   HC contents: 100 ppm or less

7. If the idle speed is not within the standard value, check the following items:
   - Diagnostic output
   - Closed-loop control (When the closed-loop control is carried out normally, the output signal of the heated oxygen sensor repeats between 0 - 400 mV and 600 - 1,000 mV at idle.)
   - Fuel pressure
   - Injector
   - Ignition coil, spark plug cable, spark plug
   - EGR system and the EGR valve leak
   - Evaporative emission control system
   - Compression pressure

   NOTE
   Replace the three-way catalyst whenever the CO and HC contents do not remain inside the standard value. (even though the result of the inspection is normal on all items).

COMPRESSION PRESSURE CHECK 11100260680

1. Before inspection, set the vehicle in the following condition.
   - Engine coolant temperature: 80 - 95°C (176 - 203°F)
   - Lights, electric cooling fan and all accessories: OFF
   - Transaxle: Neutral (P range on vehicles with A/T)
2. Disconnect the spark plug cables.
3. Remove all of the spark plugs.

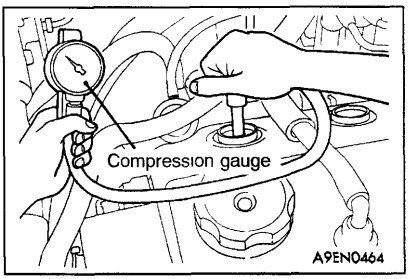


4. Disconnect the crankshaft position sensor connector.

   NOTE
   Doing this will prevent the engine module from carrying out ignition and fuel injection.

5. Cover the spark plug hole with a shop towel etc., and after the engine has been cranked, check that no foreign material is adhering to the shop towel.

   Caution
   1. **Keep away from the spark plug hole when cranking.**
   2. **If compression is measured with water, oil, fuel, etc., that has come from cracks inside the cylinder, these materials will become heated and will gush out from the spark plug hole, which is dangerous.**



6. Set compression gauge to one of the spark plug holes.
7. Crank the engine with the throttle valve fully open and measure the compression pressure.

   Standard value (at engine speed of 300 r/min):
   1,370 kPa (199 psi)
   Limit (at engine speed of 300 r/min):
   min. 1,040 kPa (151 psi)

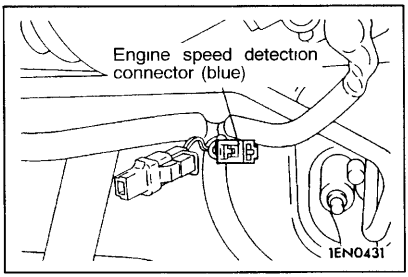
8. Measure the compression pressure for all the cylinders, and check that the pressure differences of the cylinders are below the limit.

   Limit: max. 100 kPa (14 psi)

9. If there is a cylinder with compression or a compression difference that is outside the limit, pour a small amount of engine oil through the spark plug hole, and repeat the operations in steps 7 and 8.
   (1) If the compression increases after oil is added, the cause of the malfunction is a worn or damaged piston ring and/or cylinder inner surface.
   (2) If the compression does not rise after oil is added, the cause is a burnt or defective valve seat, or pressure is leaking from the gasket.

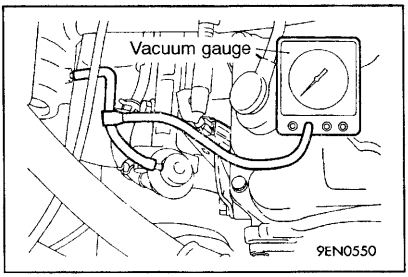
10. Connect the crankshaft position sensor connector.
11. Install the spark plugs and spark plug cables.
12. Use the scan tool to erase the diagnostic trouble codes, or disconnect the negative battery cable for more than 10 seconds and reconnect it.

NOTE
This will erase the diagnostic trouble code resulting from the crankshaft position sensor connector being disconnected.



MANIFOLD VACUUM CHECK 11100270263

1. Before inspection, set the vehicle in the following condition.
   - Engine coolant temperature: 80 - 95°C (176 - 203°F)
   - Lights, electric cooling fan and all accessories: OFF
   - Transaxle: Neutral (P range on vehicles with A/T)
2. Connect the scan tool to the data link connector, or connect a primary voltage detection type tachometer to the connector through a paper clip.

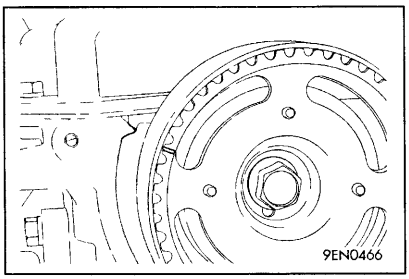


3. Attach a three-way joint to the vacuum hose connected between the intake manifold plenum and the fuel pressure regulator and connect a vacuum gauge.
4. Start the engine, and check that the curb idle speed is within the standard value range.

   Standard value: 700 ± 100 r/min

5. Check the manifold vacuum.

   Limit: min. 60 kPa (18 in.Hg)



TIMING BELT TENSION ADJUSTMENT 11100280129

1. Remove the timing belt upper cover.
2. Turn the crankshaft clockwise to set the No.1 cylinder to the top dead compression center.

   Caution
   As the purpose of this procedure is to apply the proper amount of tension to the timing belt by means of the cam drive torque, be sure not to rotate the crankshaft counterclockwise.

3. Remove the access cover.
4. Loosen the timing belt tensioner fixing bolt to apply tension to the belt by means of the force of the tensioner spring.

   Caution
   The bolt can be loosened 90° - 180°. If the belt is loosened more than necessary, the bolt may fall inside the cover.

5. Tighten the timing belt tensioner fixing bolt.
6. Install the access cover.
7. Install the timing belt upper cover.

LASH ADJUSTER CHECK

11100290436

If an abnormal noise (clicking) assumed to caused by a fault in the lash adjuster is heard and does not stop after the engine is started, inspect the following items.

NOTE

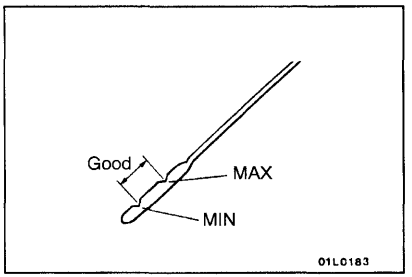
(1) The abnormal noise caused by the lash adjuster occurs just after starting and fluctuates according to the engine speed, but is not related to the engine load.
Thus, if the abnormal noise does not occur just after the engine speed, if it does not fluctuate according to the engine speed, or if it fluctuates according to the engine load, the lash adjuster is not the cause of the abnormal noise.

(2) If the lash adjuster is defective, often the abnormal noise will not stop even if warmup operation is continued in the idling state.
Note that the abnormal noise may stop only if the noise is caused by fixing of oil sludge in an engine where the oil control is poor.

1. Start the engine.
2. Check whether the abnormal noise starts immediately after starting, and whether it fluctuates according to the engine speed when the engine speed is varied.
If the abnormal noise does not occur immediately after starting, or if it does not fluctuate according to the engine speed, the cause is not with the lash adjuster, so investigate for other causes of the abnormal noise. If the abnormal noise does not fluctuate according to the engine speed, it is assumed that the cause is not the engine unit. (In this case, the lash adjuster is normal.)
3. Check whether the abnormal noise level does not change when the engine load is fluctuated (ex., shift from N to D range) in the idling state.
If the abnormal noise level fluctuates, this may be a hitting sound caused by wear of the crankshaft bearings or connecting rod bearings. (In this case, the lash adjuster is normal.)
4. Check for abnormal noise in the idling state after warmup operation is completed.
If the abnormal noise is quieter or has stopped, it is assumed that the noise was caused by fixing of the lash adjuster due to oil sludge, etc., so wash the lash adjuster. (Refer to GROUP 11D - Rocker Arms and Camshaft.)
If the abnormal noise level does not fluctuate, go to step 5.
5. Bleed the air from the lash adjuster. (Refer to GROUP 11C-14.)
6. If the abnormal noise does not stop even after purging the air, wash the lash adjuster. (Refer to GROUP 11D - Rocker Arms and Camshaft.)

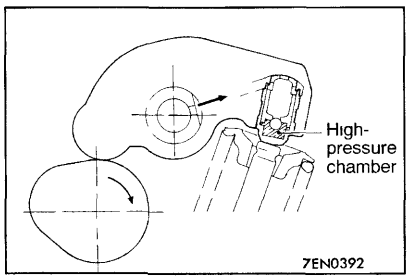
PURGING OF THE LASH ADJUSTER

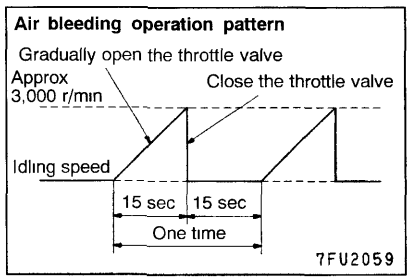
NOTE
(1) If the vehicle is parked for a long time on a slope, the oil in the lash adjuster will decrease, and air may enter the high pressure chamber when starting.
(2) When the vehicle is parked for a long time, there will be no oil in the oil passage, and it will take time for the oil to be supplied to the lash adjuster. Thus, air may enter the high pressure chamber.
(3) In the above cases, the abnormal noise can be stopped by purging the lash adjuster.



1. Check the engine oil, and replenish or replace it if necessary.

   NOTE
   (1) If the engine oil level is low, air will be sucked in from the oil screen and will enter the oil passage.
   (2) If the engine oil level is higher than the specified amount, the oil will be mixed by the crankshaft and a large amount of air may enter the oil.
   (3) If the oil is deteriorated, the air and oil will not separate easily, and the amount of air in the oil will increase.
   (4) If due to the above types of cases, air enters the oil and into the high pressure chamber of the lash adjuster, the air in the high pressure chamber will be compressed too much when the valve is opened, so abnormal noise will occur when the valve is shut. This is the same phenomenon as when the valve clearance is excessive. In this case, the lash adjuster functions will return to normal if the air in the lash adjuster is bled out.





2. Carry out warmup operation for one to three minutes in the idling state.
3. Repeat the operation pattern shown on the left in a no-load state, and check for abnormal noise. (Normally, the abnormal noise will stop after the pattern is repeated for 10 to 30 times, but if the abnormal noise level does not change even when the pattern is repeated for 30 or more times, the cause may be other than the entry of air.
4. After the abnormal noise stops, repeat the operation pattern shown on the left for another five times.
5. For one to three minutes in the idling state, check that the abnormal noise has stopped.

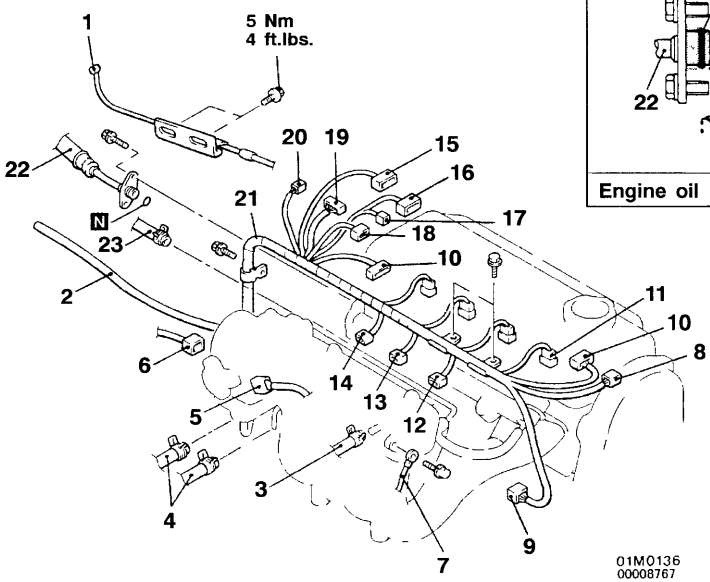
ENGINE ASSEMBLY

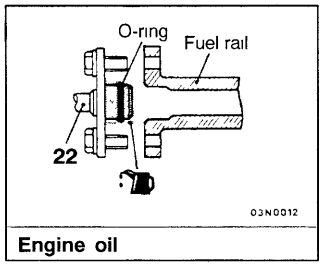
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REMOVAL AND INSTALLATION

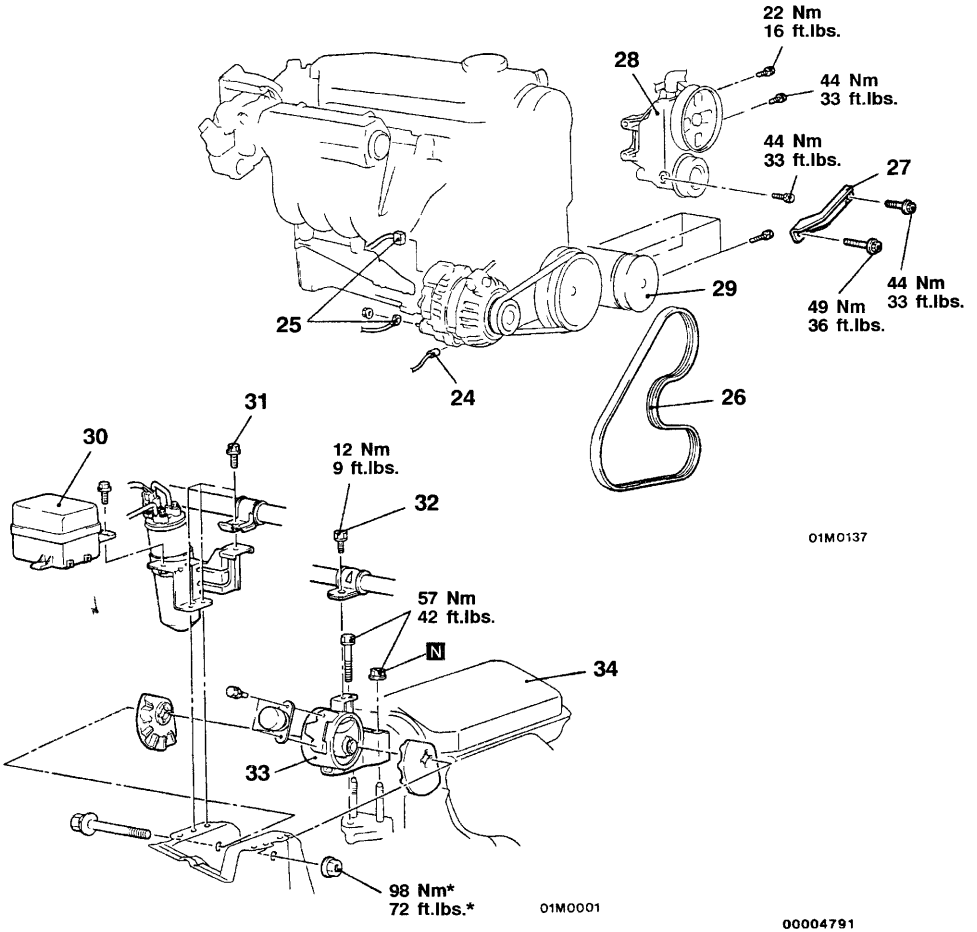
Pre-removal Operation
(1) Fuel Discharge Prevention (Refer to GROUP 13A - On-vehicle Service)
(2) Under Cover Removal
(3) Hood Removal (Refer to GROUP 42)
(4) Air Cleaner Removal
(5) Radiator Removal (Refer to GROUP 14)
(6) Front Exhaust Pipe Removal (Refer to GROUP 15.)
(7) Auto-cruise Vacuum Pump and Bracket Assembly Removal (Refer to GROUP 17)

Post-installation Operation
(1) Auto-cruise Vacuum Pump and Bracket Assembly Installation (Refer to GROUP 17)
(2) Front Exhaust Pipe Installation (Refer to GROUP 15)
(3) Radiator Installation (Refer to GROUP 14)
(4) Air Cleaner Installation
(5) Hood Installation (Refer to GROUP 42)
(6) Under Cover Installation
(7) Drive Belt Tension Adjustment
(8) Accelerator Cable Adjustment (Refer to GROUP 17 - On-vehicle Service)





Removal steps
1. Accelerator cable connection
2. Vacuum hose connection
3. Brake booster vacuum hose connection
4 Heater hose connection
5. Throttle position sensor connector
6. Idle speed control connector
7. Ground cable connection
8. Crank angle sensor connector
9. Heated oxygen sensor connector
10 Ignition coil connector
11 Injector connector
12. Evaporative emission purge solenoid
13. EGR solenoid connector
14. Manifold differential pressure sensor connector
15. Heated oxygen sensor connector <Vehicle for California>
16. Ignition failure sensor connector
17. Engine coolant temperature gauge unit connector
18. Engine coolant temperature sensor connector
19. Camshaft position sensor connector
20. Noise condensor connector
21. Control wiring harness
▶C◀ 22. High-pressure fuel hose connection
23. Fuel return hose connection



24. Oil pressure switch connector
25. Generator connector
26. Drive belt (Power steering and A/C)
27. Power steering pump bracket stay
◀A▶ 28. Power steering oil pump and bracket assembly
◀B▶ ◀C▶ 29. Air conditioning compressor
• Transaxle assembly
30. Air conditioning relay box
31. Air conditioning receiver bracket mounting bolts
32. Power steering hose mounting bolt
◀D▶ ▶B◀ 33. Engine mount bracket
◀E▶ ▶A◀ 34. Engine assembly

Caution
Mounting locations marked by * should be provisionally tightened, and then fully tightened when the body is supporting the full weight of the engine.

REMOVAL SERVICE POINTS

◀A▶ POWER STEERING OIL PUMP AND BRACKET ASSEMBLY REMOVAL

Remove the power steering oil pump and bracket assembly from the engine with the hose attached.

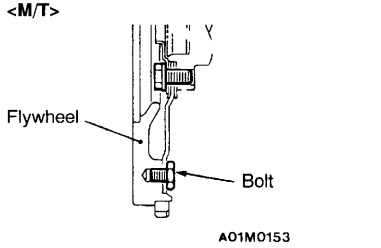
NOTE
Place the removed power steering oil pump in a place where it will not be a hindrance when removing and installing the engine assembly, and tie it with a cord.

◀B▶ A/C COMPRESSOR REMOVAL

Disconnect the A/C compressor connector and remove the compressor from the compressor bracket with the hose still attached.

NOTE
Place the removed A/C compressor where it will not be a hindrance when removing and installing the engine assembly, and tie it with a cord.

<M/T>

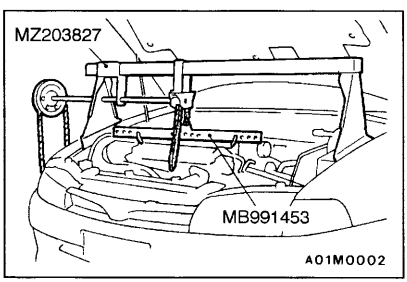


◀C▶ TRANSAXLE ASSEMBLY REMOVAL

<M/T>:
Refer to GROUP 22A.

Caution
Do not remove the flywheel mounting bolt shown by the arrow. If this bolt is removed, the flywheel will become out of balance and damaged.

<A/T>:
Refer to GROUP 23A.



◀D▶ ENGINE MOUNT BRACKET REMOVAL

1. Support the engine with a garage jack.
2. Remove the special tool which was attached when the transaxle assembly was removed.
3. Hold the engine assembly with a chain block or similar tool.
4. Place a garage jack against the engine oil pan with a piece of wood in between, jack up the engine so that the weight of the engine is no longer being applied to the engine mount bracket, and then remove the engine mount bracket.

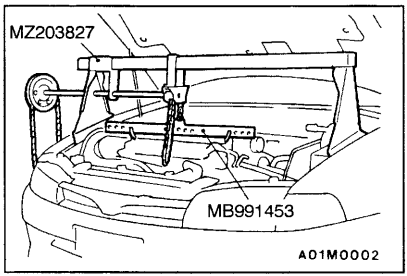
◀E▶ ENGINE ASSEMBLY REMOVAL

After checking that all cables, hoses and harness connectors, etc., are disconnected from the engine, lift the chain block slowly to remove the engine assembly upward from the engine compartment.

INSTALLATION SERVICE POINTS

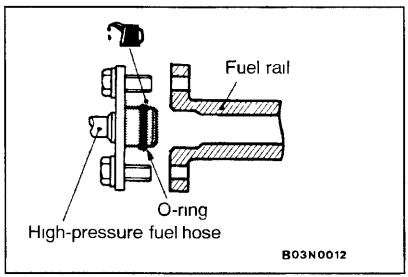
▶A◀ ENGINE ASSEMBLY INSTALLATION

Install the engine assembly, checking that the cables, hoses, and harness connectors are not pinched.



▶B◀ ENGINE MOUNT BRACKET INSTALLATION

1. Place a garage jack against the engine oil pan with a piece of wood in between, and install the engine mount bracket while adjusting the position of the engine.
2. Support the engine with the garage jack.
3. Remove the chain block and support the engine assembly with the special tool.



▶C◀ HIGH-PRESSURE FUEL HOSE INSTALLATION

1. Apply a small amount of new engine oil to the O-ring.

   Caution
   Do not let any engine oil get into the fuel rail.
2. While turning the high-pressure fuel hose clockwise and counterclockwise, install it to the fuel rail, while being careful not to damage the O-ring. After installing, check that the hose turns smoothly.
3. If the hose does not turn smoothly, the O-ring is probably being pinched. Disconnect the high-pressure fuel hose and check the O-ring for damage. After this, re-insert the fuel rail and check that the hose turns smoothly.

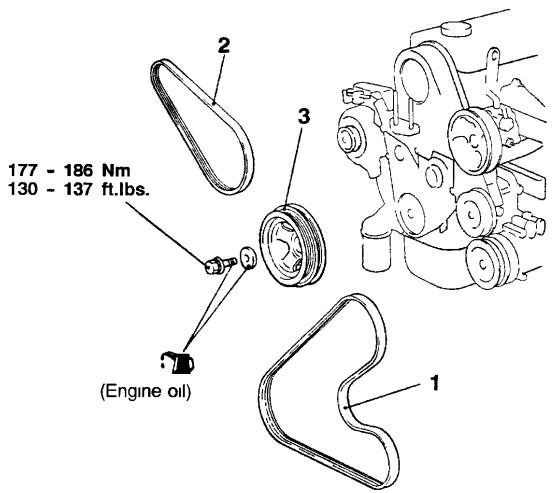
CRANKSHAFT PULLEY

11200160211

REMOVAL AND INSTALLATION

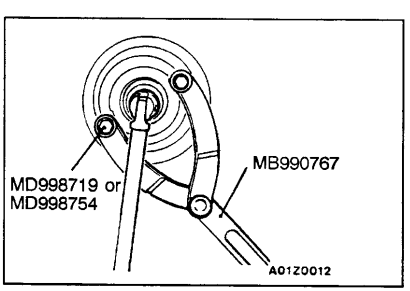
Pre-removal Operation
- Under Cover Removal

Post-installation Operation
(1) Drive Belt Tension Adjustment
(2) Under Cover Installation



Removal steps

1. Drive belt (Power steering and A/C)
2. Drive belt (Generator)
◀A▶ ▶A◀ 3. Crankshaft pulley



REMOVAL SERVICE POINT

◀A▶ CRANKSHAFT PULLEY REMOVAL

INSTALLATION SERVICE POINT

▶A◀ CRANKSHAFT PULLEY INSTALLATION

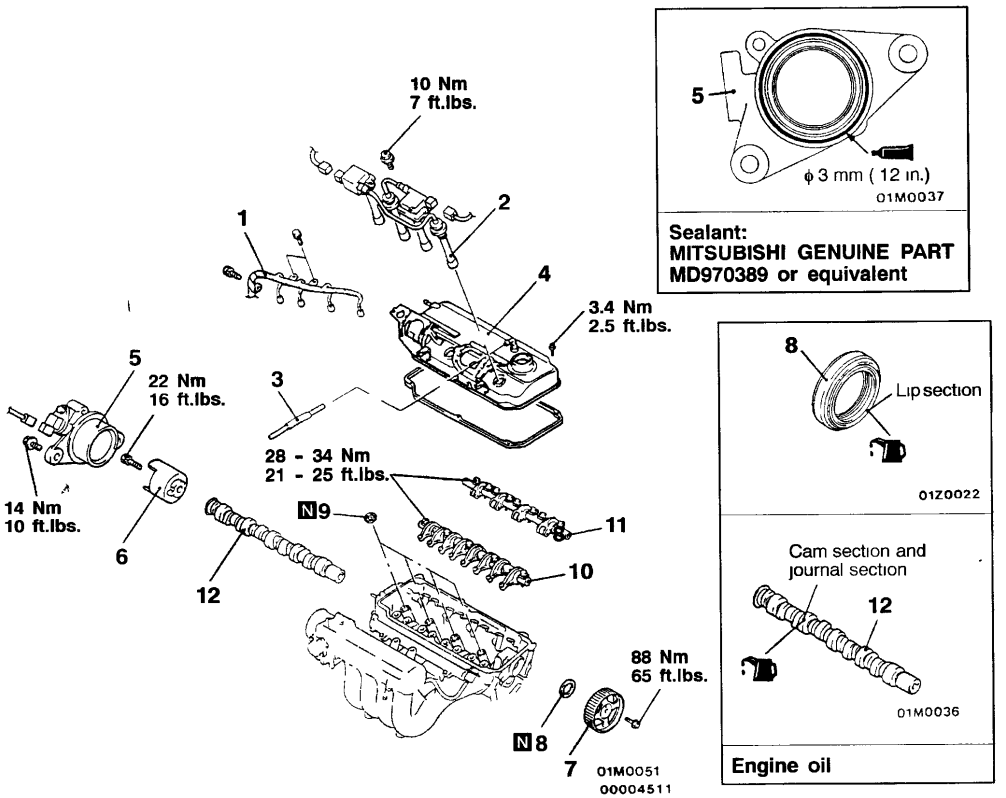
When installing the crankshaft bolt, apply a mininal amount of engine oil to the bearing surface and thread of the bolt.

CAMSHAFT AND CAMSHAFT OIL SEAL

11200190234

REMOVAL AND INSTALLATION

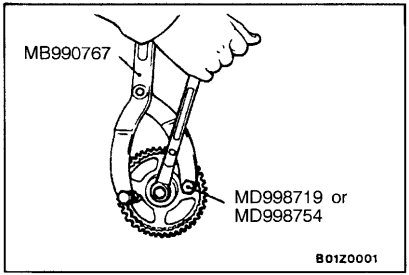
Pre-removal and Post-installation Operation
(1) Air Cleaner Removal and Installation
(2) Timing Belt Removal and Installation (Refer to P11C-30.)



Removal steps

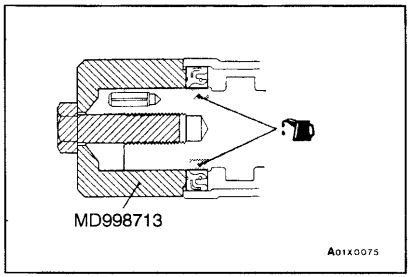
1. Control harness connection
2. Spark plug cable
3. PCV hose connection
4. Rocker cover
- Valve clearance adjustment (Refer to GROUP 00 - Maintenance Service.)
5. Camshaft position sensor support
6. Camshaft position sensing cylinder

◀A▶ ▶B◀ ▶A◀
7. Camshaft sprocket
8. Camshaft oil seal
9. Spark plug guide oil seal
10. Rocker arm and shaft assembly (intake side)
11. Rocker arm and shaft assembly (exhaust side)
12. Camshaft



REMOVAL SERVICE POINT

◀A▶ CAMSHAFT SPROCKET REMOVAL



INSTALLATION SERVICE POINTS

▶A◀ CAMSHAFT OIL SEAL INSTALLATION

1. Apply engine oil to the camshaft oil seal lip.
2. Use the special tool to press-fit the camshaft oil seal.

▶B◀ CAMSHAFT SPROCKET INSTALLATION

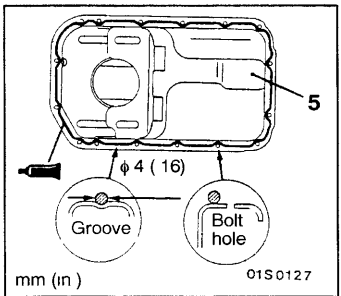
Use the special tool to stop the camshaft sprocket from turning in the same way as was done during removal, and then tighten the bolts to the specified torque.

OIL PAN

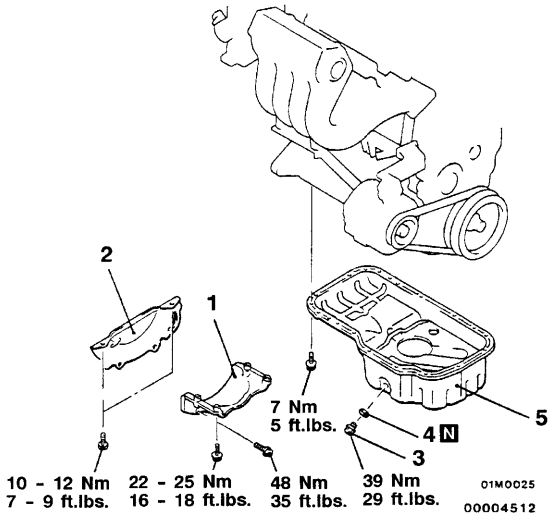
11200280313

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
(1) Engine Oil Draining and Supplying (Refer to GROUP 00 - Maintenance Service)
(2) Oil Dipstick Removal and Installation
(3) Front Exhaust Pipe Removal and Installation (Refer to GROUP 15)



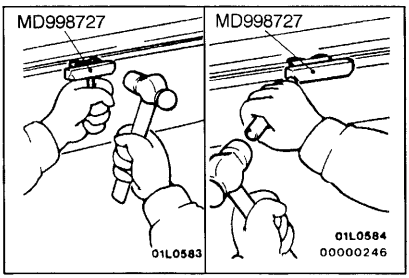
Sealant:
MITSUBISHI GENUINE PART
MD970389 or equivalent



Removal steps

1. Transaxle stay
2. Bell housing cover
3. Drain plug

◀A▶ ▶A◀ 4. Drain plug gasket
5. Oil pan

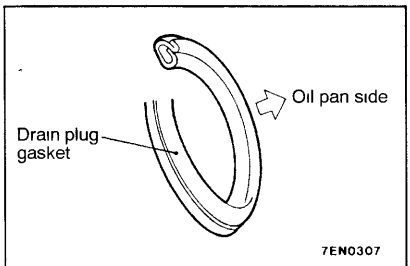


REMOVAL SERVICE POINT

◀A▶ OIL PAN REMOVAL

After removing the oil pan mounting bolts, remove the oil pan with the special tool and a brass bar.

Caution
Perform this slowly to avoid deformation of the oil pan flange.



INSTALLATION SERVICE POINT

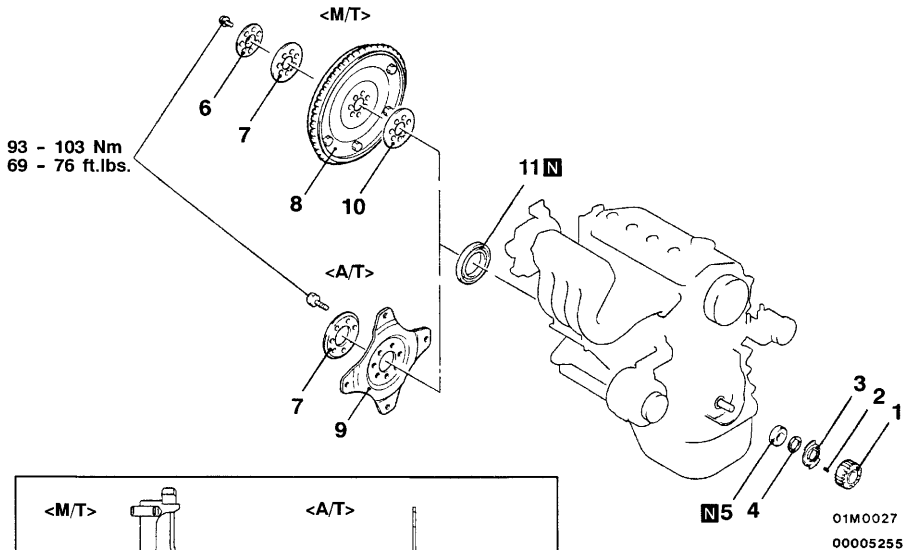
▶A◀ DRAIN PLUG GASKET INSTALLATION

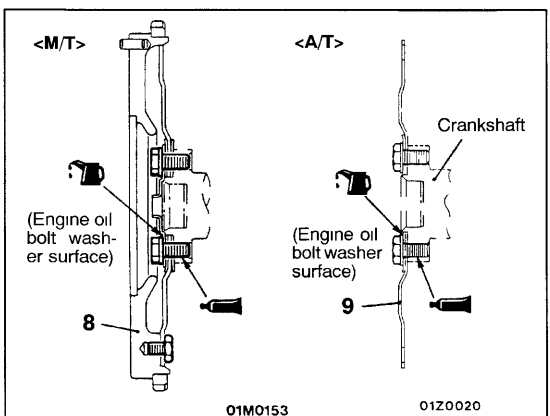
Install the drain plug gasket so it faces in the direction shown in the illustration.

CRANKSHAFT OIL SEAL

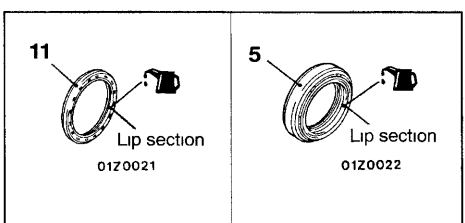
11200310234

REMOVAL AND INSTALLATION





Sealant: 3M Stud Locking 4170 or equivalent



Engine oil

Crankshaft front oil seal removal steps

- Timing belt (Refer to P.11C-30.)
- Crankshaft position sensor (Refer to GROUP 16)

1 Crankshaft sprocket
2 Key
3 Crankshaft sensing blade
4 Crankshaft spacer
▶C◀ 5 Crankshaft front oil seal

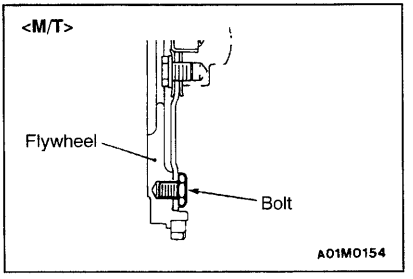
Crankshaft rear oil seal removal steps

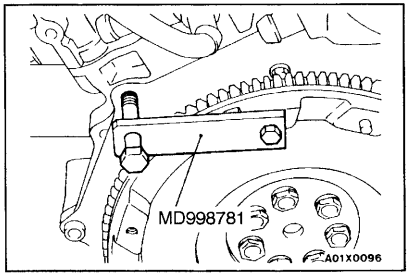
- Oil pan (Refer to P.11C-22.)

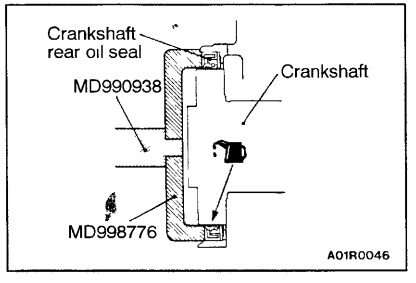
◀A▶
- Transaxle assembly
- Clutch cover and disc <M/T>

◀B▶ ▶B◀ 6 Plate <M/T>
◀B▶ ▶B◀ 7. Adapter plate
◀B▶ ▶B◀ 8. Flywheel <M/T>
◀B▶ ▶B◀ 9. Drive plate <A/T>
◀B▶ ▶B◀ 10. Adapter plate <M/T>
▶A◀ 11. Crankshaft rear oil seal

Caution
Do not disassemble the flywheel, as its runout is adjusted as an assembly. If it is disassembled, the flywheel may lose the balance and get damage.







REMOVAL SERVICE POINT

◀A▶ TRANSAXLE ASSEMBLY REMOVAL

<M/T>:
Refer to GROUP 22A.

Caution
Do not remove the flywheel mounting bolt shown by the arrow. If this bolt is removed, the flywheel will become out of balance and damaged.

<A/T>:
Refer to GROUP 23A.

◀B▶ PLATE <M/T>/ADAPTER PLATE/FLYWHEEL <M/T>/DRIVE PLATE <A/T> REMOVAL

Use the special tool to secure the flywheel or drive plate, and remove the bolts.

INSTALLATION SERVICE POINTS

▶A◀ CRANKSHAFT REAR OIL SEAL INSTALLATION

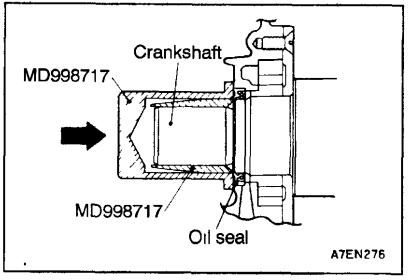
1. Apply a small amount of engine oil to the entire circumference of the oil seal lip.
2. Install the oil seal by tapping it as far as the chamfered position of the oil seal case as shown in the illustration.

▶B◀ DRIVE PLATE <A/T>/FLYWHEEL <M/T>/ADAPTER PLATE/PLATE <M/T> INSTALLATION

1. Clean off all sealant, oil and other substances which are adhering to the threaded bolts, crankshaft thread holes and the flywheel or drive plate.
2. Apply oil to the bearing surface of the flywheel or drive plate bolts.
3. Apply oil to the crankshaft thread holes.
4. Apply sealant to the threaded mounting holes.

   Specified sealant:
   3M Stud locking 4170 or equivalent

5. Use the special tool to hold the flywheel or drive plate in the same manner as removal, and install the bolt.



▶C◀ CRANKSHAFT FRONT OIL SEAL INSTALLATION

1. Apply a small amount of engine oil to the entire circumference of the oil seal lip.
2. Tap the oil seal until it is flush with the oil seal case.

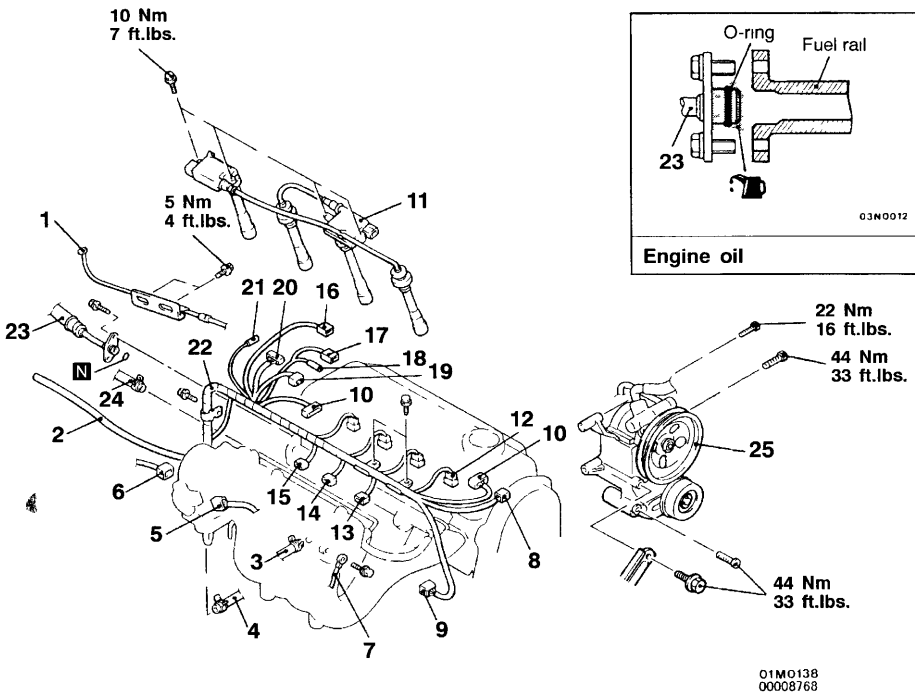
CYLINDER HEAD GASKET

11200400788

REMOVAL AND INSTALLATION

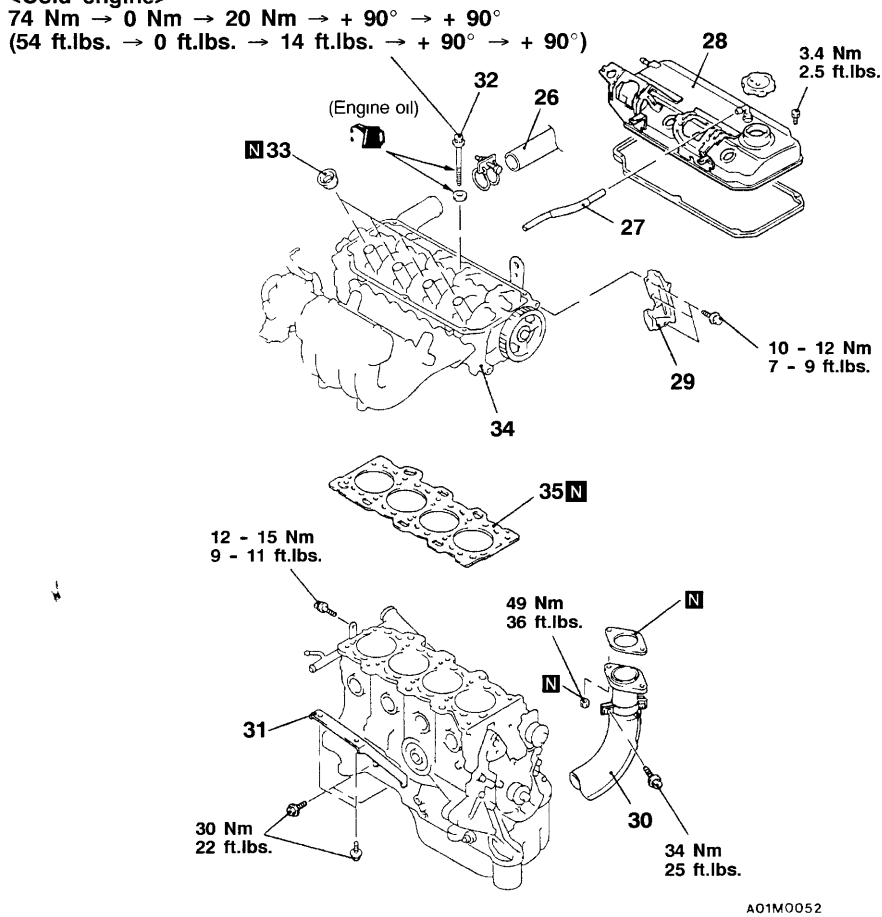
Pre-removal Operation
(1) Fuel Discharge Prevention (Refer to GROUP 13A - On-vehicle Service)
(2) Engine Oil Draining (Refer to GROUP 00 - Maintenance Service)
(3) Thermostat Case Assembly Removal (Refer to GROUP 14 - Water Hose and Water Pipe)

Post-installation Operation
(1) Thermostat Case Assembly Installation (Refer to GROUP 14 - Water Hose and Water Pipe)
(2) Engine Oil Supplying (Refer to GROUP 00 - Maintenance Service)
(3) Accelerator Cable Adjustment (Refer to GROUP 17 - On-vehicle Service)



Removal steps

1. Accelerator cable connection
2. Vacuum hose connection
3. Brake booster vacuum hose connection
4. Water hose connection
5. Throttle position sensor connector
6. Idle speed control connector
7. Ground cable connection
8. Crankshaft position sensor connector
9. Heated oxygen sensor connector
10. Ignition coil connector
11. Ignition coil assembly
12. Injector connector
13. Evaporative emission purge solenoid connector
14. EGR solenoid valve connector
15. Manifold differential pressure sensor connector
16. Heated oxygen sensor connector <Vehicles for California>
17. Ignition failure sensor connector
18. Engine coolant temperature gauge unit connector
19. Engine coolant temperature sensor connector
20. Camshaft position sensor connector
21. Noise condensor connector
22. Control wiring harness
▶D◀ 23. High-pressure fuel hose connection
24. Fuel return hose connection
◀A▶ 25. Power steering oil pump and bracket assembly



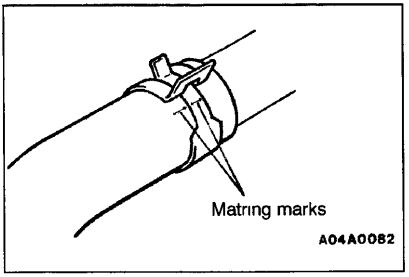
◀B▶ ▶C◀ 26. Radiator upper hose connection
27 PCV hose
28 Rocker cover
• Timing belt (Refer to P.11C-30.)
29. Timing belt rear cover
30. Front exhaust pipe connection
31. Intake manifold stay
◀C▶ ▶B◀ 32. Cylinder head bolt
33. Spark plug guide oil seal
34 Cylinder head assembly
▶A◀ 35. Cylinder head gasket

REMOVAL SERVICE POINTS

◀A▶ POWER STEERING OIL PUMP AND BRACKET ASSEMBLY REMOVAL

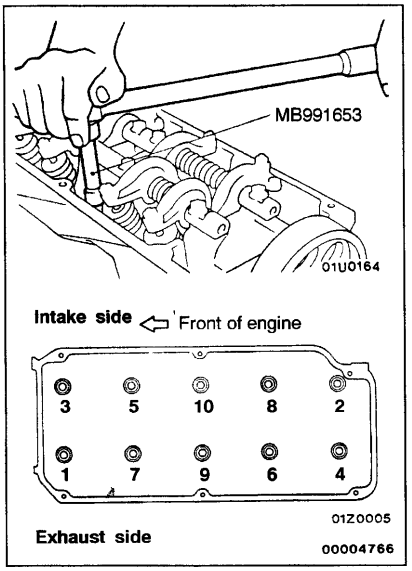
Remove the power steering oil pump and bracket assembly from the engine with the hose attached.

NOTE
Place the removed power steering oil pump in a place where it will not be a hindrance when removing and installing the cylinder head assembly, and tie it with a cord.



◀B▶ RADIATOR UPPER HOSE DISCONNECTION

After making mating marks on the radiator hose and the hose clamp, disconnect the radiator hose.



◀C▶ CYLINDER HEAD BOLT REMOVAL

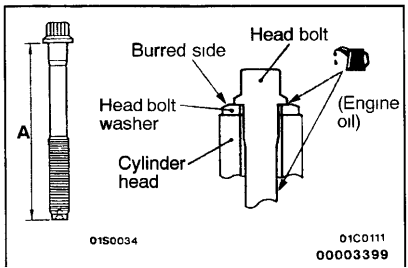
Using the special tool, loosen the bolts in 2 or 3 steps in the order of the numbers shown in the illustration, and remove the cylinder head assembly.

Caution
Because the plug guides cannot be replaced by themselves, be careful not to damage or deform them when removing the cylinder head bolts.

INSTALLATION SERVICE POINTS

▶A◀ CYLINDER HEAD GASKET INSTALLATION

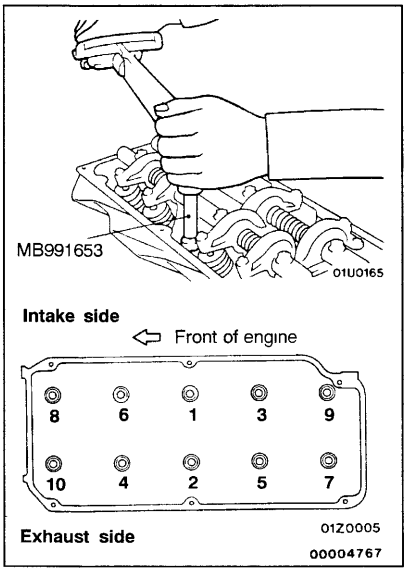
1. Wipe off all oil and grease from the gasket mounting surface.
2. Install so that the cylinder head holes match the respective cylinder head gasket holes.



▶B◀ CYLINDER HEAD BOLT INSTALLATION

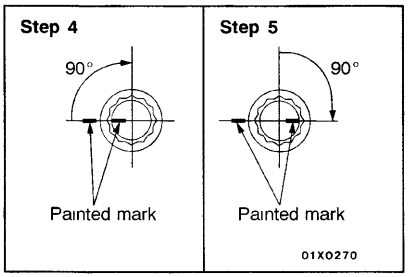
1. When installing the cylinder head bolts, the length below the head of the bolts should be within the limit. If it is outside the limit, replace the bolts.

   Limit (A): 96.4 mm (3.80 in.)
2. The head bolt washer should be installed with the burred side, caused by tapping out, facing upwards.
3. Apply a small amount of engine oil to the thread section and the washer of the cylinder head bolt.

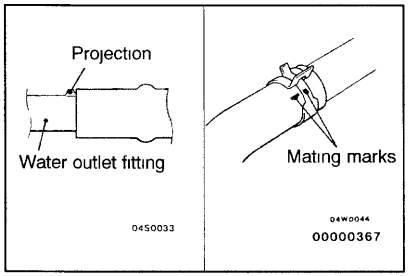


4. Using the special tool, tighten the bolts by the following procedure.

Step	Operation	Remarks
1	Tighten to 74 Nm (54 ft lbs.)	In the order shown in the illustration.
2	Fully loosen.	In the reverse order of that shown in the illustration.
3	Tighten to 20 Nm (14 ft.lbs.).	In the order shown in the illustration.
4	Tighten 90° of a turn.	In the order shown in the illustration. Mark the head of the cylinder head bolt and cylinder head by paint.
5	Tighten 90° of a turn.	In the order shown in the illustration. Check that the painted mark of the head bolt is lined up with that of the cylinder head

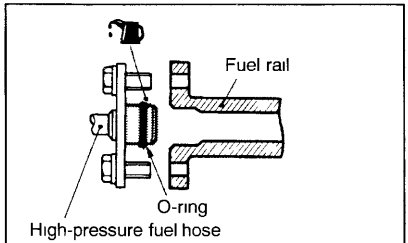


Caution
1. **Always make a tightening angle just 90°. If it is less than 90°, the head bolt will be loosened.**
2. **If it is more than 90°, remove the head bolt and repeat the procedure from step 1.**



▶C◀ RADIATOR UPPER HOSE CONNECTION

1. Insert each hose as far as the projection of the water inlet fitting.
2. Align the mating marks on the radiator hose and hose calmp, and then connect the radiator hose.



▶D◀ HIGH-PRESSURE FUEL HOSE INSTALLATION

1. Apply a small amount of new engine oil to the O-ring.

   Caution
   Do not let any engine oil get into the fuel rail.
2. While turning the high-pressure fuel hose clockwise and counterclockwise, install the fuel rail, be careful not to damage the O-ring. After installing, check that the hose turns smoothly.

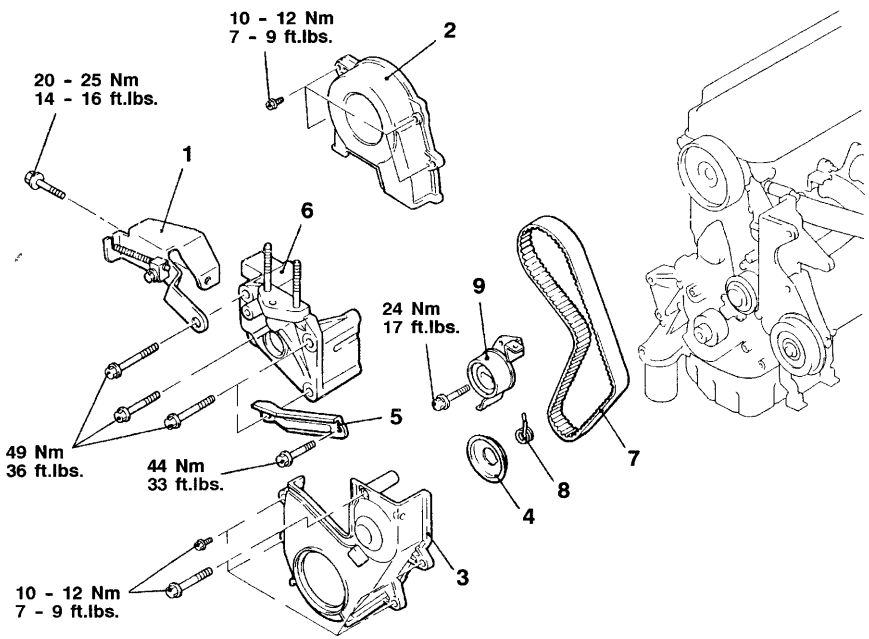
3. If the hose does not turn smoothly, the O-ring is probably being pinched. Disconnect the high-pressure fuel hose and check the O-ring for damage. After this, re-insert the fuel rail and check that the hose turns smoothly.

TIMING BELT

11200430299

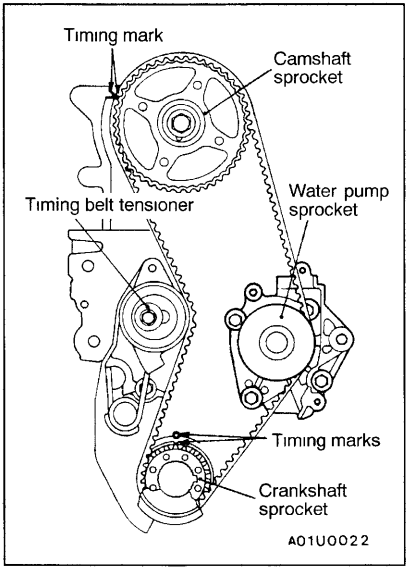
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
(1) Crankshaft Pulley Removal and Installation (Refer to P.11C-19.)
(2) Engine Mount Bracket Removal and Installation (Refer to GROUP 32 - Engine Mounting.)



Removal steps

1. Generator brace
2. Timing belt upper cover
3. Timing belt lower cover
▶C◀ 4. Flange
5. Power steering pump bracket stay
6. Engine support bracket
▶B◀ • Timing belt tension adjustment
◀A▶ ▶A◀ 7. Timing belt
8. Tensioner spring
9. Timing belt tensioner

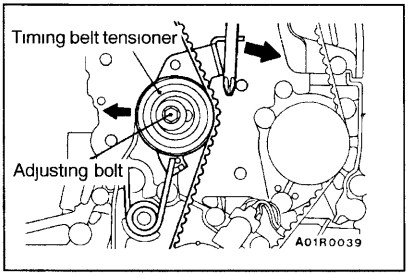


REMOVAL SERVICE POINT

◀A▶ TIMING BELT REMOVAL

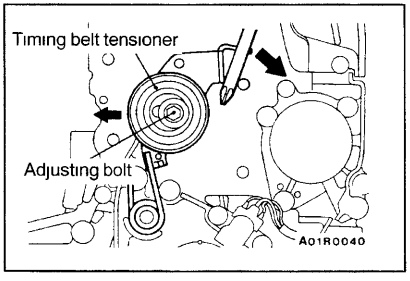
1. Turn the crankshaft clockwise (right turn) to align each timing mark and to set the No. 1 cylinder at compression top dead center.

Caution
The crankshaft should always be turned only clockwise.



2. Loosen the adjusting bolt.
3. Set a screwdriver to the timing belt tensioner and press it fully back in the direction of the arrow.
4. Provisionally tighten the adjusting bolt.
5. Remove the timing belt.

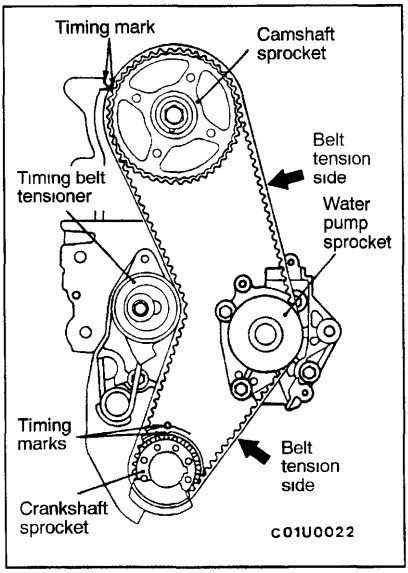
Caution
If the timing belt is to be re-used, use chalk to mark the flat side of the belt with an arrow indicating the direction of rotation (right turn).



INSTALLATION SERVICE POINTS

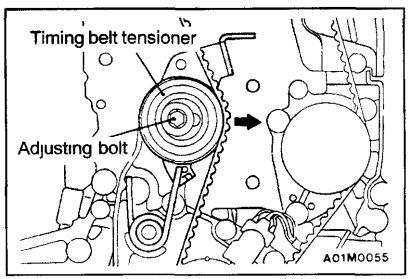
▶A◀ TIMING BELT INSTALLATION

1. Set a screwdriver to the timing belt tensioner and press it fully back in the direction of the arrow.
2. Provisionally tighten the adjusting bolt.



3. Align each of the camshaft sprocket and the crankshaft sprocket timing marks.
4. Install the timing belt in the following order, while making sure that the tension side of the belt is not slackened.
   (1) Crankshaft sprocket
   (2) Water pump sprocket
   (3) Camshaft sprocket
   (4) Tensioner pulley

Caution
After installing the timing belt, apply force to turn the camshaft sprocket counterclockwise, and recheck to be sure that the belt is fully tensioned and that each timing mark is in the proper position.

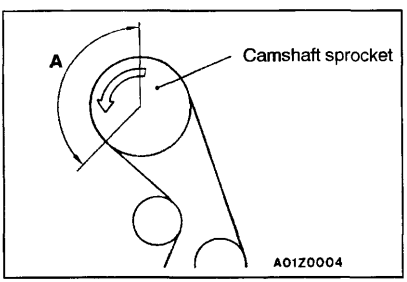


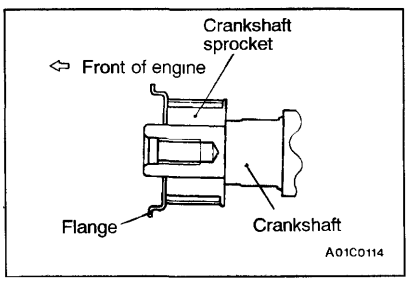
▶B◀ TIMING BELT TENSION ADJUSTMENT

1. Loosen the adjusting bolt of the temporarily secured timing belt tensioner by 1/4 - 1/2 turn, and use the force of the tensioner spring to apply tension to the belt.
2. Turn the crankshaft clockwise for two rotations, and recheck to be sure that the timing marks on each sprocket are aligned.

Caution
As the purpose of this procedure is to apply the proper amount of tension to the tension side of the timing belt by using the cam driving torque, turn the crankshaft only by the amount given above. Be sure not to turn the crankshaft counterclockwise.

3. After checking to be sure that no belt teeth in the section marked with A are lifted up and that the teeth in each sprocket are engaged, secure the tensioner pulley.





▶C◀ FLANGE INSTALLATION

Install the flange as shown in the illustration.

ENGINE OVERHAUL <1.8L>

CONTENTS

11309000371

CRANKSHAFT AND CYLINDER BLOCK ... 50

CYLINDER HEAD AND VALVES 30

FUEL AND EMISSION CONTROL SYSTEM 17

GENERAL INFORMATION 2

- General Specification 2

GENERATOR AND IGNITION SYSTEM 10

INTAKE AND EXHAUST MANIFOLDS 19

OIL PUMP AND OIL PAN 37

PISTON AND CONNECTING ROD 42

ROCKER ARMS AND CAMSHAFT 24

SPECIAL TOOLS 7

SPECIFICATIONS 3

- Rework Dimensions 4
- Sealant 7
- Service Specifications 3
- Torque Specifications 5

TIMING BELT 12

WATER PUMP AND WATER HOSE 21

GENERAL INFORMATION

11300010243

GENERAL SPECIFICATION

Descriptions			Specifications
Type			In-line OHV, SOHC
Number of cylinders			4
Combustion chamber			Pentroof type
Total displacement dm^3 (cu.in.)			1,834 (111.9)
Cylinder bore mm (in.)			81.0 (3.19)
Piston stroke mm (in.)			89.0 (3.50)
Compression ratio			9.5
Number of valve		Intake	8
		Exhaust	8
Valve timing	Intake valve	Opens (BTDC)	6°
		Closes (ABDC)	54°
	Exhaust valve	Opens (BBDC)	54°
		Closes (ATDC)	6°
Lubrication system			Pressure feed, full-flow filtration
Oil pump type			Trochoid type
Cooling system			Water-cooled forced circulation
Water pump type			Centrifugal impeller type

SPECIFICATIONS

11300030454

SERVICE SPECIFICATIONS

Items		Standard value	Limit
Rocker arms and camshaft			
Camshaft cam height mm (in.)	Intake	37 11 (1 46)	36 61 (1 44)
	Exhaust	37 15 (1.46)	36.65 (1.44)
Cylinder head and valve			
Cylinder head flatness of gasket surface mm (in)		Less than 0.03 (.0012)	0.2 (.008)
Cylinder head grinding limit of gasket surface mm (in.) *Total resurfacing depth of both cylinder head and cylinder block		-	0.2* (.008)
Cylinder head overall height mm (in.)		119.9 - 120.1 (4.720 - 4.728)	-
Cylinder head bolt shank length mm (in.)		-	96 4 (17.23)
Valve stem O.D. mm (in)		6 0 (234)	-
Valve stem-to-guide clearance mm (in.)	Intake	0 02 - 0 05 (.0008 - .0020)	0.10 (.0039)
	Exhaust	0.05 - 0 09 (0020 - .0035)	0.15 (0059)
Valve face angle		45° - 45.5°	-
Valve margin mm (in)	Intake	1.0 (.039)	0.5 (.020)
	Exhaust	1.3 (.051)	0 8 (.031)
Valve stem projection mm (in.)	Intake	49 30 (1 9409)	49.80 (1.9606)
	Exhaust	49.35 (1.9429)	49.85 (1.9626)
Overall valve length mm (in.)	Intake	110.15 (4.337)	109.65 (4.317)
	Exhaust	113.70 (4 476)	113.20 (4.457)
Valve spring free height mm (in)		50.9 (2.00)	49.9 (1.96)
Valve spring load/installed height N/mm (lbs./in.)		216/44.2 (59/1.74)	-
Valve spring squareness		Max 2°	4°
Valve seat contact width mm (in.)		0.9 - 1 3 (.035 - .051)	-
Valve guide I.D. mm (in)		6.0 (.234)	-
Valve guide projection mm (in.)		14.0 (.551)	-
Oil pump and oil pan			
Oil pump tip clearance mm (in.)		0.06 - 0.18 (0024 - .0071)	-
Oil pump side clearance mm (in)		0.04 - 0 10 (.0016 - .0039)	-
Oil pump body clearance mm (in.)		0 10 - 0.18 (.0039 - .0071)	0.35 (0138)
Piston and connecting rod			
Piston O D. mm (in)		81.0 (3.19)	-
Piston ring side clearance mm (in.)	No.1	0.03 - 0 07 (.0012 - .0028)	0.1 (0039)
	No.2	0.02 - 0 06 (.0008 - 0024)	0.1 (.0039)
Piston ring end gap mm (in.)	No.1	0 25 - 0 40 (0098 - 0157)	0.8 (.031)
	No.2	0.40 - 0.55 (.0157 - .0217)	0.8 (.031)
	Oil ring	0.20 - 0 60 (0078 - .0236)	1.0 (.039)

Items	Standard value	Limit
Piston pin O D mm (in.)	19 0 (.75)	-
Piston pin press-in load [at room temperature] N (lbs.)	4900 - 14700 (1.1020 - 3.3070)	-
Crankshaft pin oil clearance mm (in)	0.02 - 0.05 (.0008 - .0020)	0.1 (.004)
Connecting rod big end side clearance mm (in)	0 10 - 0.25 (0039 - .0098)	0.4 (016)
Crankshaft and cylinder block		
Crankshaft end play mm (in)	0.05 - 0.25 (.0020 - .0098)	0.4 (.016)
Crankshaft journal O.D. mm (in.)	50 (1.97)	-
Crankshaft pin O.D. mm (in.)	45 (1.77)	-
Crankshaft journal oil clearance mm (in)	0.02 - 0.02 (.0008 - 0016)	0 1 (.004)
Cylinder block gasket surface flatness mm (in.)	0.05 (.0020)	0.1 (.004)
Cylinder block gasket surface grinding limit mm (in)	-	0.2 (.008)
Cylinder block overall height mm (in.)	263 5 (10.374)	-
Cylinder bore I.D. mm (in.)	81 0 (3.19)	-
Cylinder bore cylindricity mm (in.)	0.01 (.0004) or less	-
Piston-to-cylinder clearance mm (in.)	0.02 - 0 04 (0008 - .0016)	-
Bearing cap bolt shank length mm (in)	-	71.1 (2.799)

REWORK DIMENSIONS

Items		Standard value
Cylinder head and valves		
Oversize valve guide hole diameter mm (in.)	0.05 O.S.	11.05 - 11.07 (.4350 - 4358)
	0.25 O.S.	11 25 - 11.27 (.4429 - 4337)
	0.50 O S.	11.50 - 11.52 (.4528 - .4535)
Oversize intake valve seat hole diameter mm (in.)	0 30 O S.	31 80 - 31 83 (1 2520 - 1 2531)
	0.60 O S	32.10 - 32 13 (1 2638 - 1.2650)
Oversize exhaust valve seat hole diameter mm (in)	0.30 O S.	29 30 - 29 32 (1 1535 - 1.1543)
	0 60 O S.	29.60 - 29.62 (1.1654 - 1.1661)

NOTE
O S. Oversize diameter

TORQUE SPECIFICATIONS

Items	Nm	ft lbs.
Generator and ignition system		
Ignition coil	10	7
Spark plug	25	18
Crankshaft bolt	181	131
Generator brace (M10)	49	35
Generator brace (M8)	23	17
Lock bolt	23	17
Adjusting bolt	10	7
Generator pivot nut	44	32
Ignition failure sensor	23	17
Cam position sensor	9	7
Cam position sensor support	13	9
Cam position sensing cylinder	21	15
Timing belt		
Camshaft sprocket bolt	88	64
Crank angle sensor	9	6
Timing belt rear cover	11	8
Timing belt tensioner	23	17
Engine support bracket, right	49	35
Timing belt cover	11	8
Fuel system and emission system		
Fuel return pipe	9	7
Fuel rail	12	9
Fuel pressure regulator	9	7
EGR Valve	22	16
Throttle body	19	14
Vacuum hose and pipe assembly	11	8
Intake manifold and exhaust manifold		
Manifold differential pressure sensor	5	4
Exhaust manifold (M10)	29	21
Exhaust manifold (M8)	18	13
Exhaust manifold bracket	19	14
Engine hanger	18	9
Oil dipstick guide	14	10
Exhaust manifold cover	13	9
Intake manifold	20	15
Intake manifold stay	30	22

Items	Nm	ft.lbs.
Water pump and water hose		
Water pump	24	17
Water inlet pipe	14	10
Thermostat case	24	17
Water inlet fitting	18	14
Water outlet fitting	14	10
Engine coolant temperature gauge unit	10	7
Engine coolant temperature sensor	29	21
Rocker arms and camshaft		
Rocker arm shaft	31	22
Rocker cover	4	3
Cylinder head and valves		
Cylinder head bolt [74 Nm (54 ft.lbs.) and then completely loosen finally tighten]	20 + 90° + 90°	15 + 90° + 90°
Oil pump and oil pan		
Oil pump cover	10	7
Front case	14	10
Relief plug	44	32
Oil screen	19	14
Oil pan	7	5
Drain plug	39	28
Oil pressure switch	10	7
Piston and connecting rod		
Connecting rod cap nut	20 + 90° to 100°	15 + 90° to 100°
Crankshaft and cylinder block		
Bearing cap bolt	25 + 90° to 100°	18 + 90° to 100°
Oil seal case	11	8
Bell housing cover	9	7
Rear plate	11	8
Drive plate bolt	98	71
Flywheel bolt	98	71

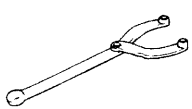
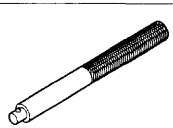
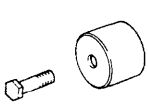
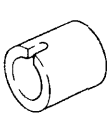
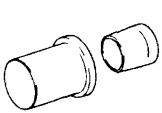
SEALANT

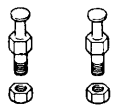
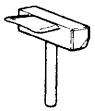
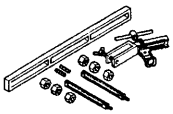
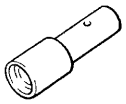
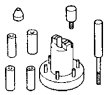
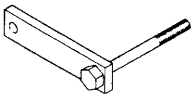
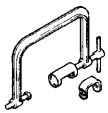
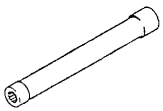
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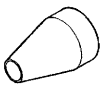
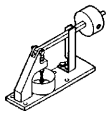
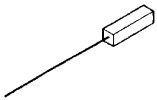
Items	Specified sealant	Quantity
Water pump	Mitsubishi Genuine Part No.MD970389 or equivalent	As required
Thermostat case	Mitsubishi Genuine Part No MD970389 or equivalent	As required
Engine coolant temperature sensor	3M Nut Locking Part No.4171 or equivalent	As required
Engine coolant temperature gauge unit	3M ATD Part No.8660 or equivalent	As required
Oil pressure switch	3M ATD Part No.8660 or equivalent	As required
Water outlet fitting	Mitsubishi Genuine Part No.MD970389 or equivalent	As required
Front case	Mitsubishi Genuine Part No MD970389 or equivalent	As required
Oil pan	Mitsubishi Genuine Part No MD970389 or equivalent	As required
Oil seal case	Mitsubishi Genuine Part No MD970389 or equivalent	As required
Drive plate bolt	3M Nut Locking Part No.4171 or equivalent	As required
Flywheel bolt	3M Nut Locking Part No.4171 or equivalent	As required
Cam position sensor support	Mitsubishi Genuine Part No.MD970389 or equivalent	As required

SPECIAL TOOLS

11300060361

Tool	Tool number and name	Supersession	Application
	MB990767 End yoke holder Use with MD998719	MB990767-01 Use with MIT308239	Holding camshaft sprocket when loosening or torquing bolt
	MB990938 Handle	MB990938-01	Installation of crankshaft rear oil seal
	MD998713 Camshaft oil seal installer	MD998713-01	Installation of camshaft oil seal
	MD998716 Crankshaft wrench	MD998716-01	Turning crankshaft
	MD998717 Crankshaft front oil seal installer	MD998717-01	Installation of crankshaft front oil seal

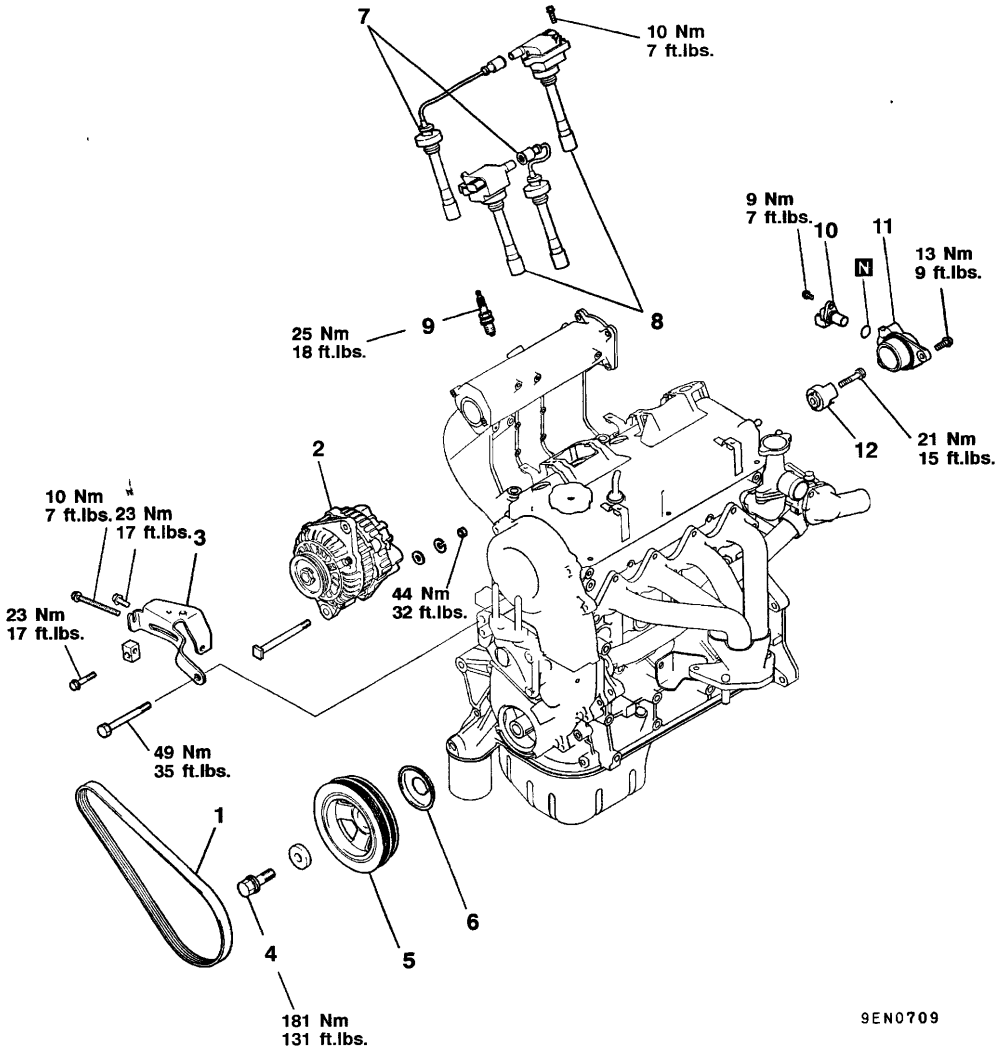
Tool	Tool number and name	Supersession	Application
	MD998719 Pulley holding pins (2)	MIT308239	Holding camshaft sprocket when loosening or torquing bolt
	MD998727 Oil pan remover	-	Removal of oil pan
	MD998772 Valve spring compressor	General service tool	Compressing valve spring
	MD998774 Valve stem seal installer	-	Installation of valve stem seal
	MD998776 Crankshaft rear oil seal installer Use with MB990938	Use with MB990938-01	Installation of crankshaft rear oil seal
	MD998780 Piston pin setting tool	MIT216941	Removal and installation of piston pin
	MD998781 Flywheel stopper	-	Holding flywheel
	MD998735 Valve spring compressor	MD998735-01	Compression of valve spring
	MB991653 Cylinder head bolt wrench	-	Loosening and torquing of cylinder head bolt

Tool	Tool number and name	Supersession	Application
	MB991659 Guide D	-	Removal of piston pin (Use with MD998780)
	MD998440 Leak down tester	-	Leak down test of lash adjuster
	MD998441 Lash adjuster retainer	-	Air bleeding of lash adjuster
	MD998442 Air bleed wire		Air bleeding of lash adjuster
	MD998443 Lash adjuster holder (8)	MD998443-01	Supporting lash adjuster to prevent it from falling when rocker arm shaft assembly is removed or installed.

GENERATOR AND IGNITION SYSTEM

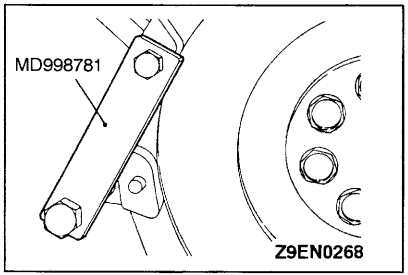
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REMOVAL AND INSTALLATION



Removal steps

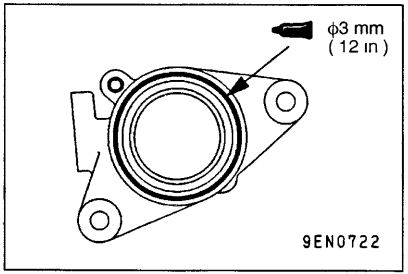
1. Drive belt
2. Generator
3. Generator brace
◀A▶ ▶B◀ 4. Crankshaft bolt
5. Crankshaft pulley
6. Front flange
7. Spark plug cable
8. Ignition coil
9. Spark plug
10. Cam position sensor
▶A◀ 11. Cam position sensor support
12. Cam position sensing cylinder



REMOVAL SERVICE POINT

◀A▶ CRANKSHAFT BOLT REMOVAL

(1) Lock the flywheel or drive plate in position using the special tool shown in the illustration, then loosen the crankshaft bolt.



INSTALLATION SERVICE POINTS

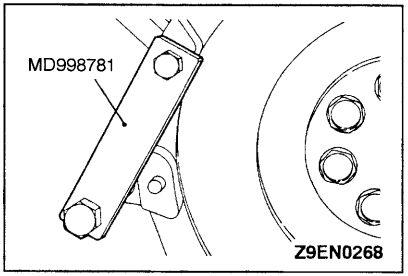
▶A◀ CAM POSITION SENSOR SUPPORT INSTALLATION

(1) Clean the sealant application surfaces of cam position sensor support and cylinder head.

(2) Apply a 3 mm (.12 in.) diameter bead of sealant to the area shown in the illustration. Be sure to install the sensor support with in 15 minutes after applying sealant.

Specified sealant:
Mitsubishi Genuine Part No.MD970389 or equivalent.

(3) After installation, wait at least one hour. Never start the engine or let engine oil touch the adhesion surface during that time.



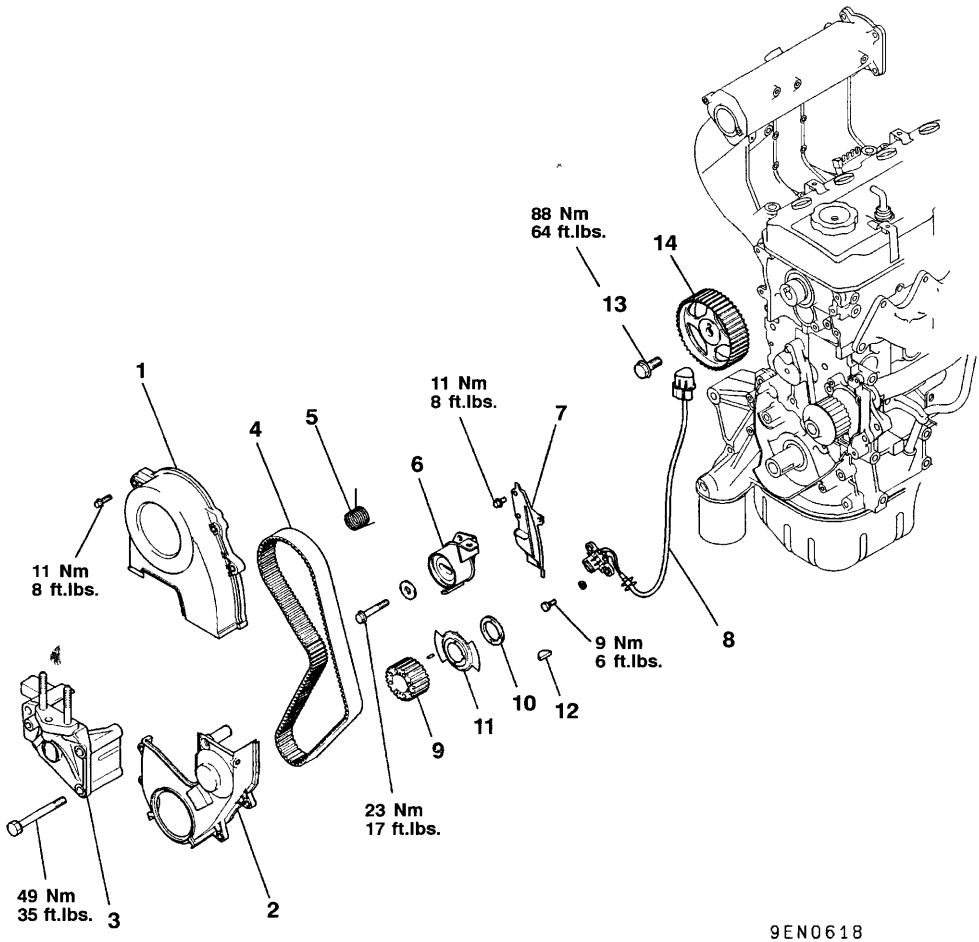
▶B◀ CRANKSHAFT BOLT INSTALLATION

(1) Lock the flywheel or drive plate in position using the special tool shown in the illustration, then tighten the crankshaft bolt.

TIMING BELT

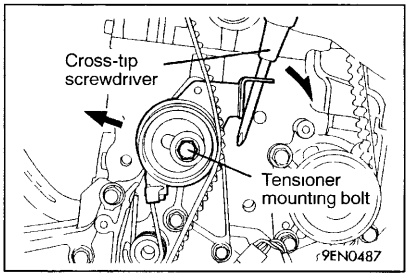
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REMOVAL AND INSTALLATION



Removal steps

1. Timing belt front upper cover
2. Timing belt front lower cover
3. Engine support bracket, right
◀A▶ ▶D◀ 4. Timing belt
▶C◀ 5. Tensioner spring
▶B◀ 6. Timing belt tensioner
7. Timing belt rear cover
8. Crankshaft angle sensor
9. Crankshaft sprocket
10. Crankshaft spacer
11. Crankshaft sensing plate
12. Crankshaft key
◀B▶ ▶A◀ 13. Camshaft sprocket bolt
14. Camshaft sprocket

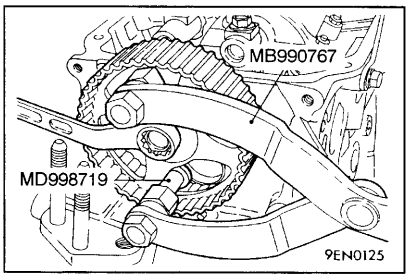


REMOVAL SERVICE POINTS

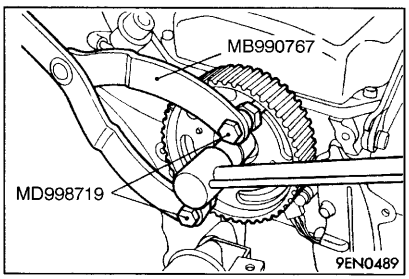
◀A▶ TIMING BELT REMOVAL

(1) Mark the belt running direction for reference in reinstallation.
(2) Loosen the tensioner mounting bolt.
(3) Insert a cross-tip screwdriver into the hole of the tensioner arm as shown illustration.
(4) Move the screwdriver all the way in the direction of the arrow, and tighten the tensioner mounting bolt to hold this position.
(5) Remove the timing belt.

NOTE
(1) Water oil on the belt shortens its life drastically, so the removed timing belt, sprocket, and tensioner must be kept free from oil and water. Do not immerse parts in cleaning solvent.
(2) If there is oil or water on any part, check the front case oil seal, camshaft oil seal and water pump for leaks.

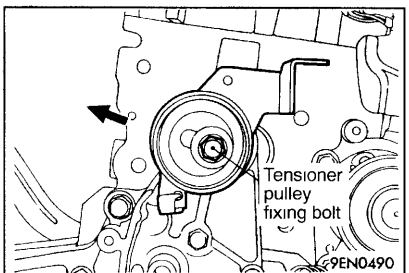


◀B▶ CAMSHAFT SPROCKET BOLT LOOSENING



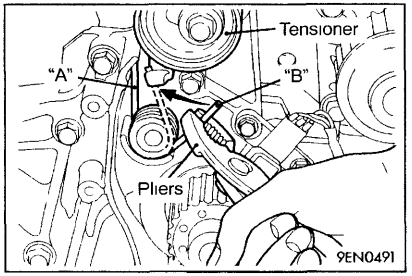
INSTALLATION SERVICE POINTS

▶A◀ CAMSHAFT SPROCKET BOLT TIGHTENING



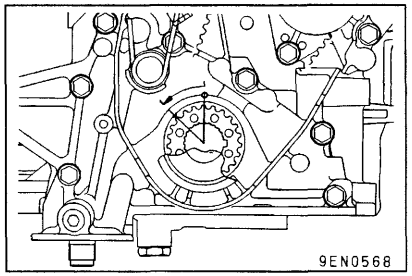
▶B◀ TIMING BELT TENSIONER INSTALLATION

(1) Install the timing belt tensioner in the illustrated position, and then tighten the tensioner mounting bolt.



▶C◀ TENSIONER SPRING INSTALLATION

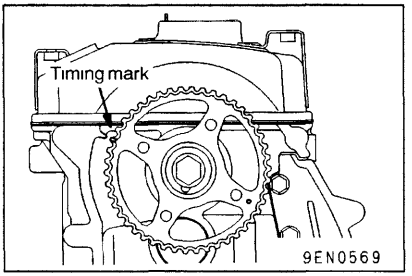
(1) Install the tensioner spring onto the boss of the front case, and then hook the spring end "A" (shorter one) to the front case rib.
(2) Grip the spring end "B" (longer one), and then hook it onto the tensioner arm.



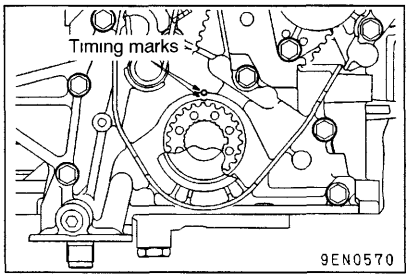
▶D◀ TIMING BELT INSTALLATION

(1) Align the crankshaft sprocket timing mark with the timing mark on the front case, and then rotate the crankshaft sprocket three teeth counterclockwise.

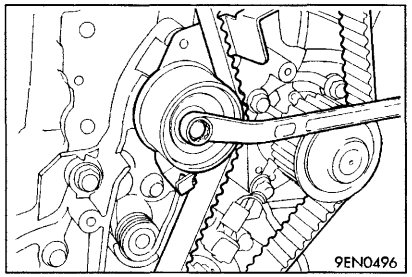
Caution
Aligning the timing marks positions the piston to the top dead center. Then, if the camshaft turns, the valves might interfere and damage the pistons.



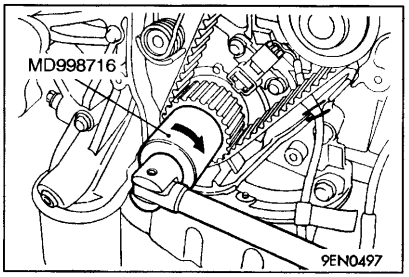
(2) Align the camshaft sprocket timing mark with the timing mark on the cylinder head.



(3) Rotate the crankshaft sprocket three teeth counterclockwise, and align the crankshaft sprocket timing mark with the timing mark on the front case.
(4) Keeping the tension side of the timing belt tight, fit the timing belt onto the crankshaft sprocket, water pump sprocket, camshaft sprocket and tensioner puller in that order.



(5) Slightly loosen the timing belt tensioner bolt to tension the belt by a force of the tensioner spring.



(6) Turn the crankshaft twice in the clockwise direction.

Caution
This procedure utilizes the camshaft's driving torque to apply tension evenly to the timing belt. Be sure to turn the crankshaft as described above. Do not turn the crankshaft counterclockwise.

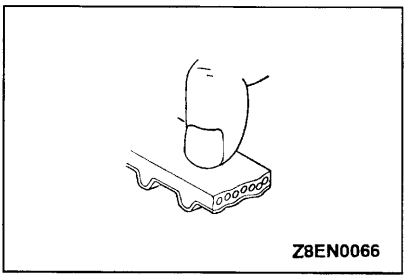
(7) Check that the timing marks are correctly aligned.
(8) Tighten the timing belt tensioner locking bolt to the specified torque.

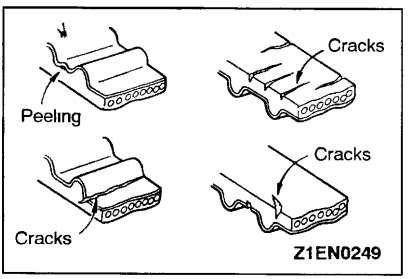
INSPECTION

11300200152

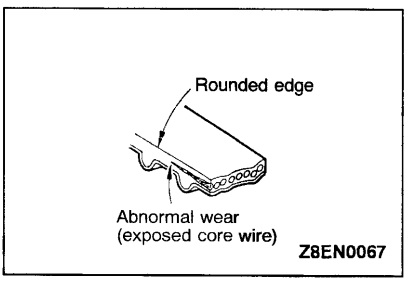
TIMING BELT

Check the timing belt closely. Replace the belt with a new one if any of the following defects are evident:
(1) Hardened backing rubber (the backing rubber is glossy, non-elastic, and so hard that scratching with fingernails leaves no mark.)



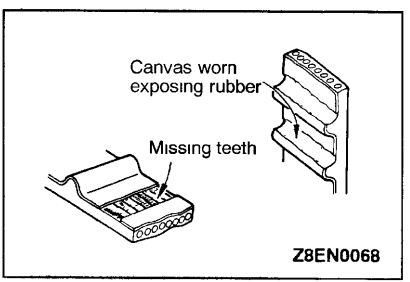


(2) Surface cracks on the backing rubber.
(3) Cracks or peeling of the canvas.
(4) Cracks on the tooth bottom.
(5) Cracks on the belt sides.

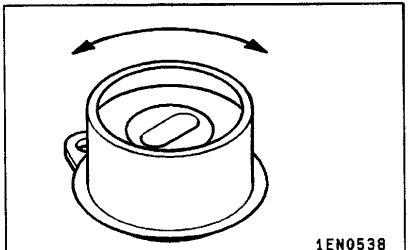


(6) Abnormal wear on the belt sides.

NOTE
The sides of the belt are normal if they are sharp as if cut by a knife.



(7) Abnormal wear on teeth.
Initial stage: Canvas worn (fluffy canvas fibers, rubbery texture gone, white discoloration, canvas texture indistinct)
Final stage: Canvas worn, exposing rubber (tooth width reduced)
(8) Missing teeth.



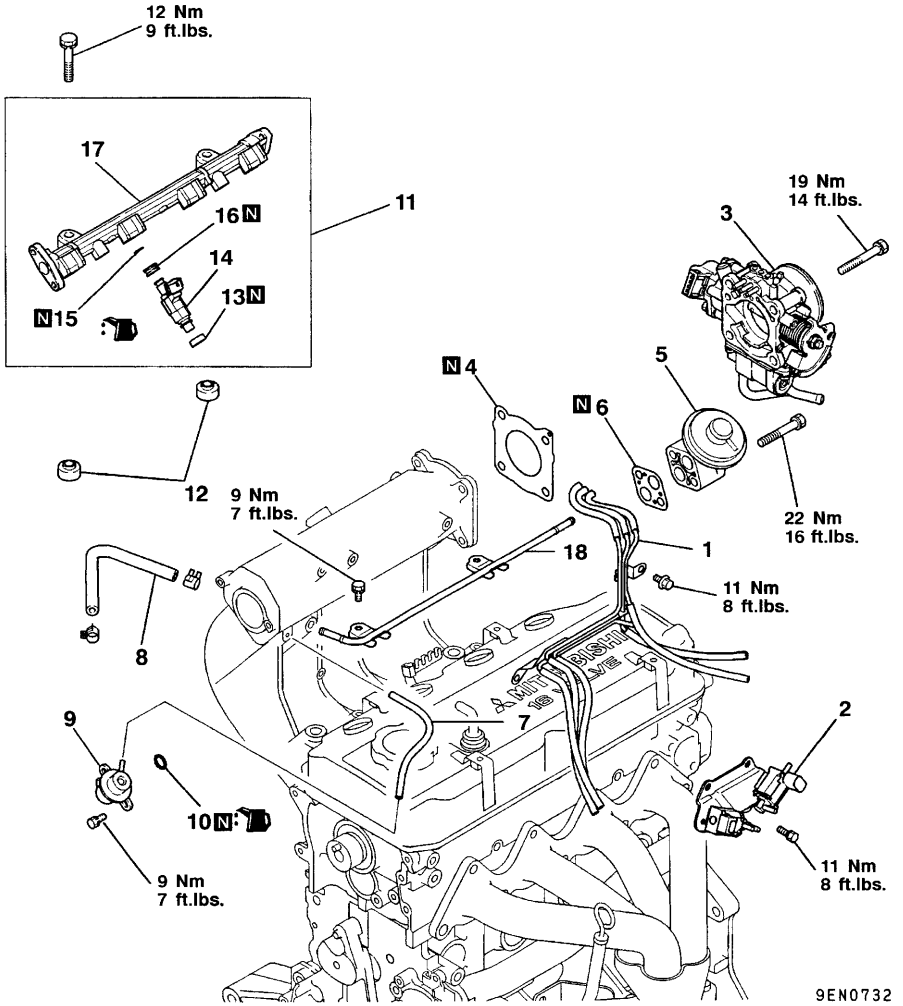
TENSIONER PULLER

(1) Check the pulley for smooth rotation, without play and are not noisy.

FUEL AND EMISSION CONTROL SYSTEM

11300220103

REMOVAL AND INSTALLATION



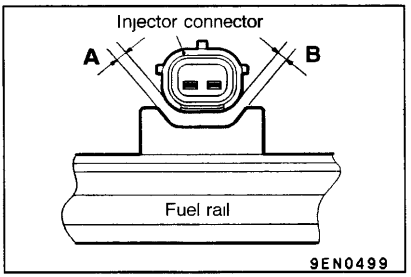
Removal steps

1. Vacuum hose and pipe assembly
2. Solenoid valve assembly
3. Throttle body
▶C◀ 4. Gasket
5. EGR valve
6. EGR valve gasket
7. Vacuum hose
8. Fuel hose
▶B◀ 9. Fuel pressure regulator
10. O-ring
11. Fuel rail and injector
12. Insulator
13. Insulator
▶A◀ 14. Injector
15. O-ring
16. Grommet
17. Fuel rail
18. Fuel return pipe

INSTALLATION SERVICE POINTS

▶A◀ INJECTORS INSTALLATION

(1) Fit a new O-ring and grommet onto the injector.



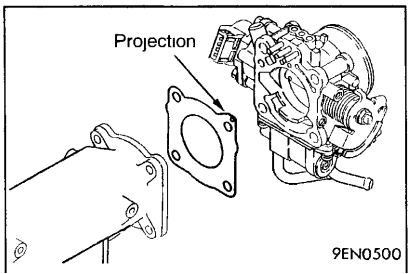
(2) Apply clean engine oil or gasoline to the injector O-ring.
(3) Fit the injector onto the fuel rail, turning it to the left and right as it goes in.
(4) Check that the injector rotates smoothly.
(5) Check that the clearance between the injector connector and the fuel rail is uniform (A = B).

▶B◀ FUEL PRESSURE REGULATOR INSTALLATION

(1) Apply a drop of clean engine oil to the O-ring, then insert the fuel pressure regulator into the fuel rail, being careful not to damage the O-ring.

Caution
Do not let engine oil get into the fuel rail.

(2) Check that the fuel pressure regulator rotates smoothly. If it does not rotate smoothly, the O-ring may be binding. If this occurs, remove the fuel pressure regulator, check the O-ring for damage, then re-insert the regulator into the fuel rail.



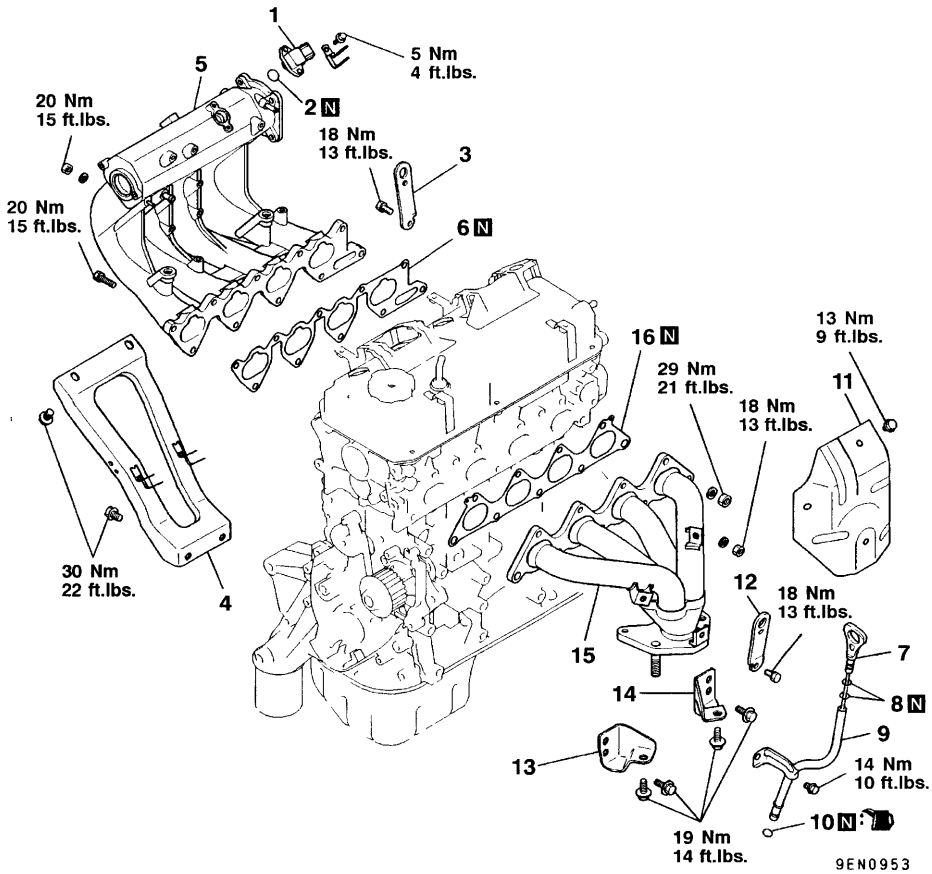
▶C◀ GASKET INSTALLATION

(1) Position the projection as shown in the illustration.

INTAKE AND EXHAUST MANIFOLDS

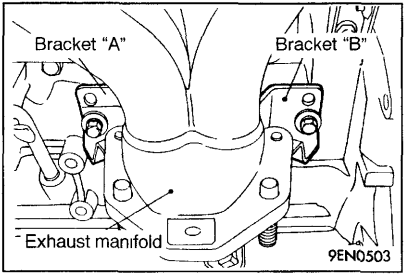
11301750113

REMOVAL AND INSTALLATION



Removal steps

1. Manifold differential pressure sensor
2. O-ring
3. Engine hanger
4. Intake manifold stay
5. Intake manifold
6. Intake manifold gasket
7. Oil dipstick
8. O-ring
9. Oil dipstick guide
10. O-ring
11. Exhaust manifold cover
12. Engine hanger
▶A◀ 13. Exhaust manifold bracket A
▶A◀ 14. Exhaust manifold bracket B
15. Exhaust manifold
16. Exhaust manifold gasket



INSTALLATION SERVICE POINT

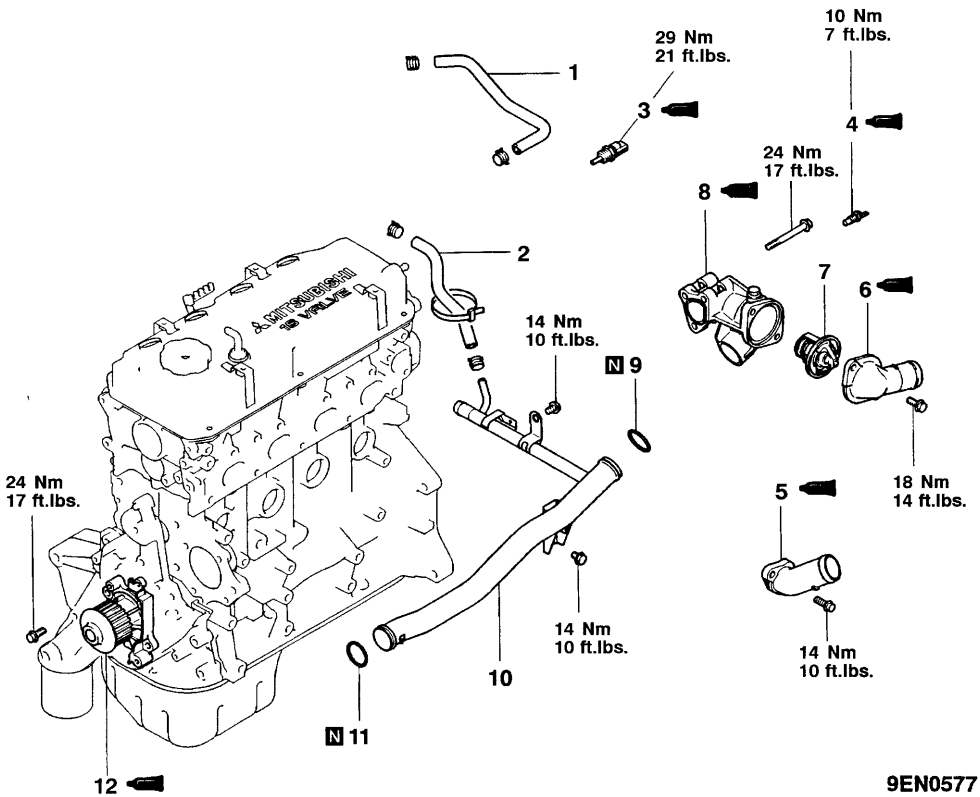
▶A◀ EXHAUST MANIFOLD/BRACKET INSTALLATION

(1) Install the exhaust manifold brackets "A" and "B" as shown in the illustration, and finger tighten each bolt.
(2) Tighten the all bolts to the specified torque.

WATER PUMP AND WATER HOSE

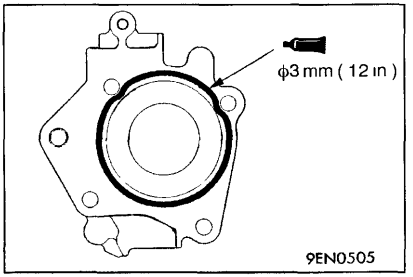
11301790030

REMOVAL AND INSTALLATION



Removal steps

1. Water hose A
2. Water hose B
- ▶G◀ 3. Engine coolant temperature sensor
- ▶F◀ 4. Engine coolant temperature gauge unit
- ▶E◀ 5. Water outlet fitting
6. Water inlet fitting
- ▶D◀ 7. Thermostat
- ▶C◀ 8. Thermostat case
- ▶B◀ 9. O-ring
- ▶B◀ 10. Water inlet pipe
- ▶B◀ 11. O-ring
- ▶A◀ 12. Water pump



INSTALLATION SERVICE POINTS

▶A◀ WATER PUMP INSTALLATION

(1) Clean the sealant application surfaces of the water pump case and cylinder block.
(2) Apply a 3 mm (.12 in.) diameter bead of sealant to the area shown in the illustration. Be sure to install the water pump within 15 minutes after applying sealant.

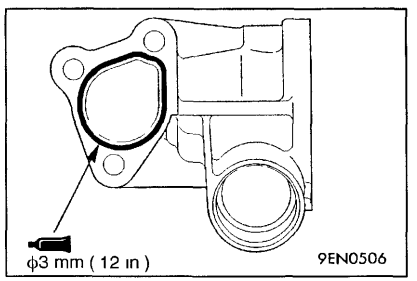
Specified sealant:
Mitsubishi Genuine Part No.MD970389 or equivalent

(3) After installation, wait at least one hour. Never start the engine or let coolant touch the adhesion surface during that time.

▶B◀ WATER INLET PIPE/O-RING INSTALLATION

(1) Replace the water inlet pipe O-ring with new ones, then apply water to the O-rings so that they can be inserted easily into the cylinder block and the thermostat case.

Caution
1. Never apply any oil or grease to the O-ring.
2. Secure the water pipe after the thermostat case has been installed.

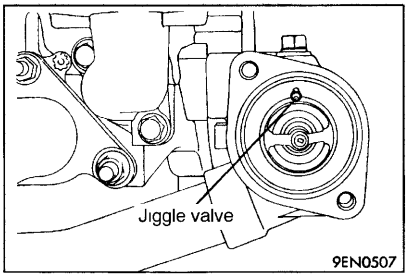


▶C◀ THERMOSTAT CASE INSTALLATION

(1) Clean the sealant application surfaces of the thermostat case and cylinder head.
(2) Apply a 3 mm (.12 in.) diameter bead of sealant to the area shown in the illustration. Be sure to install the thermostat case within 15 minutes after applying sealant.

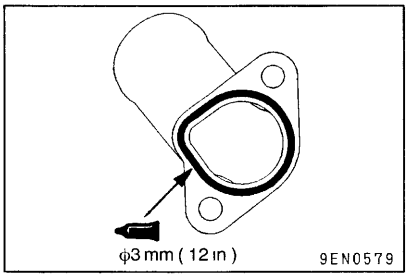
Specified sealant:
Mitsubishi Genuine Part No.MD970389 or equivalent

(3) After installation, wait at least one hour. Never start the engine or let coolant touch the adhesion surface during that time.



▶D◀ THERMOSTAT INSTALLATION

(1) Install the thermostat so that the jiggle valve is at the top.

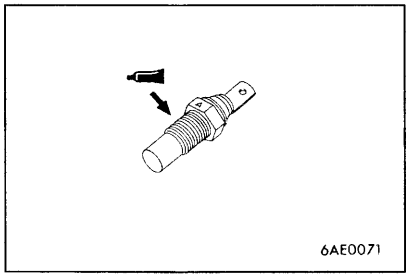


▶E◀ OUTLET FITTING INSTALLATION

(1) Clean the sealant application surfaces of the fittings and cylinder head.
(2) Apply a 3 mm (.12 in.) diameter bead of sealant to the area shown in the illustration. Be sure to install the fitting within 15 minutes after applying sealant.

Specified sealant:
Mitsubishi Genuine Part No.MD970389 or equivalent

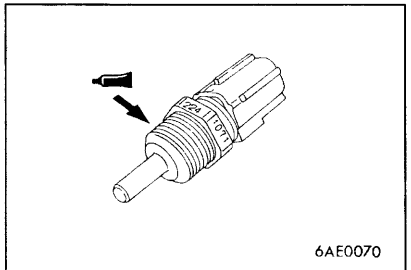
(3) After installation, wait at least one hour. Never start the engine or let coolant touch the adhesion surface during that time.



▶F◀ ENGINE COOLANT TEMPERATURE GAUGE UNIT INSTALLATION

(1) When reusing the gauge unit, clean its thread.
(2) Apply the specified sealant to the threads.

Specified sealant:
3M Nut Locking Part No.4171 or equivalent



▶G◀ ENGINE COOLANT TEMPERATURE SENSOR INSTALLATION

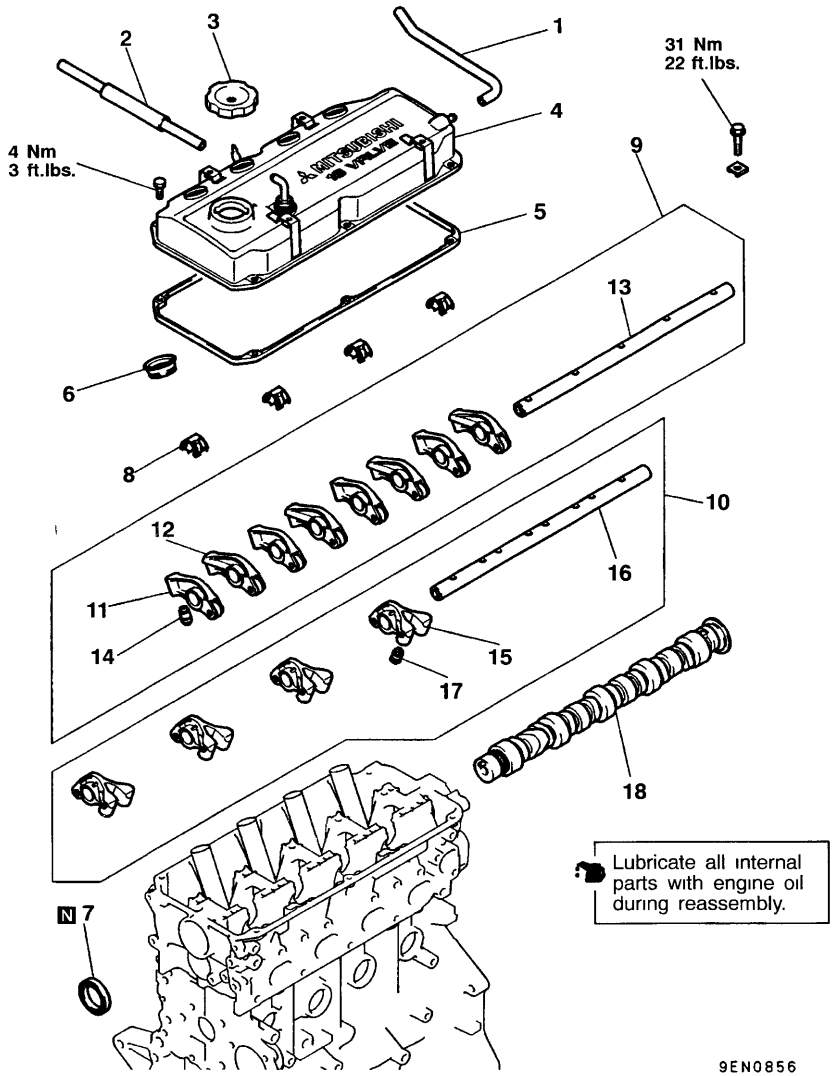
(1) When reusing the sensor, clean its thread.
(2) Apply the specified sealant to the threads.

Specified sealant:
3M ATD Part No.8660 or equivalent

ROCKER ARMS AND CAMSHAFT

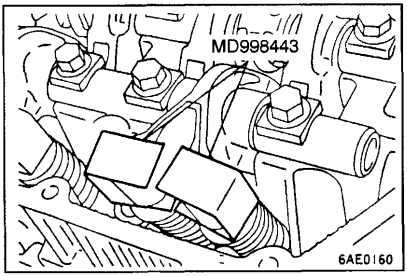
11300540421

REMOVAL AND INSTALLATION



Removal steps

1. Breather hose
2. P C V. hose
3. Oil filler cap
4. Rocker cover
5. Rocker cover gasket
6. Oil seal
- ▶E◀ 7. Oil seal
- ▶D◀ 8. Rocker arm spring
- ◀A▶ ▶C◀ 9. Rocker arms and rocker arm shaft (Intake)
- ◀A▶ 10. Rocker arms and rocker arm shaft (Exhaust)
11. Rocker arm B
12. Rocker arm A
- ▶B◀ 13. Rocker arm shaft
- ▶A◀ 14. Lash adjuster
15. Rocker arm C
- ▶B◀ 16. Rocker arm shaft
- ▶A◀ 17. Lash adjuster
18. Camshaft

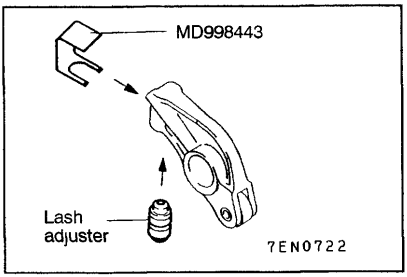


REMOVAL SERVICE POINT

◀A▶ ROCKER ARM AND ROCKER ARM SHAFT REMOVAL

Caution
If the lash adjuster is re-used, clean the lash adjuster. (Refer to 11D-26.)

(1) Set special tool MD998443 to prevent the lash adjuster coming free and falling to the floor.

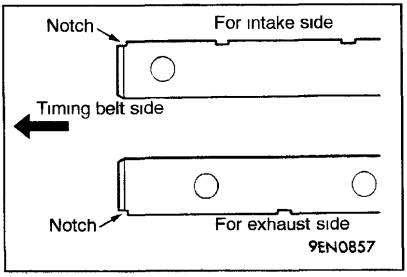


INSTALLATION SERVICE POINTS

▶A◀ LASH ADJUSTER INSTALLATION

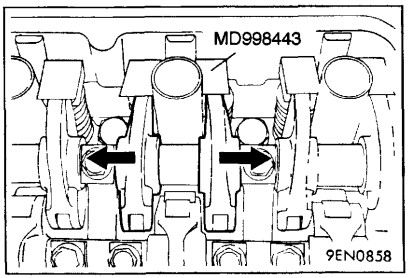
Caution
If the lash adjuster is re-used, clean the lash adjuster. (Refer to 11D-26.)

(1) Fit the lash adjuster onto the rocker arm without allowing diesel fuel to spill out. Fit special tool MD998443 to prevent the lash adjuster coming free and falling to the floor.



▶B◀ ROCKER ARM SHAFT INSTALLATION

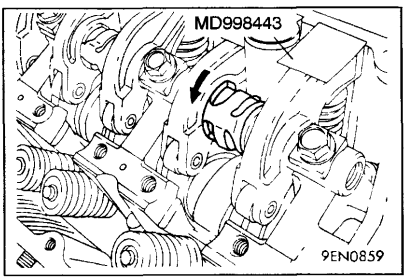
(1) Install the rocker arm shafts, place the end with notched side toward the timing belt side as shown.



▶C◀ ROCKER ARMS AND ROCKER ARM SHAFT INSTALLATION

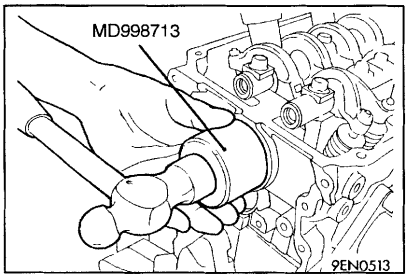
(1) Move the rocker arms in the directions shown in the illustration before tightening the rocker arm shaft bolts.

NOTE
Move the rocker arms until they touch the rocker arm shaft mounting bosses on the cylinder head.

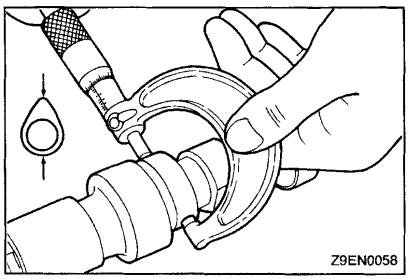


▶D◀ ROCKER ARM SPRING INSTALLATION

(1) Insert the rocker arm spring at an angle to the spark plug guide and then install it so that it is at a right angle to the guide.
(2) Remove the special tools from rocker arms.



▶E◀ OIL SEAL INSTALLATION



INSPECTION

11300550400

CAMSHAFT

(1) Measure the cam height and replace the camshaft if any height exceeds the specified limit.

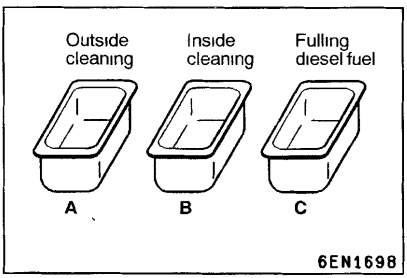
Standard value:
Intake: 37.11 mm (1.46 in.)
Exhaust: 37.15 mm (1.46 in.)

Limit:
Intake: 36.61 mm (1.44 in.)
Exhaust: 36.65 mm (1.44 in.)

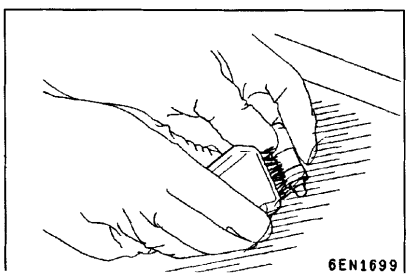
LASH ADJUSTERS

Caution

1. **The lash adjusters are precision-engineered mechanisms. Do not allow them to become contaminated by dirt or other foreign substances.**
2. **Do not attempt to disassemble the lash adjusters.**
3. **Use only fresh diesel fuel to clean the lash adjusters.**

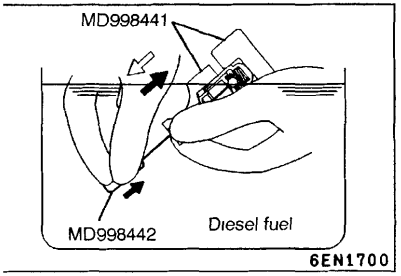


(1) Prepare three containers and approximately five liters of diesel fuel. Into each container, pour enough diesel fuel to completely cover a lash adjuster when it is standing upright. Then, perform the following steps with each lash adjuster.



(2) Place the lash adjuster in container A and clean its outside surface.

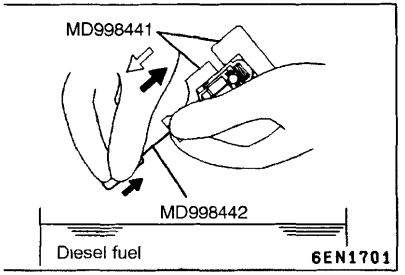
NOTE
Use a nylon brush if deposits are hard to remove.



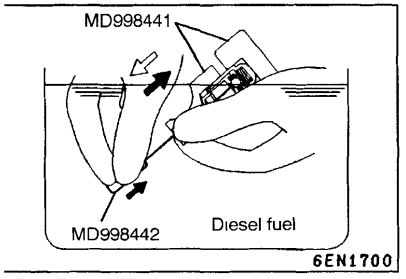
(3) Fit special tool MD998441 onto the lash adjuster.
(4) While gently pushing down the internal steel ball using special tool MD998442, move the plunger through 5 to 10 strokes until it slides smoothly. In addition to eliminating stiffness in the plunger, this operation will removed dirty oil.

Caution
The steel ball spring is extremely weak, so the lash adjuster's functionality may be lost if the air bleed wire is pushed in hard.

NOTE
If the plunger remains stiff or the mechanism appears otherwise abnormal, replace the lash adjuster.

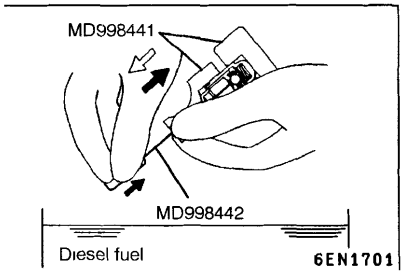


(5) Remove the lash adjuster from the container. Then, push down the steel ball gently and push the plunger to eliminate diesel fuel from the pressure chamber.

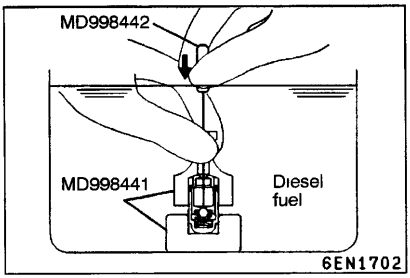


(6) Fit special tool MD998441 onto the lash adjuster.
(7) Place the lash adjuster in container B. Then, gently push down the internal steel ball using special tool MD998442 and move the plunger through 5 to 10 strokes until it slides smoothly. This operation will clean the lash adjuster's pressure chamber.

Caution
The steel ball spring is extremely weak, so the lash adjuster's functionality may be lost if the air bleed wire is pushed in hard.

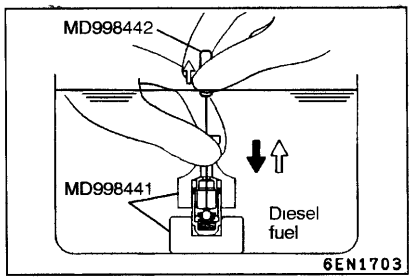


(8) Remove the lash adjuster from the container. Then, push down the steel ball gently and push the plunger to eliminate diesel fuel from the pressure chamber.

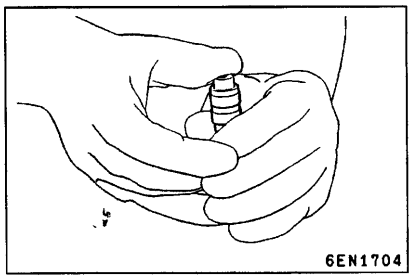


(9) Place the lash adjuster in container C. Then, gently push down the internal steel ball using special tool MD998442.

Caution
Do not use container C for cleaning. If cleaning is performed in container C, foreign matter could enter the pressure chamber when the chamber is filled with diesel fuel.

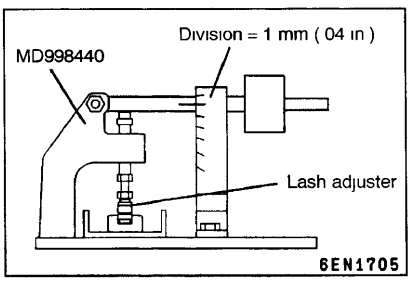


(10) Stand the lash adjuster with its plunger at the top, then push the plunger downward firmly until it moves through its greatest possible stroke. Return the plunger slowly, then release the steel ball and allow the pressure chamber to fill with diesel fuel.
(11) Remove special tool MD998441.



(12) Remove the lash adjuster from the container, then stand the lash adjuster with its plunger at the top. Push the plunger firmly and check that it does not move. Also, check that the lash adjuster's height matches that of a new lash adjuster.

NOTE
If lash adjuster contracts, perform the operations (9) through (12) again to fill it with diesel fuel completely. Replace the lash adjuster if it still contracts after performing these steps.

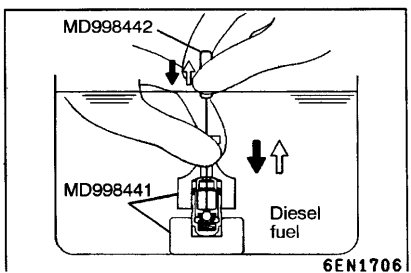


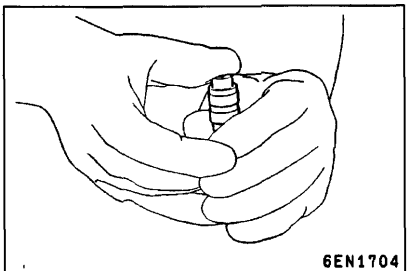
(13) Set the ash adjuster on the special tool MD998440 (leak down tester).
(14) After the plunger has moved downward slightly [0.2 to 0.5 mm (.008 - .019 in.)], measure the time taken for it to move downward by a further 1 mm (.04 in.).

Standard value:
3 - 20 seconds/1 mm (.04 in.)
[with diesel fuel at 15 to 20°C (59 - 68°F)]

NOTE
Replace the lash adjuster if the time measurement is out of specification.

(15) Fit special tool MD998441 onto the lash adjuster.
(16) Place the lash adjuster in container C again, then gently push down the internal steel ball using special tool MD998442.
(17) Stand the lash adjuster with its plunger at the top, then push the plunger downward firmly until it moves through its greatest possible stroke. Return the plunger slowly, then release the steel ball and allow the pressure chamber to fill with diesel fuel.
(18) Remove special tool MD998441.





(19) Remove the lash adjuster from the container, then stand the lash adjuster with its plunger at the top. Push the plunger firmly and check that it does not move. Also, check that the lash adjuster's height matches that of a new lash adjuster.

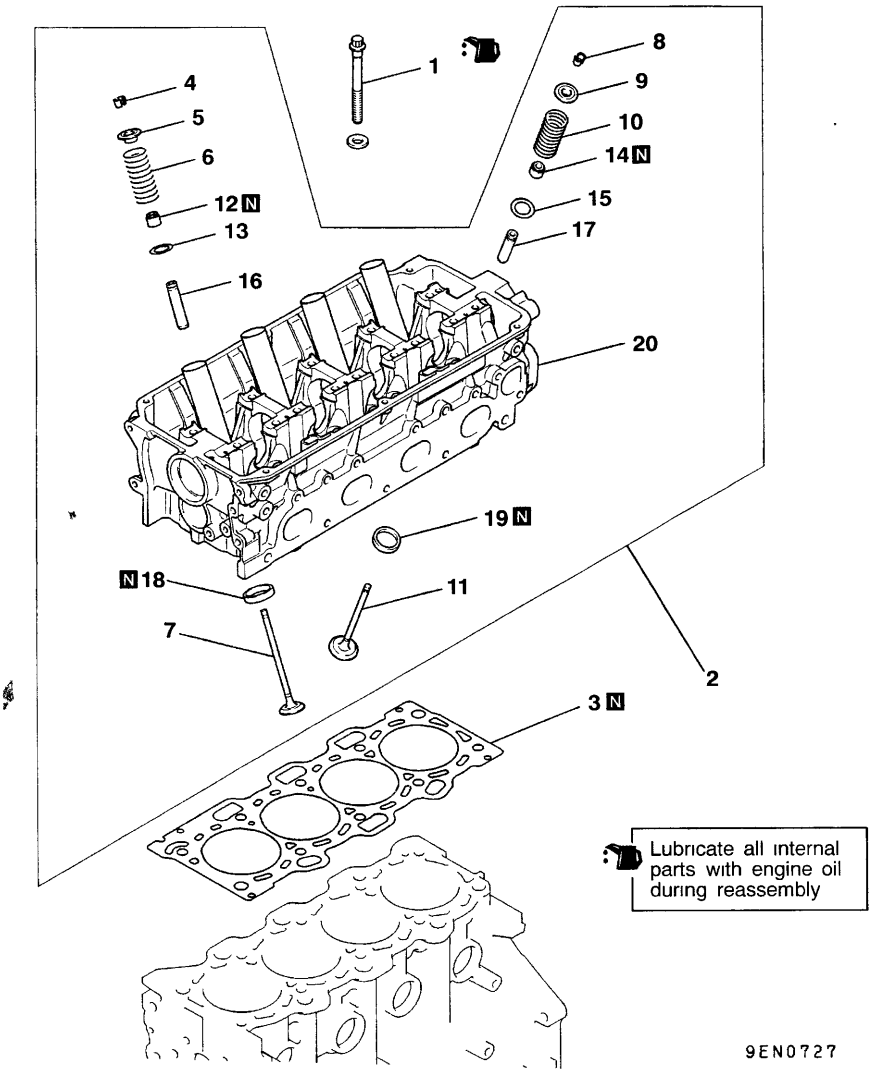
NOTE
If lash adjuster contracts, perform the operations (15) through (19) again to fill it with diesel fuel completely. Replace the lash adjuster if it still contracts after performing these steps.

(20) Stand the lash adjuster upright to prevent diesel fuel spilling out. Do not allow the lash adjuster to become contaminated by dirt or other foreign matter. Fit the lash adjuster onto the engine as soon as possible.

CYLINDER HEAD AND VALVES

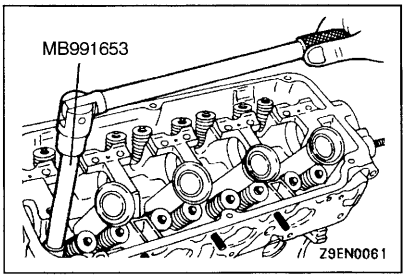
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REMOVAL AND INSTALLATION



Removal steps

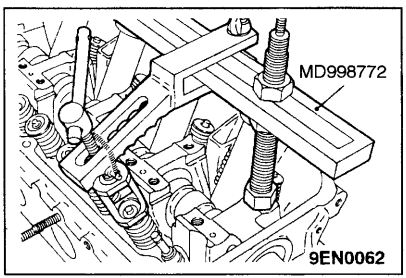
◀A▶ ▶D◀ 1. Cylinder head bolt
2. Cylinder head assembly
3. Cylinder head gasket
◀B▶ ▶C◀ 4. Retainer lock
5. Valve spring retainer
▶B◀ 6. Valve spring
7. Exhaust valve
◀B▶ ▶C◀ 8. Retainer lock
9. Valve spring retainer
▶B◀ 10. Valve spring
11. Intake valve
◀C▶ ▶A◀ 12. Valve stem seal
13. Valve spring seat
◀C▶ ▶A◀ 14. Valve stem seal
15. Valve spring seat
16. Exhaust valve guide
17. Intake valve guide
18. Exhaust valve seat
19. Intake valve seat
20. Cylinder head



REMOVAL SERVICE POINTS

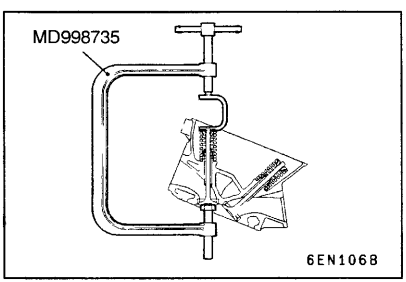
◀A▶ CYLINDER HEAD BOLT REMOVAL

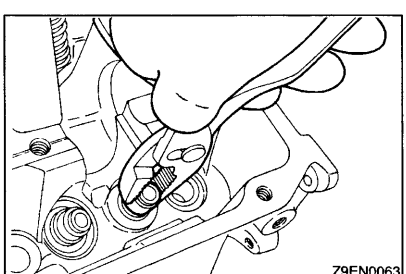
(1) Loosen the cylinder head bolts using the special tool.



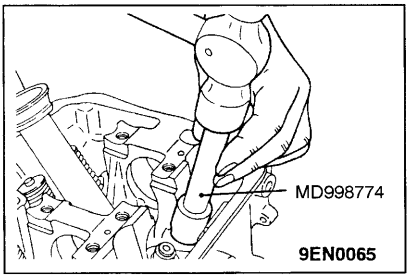
◀B▶ RETAINER LOCK REMOVAL

(1) Tag removed valves, springs and other components, noting their cylinder numbers and locations to facilitate reassembly. Store these components safely.





◀C▶ VALVE STEM SEAL REMOVAL

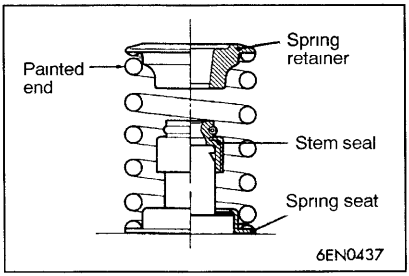


INSTALLATION SERVICE POINTS

▶A◀ VALVE STEM SEAL INSTALLATION

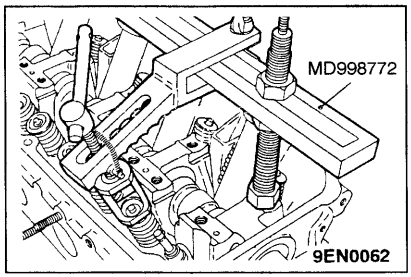
(1) Install the valve spring seat.
(2) Install a new valve stem seal using the special tool shown in the illustration.

Caution
1. Do not reuse removed valve stem seals.
2. The valve stem seal must be installed using the correct special tool. Incorrect installation could result in oil leaking past the valve guide.



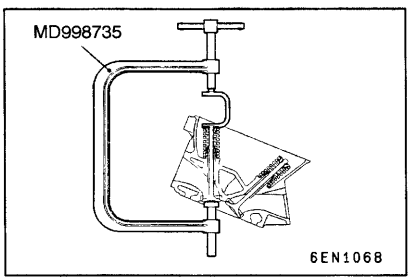
▶B◀ VALVE SPRING INSTALLATION

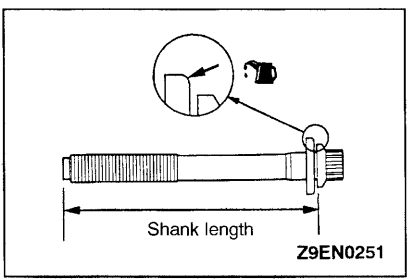
(1) Install the valve spring so that the painted end is on the rocker arm side.



▶C◀ RETAINER LOCK INSTALLATION

(1) The valve spring, if excessively compressed, causes the bottom end of retainer to be in contact with the stem seal, and damage it.



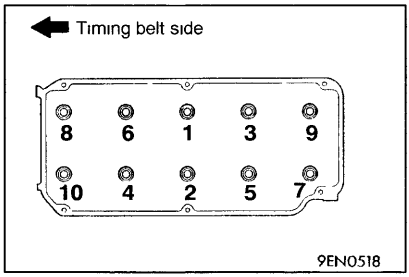


▶D◀ CYLINDER HEAD BOLT INSTALLATION

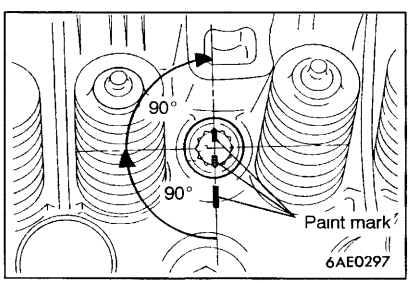
(1) Before reusing the cylinder head bolt, measure that its shank length does not exceed the specified limit. Replace the bolt if this measurement exceeds the limit.

Limit: Max. 96.4 mm (17.23 in.)

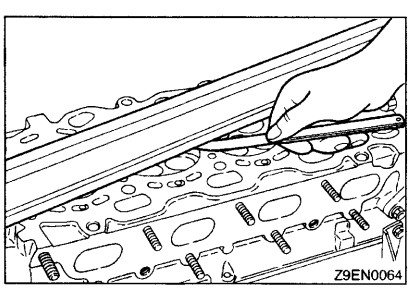
(2) Fit the washer as shown.
(3) Apply engine oil to the bolt thread and washer.



(4) Tighten the bolts in the sequence shown until each is torqued to 74 Nm (54 ft.lbs.) using the special tool (MB991653).
(5) Loosen all bolts fully.
(6) Retighten the bolts in the sequence shown until each is torqued to 20 Nm (15 ft.lbs.).
(7) Make paint marks on the cylinder head bolt heads and cylinder head as shown.
(8) In accordance with the tightening sequence, tighten each bolt by 90° (1/4 turn).
(9) Tighten each bolt by further 90° (1/4 turn) and check that the paint marks on the bolt head and cylinder head are aligned.



Caution
If the bolts are tightened by an angle of less than 90° (1/4 turn), they may not hold the cylinder head with sufficient strength.
If the bolts are tightened by an angle exceeding 90°, completely remove them and repeat the installation procedure.



INSPECTION

11300700195

CYLINDER HEAD

(1) Before cleaning the cylinder head, check it for water leaks, gas leaks, cracks, and other damage.
(2) Remove all oil, water scale, sealant, and carbon. After cleaning the oil passages, blow air through them to verify that they are not blocked.
(3) Check the cylinder head gasket surface for flatness by using a straight edge and feeler gauge.

Standard value: 0.03 mm (.0012 in.)

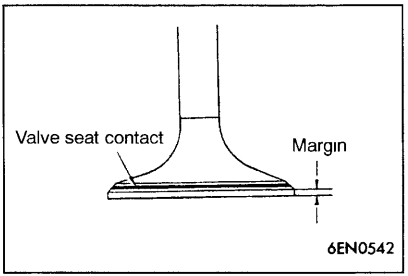
Limit: 0.2 mm (.008 in.)

(4) If flatness exceeds the specified limit, grind the gasket surface to specification.

Grinding limit: *0.2 mm (.008 in.)

*Includes/combined with cylinder block grinding

Cylinder head height (Specification when new): 119.9 - 120.1 mm (4.720 - 4.728 in.)



VALVE

(1) Check the valve face for correct contact. If contact is uneven or incomplete, reface the valve seat.
(2) If the margin is less than specified, replace the valve.

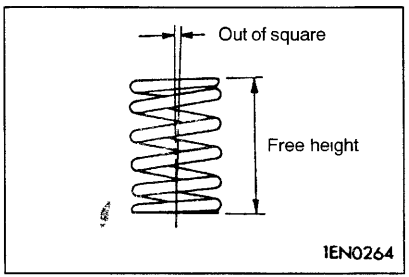
Standard value:
Intake: 1.0 mm (.039 in.)
Exhaust: 1.3 mm (.051 in.)

Limit:
Intake: 0.5 mm (.020 in.)
Exhaust: 0.8 mm (.031 in.)

(3) Measure the valve length. If the measurement is less than specified, replace the valve.

Standard value:
Intake: 110.15 mm (4.337 in.)
Exhaust: 113.70 mm (4.476 in.)

Limit:
Intake: 109.65 mm (4.317 in.)
Exhaust: 113.20 mm (4.457 in.)



VALVE SPRING

(1) Measure the valve spring free height. If the measurement is less than specified, replace spring.

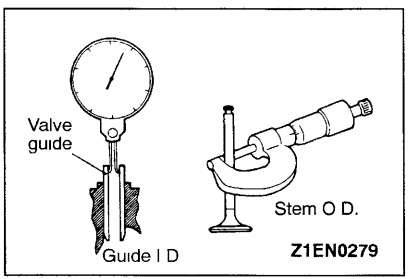
Standard value: 50.9 mm (2.00 in.)

Limit: 49.9 mm (1.96 in.)

(2) Measure the squareness of the spring. If the measurement is less than specified, replace the spring.

Standard value: 2° or less

Limit: 4°

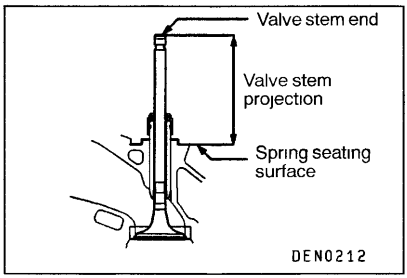


VALVE GUIDE

(1) Measure the clearance between the valve guide and valve stem. If the clearance exceeds the specified limit, replace valve guide or valve, or both.

Standard value:
Intake: 0.02 - 0.05 mm (.0008 - .0020 in.)
Exhaust: 0.05 - 0.09 mm (.0020 - .0035 in.)

Limit:
Intake: 0.10 mm (.0039 in.)
Exhaust: 0.15 mm (.0059 in.)

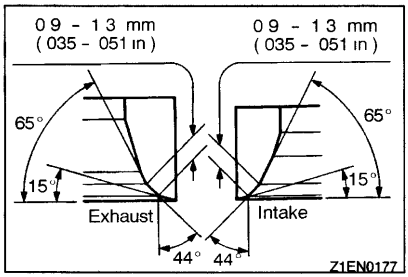


VALVE SEAT

(1) Assemble the valve, then measure the valve stem projection between the end of the valve stem and the spring seating surface. If the measurement exceeds the specified limit, replace the valve seat.

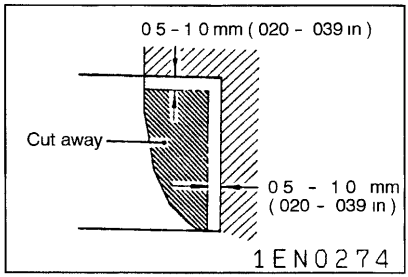
Standard value:
Intake: 49.30 mm (1.9409 in.)
Exhaust: 49.35 mm (1.9429 in.)

Limit
Intake: 49.80 mm (1.9606 in.)
Exhaust: 49.85 mm (1.9626 in.)



VALVE SEAT RECONDITIONING PROCEDURE

(1) Before correcting the valve seat, check the clearance between the valve guide and valve. If necessary, replace the valve guide.
(2) Using the appropriate special tool or seat grinder, correct the valve seat to achieve the specified seat width and angle.
(3) After correcting the valve seat, lap the valve and valve seat using lapping compound. Then, check the valve stem projection (refer to VALVE SEAT in INSPECTION).



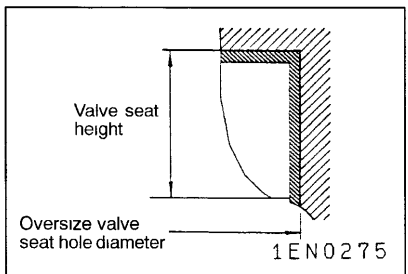
VALVE SEAT REPLACEMENT PROCEDURE

(1) Cut the valve seat to be replaced from the inside to reduce the wall thickness. Then, remove the valve seat.
(2) Rebore the valve seat hole in the cylinder head to match the selected oversize valve seat diameter.

Intake valve seat hole diameter
0.3 O.S.: 31.80 - 31.83 mm (1.2520 - 1.2531 in.)
0.6 O.S.: 32.10 - 31.13 mm (1.2638 - 1.2650 in.)

Exhaust valve seat hole diameter
0.3 O.S.: 29.30 - 29.32 mm (1.1535 - 1.1543 in.)
0.6 O.S.: 29.60 - 29.62 mm (1.1654 - 1.1661 in.)

(3) Prevent galling of the cylinder head bore by cooling the valve seat with liquid nitrogen before press-fitting it.
(4) Correct the valve seat to achieve the specified width and angle (refer to VALVE SEAT RECONDITIONING PROCEDURE).



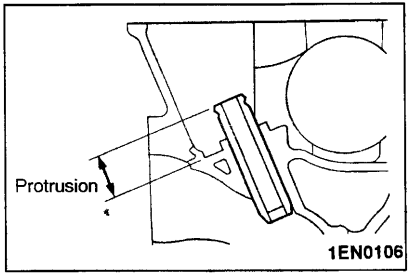
VALVE GUIDE REPLACEMENT PRCEDURE

(1) Using a press, push the valve guide out toward the cylinder block side.

(2) Rebore the valve guide hole in the cylinder head to match the oversize valve guide that is to be fitted.

Caution
Do not install a valve guide of the same size again.

Valve guide hole diameters in cylinder head
0.05 O.S.: 11.05 - 11.07 mm (.4350 - .4358 in.)
0.25 O.S.: 11.25 - 11.27 mm (.4429 - .4337 in.)
0.50 O.S.: 11.50 - 11.52 mm (.4528 - .4535 in.)



(3) Press-fit the valve guide until it projects by the specified amount.

Caution
1. **The valve guide must be installed from the upper side of the cylinder head.**
2. **The valve guides differ in length on the intake and exhaust sides.**

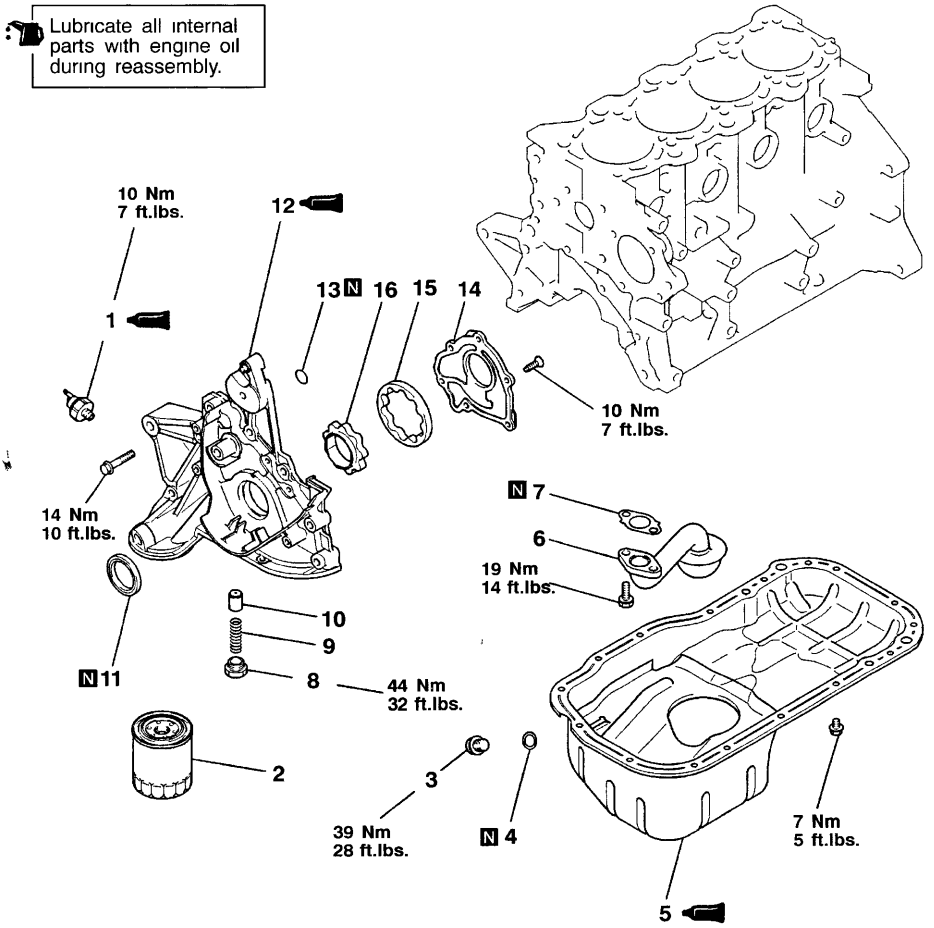
VALVE GUIDE LENGTH
INTAKE: 45.5 mm (1.791 in.)
EXHAUST: 50.5 mm (1.988 in.)

(4) After press-fitting the valve guide, insert a new valve and check that it slides smoothly.

OIL PUMP AND OIL PAN

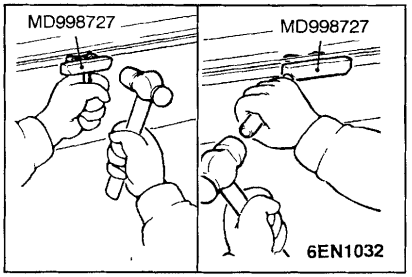
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REMOVAL AND INSTALLATION



Removal steps

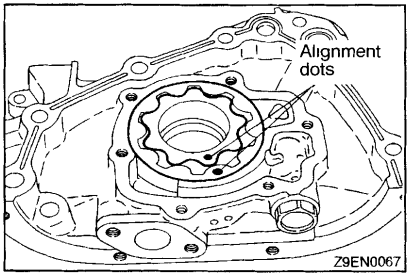
- ▶G◀ ▶F◀ 1. Oil pressure switch
- ▶F◀ 2 Oil filter
- 3 Drain plug
- ▶E◀ 4 Gasket
- ◀A▶ ▶D◀ 5 Oil pan
- 6. Oil screen
- 7. Oil screen gasket
- 8 Relief plug
- 9 Relief spring
- 10. Relief plunger
- ▶C◀ 11. Oil seal
- ▶B◀ 12. Front case
- 13. O-ring
- 14. Oil pump case cover
- ◀B▶ ▶A◀ 15. Outer rotor
- ◀B▶ ▶A◀ 16. Inner rotor



REMOVAL SERVICE POINTS

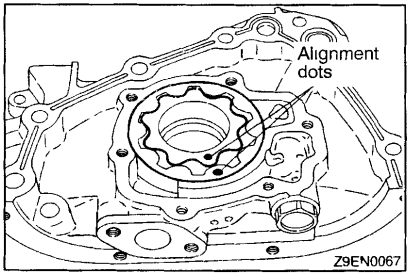
◀A▶ OIL PAN REMOVAL

(1) Remove the oil pan mounting bolts.
(2) Knock the special tool between the oil pan and cylinder block as shown in the illustration.
(3) Tapping the side of the special tool, slide the tool along the oil pan/cylinder block seal and thus remove the oil pan.



◀B▶ OUTER ROTOR/INNER ROTOR REMOVAL

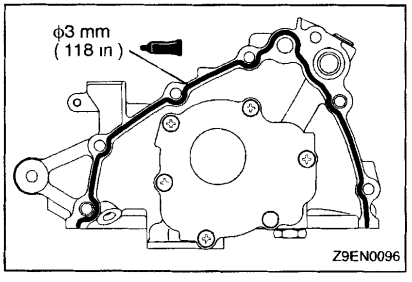
(1) Make alignment dots on the outer and inner rotors for reference in reassembly.



INSTALLATION SERVICE POINTS

▶A◀ INNER ROTOR/OUTER ROTOR INSTALLATION

(1) Apply engine oil to the rotors. Then, install the rotors ensuring that the alignment dots made at disassembly are properly aligned.

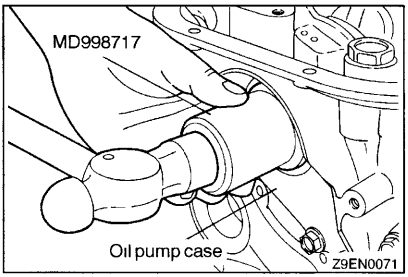


▶B◀ FRONT CASE INSTALLATION

(1) Clean the sealant application surfaces on the cylinder block and front case.
(2) Apply a 3 mm (.12 in) diameter bead of sealant to the area shown. Be sure to install the front case within 15 minutes after applying sealant.

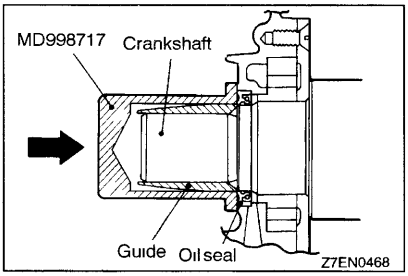
Specified sealant:
Mitsubishi Genuine Part No.MD970389 or equivalent

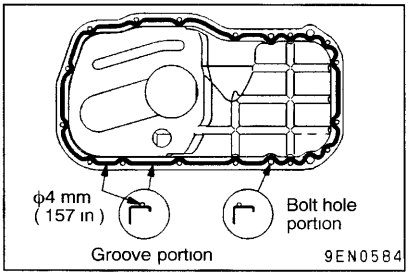
(3) Tighten the front case bolts to the specified torque.
(4) After installation, wait at least one hour. Never start the engine or let engine oil touch the adhesion surface during that time.



▶C◀ FRONT OIL SEAL INSTALLATION

(1) Place the special tool on the crankshaft front end and apply engine oil to the its outer diameter.
(2) Apply engine oil to the oil seal lip, then push the oil seal along the guide by hand until it touches the front case. Tap the oil seal into place using the special tool.



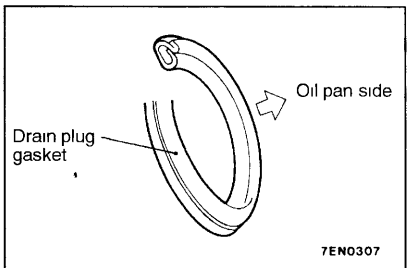


▶D◀ OIL PAN INSTALLATION

(1) Clean the mating surfaces of the oil pan and cylinder block.
(2) Apply a 4 mm (.16 in.) diameter bead of sealant to the oil pan flange. Be sure to install the oil pan within 15 minutes after applying sealant.

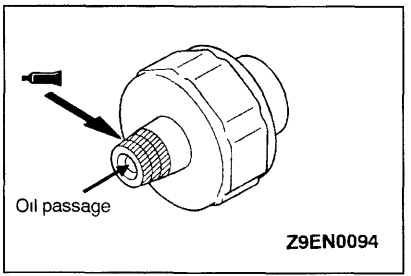
Specified sealant:
Mitsubishi Genuine Part No.MD970389 or equivalent

(3) Tighten the oil pan bolts to the specified torque.
(4) After installation, wait at least one hour. Never start the engine or let engine oil touch the adhesion surface during that time.



▶E◀ DRAIN PLUG GASKET INSTALLATION

(1) Replace the drain plug gasket with a new one. Fit the new gasket as shown.



▶F◀ OIL FILTER INSTALLAION

(1) Clean the filter mounting surfaces on the front case.
(2) Apply clean engine oil to the O-ring of the oil filter.
(3) Screw on the oil filter until its O-ring is seated on the mounting surface. Then, give the oil filter one further turn.

Caution
The oil filter must be tightened using a commercially available filter wrench. If the filter is tightened by hand only, it will be insufficiently torqued, resulting in oil leaks.

▶G◀ OIL PRESSURE SWITCH INSTALLATION

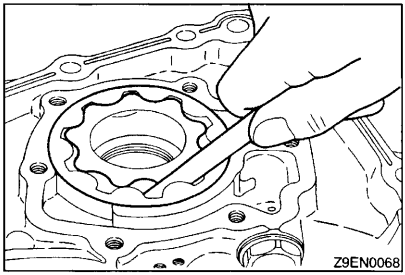
(1) Apply the specified sealant to the threads of the switch.

Specified sealant:
3M ATD Part No.8660 or equivalent

Caution
Use care not to allow the sealant to plug the oil passage.

(2) Install and tighten the switch to the specified torque by using a socket wrench and torque wrench.

Caution
If the switch is tightened with a spanner or offset wrench, an over-torque may be applied and the switch to be damaged.

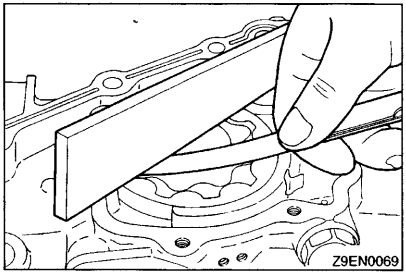


INSPECTION

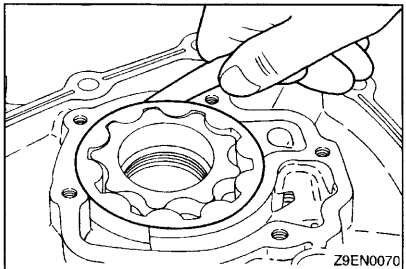
11300820099

OIL PUMP

(1) Fit the rotors into the front case.
(2) Check the tip clearance, using a feeler gauge.
Standard value: 0.06 - 0.18 mm (.0024 - .0071 in.)



(3) Check the side clearance, using a straight and feeler gauge.
Standard value: 0.04 - 0.10 mm (.0016 - .0039 in.)

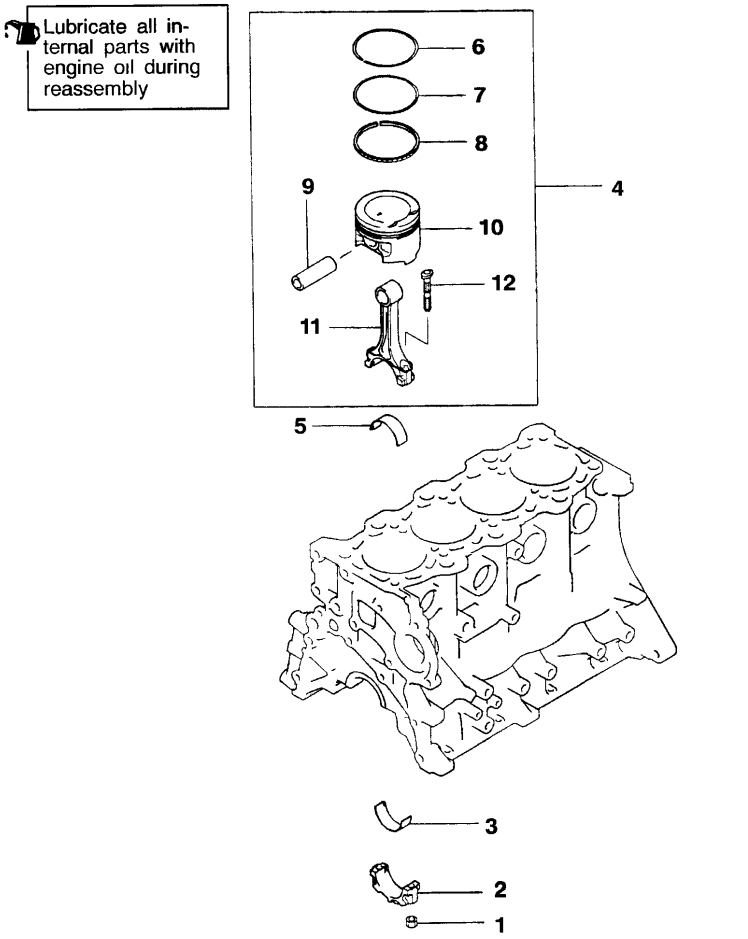


(4) Check the body clearance, using a feeler gauge.
Standard value: 0.10 - 0.18 mm (.0039 - .0071 in.)
Limit: 0.35 mm (.0138 in.)

PISTON AND CONNECTING ROD

11300840170

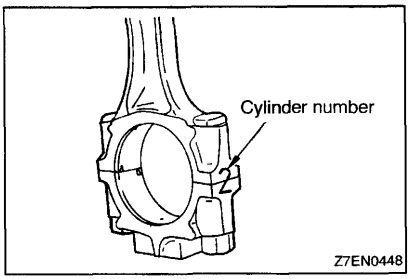
REMOVAL AND INSTALLATION



Z9EN0043

Removal steps

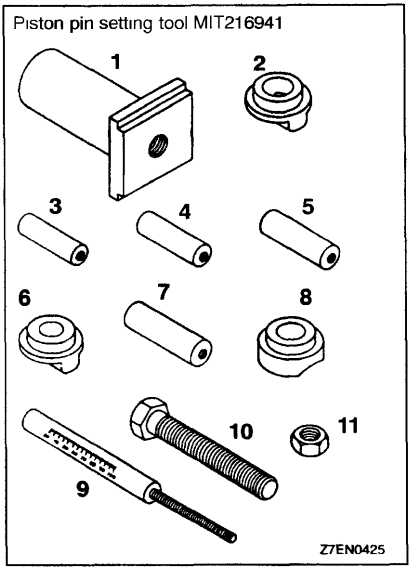
- ▶G◀ 1. Nut
- ◀A▶ ▶F◀ 2. Connecting rod cap
- ▶E◀ 3. Connecting rod bearing
- ▶D◀ 4. Piston and connecting rod
- ▶E◀ 5. Connecting rod bearing
- ▶C◀ 6. Piston ring No.1
- ▶C◀ 7. Piston ring No.2
- ▶B◀ 8. Oil ring
- ◀B▶ ▶A◀ 9. Piston pin
- 10. Piston
- 11. Connecting rod
- 12. Bolt



REMOVAL SERVICE POINTS

◀A▶ CONNECTING ROD CAP REMOVAL

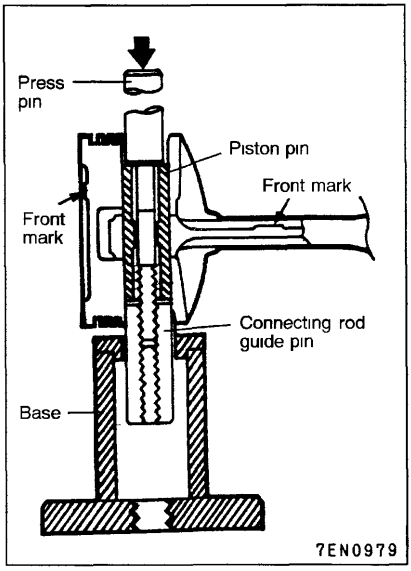
(1) Mark the cylinder number on the side of the connecting rod big end for correct reassembly.
(2) Keep the removed connecting rods, caps, and bearings in order according to the cylinder number.



◀B▶ PISTON PIN REMOVAL

Item No.	Part No	Description
1	MIT310134	Base
2	MIT310136	Piston Support
3	MIT310137	Connecting Rod Guide Pin
4	MIT310138	Connecting Rod Guide Pin
5	MIT310139	Connecting Rod Guide Pin
6	MIT310140	Piston Support
7	MIT310141	Connecting Rod Guide Pin
8	MIT310142	Piston Support
9	MIT48143	Press Pin
10	216943	Stop Screw
11	10396	Nut

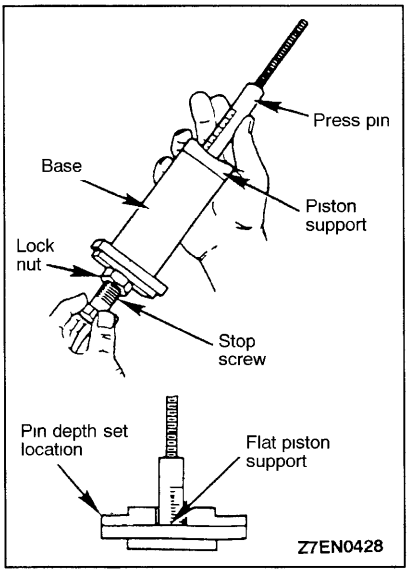
(1) Remove the stop screw from the base.
(2) Select the correct piston support for your application (See above). Fit the piston support onto the base. Place the base on press support blocks.



(3) Insert the press pin through the piston pin hole. Select the correct connecting rod guide pin (See above). Thread the guide pin onto the threaded portion of the press pin.
(4) Position the piston assembly on the piston support in the press. With the press pin up as shown in Figure 4, insert the guide pin through the hole in the piston and through the hole in the piston support.
(5) Press the piston pin out of the assembly.

IMPORTANT: To avoid piston damage,
- **The piston support must seat squarely against the piston.**
- **Verify that the piston pin will slide through the hole in the piston support.**

(6) Remove the piston pin from the press pin.



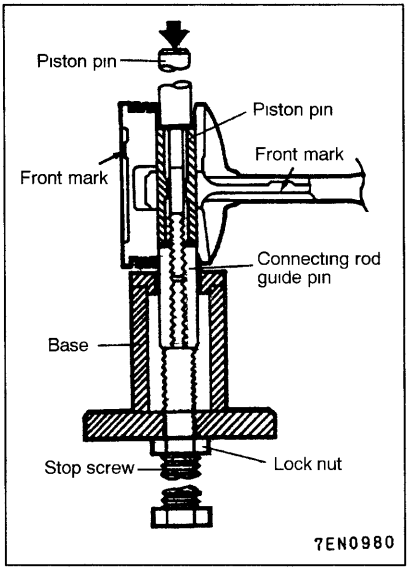
INSTALLATION SERVICE POINTS

▶A◀ PISTON PIN INSTALLATION

(1) Thread the stop screw and lock nut assembly into the base. Fit the correct piston support on top of the base. Insert the press pin, threaded end up, into the hole in the piston support until the press pin touches the stop screw.

(2) Using the markings on the press pin, adjust the stop screw to the depth as shown below.

Depth: Refer to the operating instructions on the special tool.



(3) Place the base on press support blocks.

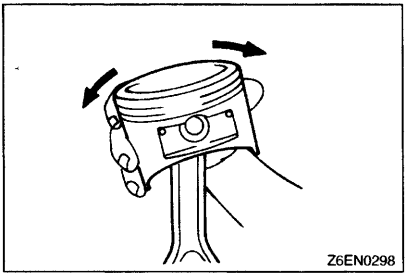
(4) Slide the piston pin over the threaded end of the press pin, and thread the correct guide pin up against it.

(5) Coat the piston pin with oil, and with the connecting rod held in position, slide the guide pin through the piston and connecting rod.

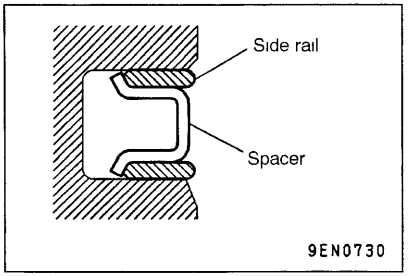
(6) Press the piston pin through the connecting rod until the guide pin contacts the stop screw.

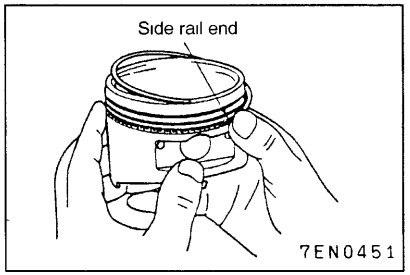
(7) Remove the piston assembly from the base. Remove the guide pin and press pin from the assembly.

IMPORTANT: Due to production tolerance variations, it is necessary to visually inspect the piston pin depth after installation to verify that the piston pin is centered. Adjust if necessary.



(8) Check that the piston moves smoothly.





▶B◀ OIL RING INSTALLATION

(1) Fit the oil ring spacer into the piston ring groove. Then fit the upper and lower side rails.

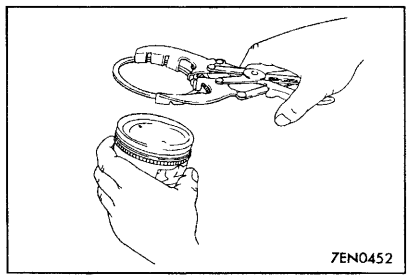
NOTE
(1) The spacer and side rails may be fitted in either direction. No distinciton is made between top and bottom.
(2) Spacer and side rail sizes are color-coded as follows:

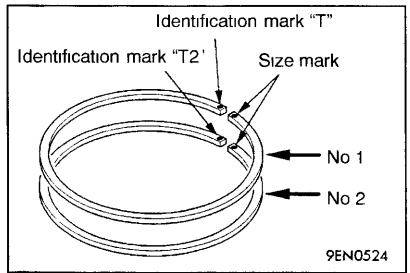
Size	Identification color
Standard size	None
0.50 mm O.S.	Blue
1.00 mm O.S.	Yellow

To install a side rail, fit one end of the rail into the groove, then press the rest of the rail into position by hand as shown.

Caution
Do not fit side rails using a piston ring expander since they may break.

(2) After installing the side rails, check that they more smoothly in both directions.





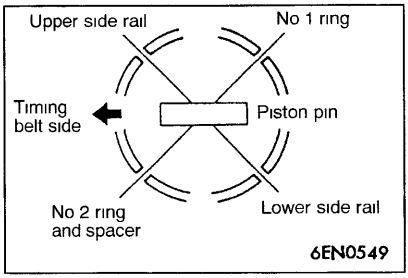
▶C◀ PISTON RING NO.2/PISTON RING NO.1 INSTALLATION

(1) Using a ring expander, fit ring No.2 and ring No.1 with their identification marks facing upward (on the piston crown side).

Identification mark:
No.1 ring: T
No.2 ring: T2

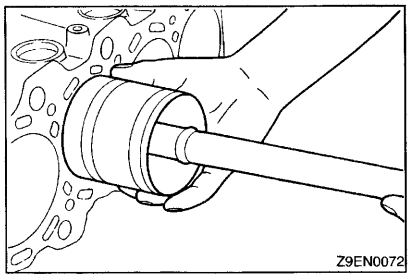
NOTE
The piston ring is stamped with the following size mark.

Size	Size mark
Standard size	None
0.50 mm O.S.	50
1.00 mm O.S	100

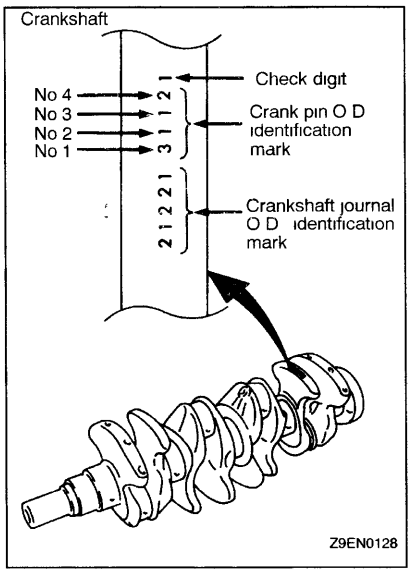


▶D◀ PISTON AND CONNECTING ROD ASSEMBLY INSTALLATION

(1) Apply oil to the piston, piston ring, and oil ring.
(2) Align the gaps of the piston rings and oil rings (side rails and spacer) as shown.
(3) With the piston crown's front arrow mark pointing toward the timing belt side, press the piston and connecting rod assembly into the cylinder from the top of the cylinder.



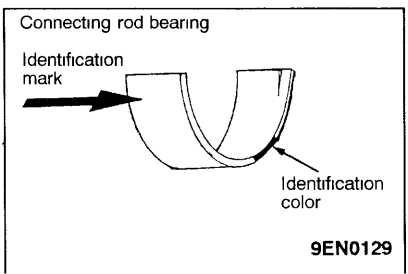
(4) Compress the piston rings tightly with a suitable ring compression tool, then press the piston and connecting rod fully into the cylinder. Do not strike the piston hard since the piston rings may break and the crank pin may be nicked.

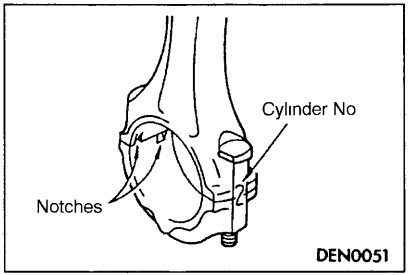


▶E◀ CONNECTING ROD BEARING INSTALLATION

(1) When replacing the bearings and/or crankshaft, read off the identification mark on the crankshaft (as illustrated), and select a bearing according to the following table.

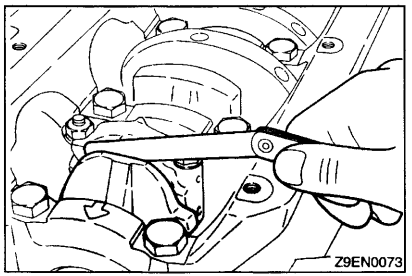
Crankshaft pin O.D.	Connecting rod bearing	
Identification mark	Identification mark	Identification color
1	S1	Brown
2	S2	Black
3	S3	Green





▶F◀ CONNECTING ROD CAP INSTALLATION

(1) Aligning the marks made during disassembly, fit the bearing cap onto the connecting rod. If the connecting rod is new and has no index mark, ensure that the bearing locking notches are both on the same side.



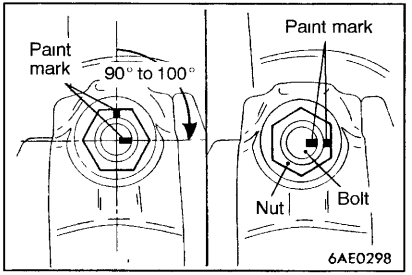
(2) Check that the connecting rod big end side clearance confirms with specification.

Standard value: 0.10 - 0.25 mm (.0039 - .0098 in.)

Limit: 0.4 mm (.016 in.)

▶G◀ CONNECTING ROD CAP NUT TIGHTENING

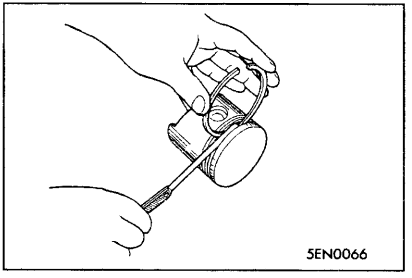
(1) Since the connecting rod cap bolts and nuts are torqued using the plastic area tightening method the bolts should be examined BEFORE reuse. If the bolt threads are "necked down", the bolt should be replaced.
Necking can be checked by running a nut with your fingers the full length of the bolt threads. If the nut does not run down smoothly, the bolt should be replaced.
(2) Before installation of each nut, apply engine oil to the nut.
(3) Install each nut to the bolt and finger-tighten it. Then tighten the nuts alternately to install the cap properly.
(4) Tighten the nuts to a torque of 20 Nm (15 ft.lbs.).



(5) Make a paint mark on the head of each nut.
(6) Make a paint mark on the bolt end at the position 90° to 100° from the paint mark made on the nut in the direction of tightening the nut.
(7) Give a 90° to 100° turn to the nut and make sure that the paint mark on the nut and that on the bolt are in alignment.

Caution

1. **If the nut is turned less than 90°, proper fastening performance may not be expected. When tightening the nut, therefore, be careful to give a sufficient turn to it.**
2. **If the nut is overtightened (exceeding 100°), loosen the nut completely and then retighten it by repeating the tightening procedure from step (1).**



INSPECTION

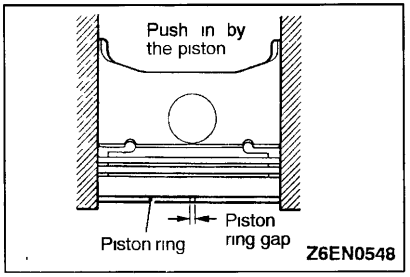
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PISTON RING

(1) Check for side clearance.
If the limit is exceeded, replace the ring or piston, or both

Standard value:
No.1: 0.03 - 0.07 mm (.0012 - .0028 in.)
No.2: 0.02 - 0.06 mm (.0008 - .0024 in.)

Limit:
No.1: 0.1 mm (.0039 in.)
No.2: 0.1 mm (.0039 in.)

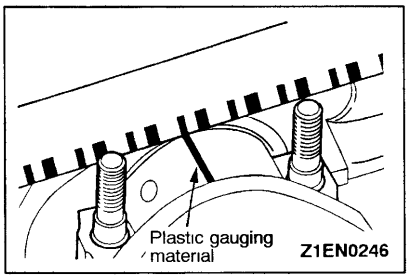


(2) Install the piston ring into the cylinder bore. Force the ring down with a piston, the piston crown being in contact with the ring, to correctly position it at right angles to the cylinder wall. Then, measure the end gap with a feeler gauge.
If the end gap is excessive, replace the piston ring.

Standard value:
No.1: 0.25 - 0.40 mm (.0098 - .0157 in.)
No.2: 0.40 - 0.55 mm (.0157 - .0217 in.)

Oil: 0.20 - 0.60 mm (.0078 - .0236 in.)

Limit:
No.1, No.2: 0.8 mm (.031 in.)
Oil: 1.0 mm (.039 in.)



CRANKSHAFT PIN OIL CLEARANCE (PLASTIC GAUGING MATERIAL METHOD)

(1) Remove oil from the crankshaft pin and connecting rod bearing.
(2) Cut the plastic gauging material to the same length as the width of bearing and place it on crankshaft pin in parallel with its axis.
(3) Install the connecting rod cap carefully and tighten the nuts to the specified torque. (See "Connecting rod cap nut tightening" procedure.)
(4) Carefully remove the connecting rod cap.
(5) Measure the width of the plastic gauging material at its widest part by using a scale printed on its package.

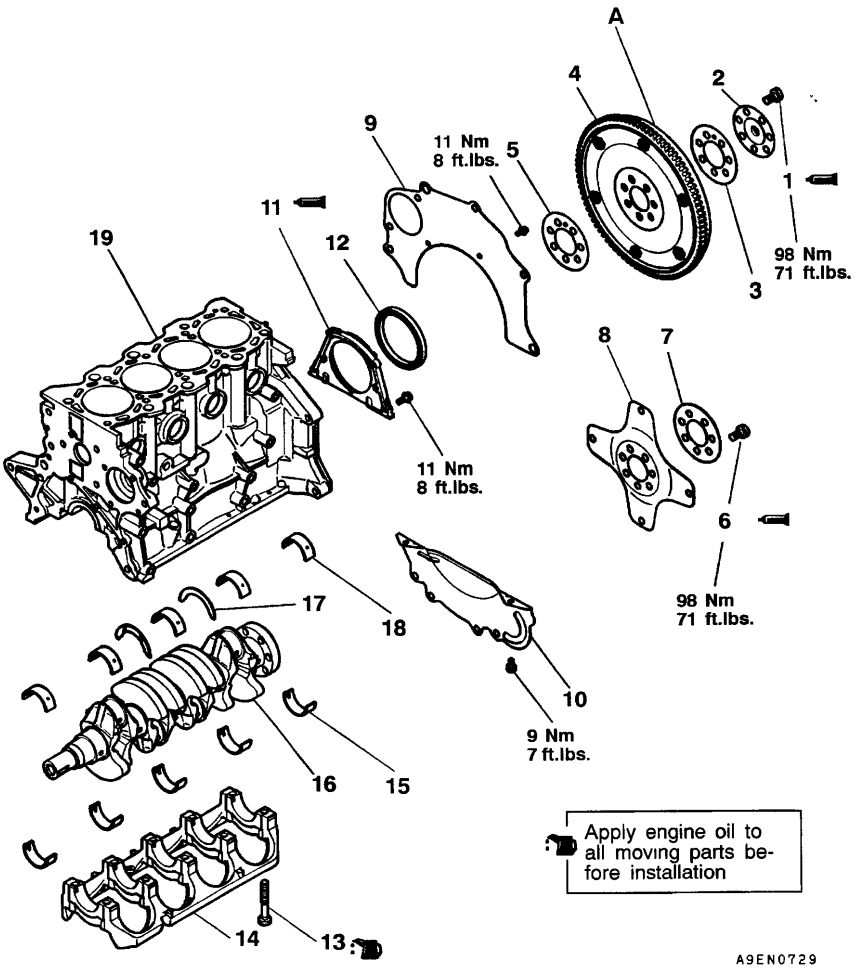
Standard value: 0.02 - 0.05 mm (.0008 - .0020 in.)

Limit: 0.1 mm (.004 in.)

CRANKSHAFT AND CYLINDER BLOCK

11300870179

REMOVAL AND INSTALLATION

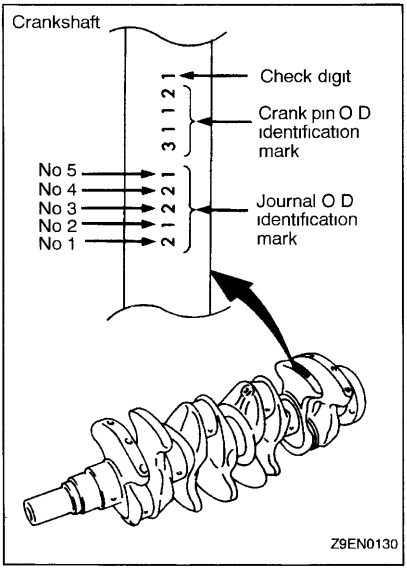


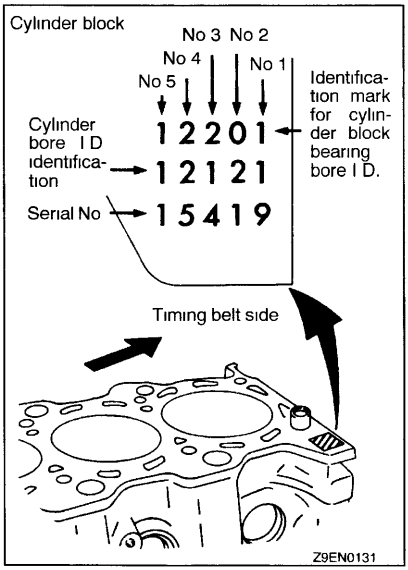
Removal steps

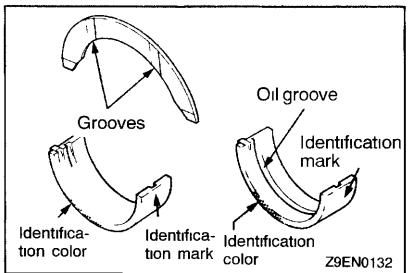
- ▶E◀ 1. Flywheel bolt <M/T>
- 2. Plate <M/T>
- 3 Adapter plate <M/T>
- 4. Flywheel (Non-disassemblable parts) <M/T>
- 5. Adapter plate <M/T>
- ▶E◀ 6. Drive plate bolt <A/T>
- 7 Adapter plate <A/T>
- 8. Drive plate <A/T>
- 9. Rear plate
- 10. Bell housing cover
- ▶D◀ 11 Rear oil seal case
- ▶C◀ 12. Rear oil seal
- ▶B◀ 13. Bearing cap bolt
- ▶B◀ 14. Bearing cap
- ▶A◀ 15. Crankshaft bearing, lower
- 16. Crankshaft
- ▶A◀ 17. Thrust plate
- ▶A◀ 18. Crankshaft bearing, upper
- 19. Cylinder block

Caution

Do not remove any of the bolts "A" of the flywheel shown in the illustration. The balance of the flexible type flywheel is adjusted in an assembled condition. Removing the bolt, therefore, can cause the flexible flywheel to be out of balance, giving damage to the flywheel.







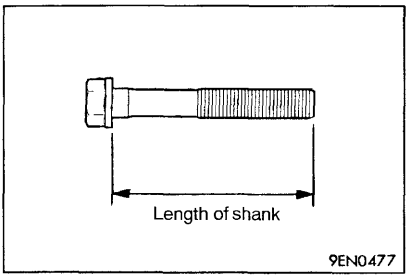
INSTALLATION SERVICE POINTS

▶A◀ CRANKSHAFT BEARING INSTALLATION

(1) When replacing the bearings, crankshaft and/or cylinder block, read off the identification mark on the crankshaft and cylinder block (as illustrated), and select a bearing according to the flollowing table.

Crankshaft journal O D.	Cylinder block bearing bore I.D.	Crankshaft bearing	
Identification mark	Identification mark	Identification mark	Identification color
1	0	S1	Brown
	1	S2	Black
	2	S3	Green
2	0	S2	Black
	1	S3	Green
	2	S4	Yellow
3	0	S3	Green
	1	S4	Yellow
	2	S5	Red

(2) Install bearings having an oil groove to the cylinder block.
(3) Install bearings having no oil groove onto the bearing caps.
(4) Install the thrust bearings at the No.3 upper bearing with the grooved side toward the crankshaft web.

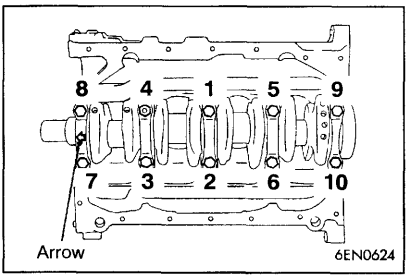


▶B◀ BEARING CAP/BEARING CAP BOLT INSTALLATION

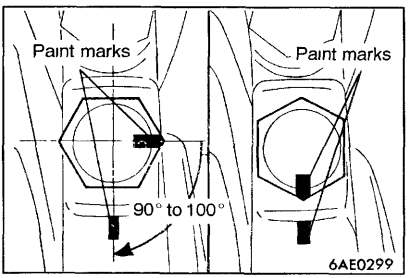
(1) Install the bearing cap so their arrow is positioned on the timing belt side.
(2) When reusing the bearing cap bolt, measure that its shank length dose not exceed the specified limit. Replace the bolt if this measurement exceeds the limint.

Limit: max. 71.1 mm (2.799 in.)

(3) Apply engine oil to the bolt thread and flange of the bolt.



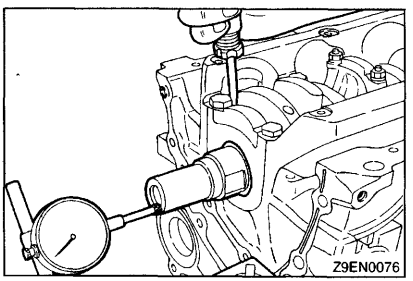
(4) Tighten the bearing cap bolts to 25 Nm (18 ft.lbs.) torque in the sequence shown.



(5) Make a paint mark on the head of each bolt.
(6) Make a paint mark on the bearing cap at the position 90° to 100° from the paint mark on the bolt head in the direction of tightening the bolt.
(7) Give a 90° to 100° turn to the bolt in the tightening sequence. Make sure that the paint mark on the bolt and that on the bearing cap are in alignment.

Caution

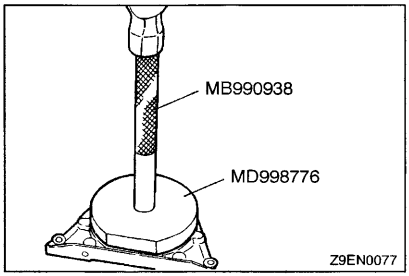
1. **If the bolt is turned less than 90°, proper fastening performance may not be expected. When tightening the bolt, therefore, be careful to give a sufficient turn to it.**
2. **If the bolt is overtightened (exceeding 100°), loosen the bolt completely and then retighten it by repeating the tightening procedure from step (1).**



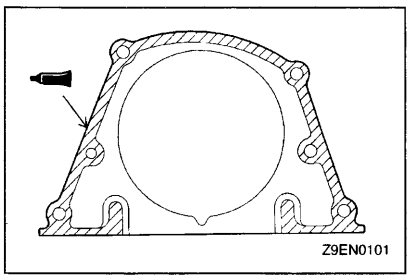
(8) Check that the crankshaft rotates smoothly.
(9) Measure the end play in the crankshaft. If the measurement exceeds the specified limit, replace the crankshaft bearings.

Standard value: 0.05 - 0.25 mm (.0020 - .0098 in.)

Limit: 0.4 mm (.016 in.)

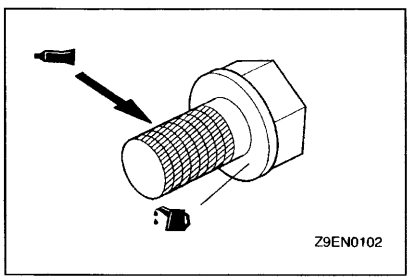


▶C◀ REAR OIL SEAL INSTALLATION



▶D◀ SEALANT APPLICATION TO OIL SEAL CASE

Specified sealant:
Mitsubishi Genuine Part No.MD970389 or equivalent



▶E◀ DRIVE PLATE BOLT/FLYWHEEL BOLT INSTALLATION

(1) Remove all the remaining sealant from bolts and thread holes of crankshaft.
(2) Apply engine oil to the flange of bolt.
(3) Apply engine oil into the thread holes of crankshaft.
(4) Apply specified sealant to the thread of bolt.

Specified sealant:
3M Nut Locking Part No.4171 or equivalent

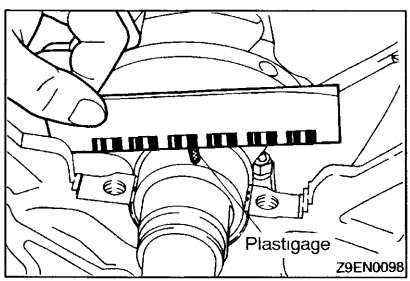
(5) Tighten the bolts to specified torque.

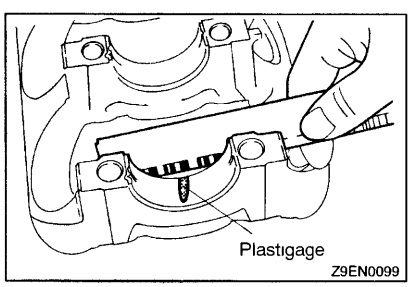
INSPECTION

11300880158

CRANKSHAFT JOURNAL OIL CLEARANCE (PLASTIGAGE METHOD)

(1) Remove oil from the crankshaft journal and the crankshaft bearing.
(2) Install the crankshaft.
(3) Cut the Plastigage to the same length as the width of bearing and place it on the journal in parallel with its axis.

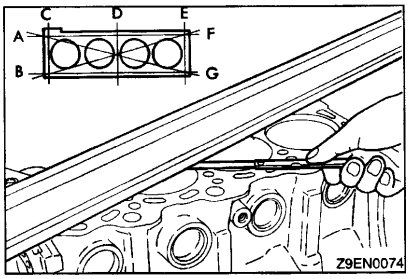




(4) Install the crankshaft bearing cap carefully and tighten the bolts to the specified torque.
(5) Carefully remove the crankshaft bearing cap.
(6) Measure the width of the Plastigage at its widest part by using a scale printed on the Plastigage package.

Standard value: 0.02 - 0.04 mm (.0008 - .0016 in.)

Limit: 0.1 mm (.004 in.)



CYLINDER BLOCK

(1) Visually check for cracks, rust, and corrosion, and inspect the cylinder block using a flaw detecting agent. Rectify defects where possible or replace the cylinder block.

(2) Ensure that the top surface is free of gasket chips and other foreign material. Check the cylinder block top surface for distortion using a straight edge and feeler gauge.

Standard value: 0.05 mm (.0020 in.) or less

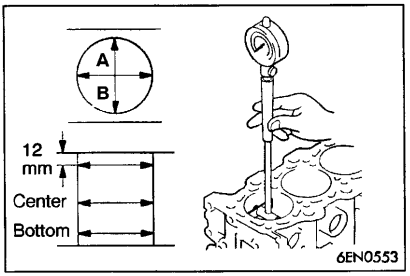
Limit: 0.1 mm (.004 in.)

(3) If the distortion is excessive, correct within the allowable limit or replace.

Grinding limit: 0.2 mm (.008 in.)
The total thickness of the stock allowed to be removed from cylinder block and mating cylinder head 0.2 mm (.008 in.) at maximum.

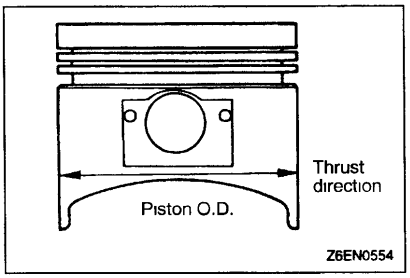
Cylinder block height (when new):
263.5 mm (10.374 in.)

(4) Check the cylinder walls for cracks and seizure marks. If defects are evident, bore all the cylinders to oversize or replace the cylinder block.



(5) Using a cylinder gauge, measure each cylinder bore and cylindricity. If any cylinder is severely worn, bore all the cylinders to oversize and replace the piston and piston rings accordingly. Take measurements at the points shown.

Standard value:
Cylinder bore I.D.: 81.0 mm (3.19 in.)
Cylindricity: 0.01 mm (.0004 in.) or less



BORING CYLINDER

(1) Oversize pistons should be based on the largest bore cylinder.

Piston size identification

Size	Identification mark
0.50 mm O S.	0.50
1.00 mm O.S.	1.00

NOTE
The size mark is stamped on the piston top.

(2) Measure the outside diameter of piston to be used. Measure it in thrust direction as shown.

(3) Based on the measured piston O.D., calculate the boring finish dimension.

Boring finish dimension = Piston O.D. + (Clearance between piston O.D. and cylinder) - 0.02 mm (.0008 in.) (honing margin)

(4) Bore each cylinders to the calculated boring finish dimension.

Caution
To prevent distortion caused by heat increased during boring, bore the cylinders in the following order: No.2, No.4, No.1, No.3.

(5) Hone the cylinders to the final finish dimension (Piston O.D. + Piston-to-cylinder clearance).

(6) Check the clearance between piston and cylinder.

Standard value:
0.02 - 0.04 mm (.0008 - .0016 in.)

NOTE
When boring cylinders, finish all of four cylinders to the same oversize. Do not bore only one cylinder to an oversize.

ENGINE LUBRICATION

CONTENTS

12109000044

GENERAL INFORMATION 2

LUBRICANTS 2

ON-VEHICLE SERVICE 3

Engine Oil Inspection 3

Engine Oil Replacement 3

Oil Filter Replacement 4

SPECIAL TOOL 3

GENERAL INFORMATION

12100010046

The lubrication method is a fully force-fed, full-flow filtration type. The oil pump is a trochoid type which is directly mounted to the crankshaft.

ENGINE OILS

Health Warning

Prolonged and repeated contact with mineral oil will result in the removal of natural fats from the skin, leading to dryness, irritation and dermatitis. In addition, used engine oil contains potentially harmful contaminants which may cause skin cancer. Adequate means of skin protection and washing facilities must be provided.

Recommended Precautions

The most effective precaution is to adapt working practices which prevent, as far as practicable, the risk of skin contact with mineral oils. For example; Use enclosed systems for handling used engine oil and degrease components, where practicable, before handling them.
Other precautions:

- Avoid prolonged and repeated contact with oils, particularly used engine oils.
- Wear protective clothing, including impervious gloves where practicable.
- Avoid contaminating clothes, particularly underpants, with oil.
- Do not put oily rags in pockets, the use of overalls without pockets will avoid this.
- Do not wear heavily soiled clothing and oil-impregnated foot-wear. Overalls must be cleaned regularly and kept separate from personal clothing.
- Where there is a risk of eye contact, eye protection should be worn. For example; chemical goggles or face shields. In addition, an eye wash facility should be provided.
- Obtain First Aid treatment immediately for open cuts and wounds.
- Wash regularly with soap and water to ensure all oil is removed, especially before meals (skin cleansers and nail brushes will help). After cleaning, the application of preparations containing lanolin to replace the natural skin oils is advised.
- Do not use gasoline, kerosine, diesel fuel, gas oil, thinners or solvents for cleaning skin.
- Use barrier creams, applying them before each work period, to help the removal of oil from the skin after work.
- If skin disorders develop, obtain medical advice immediately.

LUBRICANTS

12100040298

Items		Engine oil (API classification)	Quantity dm^3 (qts.)
Oil filter		SJ or higher	0.3 (0.32)
Total quantity	1.5L engine		3.3 (3.5)
	1.8L engine		3 8 (4.0)

EOLCS certification mark



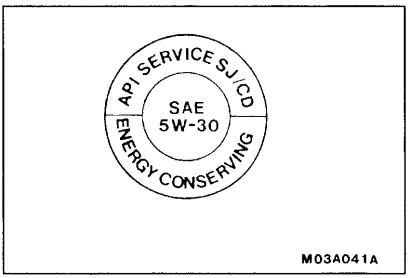
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ENGINE OIL

Caution
Never use nondetergent or straight mineral oil.

Oil Identification Symbol

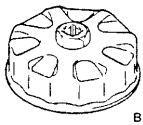
Use only engine oils displaying the EOLCS certification mark on the container.



If these oils are not available, an API classification SJ EC or SJ/CD EC can be used.

SPECIAL TOOL

12100060058

Tool	Tool number and name	Supersession	Application
 B991396	MB991396 Oil filter wrench		Removal and installation of engine oil filter (When using the oil filter of MD135737)

ON-VEHICLE SERVICE

12100090040

ENGINE OIL INSPECTION

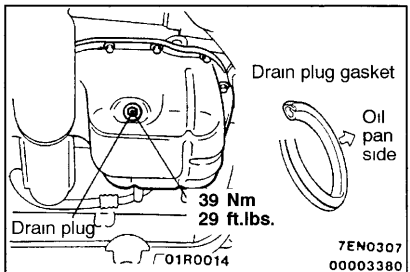
1. Pull out the oil dipstick slowly and check that the oil level is within the marks on the oil dipstick.
2. Check that the oil is not excessively dirty, that there is no coolant or gasoline mixed in, and that it has sufficient viscosity.

ENGINE OIL REPLACEMENT

12100100231

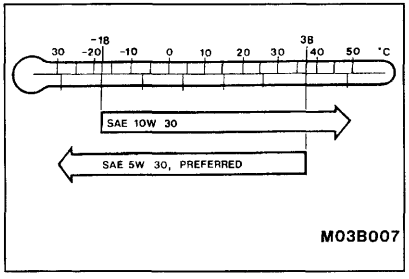
1. Start the engine and allow it to warm up until the temperature of the coolant reaches 80°C (176°F) to 90°C (194°F).
2. Remove the engine oil filler cap.
3. Remove the drain plug to drain oil.

Caution
Use care as oil could be hot.



4. Install a new drain plug gasket so that it faces in the direction shown in the illustration, and then tighten the drain plug to the specified torque.

NOTE
Install the drain plug gasket so it faces in the direction shown in the illustration.



5. Refill the specified quantity of oil.

   Specified Engine Oil (API classification): SJ or higher

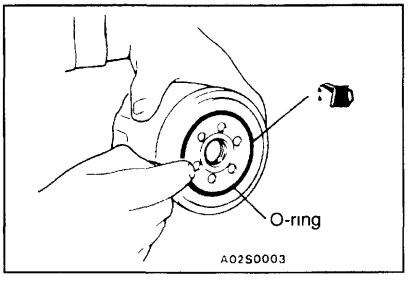
   Total quantity (Includes volume inside oil filter):
   <1.5L engine> 3.3 dm^3 (3.5 qts.)
   <1.8L engine> 3.8 dm^3 (4.0 qts.)
6. Install the engine oil filler cap.
7. Check oil level.

OIL FILTER REPLACEMENT

12100110227

1. Start the engine and allow it to warm up until the temperature of the coolant reaches 80°C (176°F) to 90°C (194°F).
2. Remove the engine oil filler cap.
3. Remove the drain plug to drain oil.

   Caution
   Use care as oil could be hot.
4. Use the following tools to remove the engine oil filter from the underside of the vehicle.
   - MB991396 or equivalent (When using the oil filter of MD135737)
   - Commercial tool (When using the oil filter of MD325714)
5. Clean the filter bracket side mounting surface and ensure the old O-ring has been removed.



6. Apply a small amount of engine oil to the O-ring of the new oil filter.
7. Install the engine oil filter.

   NOTE
   Tightening torque:
   When using the oil filter of MD135737: 14 Nm (10 ft.lbs.)
   When using the oil filter of MD325714: 16 Nm (12 ft.lbs.)
8. Install the drain plug and refill engine oil. (Refer to Engine Oil Replacement on P.12-3.)
9. Race the engine a few times, and check to be sure that no engine oil leaks from the installation section of the oil filter.

FUEL

CONTENTS

13109000638

MULTIPORT FUEL INJECTION (MFI) <1.5L ENGINE> 13A

MULTIPORT FUEL INJECTION (MFI) <1.8L ENGINE> 13B

FUEL SUPPLY 13C

AUTO-CRUISE CONTROL SYSTEM ..... Refer to GROUP 17

MULTIPORT FUEL INJECTION (MFI) <1.5L ENGINE>

CONTENTS

13109000621

GENERAL INFORMATION 3

INJECTOR 158

ON-VEHICLE SERVICE

- Basic Idle Speed Adjustment 143
- Closed Throttle Position Switch and Throttle Position Sensor Adjustment 141
- Closed Throttle Position Switch Check 153
- Component Location 149
- Curb Idle Speed Check .... Refer to GROUP 11A
- EGR Solenoid Check 157
- Engine Coolant Temperature Sensor Check 152
- Evaporative Emission Purge Solenoid Check 157
- Fixed SAS Adjustment 143
- Fuel Pressure Test 144
- Fuel Pump Connector Disconnection (How to Reduce Pressurized Fuel Lines) 147
- Fuel Pump Operation Check 147
- Heated Oxygen Sensor Check 154
- Idle Air Control Motor (Stepper Motor) Check 156
- Injector Check 155
- Intake Air Temperature Sensor Check 152
- Multiport Fuel Injection (MFI) Relay and Fuel Pump Relay Continuity Check 152
- Throttle Body (Throttle Valve Area) Cleaning 141
- Throttle Position Sensor Check 153

SEALANT 7

SERVICE SPECIFICATIONS 7

SPECIAL TOOLS 8

TROUBLESHOOTING 9

THROTTLE BODY 160

GENERAL INFORMATION

13100010708

The Multiport Fuel Injection System consists of sensors which detect the engine conditions, the ENGINE CONTROL MODULE (ECM) which controls the system based on signals from these sensors, and actuators which operate under the control of the ECM.
The ECM carries out activities such as fuel injection control, idle air control, and ignition timing control. In addition, the ECM is equipped with several diagnostic test modes which simplify troubleshooting when a problem develops.

FUEL INJECTION CONTROL

The injector drive times and injector timing are controlled so that the optimum air/fuel mixture is supplied to the engine to correspond to the continually-changing engine operation conditions.
A single injector is mounted at the intake port of each cylinder. Fuel is sent under pressure from the fuel tank to the fuel injectors by the fuel pump, with the pressure being regulated by the fuel pressure regulator. The regulated fuel is distributed to each of the injectors.
Fuel injection is normally carried out once for each cylinder for every two rotations of the crankshaft. The firing order is 1-3-4-2. Each cylinder has a dedicated fuel injector. This is called multiport. The ECM provides a richer air/fuel mixture by carrying out "open-loop" control when the engine is cold or operating under high load conditions in order to maintain engine performance.
In addition, when the engine is under normal operating temperature after warming-up, the ECM controls the air/fuel mixture by using the heated oxygen sensor signal to carry out "closed-loop" control. The closed-loop control achieves the theoretical air/fuel mixture ratio where the catalytic converter can obtains the maximum cleaning performance.

IDLE AIR CONTROL

The idle speed is kept at the optimum speed by controlling the amount of air that bypasses the throttle valve in accordance with changes in idling conditions and engine load during idling.
The ECM drives the idle air control (IAC) motor to keep the engine running at the pre-set idle target speed in accordance with the engine coolant temperature and air conditioning load. In addition, when the air conditioning switch is turned off and on while the engine is idling, the IAC motor adjusts the throttle valve bypass air amount according to the engine load conditions to avoid fluctuations in the engine speed.

IGNITION TIMING CONTROL

The ignition power transistor located in the ignition primary circuit turns ON and OFF to control the primary current flow to the ignition coil. This controls the ignition timing to provide the optimum ignition timing with respect to the engine operating conditions. The ignition timing is determined by the ECM from the engine speed, intake air volume, engine coolant temperature, and atmospheric pressure.

DIAGNOSTIC TEST MODE

- When an abnormality is detected in one of the sensors or actuators related to emission control, the SERVICE ENGINE SOON/MALFUNCTION INDICATOR LAMP illuminates to warn the driver.
- When an abnormality is detected in one of the sensors or actuators, a diagnostic trouble code corresponding to the abnormality is stored in the ECM.
- The RAM data inside the ECM that is related to the sensors and actuators can be read with the scan tool.
  In addition, the actuators can be controlled by the Scan tool (MUT-II) under certain circumstances.

OTHER CONTROL FUNCTIONS

1. Fuel Pump Control
   Turns the fuel pump relay ON so that current is supplied to the fuel pump while the engine is cranking or running.
2. A/C Compressor Clutch Relay Control
   Turns the compressor clutch of the A/C ON and OFF.
3. Fan Relay Control
   The radiator fan and condenser fan speeds are controlled in response to the engine coolant temperature and vehicle speed.
4. Evaporative Emission Purge Control
   (Refer to GROUP 17.)
5. EGR Control
   (Refer to GROUP 17.)

GENERAL SPECIFICATIONS

Items		Specifications
Throttle body	Throttle bore mm (in.)	46 (1.81)
	Throttle position sensor	Variable resistor type
	Idle air control motor	Stepper motor (Stepper motor type by-pass air control system with the air volume limiter)
	Closed throttle position switch	Rotary contact type, within throttle position sensor
	Idle air control valve position sensor	Hall element type
Engine control module (ECM)	Identification model No.	E2T69284 <Federal> E2T69283 <California>
Sensors	Manifold absolute pressure sensor	Semiconductor type
	Intake air temperature sensor	Thermistor type
	Engine coolant temperature sensor	Thermistor type
	Heated oxygen sensor	Zirconia type
	Vehicle speed sensor	Electromagnetic resistance element type
	Park/Neutral position switch	Contact switch type
	Camshaft position sensor	Hall element type
	Crankshaft position sensor	Hall element type
	Power steering pressure switch	Contact switch type
Actuators	Multiport fuel injection (MFI) relay	Contact switch type
	Fuel pump relay	Contact switch type
	Injector type and number	Electromagnetic type, 4
	Injector identification mark	CDH166
	EGR solenoid	Duty cycle type solenoid valve
	Evaporative emission purge solenoid	Duty cycle type solenoid valve
Fuel pressure regulator	Regulator pressure kPa (psi)	335 (47.6)

MULTIPORT FUEL INJECTION (MFI) SYSTEM DIAGRAM

<Vehicles for Federal>

SENSE

- ★1 Heated oxygen sensor (front)
- ★2 Intake air temperature sensor
- ★3 Throttle position sensor
- ★4 Closed throttle position switch
- ★5 Camshaft position sensor
- ★6 Crankshaft position sensor
- ★7 Engine coolant temperature sensor
- ★8 Heated oxygen sensor (rear)
- ★9 Manifold absolute pressure sensor
- ★10 Fuel tank differential pressure sensor

- Power supply
- Vehicle speed sensor
- A/C switch
- Park/Neutral position switch
- Power steering pressure switch
- Ignition switch-ST

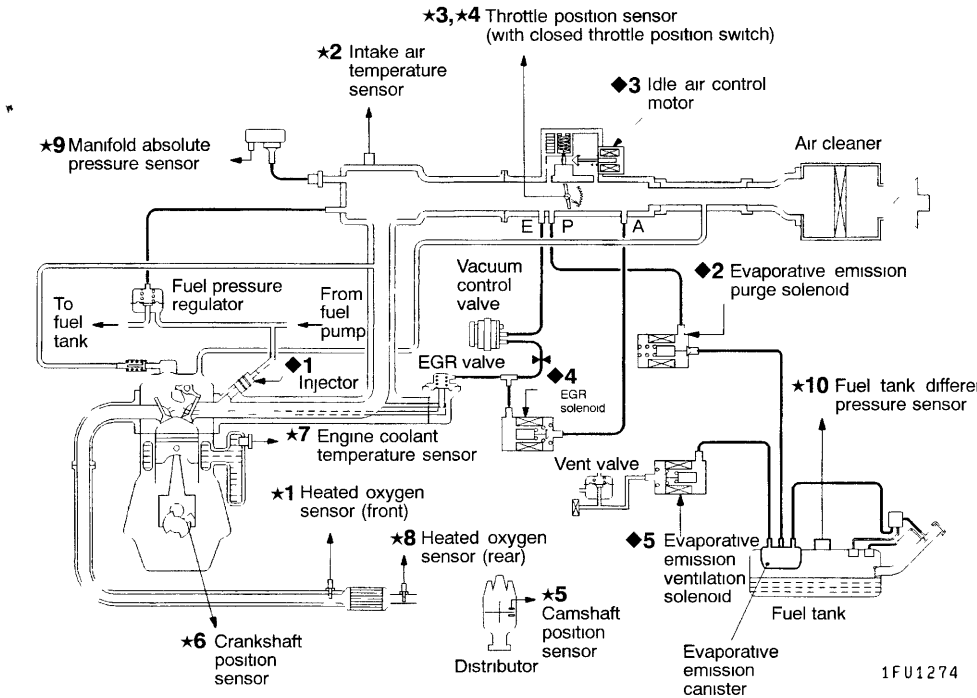
DECIDE

Engine control module

ACT

- ◆1 Injector
- ◆2 Evaporative emission purge solenoid
- ◆3 Idle air control motor
- ◆4 EGR solenoid
- ◆5 Evaporative emission ventilation solenoid

- Fuel pump relay
- Multiport fuel injection (MFI) relay
- A/C compressor clutch relay
- Service Engine Soon/Malfunction Indicator Lamp
- Diagnostic output
- Ignition coil, Ignition power transistor



<Vehicles for California>

SENSE

- ★1 Heated oxygen sensor (front)
- ★2 Intake air temperature sensor
- ★3 Throttle position sensor
- ★4 Closed throttle position switch
- ★5 Camshaft position sensor
- ★6 Crankshaft position sensor
- ★7 Engine coolant temperature sensor
- ★8 Heated oxygen sensor (rear)
- ★9 Manifold absolute pressure sensor
- ★10Fuel tank differential pressure sensor

- Power supply
- Vehicle speed sensor
- A/C switch
- Park/Neutral position switch
- Power steering pressure switch
- Ignition switch-ST

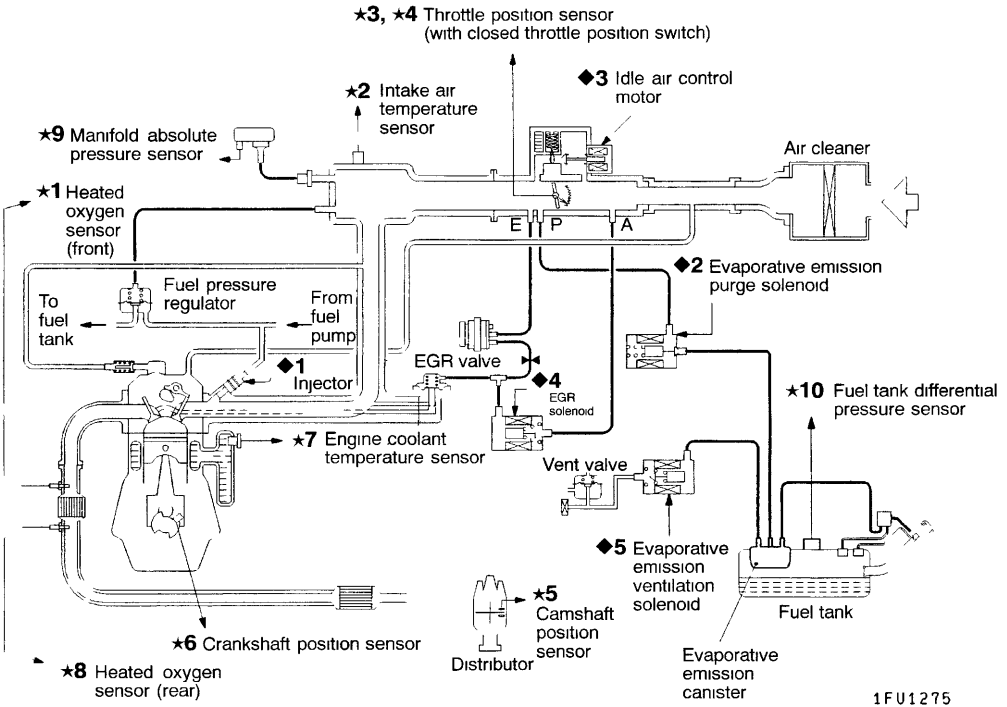
DECIDE

Engine control module

ACT

- ◆1 Injector
- ◆2 Evaporative emission purge solenoid
- ◆3 Idle air control motor
- ◆4 EGR solenoid
- ◆5 Evaporative emission ventilation solenoid

- Fuel pump relay
- Multiport fuel injection (MFI) relay
- A/C compressor clutch relay
- Service Engine Soon/Malfunction Indicator Lamp
- Diagnostic output
- Ignition coil, Ignition power transistor



SERVICE SPECIFICATIONS

13100030476

Items			Standard value
Basic ignition timing			5° BTDC ± 3° at curb idle
Curb idle speed r/min			700 ± 100
Idle speed when A/C is ON r/min			850 in Neutral
Basic idle speed r/min			700 ± 50
Throttle position sensor adjusting voltage mV			400-1000
Throttle position sensor resistance kΩ			3.5-6 5
Intake air temperature sensor resistance kΩ		20°C (86°F)	2.3-3.0
		80°C (176°F)	0.30-0.42
Engine coolant temperature sensor resistance kΩ		20°C (68°F)	2.1-2 7
		80°C (176°F)	0 26-0 36
Heated oxygen sensor output voltage V			0.6-1.0
Fuel pressure kPa (psi)	Vacuum hose disconnected		330-350 (47-50) at curb idle
	Vacuum hose connected		Approx. 270 (38) at curb idle
Injector coil resistance Ω			13-16 [at 20°C (68°F)]
Idle air control motor coil resistance Ω			28-33 [at 20°C (68°F)]

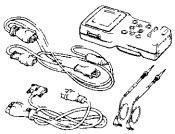
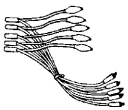
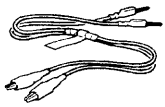
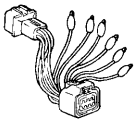
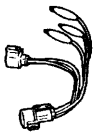
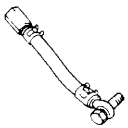
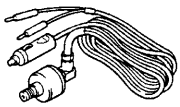
SEALANT

13100050021

Item	Specified sealant
Engine coolant temperature sensor threaded portion	3M Nut Locking Part No. 4171 or equivalent

SPECIAL TOOLS

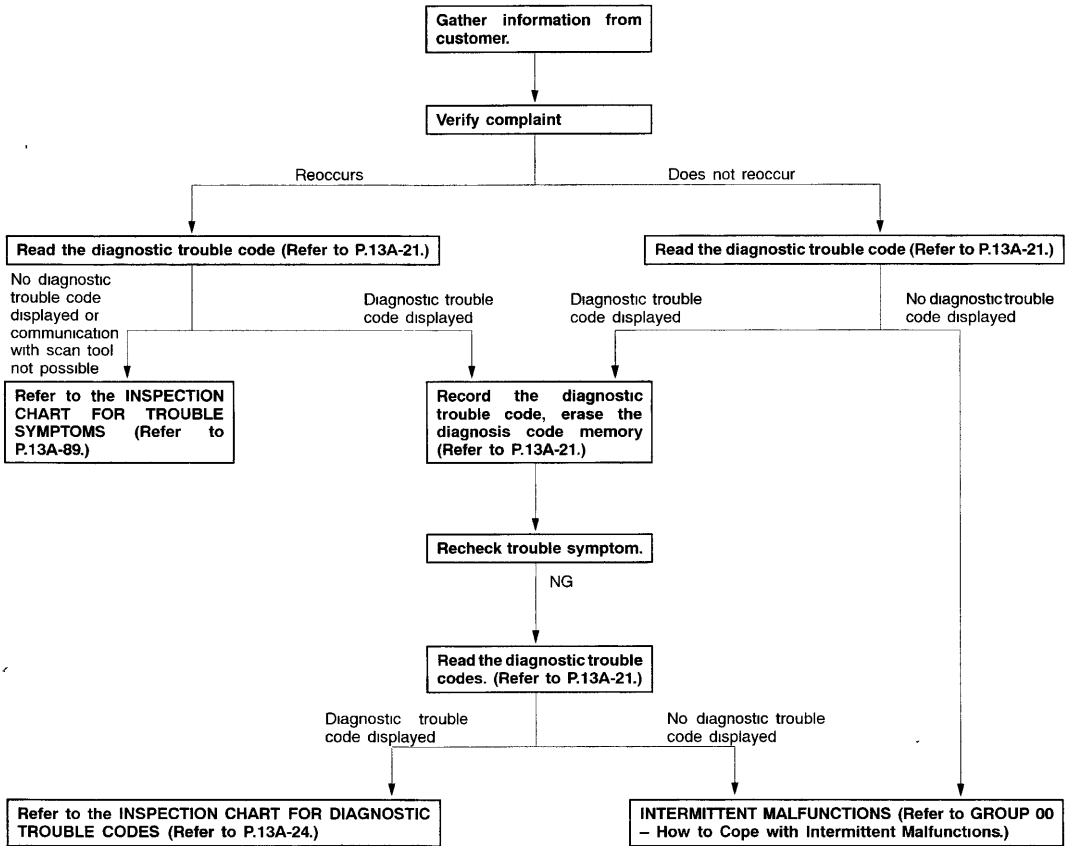
13100060536

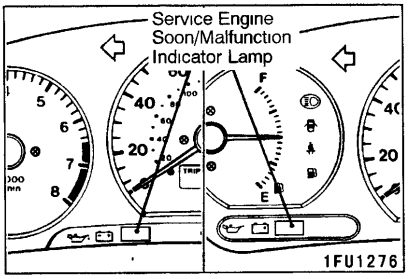
Tool	Tool number and name	Supersession	Application
	MB991502 Scan tool <MUT-II>	MB991496-OD	• Reading diagnostic trouble code • MFI system inspection
	MB991348 Test harness set	MB991348-01	• Adjustment of closed throttle position switch, throttle position sensor • Inspection using an analyzer
	MB991529 Diagnostic trouble code check harness	Tool not necessary if scan tool <MUT-II> is available	Check for diagnostic trouble codes.
	MD998463 Test harness (6 pin, square)	MD998463-01	• Inspection of idle air control motor • Inspection using an analyzer
	MD998464 Test harness (4 pin, square)	MD998464-01	• Inspection of heated oxygen sensor • Inspection using an analyzer
	MD998478 Test harness (3 pin, triangle)	MD998478-01	Inspection using an analyzer
	MD998709 Adaptor hose	MIT210196	Measurement of fuel pressure
	MD998742 Hose adaptor	MD998742-01	Measurement of fuel pressure
 B991637	MB991637 Fuel pressure gauge set	Tool not available	Measurement of fuel pressure

TROUBLESHOOTING

13100850454

DIAGNOSTIC TROUBLESHOOTING FLOW





DIAGNOSTIC TEST MODE

13100860648

SERVICE ENGINE SOON/MALFUNCTION INDICATOR LAMP

Among the on-board diagnostic items, a Service Engine Soon/ Malfunction Indicator Lamp illuminates to notify the driver of an emission control malfunction.
However, when an irregular signal returns to normal and the engine control module judges that it has returned to normal, the Service Engine Soon/Malfunction Indicator Lamp is switched off.
Moreover, when the ignition switch is turned off, the lamp is switched off. Even if the ignition switch is turned on again, the lamp does not illuminate until the malfunction is detected.
Here, immediately after the ignition switch is turned on, the Service Engine Soon/Malfunction Indicator Lamp is lit for 5 seconds to indicate that the Service Engine Soon/Malfunction Indicator Lamp operates normally.

Items Indicated by the Service Engine Soon/Malfunction Indicator Lamp

DTC No.	Items
-	Engine control module (ECM) malfunction
P0105	Manifold absolute pressure circuit malfunction
P0110	Intake air temperature circuit malfunction
P0115	Engine coolant temperature circuit malfunction
P0120	Throttle position circuit malfunction
P0125*	Excessive time to enter closed loop fuel control
P0130	Heated oxygen sensor circuit malfunction (sensor 1)
P0135	Heated oxygen sensor heater circuit malfunction (sensor 1)
P0136	Heated oxygen sensor circuit malfunction (sensor 2)
P0141	Heated oxygen sensor heater circuit malfunction (sensor 2)
P0170	Fuel trim malfunction
P0201	Injector circuit malfunction cylinder-1
P0202	Injector circuit malfunction cylinder-2
P0203	Injector circuit malfunction cylinder-3
P0204	Injector circuit malfunction cylinder-4
P0300*	Random misfire detected
P0301*	Cylinder 1 misfire detected
P0302*	Cylinder 2 misfire detected
P0303*	Cylinder 3 misfire detected
P0304*	Cylinder 4 misfire detected
P0335	Crankshaft position sensor circuit malfunction

DTC No.	Items
P0340	Camshaft position sensor circuit malfunction
P0400	Exhaust gas recirculation flow malfunction
P0403	Exhaust gas recirculation solenoid malfunction
P0420	Catalyst system efficiency below threshold <Federal>
P0421	Warm up catalyst efficiency below threshold <California>
P0442	Evaporative emission control system leak detected
P0443	Evaporative emission control system purge control valve circuit malfunction
P0446	Evaporative emission control system vent control malfunction
P0450	Evaporative emission control system pressure sensor malfunction
P0455	Evaporative emission control system leak detected (Gross leak)
P0505	Idle control system malfunction
P0510	Closed throttle position switch malfunction
P0551	Power steering pressure sensor circuit Range/Performance
P0705	Transmission range sensor circuit malfunction (PRND2L input)
P0710	Transmission fluid temperature sensor circuit malfunction
P0715	Input/turbine speed sensor circuit malfunction
P0720	Output speed sensor circuit malfunction
P0725	Engine speed input circuit malfunction
P0740	Torque converter clutch system malfunction
P0750	Shift solenoid A malfunction
P0755	Shift solenoid B malfunction
P0760	Shift solenoid C malfunction
P0765	Shift solenoid D malfunction
P1600	Serial communication link malfunction
P1751	A/T control relay malfunction
P1795	Throttle position input circuit malfunction

NOTE

1. After the Engine Control Module (ECM) detects a malfunction, the Service Engine Soon/Malfunction Indicator Lamp illuminates when the engine is next turned on and the same malfunction is re-detected.
   However, for items marked with a "*", the Service Engine Soon/Malfunction Indicator Lamp illuminates on the first detection of the malfunction.
2. After the Service Engine Soon/Malfunction Indicator Lamp illuminates, it will be switched off under the following conditions.
   - When the ECM monitored the powertrain malfunction three times* and detected no malfunction.
     *: In this case, "one time" indicates from engine start to stop.
   - For misfiring or a fuel trim malfunction, when driving conditions (engine speed, engine coolant temperature, etc.) are similar to those when the malfunction was first recorded.

Caution

If the Service Engine Soon/Malfunction Indicator Lamp illuminates because of a malfunction of the ECM, transmission between the scan tool and the ECM cannot occur. In this case, the diagnostic trouble code cannot be read.

ON-BOARD DIAGNOSTICS

The engine control module monitors the input/output signals (some signals all the time and others under specified conditions) of the engine control module.
When a malfunction continues for a specified time or longer after the irregular signal is initially monitored, the engine control module judges that a malfunction has occurred.
After the engine control module first detects a malfunction, a diagnostic trouble code is recorded when the engine is restarted and the same malfunction is re-detected However, for items marked with a "*", a diagnostic trouble code is recorded on the first detection of the malfunction.
There are 48 diagnostic items. The diagnostic results can be read out with a scan tool.
Since memorization of the diagnostic trouble codes is backed up directly by the battery, the diagnostic results are memorized even if the ignition key is turned off. The diagnostic trouble codes will, however, be erased when the battery terminal or the engine control module connector is disconnected.
In addition, the diagnostic trouble code can also be erased by turning the ignition switch to ON and sending the diagnostic trouble code erase signal from the scan tool to the engine control module.

Caution
If the sensor connector is disconnected with the ignition switch turned on, the diagnostic trouble code is memorized. In this case, send the diagnostic trouble code erase signal to the engine control module in order to erase the diagnostic memory.

The 48 diagnostic items are all indicated sequentially from the smallest code number.
The engine control module records the engine operating condition when the diagnostic trouble code is set. This data is called "Freeze-frame" data. This data can be read by using the scan tool, and can then be used in simulation tests for troubleshooting. Data items are as follows.

Data	Unit
Engine coolant temperature	°C or °F
Engine speed	r/min
Vehicle speed	km/h or mph
Long-term fuel compensation (Long-term fuel trim)	%
Short-term fuel compensation (Short-term fuel trim)	%
Fuel control condition	• Open loop • Closed loop • Open loop-drive condition • Open loop-DTC set • Closed loop-O_2 (rear) failed
Calculation load value	%
Diagnostic trouble code during data recording	-

OBD-II DRIVE CYCLE

All kinds of diagnostic trouble codes can be monitored by carrying out a short drive in accordance with the following 6 drive cycle patterns. In other words, doing such a drive allows to regenerate any kind of trouble which involves illuminating the Service Engine Soon/Malfunction Indicator Lamp and to check the repair procedure has eliminated the trouble (the Service Engine Soon/Malfunction Indicator Lamp is no longer illuminated).

Caution
Two mechanics should always get on the vehicle when carrying out a drive test.

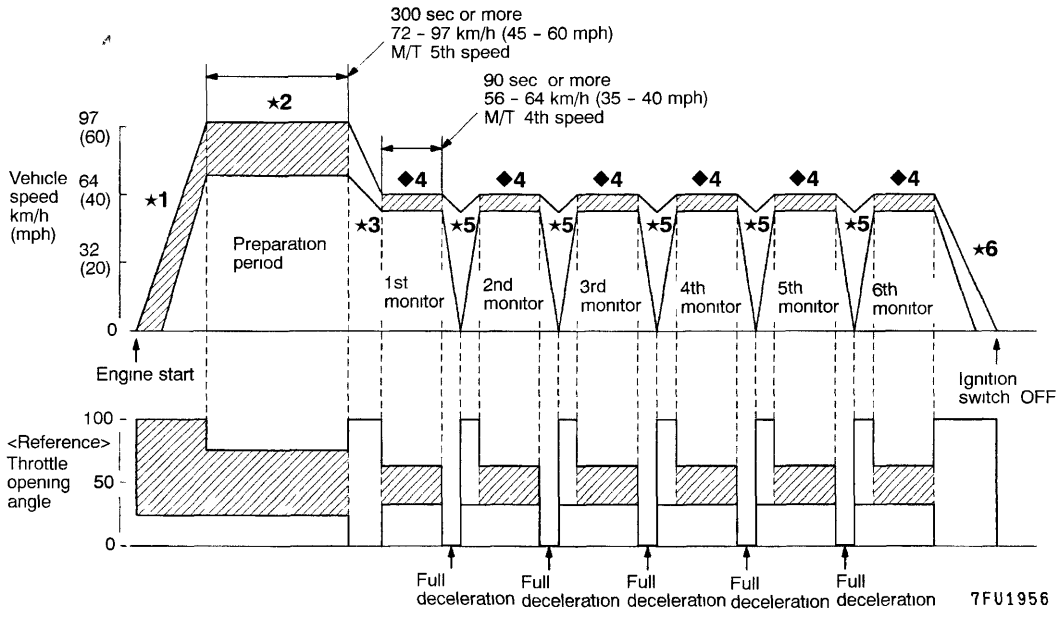
Catalytic converter monitor (P0420, P0421)

Test requirements/procedure

1. All of the following requirements should be met when carrying out a drive test.
   (1) Atmospheric temperature: -10°C (14°F) or more
   (2) Condition of A/T:
   - Selector lever position: D range

   (3) A/C switch: OFF
2. One trip monitor will be completed by driving according to the steps below (from start to switch off). It will take 20 minutes.
   ★1: Start the engine, and accelerate gradually to 72 km/h (45 mph) or more.
   ★2: Preparation period; continue driving between 72 and 97 km/h (45 and 60 mph) for 300 seconds. Brake may be applied for this period if it continues for only a few seconds.
   ★3: Decelerate to 56 - 64 km/h (35 - 40 mph).
   ◆4: Drive between 56 and 64 km/h (35 and 40 mph) at a constant throttle angle (by not moving the throttle pedal as much as possible) for 90 seconds or more during monitor.
   ★5: Decelerate with the throttle valve fully closed (Brake may be applied for this period). After the vehicle is being decelerated for ten seconds, accelerate gradually to 56 - 64 km/h (35 - 40 mph).
   ★6: Decelerate and stop the vehicle. Then turn off the ignition switch.

Drive cycle pattern



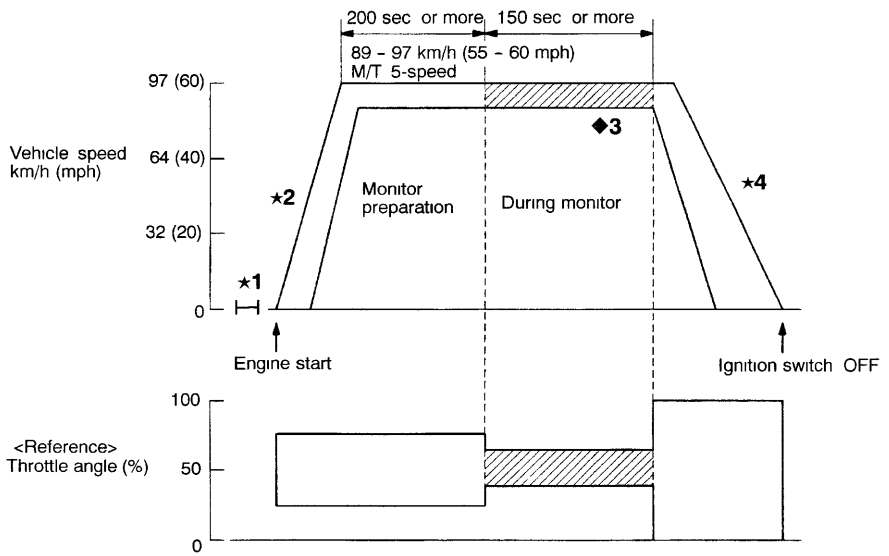
Caution
Vehicle speed and throttle opening angle should be within the shaded rage.

Evaporative emission control system leak monitor (P0442, P0450, P0455)

Test requirements/procedure

1. All of the following requirements should be met when carrying out a drive test.
   (1) Engine coolant temperature: 45°C (113°F) or less (before starting drive test, engine stopped)
   (2) Atmospheric temperature: 5°C (41°F) or more, 45°C (113°F) or less
   (3) Condition of A/T:
   - Selector lever position: D range
   - Overdrive switch: ON
2. One trip monitor will be completed by driving according to the steps below (from start to switch off). (It takes approx. 8 minutes.)
   ★1: Check that both engine coolant temperature and air intake temperature satisfy requirement 1 (engine stopped).
   ★2: Monitor preparation period; Start the engine, and accelerate to 89 - 97 km/h (55 - 60 mph). For this period, acceleration, deceleration, or braking may be carried out.
   Continue driving between 89 and 97 km/h (55 and 60 mph) for 200 seconds or more. For this period, braking or throttle operation may be carried out if vehicle speed is within the specified value.
   ◆3: Drive between 89 and 97 km/h (55 and 60 mph) at a constant throttle angle (by not moving the throttle pedal as much as possible) for 150 seconds or more during monitor. Moreover, do not turn the steering wheel suddenly.
   ★4: Decelerate and stop the vehicle. After stop, turn off the ignition switch.

Drive cycle pattern



7FU1957

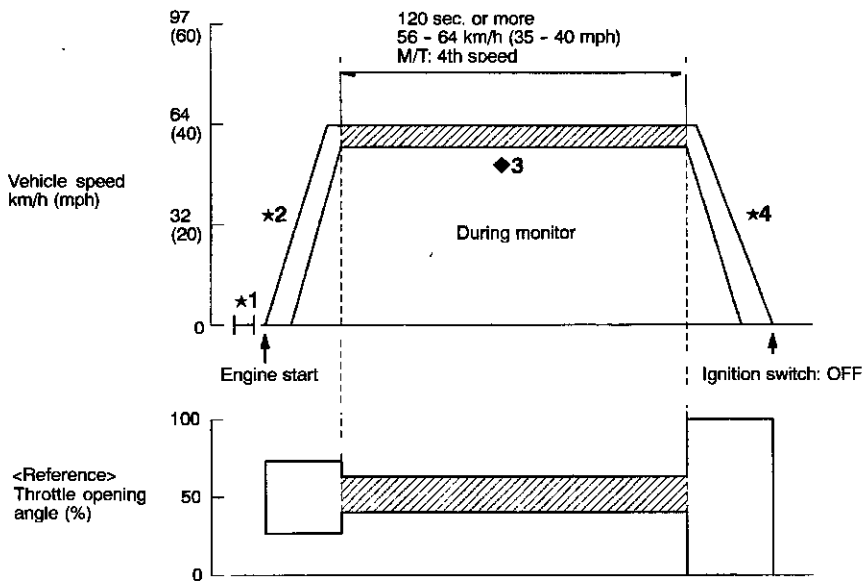
Caution
Drive within the shaded area in the graph above.

Heated oxygen sensor monitor (P0130, P0136)

Test requirements/procedure

1. Test requirements/procedure
   (1) Engine coolant temperature: 80°C (176°F) or more (Engine fully warmed up)
   (2) Atmospheric temperature: -10°C (14°F) or more
   (3) Condition of A/T:
   - Selector lever position: D range
2. One trip monitor will be completed by driving according to the steps below (from start to switch off). It will take 5 minutes.
   ★1: After warming up the engine, turn off the ignition switch.
   ★2: Start the engine, and accelerate to 56 - 64 km/h (35 - 40 mph).
   ◆3: Drive between 56 and 64 km/h (35 and 40 mph) at a constant throttle angle (by not moving the throttle pedal as much as possible) for 120 seconds or more during monitor. Moreover, do not turn the steering wheel suddenly.
   ★4: Decelerate and stop the vehicle. Then turn off the ignition switch.

Drive cycle pattern



Caution
Vehicle speed and throttle opening angle should be within the shaded rage.

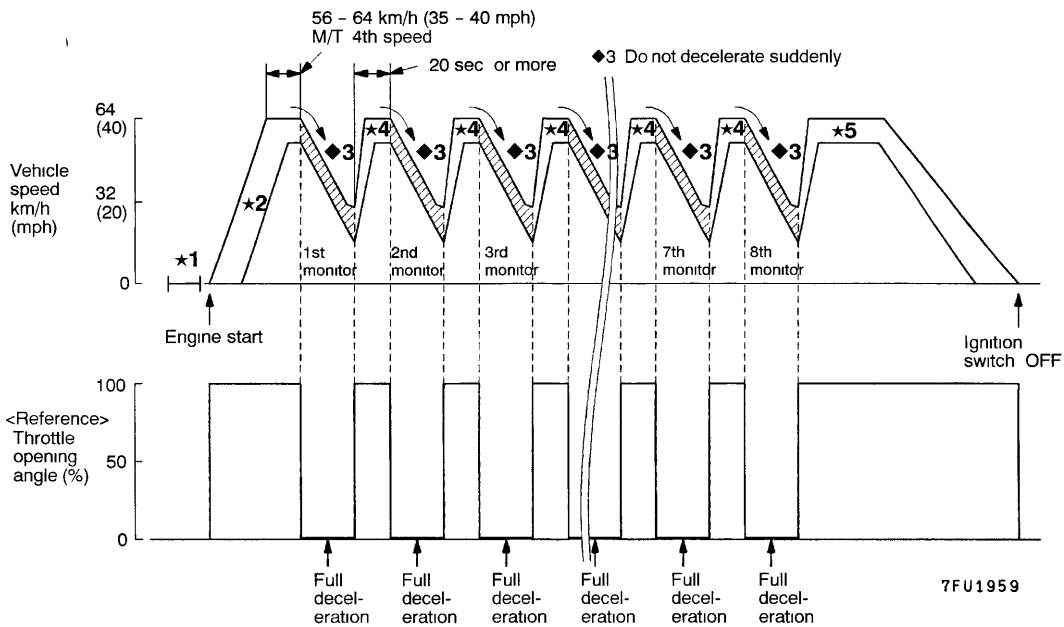
Exhaust gas recirculation (EGR) system monitor (P0400)

Test requirements/procedure

1. All of the following requirements should be met when carrying out a drive test.
   (1) Engine coolant temperature: 80°C (176°F) or more (Engine fully warmed up)
   (2) Atmospheric temperature: 5°C (41°F) or more
   (3) Condition of A/T:
   - Selector lever position: D range

   (4) A/C switch: OFF
2. One trip monitor will be completed by driving according to the steps below (from start to switch off). It will take approx. 10 minutes.
   ★1: After warming up, turn off the ignition switch.
   ★2: Start the engine, and accelerate to 56 - 64 km/h (35 - 40 mph).
   ◆3: Close the throttle fully from 2000 - 3000 r/min with the clutch engaged <M/T>, and then decelerate to 900 r/min without applying brakes. Moreover, do not turn the steering wheel or switch on or off the lights.
   ★4: Accelerate to 56 - 64 km/h (35 - 40 mph), and continue driving for 20 seconds. (After 1st monitor (deceleration), wait for 20 seconds or more until the next monitor (deceleration) starts). Then repeat ◆3 and ★4 steps eight times.
   ★5: Decelerate and stop. Then turn off the ignition switch.

Drive cycle pattern



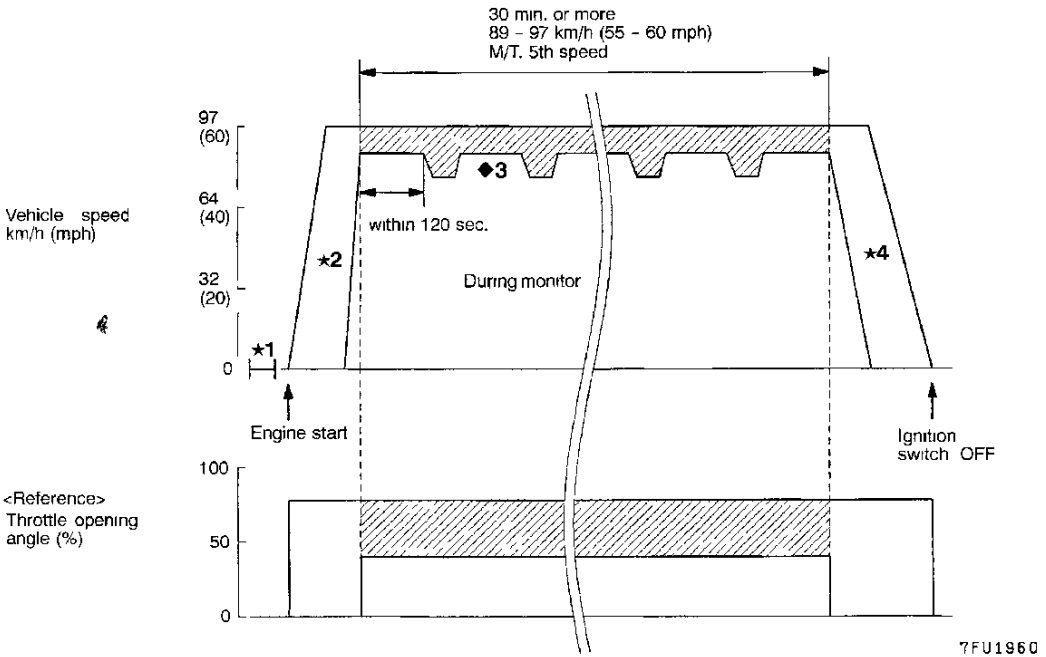
Caution
Vehicle speed should be within the shaded rage.

Fuel trim monitor (P0170)

Test requirements/procedure

1 All of the following requirements should be met when carrying out a drive test
   (1) Engine coolant temperature: 80°C - 97°C (176 - 207°F) (Engine fully warmed up)
   (2) Atmospheric temperature: -10°C (14°F) or more, 60°C (140°F) or less
   (3) Condition of A/T:
      • Selector lever position: D range
2. One trip monitor will be completed by driving according to the steps below (from start to switch off). It will take 35 minutes.
   ★1: After warming up the engine, turn off the ignition switch.
   ★2: Start the engine, and accelerate to 89 - 97 km/h (55 - 60 mph).
   ◆3: Drive between 89 and 97 km/h (55 and 60 mph) for 30 minutes or more during monitor. Moreover, do not drive the vehicle at the constant speed range for 120 seconds or more. (Accelerate or decelerate lightly within the 120 seconds. Brake may be applied, but avoid decelerating or accelerating suddenly).
   ★4: Decelerate and stop the vehicle. Then turn off the ignition switch.

Drive cycle pattern



Caution
Vehicle speed and throttle opening angle should be within the shaded rage.

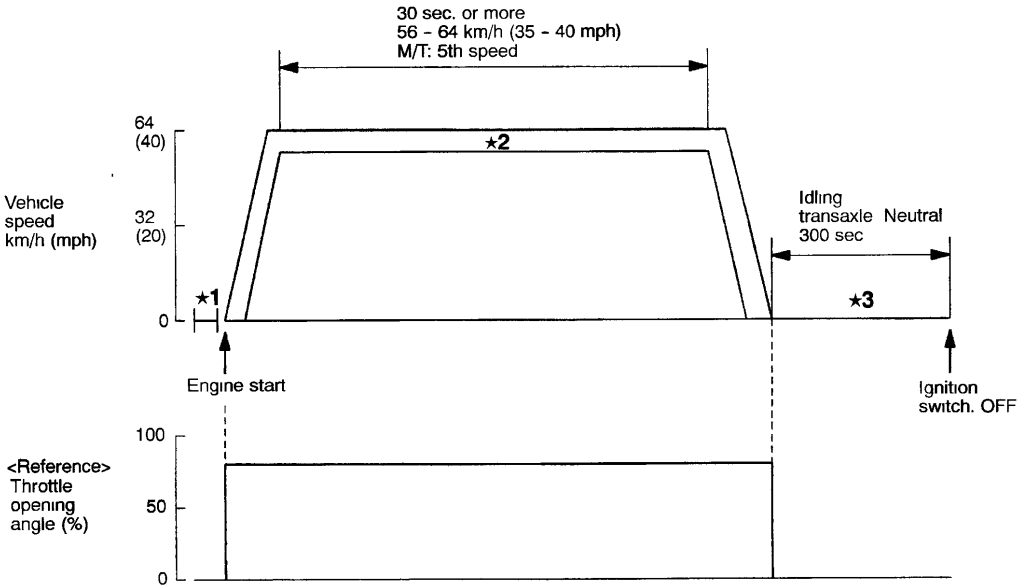
Other monitors

- Misfire (P0300, P0301, P0302, P0303, P0304)
- Evaporative emission control system (P0440)
- Idle air control system (P0505)
- Excessive time to enter closed loop fuel control (P0125)
- Throttle position sensor (P0120)
- Manifold absolute pressure circuit malfunction (P0105)
- Intake air temperature sensor (P0110)
- Serial communication link <A/T> (P1600)
- Crankshaft position sensor (P0335)
- Camshaft position sensor (P0340)
- Engine coolant temperature sensor (P0115)
- Closed throttle position switch (P0510)
- Generator FR terminal circuit (P1500)
- O_2 sensor circuit (P0130, P0136)
- O_2 sensor heater circuit (P0135, P0141)
- EGR solenoid (P0403)
- Evaporative emission purge solenoid (P0443)
- Injector circuit (P0201, P0202, P0203, P0204)
- Evaporative emission ventilation solenoid (P0446)

Test requirements/procedure

1. All of the following requirements should be met when carrying out a drive test.
   (1) Engine coolant temperature: 80°C (176°F) or more (Engine fully warmed up)
   (2) Atmospheric temperature: 5°C (41°F) or more
   (3) Condition of A/T:
   - Selector lever position D range
2. One trip monitor will be completed by driving according to the steps below (from start to switch off). It will take approx. 10 minutes.
   ★1: After warming up, turn off the ignition switch.
   ★2: Start the engine, accelerate to 56 - 64 km/h (35 - 40 mph), continue driving for 300 seconds or more at that speed range and stop. Moreover, brake or throttle may be applied for this period.
   ★3: After stopping the vehicle, continue idling for 300 seconds or more, and then turn off the ignition switch. Moreover, the vehicle should be set to the following conditions for idling.
   - A/C switch: OFF
   - Lights, electric cooling fan and all accessories: OFF
   - Transaxle: Neutral (A/T for P range)
   - Steering wheel: Straight-forward position

Drive cycle pattern



NOTE
Drive according to the graph above.

READINESS TEST STATUS

The ECM monitors the following main diagnosis items and records whether the evaluation passing or failing in the past. These records can be read with a scan tool. (When using MUT-II, "Complete" will appear to indicate that the evaluation has been completed.)
These records will all be reset if the battery terminal is disconnected or the DTC are erased, etc.
To complete the readiness test status which has been reset, the "OBD-II Drive Cycle" related to a diagnosis item should be carried out.

NOTE
If the vehicle is normal, the readiness test status will be complete by carrying out the "OBD-II Drive Cycle" once. If the ECM detects a malfunction of the vehicle, the readiness test status will be complete by carrying out the "OBD-II Drive Cycle" twice. In addition, after all readiness test status are complete, a DTC should be interrogated. If a DTC is stored, perform repair by referring to the relevant DTC procedures. Then complete the readiness test status by repeating the "OBD-II Drive Cycle". If a DTC is not stored, no further action will be needed.

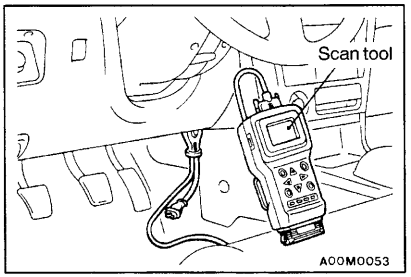
- Catalyst: P0420, P0421
- Evaporative system: P0442, P0455
- Heated oxygen sensor: P0130, P0136
- Heated oxygen sensor heater: P0135, P0141
- EGR system: P0400

HOW TO READ AND ERASE DIAGNOSTIC TROUBLE CODES

Caution

1. **If battery voltage is low, diagnostic trouble codes may not be output. Be sure to check the battery and charging system before continuing.**
2. **If the battery is disconnected or if the engine control module connector is disconnected, the diagnostic trouble code memory will be erased. Do not disconnect the battery or engine control module until after the diagnostic trouble codes are recorded.**
3. **Turn the ignition switch off before connecting or disconnecting the scan tool.**

NOTE
If a DTC is erased, its "freeze frame" data will be also erased and the readiness test status will be reset. If necessary, take a note of the "freeze frame" data before erasing the DTC.



1. Connect the scan tool to the data link connector, and read the diagnostic trouble codes.
2. Repair the malfunction while referring to the INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES.
3. Turn the ignition switch to OFF and then back to ON again.
4. Erase the diagnostic trouble codes using the scan tool.
5. Confirm that the diagnostic trouble code reading is normal.

PROVISIONAL DTCs [MUT-II OBD-II Test Mode - Results (Mode 5)]

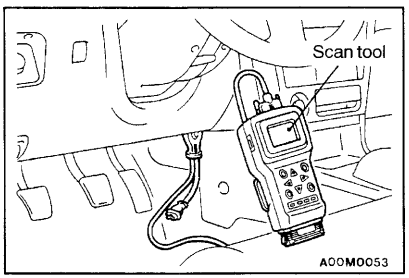
MUT-II will display the Provisional DTCs reported by ECM if the ECM detects some malfunction for "Misfire", "Fuel System" and "Comprehensive" monitoring during a SINGLE Driving Cycle.
The intended use of this data is to assist the technician after a vehicle repair, and after clearing diagnostic information, by reporting test result after a SINGLE Driving Cycle.
Note that the test results reported by this mode do not necessarily indicate a faulty component/system. If test results indicate a failure after ADDITIONAL (consecutive) driving, then the MIL will be illuminated and a DTC will set.

DIAGNOSTIC BY DIAGNOSTIC TEST MODE II (INCREASED SENSITIVITY)

When mode II is selected with MUT-II, the Service Engine Soon/Malfunction Indicator Lamp will light when the ECM first detects the trouble. (Note that this is only for engine related trouble.) At the same time, the relevant diagnostic trouble codes will be registered.
In respect to the comprehensive component electrical faults (opens/shorts), the time for the DTC to be registered after the fault occurrence is shortened (4 sec. → 1 sec.)
With this, the confirmation of the trouble symptom and the confirmation after completing repairs can be reduced.
To return to the normal mode I after mode II has been selected once, the ignition switch must be turned OFF once or mode I must be reselected with the MUT-II. The DTC, readiness test status and freeze frame data, etc., will be erased when mode I is returned to, so record these if necessary.
(1) Using the scan tool, changeover the diagnostic test mode of the engine control module to DIAGNOSTIC TEST MODE II. (INCREASED SENSITIVITY)
(2) Road test the vehicle.

(3) Read the diagnostic trouble code in the same manner as "READ OUT OF DIAGNOSTIC TROUBLE CODE" and repair the malfunctioning part.
(4) Turn OFF the ignition switch to change the ECM from the diagnostic test mode II to the diagnostic test mode I.

NOTE
Turning OFF the ignition switch will cause the ECM to changeover from the diagnostic test mode II to diagnostic test mode I.



INSPECTION USING SCAN TOOL DATA LIST AND ACTUATOR TESTING

1. Carry out inspection by means of the data list and the actuator test function.
   If there is an abnormality, check and repair the chassis harnesses and components.
2. After repairing, re-check using the scan tool and check to be sure that the abnormal input and output have returned to normal as a result of the repairs.
3. Erase the diagnostic trouble code(s).
4. Remove the scan tool.
5. Start the engine again and road test to confirm that the problem is eliminated.

NOTE
Refer to P.13A-122 for Data list.
Refer to P.13A-127 for Actuator tests.

FAIL-SAFE/BACKUP FUNCTION TABLE

13100910206

When the main sensor malfunctions are detected by the diagnostic test mode, the vehicle is controlled by means of the following defaults.

Malfunctioning item	Control contents during malfunction
Manifold absolute pressure sensor	1. Uses the throttle position sensor signal and engine speed signal (crankshaft position sensor signal) for basic injector drive time and basic ignition timing from the pre-set mapping 2. Fixes the IAC motor in the appointed position so idle air control is not performed.
Intake air temperature sensor	Controls as if the intake air temperature is 25°C (77°F).
Throttle position sensor (TPS)	No increase in fuel injection amount during acceleration due to the unreliable throttle position sensor signal
Engine coolant temperature sensor	Controls as if the engine coolant temperature is 80°C (176°F).
Camshaft position sensor	Injects fuel into the cylinders in the order 1-3-4-2 with irregular timing (After the ignition switch is turned to ON, the No 1 cylinder top dead center is not detected at all.)
Heated oxygen sensor <front>	Air/fuel ratio closed loop control is not performed
Heated oxygen sensor <rear>	Performs the closed loop control of the air/fuel ratio by using only the signal of the heated oxygen sensor (front) installed on the front side of the catalytic converter.
Generator FR terminal	No generator output suppression control is performed for the electrical load (to be operated as an ordinary generator).
Misfire detection	The ECM stops supplying fuel to the cylinder with the highest misfiring rate if a misfiring that could damage the catalytic converter is detected.

INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES (FAULT TREE) 13100870740

DTC No	Diagnostic items	Check items (Remedy)	Memory	Reference page
P0105	Manifold Absolute Pressure Circuit Malfunction	• Harness and connector (If harness and connector are normal, replace manifold absolute pressure sensor assembly)	Retained	13A-28
P0110	Intake Air Temperature Circuit Malfunction	• Harness and connector • Intake air temperature sensor	Retained	13A-29
P0115	Engine Coolant Temperature Circuit Malfunction	• Harness and connector • Engine coolant temperature sensor	Retained	13A-30
P0120	Throttle Position Circuit Malfunction	• Harness and connector • Throttle position sensor • Closed throttle position switch	Retained	13A-31
P0125	Excessive Time to Enter Closed Loop Fuel Control*	• O_2 sensor (front) • O_2 sensor harness and connector • Injector	Retained	13A-32
P0130	O_2 Sensor Circuit Malfunction (Sensor 1)	• Harness and connector [If harness and connector are normal, replace O_2 sensor (front).]	Retained	13A-33
P0135	O_2 Sensor Heater Circuit Malfunction (Sensor 1)	• Harness and connector • O_2 sensor (front) heater	Retained	13A-34
P0136	O_2 Sensor Circuit Malfunction (Sensor 2)	• Harness and connector • O_2 sensor (rear)	Retained	13A-35
P0141	O_2 Sensor Heater Circuit Malfunction (Sensor 2)	• Harness and connector • O_2 sensor (rear) heater	Retained	13A-36
P0170	Fuel Trim Malfunction	• Injector • Fuel pressure • Intake air leaks • Engine coolant temperature sensor • Intake air temperature sensor • Manifold absolute pressure sensor • O_2 Sensor • Exhaust manifold cracks	Retained	13A-37
P0201	Injector Circuit Malfunction - Cylinder 1	• Harness and connector • Injector	Retained	13A-38
P0202	Injector Circuit Malfunction - Cylinder 2			
P0203	Injector Circuit Malfunction - Cylinder 3			
P0204	Injector Circuit Malfunction - Cylinder 4			

DTC No	Diagnostic items	Check items (Remedy)	Memory	Reference page
P0300	Random Misfire Detected	• Ignition coil • Ignition power transistor • Spark plug • Ignition circuit • Injector • O_2 Sensor • Compression • Timing belt • Crankshaft position sensor • Air intake • Fuel pressure • Crankshaft position sensor circuit and connector	Retained	13A-39
P0301	Cylinder 1 Misfire Detected	• Ignition coil • Ignition power transistor • Spark plug • Ignition circuit • Injector • O_2 Sensor • Compression • Timing belt • Crankshaft position sensor • Air intake • Fuel pressure • Crankshaft position sensor circuit and connector	Retained	13A-40
P0302	Cylinder 2 Misfire Detected			
P0303	Cylinder 3 Misfire Detected			
P0304	Cylinder 4 Misfire Detected			
P0335	Crankshaft Position Sensor Circuit Malfunction	• Harness and connector (If harness and connector are normal, replace crankshaft position sensor.)	Retained	13A-41
P0340	Camshaft Position Sensor Circuit Malfunction	• Harness and connector (If harness and connector are normal, replace camshaft position sensor.)	Retained	13A-42
P0400	Exhaust Gas Recirculation Flow Malfunction	• Harness and connector • EGR valve • EGR solenoid • EGR valve control vacuum • Manifold absolute pressure sensor	Retained	13A-43
P0403	Exhaust Gas Recirculation Solenoid Malfunction	• Harness and connector • EGR solenoid	Retained	13A-44
P0420	Catalyst Efficiency Below Threshold <Federal>	• Exhaust manifold (Replace the catalytic converter if there is no cracks, etc.)	Retained	13A-45
P0421	Warm Up Catalyst Efficiency Below Threshold <California>	• Exhaust manifold (Replace the catalytic converter if there is no cracks, etc.)	Retained	13A-46
P0442	Evaporative Emission Control System Leak Detected	• Harness and connector • Evaporative emission purge solenoid • Evaporative emission ventilation solenoid • Vacuum hoses routing	Retained	13A-47

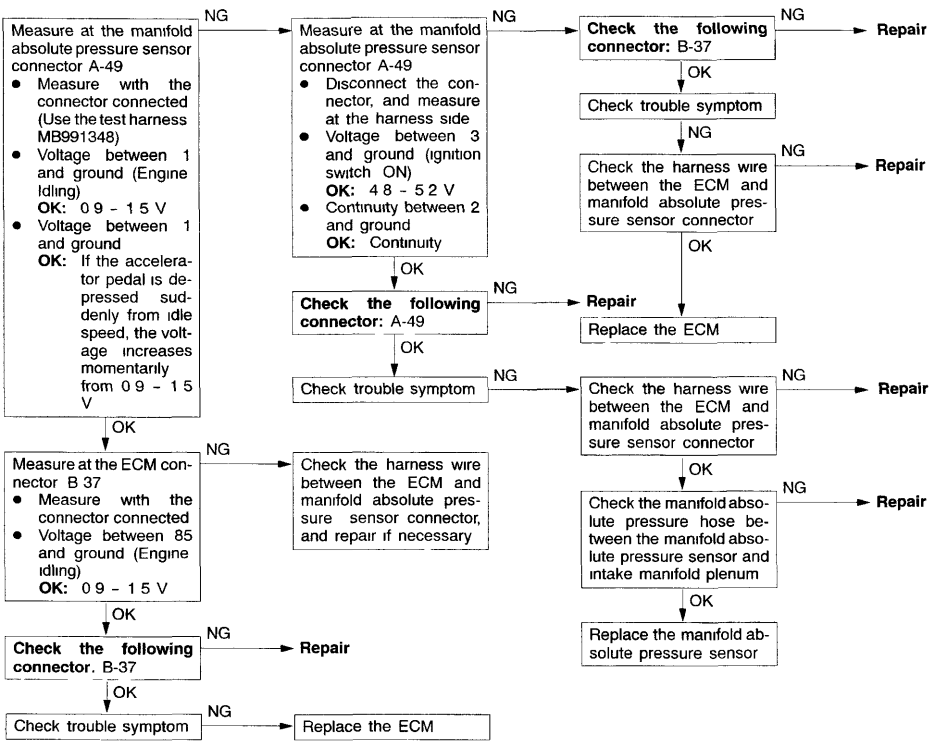
DTC No.	Diagnostic items	Check items (Remedy)	Memory	Reference page
P0443	Evaporative Emission Control System Purge Control Valve Circuit Malfunction	• Harness and connector • Evaporative emission purge solenoid	Retained	13A-57
P0446	Evaporative Emission Control System Vent Control Malfunction	• Harness and connector • Evaporative emission ventilation solenoid	Retained	13A-58
P0450	Evaporative Emission Control System Pressure Sensor Malfunction	• Harness and connector • Fuel tank differential pressure sensor	Retained	13A-59
P0455	Evaporative Emission Control System Leak Detected (Gross Leak)	• Harness and connector • Evaporative emission ventilation solenoid	Retained	13A-71
P0500	Vehicle Speed Sensor Malfunction	• Harness and connector • Vehicle speed sensor	Retained	13A-81
P0505	Idle Control System Malfunction	• Harness connector • Idle air control motor	Retained	13A-82
P0510	Closed Throttle Position Switch Malfunction	• Harness and connector • Closed throttle position switch	Retained	13A-83
P0551	Power Steering Pressure Sensor Circuit Range/Performance	• Harness and connector • Power steering pressure switch	Retained	13A-84
P0705	Transmission Range Sensor Circuit Malfunction (PRND2L Input)	• Harness and connector • Park/Neutral position switch	Retained	13A-84
P0710	Transmission Fluid Temperature Sensor Circuit Malfunction	• Harness and connector • Transaxle fluid temperature sensor	Retained	13A-84
P0715	Input/turbine Speed Sensor Circuit Malfunction	• Harness and connector • Pulse generator	Retained	13A-85
P0720	Output Speed Sensor Circuit Malfunction	• Harness and connector • Pulse generator	Retained	13A-85
P0725	Engine Speed Input Circuit Malfunction	• Harness and connector	Retained	13A-85
P0740	Torque Converter Clutch System Malfunction	• Harness and connector • Torque converter clutch solenoid	Retained	13A-85
P0750	Shift Solenoid A Malfunction	• Harness and connector • Low-reverse solenoid	Retained	13A-85
P0755	Shift Solenoid B Malfunction	• Harness and connector • Underdrive solenoid	Retained	13A-86
P0760	Shift Solenoid C Malfunction	• Harness and connector • Second solenoid	Retained	13A-86
P0765	Shift Solenoid D Malfunction	• Harness and connector • Overdrive solenoid	Retained	13A-86
P1500	Generator FR Terminal Circuit Malfunction	• Harness and connector	Retained	13A-87
P1600	Serial communication link malfunction	• Harness and connector	Retained	13A-88
P1720	Vehicle Speed Sensor Signal Line Malfunction	• Harness and connector	Retained	13A-88
P1751	A/T Control Relay Malfunction	• Harness and connector • A/T control relay	Retained	13A-88

DTC No.	Diagnostic items	Check items (Remedy)	Memory	Reference page
P1795	Throttle Position Input Circuit Malfunction	• Harness and connector	Retained	13A-88

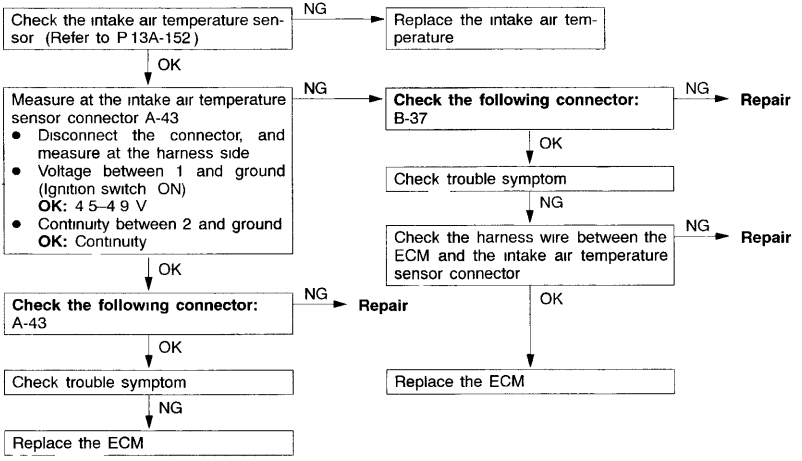
NOTE
1. Do not replace the engine control module (ECM) until a thorough terminal check reveals there are no short/open circuits.
2. After the ECM detects a malfunction, a diagnostic trouble code is recorded the next time the engine started and the same malfunction is re-detected. However, for items marked with a "★", the diagnostic trouble code is recorded on the first detection of the malfunction.
3. O_2 : Heated oxygen sensor
4. Sensor 1 : indicates sensors which are mounted closest to the engine.
5. Sensor 2 : indicates sensors which are mounted next-closest to the engine.

INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES

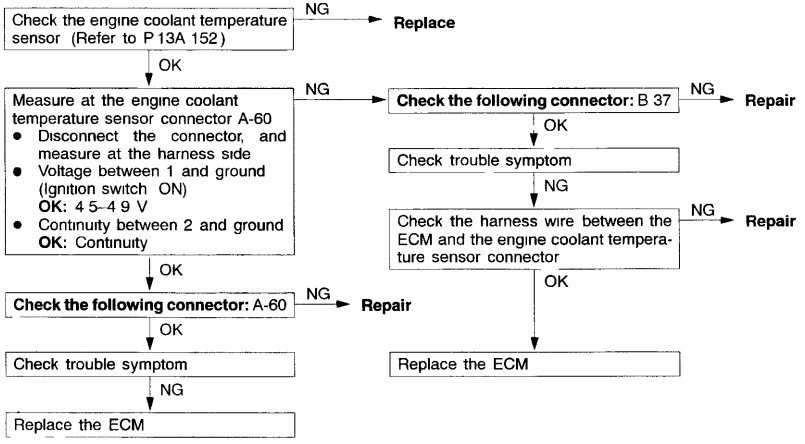
Code No.P0105 Manifold Absolute Pressure Circuit Malfunction	Probable cause
Background • The manifold absolute pressure sensor outputs a voltage which corresponds to the intake manifold plenum pressure • The engine control module checks whether this voltage is within a specified range Check Area • Ignition Switch ON Judgment Criteria • Sensor output voltage has continued to be 4 5 V or higher [corresponding to an absolute pressure of 115 kPa (17 psi) or higher] or higher for 2 sec Check Area • Throttle position sensor voltage is not lower than 1 25 V, or • Engine speed is not higher than 4000 r/min Judgment Criteria • Sensor output voltage has continued to be 0 2 V or lower [corresponding to an absolute pressure of 4 9 kPa (0 7 psi) or lower] for 2 sec Check Area • Throttle position sensor voltage is 0 8 V or lower • Engine speed is not higher than 2000 r/min Judgment Criteria • Sensor output voltage is 4 V or more for 2 seconds Check Area • Throttle position sensor voltage is 3 5 V or more • Engine speed is 2000 r/min or more Judgment Criteria • Sensor output voltage is 1 1 V or less for 2 seconds	• Manifold absolute pressure sensor failed • Open or shorted manifold absolute pressure sensor circuit, or loose connector • Engine control module failed



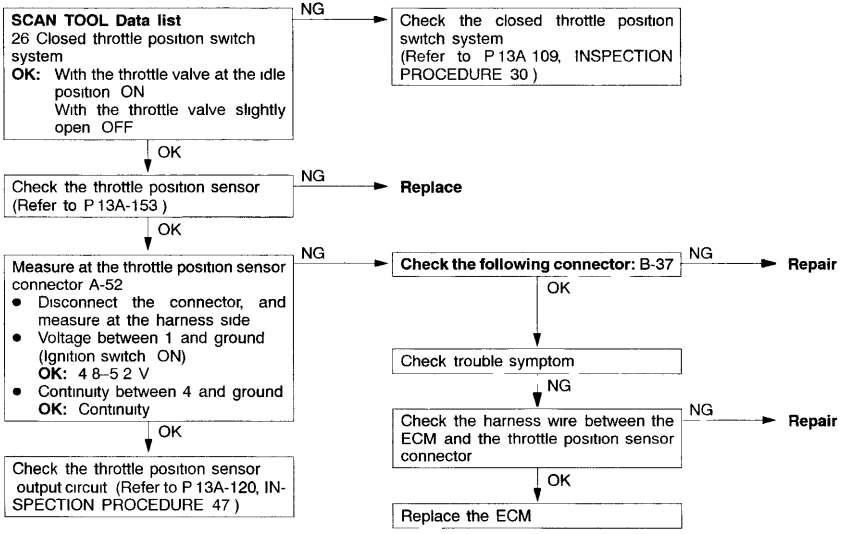
Code No. P0110 Intake Air Temperature Circuit Malfunction	Probable cause
Background • The intake air temperature sensor converts the intake air temperature to a voltage and outputs it • The engine control module checks whether the voltage is within a specified range Check Area • 2 sec or more have passed since the starting sequence was completed Judgment Criteria • Sensor output voltage has continued to be 4 6 V or higher [corresponding to an intake air temperature of -45°C (-49°F) or lower] for 2 sec, or • Sensor output voltage has continued to be 0 2 V or lower [corresponding to an intake air temperature of 125°C (257°F) or higher] for 2 sec	• Intake air temperature sensor failed • Open or shorted intake air temperature sensor circuit, or loose connector • Engine control module failed



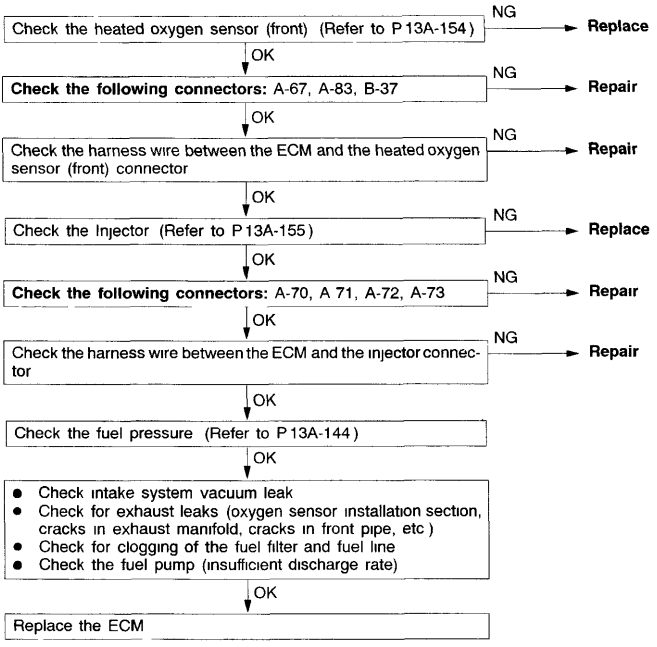
Code No. P0115 Engine Coolant Temperature Circuit Malfunction	Probable cause
Background • The engine coolant temperature sensor converts the engine coolant temperature to a voltage and outputs it • The engine control module checks whether the voltage is within a specified range In addition, it checks that the engine coolant temperature (signal) does not drop while the engine is warming up Check Area At least 2 seconds have passed since the ignition switch was turned on or the starting sequence was completed Judgment Criteria • Sensor output voltage has continued to be 4 6 V or higher [corresponding to a coolant temperature of -45°C (-49°F) or lower] for 2 sec, or • Sensor output voltage has continued to be 0 1 V or lower [corresponding to a coolant temperature of 140°C (284°F) or higher] for 2 sec Check Area Judgment Criteria • Sensor output voltage increased from a value lower than 1 6 V to a value higher than 1 6 V [Coolant temperature decreases from a higher than 40°C (104°F) temperature to a lower than 40°C (104°F) temperature] • then the sensor output voltage has continued to be 1 6 V or higher for 5 min Check Area Judgment Criteria • About 60 - 300 sec have passed for the engine coolant temperature to rise to about 40°C (104°F) after starting sequence was completed • However, time is not counted when fuel is shut off Check Area • Engine coolant temperature was 20°C (68°F) <Federal> or 7°C (44 6°F) <California> or more immediately before the engine was stopped at the last drive • Engine coolant temperature is 20°C (68°F) <Federal> or 7°C (44 6°F) <California> or more when the engine is started Judgement Criteria • Engine coolant temperature fluctuates within 1°C (1 8°F) after 5 minutes have passed since the engine was started • However, time is not counted in any of the following conditions (1) Intake air temperature is 60°C (140°F) or higher (2) Engine speed is 1 500 r/min or higher (3) Intake manifold pressure is 40 kPa (5 8 psi) or lower (4) During fuel shut-off operation • Monitored only once per trip	• Engine coolant temperature sensor failed • Open or shorted engine coolant temperature sensor circuit, or loose connector • Engine control module failed



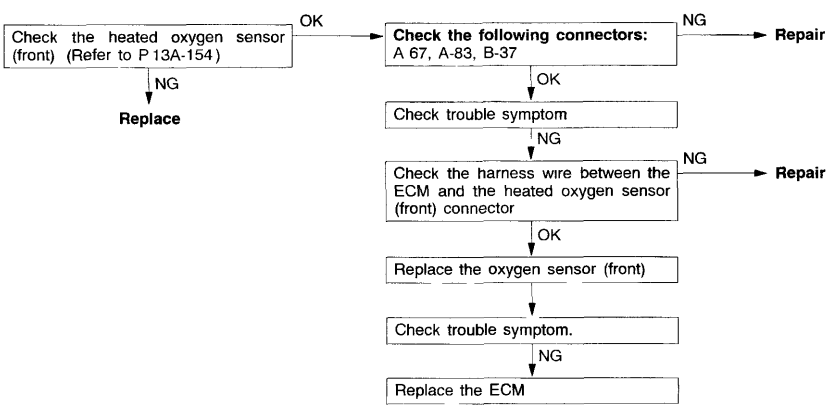
Code No. P0120 Throttle Position Circuit Malfunction	Probable cause
Background • The throttle position sensor outputs a voltage which is proportional to the throttle valve opening angle • The engine control module checks whether the voltage output by the throttle position sensor is within a specified range In addition, it checks that the voltage output does not become too large while the engine is idling Check Area • At least 2 seconds have passed since the engine was started Judgment Criteria • With the close throttle position switch set to ON, the sensor output voltage has continued to be 2 V or higher for 2 sec, or • Sensor output voltage has continued to be 0 2 V or lower for 2 sec Check Area • At least 2 seconds have passed since the engine was started • Engine speed is 3000 r/min or less • Intake air pipe pressure is 48 kPa (7 0 psi) or less Judgment Criteria • Sensor output voltage has continued to be 4 6 V or higher for 2 sec Check Area • At least 2 seconds have passed since the engine was started • Engine speed is 2000 r/min or more • Intake air pipe pressure is 53 kPa (7 7 psi) or more Judgment Criteria • Sensor output voltage is 0 8 V or less for 2 seconds	• Throttle position sensor failed or misadjusted • Open or shorted throttle position sensor circuit, or loose connector • Closed throttle position switch malfunction • Closed throttle position switch signal wire shorted • Engine control module failed



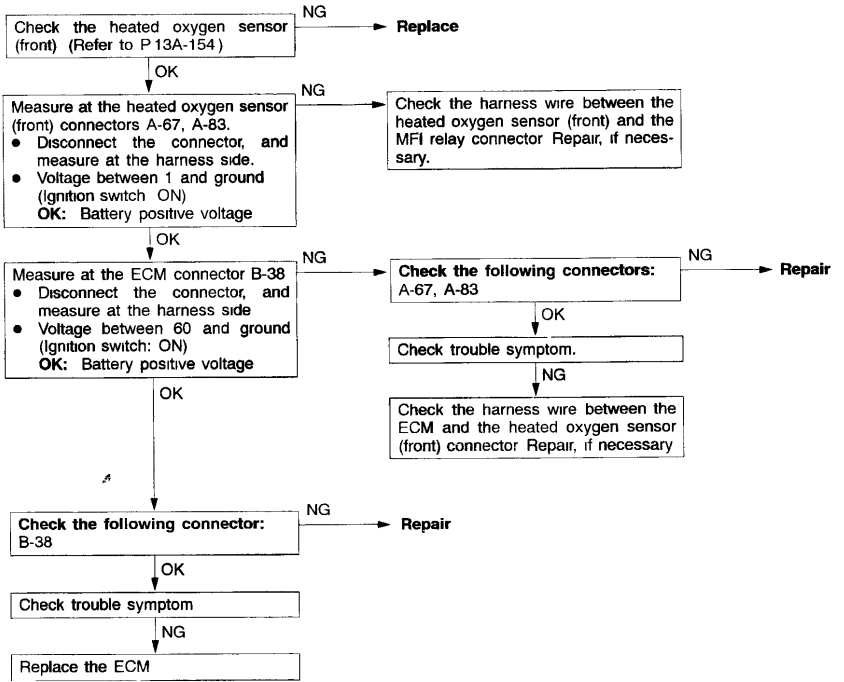
Code No. P0125 Excessive Time to Enter Closed Loop Fuel Control	Probable cause
Background • The MFI system reduces exhaust emissions by means of closed-loop fuel control • The engine control module checks the time taken until closed-loop fuel control commences Check Area • At least 2 seconds have passed since the engine was started • Engine coolant temperature is higher than 80°C (176°F) • Engine speed is at between about 1 800 and 4,000 r/min • Intake air pipe pressure is 24 kPa (3 5 psi) - 77 kPa (11 psi) • Engine operating within the air fuel ratio feedback zone • Monitoring time 30 sec Judgment Criteria • Multiport fuel injection system doesn't enter the closed loop control within about 30 sec • Monitored only once per trip	• Heated oxygen sensor failed • Injector failed • Fuel pressure regulator failed • Fuel pump failed • Fuel filter is clogged • Intake system vacuum leak • Exhaust leak • Engine control module failed



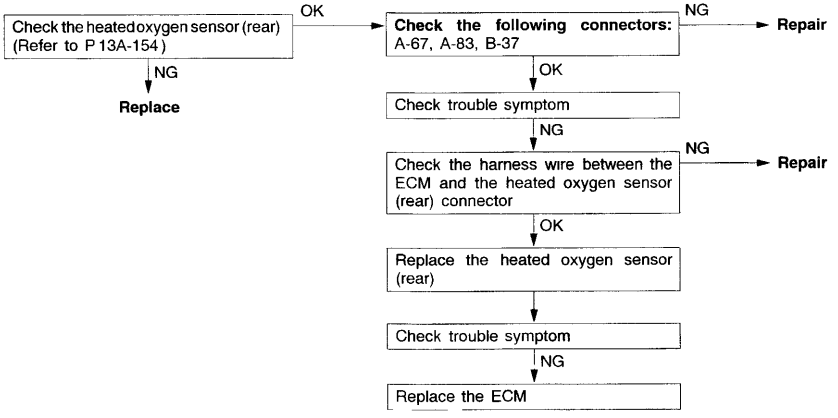
Code No. P0130 Heated Oxygen Sensor Circuit Malfunction (Sensor 1)	Probable cause
Background • When the heated oxygen sensor begins to deteriorate the oxygen sensor signal response becomes poor • The engine control module forcibly varies the air/fuel mixture to make it leaner and richer and checks the response speed of the heated oxygen sensor In addition, the engine control module also checks for an open circuit in the heated oxygen sensor output line Check Area • Coolant temperature sensor normal • Heated oxygen sensor signal voltage has continued to be 0 2 V or lower for 3 min or more after the starting sequence was completed • Engine coolant temperature is higher than 80°C (176°F) • Engine speed is higher than 1200 r/min • Intake air pressure is not lower than 40 kPa (5 8 psi) • Monitoring time 7 seconds • Volumetric efficiency is not lower than 25% Judgment Criteria • Input voltage supplied to the engine control module interface circuit is not lower than 4 5 V when 5 V is applied to the heated oxygen sensor output line via a resistor • Monitored only once per trip Check Area • Engine coolant temperature is not lower than 50°C (122°F) • Engine speed is between 1600 and 3000 r/min <M/T> or 1400 and 3200 r/min <A/T> • Intake air pipe pressure is 27 kPa (3 9 psi) - 67 kPa (9 8 psi) • Intake air temperature is -10°C (14°F) or more • Under the closed loop air-fuel control • Vehicle speed is 30 km/h (18 7 mph) or higher • Throttle valve opening angle (TPS output voltage) fluctuates within 0 117 V every 250 milliseconds • Monitoring Time 5 - 20 sec Judgment Criteria • When the air-fuel ratio is forcibly changed (lean to rich and rich to lean), the heated oxygen sensor signal doesn't provide response within 1 2 sec or • The heated oxygen sensor sends "lean" and "rich" signals alternately nine times or less for ten seconds • Monitored only three times per trip NOTE If the sensor switch time is longer than the Judgment Criteria due to the MUT-II OBD II test Mode - H02S Test Results, it is assumed that the heated oxygen sensor has deteriorated If it is short, it is assumed that the harness wire is broken or has a short circuit If the heated oxygen sensor signal voltage has not changed even once (lean/rich) after the DTC was erased, the sensor switch time will display as 0 seconds	• Heated oxygen sensor deteriorated • Open circuit in heated oxygen sensor output line • Engine control module failed



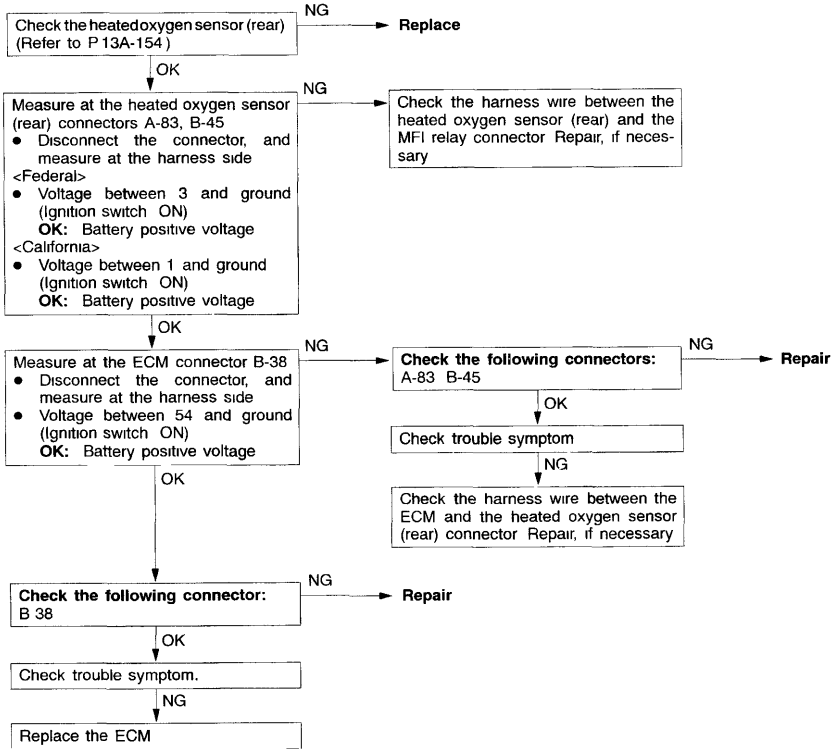
Code No. P0135 Heated Oxygen Sensor Heater Circuit Malfunction (Sensor 1)	Probable cause
Background • The engine control module checks whether the heater current is within a specified range when the heater is energized Check Area • Engine coolant temperature is 20°C (68°F) or higher. • The heated oxygen sensor heater is on • Battery voltage is between 11 and 16 V Judgment Criteria • Heater current of the front heated oxygen sensor heater (Sensor 1) has continued to be lower than 0.2 A or higher than 3.5 A for 6 sec. • Monitored only once per trip.	• Open or shorted oxygen sensor heater circuit • Open circuit in oxygen sensor heater • Engine control module failed



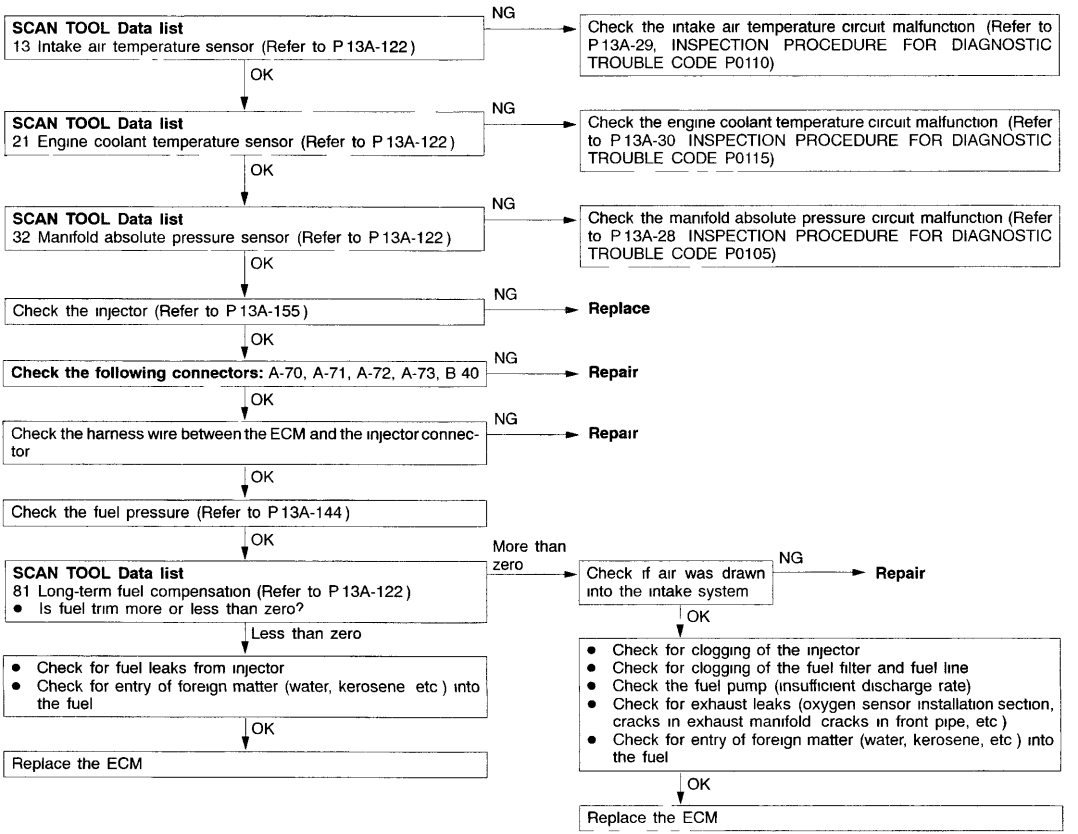
Code No. P0136 Heated Oxygen Sensor Circuit Malfunction (Sensor 2)	Probable cause
Background • The engine controls module checks for an open circuit in the heated oxygen sensor output line Check Area • Coolant temperature sensor normal • Heated oxygen sensor signal voltage has continued to be 0 1 V or lower for 3 min or more after the starting sequence was completed • Engine coolant temperature is not lower than 80°C (176°F) • Engine speed is higher than 1200 r/min • Intake air pressure is not lower than -40 kPa (-5 8 psi) • Monitoring time 7 sec Judgment Criteria • Input voltage supplied to the engine control module interface circuit is not lower than 4 5 V when 5 V is applied to the heated oxygen sensor output line via a resistor • Monitored only once per trip Check Area • Oxygen sensor signal voltage has been 0 1 V or less for 3 minutes after the engine was started • Engine coolant temperature is about 80°C (176°F) or higher • Engine speed is about 1 200 rpm or higher • Intake manifold pressure is 40 kPa (5 8 psi) or higher • At least 20 seconds have passed since fuel shut-off control was released • Oxygen sensor (front) output voltage is 0 5 V or higher • Monitoring time 10 seconds Judgement Criteria • Making the air-fuel ratio 15% richer doesn't result in raising the heated oxygen sensor output voltage beyond 0 1 V • Monitored once per trip Check Area • Engine coolant temperature is about 80°C (176°F) or more • The heated oxygen sensor (front) is operating • The engine runs for at least ten seconds when air-fuel ratio is rich • The heated oxygen sensor (rear) output voltage is 0 4 V or higher before fuel shut-off commences • While fuel is being shut off Judgment Criteria • At least 1 second has passed before heated oxygen sensor (rear) output voltage falls to 0 15 - 0 40 V or • At least 3 seconds have passed before the heated oxygen sensor (rear) output voltage falls to 0 15 V or less	• Heated oxygen sensor failed • Open circuit in heated oxygen sensor output line • Engine control module failed



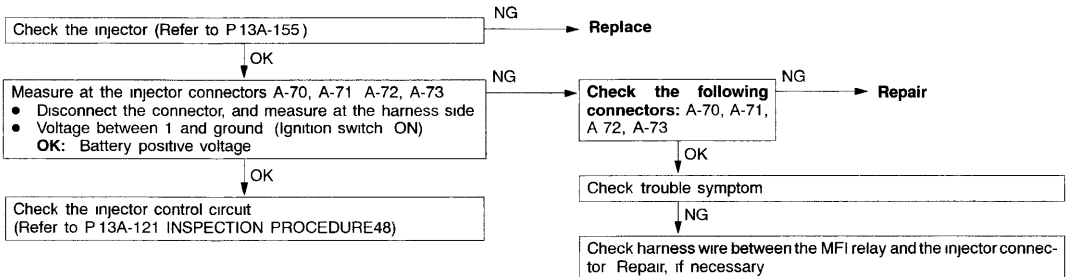
Code No. P0141 Heated Oxygen Sensor Heater Circuit Malfunction (Sensor 2)	Probable cause
Background • The engine control module checks whether the heater current is within a specified range when the heater is energized Check Area • Engine coolant temperature is 20°C (68°F) or more • The heated oxygen sensor heater is on • Battery voltage is between 11 and 16 V Judgment Criteria • Heater current of the front heated oxygen sensor heater (Sensor 2) has continued to be lower than 0.2 A or higher than 3.5 A for 6 sec • Monitored only once per trip	• Open or shorted oxygen sensor heater circuit • Open circuit in oxygen sensor heater • Engine control module failed



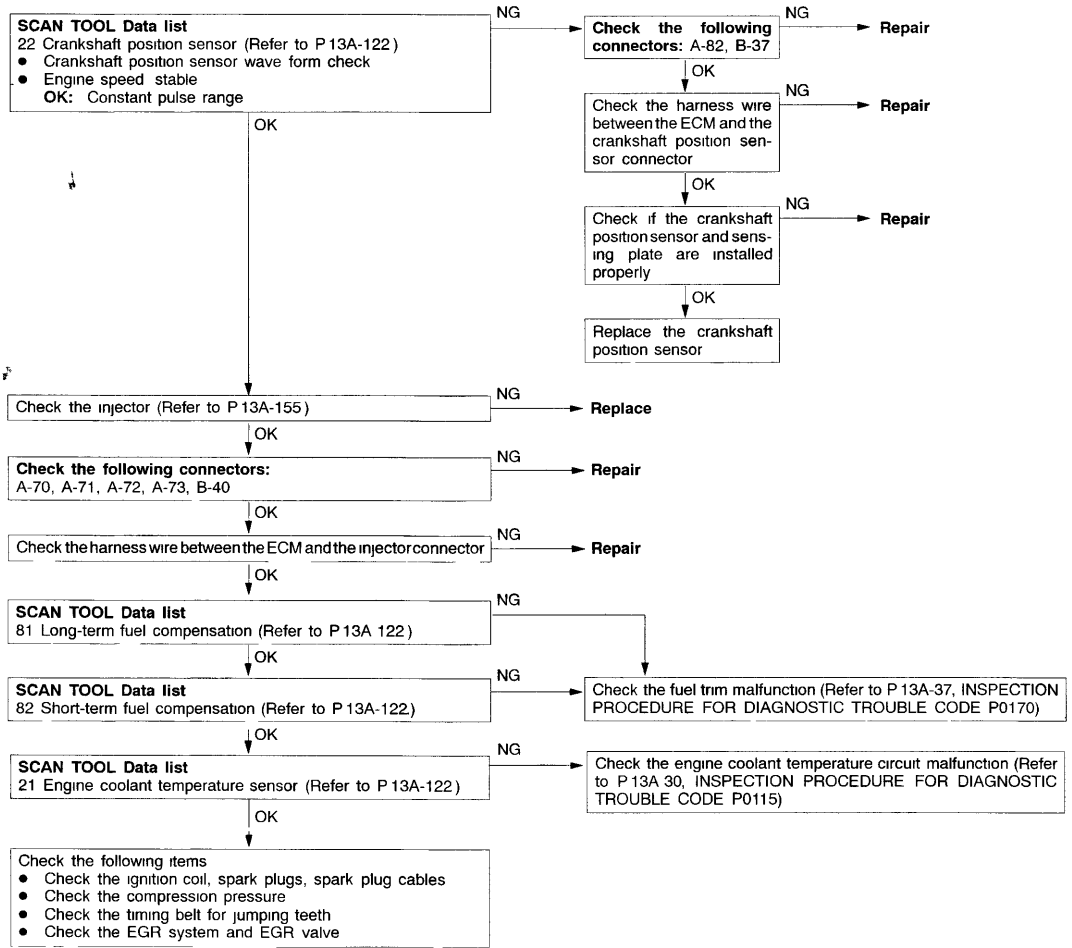
Code No. P0170 Fuel Trim Malfunction	Probable cause
Background • If a malfunction occurs in the fuel system, the fuel trim value becomes too large or too small • The engine control module checks whether the fuel trim value is within a specified range Check Area • Under the closed loop air fuel ratio control • Engine coolant temperature is -10°C (14°F) or higher • Intake air temperature -10°C (14°F) or more • Intake manifold pressure is 48 kPa (7 0 psi) or higher Judgment Criteria • Long-range fuel correction has continued to be higher than +12 5% or lower than -12 5% for 5 sec • Short-range fuel correction has continued to be higher than +10% or lower than -10% for 5 sec	• Injector failed • Incorrect fuel pressure • Air drawn in from gaps in gasket seals, etc • Heated oxygen sensor failed • Engine coolant temperature sensor failed • Intake air temperature sensor failed • Manifold absolute pressure sensor failed • Exhaust leak • Use of incorrect fuel • Engine control module failed



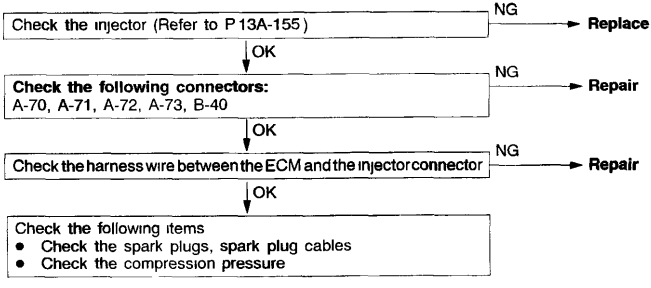
Code No. P0201, P0202, P0203, P0204 Injector Circuit Malfunction (Cylinder-1, Cylinder-2, Cylinder-3, Cylinder-4)	Probable cause
Background • A surge voltage is generated when the injectors are driven and the current flowing to the injector coil is shut off • The engine control module checks this surge voltage Check Area • Engine speed is between 50 and 1000 r/min • Throttle position sensor output voltage is lower than 1.0 V Judgment Criteria • Injector coil surge voltage (more than system voltege +2 V) has not been detected for 2 sec	• Injector failed • Open or shorted injector circuit, or loose connector • Engine control module failed



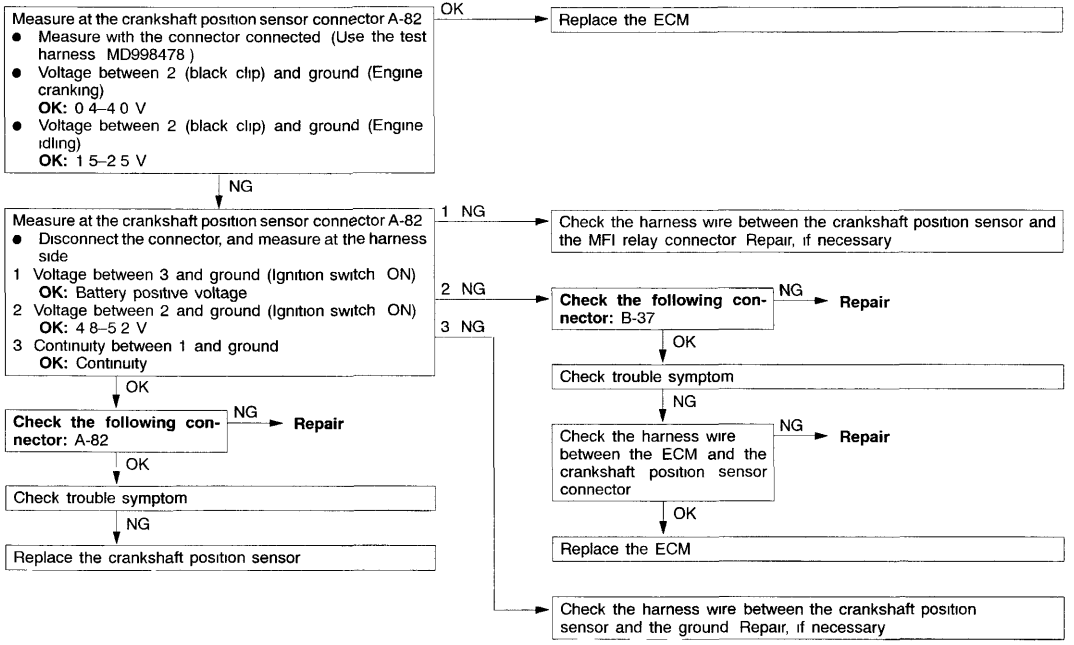
Code No. P0300 Random Misfire Detected	Probable cause
Background ● If a misfiring occurs while the engine is running, the engine speed suddenly changes ● The engine control module checks for changes in the engine speed Check Area ● 5 sec or more have passed after the engine was started ● Engine speed is between 500 and 6500 r/min ● Engine coolant temperature is -10°C (14°F) or more ● Intake air temperature -10°C (14°F) or more ● Adaptive learning is complete for the vane which generates a crankshaft position signal ● While the engine is running, excluding gear shifting, deceleration, sudden acceleration/deceleration and A/C compressor switching Judgment Criteria (change in the angular acceleration of the crankshaft is used for misfire detection) ● Misfire has occurred in the engine more than allowed (1 8%) per 200 revolutions [when the catalyst temperature is higher than 950°C (1742°F)] or ● Misfire has occurred in the engine more than allowed (1 8%) per 1 000 revolutions (Misfire exceeding 1 5 times the limit of emission standard)	● Ignition system related part(s) failed ● Poor crankshaft position sensor signal ● Incorrect air/fuel ratio ● Low compression pressure ● Engine coolant temperature sensor failed ● Timing belt teeth jumped ● Injector failed ● EGR valve failed ● Engine control module failed



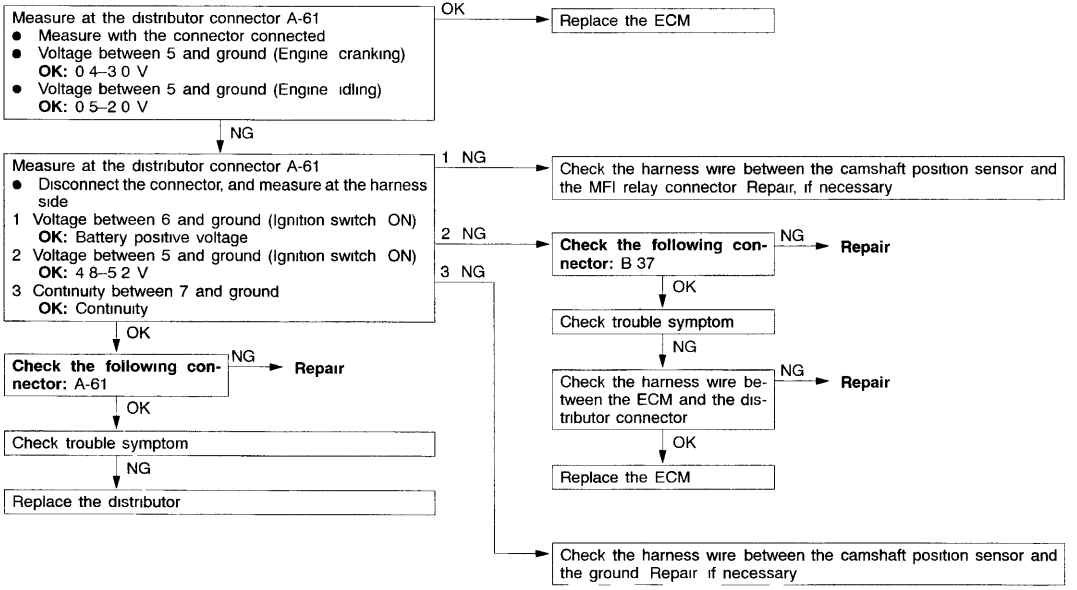
Code No. P0301, P0302, P0303, P0304, Misfire Detected (Cylinder-1, Cylinder-2, Cylinder-3, Cylinder-4)	Probable cause
Background • If a misfiring occurs while the engine is running, the engine speed suddenly changes. • The engine control module checks for changes in the engine speed Check Area • 5 sec or more have passed after the engine was started • Engine speed is between 500 and 6500 r/min • Engine coolant temperature is -10°C (14°F) or more. • Intake air temperature -10°C (14°F) or more • Adaptive learning is complete for the vane which generates a crankshaft position signal • While the engine is running, excluding gear shifting, deceleration, sudden acceleration/deceleration and A/C compressor switching. Judgment Criteria (change in the augular acceleration of the crankshaft is used for misfire detection) • Misfire has occurred in the engine more than allowed (1.8%) per 200 revolutions [when the catalyst temperature is higher than 950°C (1742°F)] or • Misfire has occurred in the engine more than allowed (1 8%) per 1,000 revolutions (Misfire exceeding 1 5 times the limit of emission standard)	• Ignition system related part(s) failed • Low compression pressure • Injector failed • Engine control module failed



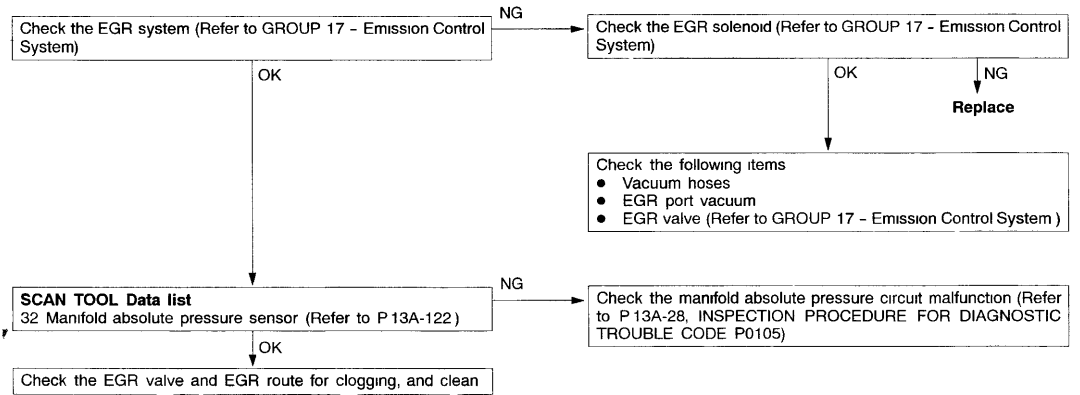
Code No. P0335 Crankshaft Position Sensor Circuit Malfunction	Probable cause
Background • When the engine is running the crankshaft position sensor outputs a pulse signal • The engine control module checks whether the pulse signal is input while the engine is cranking Check Area • Engine is being cranked Judgment Criteria • Sensor output voltage has not changed (no pulse signal is input) for 2 sec Check Area Judgment Criteria • Normal signal pattern has not been input for cylinder identification from the crankshaft position sensor signal and camshaft position sensor signal for 2 sec	• Crankshaft position sensor failed • Open or shorted crankshaft position sensor circuit or loose connector • Engine control module failed



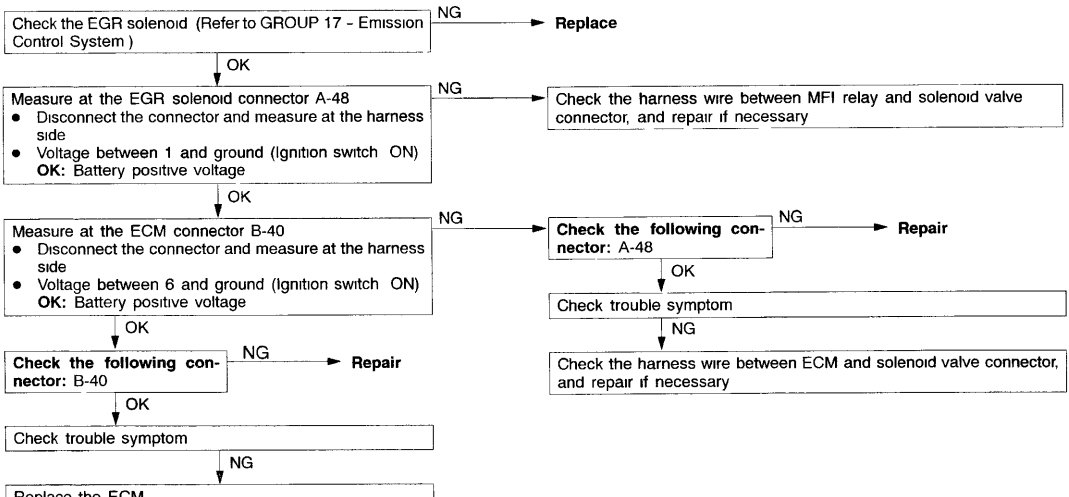
Code No. P0340 Camshaft Position Sensor Circuit Malfunction	Probable cause
Background • When the engine is running the camshaft position sensor outputs a pulse signal • The engine control module checks whether the pulse signal is input Check Area • Engine speed is 50 r/min or higher Judgment Criteria • Sensor output voltage has not changed (no pulse signal is input) for 2 sec Check Area • Engine speed is 50 r/min or higher Judgment Criteria • Normal signal pattern has not been input for cylinder identification from the crankshaft position sensor and camshaft position sensor signal for 2 sec	• Camshaft position sensor malfunction • Open or shorted camshaft position sensor circuit or loose connector • Engine control module failed



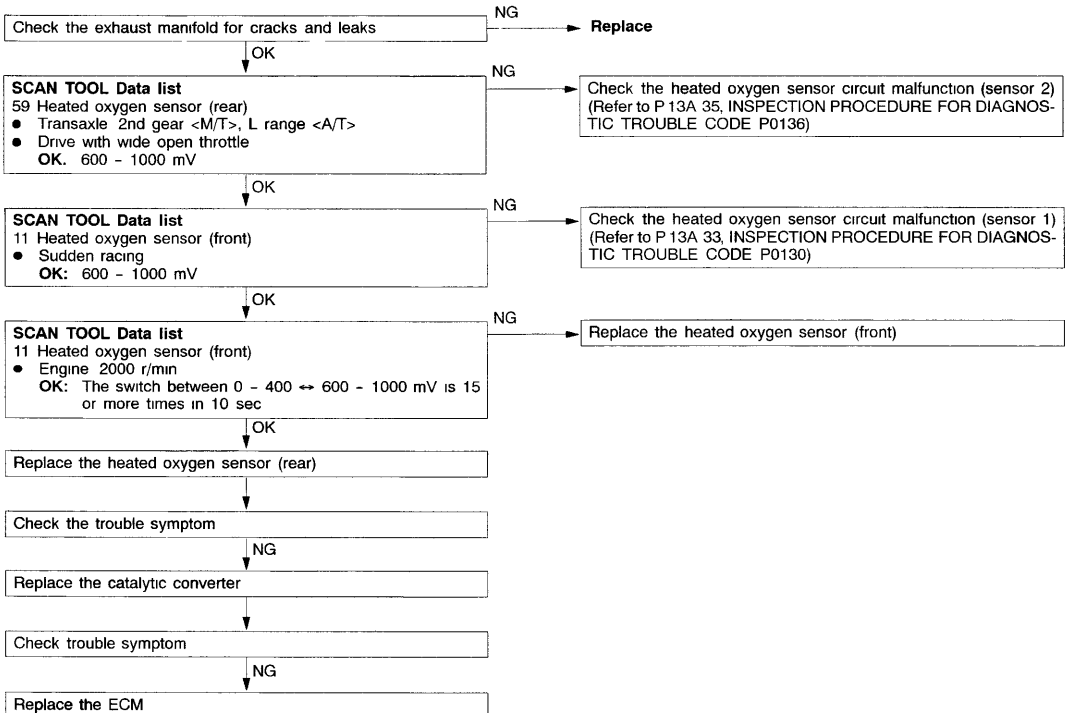
Code No. P0400 Exhaust Gas Recirculation Flow Malfunction	Probable cause
Background • When the EGR solenoid switches from OFF to ON while the engine is running, EGR gas flows • The engine control module checks how the EGR gas flow signal changes Check Area • After at least 20 seconds have passed since the last monitor finished • Engine coolant temperature is higher than 80°C (176°F) • Engine speed is between 1500 and 2000 r/min <M/T> or 1000 and 2000 r/min <A/T> • Intake air temperature is 5°C (41°F) or more • Vehicle speed is 30 km/h (18 7 mph) or higher • At least 90 seconds have passed since manifold differential pressure sensor output voltage fluctuated 1 5 V or higher • Closed throttle position switch ON • Intake air pipe pressure is 35 kPa (5 0 psi) or less <M/T>, or 47 kPa (6 8 psi) or less <A/T> • While fuel is being shut off <M/T> • Monitoring Time 2 sec Judgment Criteria • The fluctuation in the intake system is low when the EGR solenoid is turned ON • Monitored only three times per trip	• EGR valve does not open • EGR control vacuum is too low • EGR solenoid failed • Open or shorted EGR solenoid circuit, or loose connector • Manifold absolute pressure sensor failed • Engine control module failed



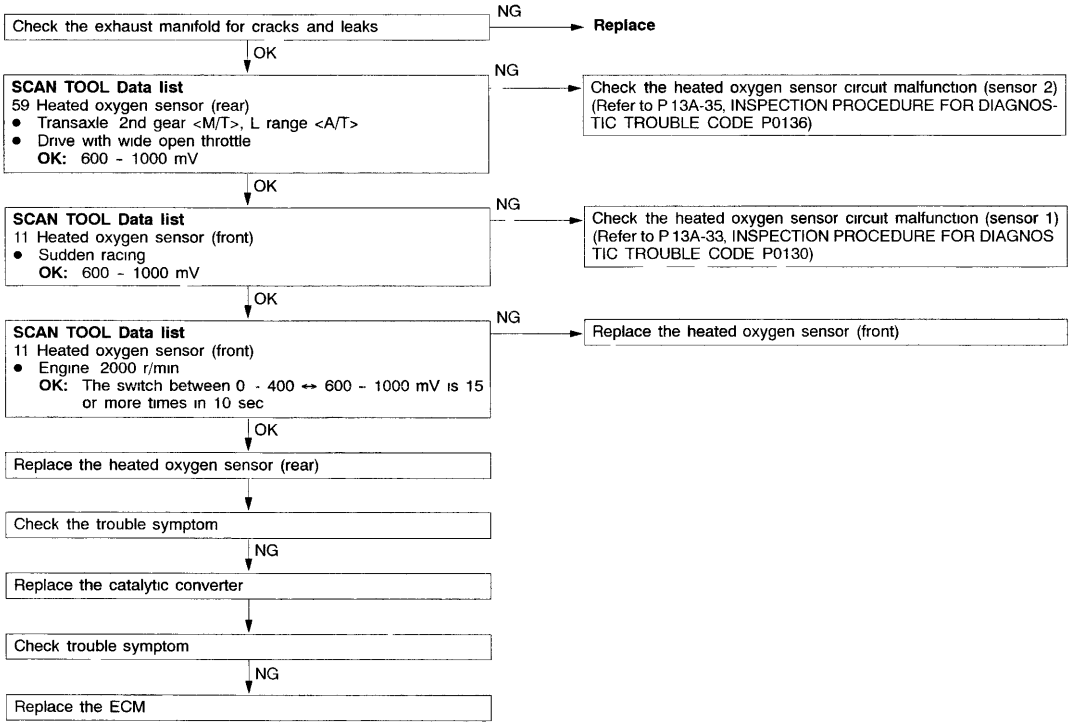
Code No. P0403 Exhaust Gas Recirculation solenoid Malfunction	Probable cause
Background • The engine control module checks current flows in the EGR solenoid drive circuit when the solenoid is ON and OFF Check Area • Battery voltage is not lower than 10 V Judgment Criteria • Solenoid coil surge voltage (more than system voltage +2V) is not detected when the EGR solenoid is turned on/off • Monitored only once per trip	• EGR solenoid failed • Open or shorted evaporative EGR solenoid circuit, or loose connector • Engine control module failed



Code No. P0420 Catalyst System Efficiency Below Threshold	Probable cause
Background • The signal from the heated oxygen sensor which follows the catalytic converter differs from that which precedes the catalytic converter That is because the catalytic converter purifies exhaust gas When the catalytic converter has deteriorated, the signal from the heated oxygen sensor which follows the catalytic converter becomes similar to that which precedes the catalytic converter • The engine control module checks the outputs of the heated oxygen sensor signals Check Area • Engine speed is not higher than 2,600 r/min • Intake air temperature is -10°C (14°F) or more • Intake air pressure is between 20 and 63 kPa (2 9 and 9 2 psi) <M/T> or between 24 and 63 kPa (3 5 and 9 2 psi) <A/T> • Closed throttle position switch OFF • Under the closed loop air-fuel ratio control • Vehicle speed is 1 5 km/h (0 93 mph) or higher • Monitoring time 140 sec Judgment Criteria • Fault in the oxygen sensor (rear) signal and oxygen sensor (front) signal	• Catalytic converter deteriorated • Heated oxygen sensor failed • Engine control module failed

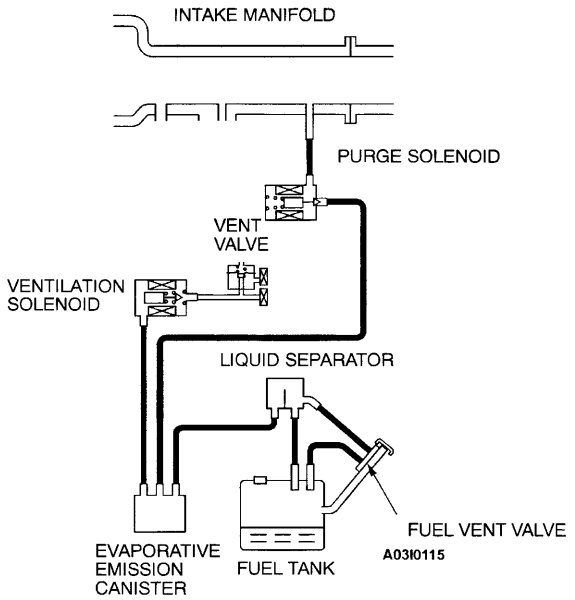


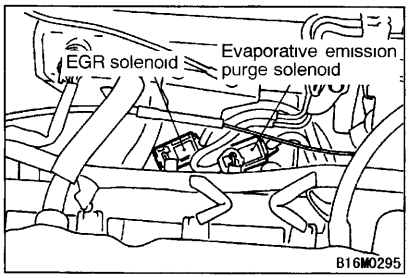
Code No. P0421 Warm Up Catalyst Efficiency Below Threshold	Probable cause
Background • The signal from the heated oxygen sensor which follows the catalytic converter differs from that which precedes the catalytic converter That is because the catalytic converter purifies exhaust gas When the catalytic converter has deteriorated, the signal from the heated oxygen sensor which follows the catalytic converter becomes similar to that which precedes the catalytic converter • The engine control module checks the outputs of the heated oxygen sensor signals Check Area • Engine speed is not higher than 2250 r/min • Intake air temperature is -10°C (14°F) or more • Intake air pressure is between 20 and 63 kPa (2 9 and 9 2 psi) <M/T> or between 24 and 63 kPa (3 5 and 9 2 psi) <A/T> • Closed throttle position switch OFF • Under the closed loop air-fuel ratio control • Vehicle speed is 1 5 km/h (0 93 mph) or higher • Monitoring time 140 sec Judgment Criteria • Fault in the oxygen sensor (rear) signal and oxygen sensor (front) signal	• Catalytic converter deteriorated • Heated oxygen sensor failed • Engine control module failed

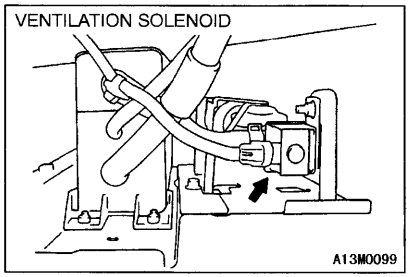


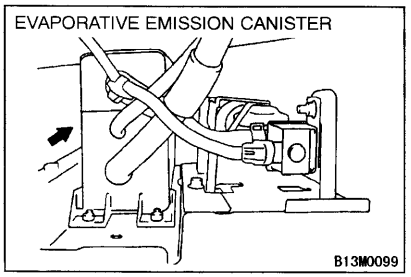
Code No. P0442	Evaporative Emission Control System Leak Detected

System Diagram









TECHNICAL DESCRIPTION

- The ECM turns on the evaporative emission ventilation solenoid which shuts off the evaporative emission canister outlet port. Then the evaporative emission purge solenoid is driven. As a result, the fuel system will be set into a negative pressure.
  When the fuel system reaches negative pressure, the evaporative emission purge solenoid is turned "off," and the fuel system are sealed. As the fuel pressure inside the fuel tank changes, the ECM judges if there is a leak in the fuel system.

DTC SET CONDITIONS

Check Area

- At least sixteen minutes have passed since the starting sequence was completed.
- Engine coolant temperature higher than 60°C (140°F).
- Engine speed is 1,600 r/min or more.
- Power steering pressure switch: "OFF."
- Barometric pressure is higher than 76 kPa (11 psi).
- Volumetric efficiency is at between 20 and 80 percent.
- The engine coolant temperature is 30°C (86°F) or less when the engine is started.
- Intake air temperature is higher than 5°C (41°F).
- The pressure rise when the evaporative emission purge solenoid and evaporative emission ventilation solenoid are closed is less than 451 Pa (0.065 psi).
- The pressure fluctuation width is less than 647 Pa (0.094 psi).
- At least twenty seconds have passed since pressure fluctuation detection commenced.
- Fuel tank differential pressure sensor output voltage is 1 - 4 volts.
- Intake air temperature is 30°C (86°F) or less when the engine started.
- Vehicle speed is 30 km/h (18.7 mph) or more.
- Monitoring time: 75 - 125 seconds

Judgment Criteria

- Internal pressure of the fuel tank has changed more than 843 Pa (0.122 psi) in 20 seconds after the tank and vapor line were closed.

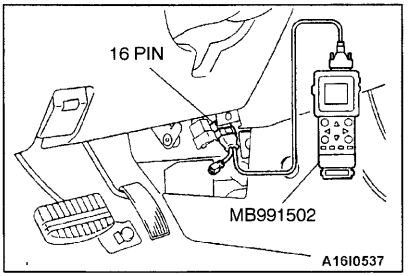
TROUBLESHOOTING HINTS

The most likely causes for this code to be set are:

- Loose fuel cap.
- Fuel cap relief pressure is incorrect.
- Evaporative emission canister seal is faulty.
- Evaporative emission canister is clogged.
- Fuel vent valve failed.
- Purge line or vapor line is clogged.
- Fuel tank, purge line or vapor line seal failed.
- Evaporative emission purge solenoid failed.
- Evaporative emission ventilation solenoid failed.
- Fuel tank differential pressure sensor failed.
- Engine coolant temperature sensor failed.
- Intake air temperature sensor failed.
- Power steering pressure switch failed.
- Use of incorrect fuel.

OVERVIEW OF TROUBLESHOOTING

- To determine the cause of DTC P0442, a performance test is needed. The performance test uses a mechanical vacuum gauge and scan tool MB991502 set on the fuel tank differential pressure sensor (TANK PRS SNSR 73). The mechanical gauge reading is used to verify scan tool MB991502 reading. A comparison of the mechanical gauge to scan tool MB991502 determines the problem in the system.
- Prior to doing the performance test, several simple inspections are needed to exclude some possibilities of the symptom.



DIAGNOSIS

Required Special Tool:
MB991502: Scan Tool (MUT-II)

Caution
To prevent damage to scan tool MB991502, turn the ignition switch off before connecting or disconnecting scan tool MB991502.

In this procedure, scan tool MB991502 should be used in the metric mode (showing the value in kPa). If not, set scan tool MB991502 by selecting the "System Setup" at the main menu.

STEP 1. Check for other DTCs.

If any other DTCs are set, please check those DTCs first then follow the steps below.

STEP 2. Evaporative Emission System Leak Monitor Test using scan tool MB991502.

NOTE: This monitor is carried out at an engine speed of 1,600 r/min or more, transmission is in "N" or "R" position. The engine speed has to be automatically adjusted.

(1) Erase the DTCs using scan tool MB991502. Ensure that the fuel cap is securely tightened.
(2) Select "System Test" and press "YES" key.
(3) Select "Evap Leak Mon" and press "YES" key.
(4) If "Evap Leak Mon" is selected before starting the engine, "Engine must be running." is displayed. In this case, start the engine and then select "Evap Leak Mon" again.
(5) If "Keep the TPS in idle position. during the test." is displayed, the ECM adjusts engine speed automatically. A manual adjustment for engine speed is not needed.
(6) Keep the idling position during the monitor.

NOTE: If the engine speed does not reach 2,000 r/min during the monitor test, adjustment of the Speed Adjusting Screw may be needed. Refer to P.13A-143 for the adjustment procedure.

(7) Item "In Progress" is displayed during the monitor. Keep the engine speed and load within the defined range. Scan tool MB991502 shows these items on the screen. Item "In Progress" will be change from "NO" to "YES" by keeping engine conditions.
(8) Message "Evap Leak Mon. Completed. Test Passed." is displayed when the test has been completed without malfunction. Evaporative emission system is working properly at this time. Please explain to customer that improperly tightened fuel cap can cause to MIL turn on. No further steps are needed.
(9) Message "Evap Leak Mon. Completed. Test Failed & DTCs Set." is displayed when a malfunction has been detected during the test. Go to Step 3.

(10) Message "Evap Leak Mon. discontinued. Retest again from the first" is displayed when the monitor was discontinued by a certain reason (input vehicle speed, engine speed and engine load was put of the specified range). Turn the ignition switch off once and start monitoring from the beginning.

NOTE: Monitoring will not start unless turning off the ignition switch is turned off once and the engine restarted.

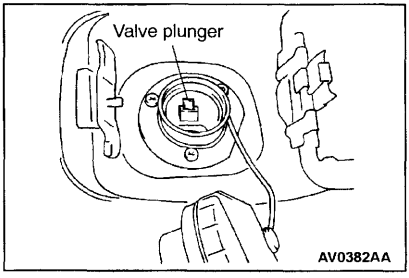
STEP 3. Using scan tool MB991502, check "Fuel tank differential pressure sensor (date list 73)" output.

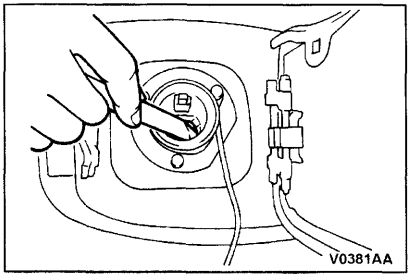
In this step, the fuel tank differential pressure sensor reading is checked to determine if the fuel tank differential pressure sensor output is within the normal range.

(1) Check the MFI data list item: TANK PRS SNSR 73
(2) Watch the sensor reading. This value varies depending on pressure inside the fuel tank.
(3) Remove the fuel cap.

NOTE: If the fuel cap is not securely tightened, it might have the cause of a leak in the EVAP system and set the DTC P0442.

(4) After the fuel cap has been removed, the pressure sensor reading should be between -0.5 kPa (-0.07 psi) and 0.5 kPa (0.07 psi).
- If the reading is between -0.5 kPa (-0.07 psi) and 0.5 kPa (0.07 psi), the fuel tank differential pressure sensor circuit is OK. Therefore, go to Step 4.
- If the reading is not between -0.5 kPa (-0.07 psi) and 0.5 kPa (0.07 psi), the fuel tank differential pressure sensor is not working properly. Replace the fuel tank differential pressure sensor.





STEP 4. Check the fuel vent valve plunger and flapper door operation.

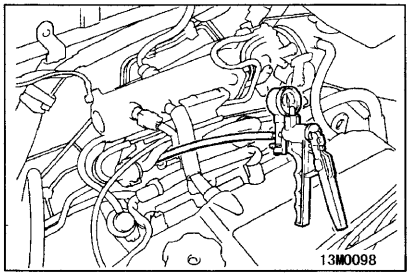
NOTE: When a fuel nozzle is inserted to the fuel tank filler tube and the flapper door is opened, the fuel vent valve is closed (plunger moves towards the top of the neck). When the fuel cap is closed, the fuel cap pushes the plunger back in, which then opens the vent valve. If the flapper door or plunger does not operate properly, the vent valve stays closed even after the fuel cap is closed. This may block the vapor passage. A faulty vent valve plunger may also cause the fuel cap not to seat properly. Either of these conditions can set DTC P0442.

(1) Remove the fuel cap.
(2) Push the flapper in to operate the valve.

NOTE: When the flapper is pushed in, the plunger of the valve should move towards the top.

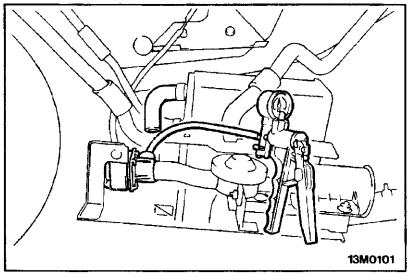
(3) Reinstall and tighten the fuel cap until three clicks are heard.
(4) Remove the cap again and check the protrusion of the plunger to verify if it is pushed back.

(5) Distance between the tip of vent valve plunger and that of fuel tank filler tube should be 28 mm (1.1 inches) or more.
- If the plunger does not return, replace the fuel tank filler tube and securely tighten the cap.
- If the operation is OK, install and securely tighten the fuel cap.



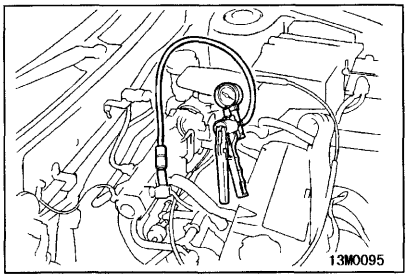
STEP 5. Using scan tool MB991502, actuator test item 08 : Evaporative Emission Purge Solenoid.

(1) Disconnect the hose connected to the evaporative emission canister from the purge solenoid.
(2) Connect a hand vacuum pump to the nipple where the hose is disconnected at the previous step.
(3) The vacuum should be maintained when vacuum is applied and vacuum should leak when the purge solenoid is activated by the actuator test of scan tool MB991502.
- If correct, go to Step 6.
- If not, refer to DTC P0443 (Evaporative Emission Control System Purge Control Valve Circuit Malfunction) on P.13A-57.



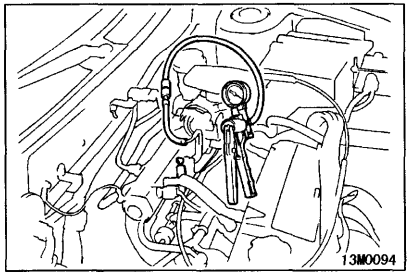
STEP 6. Using scan tool MB991502, actuator test item 29 : evaporative Emission Ventilation Solenoid.

(1) Disconnect the hose connected to the vent solenoid valve from the evaporative emission canister.
(2) Connect a hand vacuum pump to the hose that is disconnected in the previous step.
(3) The vacuum should leak when vacuum is applied, and the vacuum should be maintained when the purge solenoid is activated by the actuator test of scan tool MB991502.
- If correct, go to Step 7.
- If not, refer to DTC P0446 (Evaporative Emission Control System Vent Control Malfunction) on P.13A-58.



STEP 7. Check the purge solenoid-to-air intake plenum hose for blockage.

(1) Disconnect the purge solenoid-to-air intake plenum hose at the purge solenoid side.
(2) Connect a hand vacuum pump to the disconnected hose end.
(3) Apply vacuum, and check if the vacuum is not maintained.
- If not maintained, go to STEP 8.
- If maintained, replace the hose or intake plenum Then go to STEP 9.



STEP 8. Check the purge solenoid-to-air intake plenum hose for vacuum leakage.

(1) Plug the purge solenoid-to-air intake plenum hose at the purge solenoid side.
(2) Disconnect the purge solenoid-to-air intake plenum hose at the air intake plenum side.
(3) Connect a hand vacuum pump to disconnected hose end.
(4) Apply vacuum, and check if the vacuum is maintained.
- If maintained, go to STEP 9.
- If not maintained, replace the hose. Then go to STEP 9.

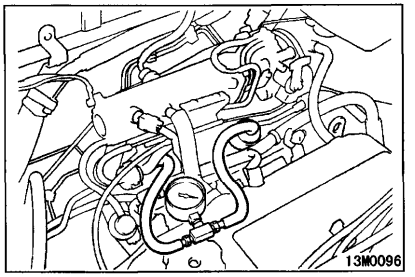
STEP 9. Performance test.

NOTE: Fuel temperature should be lower than 40°C (104°F) during the performance test.

In this step, verify if the EVAP system works properly, or determine which area of the evaporative emission system has a failure.

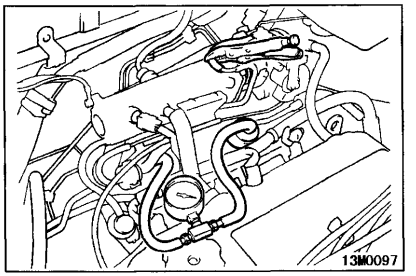
Caution
As a 0 - 6.2 kPa (0 - 0.90 psi) range vacuum gauge is used, the gauge may be broken if excessive vacuum pressure is applied. Do not apply a vacuum of more than 2.9 kPa (0.42 psi).

To achieve the performance test efficiently, a mechanical vacuum gauge [0 - 6.2 kPa (0 - 0.90 psi) range] and scan tool MB991502 should be used, and the engine to generate vacuum.

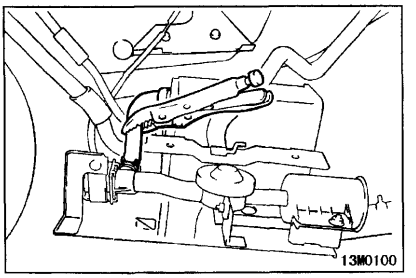


(1) Install a mechanical vacuum gauge [0 - 6.2 kPa (0 - 0.90 psi) range] between the EVAP purge solenoid valve and the purge hose that comes from the evaporative emission canister.
(2) Before starting the performance test, set the vehicle in the following condition.
- Engine coolant temperature: 80 - 90°C (176 - 203°F)
- Lights and all accessories: OFF
- Transmission: "N" or "P" position

(3) Select the item TANK PRS SNSR (data list 73) on scan tool MB991502 to see the differential pressure sensor output.
(4) Run the engine at idle.



(5) Using locking pliers, pinch the hose between the purge solenoid and the intake plenum to close the purge flow, as a preparation of the performance test.



(6) Using another locking pliers, pinch the vent hose between the evaporative emission canister and the vent solenoid. Momentary, remove the locking pliers at the purge hose; this will cause the vacuum build up in the EVAP system.
(7) The engine vacuum comes from the purge port through the purge solenoid.

NOTE: During this operation, the purge solenoid may turn off but will resume operation in about 20 seconds. Operation of the purge solenoid can be checked by needle fluctuation of the mechanical vacuum gauge.

(8) Watch the vacuum reading on the mechanical vacuum gauge and scan tool MB991502.
(9) When the vacuum reading reaches 2.9 kPa (0.42 psi) on the mechanical vacuum gauge and -2.9 kPa (-0.42 psi) on scan tool MB991502, pinch the hose between the purge solenoid and the intake manifold plenum using another locking pliers; this stops the application of vacuum and seals the EVAP system for the leak test.

NOTE: If there is a system failure, either of both vacuum readings may not reach to the above specifications. In this case, it is not necessary to pinch off the purge hose as shown. Refer to the performance test results table below for further steps.

(10) After an elapsed time of 20 seconds, check the fuel tank differential pressure reading on scan tool MB991502.

OK: Change in pressure reading is 0.4 kPa (0.06 psi) or less [holding -2.5 kPa (-0.36 psi) or more vacuum].

Performance test result table:

MECHANICAL VACUUM GAUGE READING	SCAN TOOL MB991502 READING	RESULT	GO TO
Reaches 2.9 kPa (0 42 psi).	Reaches -2 9 kPa (-0 42 psi) and vacuum drops not more than 0.4 kPa (0.06 psi) in 20 seconds.	Satisfactory No leak nor blockage detected.	Step 10
Reaches 2.9 kPa (0 42 psi).	Does not reach -2.9 kPa (-0.42 psi) *	Blockage in the system or bad differential sensor.	Step 11
Does not reach 2.9 kPa (0.42 psi)	Does not reach -2.9 kPa (-0.42 psi).	Large leak in EVAP system.	Step 13
Reaches 2.9 kPa (0.42 psi)	Reaches -2.9 kPa (-0.42 psi) but vacuum drops more than 0.4 kPa (0 06 psi) in 20 seconds.	Small leak in EVAP system.	Step 14

NOTE
*: If there is a blockage, scan tool MB991502 reading can be a positive value (positive pressure) due to the heat of return fuel from the engine.

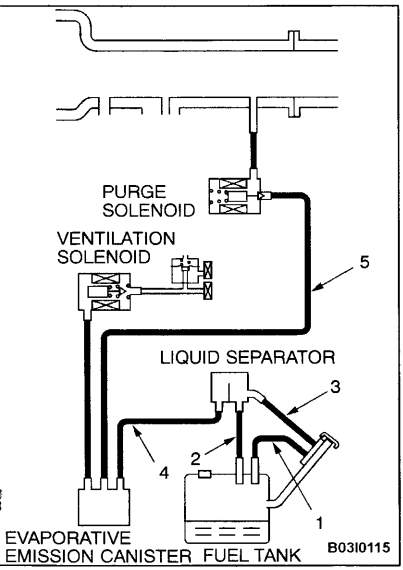
STEP 10. Vacuum reading on both the mechanical gauge and scan tool MB991502 reaches the specifications and satisfy the specifications after 20 seconds:

EVAP system is properly working at the moment. The cause of DTC might have been a loose fuel cap and the customer may have already tightened fuel cap causing the MIL to turn on. No further steps are needed.

STEP 11. Vacuum reading on the mechanical gauge reaches 2.9 kPa (0.42 psi) but scan tool MB991502 does not reach -2.9 kPa (-0.42 psi) :

(1) If the vacuum reading on the gauge reaches 2.9 kPa (0.42 psi) but the reading on scan tool MB991502 does not reach -2.9 kPa (-0.42 psi), either a system blockage or a bad differential pressure sensor may be the cause.
(2) To determine if there is a blockage in the system, remove the fuel cap.

- If the vacuum reading on the vacuum gauge [at this point 2.9 kPa (0.42 psi)] remains the same, there is a blockage in the system. Go to Step 12.
- If the reading drops to about 0 kPa (0 psi), there is no blockage in the EVAP system. The fuel tank differential pressure sensor needs to be replaced. After replacing the differential pressure sensor, go to Step 15.

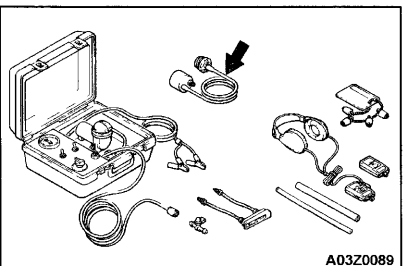


STEP 12. System blockage inspection.

(1) Disconnect the number 1 and 2 hoses shown in the illustration, check the mechanical vacuum gauge reading. If the vacuum reading does not drop, then the blockage is not in the fuel tank.
(2) Disconnect one portion of the EVAP system at a time working towards the front of the vehicle until blockage is found (number 1 to 5 hoses in the illustration).
(3) Repair the location of the blockage and go to Step 15.

STEP 13. Vacuum readings on both the mechanical gauge and scan tool MB991502 do not reach the specifications [2.9 kPa (0.42 psi) and -2.9 kPa (-0.42 psi)]:

This condition shows that there is a significant leakage in the system. The inspection procedure for the large system leakage is the same as the small leakage test in Step 14.

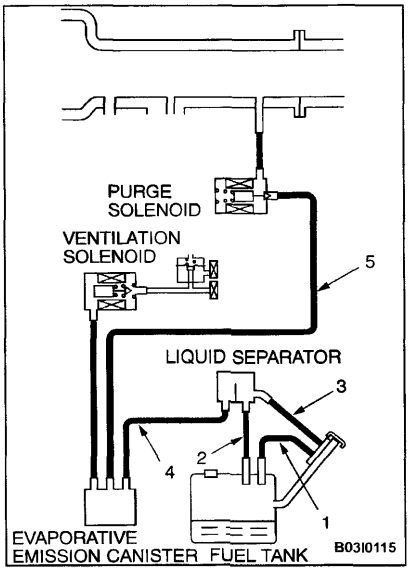


STEP 14. Vacuum readings on both the mechanical gauge and scan tool MB991502 do not reach the specification [2.9 kPa (0.42 psi) and -2.9 kPa (-0.42 psi)] but do not maintain the vacuum.

This condition shows that there is a slight leakage in the system. Follow the procedure below to locate the source of the leak.

(1) The fuel cap relief valve inspection.

a. Remove the fuel cap and install the fuel tank filler tube adapter in the emission system tester kit in place of the fuel cap.
b. Plug the nipple on the fuel tank filler tube adapter.
c. Repeat the performance test. If the EVAP system holds the vacuum, then the fuel cap is faulty. Replace the fuel cap, and go to Step 15.



(2) To find the vacuum leakage in the system, clamp the number 1 and 2 hoses shown in the illustration. Repeat the performance test. This will determine if the vacuum leak is either in the fuel tank area or in the rest of the system.

NOTE: In this case, as we clamped off the vacuum hose connecting to the fuel tank, scan tool MB991502 reading will not change. Please use the mechanical gauge reading.

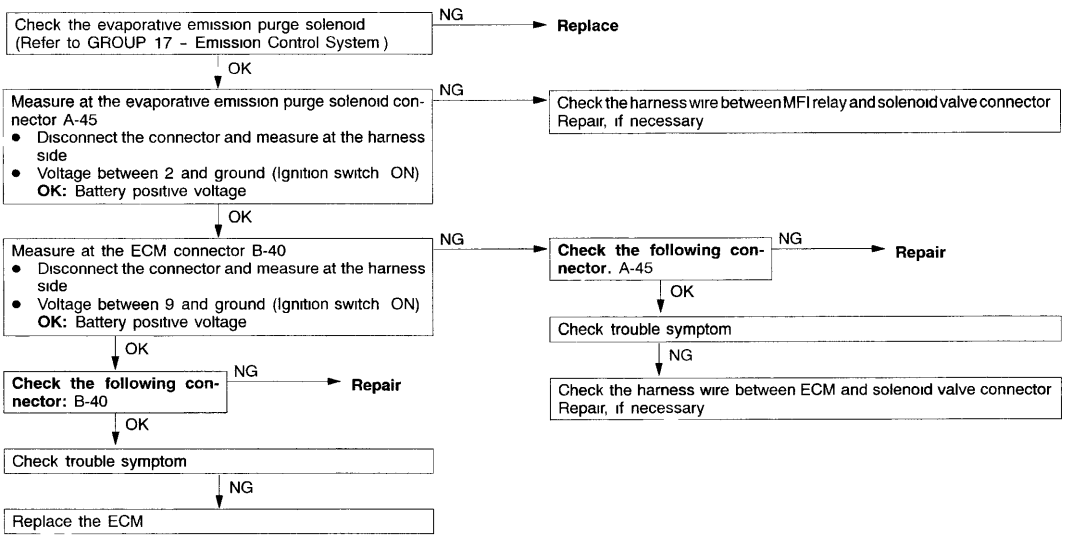
- If the EVAP system hold the vacuum leak is in the fuel tank area. To locate the leakage, pressurize the EVAP system to 3.4 kPa (0.49 psi) and look for leaky area using the ultrasonic leak detector in the Evaporative Emission System Tester. After repairing the leakage, go to Step 15.
- If the vacuum leak still exists, the leak is at other than fuel tank area.

(3) Clamp off the vacuum hose one component at a time working towards the front of the vehicle until leakage is found (number 1 to 5 hoses shown in the illustration).
(4) Repair the leakage at that location and go to Step 15.

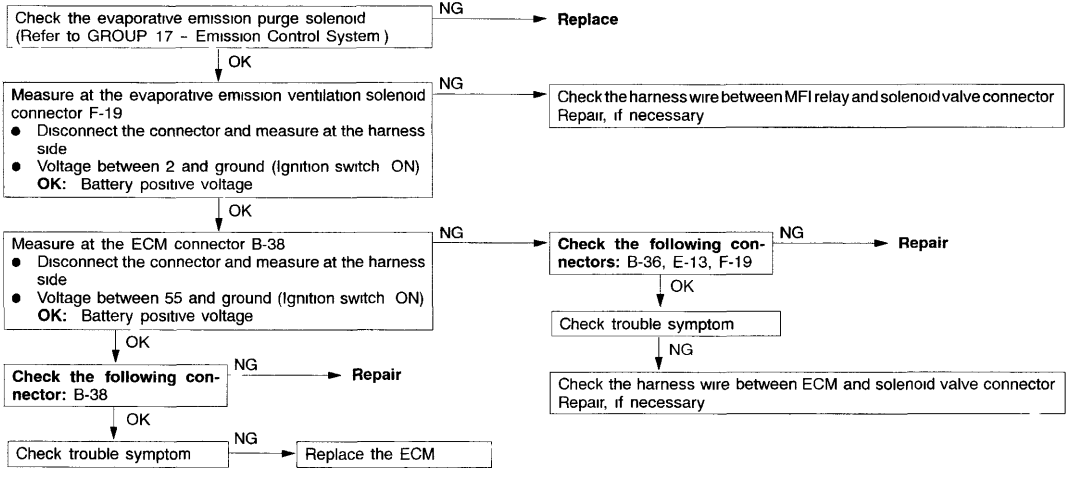
STEP 15. Confirmation test.

After system failures are repaired, repeat the Evaporative Emission System Leak Monitor test (Step 2) to check that the EVAP system operates correctly.

Code No. P0443 Evaporative Emission Control System Purge Control Valve Circuit Malfunction	Probable cause
Background • The engine control module checks current flows in the evaporative emission purge solenoid (No 1) drive circuit when the solenoid is ON and OFF Check Area • Battery voltage is not lower than 10 V Judgment Criteria • Solenoid coil surge voltage (more than system voltage +2 V) is not detected when the EVAP purge solenoid is turned on/off • Monitored only once per trip	• Evaporative emission purge solenoid failed • Open or shorted evaporative emission purge solenoid circuit, or loose connector • Engine control module failed

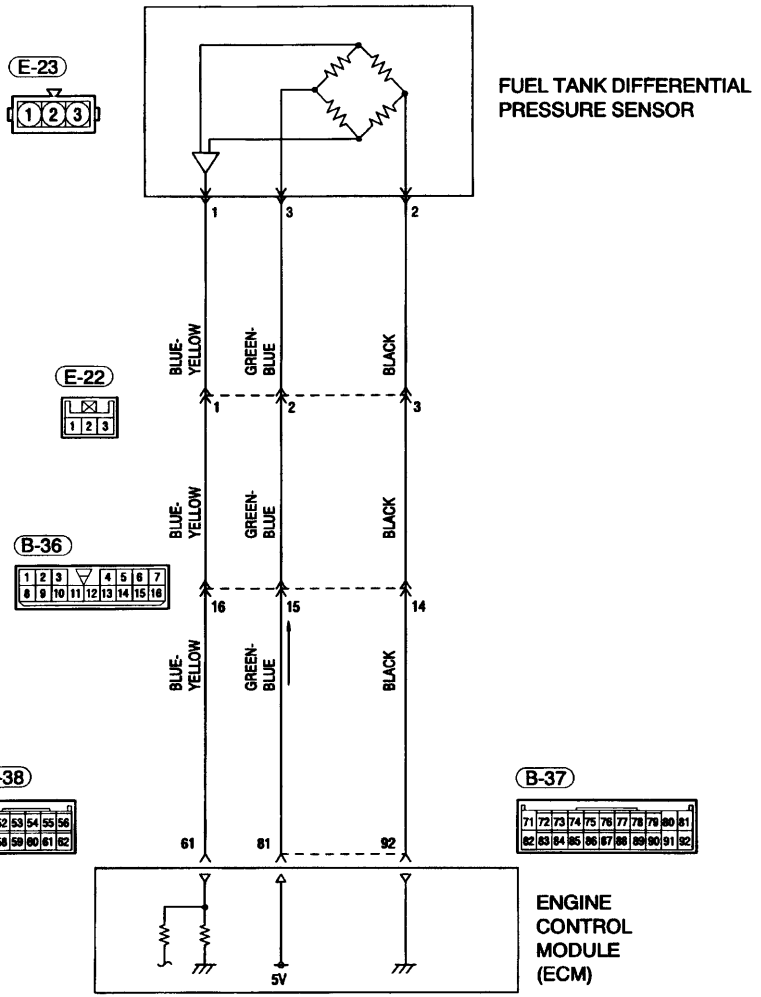


Code No. P0446 Evaporative Emission Control System Vent Control Malfunction	Probable cause
[Comment] Background • The engine control module checks current flows in the evaporative emission ventilation solenoid drive circuit when the solenoid is ON and OFF Check Area • Battery voltage is 10 V or higher Judgment Criteria • Solenoid coil surge voltage (system voltage +2 V) is not detected when the EVAP emission vent solenoid is turned on/off • Monitored only once per trip	• Evaporative emission ventilation solenoid failed • Open or shorted evaporative emission ventilation solenoid circuit, or loose connector • Engine control module failed

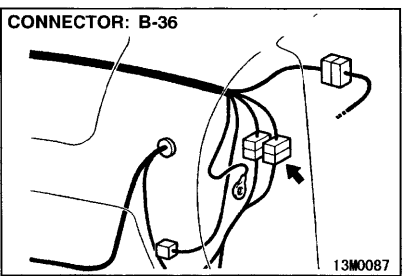


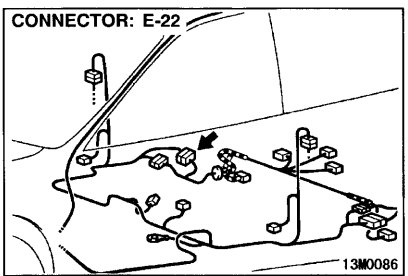
Code No.	Evaporative Emission Control System Pressure Sensor Malfunction
P0450	

Fuel Tank Differential Pressure Sensor Circuit

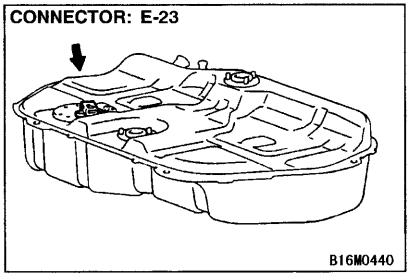


13M0085



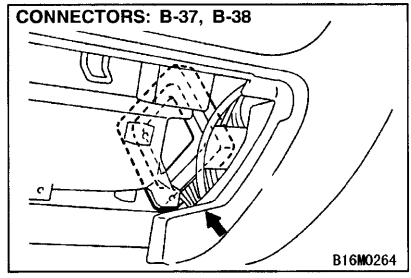


CONNECTOR: E-23



B16M0440

CONNECTORS: B-37, B-38



B16M0264

CIRCUIT OPERATION

- A 5-volt voltage is supplied to the power terminal of the fuel tank differential pressure sensor (terminal 3) from the ECM (terminal 81). The ground terminal (terminal 2) is grounded with the ECM (terminal 92).
- A voltage proportional to the pressure in the fuel tank is sent from the output terminal of the fuel tank differential pressure sensor (terminal 1) to the ECM (terminal 61).

TECHNICAL DESCRIPTION

- The fuel tank differential pressure sensor outputs the voltage in proportion to the pressure in the fuel tank (differential pressure against the barometric pressure).
- The ECM checks whether the output voltage of the fuel tank differential pressure sensor is with in the specified range.

DTC SET CONDITIONS

Check Area

- Intake air temperature is higher than 5°C (41°F).
- Engine speed is higher than 1,600 r/min.
- Volumetric efficiency is between 20 and 80 percent.

Judgement Criteria

- The sensor output voltage is more than 4 volts for 10 seconds even if the evaporative emission purge solenoid is driven at a 100 percent duty when the intake air temperature is between 5 and 45°C (41 - 113°F).

or

- The sensor output voltage is less than 1 volt for 10 seconds even if the evaporative emission purge solenoid is not driven when the intake air temperature is 5°C (41°F) or more.

Check Area

- The throttle valve is closed.
- Engine speed is 840 r/min or less.
- Vehicle speed is 1.5 km/h (0.93 mph) or less.

Judgement Criteria

- The events are counted 20 times or more that sudden pressure fluctuation of at least 0.2 volts is detected for 25 milliseconds or more.
- The above events are detected continuous eight times during normal driving condition.

NOTE: If the number of the pressure fluctuation does not reach 20 during one engine idling, the count number will be reset to zero. In addition, the count number will be also reset to zero if the ignition switch is turned off.

NOTE: The engine control module determines that the engine has deflected from the idle operation if all of the following conditions are met.

- Engine speed is higher than 2,500 r/min.
- Vehicle speed is 15 km/h (9.3 mph) or more.
- Volumetric efficiency is 55 percent or more.

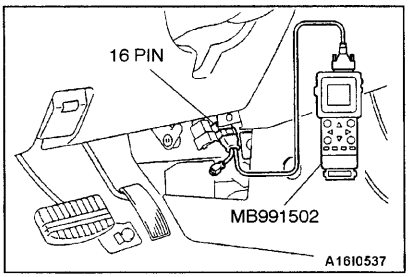
TROUBLESHOOTING HINTS

The most likely causes for this code to be set are:

- Fuel tank differential pressure sensor failed.
- Open or shorted fuel tank differential pressure sensor circuit, or loose connector.
- ECM failed.

OVERVIEW OF TROUBLESHOOTING

- DTC P0450 can be set if either of the following conditions occur:
  1. Faulty fuel tank differential pressure sensor, related circuit, or ECM.
  2. Faulty fuel tank filler tube vent valve or blocked vapor line.
- If the fuel tank filler tube vent valve is faulty and stays closed or the vapor line is blocked, the pressure inside the fuel tank is increased as the evaporative fuel is not purged especially at hot ambient temperatures. Once the pressure inside the fuel tank reaches 6 kPa, the sensor output voltage also reaches and remains 4.5 volts. This will set DTC P0450.
- To check a system blockage, do a performance test which uses a mechanical vacuum gauge and scan tool MB991502 (MUT-II) set on the fuel tank differential pressure sensor (TANK PRS SNSR 73). The mechanical gauge reading is used to verify scan tool MB991502 reading. A comparison of the mechanical gauge to scan tool MB991502 determines the problem in the system.



DIAGNOSIS

Required Special Tool:
MB991502: Scan Tool (MUT-II)

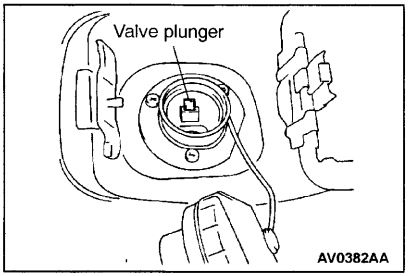
Caution
To prevent damage to scan tool MB991502, turn the ignition switch off before connecting or disconnecting scan tool MB991502.

In this procedure, scan tool MB991502 should be used in the metric mode (showing the value in kPa). If not, set scan tool MB991502 by selecting the "System Setup" at the main menu.

STEP 1. Using scan tool MB991502, check "Fuel tank differential pressure sensor (date list 73)" output.

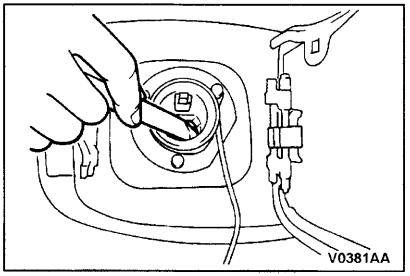
In this step, check the fuel tank differential pressure sensor reading to determine if the fuel tank differential pressure sensor is operating correctly.

(1) Check the MFI data list item· TANK PRS SNSR 73
(2) Watch the sensor reading. This value varies depending on pressure inside the fuel tank.
(3) Remove the fuel cap.
(4) After the fuel cap has been removed, the pressure sensor reading should be between -0.5 kPa (-0.07 psi) and 0.5 kPa (0.07 psi).
    - If the reading is between -0.5 kPa (-0.07 psi) and 0.5 kPa (0.07 psi), the DTC could be caused by an intermittent electrical malfunction, or by a blockage in the EVAP system. Go to step 2.
    - If the reading is not between -0.5 kPa (-0.07 psi) and 0.5 kPa (0.07 psi), there is an electrical malfunction. Go to step 9.



STEP 2. Check the fuel vent valve plunger and flapper door operation.

NOTE: When a fuel nozzle is inserted to the fuel tank filler tube and the flapper door is opened, the fuel vent valve is closed (plunger moves towards the top of the neck). When the fuel cap is closed, the fuel cap pushes the plunger back in, which then opens the vent valve. If the flapper door or plunger does not operate properly, the vent valve stays closed even after the fuel cap is closed. This may block the vapor passage and set the DTC P0450.



(1) Remove the fuel cap.
(2) Push the flapper in to operate the valve.

NOTE: When the flapper is pushed in, the plunger of the valve should move towards the top.

(3) Reinstall and tighten the fuel cap until three clicks are heard.
(4) Remove the cap again and check the protrusion of the plunger to verify if it is pushed back.
(5) The distance between the tip of vent valve plunger and that of fuel tank filler tube should be 28 mm (1.1 inches) or more.
- If the plunger does not return, replace the fuel tank filler tube and securely tighten the cap.
- If the operation is OK, install and securely tighten the fuel cap.
  Go to Step 3.

STEP 3. Evaporative Emission System Leak Monitor Test using scan tool MB991502.

NOTE: This monitor is carried out at an engine speed of 1,600 r/min or more, transmission is in "N" or "R" position. The engine speed has to be automatically adjusted.

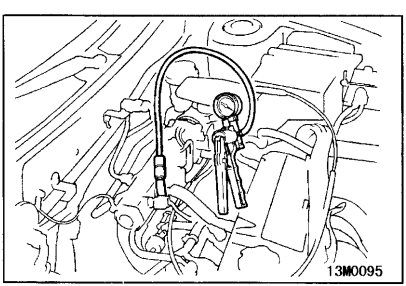
(1) Erase the DTCs using scan tool MB991502. Ensure that the fuel cap is securely tightened.
(2) Select "System Test" and press "YES" key.
(3) Select "Evap Leak Mon" and press "YES" key.
(4) If "Evap Leak Mon" is selected before starting the engine, "Engine must be running." is displayed. In this case, start the engine and then select "Evap Leak Mon" again.
(5) If "Keep the TPS in idle position. during the test." is displayed, the ECM or PCM adjusts engine speed automatically. A manual adjustment for engine speed is not needed.

(6) Keep the idling position during the monitor.

NOTE: If the engine speed does not reach 2,000 r/min during the monitor test, adjustment of the Speed Adjusting Screw may be needed. Refer to P.13A-143 for the adjustment procedure.

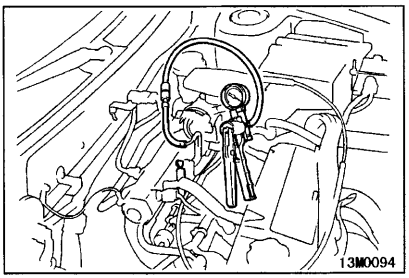
(7) Item "In Progress" is displayed during the monitor. Keep the engine speed and load within the defined range. Scan tool MB991502 shows these items on the screen. Item "In Progress" will be change from "NO" to "YES" by keeping engine conditions.
(8) Message "Evap Leak Mon. Completed. Test Passed." is displayed when the test has been completed without malfunction. Evaporative emission system is working property at the moment. Please explain to customer that improperly tightened fuel cap can cause to turn MIL on. No further steps are needed.
(9) Message "Evap Leak Mon. Completed. Test Failed & DTCs Set." is displayed when a malfunction has been detected during the test. Go to Step 4.
(10) Message "Evap Leak Mon. discontinued. Retest again from the first" is displayed when the monitor was discontinued by a certain reason (input vehicle speed, engine speed and engine load was put of the specified range). Turn the ignition switch off once and start the monitor from the beginning.

NOTE: The monitor will not start unless turning off the ignition switch once and restart the engine.



STEP 4. Check the purge solenoid-to-air intake plenum hose for blockage.

(1) Disconnect the purge solenoid-to-air intake plenum hose at the purge solenoid side.
(2) Connect a hand vacuum pump to the disconnected hose end.
(3) Apply vacuum, and check if the vacuum is not maintained.
- If not maintained, go to STEP 5.
- If maintained, replace the hose or intake plenum. Then go to STEP 6.



STEP 5. Check the purge solenoid-to-air intake plenum hose for vacuum leakage.

(1) Plug the purge solenoid-to-air intake plenum hose at the purge solenoid side.
(2) Disconnect the purge solenoid-to-air intake plenum hose at the air intake plenum side.
(3) Connect a hand vacuum pump to disconnected hose end.
(4) Apply vacuum, and check if the vacuum is maintained.
- If maintained, go to STEP 6.
- If not maintained, replace the hose. Then go to STEP 6.

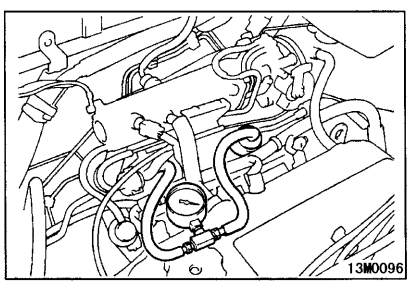
STEP 6. Performance test.

NOTE: Fuel temperature should be lower than 40°C (104°F) during the performance test.

In this step, verify if the EVAP system works properly, or determine which area of the evaporative emission system has a failure.

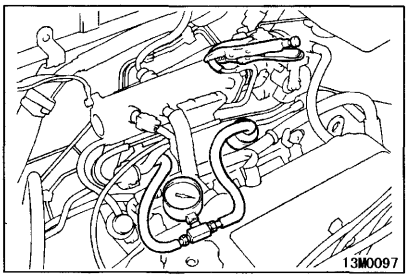
Caution
As a 0 - 6.2 kPa (0 - 0.90 psi) range vacuum gauge is used, the gauge may be broken if excessive vacuum pressure is applied. Do not apply a vacuum of more than 2.9 kPa (0.42 psi).

To achieve the performance test efficiently, a mechanical vacuum gauge [0 - 6.2 kPa (0 - 0.90 psi) range] and scan tool MB991502 should be used, and the engine to generate vacuum.

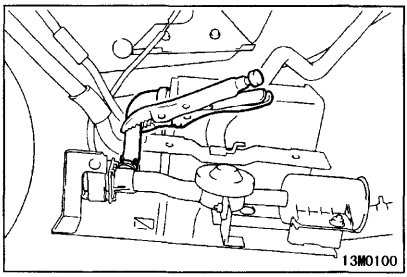


(1) Install a mechanical vacuum gauge [0 - 6.2 kPa (0 - 0.90 psi) range] between the EVAP purge solenoid valve and the purge hose that comes from the evaporative emission canister.
(2) Before starting the performance test, set the vehicle in the following condition.
- Engine coolant temperature: 80 - 90°C (176 - 203°F)
- Lights and all accessories: OFF
- Transmission: "N" or "P" position

(3) Select the item TANK PRS SNSR (data list 73) on scan tool MB991502 to see the fuel tank differential pressure sensor output.
(4) Run the engine at idle.



(5) Using locking pliers, pinch the hose between the purge solenoid and the intake plenum to close the purge flow, as a preparation of the performance test.



(6) Using another locking pliers, pinch the vent hose between the evaporative emission canister and the vent solenoid. Momentary, remove the locking pliers at the purge hose; this will cause the vacuum build up in the EVAP system.
(7) The engine vacuum comes from the purge port through the purge solenoid.

NOTE: During this operation, the purge solenoid may turn off but will resume in operation in about 20 seconds. Operation of the purge solenoid can be checked by needle fluctuation of the mechanical vacuum gauge.

(8) Watch the vacuum reading on the mechanical vacuum gauge and scan tool MB991502.
(9) When the vacuum reading reaches 2.9 kPa (0.42 psi) on the mechanical vacuum gauge and -2.9 kPa (-0.42 psi) on scan tool MB991502, pinch the hose between the purge solenoid and the intake manifold plenum using another locking pliers; this stops the application of vacuum and seals the EVAP system for the leak test.

NOTE: If there is a system failure, either of both vacuum readings may not reach to the above specifications. In this case, it is not necessary to pinch off the purge hose as shown. Refer to the performance test results table below for further steps.

(10) After an elapsed time of 20 seconds, check the fuel tank differential pressure reading on scan tool MB991502.

OK: Change in pressure reading is 0.4 kPa (0.06 psi) or less [holding -2.5 kPa (-0.36 psi) or more vacuum].

Performance test result table:

MECHANICAL VACUUM GAUGE READING	SCAN TOOL MB991502 READING	RESULT	GO TO
Reaches 2.9 kPa (0.42 psi).	Reaches -2 9 kPa (-0 42 psi) and vacuum drops not more than 0.4 kPa (0 06 psi) in 20 seconds.	Satisfactory. No leak nor blockage detected.	Step 7
Reaches 2.9 kPa (0.42 psi).	Does not reach -2.9 kPa (-0 42 psi).*	Blockage in the system or bad differential pressure sensor	Step 8
Does not reach 2.9 kPa (0 42 psi).	Does not reach -2.9 kPa (-0.42 psi)	Large leak in EVAP system.	Step 11
Reaches 2.9 kPa (0 42 psi).	Reaches -2 9 kPa (-0 42 psi) but vacuum drops more than 0.4 kPa (0 06 psi) in 20 seconds.	Small leak in EVAP system.	Step 12

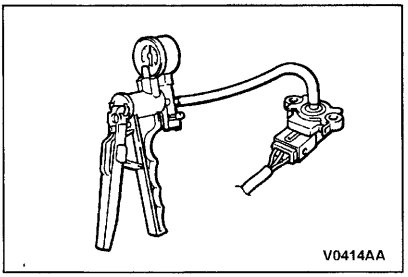
NOTE
*: If there is a blockage, scan tool MB991502 reading can be positive value (positive pressure) due to heat of return fuel from the engine.

STEP 7. Vacuum reading on both the mechanical gauge and scan tool MB991502 reaches the specifications and satisfy the specifications after 20 seconds:

EVAP system is properly working at the moment. The cause is an intermittent electrical wiring problem. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points.

STEP 8. Vacuum reading on the mechanical gauge reaches 2.9 kPa (0.42 psi) but scan tool MB991502 does not reach -2.9 kPa (-0.42 psi) :

(1) If the vacuum reading on the gauge reaches 2.9 kPa (0.42 psi) but the reading on scan tool MB991502 does not reach -2.9 kPa (-0.42 psi), either a system blockage or a bad differential pressure sensor may be the cause.
(2) To determine if there is a blockage in the system, remove the fuel cap.
- If the vacuum reading on the vacuum gauge [at this point 2.9 kPa (0.42 psi)] remain the same, there is a blockage in the system, and go to Step 8.
- If the reading drops to about 0 kPa (0 psi), there is no blockage in the EVAP system. Then the fuel tank differential pressure sensor need to be tested. Go to Step 9.



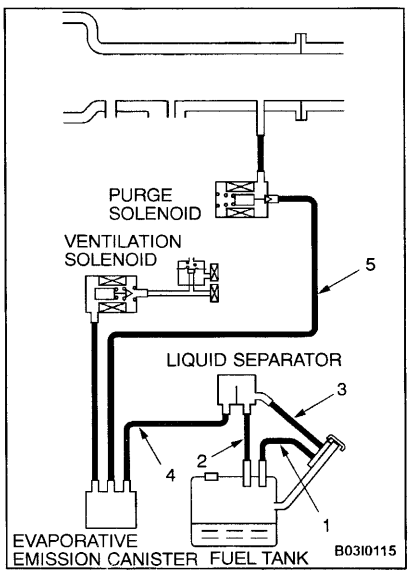
STEP 9. Check the fuel tank differential pressure sensor.

(1) Remove the floor carpet and floor cover.
(2) Remove the fuel tank differential pressure sensor. Do not disconnect the connector at this point.
(3) Connect the fuel tank differential pressure sensor to a hand vacuum pump and mechanical vacuum gauge [0 - 6.2 kPa (0 - 0.90 psi) range].
(4) Turn the ignition switch "ON."
(5) Using the scan tool, check MFI data list item 73: TANK PRS SNSR while applying vacuum.

Applying vacuum (at the gauge)	Scan tool reading	Output voltage (V)
5.0 kPa (0.72 psi)	-5 kPa	1 ± 0.1
No vacuum applied	0 kPa	2.5 ± 0.1

If not correct, go to Step 13.

If correct, it can be assumed that this malfunction is caused by an intermittent electrical wiring problem. Refer to GROUP 00. How to Use Troubleshooting/Inspection Service Points.

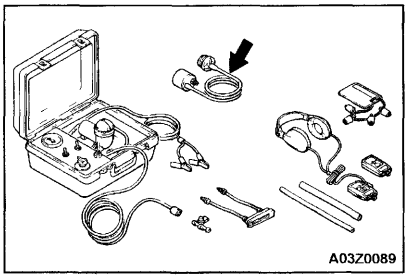


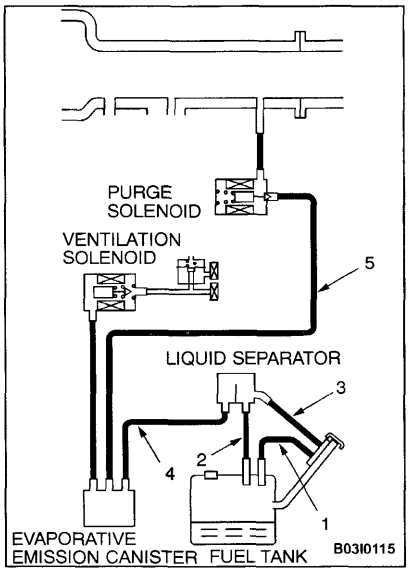
STEP 10. System blockage inspection.

(1) Disconnect the number 1 and 2 hoses shown in the illustration, check the mechanical vacuum gauge reading. If the vacuum reading does not drop, then the blockage is not in the fuel tank.
(2) Disconnect one portion of the EVAP system at a time working towards the front of the vehicle until blockage is found (number 1 to 5 hoses in the illustration).
(3) Repair the location of the blockage and go to Step 12.

STEP 11. Vacuum readings on both the mechanical gauge and scan tool MB991502 do not reach the specifications [2.9 kPa (0.42 psi) and -2.9 kPa (-0.42 psi)]:

This condition shows that there is a significant leakage in the system. The inspection procedure for the large system leakage is the same as the small leakage test in Step 12.





STEP 12. Vacuum readings on both the mechanical gauge and scan tool MB991502 do not reach the specification [2.9 kPa (0.42 psi) and -2.9 kPa (-0.42 psi)] but do not maintain the vacuum.

This condition shows that there is a slight leakage in the system. Follow the procedure below to locate the source of the leak.

(1) The fuel cap relief valve inspection.
   a. Remove the fuel cap and install the fuel tank filler tube adapter in the emission system tester kit in place of the fuel cap.
   b. Plug the nipple on the fuel tank filler tube adapter.
   c. Repeat the performance test. If the EVAP system holds the vacuum, then the fuel cap is faulty. Replace the fuel cap, and go to Step 18.

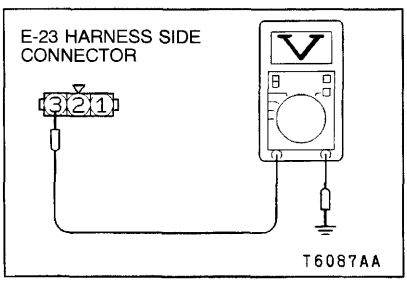
(2) To find the vacuum leakage in the system, clamp the number 1 and 2 hoses shown in the illustration. Repeat the performance test. This will determine if the vacuum leak is either in the fuel tank area or in the rest of the system.

   NOTE: In this case, as we clamped off the vacuum hose connecting to the fuel tank, scan tool MB991502 reading will not change. Please use the mechanical gauge reading.

   - If the EVAP system hold the vacuum leak is in the fuel tank area. To locate the leakage, pressurize the EVAP system to 3.4 kPa (0.49 psi) and look for leaky area using the ultrasonic leak detector in the Evaporative Emission System Tester. After repairing the leakage, go to Step 18.
   - If the vacuum leak still exists, the leak is at other than fuel tank area.

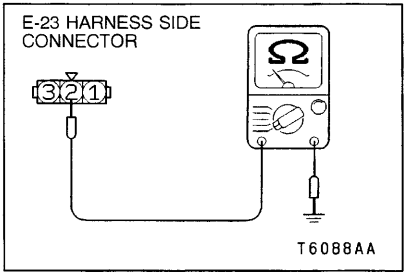
(3) Clamp off the vacuum hose one component at a time working towards the front of the vehicle until leakage is found (number 1 to 5 hoses shown in the illustration).

(4) Repair the location of the leakage and go to Step 18.



STEP 13. Check the circuits at fuel tank differential pressure sensor connector E-23.

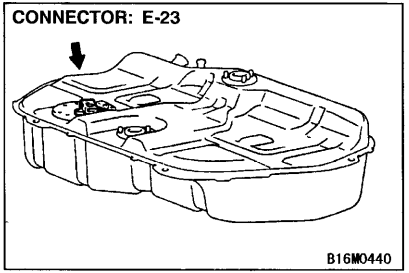
(1) Disconnect connector E-23 and measure at the harness side.
(2) Turn the ignition switch "ON."
(3) Measure voltage between terminal 3 and ground.
   - Voltage should be between 4.8 and 5.2 volts.
(4) Turn the ignition switch "OFF."



(5) Check for continuity between terminal 2 and ground.
- There should be continuity (0 Ω).

If all checks above meet the specifications, go to Step 14.

If any check above do not meet the specifications, go to Step 16.

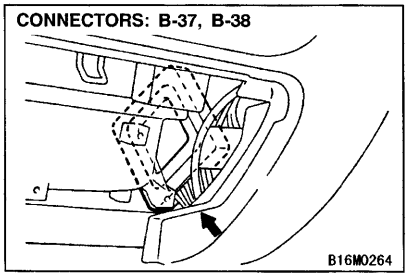


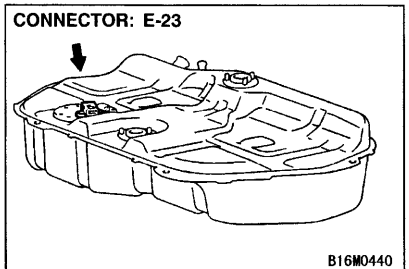
STEP 14. Check the harness wire between fuel tank differential pressure sensor connector E-23 (terminal 1) and ECM connector B-38 (terminal 61).

NOTE: Check the wire after checking intermediate connectors B-36 and E-22. If intermediate connectors B-36 and E-22 are faulty, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection. Then go to Step 18.

If the wire between fuel tank differential pressure sensor connector E-23 (terminal 1) and ECM connector B-38 (terminal 61) is not damaged, go to Step 15.

If the wire between fuel tank differential pressure sensor connector E-23 (terminal 1) and ECM connector B-38 (terminal 61) is damaged, repair it. Then go to Step 18.

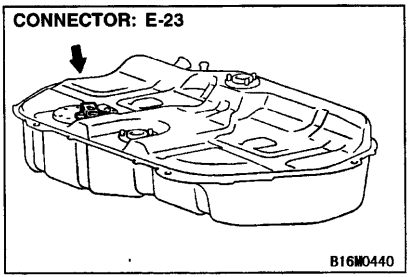




STEP 15. Check harness connector E-23 at the fuel tank differential pressure sensor for damage.

If harness connector E-23 is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection.

If harness connector E-23 is not damaged, check ECM connectors B-37 and B-38, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection. If ECM connectors B-37 and B-38 are in good condition, replace the ECM. Then go to Step 18.

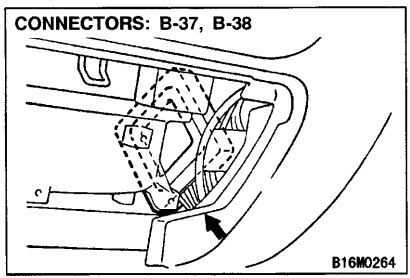


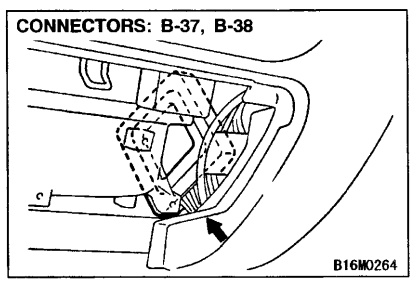
STEP 16. Check the harness wire between fuel tank differential pressure sensor connector E-23 and ECM connectors B-37 and B-38.

NOTE: Check the wire after checking the intermediate connectors B-36 and E-22. If the intermediate connectors B-36 and E-22 are faulty, repair or replace them. Refer to GROUP 00E. Harness Connector Inspection. Then go to Step 18.

If the wire between fuel tank differential pressure sensor connector E-23 and ECM connectors B-37 and B-38 are not damaged, go to Step 17.

If the wire between fuel tank differential pressure sensor connector E-23 and ECM connectors B-37 and B-38 are damaged, repair it. Then go to Step 18.





STEP 17. Check harness connectors B-37 and B-38 at the ECM.

If harness connectors B-37 and B-38 are damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection.

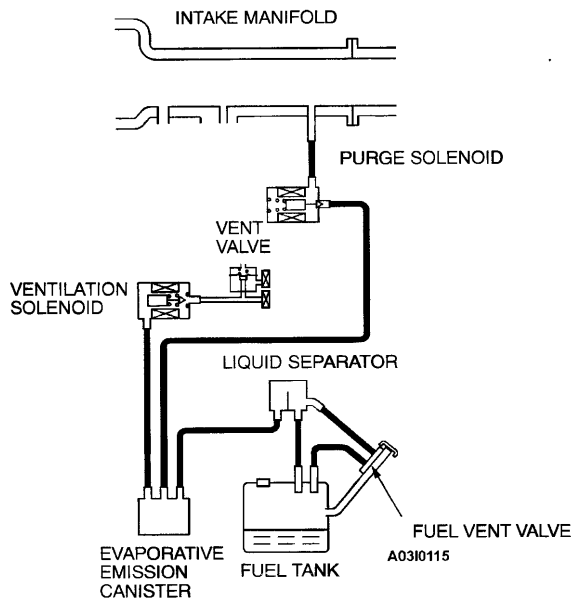
If harness connectors B-37 and B-38 are not damaged, replace the ECM. Then go to Step 18.

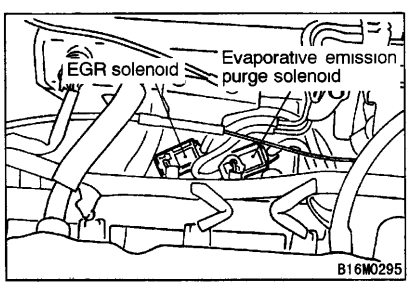
STEP 18. Confirmation test.

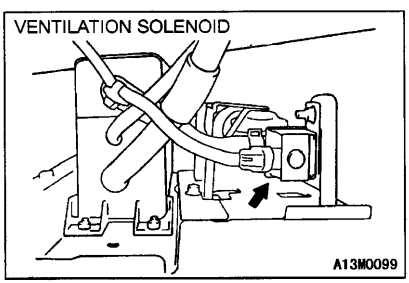
After system failures are repaired, repeat the Evaporative Emission System Leak Monitor test (Step 3) to check that the EVAP system operates correctly.

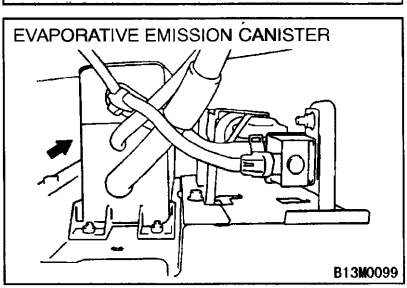
Code No.	Evaporative Emission Control System Leak Detected (Gross Leak)
P0455	

System Diagram









TECHNICAL DESCRIPTION

- The ECM turns on the evaporative emission ventilation solenoid which shuts off the evaporative emission canister outlet port. Then the evaporative emission purge solenoid is driven. As a result, the fuel system will be set into a negative pressure.
  When the fuel system reaches negative pressure, the evaporative emission purge solenoid is turned "off," and the fuel system are sealed. As the fuel pressure inside the fuel tank changes, the ECM judges if there is a leak in the fuel system.

DTC SET CONDITIONS

Check Area

- At least sixteen minutes have passed since the starting sequence was completed.
- Engine coolant temperature higher than 60°C (140°F).
- Engine speed is 1,600 r/min or more.
- Power steering pressure switch: "OFF."
- Barometric pressure is higher than 76 kPa (11 psi).
- Volumetric efficiency is at between 20 and 80 percent.
- The engine coolant temperature is 30°C (86°F) or less when the engine is started.
- Intake air temperature is higher than 5°C (41°F).
- The pressure rise when the evaporative emission purge solenoid and evaporative emission ventilation solenoid are closed is less than 451 Pa (0.065 psi).
- The pressure fluctuation width is less than 647 Pa (0.094 psi).
- At least twenty seconds have passed since pressure fluctuation detection commenced.
- Fuel tank differential pressure sensor output voltage is 1 - 4 volts.
- Intake air temperature is 30°C (86°F) or less when the engine started.
- Vehicle speed is 30 km/h (18.7 mph) or more.
- Monitoring time: 75 - 125 seconds

Judgment Criteria

- Internal pressure of the fuel tank has changed more than 843 Pa (0.122 psi) in 20 seconds after the tank and vapor line were closed.

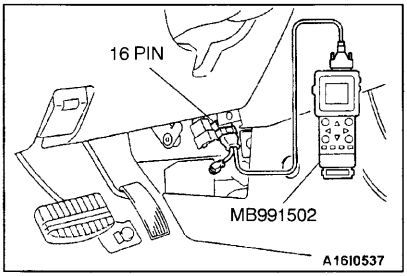
TROUBLESHOOTING HINTS

The most likely causes for this code to be set are:

- Loose fuel cap.
- Fuel cap relief pressure is incorrect.
- Evaporative emission canister seal is faulty.
- Evaporative emission canister is clogged.
- Fuel vent valve failed.
- Purge line or vapor line is clogged.
- Fuel tank, purge line or vapor line seal failed.
- Evaporative emission purge solenoid failed.
- Evaporative emission ventilation solenoid failed.
- Fuel tank differential pressure sensor failed.
- Engine coolant temperature sensor failed.
- Intake air temperature sensor failed.
- Power steering pressure switch failed.
- Use of incorrect fuel.

OVERVIEW OF TROUBLESHOOTING

- To determine the cause of DTC P0442, a performance test is needed. The performance test uses a mechanical vacuum gauge and scan tool MB991502 set on the fuel tank differential pressure sensor (TANK PRS SNSR 73). The mechanical gauge reading is used to verify scan tool MB991502 reading. A comparison of the mechanical gauge to scan tool MB991502 determines the problem in the system.
- Prior to doing the performance test, several simple inspections are needed to exclude some possibilities of the symptom.



DIAGNOSIS

Required Special Tool:
MB991502: Scan Tool (MUT-II)

Caution
To prevent damage to scan tool MB991502, turn the ignition switch off before connecting or disconnecting scan tool MB991502.

In this procedure, scan tool MB991502 should be used in the metric mode (showing the value in kPa). If not, set scan tool MB991502 by selecting the "System Setup" at the main menu.

STEP 1. Check for other DTCs.

If any other DTCs are set, please check those DTCs first then follow the steps below.

STEP 2. Evaporative Emission System Leak Monitor Test using scan tool MB991502.

NOTE: This monitor is carried out at an engine speed of 1,600 r/min or more, transmission is in "N" or "R" position. The engine speed has to be automatically adjusted.

(1) Erase the DTCs using scan tool MB991502. Ensure that the fuel cap is securely tightened.
(2) Select "System Test" and press "YES" key.
(3) Select "Evap Leak Mon" and press "YES" key
(4) If "Evap Leak Mon" is selected before starting the engine, "Engine must be running." is displayed. In this case, start the engine and then select "Evap Leak Mon" again.
(5) If "Keep the TPS in idle position. during the test." is displayed, the ECM adjusts engine speed automatically. A manual adjustment for engine speed is not needed.
(6) Keep the idling position during the monitor.

NOTE: If the engine speed does not reach 2,000 r/min during the monitor test, adjustment of the Speed Adjusting Screw may be needed. Refer to P.13A-143 for the adjustment procedure.

(7) Item "In Progress" is displayed during the monitor. Keep the engine speed and load within the defined range. Scan tool MB991502 shows these items on the screen. Item "In Progress" will be change from "NO" to "YES" by keeping engine conditions.
(8) Message "Evap Leak Mon. Completed. Test Passed." is displayed when the test has been completed without malfunction. Evaporative emission system is working property at this time. Please explain to customer that improperly tightened fuel cap can cause to MIL turn on. No further steps are needed.
(9) Message "Evap Leak Mon. Completed. Test Failed & DTCs Set." is displayed when a malfunction has been detected during the test. Go to Step 3.

(10) Message "Evap Leak Mon. discontinued. Retest again from the first" is displayed when the monitor was discontinued by a certain reason (input vehicle speed, engine speed and engine load was put of the specified range). Turn the ignition switch off once and start monitoring from the beginning.

NOTE: Monitoring will not start unless turning off the ignition switch is turned off once and the engine restarted.

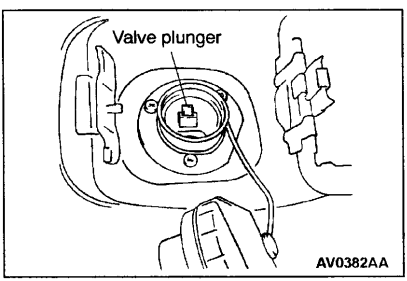
STEP 3. Using scan tool MB991502, check "Fuel tank differential pressure sensor (date list 73)" output.

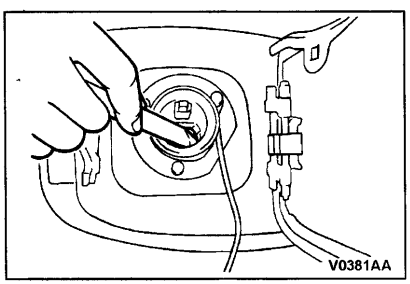
In this step, the fuel tank differential pressure sensor reading is checked to determine if the fuel tank differential pressure sensor output is within the normal range.

(1) Check the MFI data list item: TANK PRS SNSR 73
(2) Watch the sensor reading. This value varies depending on pressure inside the fuel tank.
(3) Remove the fuel cap.

NOTE: If the fuel cap is not securely tightened, it might have the cause of a leak in the EVAP system and set the DTC P0442.

(4) After the fuel cap has been removed, the pressure sensor reading should be between -0.5 kPa (-0.07 psi) and 0.5 kPa (0.07 psi).
- If the reading is between -0.5 kPa (-0.07 psi) and 0.5 kPa (0.07 psi), the fuel tank differential pressure sensor circuit is OK. Therefore, go to Step 4.
- If the reading is not between -0.5 kPa (-0.07 psi) and 0.5 kPa (0.07 psi), the fuel tank differential pressure sensor is not working properly. Replace the fuel tank differential pressure sensor.





STEP 4. Check the fuel vent valve plunger and flapper door operation.

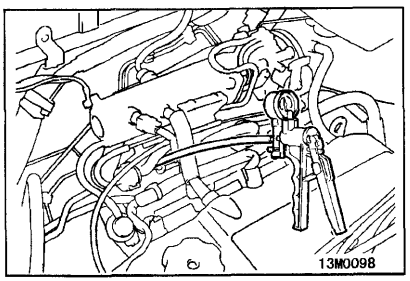
NOTE: When a fuel nozzle is inserted to the fuel tank filler tube and the flapper door is opened, the fuel vent valve is closed (plunger moves towards the top of the neck). When the fuel cap is closed, the fuel cap pushes the plunger back in, which then opens the vent valve. If the flapper door or plunger does not operate properly, the vent valve stays closed even after the fuel cap is closed. This may block the vapor passage. A faulty vent valve plunger may also cause the fuel cap not to seat properly. Either of these conditions can set DTC P0442.

(1) Remove the fuel cap.
(2) Push the flapper in to operate the valve.

NOTE: When the flapper is pushed in, the plunger of the valve should move towards the top.

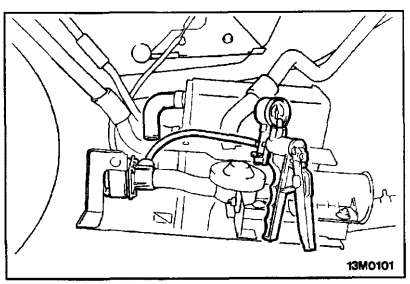
(3) Reinstall and tighten the fuel cap until three clicks are heard.
(4) Remove the cap again and check the protrusion of the plunger to verify if it is pushed back

(5) Distance between the tip of vent valve plunger and that of fuel tank filler tube should be 28 mm (1.1 inches) or more.
- If the plunger does not return, replace the fuel tank filler tube and securely tighten the cap.
- If the operation is OK, install and securely tighten the fuel cap.



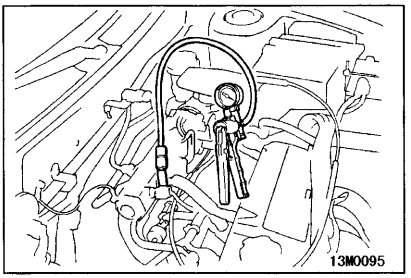
STEP 5. Using scan tool MB991502, actuator test item 08 : Evaporative Emission Purge Solenoid.

(1) Disconnect the hose connected to the evaporative emission canister from the purge solenoid.
(2) Connect a hand vacuum pump to the nipple where the hose is disconnected at the previous step.
(3) The vacuum should be maintained when vacuum is applied and vacuum should leak when the purge solenoid is activated by the actuator test of scan tool MB991502.
- If correct, go to Step 6.
- If not, refer to DTC P0443 (Evaporative Emission Control System Purge Control Valve Circuit Malfunction) on P.13A-57.



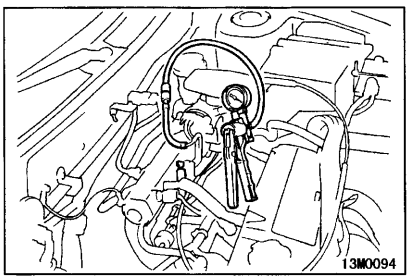
STEP 6. Using scan tool MB991502, actuator test item 29 : evaporative Emission Ventilation Solenoid.

(1) Disconnect the hose connected to the vent solenoid valve from the vent solenoid valve.
(2) Connect a hand vacuum pump to the nipple that is disconnected in the previous step.
(3) The vacuum should leak when vacuum is applied, and the vacuum should be maintained when the purge solenoid is activated by the actuator test of scan tool MB991502.
- If correct, go to Step 7.
- If not, refer to DTC P0446 (Evaporative Emission Control System Vent Control Malfunction) on P.13A-58.



STEP 7. Check the purge solenoid-to-air intake plenum hose for blockage.

(1) Disconnect the purge solenoid-to-air intake plenum hose at the purge solenoid side.
(2) Connect a hand vacuum pump to the disconnected hose end.
(3) Apply vacuum, and check if the vacuum is not maintained.
- If not maintained, go to STEP 8.
- If maintained, replace the hose or intake plenum. Then go to STEP 9.



STEP 8. Check the purge solenoid-to-air intake plenum hose for vacuum leakage.

(1) Plug the purge solenoid-to-air intake plenum hose at the purge solenoid side.
(2) Disconnect the purge solenoid-to-air intake plenum hose at the air intake plenum side.
(3) Connect a hand vacuum pump to disconnected hose end.
(4) Apply vacuum, and check if the vacuum is maintained.
- If maintained, go to STEP 9.
- If not maintained, replace the hose. Then go to STEP 9.

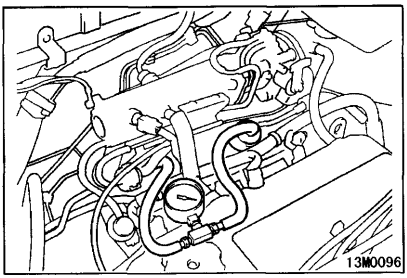
STEP 9. Performance test.

NOTE: Fuel temperature should be lower than 40°C (104°F) during the performance test.

In this step, verify if the EVAP system works properly, or determine which area of the evaporative emission system has a failure.

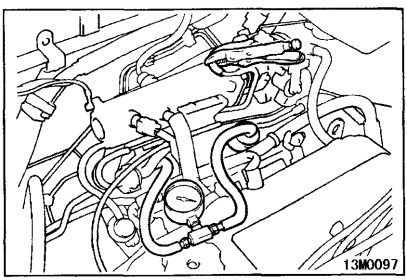
Caution
As a 0 - 6.2 kPa (0 - 0.90 psi) range vacuum gauge is used, the gauge may be broken if excessive vacuum pressure is applied. Do not apply a vacuum of more than 2.9 kPa (0.42 psi).

To achieve the performance test efficiently, a mechanical vacuum gauge [0 - 6.2 kPa (0 - 0.90 psi) range] and scan tool MB991502 should be used, and the engine to generate vacuum.

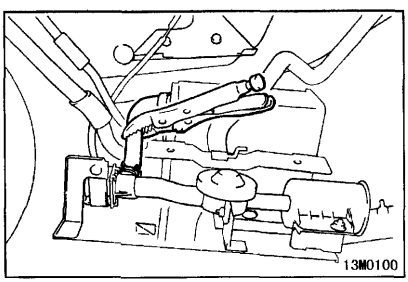


(1) Install a mechanical vacuum gauge [0 - 6.2 kPa (0 - 0.90 psi) range] between the EVAP purge solenoid valve and the purge hose that comes from the evaporative emission canister.
(2) Before starting the performance test, set the vehicle in the following condition.
- Engine coolant temperature: 80 - 90°C (176 - 203°F)
- Lights and all accessories: OFF
- Transmission: "N" or "P" position

(3) Select the item TANK PRS SNSR (data list 73) on scan tool MB991502 to see the differential pressure sensor output.
(4) Run the engine at idle.



(5) Using locking pliers, pinch the hose between the purge solenoid and the intake plenum to close the purge flow, as a preparation of the performance test.



(6) Using another locking pliers, pinch the vent hose between the evaporative emission canister and the vent solenoid. Momentary, remove the locking pliers at the purge hose; this will cause the vacuum build up in the EVAP system.
(7) The engine vacuum comes from the purge port through the purge solenoid.

NOTE: During this operation, the purge solenoid may turn off but will resume operation in about 20 seconds. Operation of the purge solenoid can be checked by needle fluctuation of the mechanical vacuum gauge.

(8) Watch the vacuum reading on the mechanical vacuum gauge and scan tool MB991502.
(9) When the vacuum reading reaches 2.9 kPa (0.42 psi) on the mechanical vacuum gauge and -2.9 kPa (-0.42 psi) on scan tool MB991502, pinch the hose between the purge solenoid and the intake manifold plenum using another locking pliers; this stops the application of vacuum and seals the EVAP system for the leak test.

NOTE: If there is a system failure, either of both vacuum readings may not reach to the above specifications. In this case, it is not necessary to pinch off the purge hose as shown. Refer to the performance test results table below for further steps.

(10) After an elapsed time of 20 seconds, check the fuel tank differential pressure reading on scan tool MB991502.

OK: Change in pressure reading is 0.4 kPa (0.06 psi) or less [holding -2.5 kPa (-0.36 psi) or more vacuum].

Performance test result table:

MECHANICAL VACUUM GAUGE READING	SCAN TOOL MB991502 READING	RESULT	GO TO
Reaches 2.9 kPa (0.42 psi).	Reaches -2.9 kPa (-0.42 psi) and vacuum drops not more than 0 4 kPa (0.06 psi) in 20 seconds.	Satisfactory. No leak nor blockage detected.	Step 10
Reaches 2.9 kPa (0 42 psi).	Does not reach -2.9 kPa (-0 42 psi) *	Blockage in the system or bad differential sensor.	Step 11
Does not reach 2.9 kPa (0.42 psi).	Does not reach -2.9 kPa (-0.42 psi).	Large leak in EVAP system.	Step 13
Reaches 2 9 kPa (0 42 psi).	Reaches -2 9 kPa (-0.42 psi) but vacuum drops more than 0.4 kPa (0.06 psi) in 20 seconds.	Small leak in EVAP system.	Step 14

NOTE
*: If there is a blockage, scan tool MB991502 reading can be a positive value (positive pressure) due to the heat of return fuel from the engine.

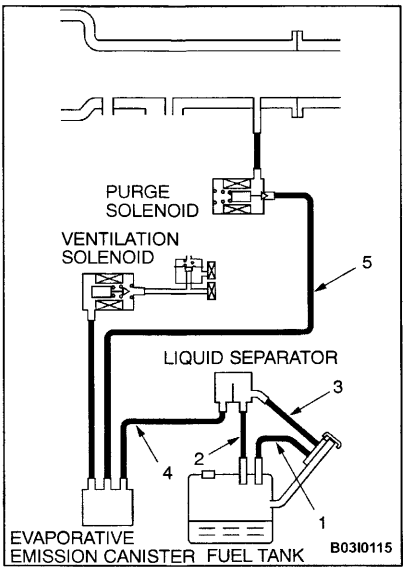
STEP 10. Vacuum reading on both the mechanical gauge and scan tool MB991502 reaches the specifications and satisfy the specifications after 20 seconds:

EVAP system is properly working at the moment. The cause of DTC might have been a loose fuel cap and the customer may have already tightened fuel cap causing the MIL to turn on. No further steps are needed.

STEP 11. Vacuum reading on the mechanical gauge reaches 2.9 kPa (0.42 psi) but scan tool MB991502 does not reach -2.9 kPa (-0.42 psi) :

(1) If the vacuum reading on the gauge reaches 2.9 kPa (0 42 psi) but the reading on scan tool MB991502 does not reach -2.9 kPa (-0.42 psi), either a system blockage or a bad differential pressure sensor may be the cause.
(2) To determine if there is a blockage in the system, remove the fuel cap.

- If the vacuum reading on the vacuum gauge [at this point 2.9 kPa (0.42 psi)] remains the same, there is a blockage in the system. Go to Step 12.
- If the reading drops to about 0 kPa (0 psi), there is no blockage in the EVAP system. The fuel tank differential pressure sensor needs to be replaced. After replacing the differential pressure sensor, go to Step 15.

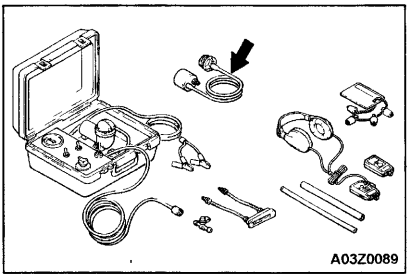


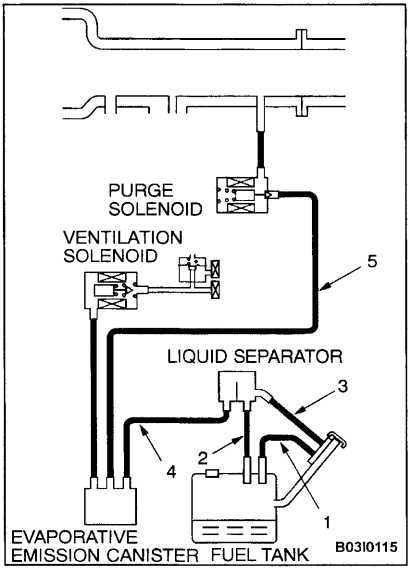
STEP 12. System blockage inspection.

(1) Disconnect the number 1 and 2 hoses shown in the illustration, check the mechanical vacuum gauge reading. If the vacuum reading does not drop, then the blockage is not in the fuel tank.
(2) Disconnect one portion of the EVAP system at a time working towards the front of the vehicle until blockage is found (number 1 to 5 hoses in the illustration).
(3) Repair the location of the blockage and go to Step 15.

STEP 13. Vacuum readings on both the mechanical gauge and scan tool MB991502 do not reach the specifications [2.9 kPa (0.42 psi) and -2.9 kPa (-0.42 psi)]:

This condition shows that there is a significant leakage in the system. The inspection procedure for the large system leakage is the same as the small leakage test in Step 14.





STEP 14. Vacuum readings on both the mechanical gauge and scan tool MB991502 do not reach the specification [2.9 kPa (0.42 psi) and -2.9 kPa (-0.42 psi)] but do not maintain the vacuum.

This condition shows that there is a slight leakage in the system. Follow the procedure below to locate the source of the leak.

(1) The fuel cap relief valve inspection.
   a. Remove the fuel cap and install the fuel tank filler tube adapter in the emission system tester kit in place of the fuel cap.
   b. Plug the nipple on the fuel tank filler tube adapter.
   c. Repeat the performance test. If the EVAP system holds the vacuum, then the fuel cap is faulty. Replace the fuel cap, and go to Step 15.

(2) To find the vacuum leakage in the system, clamp the number 1 and 2 hoses shown in the illustration. Repeat the performance test. This will determine if the vacuum leak is either in the fuel tank area or in the rest of the system.

   NOTE: In this case, as we clamped off the vacuum hose connecting to the fuel tank, scan tool MB991502 reading will not change. Please use the mechanical gauge reading.

   - If the EVAP system hold the vacuum leak is in the fuel tank area. To locate the leakage, pressurize the EVAP system to 3.4 kPa (0.49 psi) and look for leaky area using the ultrasonic leak detector in the Evaporative Emission System Tester. After repairing the leakage, go to Step 15.
   - If the vacuum leak still exists, the leak is at other than fuel tank area.

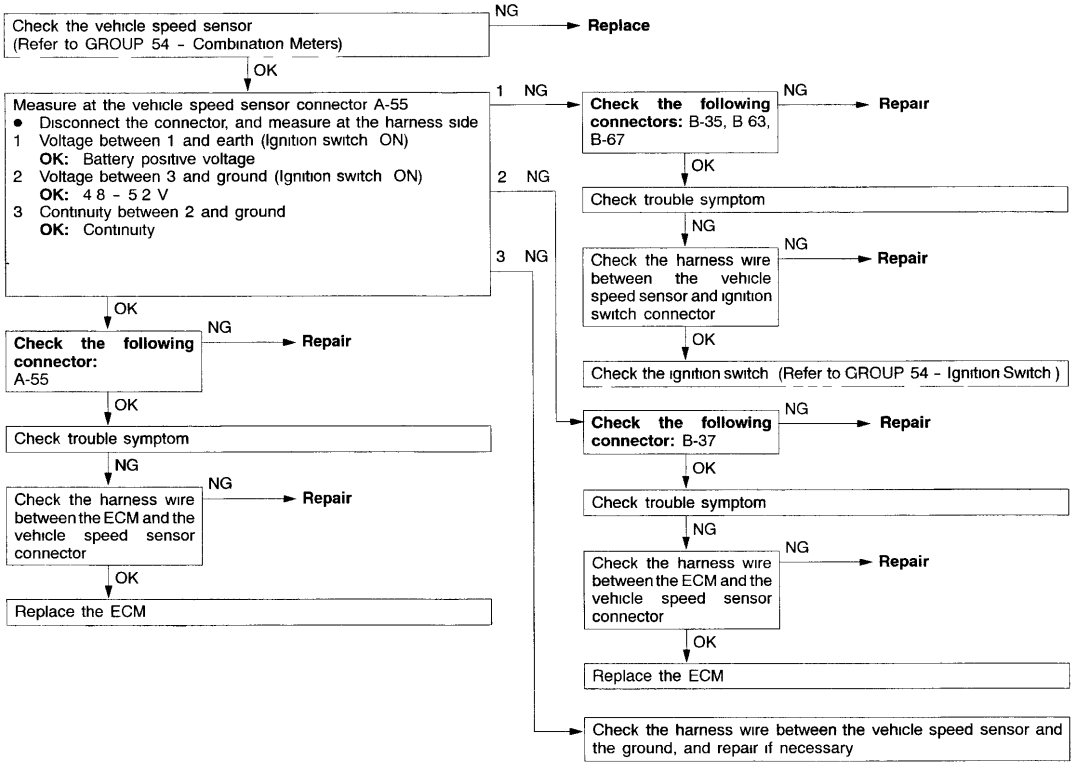
(3) Clamp off the vacuum hose one component at a time working towards the front of the vehicle until leakage is found (number 1 to 5 hoses shown in the illustration).

(4) Repair the leakage at that location and go to Step 15.

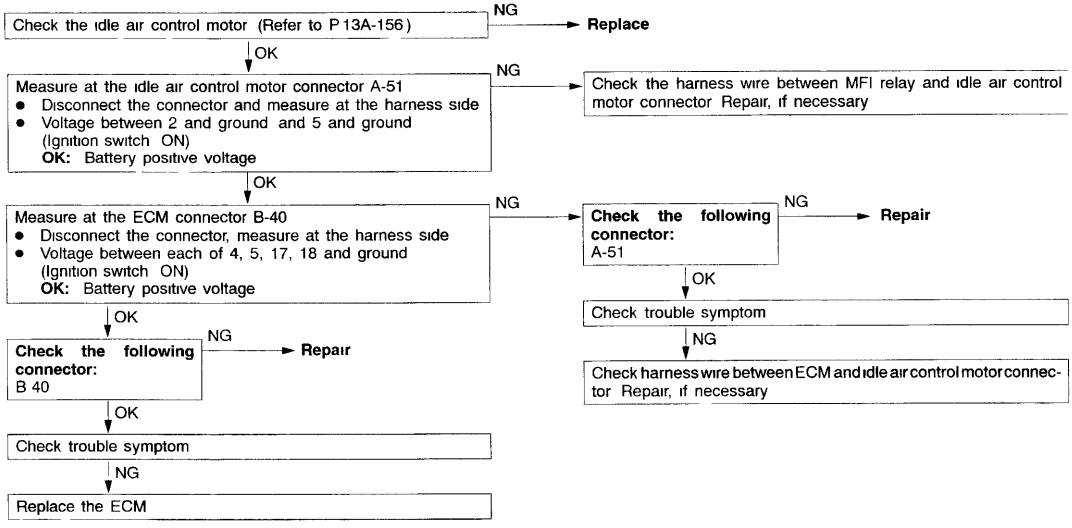
STEP 15. Confirmation test.

After system failures are repaired, repeat the Evaporative Emission System Leak Monitor test (Step 2) to check that the EVAP system operates correctly.

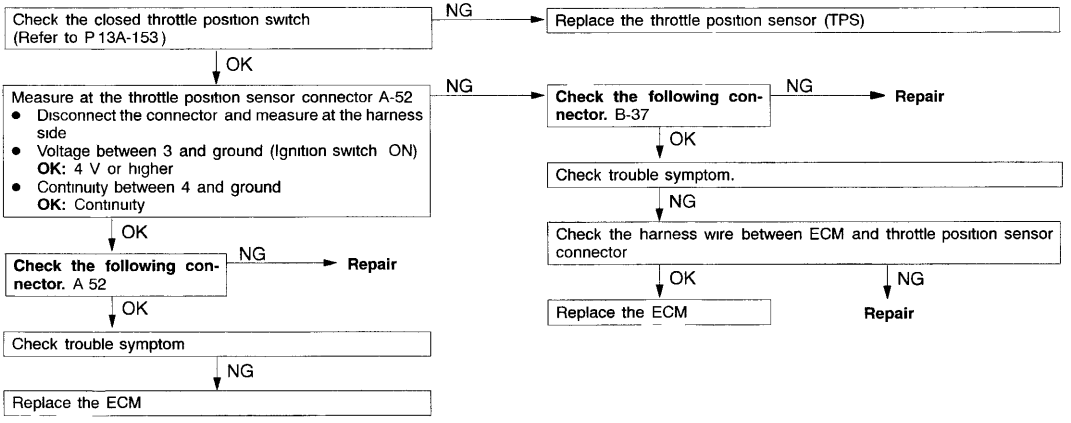
Code No. P0500 Vehicle Speed Sensor Malfunction	Probable cause
Background • The vehicle speed sensor outputs a pulse signal while the vehicle is driven • The engine control module checks whether the pulse signal is output Check Area • At least 2 seconds have passed since the engine was started • Closed throttle position switch OFF • Engine speed is not lower than 3000 r/min • Intake air pipe pressure is 83 kPa (12 psi) or more Judgment Criteria • Sensor output voltage has not changed (no pulse signal is input) for 2 sec	• Vehicle speed sensor failed • Open or shorted vehicle speed sensor circuit or loose connector • Engine control module failed



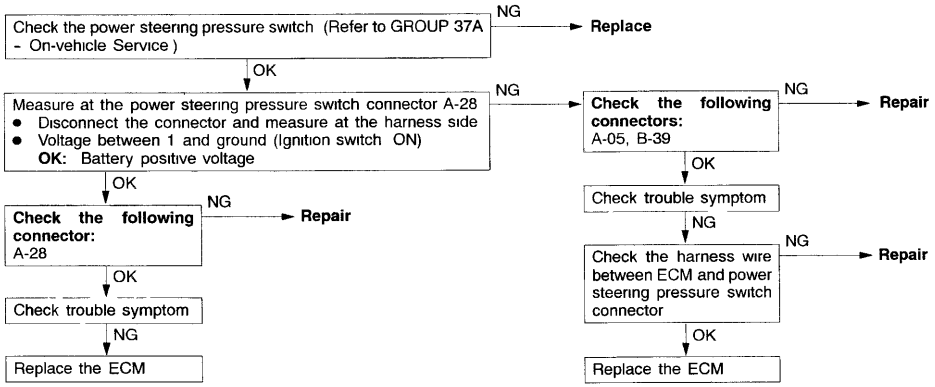
Code No. P0505 Idle Control System Malfunction	Probable cause
Background • If there is a malfunction of the IAC system, the actual engine speed will not be identical to the target engine speed • The engine control module checks the difference between the actual engine speed and the target engine speed Check Area • Vehicle speed has reached 1 5 km/h (0 93 mph) at least once • Under the closed loop idle speed control Judgment Criteria • Actual idle speed has continued to be higher than the target idle speed by 300 r/min or more for 10 sec Check Area • Vehicle speed has reached 1 5 km/h (0 93 mph) at least once • During idle speed closed loop control • The highest temperature at the last drive is 45°C (113°F) or less • Engine coolant temperature is approx 80°C (176°F) or more • Battery voltage is 10 V or more • Intake air temperature is -10°C (14°F) or more Judgment Criteria • Actual idle speed has been minimum 200 r/min higher than the target idle speed for ten seconds Check Area • During idle speed closed loop control • Engine coolant temperature is about 80°C (176°F) or higher • Battery voltage is 10 V or higher • Power steering switch is off • Intake air pipe pressure is 53 kPa (7 7 psi) or less • Intake air temperature is -10°C (14°F) or more Judgment Criteria • Actual idle speed has been minimum 100 r/min higher than the target idle speed for ten seconds	• Idle air control motor failed • Open or shorted idle air control motor circuit, or loose connector • Engine control module failed



Code No. P0510 Closed Throttle Position Switch Malfunction	Probable cause
Background • While the engine is idling without depressing the accelerator pedal "ON" signal can be input from the closed throttle position switch to the engine control module • The engine control module is used for checking the input signal while the engine is idling or the accelerator pedal is depressed slightly Check Area • Throttle position sensor output voltage is 2.0 V or more Judgment Criteria • Closed throttle position switch has been turned on Check Area • Repeat the *1 drive and *2 stop 15 times *1 drive: Engine speed is 1500 r/min or more, intake air pipe pressure is 40 kPa (5.8 psi) or more for two seconds or more *2 stop: Vehicle speed is 1.5 km/h (0.93 mph) or lower Judgment Criteria • Closed throttle position switch remains off	• Closed throttle position switch failed • Open or shorted closed throttle position switch circuit, or loose connector • Engine control module failed



Code No.P0551 Power Steering Pressure Sensor Circuit Range/Performance	Probable cause
Background • The steering wheel will be set to the straight ahead position for a while during driving At that time the power steering pressure switch will be turned off • The engine control module checks whether the power steering pressure switch is turned off during drive Check Area • Intake air temperature is -10°C (14°F) or higher • Barometric pressure is 76 kPa (11 psi) or higher • Engine coolant temperature is 30°C (86°F) or more • Repeat *1 drive and *2 stop ten times or more *1 Engine speed is 2,500 r/min or higher, intake air pipe pressure is 75 kPa (10 8 psi) and vehicle speed is 5 km/h (3 1 mph) or higher for at least 4 seconds *2 Vehicle speed is 1 5 km/h (0 93 mph) or lower Judgment Criteria • Power steering pressure switch remains on	• Power steering pressure switch failed • Open or shorted power steering pressure switch circuit, or loose connector • Engine control module failed



Code No. P0705 Transmission Range Sensor Circuit Malfunction (RPNDL Input)	Probable cause
Background • When a malfunction of the park/neutral position switch is detected the transaxle control module outputs a malfunction signal to the engine control module Range of Check, Set Conditions • A park/neutral position switch malfunction signal is input to the engine control module from the transaxle control module	• Park/neutral position switch failed • Open or shorted Park/neutral position switch circuit, or loose connector • Engine control module failed

Check the automatic transaxle diagnostic trouble codes (Refer to GROUP 23A - Troubleshooting)

Code No. P0710 Transmission Fluid Temperature Sensor Circuit Malfunction	Probable cause
Background • When a malfunction of the fluid temperature sensor is detected, the transaxle control module outputs a malfunction signal to the engine control module Check Area Judgment Criteria • The signal which indicates the failure of the oil temperature sensor is input from the transaxle control module to the engine control module	• Oil temperature sensor failed • Open or shorted oil temperature sensor circuit, or loose connector • Engine control module failed

Check the automatic transaxle diagnostic trouble codes (Refer to GROUP 23A - Troubleshooting)

Code No. P0715 Input/Turbine Speed Sensor Circuit Malfunction	Probable cause
Background • When a malfunction of the input shaft speed sensor is detected, the transaxle control module outputs a malfunction signal to the engine control module Check Area, Judgment Criteria • Input shaft speed sensor failure signal is input to the engine control module from the transaxle control module	• Input shaft speed sensor failed • Open or shorted Input shaft speed sensor circuit, or loose connector • Engine control module failed

Check the automatic transaxle diagnostic trouble codes (Refer to GROUP 23A - Troubleshooting)

Code No. P0720 Output Speed Sensor Circuit Malfunction	Probable cause
Background • When a malfunction of the output shaft speed sensor is detected, the transaxle control module outputs a malfunction signal to the engine control module Check Area, Judgment Criteria • Output shaft speed sensor failure signal is input to the engine control module from the transaxle control module	• Output shaft speed sensor failed • Open or shorted output shaft speed sensor circuit, or loose connector • Engine control module failed

Check the automatic transaxle diagnostic trouble codes (Refer to GROUP 23A - Troubleshooting)

Code No. P0725 Engine Speed Input Circuit Malfunction	Probable cause
Background • When a malfunction of the crankshaft position sensor is detected, the transaxle control module outputs a malfunction signal to the engine control module Check Area, Judgment Criteria • Crankshaft position sensor failure signal is input to the engine control module from the transaxle control module	• Crankshaft position sensor failed • Open or shorted input shaft speed sensor circuit, or loose connector • Engine control module failed

Check the automatic transaxle diagnostic trouble codes (Refer to GROUP 23A - Troubleshooting)

Code No. P0740 Torque Converter Clutch System Malfunction	Probable cause
Background • When a malfunction of the torque converter clutch or its related system is detected, the transaxle control module outputs a malfunction signal to the engine control module Check Area, Judgment Criteria • Failure signal of the torque converter clutch or its related system is input to the engine control module form the transaxle control module	• Torque converter clutch or its related system failed • Open or shorted torque converter clutch or its related system circuit, or loose connector • Engine control module failed

Check the automatic transaxle diagnostic trouble codes (Refer to GROUP 23A - Troubleshooting)

Code No. P0750 Shift Solenoid A Malfunction	Probable cause
Background • When a malfunction of the shift solenoid A (Low-reverse solenoid) is detected, the transaxle control module outputs a malfunction signal to the engine control module Check Area, Judgment Criteria • Low-reverse solenoid failure signal is input to the engine control module from the transaxle control module	• Low-reverse solenoid failed • Open or shorted low reverse solenoid circuit, or loose connector • Engine control module failed

Check the automatic transaxle diagnostic trouble codes (Refer to GROUP 23A - Troubleshooting)

Code No. P0755 Shift Solenoid B Malfunction	Probable cause
Background • When a malfunction of the shift solenoid B (Underdrive solenoid) is detected, the transaxle control module outputs a malfunction signal to the engine control module Check Area, Judgment Criteria • Underdrive solenoid failure signal is input to the engine control module from the transaxle control module	• Underdrive solenoid failed • Open or shorted underdrive solenoid circuit, or loose connector • Engine control module failed

Check the automatic transaxle diagnostic trouble codes (Refer to GROUP 23A - Troubleshooting.)

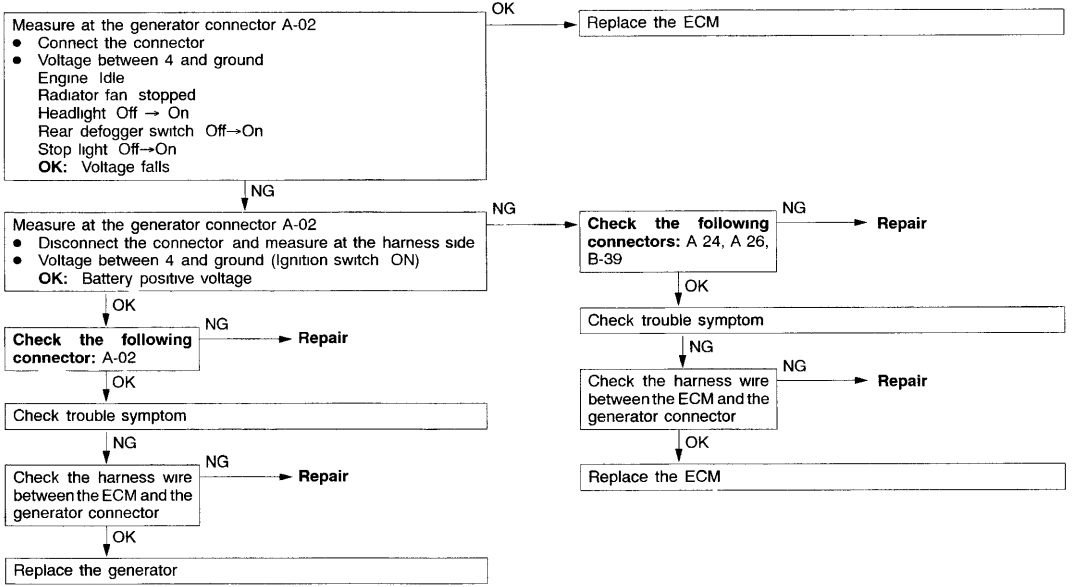
Code No. P0760 Shift Solenoid C Malfunction	Probable cause
Background • When a malfunction of the shift solenoid C (Second solenoid) is detected the transaxle control module outputs a malfunction signal to the engine control module Check Area, Judgment Criteria • Second solenoid failure signal is input to the engine control module form the transaxle control module	• Second solenoid failed • Open or shorted second solenoid circuit, or loose connector • Engine control module failed

Check the automatic transaxle diagnostic trouble codes (Refer to GROUP 23A - Troubleshooting.)

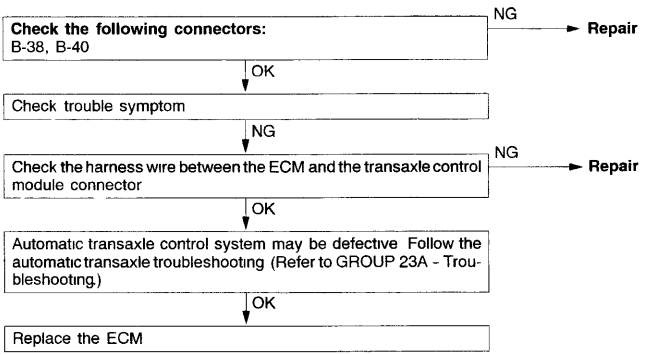
Code No. P0765 Shift Solenoid D Malfunction	Probable cause
Background • When a malfunction of the shift solenoid D (Overdrive solenoid) is detected, the transaxle control module outputs a malfunction signal to the engine control module Check Area, Judgment Criteria • Overdrive solenoid failure signal is input to the engine control module from the transaxle control module	• Overdrive solenoid failed • Open or shorted overdrive solenoid circuit, or loose connector • Engine control module failed

Check the automatic transaxle diagnostic trouble codes (Refer to GROUP 23A - Troubleshooting.)

Code No. P1500 Generator FR Terminal Circuit Malfunction	Probable cause
Background • When the generator field coils is controlled, the generator FR terminal inputs a signal to the engine control module • The engine control module detects the generator output with the input signal, and controls the idle air control motor according to the generator output Check Area • Engine speed is higher than 50 r/min Judgment Criteria • Input voltage from the generator FR terminal has been equal to battery positive voltage for 20 seconds	• Open circuit in generator FR terminal circuit • Engine control module failed



Code No. P1600 Serial Communication Link Malfunction	Probable cause
Background • The engine control module receives various messages from the transaxle control module via communication line • The engine control module monitors an abnormal message signal due to open circuit in communication line and transaxle control module failure Check Area • Two seconds or more have passed immediately after the engine started Judgment Criteria • Abnormal communication line (TCM to ECM) with the transaxle control module (TCM) • Transaxle control module (TCM) failed.	• Automatic transaxle control system failed • Open or short circuit, or loose connector in communication line between engine control module and transaxle control module • Transaxle control module failed • Engine control module failed



Code No. P1720 Vehicle Speed Sensor Signal Line Malfunction	Probable cause
Background • When a malfunction of the vehicle speed sensor is detected, the transaxle control module outputs a malfunction signal to the engine control module Check Area Judgment Criteria • Vehicle speed sensor failure signal is input to the engine control module from the transaxle control module	• Vehicle speed sensor failed • Open or shorted output vehicle speed sensor circuit or loose connector • Engine control module failed

Check the automatic transaxle diagnostic trouble codes (Refer to GROUP 23A - Troubleshooting.)

Code No. P1751 A/T Control Relay Malfunction	Probable cause
Background • When a malfunction of the A/T control relay is detected, the transaxle control module outputs a malfunction signal to the engine control module Check Area, Judgment Criteria • A/T control relay failure signal is input to the engine control module from the transaxle control module	• A/T control relay failed • Open or shorted output A/T control relay circuit, or loose connector • Engine control module failed

Check the automatic transaxle diagnostic trouble codes (Refer to GROUP 23A - Troubleshooting.)

Code No. P1795 Throttle Position Input Circuit Malfunction	Probable cause
Background • When a malfunction of the throttle position sensor is detected the transaxle control module outputs a malfunction signal to the engine control module Check Area, Judgment Criteria • Throttle position sensor failure signal is input to the engine control module from the transaxle control module	• Throttle position sensor failed • Open or shorted input shaft speed sensor circuit, or loose connector • Engine control module failed

Check the automatic transaxle diagnostic trouble codes (Refer to GROUP 23A - Troubleshooting.)

INSPECTION CHART FOR TROUBLE SYMPTOMS

13100880644

Trouble symptom		Inspection procedure No.	Reference Page
Communication with scan tool is impossible	Communication with all systems is not possible.	1	13A-91
	Communication with ECM only is not possible.	2	13A-91
Service Engine Soon/ Malfunction Indicator Lamp and related parts	The Service Engine Soon/Malfunction Indicator Lamp does not illuminate right after the ignition switch is turned to the ON position.	3	13A-92
	The Service Engine Soon/Malfunction Indicator Lamp remains illuminated and never goes out	4	13A-93
Starting	Cranks, won't start	5	13A-93
	Fires up and dies	6	13A-94
	Hard starting	7	13A-95
Idling stability (Improper idling)	Unstable idle (Rough idle, hunting)	8	13A-96
	Idle speed is high. (Improper idle speed)	9	13A-97
	Idle speed is low. (Improper idle speed)	10	13A-98
Idling stability (Engine stalles)	When the engine is cold, it stalls at idle (Die out)	11	13A-99
	When the engine becomes hot, it stalls at idle (Die out)	12	13A-100
	The engine stalls when accelerating. (Pass out)	13	13A-101
	The engine stalls when decelerating.	14	13A-101
Driving	Hesitation, sag or stumble	15	13A-102
	Acceleration shock	16	13A-102
	Deceleration shock	17	13A-103
	Poor acceleration	18	13A-103
	Surge	19	13A-104
	Knocking	20	13A-104
Dieseling		21	13A-104
Too high CO and HC concentration when idling		22	13A-105
Generator output voltage is low (approx. 12.3V)		23	13A-106
Fans (radiator fan, A/C condenser fan) are inoperative		24	13A-106
IM240 test failure	Transient, mass emission tailpipe test	25	13A-107
	Purge flow test of the evaporative canister	26	13A-108
	Pressure test of the evaporative system	27	13A-108

PROBLEM SYMPTOMS TABLE (FOR YOUR INFORMATION)

Items		Symptom
Starting Idling stability	Won't start	The starter is used to crank the engine, but there is no combustion within the cylinders, and the engine won't start
	Fires up and dies	There is combustion within the cylinders, but then the engine soon stalls
	Hard starting	Engine starts after cranking a while.
Starting Idling stability	Hunting	Engine speed doesn't remain constant; changes at idle
	Rough idle	Usually, a judgement can be based upon the movement of the tachometer pointer, and the vibration transmitted to the steering wheel, shift lever, body, etc. This is called rough idle
	Incorrect idle speed	The engine doesn't idle at the usual correct speed.
	Engine stall (Die out)	The engine stalls when the foot is taken from the accelerator pedal, regardless of whether the vehicle is moving or not.
	Engine stall (Pass out)	The engine stalls when the accelerator pedal is depressed or while it is being used.
Driving	Hesitation Sag	"Hesitation" is the delay in response of the vehicle speed (engine speed) that occurs when the accelerator is depressed in order to accelerate from the speed at which the vehicle is now traveling, or a temporary drop in vehicle speed (engine speed) during such acceleration. Serious hesitation is called "sag". (Refer to Fig. 1)
	Poor acceleration	Poor acceleration is inability to obtain an acceleration corresponding to the degree of throttle opening, even though acceleration is smooth, or the inability to reach maximum speed.
	Stumble	Engine speed increase is delayed when the accelerator pedal is initially depressed for acceleration. (Refer to Fig 2)
	Shock	The feeling of a comparatively large impact or vibration when the engine is accelerated or decelerated.
	Surge	This is slight acceleration and deceleration feel usually felt during steady, light throttle cruise. Most notable under light loads.
	Knocking	A sharp sound like a hammer striking the cylinder walls during driving and which adversely affects driving.
Stopping	Run on ("Dieseling")	The condition in which the engine continues to run after the ignition switch is turned to OFF. Also called "Dieseling".

Fig. 1

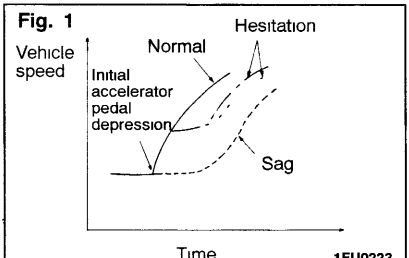
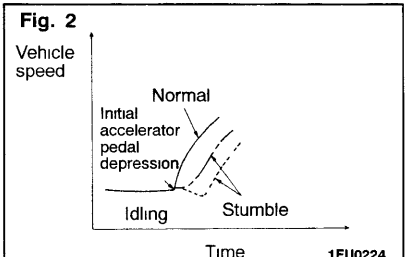


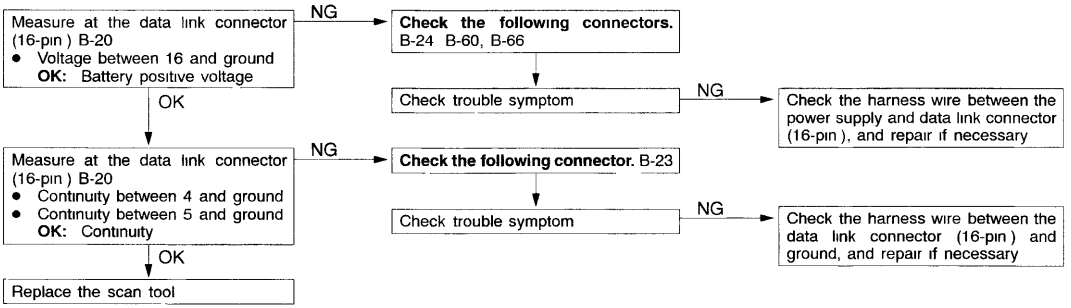
Fig. 2



INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

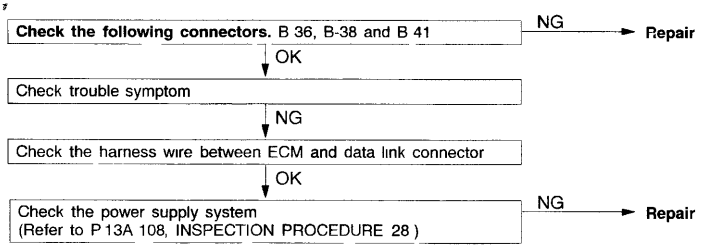
INSPECTION PROCEDURE 1

Communication with scan tool is not possible. (Communication with all systems is not possible.)	Probable cause
The cause is probably a defect in the power supply system (including ground) for the on-board diagnostic test mode line	• Malfunction of the connector • Malfunction of the harness wire



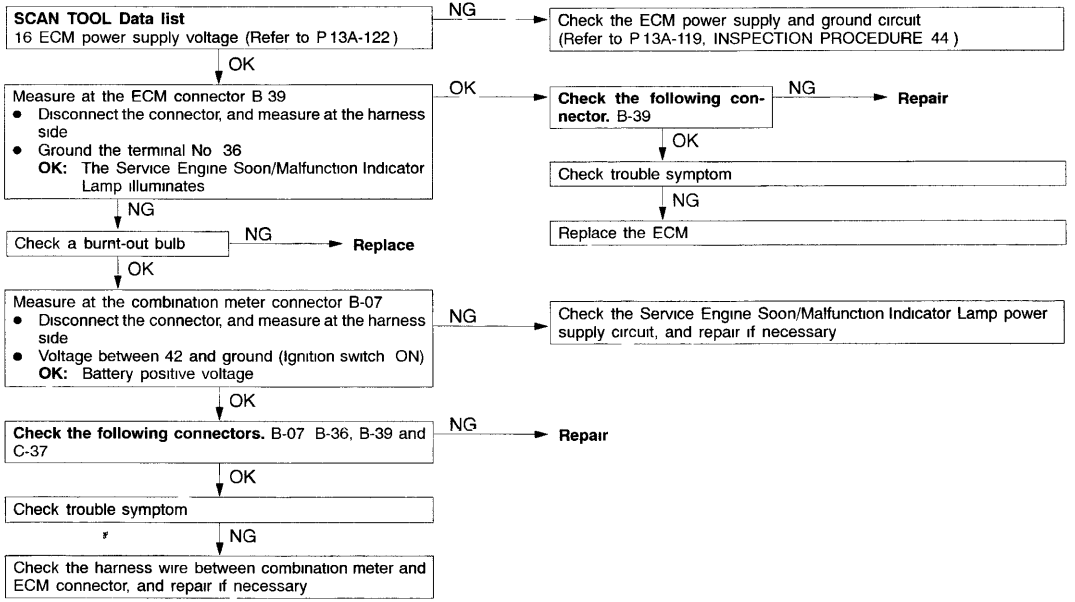
INSPECTION PROCEDURE 2

Scan tool communication with ECM is not possible.	Probable cause
One of the following causes may be suspected • No power supply to ECM • Defective ground circuit of ECM • Defective ECM • Improper communication line between ECM and scan tool	• Malfunction of ECM power supply circuit • Malfunction of the ECM • Open circuit between ECM and data link connector



INSPECTION PROCEDURE 3

The Service Engine Soon/Malfunction Indicator Lamp does not illuminate right after the ignition switch is turned to the ON position.	Probable cause
The ECM causes the Service Engine Soon/Malfunction Indicator Lamp to illuminate for five seconds immediately after the ignition switch is turned to ON If the Service Engine Soon/Malfunction Indicator Lamp does not illuminate immediately after the ignition switch is turned to ON, one of the malfunctions listed at right has probably occurred	• Burnt-out bulb • Defective Service Engine Soon/Malfunction Indicator Lamp circuit • Malfunction of the ECM



INSPECTION PROCEDURE 4

The Service Engine Soon/Malfunction Indicator Lamp remains illuminated and never goes out.	Probable cause
In cases such as the above the cause is probably that the ECM is detecting a problem in a sensor or actuator, or that one of the malfunctions listed at right has occurred	• Short-circuit between the Service Engine Soon/Malfunction Indicator Lamp and ECM • Malfunction of the ECM

SCAN TOOL DTC
Are diagnostic trouble codes output?
- YES → Refer to P13A-24, INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES
- NO ↓

Measure at the combination meter connector B-07
- Disconnect the connector and measure at the harness side
- Disconnect the ECM connector
- Continuity between 53 and ground
  OK: No continuity

- NG → Check the harness wire between combination meter and ECM connector, and repair if necessary
- OK ↓

Replace the ECM

INSPECTION PROCEDURE 5

Cranks, won't start	Probable cause
In cases such as the above, the cause is probably no spark, or fuel delivery or fuel quality problems In addition, foreign materials (water, kerosene, etc) may be mixed with the fuel	• Malfunction of the ignition system • Malfunction of the fuel pump system • Malfunction of the injectors • Malfunction of the ECM • Foreign materials in fuel

Check battery positive voltage when cranking
OK: 8 V or higher
- NG → Check the battery (Refer to GROUP 54-Battery)
- OK ↓

Scan tool Inspection of no initial combustion (Refer to P13A-113, INSPECTION PROCEDURE 36)
- OK ↓

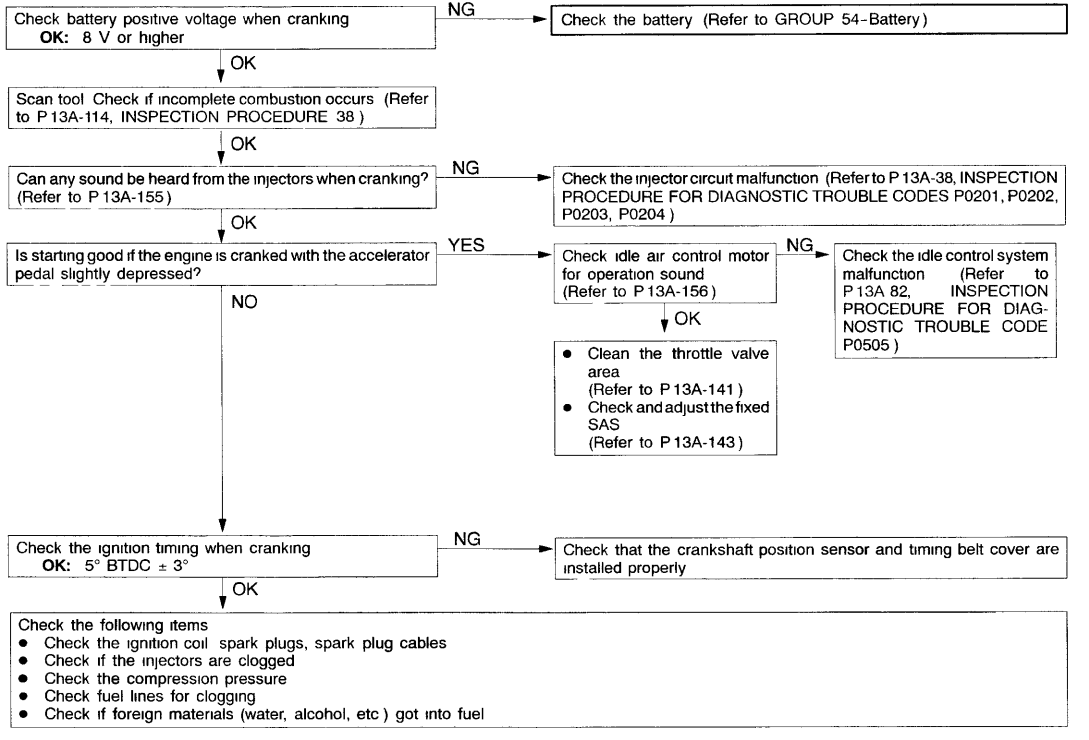
Can any sound be heard from the injectors when cranking? (Refer to P13A-155)
- NG → Check the injector circuit malfunction (Refer to P13A-38, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES P0201, P0202 P0203, P0204)
- OK ↓

Ignition system Inspection of no initial combustion (Refer to P13A-114, INSPECTION PROCEDURE 37)
- OK ↓

Check the following items
- Check the ignition coil, spark plugs spark plug cables
- Check if the injectors are clogged
- Check if foreign materials (water alcohol, etc) got into fuel
- Check the compression pressure

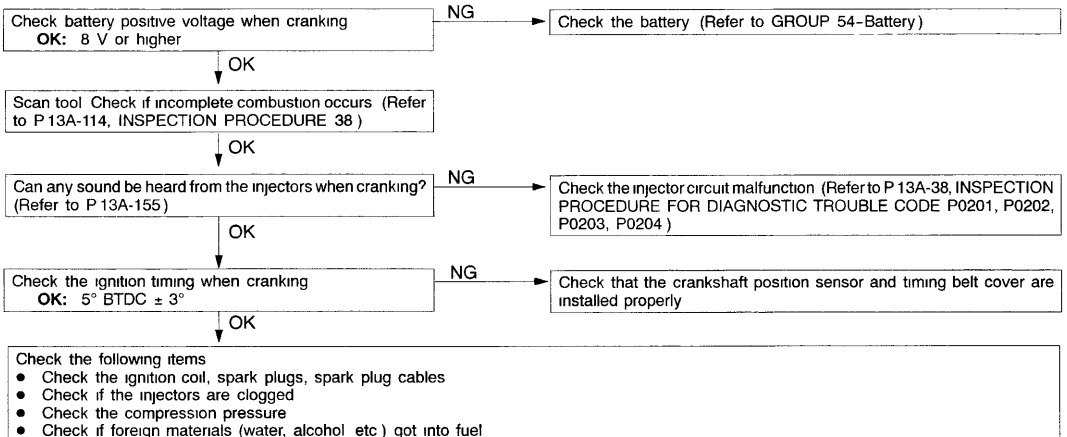
INSPECTION PROCEDURE 6

Fires up and dies.	Probable cause
In such cases as the above, the cause is usually improper air/fuel mixture It is possible, though less likely, that the spark plugs are generating sparks but the sparks are weak	• Malfunction of the ignition system • Malfunction of the injector system • Foreign materials in fuel • Poor compression • Malfunction of the ECM



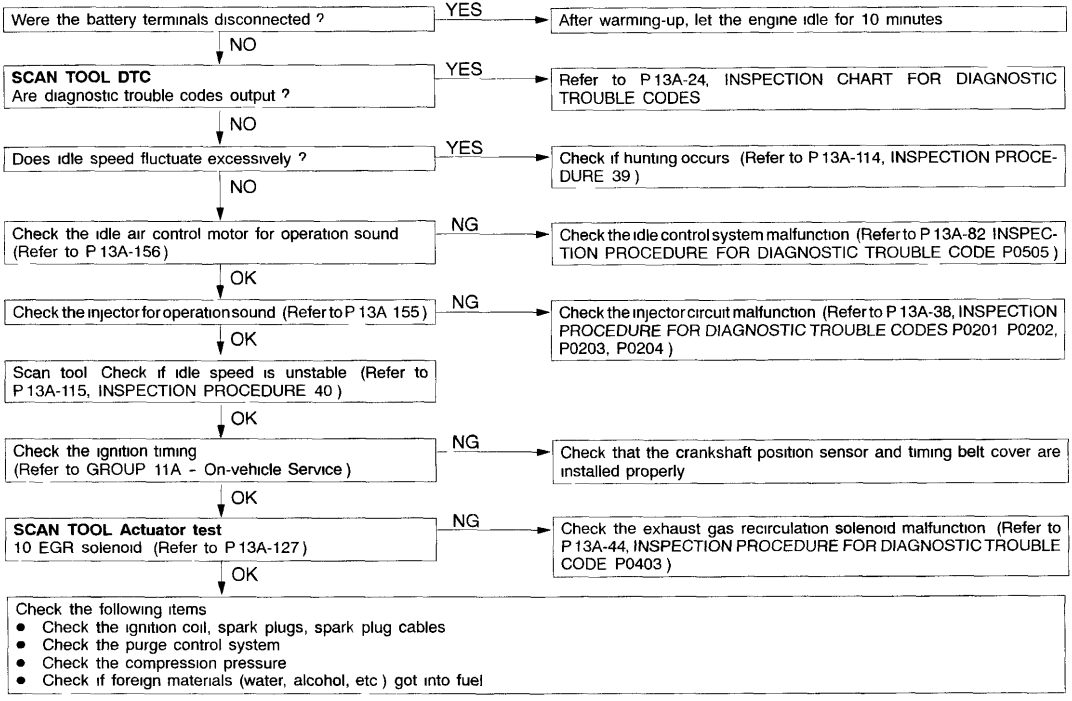
INSPECTION PROCEDURE 7

Hard starting	Probable cause
In cases such as the above, the cause is probably that the spark is weak and ignition is difficult, the initial mixture for starting is not appropriate, or sufficient compression pressure is not being obtained	• Malfunction of the ignition system • Malfunction of the injector system • Inappropriate fuel quality • Poor compression



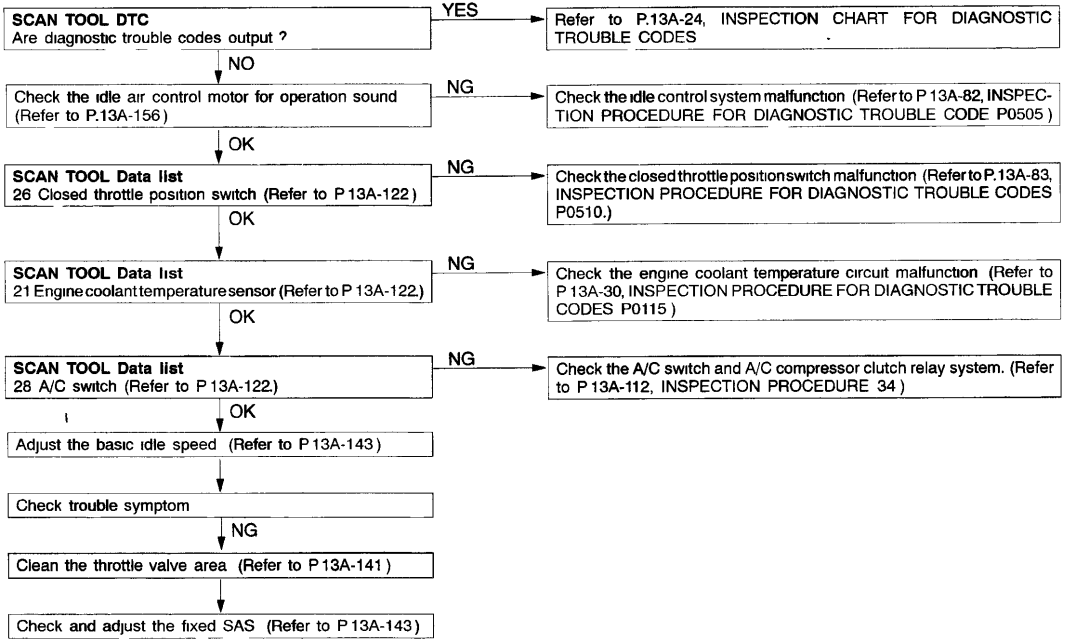
INSPECTION PROCEDURE 8

Unstable idle (Rough idle, hunting)	Probable cause
In cases such as the above, the cause is probably that the ignition system, air/fuel mixture, idle air control motor or compression pressure is defective Because the range of possible causes is broad, inspection is narrowed down to simple items	• Malfunction of the ignition system • Malfunction of air-fuel ratio control system • Malfunction of the IAC system • Malfunction of the evaporative emission purge solenoid system • Poor compression • Vacuum leak • Malfunction of the EGR solenoid system



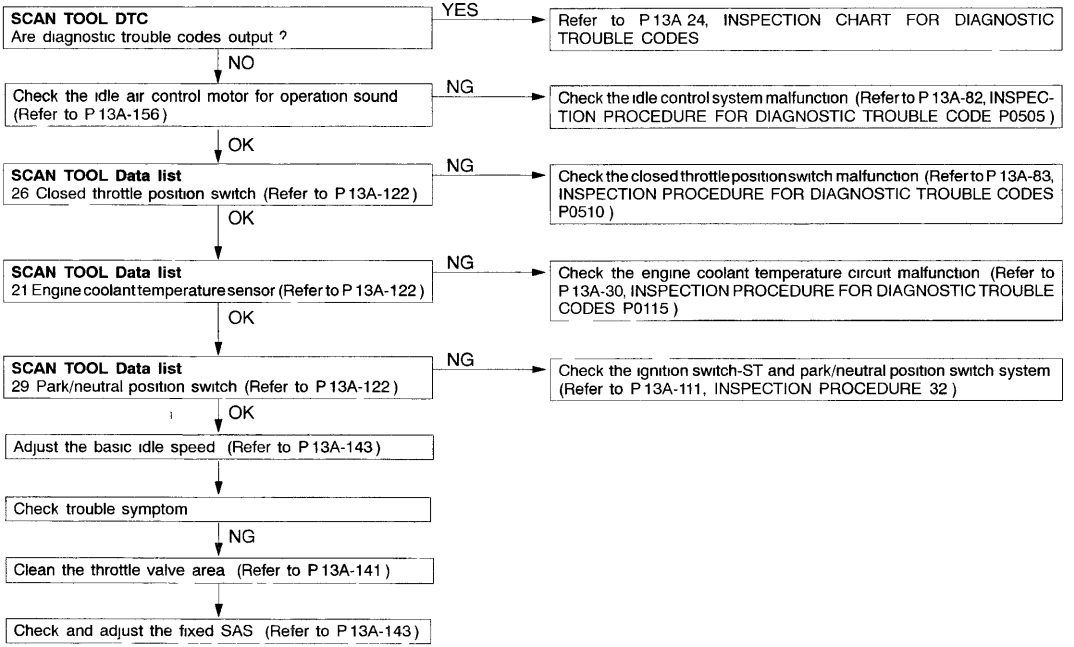
INSPECTION PROCEDURE 9

Idle speed is high. (Improper idle speed)	Probable cause
In such cases as the above, the cause is probably that the intake air volume during idle is too great	• Malfunction of the idle air control motor system • Malfunction of the throttle body



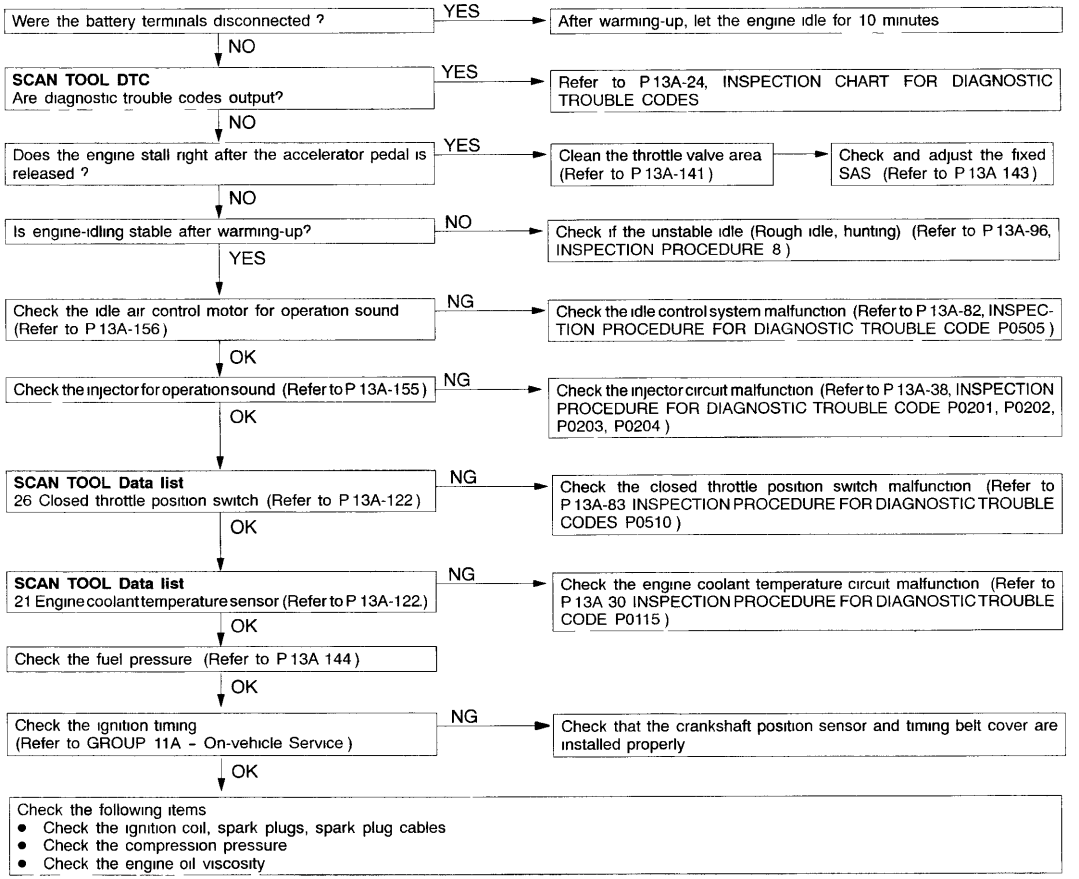
INSPECTION PROCEDURE 10

Idle speed is low. (Improper idle speed)	Probable cause
In cases such as the above, the cause is probably that the intake air volume during idling is too small	• Malfunction of the idle air control motor system • Malfunction of the throttle body



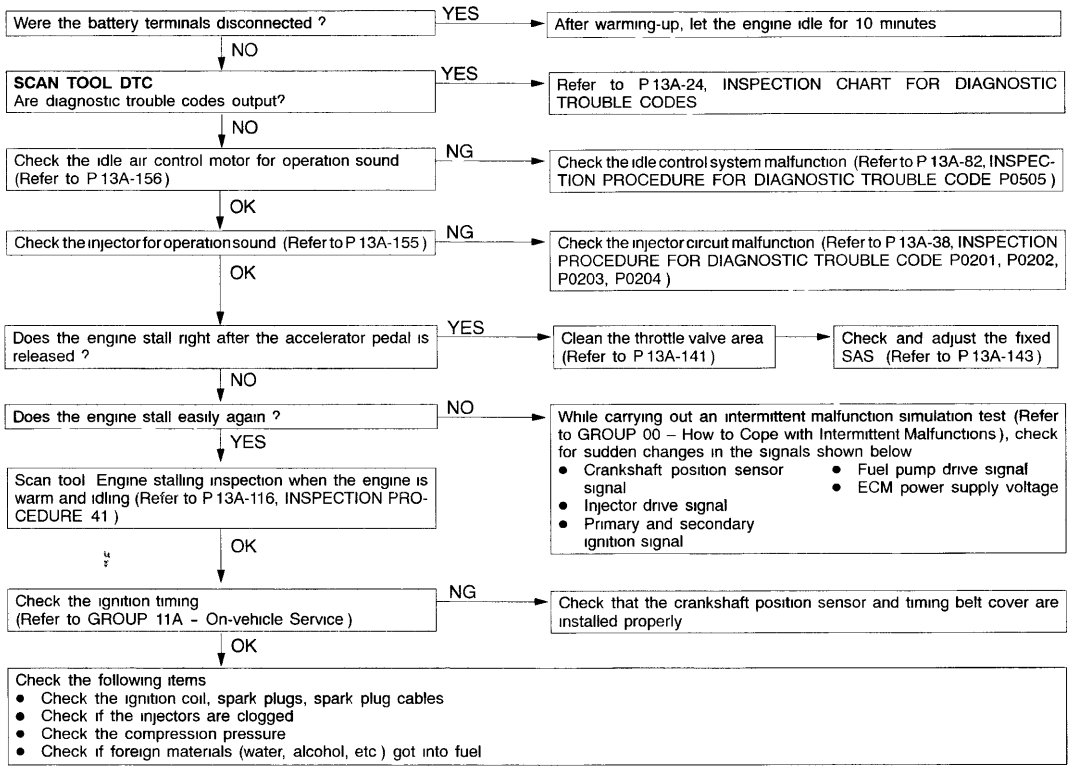
INSPECTION PROCEDURE 11

When the engine is cold, it stalls at idle. (Die out)	Probable cause
In such cases as the above, the cause is probably that the air/fuel mixture is inappropriate when the engine is cold, or that the intake air volume is insufficient	• Malfunction of the idle air control motor system • Malfunction of the throttle body • Malfunction of the injector system • Malfunction of the ignition system



INSPECTION PROCEDURE 12

When the engine is hot, it stalls at idle. (Die out)	Probable cause
In cases such as the above, the cause is probably that ignition system air/fuel mixture, idle air control motor or compression pressure is defective In addition, if the engine suddenly stalls, the cause may also be a defective connector contact	• Malfunction of the ignition system • Malfunction of air fuel ratio control system • Malfunction of the IAC system • Vacuum leak • Improper connector contact



INSPECTION PROCEDURE 13

The engine stalls when accelerating. (Pass out)	Probable cause
In cases such as the above, the cause is probably misfiring due to a weak spark, or an inappropriate air/fuel mixture when the accelerator pedal is depressed	• Vacuum leak • Malfunction of the ignition system

SCAN TOOL DTC
Are diagnostic trouble codes output?
YES → Refer to P.13A-24, INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES
NO ↓

SCAN TOOL Actuator test
10 EGR solenoid (Refer to P 13A-127)
NG → Exhaust gas recirculation solenoid malfunction (Refer to P 13A-44, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0403)
OK ↓

Check the following items
- Check the ignition coil, spark plugs, spark plug cables
- Check if air was drawn into the intake system.
  - Broken intake manifold gasket
  - Broken or disconnected vacuum hose
  - Improper operation of the PCV valve
  - Broken air intake hose

INSPECTION PROCEDURE 14

The engine stalls when decelerating.	Probable cause
In cases such as the above, the cause is probably that the intake air volume is insufficient due to a defective idle air control motor system.	• Malfunction of the IAC system

Were the battery terminals disconnected ?
YES → After warming up let the engine idle for 10 minutes.
NO ↓

SCAN TOOL DTC
Are diagnostic trouble codes output?
YES → Refer to P 13A-24, INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES.
NO ↓

SCAN TOOL Data list
26 Closed throttle position switch (Refer to P 13A-122)
NG → Check the closed throttle position switch malfunction (Refer to P 13A-83, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES P0510)
OK ↓

SCAN TOOL Data list
14 Throttle position sensor (Refer to P 13A-122)
NG → Check the throttle position circuit malfunction (Refer to P.13A-31, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0120)
OK ↓

SCAN TOOL Data list
55 Idle air control valve position sensor
- Is the idle speed control motor position dropped to 0-2 steps when decelerating (engine rpm more than 1,000)?

YES → Check the vehicle speed sensor malfunction (Refer to P 13A-81, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0500)
NO ↓

SCAN TOOL Actuator test
10 EGR solenoid (Refer to P 13A 127)
NG → Exhaust gas recirculation solenoid malfunction (Refer to P 13A-44, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0403.)
OK ↓

Check the following items.
- Check the ignition coil spark plugs, spark plug cables
- Clean the throttle valve area
- Check and adjust the fixed SAS.

INSPECTION PROCEDURE 15

Hesitation, sag or stumble	Probable cause
In cases such as the above, the cause is probably that ignition system, air/fuel mixture or compression pressure is defective	• Malfunction of the ignition system • Malfunction of air-fuel ratio control system • Malfunction of the fuel supply system • Malfunction of the EGR solenoid system • Poor compression

SCAN TOOL DTC
Are diagnostic trouble codes output ?
YES → Refer to P13A-24, INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES
NO ↓

Check the injectors for operation sound (Refer to P13A-155)
NG → Check the injector circuit malfunction (Refer to P13A-38, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0201, P0202, P0203, P0204)
OK ↓

Check the ignition timing (Refer to GROUP 11A - On vehicle Service)
NG → Check that the crankshaft position sensor and timing belt cover are installed properly
OK ↓

Scan Tool Check if hesitation, sag stumble or poor acceleration occur (Refer to P13A-117 INSPECTION PROCEDURE 42)
OK ↓

Check the fuel pressure (Refer to P13A-144)
OK ↓

Check the following items
- Check the ignition coil, spark plugs, spark plug cables
- Check the EGR system
- Check the compression pressure
- Check the fuel filter or fuel line for clogging

INSPECTION PROCEDURE 16

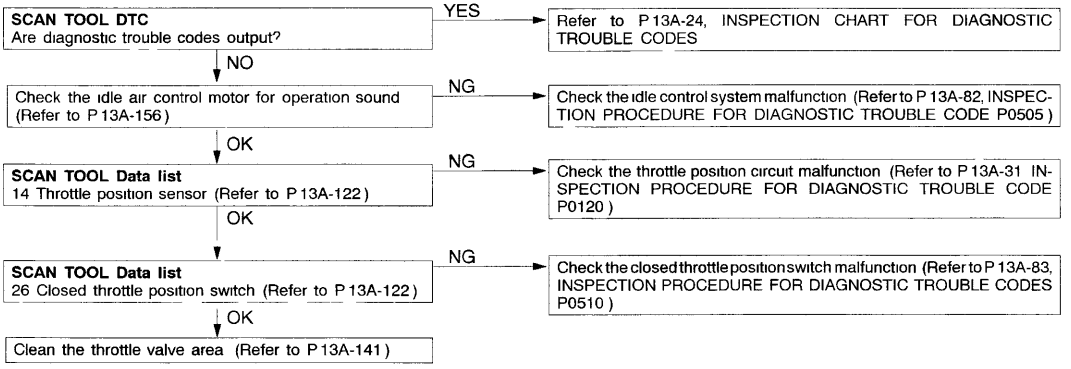
Acceleration shock	Probable cause
In cases such as the above, the cause is probably that there is an ignition leak accompanying the increase in the spark plug demand voltage during acceleration	• Malfunction of the ignition system

SCAN TOOL DTC
Are diagnostic trouble codes output ?
YES → Refer to P13A-24, INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES
NO ↓

Check the following items
- Check the ignition coil, spark plugs, spark plug cables
- Check for occurrence of ignition leak

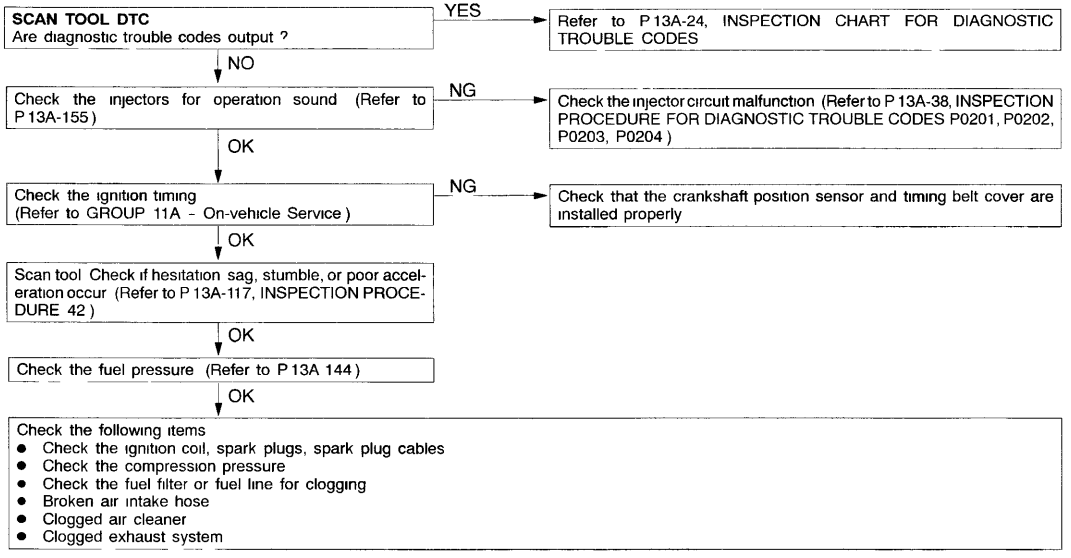
INSPECTION PROCEDURE 17

Deceleration shock	Probable cause
Malfunction of the IAC system is suspected	• Malfunction of the IAC system



INSPECTION PROCEDURE 18

Poor acceleration	Probable cause
Defective ignition system, abnormal air-fuel ratio, poor compression pressure etc are suspected	• Malfunction of the ignition system • Malfunction of air-fuel ratio control system • Malfunction of the fuel supply system • Poor compression • Clogged exhaust system



INSPECTION PROCEDURE 19

Surge	Probable cause
Defective ignition system, abnormal air-fuel ratio, etc are suspected	• Malfunction of the ignition system • Malfunction of air-fuel ratio control system • Malfunction of the EGR solenoid system

SCAN TOOL DTC
Are diagnostic trouble codes output ?
YES → Refer to P.13A-24, INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES
NO ↓

Check the injectors for operation sound (Refer to P.13A-155)
NG → Check the injector circuit malfunction (Refer to P.13A-38, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0201, P0202, P0203 P0204)
OK ↓

Check the ignition timing
(Refer to GROUP 11A - On-vehicle Service)
NG → Check that the crankshaft position sensor and timing belt cover are installed properly
OK ↓

Scan Tool Check if surge occurs (Refer to P.13A-118, INSPECTION PROCEDURE 43)
OK ↓

Check the fuel pressure (Refer to P.13A-144)
OK ↓

Check the following items
- Check the ignition coil, spark plugs, spark plug cables
- Check the EGR system

INSPECTION PROCEDURE 20

Knocking	Probable cause
In cases such as the above, the cause is probably that the heat value of the spark plug is inappropriate or low fuel quality	• Inappropriate heat value of the spark plug

Check the following items
- Fuel quality, octane level
- Spark plugs
- Check if foreign materials (water, alcohol, etc) got into fuel

INSPECTION PROCEDURE 21

Dieseling	Probable cause
Fuel leakage from injectors is suspected or carbon build up	• Fuel leakage from injectors

Check the injectors for fuel leakage

INSPECTION PROCEDURE 22

Too high CO and HC concentration when idling	Probable cause
Abnormal air-fuel ratio is suspected	• Malfunction of the air-fuel ratio control system • Deteriorated catalyst

SCAN TOOL DTC
Are diagnostic trouble codes output?
YES → Refer to P 13A-24, INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES
NO ↓

Check the ignition timing
(Refer to GROUP 11A - On vehicle Service)
NG → Check that the crankshaft position sensor and timing belt cover are installed properly
OK ↓

SCAN TOOL Data list
21 Engine coolant temperature sensor
(Refer to P 13A 122)
NG → Check the engine coolant temperature circuit malfunction (Refer to P 13A 30, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0115)
OK ↓

SCAN TOOL Data list
13 Intake air temperature sensor (Refer to P 13A-122)
NG → Check the intake air temperature circuit malfunction (Refer to P 13A-29, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0110)
OK ↓

SCAN TOOL Data list
59 Heated oxygen sensor (rear) (Refer to P 13A-122.)
- Transaxle 2nd gear <M/T>, L range <A/T>
- Driving with the throttle wide open
  OK: 600 - 1,000 mV

NG → Check the oxygen sensor circuit malfunction (sensor 2) (Refer to P 13A-35, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0136)
OK ↓

SCAN TOOL Data list
11 Heated oxygen sensor (front) (Refer to P 13A-122)
OK: 600 - 1,000 mV when racing suddenly
NG → Check the oxygen sensor circuit malfunction (sensor 1) (Refer to P 13A-33 INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0130)
OK ↓

SCAN TOOL Data list
11 Heated oxygen sensor (front) (Refer to P 13A-122)
OK: Repeat 0 - 400 mV and 600 - 1 000 mV alternately when idling
OK → Replace the heated oxygen sensor (front) → Check trouble symptom → NG ↓
NG ↓

Check the fuel pressure (Refer to P 13A 144)
OK ↓

Check the following items
- Check the injectors for operation sound
- Check the injectors for fuel leakage
- Check the ignition coil, spark plugs, spark plug cables
- Check the compression pressure
- Check the positive crankcase ventilation system
- Check the evaporative emission control system
- Check the EGR system

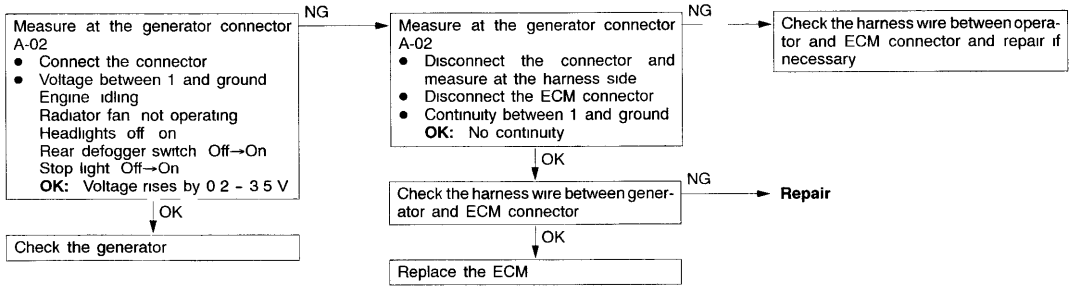
↓

Check trouble symptom
NG ↓

Replace the three-way catalytic converter

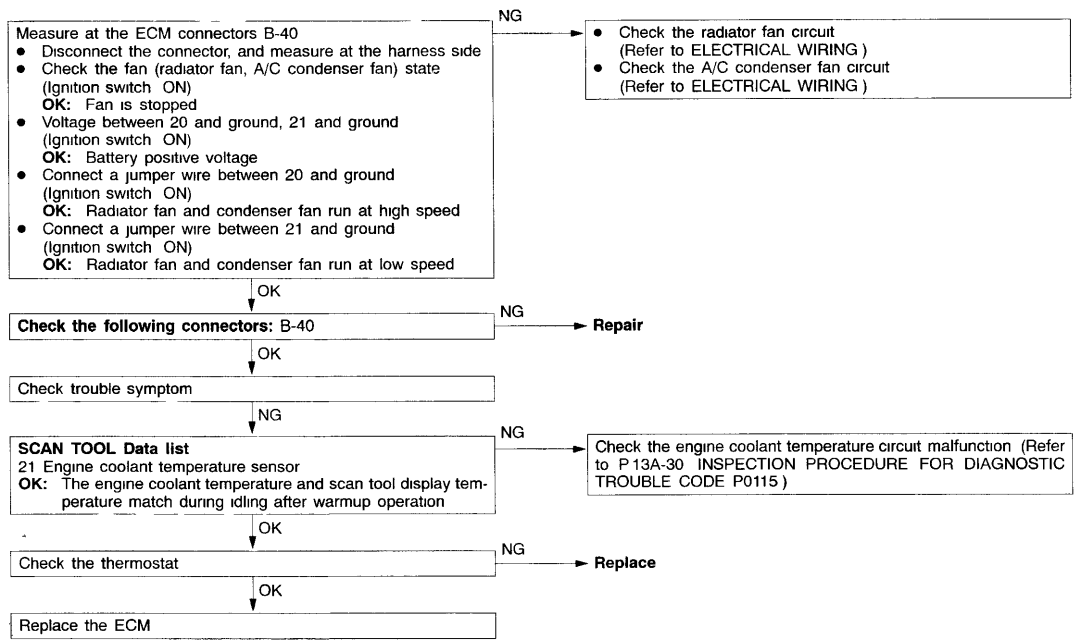
INSPECTION PROCEDURE 23

Low generator output voltage (approx. 12.3 V)	Probable cause
The cause may be a malfunction of the generator or one of the problems listed at right	• Malfunction of charging system • Short circuit in harness between Generator G terminal and engine control module • Malfunction of ECM



INSPECTION PROCEDURE 24

Fans (radiator fan, A/C condenser fan) are inoperative	Probable cause
[Comment] The fan motor relay is controlled by the power transistor inside the PCM turning ON and OFF	• Malfunction of fan motor relay • Malfunction of fan motor • Malfunction of thermostat • Improper connector contact, open circuit or short-circuited harness wire • Malfunction of the PCM



INSPECTION PROCEDURE 25

Transient, mass emission tailpipe test failure	Probable cause
The test is failed when the air-fuel ratio is not controlled to the ideal air fuel ratio due to the feedback control by oxygen sensor signals, or when the EGR flow rate is insufficient, or the catalyst has deteriorated	• Malfunction of the air-fuel ratio control system • Malfunction of the EGR system • Deteriorated catalyst

NOTE
If the three-way catalyst temperature is low when checking the exhaust gas, the three-way catalyst cannot sufficiently perform for cleaning the emission. Warm up the engine sufficiently before checking the exhaust, and check immediately

Has the engine been warmed up sufficiently before checking the exhaust gas? (Confirm with owner)
NO → Sufficiently warm up the engine, and then check the exhaust
Yes ↓

- Check all vacuum hoses and connectors
- Check electrical wires and connectors for obvious problems.
- Check the exhaust system for missing or damage parts

NG → Repair
OK ↓

Does the vehicle have poor driveability?
YES → Refer to P 13A-89, INSPECTION CHART FOR TROUBLE SYMPTOMS.
NO ↓

SCAN TOOL DTC
Are diagnostic trouble code(s) output?
YES → Refer to P 13A-24, INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODE
NO ↓

Check the ignition timing
(Refer to GROUP 11A - On-vehicle Service)
NG → Check that the crankshaft position sensor and timing belt cover are installed properly
OK ↓

SCAN TOOL Data list
21 Engine coolant temperature sensor (Refer to P.13A-122.)
NG → Check the engine coolant temperature sensor circuit malfunction. (Refer to P 13A-30, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0115)
OK ↓

SCAN TOOL Data list
13 Intake air temperature sensor (Refer to P 13A-122)
NG → Check the intake air temperature sensor circuit malfunction (Refer to P 13A-29 INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0110)
OK ↓

SCAN TOOL Data list
59 Heated oxygen sensor (rear)

- Transaxle 2nd gear <M/T>, L range <A/T>
- Drive with wide open throttle

OK: 600 - 1000 mV
NG → Check the oxygen sensor circuit malfunction (sensor 2). (Refer to P 13A-35, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0136)
OK ↓

SCAN TOOL Data list
11 Heated oxygen sensor (front)
OK: 600 - 1000 mV when racing suddenly
NG → Check the oxygen sensor circuit malfunction (sensor 1) (Refer to P 13A-33 INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0130)
OK ↓

SCAN TOOL Data list
11 Heated oxygen sensor (front)
OK: 0 - 400 mV ↔ 600 - 1000 mV alternately when idling and 2500 r/min
OK → Check the EGR system. (Refer to GROUP 17 - Emission Control System.)
NG ↓

Check the fuel pressure (Refer to P.13A-144)
OK → Measure the CO concentration during idling
OK: 0.5% or less
NG → Replace the heated oxygen sensor (front)
OK ↓

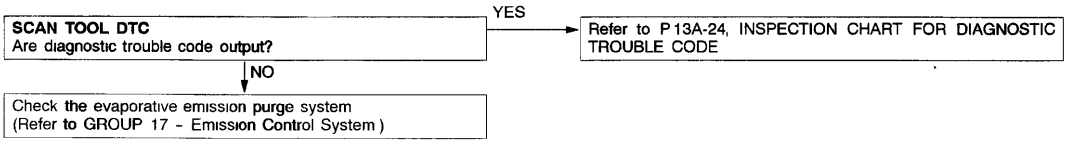
Check the following items.

- Check the injectors for operation sound
- Check the injectors for fuel leakage
- Check the ignition coil spark plugs, spark plug cables.
- Check the compression pressure
- Check the positive crankcase ventilation system
- Check the evaporative emission control system

OK → Check trouble symptom.
NG → Replace the three-way catalytic converter

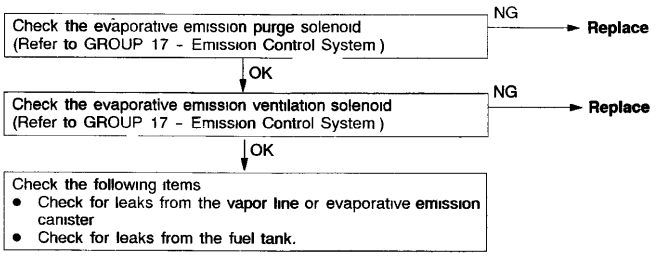
INSPECTION PROCEDURE 26

Evaporative canister purge flow test failure	Probable cause
The test fails when the purge line or purge port is clogged or if the evaporative emission purge solenoid fails	• Purge line or purge port is clogged • Malfunction of evaporative emission purge solenoid • Evaporative emission canister is clogged



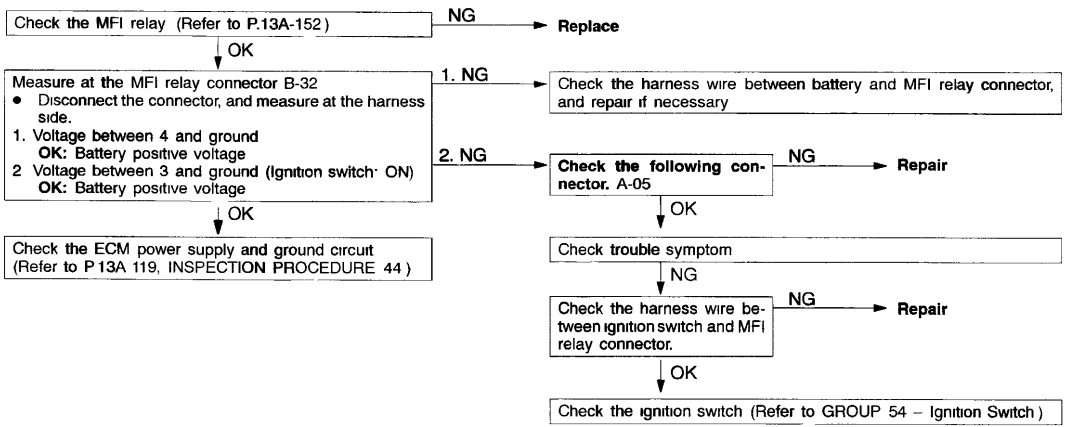
INSPECTION PROCEDURE 27

Evaporative system pressure test failure	Probable cause
The test fails if there is a leak from the fuel tank or vapor line	• Improper tightening of fuel tank filler tube cap clamp • Broken seal in fuel tank, vapor line evaporative emission canister



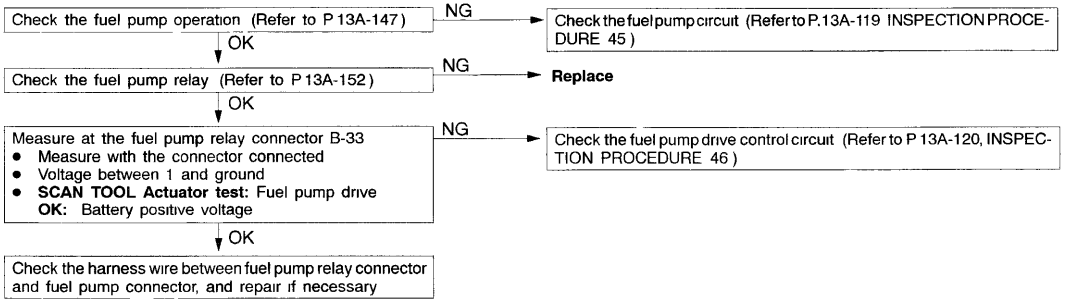
INSPECTION PROCEDURE 28

Power supply system	Probable cause
While the ignition switch is ON, battery power is supplied to ECM, injectors, volume air flow sensor, etc through MFI relay	• Malfunction of the MFI relay • Improper connector contact open circuit or short circuited harness wire • Disconnected ECM ground wire • Malfunction of the ECM



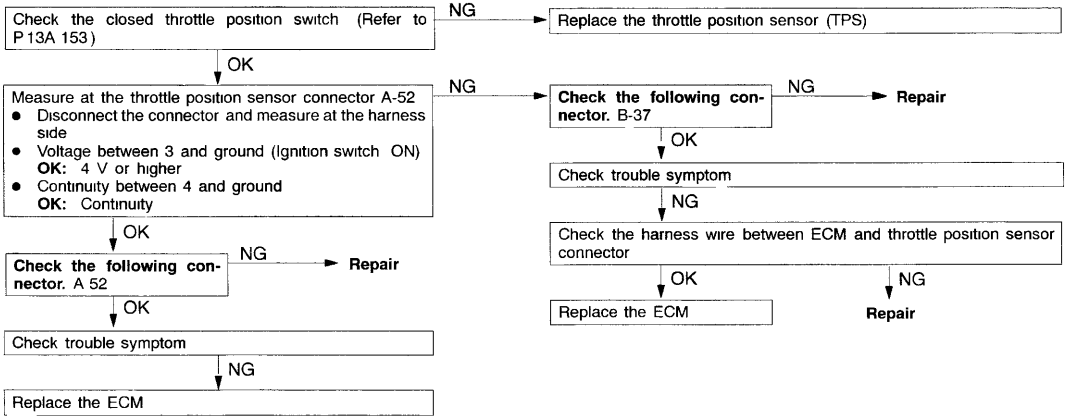
INSPECTION PROCEDURE 29

Fuel pump system	Probable cause
The ECM turns the fuel pump relay ON when the engine is cranking or running, and this supplies power to drive the fuel pump	• Malfunction of the fuel pump relay • Malfunction of the fuel pump • Improper connector contact, open circuit or short-circuited harness wire • Malfunction of the ECM



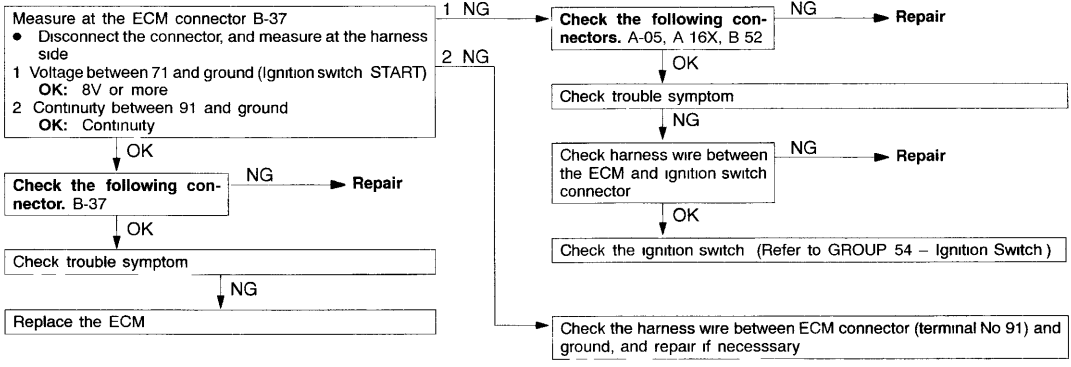
INSPECTION PROCEDURE 30

Closed throttle position switch system	Probable cause
The closed throttle position switch inputs the condition of the accelerator pedal, i e whether it is depressed or released (HIGH/LOW), to the ECM The ECM controls the idle air control motor based on this input	• Misadjustment of the accelerator pedal • Misadjustment of the fixed SAS • Misadjustment of the closed throttle position switch and throttle position sensor • Improper connector contact open circuit or short circuited harness wire • Malfunction of the ECM



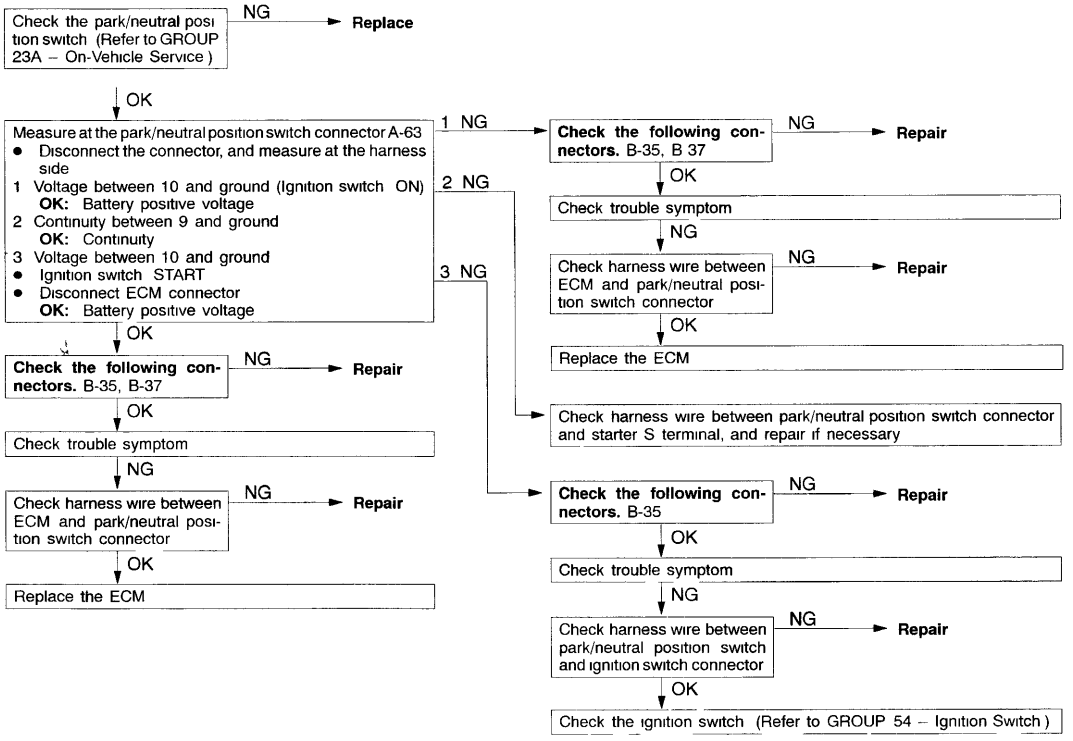
INSPECTION PROCEDURE 31

Ignition switch-ST system	Probable cause
The ignition switch – ST inputs a HIGH signal to the ECM while the engine is cranking The ECM controls fuel injection, etc during starting based on this input	• Malfunction of ignition switch • Improper connector contact, open circuit or short-circuited harness wire • Malfunction of the ECM



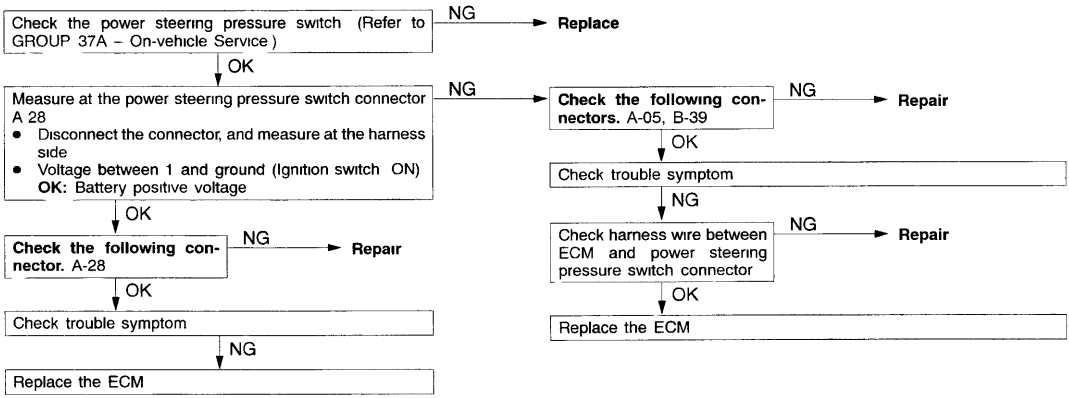
INSPECTION PROCEDURE 32

Ignition switch-ST and park/neutral position switch system <A/T>	Probable cause
• The ignition switch – ST inputs a HIGH signal to the ECM while the engine is cranking The ECM controls fuel injection, etc during starting based on this input • The park/neutral position switch inputs the condition of the select lever, i e whether it is in P or N range or in some other range, to the ECM The ECM controls the idle air control motor using this input	• Malfunction of ignition switch • Malfunction of park/neutral position switch • Improper connector contact, open circuit or short-circuited harness wire • Malfunction of the ECM



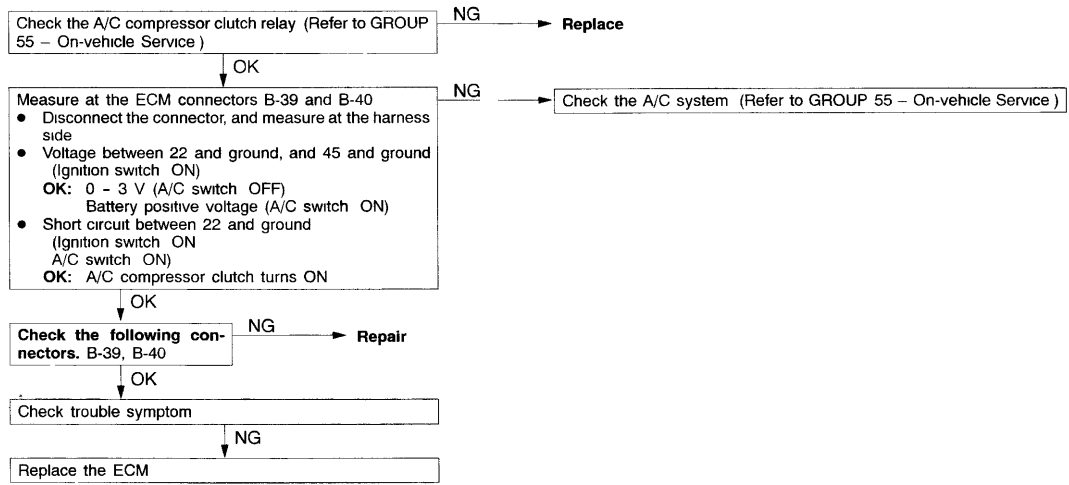
INSPECTION PROCEDURE 33

Power steering pressure switch system	Probable cause
The presence or absence of power steering load is input to the ECM The ECM controls the idle air control motor using this input	• Malfunction of power steering pressure switch • Improper connector contact, open circuit or short-circuited harness wire • Malfunction of the ECM



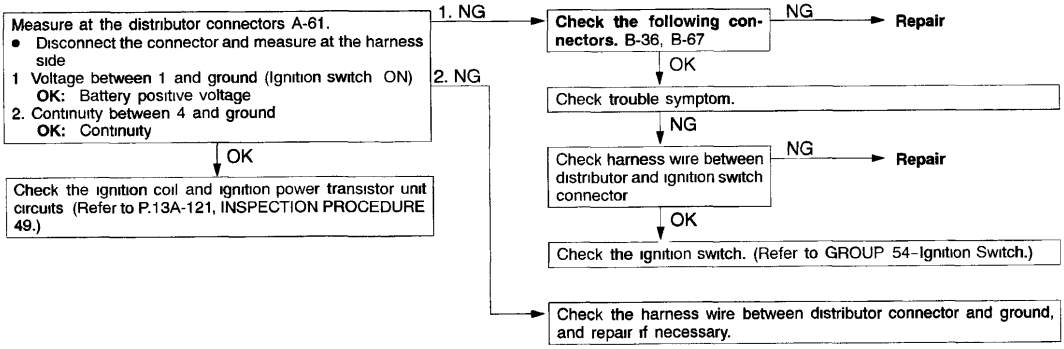
INSPECTION PROCEDURE 34

A/C switch and A/C compressor clutch relay system	Probable cause
When an A/C ON signal is input to the ECM the ECM carries out control of the idle air control motor, and also operates the A/C compressor magnetic clutch	• Malfunction of A/C control system • Malfunction of A/C switch • Improper connector contact, open circuit or short-circuited harness wire • Malfunction of ECM



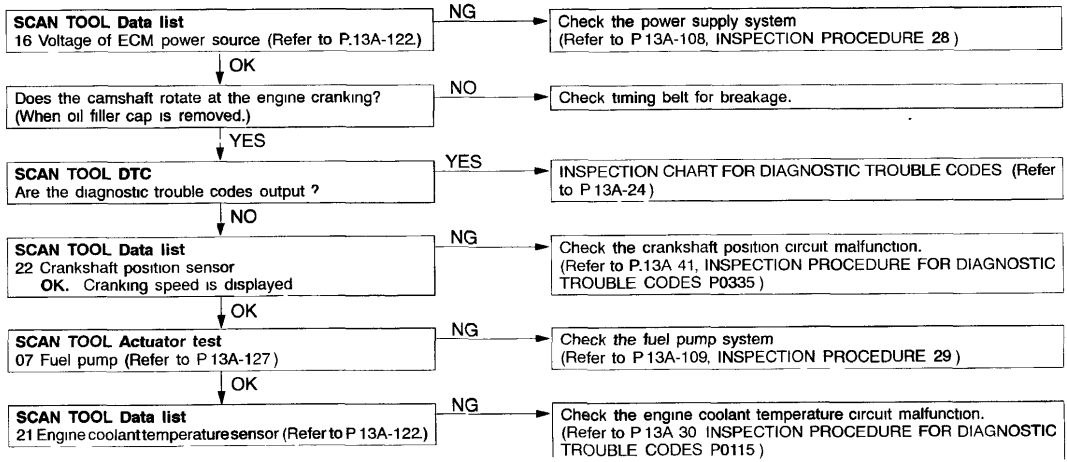
INSPECTION PROCEDURE 35

Ignition circuit system	Probable cause
The ECM interrupts the ignition coil primary current by turning the ignition power transistor inside the ECM ON and OFF	• Malfunction of ignition coil • Malfunction of ignition power transistor unit • Improper connector contact, open circuit or short-circuited harness wire • Malfunction of the ECM



INSPECTION PROCEDURE 36

Scan tool: Inspection of no initial combustion



INSPECTION PROCEDURE 37

Ignition system: Inspection of no initial combustion

Does the engine tachometer display the cranking speed?
- Connect tachometer to ignition coil negative terminal

NG → Check the ignition circuit system (Refer to P 13A-113 INSPECTION PROCEDURE 35)

OK ↓

Check the ignition timing when cranking
OK: 5° BTDC ± 3°

NG → Check for the correct installation condition of crankshaft position sensor and timing belt cover

INSPECTION PROCEDURE 38

Scan tool: Check if incomplete combustion occurs.

SCAN TOOL DTC
Are diagnostic trouble code output ?

YES → INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODE (Refer to P 13A-24.)

NO ↓

SCAN TOOL Actuator test
07 Fuel pump (Refer to P 13A-127)

NG → Check the fuel pump system (Refer to P 13A 109, INSPECTION PROCEDURE 29)

OK ↓

SCAN TOOL Data list
21 Engine coolant temperature sensor (Refer to P 13A-122.)

NG → Check the engine coolant temperature circuit malfunction. (Refer to P 13A-30 INSPECTION PROCEDURES FOR DIAGNOSTIC TROUBLE CODE P0115)

OK ↓

SCAN TOOL Data list
18 Ignition switch-ST (Refer to P 13A-122)

NG → Check the ignition switch-ST system<M/T> (Refer to P.13A-110, INSPECTION PROCEDURE 31.)
Check the ignition switch-ST and park/neutral position switch system<A/T> (Refer to P 13A-111, INSPECTION PROCEDURE 32.)

INSPECTION PROCEDURE 39

Check if hunting occurs.

Clean the throttle body (Refer to P 13A-141)

↓

Check and adjust the fixed SAS (Refer to P 13A-143)

↓

Check trouble symptom

NG ↓

Inspect for vacuum leak
- Broken intake manifold gasket
- Broken air intake hose
- Broken vacuum hose
- Positive crankcase ventilation valve does not operate

INSPECTION PROCEDURE 40

Scan tool: Check if idle speed is unstable.

SCAN TOOL Data list
26 Closed throttle position switch (Refer to P 13A-122)
NG → Check the closed throttle position switch malfunction (Refer to P 13A-83 INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0510)
OK ↓

SCAN TOOL Data list
13 Intake air temperature sensor (Refer to P 13A-122)
NG → Check the intake air temperature circuit malfunction (Refer to P 13A-29, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0110)
OK ↓

SCAN TOOL Data list
21 Engine coolant temperature sensor (Refer to P 13A-122)
NG → Check the engine coolant temperature circuit malfunction (Refer to P 13A 30, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0115)
OK ↓

SCAN TOOL Actuator test
08 Evaporative emission purge solenoid (Refer to P 13A 127)
NG → Check the evaporative emission control system purge control valve circuit malfunction (Refer to P 13A-57 INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0443)
OK ↓

SCAN TOOL Actuator test
10 EGR solenoid (Refer to P 13A-127)
NG → Exhaust gas recirculation solenoid malfunction (Refer to P 13A-44, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0403)
OK ↓

SCAN TOOL Data list
59 Heated oxygen sensor (rear) (Refer to P 13A-122)
- Transaxle 2nd gear <M/T>, L range <A/T>
- Drive with wide open throttle
  OK: 600–1,000 mV

NG → Check the O_2 sensor circuit malfunction (Sensor 2) (Refer to P 13A-35, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0136)
OK ↓

SCAN TOOL Data list
11 Heated oxygen sensor (front) (Refer to P 13A-122)
OK: 600–1,000 mV during sudden racing
NG → Check the O_2 sensor circuit malfunction (Sensor 1) (Refer to P 13A 33, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0130)
OK ↓

SCAN TOOL Data list
11 Heated oxygen sensor (front) (Refer to P 13A-122)
OK: Changes between 0–400 mV and 600–1,000 mV during idling
NG → Check the fuel pressure (Refer to P 13A-144)
OK → 1 Inspect for vacuum leak
- Broken intake manifold gasket
- Broken vacuum hose
- PCV valve does not operate
- Broken air intake hose

2 Check the injector for clog

OK ↓

SCAN TOOL Data list
27 Power steering pressure switch (Refer to P 13A-122)
NG → Check the power steering pressure switch system (Refer to P 13A-112, INSPECTION PROCEDURE 33)
OK ↓

SCAN TOOL Data list
28 A/C switch (Refer to P 13A-122)
NG → Check the A/C switch and A/C relay system (Refer to P 13A-112, INSPECTION PROCEDURE 34)
OK ↓

SCAN TOOL Data list
29 Park/neutral position switch (Refer to P 13A-122)
NG → Check the ignition switch-ST and park/neutral position switch system (Refer to P 13A-111, INSPECTION PROCEDURE 32)
OK ↓

SCAN TOOL Data list
55 Idle air control valve position sensor (Refer to P 13A-122)
NG → Adjust the basic idle speed (Refer to P 13A-143)

INSPECTION PROCEDURE 41

Scan tool: Engine stalling inspection when the engine is warm and idling.

SCAN TOOL Data list
26 Closed throttle position switch (Refer to P 13A-122)
NG → Check the closed throttle position switch malfunction (Refer to P 13A 83, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0510)
OK ↓

SCAN TOOL Data list
13 Intake air temperature sensor (Refer to P 13A 122)
NG → Check the intake air temperature circuit malfunction (Refer to P 13A-29, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0110)
OK ↓

SCAN TOOL Data list
21 Engine coolant temperature sensor (Refer to P 13A-122)
NG → Check the engine coolant temperature circuit malfunction (Refer to P 13A 30 INSPECTION PROCEDURE FOR DIAGNOSTIC CODE P0115)
OK ↓

SCAN TOOL Actuator test
10 EGR solenoid (Refer to P 13A-127)
NG → Exhaust gas recirculation solenoid malfunction (Refer to P 13A-44, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0403)
OK ↓

SCAN TOOL Data list
59 Heated oxygen sensor (rear) (Refer to P 13A-122)
- Transaxle
  2nd gear <M/T>,
  L range <A/T>
- Drive with wide open throttle
  OK: 600–1 000 mV

NG → Check the O_2 sensor circuit malfunction (Sensor 2) (Refer to P 13A-35, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0136)
OK ↓

SCAN TOOL Data list
11 Heated oxygen sensor (front) (Refer to P 13A-122)
OK: Changes between 600–1,000 mV during sudden racing

NG → Check the O_2 sensor circuit malfunction (Sensor 1) (Refer to P 13A-33, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0130)
OK ↓

SCAN TOOL Data list
11 Heated oxygen sensor (front) (Refer to P 13A-122)
OK: Changes between 0–400 mV and 600–1,000 mV during idling

NG → Check the fuel pressure (Refer to P 13A-144)
OK → 1 Inspect for vacuum leak
- Broken intake manifold gasket
- Broken vacuum hose
- PCV valve does not operate
- Broken air intake hose

2 Check the injector for clog

OK ↓

SCAN TOOL Data list
27 Power steering pressure switch (Refer to P 13A-122)
NG → Check the power steering pressure switch system (Refer to P 13A 112, INSPECTION PROCEDURE 33)
OK ↓

SCAN TOOL Data list
28 A/C switch (Refer to P 13A-122)
NG → Check the A/C switch and A/C compressor clutch relay system (Refer to P 13A-112, INSPECTION PROCEDURE 34)
OK ↓

SCAN TOOL Data list
29 Park/neutral position switch (Refer to P 13A-122)
NG → Check the ignition switch-ST and park/neutral position switch system (Refer to P 13A-111, INSPECTION PROCEDURE 32)
OK ↓

SCAN TOOL Data list
55 Idle air control valve position sensor (Refer to P 13A-122)
NG → Adjust the basic idle speed (Refer to P 13A-143)

INSPECTION PROCEDURE 42

Scan tool: Check if hesitation, sag, stumble or poor acceleration occurs.

SCAN TOOL Data list
26 Closed throttle position switch (Refer to P 13A-122)
NG → Check the closed throttle position switch malfunction (Refer to P 13A-83, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0510)
OK ↓

SCAN TOOL Data list
13 Intake air temperature sensor (Refer to P 13A-122)
NG → Check the intake air temperature circuit malfunction (Refer to P 13A-29, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0110)
OK ↓

SCAN TOOL Data list
21 Engine coolant temperature sensor (Refer to P 13A-122)
NG → Check the engine coolant temperature circuit malfunction (Refer to P 13A 30, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0115)
OK ↓

SCAN TOOL Data list
14 Throttle position sensor (Refer to P 13A 122)
NG → Check the throttle position circuit malfunction (Refer to P 13A 31, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0120)
OK ↓

SCAN TOOL Actuator test
10 EGR solenoid (Refer to P 13A-127)
NG → Exhaust gas recirculation solenoid malfunction (Refer to P 13A-44, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0403)
OK ↓

SCAN TOOL Data list
59 Heated oxygen sensor (rear) (Refer to P 13A-122)
- Transaxle 2nd gear <M/T>, L range <A/T>
- Drive with wide open throttle
  OK: 600–1,000 mV

NG → Check the O_2 sensor circuit malfunction (Sensor 2) (Refer to P 13A-35, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0136)
OK ↓

SCAN TOOL Data list
11 Heated oxygen sensor (front) (Refer to P 13A-122)
OK: Changes between 600–1 000 mV during sudden racing

NG → Check the O_2 sensor circuit malfunction (Sensor 1) (Refer to P 13A-33, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0130)
OK ↓

SCAN TOOL Data list
11 Heated oxygen sensor (front) (Refer to P 13A 122)
OK: Changes between 0–400 mV and 600–1 000 mV during idling

NG → Check the fuel pressure (Refer to P 13A-144)
OK → 1 Inspect for vacuum leak
- Broken intake manifold gasket
- Broken vacuum hose
- PCV valve does not operate
- Broken air intake hose

2 Check the injector for clog

INSPECTION PROCEDURE 43

Scan tool: Check if surge occurs.

SCAN TOOL Data list
26 Closed throttle position switch (Refer to P 13A-122)
NG → Check the closed throttle position switch malfunction (Refer to P 13A-83, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0510)
OK ↓

SCAN TOOL Data list
13 Intake air temperature sensor (Refer to P 13A-122)
NG → Check the intake air temperature circuit malfunction (Refer to P 13A-29, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0110)
OK ↓

SCAN TOOL Data list
21 Engine coolant temperature sensor (Refer to P 13A-122)
NG → Check the engine coolant temperature circuit malfunction (Refer to P 13A-30 INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0115)
OK ↓

SCAN TOOL Data list
14 Throttle position sensor (Refer to P 13A-122)
NG → Check the throttle position circuit malfunction (Refer to P 13A-31, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0120)
OK ↓

SCAN TOOL Actuator test
10 EGR solenoid (Refer to P 13A 127)
NG → Exhaust gas recirculation solenoid malfunction (Refer to P 13A-44, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0403)
OK ↓

SCAN TOOL Data list
59 Heated oxygen sensor (rear) (Refer to P 13A-122)
- Transaxle 2nd gear <M/T>, L range <A/T>
- Drive with wide open throttle
  OK: 600-1,000 mV

NG → Check the O_2 sensor circuit malfunction (Sensor 2) (Refer to P 13A-35, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0136)
OK ↓

SCAN TOOL Data list
11 Heated oxygen sensor (front) (Refer to P 13A-122)
OK: Changes between 600-1,000 mV during sudden racing

NG → Check the O_2 sensor circuit malfunction (Sensor 1) (Refer to P 13A 33, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0130)
OK ↓

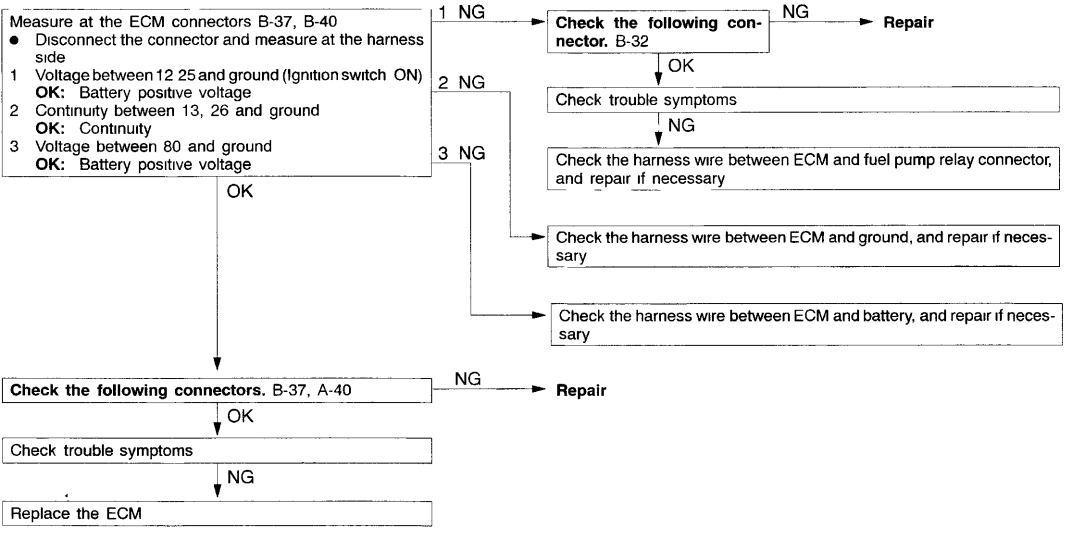
SCAN TOOL Data list
11 Heated oxygen sensor (front) (Refer to P 13A-122)
OK: Changes between 0-400 mV and 600-1,000 mV during idling

NG → Check the fuel pressure (Refer to P 13A 144)
OK →
1 Inspect for vacuum leak
- Broken intake manifold gasket
- Broken vacuum hose
- PCV valve does not operate
- Broken air intake hose

2 Check the injector for clog

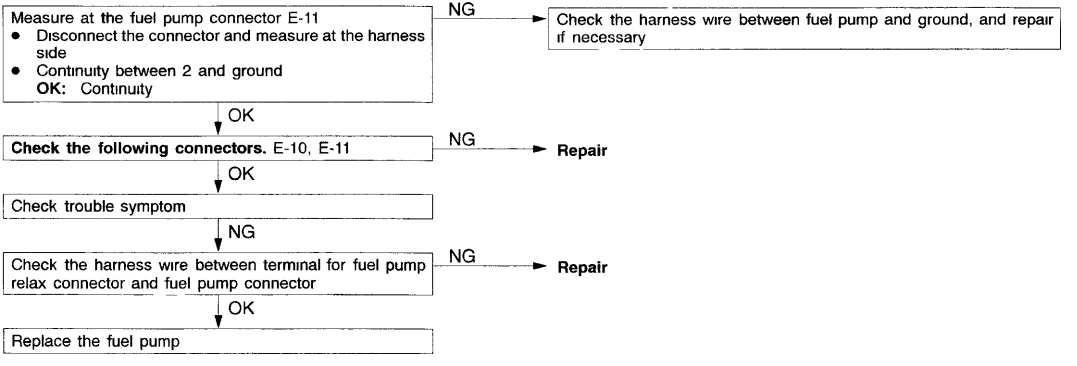
INSPECTION PROCEDURE 44

Check the ECM power supply and ground circuit.



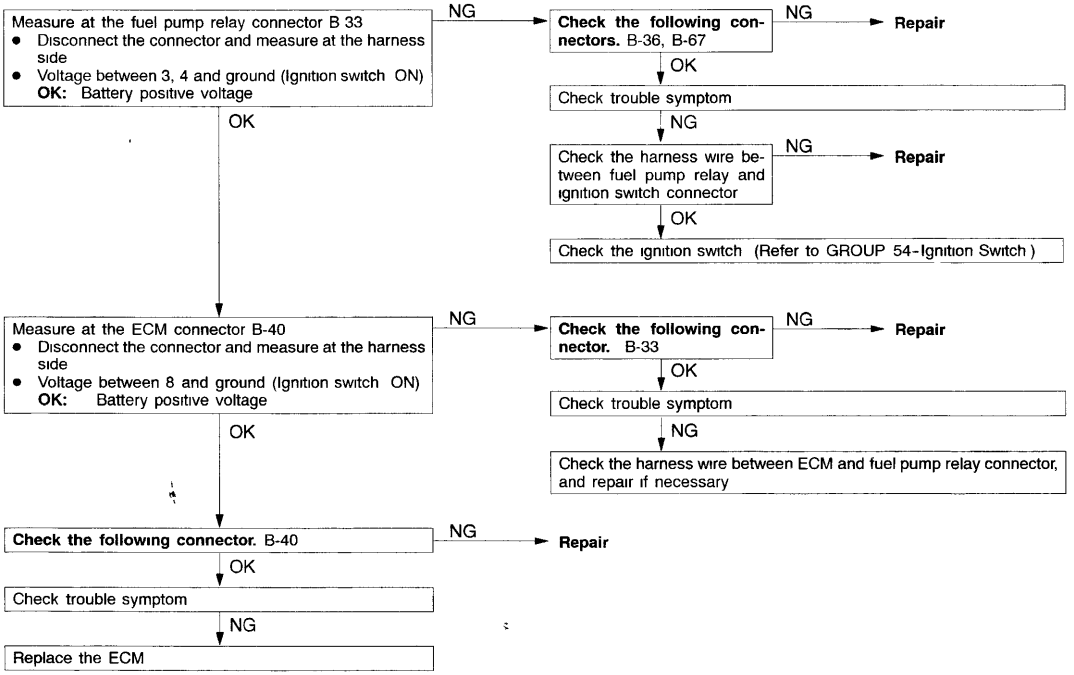
INSPECTION PROCEDURE 45

Check fuel pump circuit.



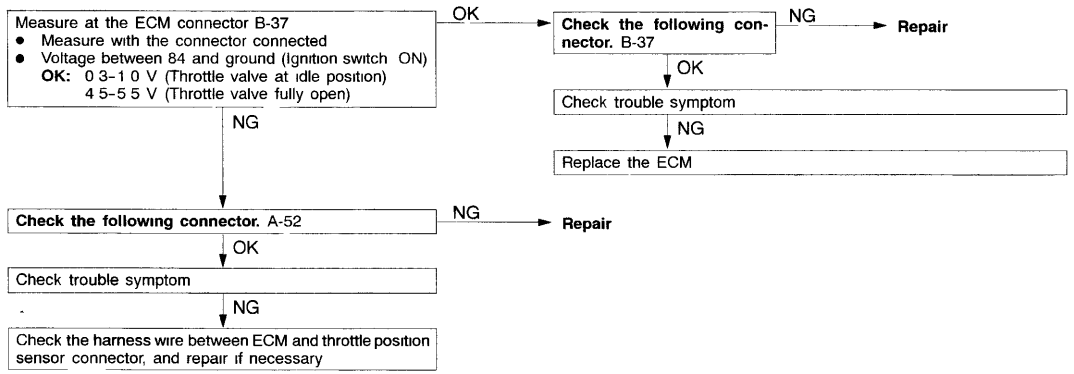
INSPECTION PROCEDURE 46

Check the fuel pump drive control circuit.



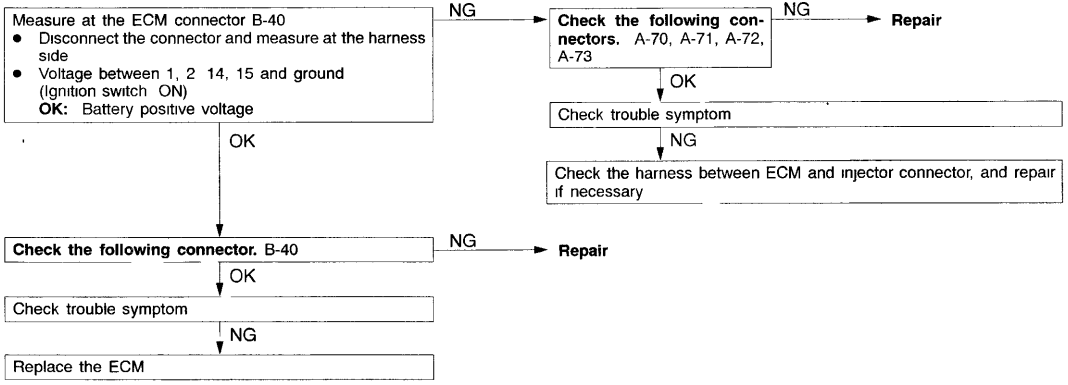
INSPECTION PROCEDURE 47

Check throttle position sensor (TPS) output circuit.



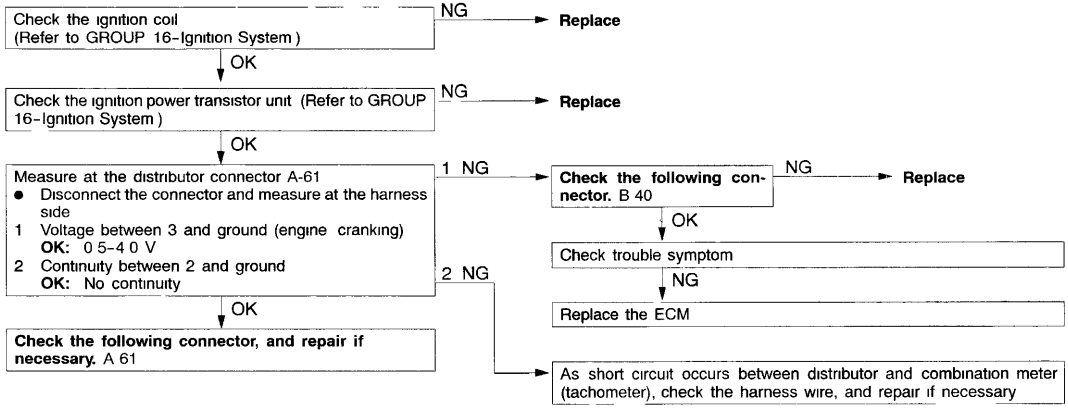
INSPECTION PROCEDURE 48

Check injector control circuit



INSPECTION PROCEDURE 49

Check ignition coil and ignition power transistor unit circuit.



DATA LIST REFERENCE TABLE

13100890548

The scan tool (MUT-II) has two operation modes: the general scan mode and the scan tool (MUT-II) mode.
The data list which can be read in either mode is shown in the table below.

Item No.	Inspection item	General scan tool model	Scan tool (MUT-II) mode
11	Heated oxygen sensor (Front)	×	×
13	Intake air temperature sensor	×	×
14	Throttle position sensor	×	×
16	Power supply voltage	-	×
18	Cranking signal (Ignition switch-ST)	-	×
21	Engine coolant temperature sensor	×	×
22	Crankshaft position sensor	×	×
24	Vehicle speed sensor	×	-
26	Closed throttle position switch	-	×
27	Power steering pressure switch	-	×
28	A/C switch	-	×
29	Park/Neutral position switch <A/T>	-	×
32	Manifold absolute pressure sensor	×	×
41	Injectors	-	×
44	Ignition coils and ignition power transistor	-	×
45	Idle air control position	-	×
49	A/C compressor clutch relay	-	×
59	Heated oxygen sensor (Rear)	×	×
73	Fuel tank differential pressure sensor	×	×
81	Long-term fuel compensation	×	-
82	Short-term fuel compensation	×	-
87	Calculation load	×	-
88	Fuel control condition	×	-

Caution

1. **When shifting the select lever to D range, the brakes should be applied so that the vehicle does not move forward.**
2. **Driving tests always require another person.**

NOTES FOR DATA LIST ITEMS BELOW

*1: When idling to warm up from an engine coolant temperature of approx. -20°C (-4°F), if the idling speed is lower than the standard value even when the IAC motor is fully opened, the air volume limiter built in the throttle body could be defective.

*2: The closed throttle position switch normally turns off when the voltage of the throttle position sensor is 50 - 100mV higher than the voltage at the idle position. If the closed throttle position switch turns back on after the throttle position sensor voltage has risen by 100mV and the throttle valve has opened, the closed throttle position switch and the throttle position sensor need to be adjusted

*3 In a new vehicle [driven approximately 500 km (300 mile) or less], the volume air flow sensor output frequency is sometimes 10% higher than the standard frequency.

*4. The injector drive time represents the time when the cranking speed is at 250 r/min or below when the power supply voltage is 11 V

*5. In a new vehicle [driven approximately 500 km (300 mile) or less], the injector drive time is sometimes 10% longer than the standard time.

*6: In a new vehicle [driven approximately 500 km (300 mile) or less], the servo valve position is sometimes 20 steps greater than the standard value.

Item No	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
11	Heated oxygen sensor (front)	Engine: Warm (Air/fuel mixture is made leaner when decelerating, and is made richer when racing.)	When at 4,000 r/min, engine is suddenly decelerated	200 mV or less	Code No. P0130	P.13A-33
			When engine is suddenly raced	600-1,000 mV		
		Engine: Warm (The heated oxygen sensor signal is used to check the air/fuel mixture ratio, and control condition is also checked by the ECM.)	Engine is idling	400 mV or less ↔ 600-1,000 mV (Changes)		
			2,500 r/min			
13	Intake air temperature sensor	Ignition switch: ON or with engine running	When intake air temperature is -20°C (-4°F)	-20°C (-4°F)	Code No. P0110	P.13A-29
			When intake air temperature is 0°C (32°F)	0°C (32°F)		
			When intake air temperature is 20°C (68°F)	20°C (68°F)		
			When intake air temperature is 40°C (104°F)	40°C (104°F)		
			When intake air temperature is 80°C(176°F)	80°C (176°F)		
14	Throttle position sensor	Ignition switch. ON	Set to idle position	300-1,000 mV (6 - 20%)	Code No. P0120	P.13A-31
			Gradually open	Increases in proportion to throttle opening angle		
			Open fully	4,500-5,500 mV (80 - 100%)		
16	Power supply voltage	Ignition switch: ON		Battery positive voltage	Procedure No. 28	P.13A-108

Item No	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
18	Cranking signal (ignition switch-ST)	Ignition switch: ON	Engine: Stopped	OFF	Procedure No. 31 <M/T> Procedure No. 32 <A/T>	P.13A-110 <M/T> P.13A-111 <A/T>
			Engine· Cranking	ON		
21	Engine coolant temperature sensor	Ignition switch: ON or with engine running	When engine coolant temperature is -20°C (-4°F)	-20°C (-4°F)	Code No. 0115	P 13A-30
			When engine coolant temperature is 0°C (32°F)	0°C (32°F)		
			When engine coolant temperature is 20°C (68°F)	20°C (68°F)		
			When engine coolant temperature is 40°C (104°F)	40°C (104°F)		
			When engine coolant temperature is 80°C (176°F)	80°C (176°F)		
22	Crankshaft position sensor*1	• Engine· Cranking • Tachometer: Connected	Compare the rpm of the tachometer with the one of the scan tool.	Identical	Code N0. P0335	P.13A-41
		• Engine: Idling • Closed throttle position switch: ON	When engine coolant temperature is -20°C (-4°F)	1,400 - 1,600 r/min		
			When engine coolant temperature is 0°C (32°F)	1,300 - 1,500 r/min		
			When engine coolant temperature is 20°C (68°F)	1,200 - 1,400 r/min		
			When engine coolant temperature is 40°C (104°F)	1,000 - 1,200 r/min		
			When engine coolant temperature is 80°C (176°F)	600 - 800 r/min		
24	Vehicle speed sensor	Drive at 40 km/h (25 miles/h)		Approx. 40 km/h	Code No. P0500	P.13A-81
26	Closed throttle position switch	Ignition switch: ON Check by operating accelerator pedal repeatedly	Throttle valve: Set to idle position	ON	Code N0. P0510	P 13A-83
			Throttle valve: Slightly open	OFF*2		
27	Power steering pressure switch	Engine: Idling	Steering wheel stationary	OFF	Code N0. P0551	P.13A-84
			Steering wheel turning	ON		

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
28	A/C switch	Engine: Idling (When A/C switch is ON, A/C compressor should be operating)	A/C switch. OFF	OFF	Procedure No. 34	P.13A-112
			A/C switch: ON	ON		
29	Park/Neutral positon switch <A/T>	Ignition switch: ON	P or N	P or N	Procedure No 32	P.13A-111
			D, 2, L or R	D, 2, L or R		
32	Manifold absolute pressure sensor*3	• Engine coolant temperature: 80 - 95°C (176 - 203°F) • Lights, electric cooling fan and all accessories: OFF • Transaxle: Neutral (A/T: P range) • Ignition switch: ON	Engine stopped [At altitude of 0 m (0 ft.)]	101 kPa	Code No. P0105	P.13A-28
			Engine stopped [At altitude of 600 m (1,969 ft.)]	95 kPa		
			Engine stopped [At altitude of 1,200 m (3,937 ft.)]	88 kPa		
			Engine stopped [At altitude of 1,800 m (5,906 ft)]	81 kPa		
			Engine· Idling	25.3 - 38.7 kPa		
			When engine is suddenly raced	Increases		
41	Injectors *4	Engine: Cranking	When engine coolant temperature is 0°C (32°F) (injection is carried out for all cylinders simultaneously)	15 - 23 ms	-	-
			When engine coolant temperature is 20°C (68°F)	32 - 48 ms	-	-
			When engine coolant temperature is 80°C (176°F)	7.5 - 11.3 ms		
	Injectors *5	• Engine coolant temperature: 80–95°C (176-203°F) • Lights, electric cooling fan and all accessories: OFF • Transaxle· Neutral (A/T · P range)	Engine is idling	1.7 - 2.9 ms		
			2,500 r/min	1.4 - 2 6 ms		
			When engine is suddenly raced	Increases		
44	Ignition coils and ignition power transistors	• Engine: After having warmed up • Timing light is set. (The timing light is set in order to check actual ignition timing)	Engine is idling	2 - 18 °BTDC	-	-
			2,500 r/min	29 - 49 °BTDC <Federal> 30 - 50 °BTDC <California>		

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
45	Idle air control (stepper) position sensor*6	• Engine coolant temperature: 80 – 95° (176-203°F) • Lights, electric cooling fan and all accessories: OFF • Transaxle. Neutral (A/T : P range) • Closed throttle position switch. ON • Engine· Idling (When A/C switch is ON, A/C compressor should be operating)	A/C switch· OFF	Increases by 2 - 25 steps	-	-
			A/C switch: OFF → ON	Increases by 10 - 70 steps		
			• A/C switch· OFF • Select lever: N range → D range	Increases by 5 - 50 steps		
49	A/C compressor clutch relay	Engine After having warmed up /Engine is idling	A/C switch OFF	OFF (Compressor clutch is not operating)	Procedure No. 34	P 13A-112
			A/C switch: ON	ON (Compressor clutch is operating)		
59	Heated oxygen sensor (rear)	• Transaxle: 2nd gear <M/T> L range <A/T> • Drive with wide open throttle	3,500 r/min	600- 1,000 mV	Code No. P0136	P.13A-35
73	Fuel tank differential pressure sensor	• Ignition switch: ON • Fuel tank filler tube cap removal		-3.3 - 3.3 kPa	-	-
81	Long-term fuel compensation	Engine: Warm, 2,500 r/min without any load (during closed loop)		-12.5 - 12.5 %	Code No. P0170	P.13A-37
82	Short-term fuel compensation	Engine: Warm, 2,500 r/min without any load (during closed loop)		-17 - 17 %	Code No. P0170	P 13A-37
87	Calculation load value	Engine: Warm	Engine is idling	20 - 33 %	-	-
			2,500 r/min	20 - 33 %		
88	Fuel control condition	Engine: Warm	2,500 r/min	Closed loop	Code No. P0125	P.13A-32
			When engine is suddenly raced	Open loop - drive condition		

ACTUATOR TEST REFERENCE TABLE

13100900623

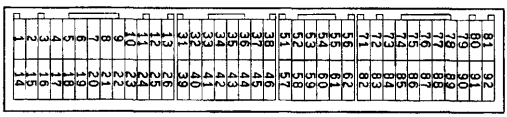
Item No.	Drive contents	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
01	Injectors	Cut fuel to No. 1 injector	Engine: Warm, idle (Cut the fuel supply to each injector in turn and check cylinders which don't affect idling.)		Idle speed drops equally for each injector	Code No. P0201, P0202, P0203, P0204,	P 13A-38
02		Cut fuel to No 2 injector					
03		Cut fuel to No. 3 injector					
04		Cut fuel to No 4 injector					
07	Fuel pump	Fuel pump operates and fuel is recirculated.	• Engine: Cranking • Fuel pump: Activated Inspect according to both the above conditions.	Pinch the return hose with fingers to feel the pulse of the fuel being recircu-lated.	Pulse is felt.	Procedure No 29	P.13A-109
				Listen near the fuel tank for the sound of fuel pump operation.	Typical electric fuel pump whine.		
08	Evaporative emission purge solenoid	Solenoid valve turns from OFF to ON.	Ignition switch: ON		Clicks when solenoid valve is driven.	Code No. P0443	P 13A-57
10	EGR solenoid	Solenoid valve turns from OFF to ON.	Ignition switch: ON		Clicks when solenoid valve is driven.	Code No P0403	P 13A-44
17	Basic ignition timing	Set to ignition timing adjustment mode	Engine: Idle Timing light is set		5°BTDC	-	-
20	Radiator fan (Hi) Condenser fan (Hi)	Drive the fan motors (radiator and condenser).	Ignition switch: ON A/C switch: ON		Fan motor operates at high speed.	Procedure No 24	P 13A-106
21	Radiator fan (Hi) Condenser fan (Low)	Drive the fan motors (radiator and condenser).	Ignition switch: ON A/C switch: ON		Fan motor operates at low speed.	Procedure No. 24	P.13A-106
29	Evapora-tive emis-sion ven-tilation so-lenoid	Solenoid valve turns from OFF to ON.	Ignition switch: ON		Clicks when solenoid valve is driven.	Code No. P0446	P.13A-58

CHECK AT THE ENGINE CONTROL MODULE (ECM)

13100920551

TERMINAL VOLTAGE CHECK CHART

Engine Control Module (ECM) Connector Terminal Arrangement



9FU0393

Terminal No.	Check item	Check condition (Engine condition)	Normal condition
1	No. 1 injector	While engine is idling after having warmed up, suddenly depress the accelerator pedal.	From 11 - 14 V, momentarily drops slightly
14	No 2 injector		
2	No. 3 injector		
15	No. 4 injector		
4	Stepper motor coil <A1>	Engine: Soon after the warmed up engine is started	B+ ↔ 0 V (Changes repeatedly)
17	Stepper motor coil <A2>		
5	Stepper motor coil <B1>		
18	Stepper motor coil <B2>		
6	EGR solenoid	Ignition switch: ON	B+
		While engine is idling, suddenly depress the accelerator pedal.	From B+, momentarily drops
8	Fuel pump relay	Ignition switch: ON	B+
		Engine: Idle speed	0 - 3 V
9	Evaporative emission purge solenoid	Ignition switch: ON	B+
		Running at 3,000 r/min while engine is warming up after having been started.	0 - 3 V
10	Ignition power transistor	Engine r/min: 3,000 r/min	0.3 - 3.0 V
12	Power supply	Ignition switch: ON	B+
25			
20	Condenser fan motor relay	Condenser fan is not operating [Engine coolant temperature is 90°C (194°F) or less]	B+
		Condenser fan is operating [Engine coolant temperature is 105°C (221°F) or more]	0 - 3 V

Terminal No.	Check item	Check condition (Engine condition)		Normal condition
21	Radiator fan motor relay	Radiator fan is not operating [Engine coolant temperature is 90°C (194°F) or less)]		B+
		Radiator fan is operating [Engine coolant temperature is 90 - 105°C (194 - 221°F)]		0 - 3 V
22	A/C relay	• Engine: Idle speed • A/C switch. OFF → ON (A/C compressor is operating)		B+ or momentarily 6V or more → 0 - 3 V
31	Engine ignition signal	Engine r/min: 3,000 r/min		0.3 - 3.0 V
33	Generator G terminal	• Engine. Warm, idle (radiator fan OFF) • Headlamp OFF to ON • Rear defogger switch: OFF to ON • Stop light· OFF to ON		Voltage rises by 0.2 - 3.5 V.
41	Generator FR terminal	• Engine: Warm, idle (radiator fan: OFF) • Headlamp: OFF to ON • Rear defogger switch. OFF to ON • Stop light: OFF to ON		Voltage falls
36	Service Engine Soon/ Malfunction Indicator Lamp	Ignition switch: OFF → ON		0 - 3 V → 9 - 13 V (After several seconds have elapsed)
37	Power steering pressure switch	Engine: Idling after warming up	When steering wheel is stationary	B+
			When steering wheel is turned	0 - 3 V
38	MFI relay (Power supply)	Ignition switch: OFF		B+
		Ignition switch ON		0 - 3 V
45	A/C switch	Engine: Idle speed	Turn the A/C switch OFF	0 - 3 V
			Turn the A/C switch ON (A/C compressor is operating)	B+
54	Heated oxygen sensor heater (Rear)	Engine Idling after warming up		0 - 3 V
		Engine r/min· 5,000 r/min		B+
55	Evaporative emission ventilation solenoid	Ignition switch. ON		B+
		After the engine has warmed up, drive the vehicle at a constant speed 88 km/h (55 mph) (OBD-II monitoring conditions).		Momentarily 0 - 3 V
60	Heated oxygen sensor heater (Front)	Engine: Idling after warming up		0 - 3 V
		Engine r/min· 5,000r/min.		B+
61	Fuel tank differential pressure sensor	Engine. Idle		1.2 - 3.8 V
71	Ignition switch - ST	Engine Cranking		8 V or more

Terminal No.	Check item	Check condition (Engine condition)		Normal condition
72	Intake air temperature sensor	Ignition switch: ON	When intake air temperature is 0°C (32°F)	3.2 - 3.8 V
			When intake air temperature is 20°C (68°F)	2.3 - 2.9 V
			When intake air temperature is 40°C (104°F)	1.5 - 2.1 V
			When intake air temperature is 80°C (176°F)	0.4 - 1.0 V
75	Heated oxygen sensor (Rear)	• Transaxle: 2nd <M/T>, L range <A/T> • Driving with the throttle widely open • Engine: 3,500 r/min or more		0.6 - 1.0 V
76	Heated oxygen sensor (Front)	Engine: Running at 2,500 r/min after warmed up (Check using a digital type voltmeter)		0 ↔ 0.8 V (Changes repeatedly)
80	Backup power supply	Ignition switch: OFF		B+
81	Sensor impressed voltage	Ignition switch: ON		4.5 - 5.5 V
82	Ignition switch - IG	Ignition switch. ON		B+
83	Engine coolant temperature sensor	Ignition switch: ON	When engine coolant temperature is 0°C (32°F)	3.2 - 3.8 V
			When engine coolant temperature is 20°C (68°F)	2.3 - 2.9 V
			When engine coolant temperature is 40°CB (104°F)	1.3 - 1.9 V
			When engine coolant temperature is 80°C (176°F)	0.3 - 0.9 V
84	Throttle position sensor	Ignition switch: ON	Set throttle valve to idle position	0.3 - 1.0 V
			Fully open throttle valve	4.5 - 5.5 V
85	Manifold absolute pressure sensor	Ignition switch: ON [when altitude is 0 m (0 ft.)]		3.7 - 4.3 V
		Ignition switch. ON [when altitude is 1,200 m (3,937 ft.)]		3.2 - 3.8 V
		Engine: Idle speed		0.9 - 1.5 V
		While engine is idling after having warmed up, suddenly depress the accelerator pedal		From 0.9 - 1.5 V, momentarily increases

Terminal No.	Check item	Check condition (Engine condition)		Normal condition
86	Vehicle speed sensor	• Ignition switch: ON • Move the vehicle slowly forward		0 ↔ 5 V (Changes repeatedly)
87	Closed throttle position switch	Ignition switch: ON	Set throttle valve to idle position	0 - 1 V
			Slightly open throttle valve	4 V or more
88	Camshaft position sensor	Engine: Cranking		0.4 - 3.0 V
		Engine: Idle speed		0.5 - 2.0 V
89	Crankshaft position sensor	Engine: Cranking		0.4 - 4.0 V
		Engine: Idle speed		1.5 - 2.5 V
91	Park/Neutral position switch <A/T>	Ignition switch: ON	Set selector lever to P or N	0 - 3 V
			Set selector lever to R, D, 2, or L	8 - 14 V

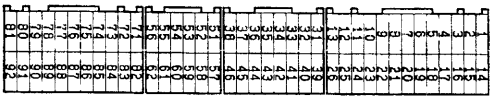
TERMINAL RESISTANCE AND CONTINUITY CHECK

1. Turn the ignition switch to OFF.
2. Disconnect the ECM connector.
3. Measure the resistance and check for continuity between the terminals of the ECM harness-side connector while referring to the check chart.

   NOTE
   1. When measuring resistance and checking continuity, use a harness for checking contact pin pressure instead of inserting a test probe.
   2. Checks do not have to be carried out in the order given in this chart.

   Caution
   If resistance or continuity checks are performed on the wrong terminals, damage to the vehicle wiring, sensors, ECM, and/or ohmmeter may occur. Use care to prevent this!
4. If the ohmmeter shows any deviation from the normal condition, check the corresponding sensor, actuator and related electrical wiring, and then repair or replace.
5. After repair or replacement, recheck with the ohmmeter to confirm that the repair or replacement has corrected the problem.

ECM Harness Side Connector Terminal Arrangement



9FU0392

Terminal No.	Inspection item	Normal condition (Check condition)
1 - 12	No. 1 injector	13-16 Ω [At 20°C (68°F)]
14 - 12	No. 2 injector	
2 - 12	No. 3 injector	
15 - 12	No 4 injector	
4 - 12	Stepper motor coil (A1)	28-33 Ω [At 20°C (68°F)]
17 - 12	Stepper motor coil (A2)	
5 - 2	Stepper motor coil (B1)	
18 - 12	Stepper motor coil (B2)	
6 - 12	EGR solenoid	36-44 Ω [At 20°C (68°F)]
9 - 12	Evaporative emission purge solenoid	36-44 Ω [At 20°C (68°F)]
13 - Body ground	ECM ground	Continuity (0Ω)
26 - Body ground	ECM ground	

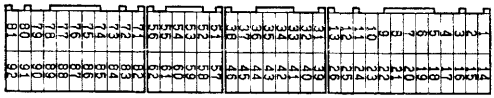
TERMINAL RESISTANCE AND CONTINUITY CHECK

1. Turn the ignition switch to OFF.
2. Disconnect the ECM connector.
3. Measure the resistance and check for continuity between the terminals of the ECM harness-side connector while referring to the check chart.

   NOTE
   1. When measuring resistance and checking continuity, use a harness for checking contact pin pressure instead of inserting a test probe.
   2. Checks do not have to be carried out in the order given in this chart.

   Caution
   If resistance or continuity checks are performed on the wrong terminals, damage to the vehicle wiring, sensors, ECM, and/or ohmmeter may occur. Use care to prevent this!
4. If the ohmmeter shows any deviation from the normal condition, check the corresponding sensor, actuator and related electrical wiring, and then repair or replace.
5. After repair or replacement, recheck with the ohmmeter to confirm that the repair or replacement has corrected the problem.

ECM Harness Side Connector Terminal Arrangement

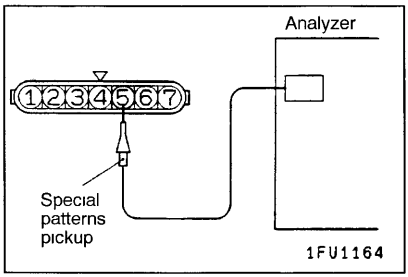


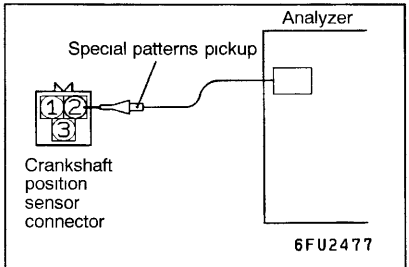
9FU0392

Terminal No.	Inspection item	Normal condition (Check condition)
1 - 12	No. 1 injector	13-16 Ω [At 20°C (68°F)]
14 - 12	No. 2 injector	
2 - 12	No. 3 injector	
15 - 12	No. 4 injector	
4 - 12	Stepper motor coil (A1)	28-33 Ω [At 20°C (68°F)]
17 - 12	Stepper motor coil (A2)	
5 - 2	Stepper motor coil (B1)	
18 - 12	Stepper motor coil (B2)	
6 - 12	EGR solenoid	36-44 Ω [At 20°C (68°F)]
9 - 12	Evaporative emission purge solenoid	36-44 Ω [At 20°C (68°F)]
13 - Body ground	ECM ground	Continuity (0Ω)
26 - Body ground	ECM ground	

Terminal No.	Check item	Check condition (Engine condition)		Normal condition
86	Vehicle speed sensor	• Ignition switch ON • Move the vehicle slowly forward		0 ↔ 5 V (Changes repeatedly)
87	Closed throttle position switch	Ignition switch: ON	Set throttle valve to idle position	0 - 1 V
			Slightly open throttle valve	4 V or more
88	Camshaft position sensor	Engine: Cranking		0.4 - 3.0 V
		Engine: Idle speed		0.5 - 2.0 V
89	Crankshaft position sensor	Engine. Cranking		0.4 - 4.0 V
		Engine· Idle speed		1.5 - 2.5 V
91	Park/Neutral position switch <A/T>	Ignition switch: ON	Set selector lever to P or N	0 - 3 V
			Set selector lever to R, D, 2, or L	8 - 14 V

Terminal No.	Inspection item	Normal condition (Check condition)
54 - 12	Heated oxygen sensor heater (Rear)	4.5 - 8.0 Ω [At 20°C (68°F)]
55 - 12	Evaporative emission ventilation solenoid	36 - 44 Ω [At 20°C (68°F)]
60 - 12	Heated oxygen sensor heater (Front)	4.5 - 8.0 Ω [At 20°C (68°F)]
72 - 92	Intake air temperature sensor	5.3 - 6.7 kΩ [When intake air temperature is 0°C (32°F)]
		2.3 - 3.0 kΩ [When intake air temperature is 20°C (68°F)]
		1.0 - 1.5 kΩ [When intake air temperature is 40°C (104°F)]
		0.30 - 0.42 kΩ [When intake air temperature is 80°C (176°F)]
83 - 92	Engine coolant temperature sensor	5.1 - 6.5 kΩ [When coolant temperature is 0°C (32°F)]
		2.1 - 2.7 kΩ [When coolant temperature is 20°C (68°F)]
		0.9 - 1.3 kΩ [When coolant temperature is 40°C (104°F)]
		0.26 - 0.36 kΩ [When coolant temperature is 80°C (176°F)]
87 - 92	Closed throttle position switch	Continuity (when throttle valve is at idle position)
		No continuity (when throttle valve is slightly open)
91 - Body ground	Park/Neutral position switch <A/T>	Continuity (when select lever is at P or N)
		No continuity (when select lever is at D, 2, L or R)





INSPECTION PROCEDURE USING AN ANALYZER

13100930134

CAMSHAFT POSITION SENSOR AND CRANKSHAFT POSITION SENSOR

Measurement Method

1. Disconnect the distributor (camshaft position sensor) connector and connect the special tool (test harness: MB991348) in between. (All terminals should be connected.)
2. Connect the analyzer special patterns pickup to distributor connector terminal 5.
3. Disconnect the crankshaft position sensor connector and connect the special tool (test harness: MD998478) in between.
4. Connect the analyzer special patterns pickup to crankshaft position sensor connector terminal 2.

Alternate method (Test harness not available)

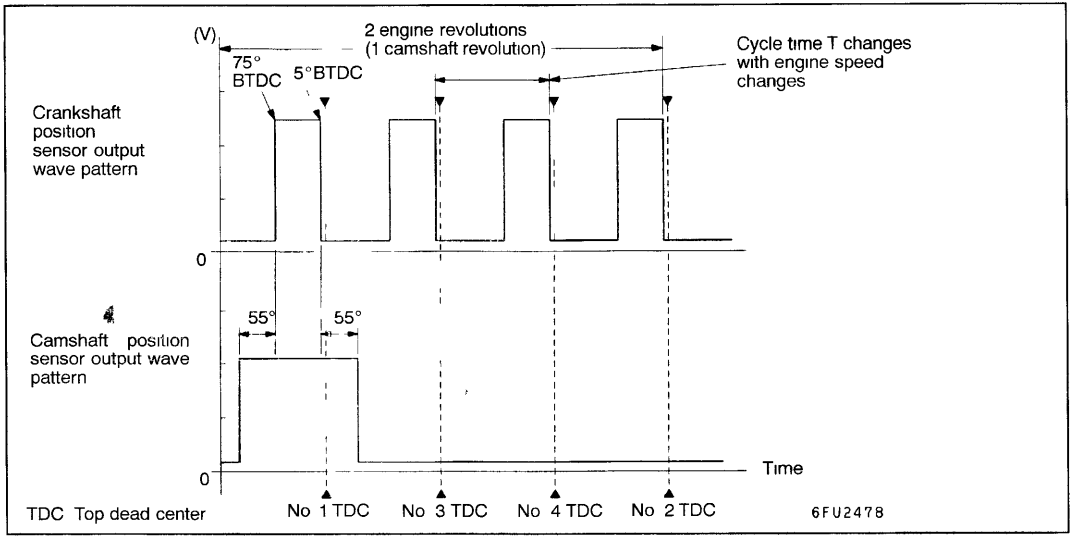
1. Connect the analyzer special patterns pickup to ECM terminal 88. (When checking the camshaft position sensor signal wave pattern)
2. Connect the analyzer special patterns pickup to ECM terminal 89. (When checking the crankshaft position sensor signal wave pattern)

Standard Wave Pattern

Observation conditions

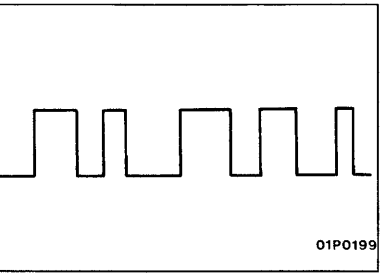
Function	Special patterns
Pattern height	Low
Pattern selector	Display
Engine r/min	Idle

Standard wave pattern



Wave Pattern Observation Points

Check to be sure that cycle time T becomes shorter when the engine speed increases.



Examples of Abnormal Wave Patterns

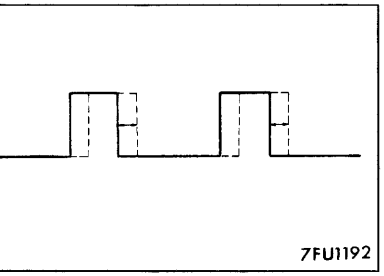
- Example 1

  CAUSE OF PROBLEM

  Sensor interface malfunction

  WAVE PATTERN CHARACTERISTICS

  Rectangular wave pattern is output even when the engine is not started.



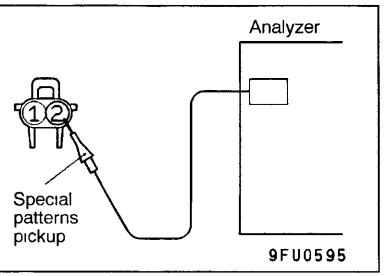
- Example 2

  CAUSE OF PROBLEM

  Loose timing belt
  Abnormality in sensor disk

  WAVE PATTERN CHARACTERISTICS

  Wave pattern jumps to the left or right.



INJECTOR

Measurement Method

1. Disconnect the injector connector and connect the special tool (test harness: MB991348) in between. (Both the terminal on the engine control module side and the terminal on the power supply side should be connected.)
2. Connect the analyzer special patterns pickup to the test harness clip on the engine control module side.

Alternate method (Test harness not available)

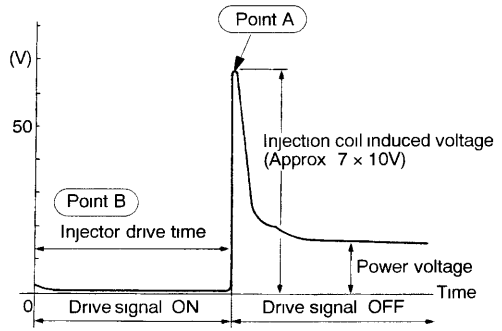
1. Connect the analyzer special patterns pickup to ECM terminal 1 to analyze the No.1 cylinder, connection terminal 2 to analyze the No.3 cylinder, connection terminal 14 to analyze the No.2 cylinder and connection terminal 15 to analyze the No.4 respectively.

Standard Wave Pattern

Observation conditions

Function	Special patterns
Pattern height	Variable
Variable knob	Adjust while viewing the wave pattern
Pattern selector	Display
Engine r/min	Idle

Standard wave pattern



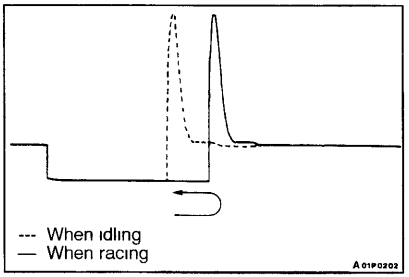
7FU1202

Wave Pattern Observation Points

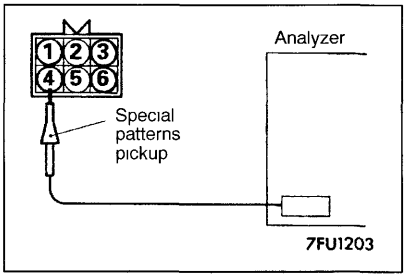
Point A: Height of injector coil induced voltage

Contrast with standard wave pattern	Probable cause
Injector coil induced voltage is low or doesn't appear at all.	Short in the injector solenoid

Point B: Injector drive time



- The injector drive time will be synchronized with the scan tool tester display.
- When the engine is suddenly raced, the drive time will be greatly extended at first, but the drive time will soon match the engine speed.



IDLE AIR CONTROL (STEPPER) MOTOR

Measurement Method

1. Disconnect the IAC motor connector, and connect the special tool (test harness: MD998463) in between.
2. Connect the analyzer special patterns pickup to the IAC motor-side connector terminal 1 (red clip of special tool), terminal 3 (blue clip), terminal 4 (black clip) and terminal 6 (yellow clip) respectively.

Alternate Method (Test harness not available)

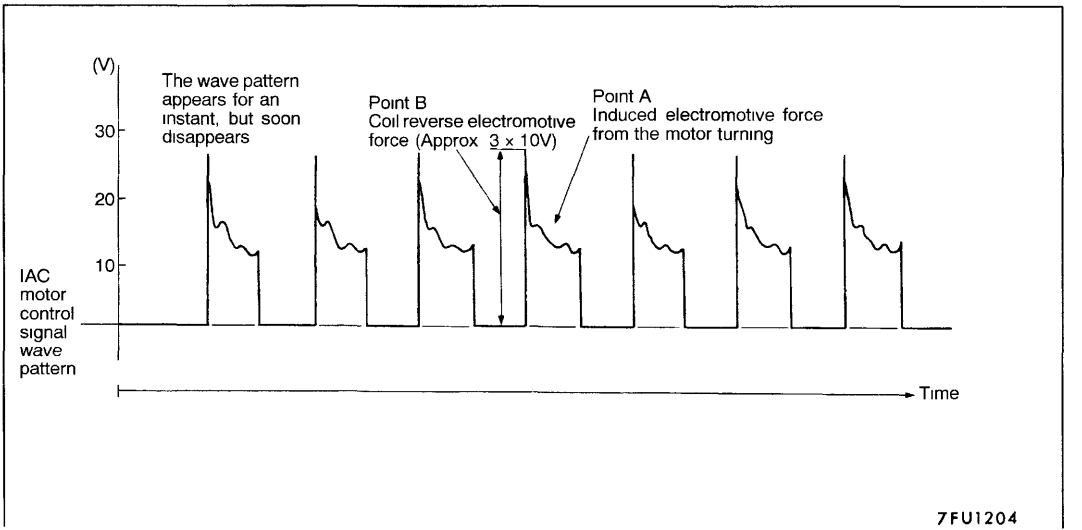
1. Connect the analyzer special patterns pickup to ECM terminal 4, connection terminal 5, connection terminal 17, and connection terminal 18 respectively.

Standard Wave Pattern

Observation conditions

Function	Special patterns
Pattern height	High
Pattern selector	Display
Engine condition	When the engine coolant temperature is 20°C or below, turn the ignition switch from OFF to ON (without starting the engine).
	While the engine is idling, turn the A/C switch to ON.
	Immediately after starting the warm engine

Standard wave pattern



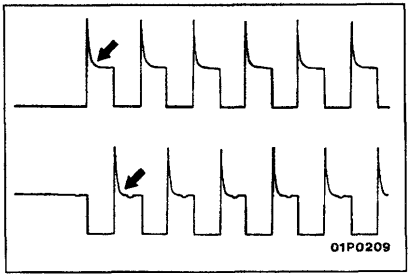
Wave Pattern Observation Points

Check that the standard wave pattern appears when the IAC motor is operating.
Point A: Presence or absence of induced electromotive force from the motor turning. (Refer to the abnormal wave pattern.)

Contrast with standard wave pattern	Probable cause
Induced electromotive force does not appear or is extremely small.	Motor is malfunctioning

Point B: Height of coil reverse electromotive force

Contrast with standard wave pattern	Probable cause
Coil reverse electromotive force does not appear or is extremely small.	Short in the coil



Examples of Abnormal Wave Pattern

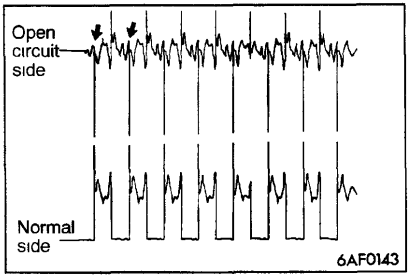
- Example 1

  Cause of problem

  Motor is malfunctioning. (Motor is not operating.)

  Wave pattern characteristics

  Induced electromotive force from the motor turning does not appear.



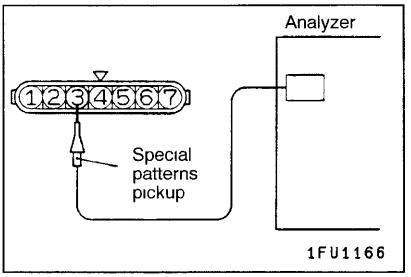
- Example 2

  Cause of problem

  Open circuit in the line between the IAC motor and the ECM.

  Wave pattern characteristics

  Current is not supplied to the motor coil on the open circuit side. (Voltage does not drop to 0 V.)
  Furthermore, the induced electromotive force waveform at the normal side is slightly different from the normal waveform.



IGNITION COIL AND IGNITION POWER TRANSISTOR

- Ignition coil primary signal
  Refer to GROUP 16 - Ignition System
- Ignition power transistor control signal

Measurement Method

1. Disconnect the distributor (ignition power transistor) connector, and connect the special tool (test harness: MB991348) in between. (All terminals should be connected.)
2. Connect the analyzer special patterns pickup to distributor connector terminal 3.

Alternate method (Test harness not available)

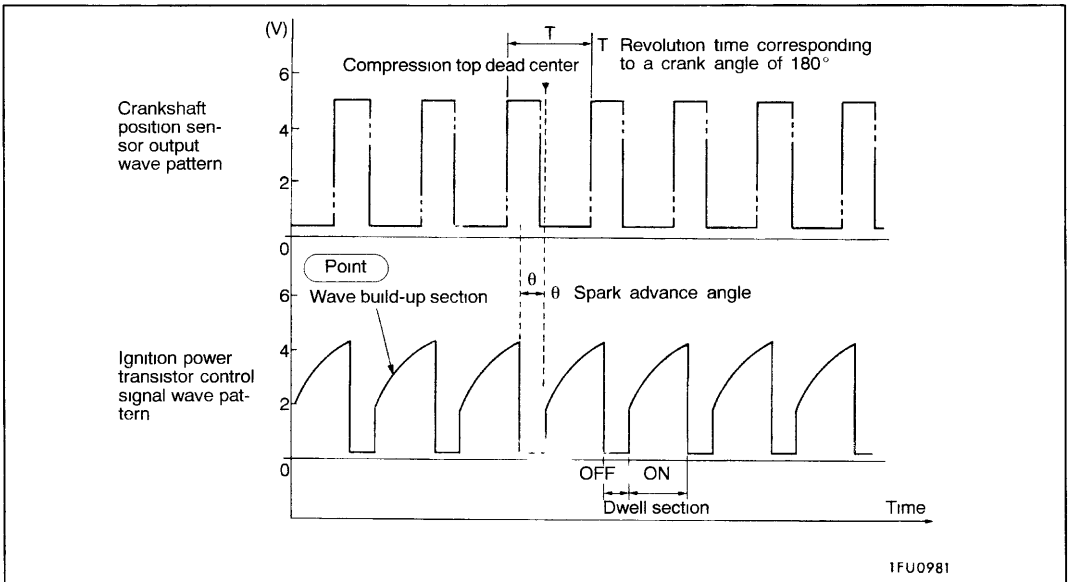
1. Connect the analyzer special patterns pickup to ECM terminal 10.

Standard Wave Pattern

Observation conditions

Function	Special patterns
Pattern height	Low
Pattern selector	Display
Engine r/min	Approx. 1,200 r/min

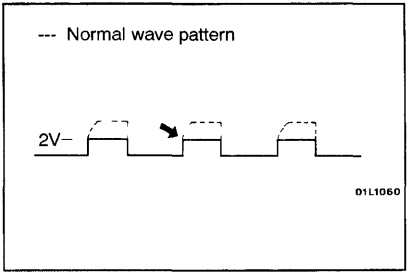
Standard wave pattern

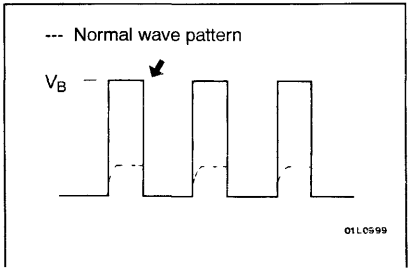


Wave Pattern Observation Points

Point: Condition of wave pattern build-up section and maximum voltage (Refer to abnormal wave pattern examples 1 and 2.)

Condition of wave pattern build-up section and maximum voltage	Probable cause
Rises from approx. 2V to approx. 4.5V at the top-right	Normal
2V rectangular wave	Open-circuit in ignition primary circuit
Rectangular wave at power voltage	Ignition power transistor malfunction





Examples of Abnormal Wave Patterns

- Example 1
  Wave pattern during engine cranking
  CAUSE OF PROBLEM
  Open-circuit in ignition primary circuit
  WAVE PATTERN CHARACTERISTICS
  Top-right part of the build-up section cannot be seen, and voltage value is too low approximately 2V.

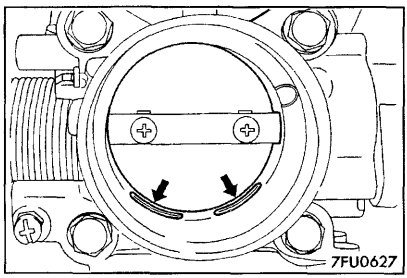
- Example 2
  Wave pattern during engine cranking
  CAUSE OF PROBLEM
  Malfunction in ignition power transistor
  WAVE PATTERN CHARACTERISTICS
  Power voltage results when the ignition power transistor is ON.

ON-VEHICLE SERVICE

13100100474

THROTTLE BODY (THROTTLE VALVE AREA) CLEANING

1. Start the engine and warm it up until the coolant is heated to 80°C (176°F) or higher and then stop the engine.
2. Remove the air intake hose from the throttle body.



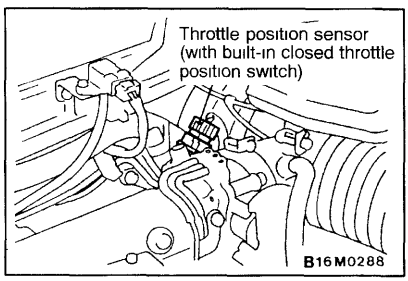
3. Plug the bypass passage inlet (arrow) of the throttle body.

   Caution
   Do not allow cleaning solvent to enter the bypass passage.
4. Spray cleaning solvent into the valve through the throttle body intake port and leave it for about 5 minutes.
5. Start the engine, race it several times and idle it for about 1 minute. If the idling speed becomes unstable (or if the engine stalls) due to the bypass passage being plugged, slightly open the throttle valve to keep the engine running.
6. If the throttle valve deposits are not removed, repeat steps 4 and 5.
7. Unplug the bypass passage inlet.
8. Attach the air intake hose.
9. Use the scan tool to erase the diagnostic trouble code.
10. Adjust the basic idle speed. (Refer to P.13A-143.)

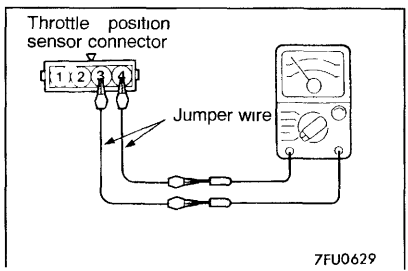
    NOTE
    If the engine hunts while idling after adjustment of the basic idle speed, disconnect the (–) cable from the battery for 10 seconds or more, and then reconnect it and run the engine at idle for about 10 minutes.

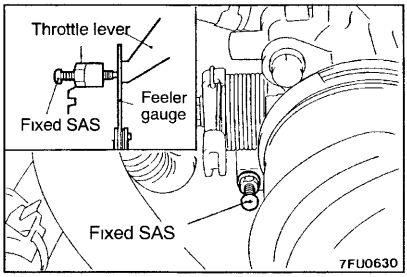
CLOSED THROTTLE POSITION SWITCH AND THROTTLE POSITION SENSOR ADJUSTMENT

13100130190

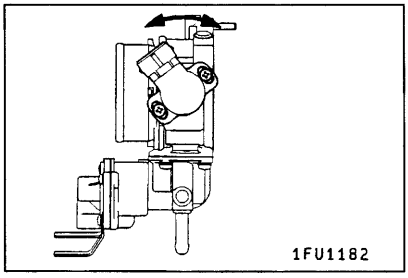


1. Connect the scan tool to the data link connector. When not using the scan tool, proceed as follows.
   (1) Disconnect the connector of the throttle position sensor.
   (2) Connect an ohmmeter between terminal 3 (closed throttle position switch) and 4 (sensor ground) by using jumper wires.



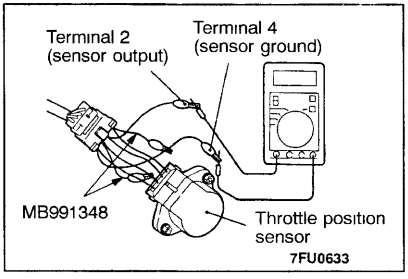


2. Insert a feeler gauge with a thickness of 0.45 mm (0.177 in.) between the fixed SAS and the throttle lever.
3. When using the scan tool, turn the ignition switch ON. (Do not start engine.) Observe operation of the closed throttle position switch.



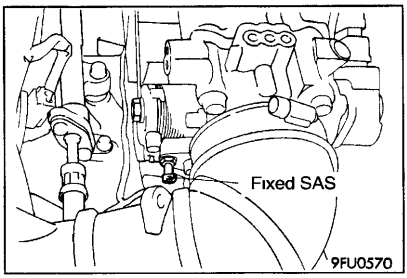
4. Loosen the throttle position sensor mounting bolt; then turn the throttle position sensor body fully counter clockwise.
5. In this condition, make sure that the closed throttle position switch is ON.

6. Slowly turn the throttle position sensor clockwise until the point at which the closed throttle position switch is turned OFF is found.
   Tighten the throttle position sensor installation bolt at that position. Proceed to Step 8.



7. When not using the scan tool, proceed as follows:
   (1) Connect the special tool (test harness set) between the throttle position sensor connectors which have been disconnected. (Connect all terminals taking care not to mistake the terminal No.)
   (2) Connect a digital voltmeter between the throttle position sensor terminal 2 (sensor output) and terminal 4 (sensor ground.)
   (3) Turn the ignition switch ON (but do not start the engine).

8. Check the throttle position sensor output voltage.
   Standard value: 400-1,000 mV
9. If there is a deviation from the standard value, check the throttle position sensor and the related harness.
10. Remove the feeler gauge.
11. Switch OFF the ignition switch.



FIXED SAS ADJUSTMENT

13100150431

NOTE
1. The fixed SAS should not be moved unnecessarily; it has been precisely adjusted by the manufacturer.
2. If the adjustment is disturbed for any reason, readjust as follows.

1. Loosen the tension of the accelerator cable sufficiently.
2. Back out the fixed SAS lock nut.
3. Turn the fixed SAS counterclockwise until it is sufficiently backed out, and fully close the throttle valve.
4. Turn the fixed SAS clockwise until the throttle lever is touched (i.e., the point at which the throttle valve begins to open).
   From that point, turn the fixed SAS clockwise another 1-1/4 turn.
5. While holding the fixed SAS so that it doesn't move, tighten the lock nut securely.
6. Adjust the tension of the accelerator cable.
7. Adjust the basic idle speed.
8. Adjust the closed throttle position switch and the throttle position sensor. (Refer to P.13A-141.)

BASIC IDLE SPEED ADJUSTMENT

13100180539

NOTE
1. The standard idling speed has been adjusted, by the speed adjusting screw (SAS), by the manufacturer, and there should usually be no need for readjustment.
2. If the adjustment has been changed by mistake, the idle speed may become too high or the idle speed may drop too low when loads from components such as the A/C are placed on the engine. If this occurs, adjust by the following procedure.
3. The adjustment, if made, should be made after first confirming that the spark plugs, the injectors, the idle air control motor, the compression pressure, etc., are all normal.

1. The vehicle should be prepared as follows before the inspection and adjustment.
   - Engine coolant temperature: 80 - 95°C (176 - 203°F)
   - Lights, cooling fan and accessories: OFF
   - Transaxle: Neutral (A/T for P range)
2. Connect the scan tool to the data link connector (16-pin).

   NOTE
   When the scan tool is connected, the diagnostic test mode control terminal should be grounded.

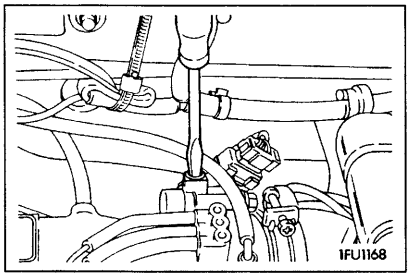
3. Start the engine and run at idle.
4. Select the item No.30 of the scan tool Actuator test.

   NOTE
   This holds the IAC motor at the basic step to adjust the basic idle speed.

5. Check the idle speed.

   Standard value: 700 ± 50 r/min

   NOTE
   1. The engine speed may be 20 to 100 r/min lower than indicated above for a new vehicle [driven approximately 500 km (300 mile) or less], but no adjustment is necessary.
   2. If the engine stalls or the engine speed is low even though the vehicle has been driven approximately 500 km (300 mile) or more, it is probable that deposits are adhered to the throttle valve, so clean it. (Refer to P.13A-141.)



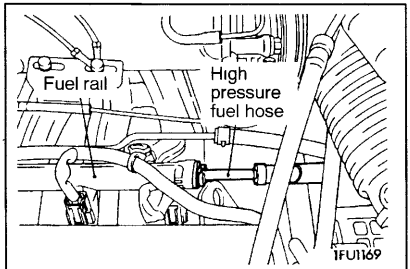
6. If not within the standard value range, turn the speed adjusting screw (SAS) to make the necessary adjustment.

   NOTE
   If the idling speed is higher than the standard value range even when the SAS is fully closed, check whether or not there is any indication that the fixed SAS has been moved. If there is an indication that it has been moved, adjust the fixed SAS.

7. Press the scan tool clear key, and release the IAC motor Actuator test mode.

   NOTE
   Unless the IAC motor is released, the Actuator test mode will continue 27 minutes.

8. Switch OFF the ignition switch.
9. Disconnect the scan tool.
10. Start the engine again and let it run at idle speed for about 10 minutes; check that the idling condition is normal.



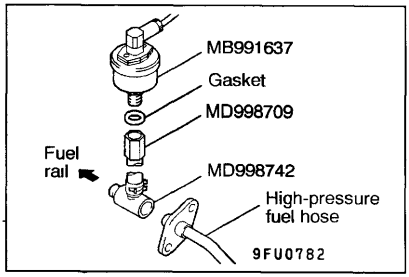
FUEL PRESSURE TEST

13100190488

1. Release residual pressure from the fuel line to prevent fuel spray. (Refer to P.13A-147.)
2. Disconnect the high pressure fuel hose at the fuel rail side.

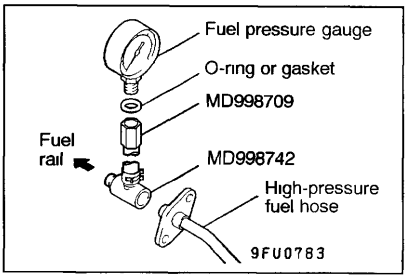
   Caution
   Cover the hose connection with rags to prevent splash of fuel that could be caused by some residual pressure in the fuel pipe line.

3. Remove the union joint and bolt from the special tool (adapter hose MD998709) and instead attach the special tool (hose adapter MD998742) to the adapter hose.



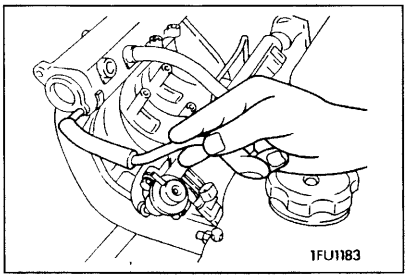
4. Install the special tool (for measuring the fuel pressure) that was set up in step 3.

   <When using the fuel pressure gauge set (special tool MB991637)>
   (1) Install the special tool (for measuring the fuel pressure) between the high-pressure fuel hose and the fuel rail.
   (2) Install the fuel pressure gauge set (special tool) on the special tool (for measuring the fuel pressure) putting the gasket between them.
   (3) Connect the lead wire of the fuel pressure gauge set (special tool) to the power supply (cigarette lighter socket) and to the scan tool.



   <When using the fuel pressure gauge>
   (1) Install the fuel pressure gauge on the special tool (for measuring the fuel pressure) putting a suitable O-ring or gasket between them.
   (2) Install the special tool which was set up in step (1) between the high-pressure fuel hose and the fuel rail.
5. Connect the scan tool to the data link connector.
6. Turn the ignition switch to ON. (But do not start the engine.)
7. Use the scan tool to operate the fuel pump. Check that there are no fuel leaks from any parts.
8. Finish the actuator test or turn the ignition switch to OFF.
9. Start the engine and run at idle.
10. Measure fuel pressure while the engine is running at idle.

    Standard value:
    Approx. 270 kpa (38 psi) at curb idle



11. Disconnect the vacuum hose from the fuel pressure regulator and measure fuel pressure with the hose end closed by a finger.

    Standard value:
    330-350 kPa (47-50 psi) at curb idle

12. Check to see that fuel pressure at idle does not drop even after the engine has been raced several times.
13. Racing the engine repeatedly, hold the fuel return hose lightly with fingers to feel that fuel pressure is present in the return hose.

    NOTE
    If the fuel flow rate is low, there will be no fuel pressure in the return hose.

14. If any of fuel pressure measured in steps 10 to 13 is out of specification, troubleshoot and repair according to the table below.

Symptom	Probable cause	Remedy
• Fuel pressure too low • Fuel pressure drops after racing • No fuel pressure in fuel return hose	Clogged fuel filter	Replace fuel filter
	Fuel leaking to return side due to poor fuel regulator valve seating or settled spring	Replace fuel pressure regulator
	Low fuel pump delivery pressure	Replace fuel pump
Fuel pressure too high	Binding valve in fuel pressure regulator	Replace fuel pressure regulator
	Clogged fuel return hose or pipe	Clean or replace hose or pipe
Same fuel pressure when vacuum hose is connected and when disconnected	Damaged vacuum hose or clogged nipple	Replace vacuum hose or clean nipple

15. Stop the engine and observe fuel pressure gauge reading. Normal if the reading does not drop within 2 minutes. If it does, observe the rate of drop and troubleshoot and repair according to the table below.
    (1) Squeeze closed the fuel return line to confirm leak-down occurs from defective fuel pressure regulator.
    (2) Squeeze closed the fuel supply line to confirm leak-down occurs from defective fuel pump check valve.
    (3) If pressure continues to drop with both fuel lines squeezed closed, injector(s) are leaking.

Symptom	Probable cause	Remedy
Fuel pressure drops gradually after engine is stopped	Leaky injector	Replace injector
	Leaky fuel regulator valve seat	Replace fuel pressure regulator
Fuel pressure drops sharply immediately after engine is stopped	Check valve in fuel pump is held open	Replace fuel pump

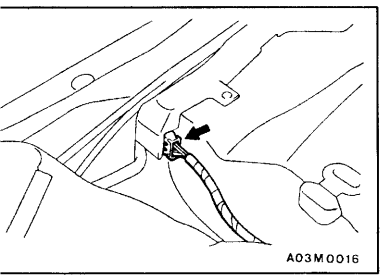
16. Release residual pressure from the fuel pipe line. (Refer to P.13A-147.)
17. Remove the fuel pressure gauge and special tool from the fuel rail.

Caution
Cover the hose connection with rags to prevent splash of fuel that could be caused by some residual pressure in the fuel pipe line.

18. Replace the O-ring at the end of the high pressure fuel hose with a new one.
19. Fit the high pressure fuel hose into the fuel rail and tighten the bolts to specified torque.

Tightening torque: 5 Nm (3.6 ft.lbs.)

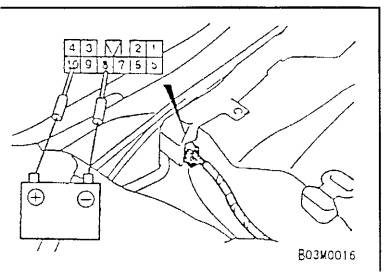
20. Check for fuel leaks.
    (1) Use the scan tool to operate the fuel pump.
    (2) Check the fuel line for leaks, repair as needed.
21. Disconnect the scan tool.


A03M0016

FUEL PUMP CONNECTOR DISCONNECTION (HOW TO REDUCE PRESSURIZED FUEL LINES) 13100090146

When removing the fuel pipe, hose, etc., since fuel pressure in the fuel pipe line is high, do the following operation so as to release fuel pressure in the line and prevent fuel from running out.

(1) Raise the rear seat cushion.
(2) Disconnect the body wiring harness and fuel wiring harness under the floor carpet.
(3) After starting the engine and letting it run until it stops naturally, turn the ignition switch to OFF.
(4) Connect the fuel wiring harness and body wiring harness.
(5) Install the rear seat cushion.


B03M0016

FUEL PUMP OPERATION CHECK 13100200334

1. Check the operation of the fuel pump by using the scan tool to force-drive the fuel pump.
2. If the fuel pump will not operate, check by using the following procedure, and if it is normal, check the drive circuit.
   (1) Turn the ignition switch to OFF.
   (2) Raise the rear seat cushion.
   (3) Disconnect the body wiring harness and fuel wiring harness under the floor carpet.

(4) Connect the battery (+) terminal to terminal No.10 of the fuel pump side directly, and battery (-) terminal to terminal No.8. Then, confirm that operation sound is heard from the pump.

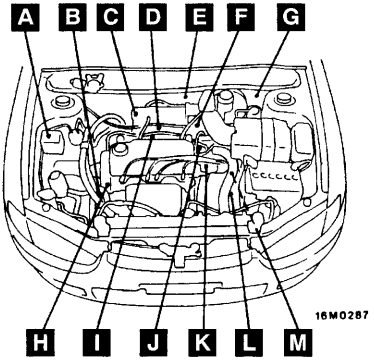
NOTE
As the fuel pump is an in-tank type, the fuel pump sound is hard to hear, so remove the fuel filler cap and check from the tank inlet.

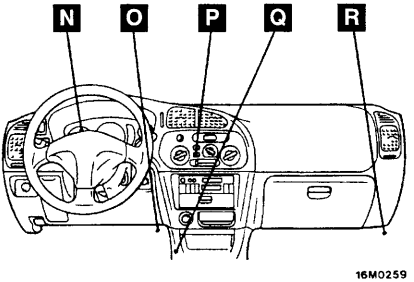
(5) Check the fuel pressure by pinching the fuel hose with the fingertips.
(6) Connect the body wiring harness and fuel wiring harness.
(7) Install the rear seat cushion.

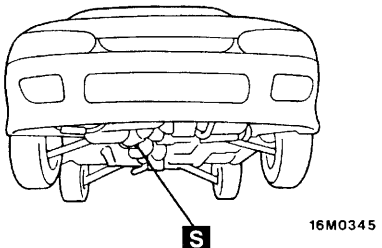
COMPONENT LOCATION

13100210627

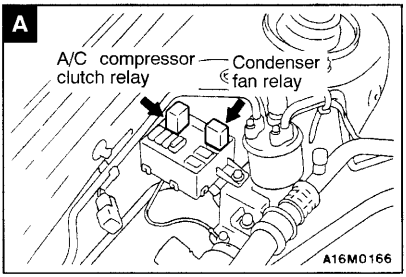
Name		Symbol	Name	Symbol
Air conditioning compressor clutch relay		A	Idle air control motor	F
Air conditioning switch		P	Ignition coil/Ignition power transistor	K
Camshaft position sensor		K	Injector	I
Crankshaft position sensor		H	Intake air temperature sensor	C
Data link connector		O	Manifold absolute pressure sensor	E
EGR Solenoid		D	Multiport fuel injection (MFI) relay/Fuel pump relay	Q
Engine control module		R		
Engine coolant temperature sensor		J	Park/Neutral position switch	L
Evaporative emission purge solenoid		D	Power steering pressure switch	B
Fuel pump check connector		G	Service Engine Soon/Malfunction Indicator Lamp	N
Heated oxygen sensor <California>	Front	S		
	Rear	S	Throttle position sensor (with built-in closed throttle position switch)	F
Heated oxygen sensor <Federal>	Front	S		
	Rear	S	Vehicle speed sensor	M



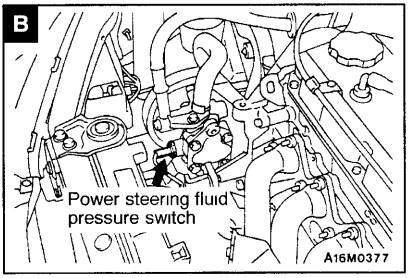




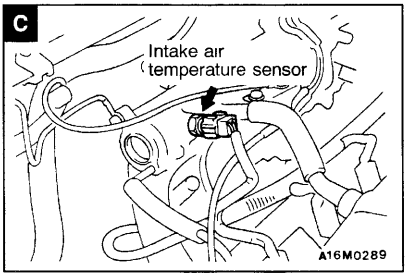
A


A/C compressor clutch relay
Condenser fan relay
A16M0166

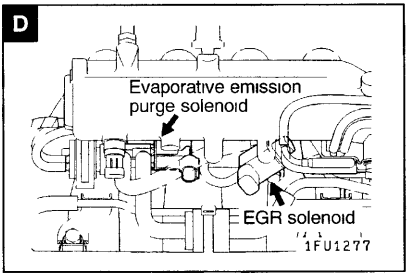
B


Power steering fluid pressure switch
A16M0377

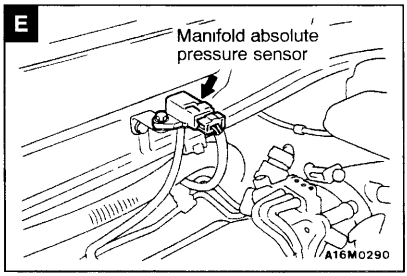
C


Intake air temperature sensor
A16M0289

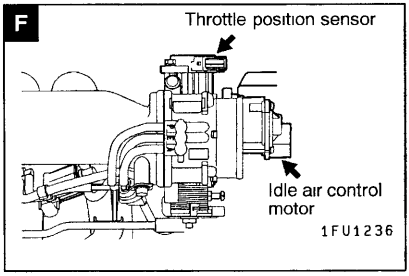
D


Evaporative emission purge solenoid
EGR solenoid
1FU1277

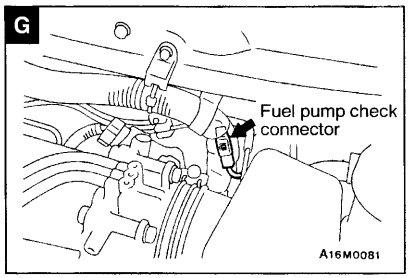
E


Manifold absolute pressure sensor
A16M0290

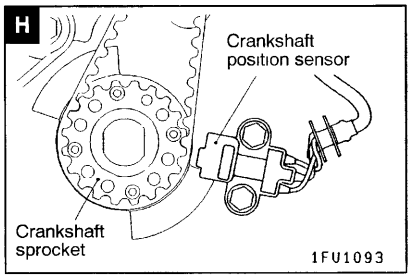
F


Throttle position sensor
Idle air control motor
1FU1236

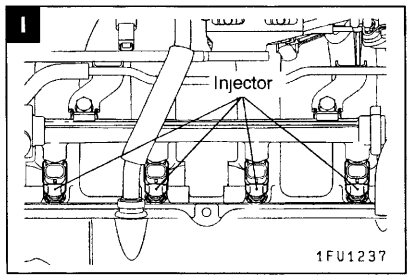
G


Fuel pump check connector
A16M0081

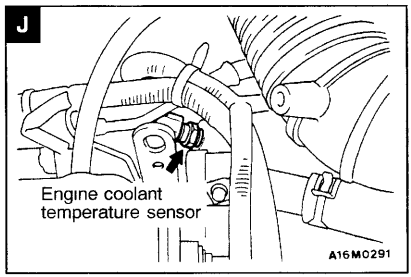
H


Crankshaft position sensor
Crankshaft sprocket
1FU1093

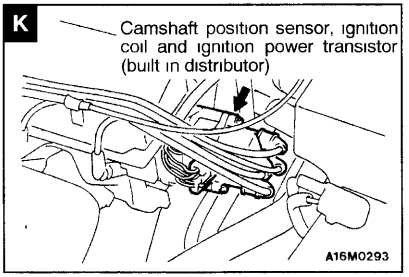
I


Injector
1FU1237

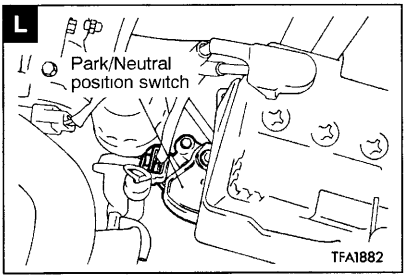
J


Engine coolant temperature sensor
A16M0291

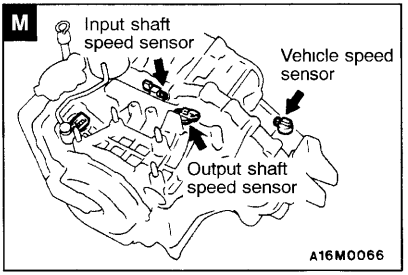
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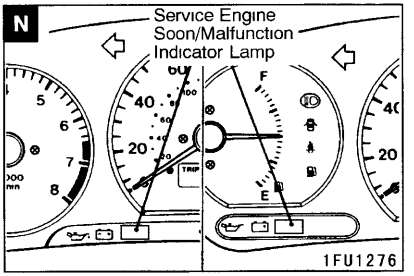
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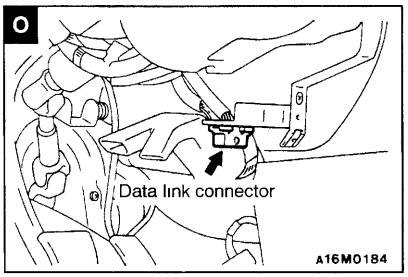
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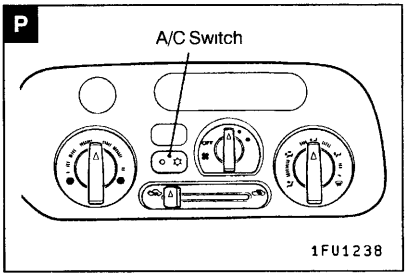
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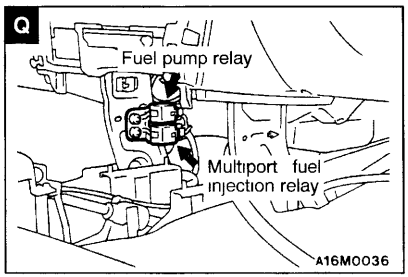
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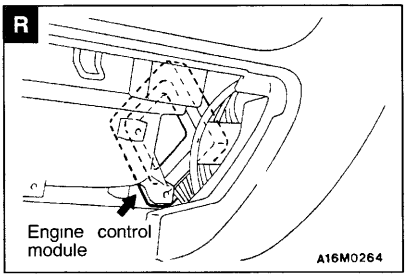
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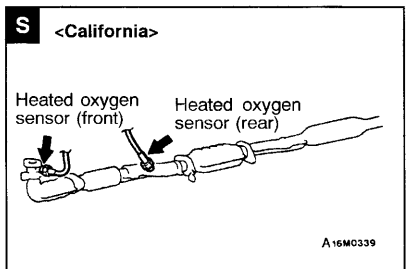
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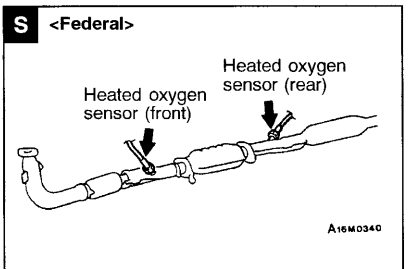
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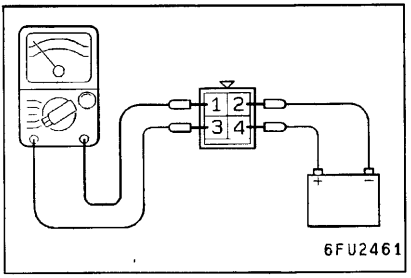


S <California>



S <Federal>

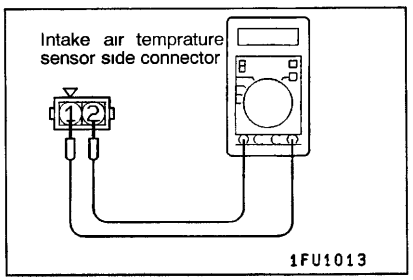




MULTIPORT FUEL INJECTION (MFI) RELAY AND FUEL PUMP RELAY CONTINUITY CHECK

13100990033

BATTERY VOLTAGE	TERMINAL NO.			
	1	2	3	4
Not supplied		○		○
Supplied	○		○	
		⊖		⊕

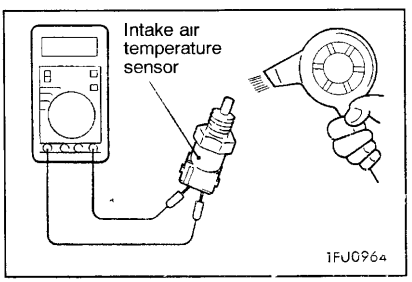


INTAKE AIR TEMPERATURE SENSOR CHECK

13100280154

1. Disconnect the intake air temperature sensor connector.
2. Measure resistance between terminals 1 and 2.

   Standard value:
   2.3 - 3.0 kΩ [at 20°C (68°F)]
   0.30 - 0.42 kΩ [at 80°C (176°F)]
3. Remove the intake air temperature sensor.



4. Measure resistance while heating the sensor using a hair dryer.

   Normal condition:

Temperature	Resistance (kΩ)
Higher	Smaller

5. If the value deviates from the standard value or the resistance remains unchanged, replace the intake air temperature sensor.
6. Install the intake air temperature sensor and tighten it to the specified torque.

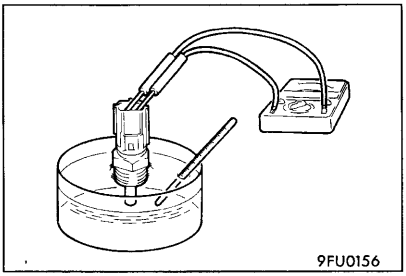
   Tightening torque: 12 - 15 Nm (9 - 11 ft.lbs.)

ENGINE COOLANT TEMPERATURE SENSOR CHECK

13100310167

Caution
Be careful not to touch the connector (resin section) with the tool when removing and installing.

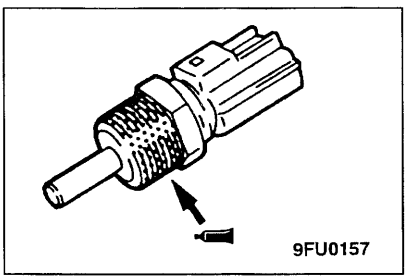
1. Remove the engine coolant temperature sensor.



2. With temperature sensing portion of engine coolant temperature sensor immersed in hot water, check resistance.

   Standard value:
   2.1 - 2.7 kΩ [at 20°C (68°F)]
   0.26 - 0.36 kΩ [at 80°C (176°F)]

3. If the resistance deviates from the standard value greatly, replace the sensor.

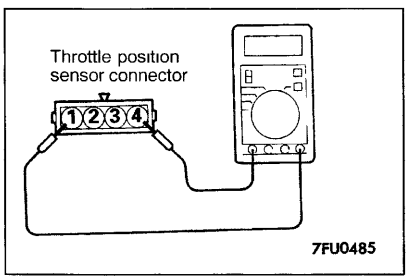


4. Apply sealant to threaded portion.

   Specified sealant:
   3M NUT Locking Part No.4171 or equivalent

5. Install the engine coolant temperature sensor and tighten it to the specified torque.

   Tightening torque: 29 Nm (22 ft.lbs.)



THROTTLE POSITION SENSOR CHECK 13100320436

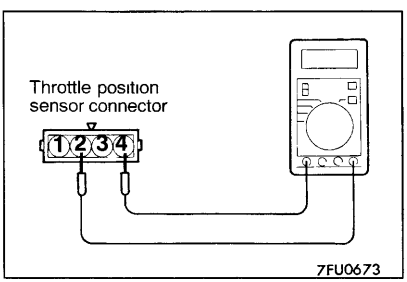
1. Disconnect the throttle position sensor connector.
2. Measure the resistance between the throttle position sensor side connector terminal 1 and terminal 4.

   Standard value: 3.5-6.5 kΩ

3. Measure the resistance between the throttle position sensor side connector terminal 2 and terminal 4.

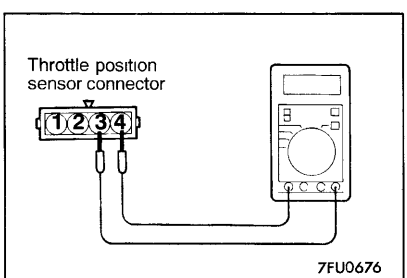
   Normal condition:

Throttle valve slowly open until fully open from the idle position	Changes smoothly in proportion to the opening angle of the throttle valve



4. If the resistance is outside the standard value, or if it doesn't change smoothly, replace the throttle position sensor.

   NOTE
   For the throttle position sensor adjustment procedure, refer to P.13A-141.



CLOSED THROTTLE POSITION SWITCH CHECK 13100330415

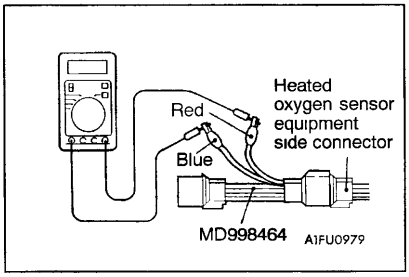
1. Disconnect the throttle position sensor connector.
2. Check the continuity between the throttle position sensor connector side terminal 3 and terminal 4.

   Normal condition:

Accelerator pedal	Continuity
Depressed	Non-conductive
Released	Conductive

3. If out of specification, replace the throttle position sensor.

NOTE
After replacement, the closed throttle position switch and throttle position sensor should be adjusted. (Refer to P.13A-141.)

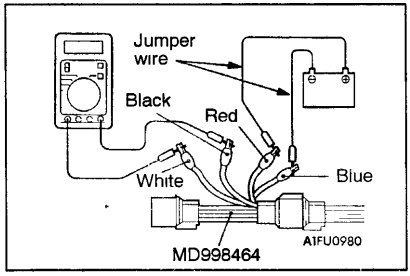


HEATED OXYGEN SENSOR CHECK 13100500199

<Heated oxygen sensor (front)>

When using Scan tool, observe HO_2S reading. If values are unsatisfactory, or if Scan tool is not available, use the following procedure:

1. Disconnect the heated oxygen sensor connector and connect the special tool (test harness) to the connector on the heated oxygen sensor side.
2. Make sure that there is continuity [4.5 - 8.0 Ω at 20°C (68°F)] between terminal 1 (red clip of special tool) and terminal 3 (blue clip of special tool) on the heated oxygen sensor connector.
3. If there is no continuity, replace the heated oxygen sensor.
4. Warm up the engine until engine coolant is 80°C (176°F) or higher.
5. Use the jumper wires to connect terminal 1 (red clip) of the heated oxygen sensor connector to the battery (+) terminal and terminal 3 (blue clip) to the battery (–) terminal.



Caution
Be very careful when connecting the jumper wires; incorrect connection can damage the heated oxygen sensor.

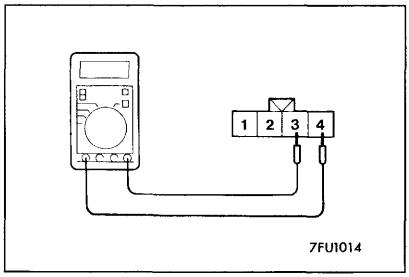
6. Connect a digital voltage meter between terminal 2 (black clip) and terminal 4 (white clip).
7. While repeatedly racing the engine, measure the heated oxygen sensor output voltage.

Standard value:

Engine	Heated oxygen sensor output voltage	Remarks
When racing engine	0.6-1.0V	If you make the air/fuel ratio rich by racing the engine repeatedly, a normal heated oxygen sensor will output a voltage of 0.6-1.0V.

8. If the sensor is defective, replace the heated oxygen sensor.

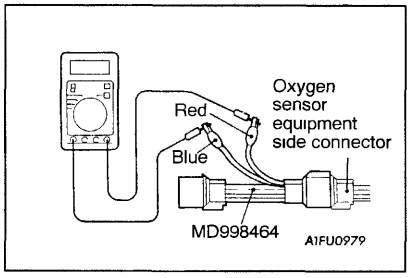
NOTE
For removal and installation of the heated oxygen sensor, refer to GROUP 15 - Exhaust Pipe and Main Muffler.



<Heated oxygen sensor (rear): Vehicles for Federal>

1. Disconnect the heated oxygen sensor connector.
2. Make sure that there is continuity [4.5 - 8.0 Ω at 20°C (68°F)] between terminal 3 and terminal 4 on the heated oxygen sensor connector.
3. If there is no continuity, replace the heated oxygen sensor.

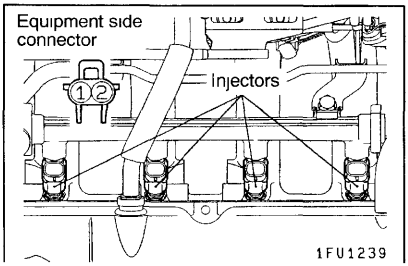
NOTE
1. If the scan tool does not display the standard value although no abnormality is found by the above mentioned continuity test and harness check, replace the heated oxygen sensor (rear).
2. For removal and installation of the oxygen sensor, refer to GROUP 15 - Exhaust Pipe and Main Muffler.



<Heated oxygen sensor (rear): Vehicles for California>

1. Disconnect the heated oxygen sensor connector and connect the special tool (test harness) to the connector on the heated oxygen sensor side.
2. Make sure that there is continuity [4.5 - 8.0 Ω at 20°C (68°F)] between terminal 1 (red clip of special tool) and terminal 3 (blue clip of special tool) on the heated oxygen sensor connector.
3. If there is no continuity, replace the heated oxygen sensor.

NOTE
1. If the scan tool does not display the standard value although no abnormality is found by the above mentioned continuity test and harness check, replace the heated oxygen sensor (rear).
2. For removal and installation of the oxygen sensor, refer to GROUP 15 - Exhaust Pipe and Main Muffler.



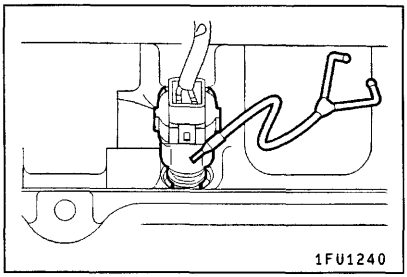
INJECTOR CHECK

13100520188

Measurement of Resistance between Terminals

1. Remove the injector connector.
2. Measure the resistance between terminals.

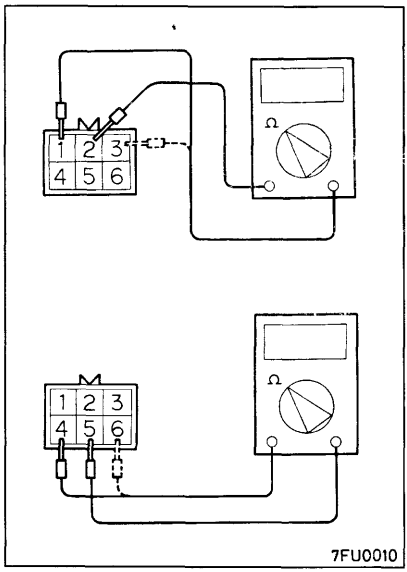
   Standard value: 13-16 Ω [at 20°C (68°F)]
3. Install the injector connector



Checking operation sound

Using a stethoscope or long blade screwdriver, check the operation sound ("tick-tick-tick") of injectors during idling or during cranking.
Check that as the engine speed increases, the frequency of the operating sound also increases.

(1) If the injector you are checking is not operating, you will hear the operating sound of the other injectors.
(2) If no operating sound is heard from the injector that is being checked, check the injector drive circuit. If there is nothing wrong with the circuit, a defective injector or engine control module is suspected.



IDLE AIR CONTROL MOTOR (STEPPER MOTOR) CHECK

13100540184

Checking the Operation Sound

1. Check that the engine coolant temperature is 20°C (68°F) or below.

   NOTE
   Disconnecting the engine coolant temperature sensor connector and connecting the harness-side of the connector to another engine coolant temperature sensor that is at 20°C (68°F) or below is okay for this test.

2. Check that the operation sound of the stepper motor can be heard after the ignition is switched ON. (but without starting the motor.)
3. If the operation sound cannot be heard, check the stepper motor's activation circuit.
   If the circuit is normal, it is probable that there is a malfunction of the stepper motor or of the engine control module.

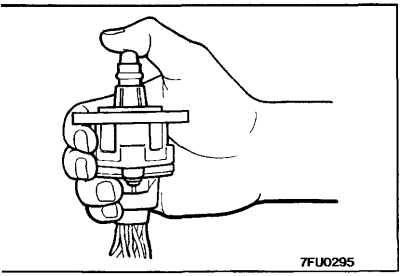
Checking the Coil Resistance

1. Disconnect the idle air control motor connector and connect the special tool (test harness).
2. Measure the resistance between terminal 2 (white clip of the special tool) and either terminal 1 (red clip) or terminal 3 (blue clip) of the connector at the idle air control motor side.

   Standard value: 28-33 Ω [at 20°C (68°F)]

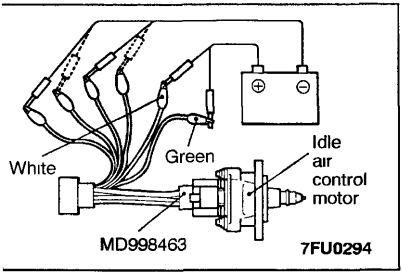
3. Measure the resistance between terminal 5 (green clip of the special tool) and either terminal 6 (yellow clip) or terminal 4 (black clip) of the connector at the idle air control motor side.

   Standard value: 28-33 Ω [at 20°C (68°F)]


7FU0295

Operation Check

1. Remove the throttle body.
2. Remove the stepper motor.
3. Connect the special tool (test harness) to the idle air control motor connector.



4. Connect the positive (+) terminal of a power supply (approx. 6 V) to the white clip and the green clip.
5. With the idle air control motor as shown in the illustration, connect the negative (-) terminal of the power supply to each clip as described in the following steps, and check whether or not a very slight vibration of the stepper motor is generated as a result of the activation of the stepper motor.
   (1) Connect the negative (-) terminal of the power supply to the red and black clip.
   (2) Connect the negative (-) terminal of the power supply to the blue and black clip.
   (3) Connect the negative (-) terminal of the power supply to the blue and yellow clip.
   (4) Connect the negative (-) terminal of the power supply to the red and yellow clip.
   (5) Connect the negative (-) terminal of the power supply to the red and black clip.
   (6) Repeat the tests in sequence from (5) to (1) to test opposite movement of the IAC.
6. If, as a result of these tests, vibration is detected, the stepper motor can be considered to be normal.

EVAPORATIVE EMISSION PURGE SOLENOID CHECK

13100560272

Refer to GROUP 17 - Emission Control System.

EGR SOLENOID CHECK

13100570138

Refer to GROUP 17 - Emission Control System.

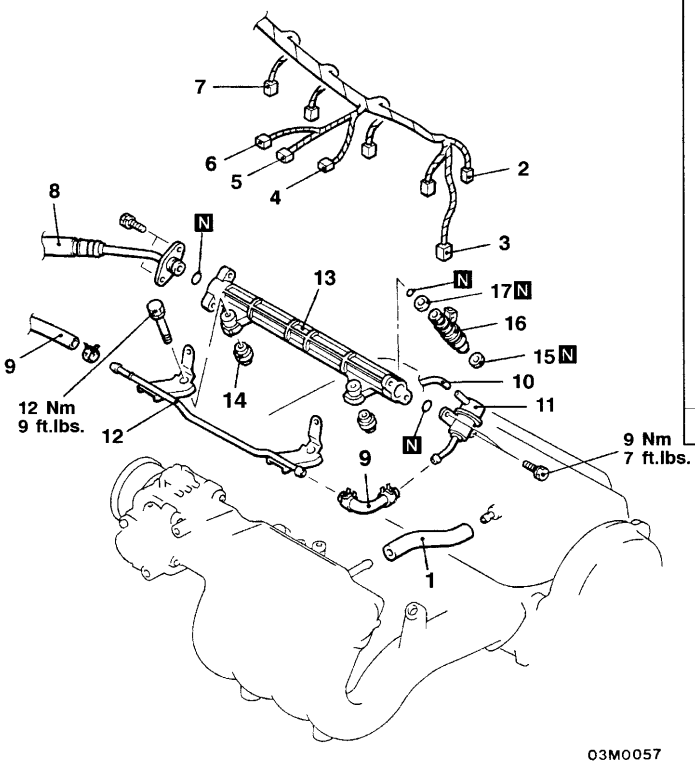
INJECTOR

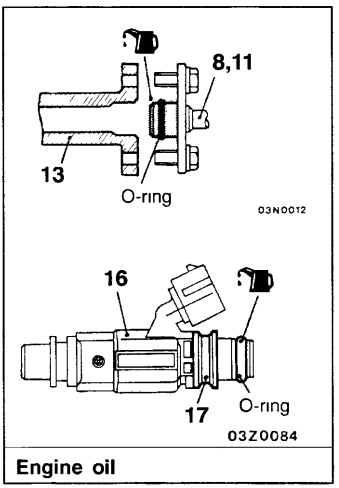
13100710189

REMOVAL AND INSTALLATION

Pre-removal Operation
(1) Fuel Discharge Prevention (Refer to P13A-147)
(2) Air Cleaner Removal

Post-installation Operation
(1) Air Cleaner Installation
(2) Fuel Leakage Checking





00004804

Removal steps

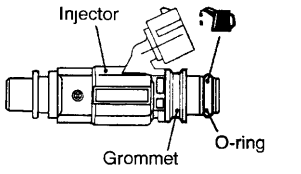
1 PCV hose
2 Crank angle sensor connector
3. Heated oxygen sensor connector
4 Intake air temperature sensor connector
5. Evaporative emission purge solenoid connector
6. EGR solenoid connector
7 Injector connector
▶A◀ 8. Fuel high-pressure hose connection
9 Fuel return hose connection
10 Vacuum hose connection
▶A◀ 11. Fuel pressure regulator
12 Fuel return pipe
◀A▶ 13 Fuel rail
14. Insulators
15. Insulators
◀A▶ ▶A◀ 16. Injectors
17. Grommets

REMOVAL SERVICE POINT

◀A▶ FUEL RAIL/INJECTOR REMOVAL

Remove the fuel rail (with the injectors attached to it).

Caution
Care must be taken, when removing the fuel rail, not to drop the injector.



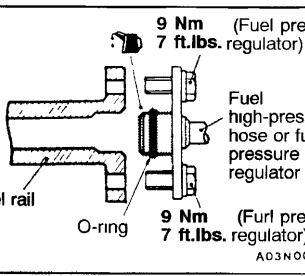
INSTALLATION SERVICE POINT

◀A▶ INJECTOR/FUEL PRESSURE REGULATOR/FUEL HIGH-PRESSURE HOSE INSTALLATION

1. Apply a drop of new engine oil to the O-ring.

   Caution
   Be sure not to let engine oil enter the fuel rail.

2. While turning the injector, fuel high-pressure hose and fuel pressure regulator to the right and left, install the fuel rail. Be careful not to damage the O-ring.
3. If it does not turn smoothly, the O-ring may be trapped, remove the fuel pressure regulator and then re-insert it into the fuel rail and check once again.



4. Tighten the fuel high-pressure hose to the standard torque, and tighten the fuel pressure regulator to the specified torque.

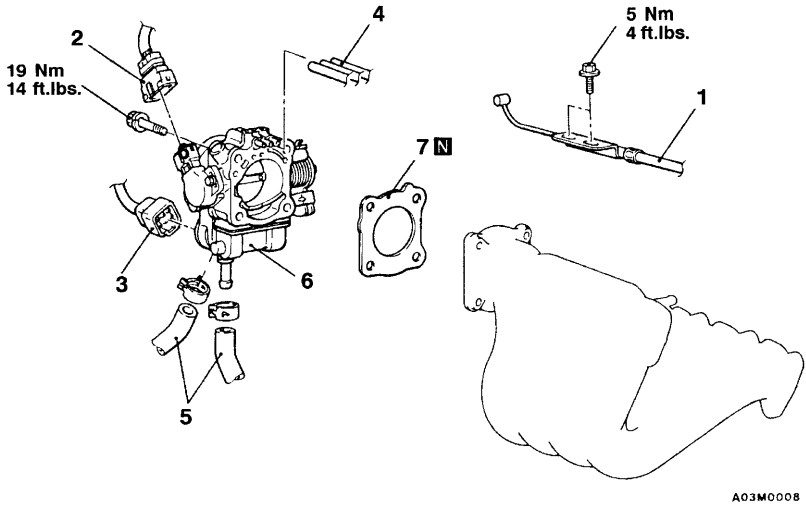
THROTTLE BODY

13100770378

REMOVAL AND INSTALLATION

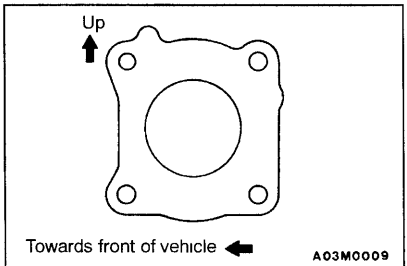
Pre-removal Operation
(1) Engine Coolant Draining (Refer to GROUP 00 - Maintenance Service)
(2) Air Cleaner Removal

Post-installation Operation
(1) Air Cleaner Installation
(2) Engine Coolant Supplying (Refer to GROUP 00 - Maintenance Service)
(3) Accelerator Cable Adjustment (Refer to GROUP 17 - On-vehicle Service)



Removal steps

1. Accelerator cable connection
2. Throttle position sensor connector
3. Idle speed control servo connector
4. Vacuum hose connection
5. Water hose connection
6. Throttle body
▶A◀ 7. Throttle body gasket



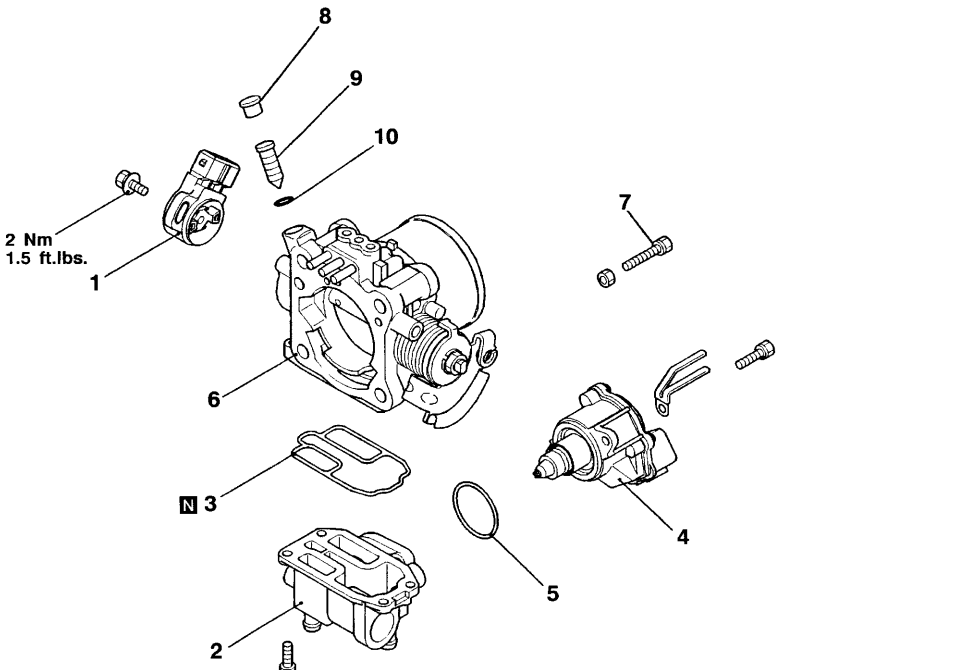
INSTALLATION SERVICE POINT

▶A◀ THROTTLE BODY GASKET INSTALLATION

Place the gasket so that the projecting part is positioned as shown in the illustration, and then install it between the intake manifold and the throttle body.

DISASSEMBLY AND REASSEMBLY

13100970532

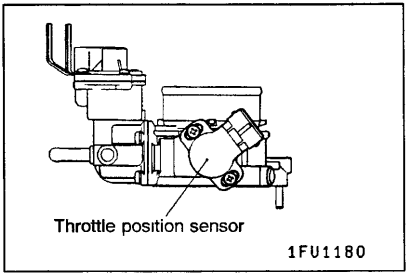


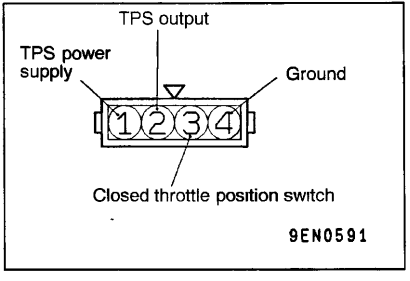
Disassembly steps

▶A◀ 1 Throttle position sensor
2 Idle speed control body assembly
3 O-ring
4. Idle speed control servo
5 O-ring
6. Throttle body
7. Fixed SAS
8 Cap
9. Speed adjusting screw
10. O-ring

NOTE
1. The fixed SAS is correctly adjusted at the factory and should not be removed.
2. If the fixed SAS should happen to have been removed, carry out fixed SAS adjustment (Refer to page 13A-143.)

3 If the speed adjusting screw should happen to have been removed, carry out speed adjusting screw adjustment.
(Refer to page 13A-143)





REASSEMBLY SERVICE POINT

▶A◀ THROTTLE POSITION SENSOR (TPS) INSTALLATION

1. Install the TPS so that it faces as shown in the illustration, and then tighten it with the screw.
2. Connect a multimeter between terminal (1) (TPS power supply) and terminal (2) (TPS output) of the TPS connector, and check that the resistance increases gradually as the throttle valve is opened slowly to the fully-open position.
3. Check the continuity between terminal (3) (closed throttle position switch) and terminal (4) (ground) of the TPS connector when the throttle valve is fully closed and fully open.

Normal condition:

Throttle valve condition	Continuity
Fully closed	Continuity
Fully open	No continuity

If there is no continuity when the throttle valve is fully closed, turn the TPS body counter-clockwise and then check again.

4. If there is an abnormality, replace the TPS.

MULTIPORT FUEL INJECTION (MFI) <1.8L ENGINE>

CONTENTS

13109000614

GENERAL INFORMATION 2

INJECTOR 153

ON-VEHICLE SERVICE

- Basic Idle Speed Adjustment 144
- Closed Throttle Position Switch and Throttle Position Sensor Adjustment 142
- Closed Throttle Position Switch Check 149
- Component Location 144
- Curb Idle Speed Check .... Refer to GROUP 11A
- EGR Solenoid Check 152
- Engine Coolant Temperature Sensor Check 148
- Evaporative Emission Purge Solenoid Check 152
- Fixed SAS Adjustment 143
- Fuel Pressure Test 144
- Fuel Pump Connector Disconnection (How to Reduce Pressurized Fuel Lines) 144
- Fuel Pump Operation Check 144
- Heated Oxygen Sensor Check 150
- Idle Air Control Motor (Stepper Motor) Check 152
- Injector Check 152
- Intake Air Temperature Sensor Check 148
- Multiport Fuel Injection (MFI) Relay and Fuel Pump Relay Continuity Check 148
- Throttle Body (Throttle Valve Area) Cleaning 142
- Throttle Position Sensor Check 148

SEALANT 6

SERVICE SPECIFICATIONS 6

SPECIAL TOOLS 6

TROUBLESHOOTING 8

THROTTLE BODY 155

GENERAL INFORMATION

13100010715

The Multiport Fuel Injection System consists of sensors which detect the engine conditions, the ENGINE CONTROL MODULE (ECM) which controls the system based on signals from these sensors, and actuators which operate under the control of the ECM.
The ECM carries out activities such as fuel injection control, idle air control, and ignition timing control. In addition, the ECM is equipped with several diagnostic test modes which simplify troubleshooting when a problem develops.

FUEL INJECTION CONTROL

The injector drive times and injector timing are controlled so that the optimum air/fuel mixture is supplied to the engine to correspond to the continually-changing engine operation conditions.
A single injector is mounted at the intake port of each cylinder. Fuel is sent under pressure from the fuel tank to the fuel injectors by the fuel pump, with the pressure being regulated by the fuel pressure regulator. The regulated fuel is distributed to each of the injectors.
Fuel injection is normally carried out once for each cylinder for every two rotations of the crankshaft. The firing order is 1-3-4-2. Each cylinder has a dedicated fuel injector. This is called multiport. The ECM provides a richer air/fuel mixture by carrying out "open-loop" control when the engine is cold or operating under high load conditions in order to maintain engine performance.
In addition, when the engine is under normal operating temperature after warming-up, the ECM controls the air/fuel mixture by using the heated oxygen sensor signal to carry out "closed-loop" control. The closed-loop control achieves the theoretical air/fuel mixture ratio where the catalytic converter can obtains the maximum cleaning performance.

IDLE AIR CONTROL

The idle speed is kept at the optimum speed by controlling the amount of air that bypasses the throttle valve in accordance with changes in idling conditions and engine load during idling.
The ECM drives the idle air control (IAC) motor to keep the engine running at the pre-set idle target speed in accordance with the engine coolant temperature and air conditioning load. In addition, when the air conditioning switch is turned off and on while the engine is idling, the IAC motor adjusts the throttle valve bypass air amount according to the engine load conditions to avoid fluctuations in the engine speed.

IGNITION TIMING CONTROL

The ignition power transistor located in the ignition primary circuit turns ON and OFF to control the primary current flow to the ignition coil. This controls the ignition timing to provide the optimum ignition timing with respect to the engine operating conditions. The ignition timing is determined by the ECM from the engine speed, intake air volume, engine coolant temperature, and atmospheric pressure.

DIAGNOSTIC TEST MODE

- When an abnormality is detected in one of the sensors or actuators related to emission control, the SERVICE ENGINE SOON/MALFUNCTION INDICATOR LAMP illuminates to warn the driver.
- When an abnormality is detected in one of the sensors or actuators, a diagnostic trouble code corresponding to the abnormality is stored in the ECM.
- The RAM data inside the ECM that is related to the sensors and actuators can be read with the scan tool.
  In addition, the actuators can be controlled by the scan tool (MUT-II) under certain circumstances.

OTHER CONTROL FUNCTIONS

1. Fuel Pump Control
   Turns the fuel pump relay ON so that current is supplied to the fuel pump while the engine is cranking or running.
2. A/C Compressor Clutch Relay Control
   Turns the compressor clutch of the A/C ON and OFF.
3. Fan Relay Control
   The radiator fan and condenser fan speeds are controlled in response to the engine coolant temperature and vehicle speed.
4. Evaporative Emission Purge Control
   (Refer to GROUP 17.)
5. EGR Control
   (Refer to GROUP 17.)

GENERAL SPECIFICATIONS

Items		Specifications
Throttle body	Throttle bore mm (in)	50 (1.97)
	Throttle position sensor	Variable resistor type
	Idle air control motor	Stepper motor (Stepper motor type by-pass air control system with the air volume limiter)
	Closed throttle position switch	Rotary contact type, within throttle position sensor
	Idle air control valve position sensor	Hall element type
Engine control module (ECM)	Identification model No.	E2T73172<Federal> E2T73171 <California>
Sensors	Volume air flow sensor	Karman vortex type
	Barometric pressure sensor	Semiconductor type
	Intake air temperature sensor	Thermistor type
	Engine coolant temperature sensor	Thermistor type
	Heated oxygen sensor	Zirconia type
	Vehicle speed sensor	Electromagnetic resistance element type
	Park/Neutral position switch	Contact switch type
	Camshaft position sensor	Hall element type
	Crankshaft position sensor	Hall element type
	Power steering pressure switch	Contact switch type
Actuators	Multiport fuel injection (MFI) relay	Contact switch type
	Fuel pump relay	Contact switch type
	Injector type and number	Electromagnetic type, 4
	Injector identification mark	CDH210
	EGR solenoid	Duty cycle type solenoid valve
	Evaporative emission purge solenoid	Duty cycle type solenoid valve
Fuel pressure regulator	Regulator pressure kPa (psi)	335 (47 6)

MULTIPORT FUEL INJECTION (MFI) SYSTEM DIAGRAM

<Vehicles for Federal>

SENSE

- ★1 Heated oxygen sensor (front)
- ★2 Volume air flow sensor
- ★3 Intake air temperature sensor
- ★4 Throttle position sensor
- ★5 Closed throttle position switch
- ★6 Camshaft position sensor
- ★7 Crankshaft position sensor
- ★8 Barometric pressure sensor
- ★9 Engine coolant temperature sensor
- ★10 Heated oxygen sensor (rear)
- ★11 Manifold differential pressure sensor
- ★12 Fuel tank differential pressure sensor

- Power supply
- Vehicle speed sensor
- A/C switch
- Park/Neutral position switch
- Power steering pressure switch
- Ignition switch-ST

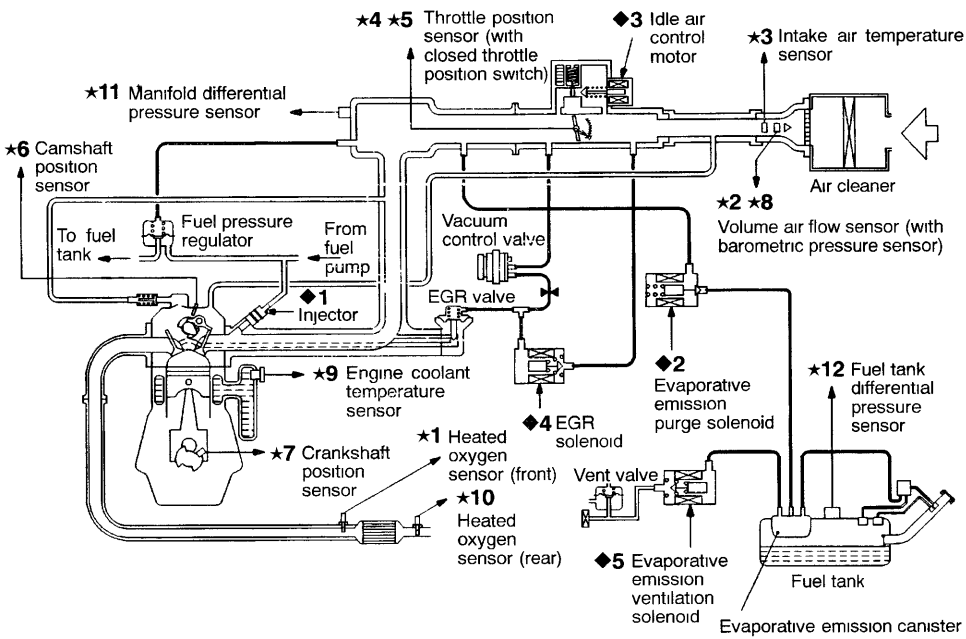
DECIDE

Engine control module

ACT

- ◆1 Injector
- ◆2 Evaporative emission purge solenoid
- ◆3 Idle air control motor
- ◆4 EGR solenoid
- ◆5 Evaporative emission ventilation solenoid

- Fuel pump relay
- Multiport fuel injection (MFI) relay
- A/C compressor clutch relay
- Service Engine Soon/Malfunction Indicator Lamp
- Diagnostic output
- Ignition coil, Ignition power transistor



6FU2B35

<Vehicles for California>

SENSE

- ★1 Heated oxygen sensor (front)
- ★2 Volume air flow sensor
- ★3 Intake air temperature sensor
- ★4 Throttle position sensor
- ★5 Closed throttle position switch
- ★6 Camshaft position sensor
- ★7 Crankshaft position sensor
- ★8 Barometric pressure sensor
- ★9 Engine coolant temperature sensor
- ★10 Heated oxygen sensor (rear)
- ★11 Manifold differential pressure sensor
- ★12 Fuel tank differential pressure sensor

- Power supply
- Vehicle speed sensor
- A/C switch
- Park/Neutral position switch
- Power steering pressure switch
- Ignition switch-ST

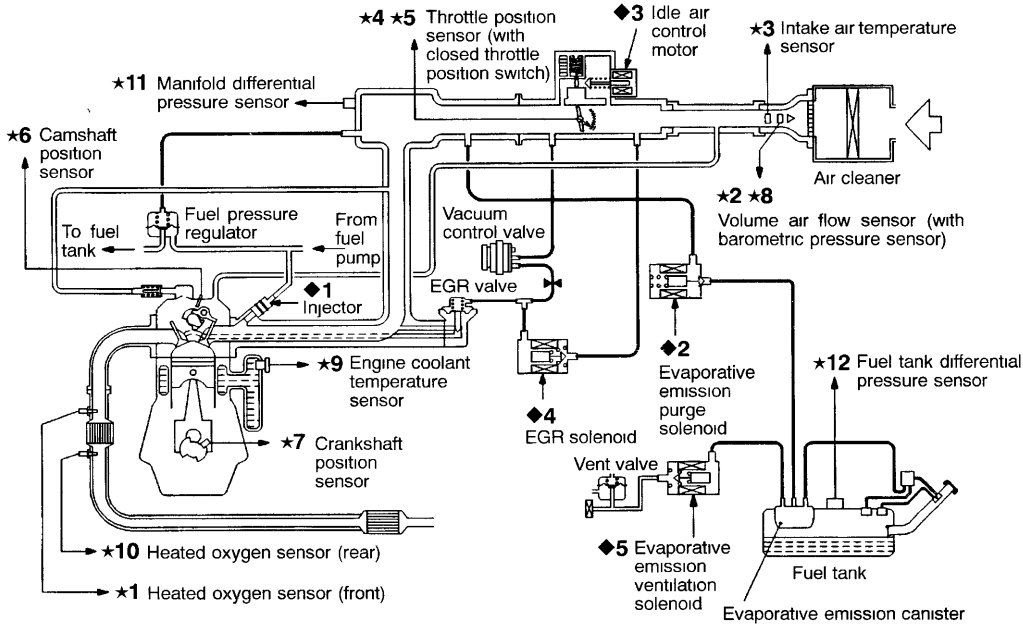
DECIDE

Engine control module

ACT

- ◆1 Injector
- ◆2 Evaporative emission purge solenoid
- ◆3 Idle air control motor
- ◆4 EGR solenoid
- ◆5 Evaporative emission ventilation solenoid

- Fuel pump relay
- Multiport fuel injection (MFI) relay
- A/C compressor clutch relay
- Service Engine Soon/Malfunction Indicator Lamp
- Diagnostic output
- Ignition coil, Ignition power transistor



6FU2836

SERVICE SPECIFICATIONS

13100030483

Items			Standard value
Basic ignition timing			5° BTDC ± 3° at curb idle
Curb idle speed r/min			700 ± 100
Idle speed when A/C is ON r/min			850 in Neutral
Basic idle speed r/min			700 ± 50
Throttle position sensor adjusting voltage mV			400–1000
Throttle position sensor resistance kΩ			3 5–6.5
Intake air temperature sensor resistance kΩ		20°C (86°F)	2.3–3.0
		80°C (176°F)	0.30–0 42
Engine coolant temperature sensor resistance kΩ		20°C (68°F)	2.1–2.7
		80°C (176°F)	0.26–0.36
Heated oxygen sensor output voltage V			0.6–1.0
Fuel pressure kPa (psi)	Vacuum hose disconnected		330–350 (47–50) at curb idle
	Vacuum hose connected		Approx. 270 (38) at curb idle
Injector coil resistance Ω			13–16 [at 20°C (68°F)]
Idle air control motor coil resistance Ω			28–33 [at 20°C (68°F)]

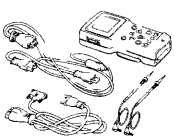
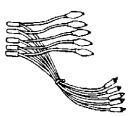
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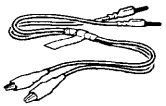
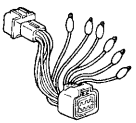
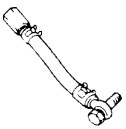
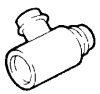
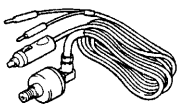
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Item	Specified sealant
Engine coolant temperature sensor threaded portion	3M Nut Locking Part No 4171 or equivalent

SPECIAL TOOLS

13100060543

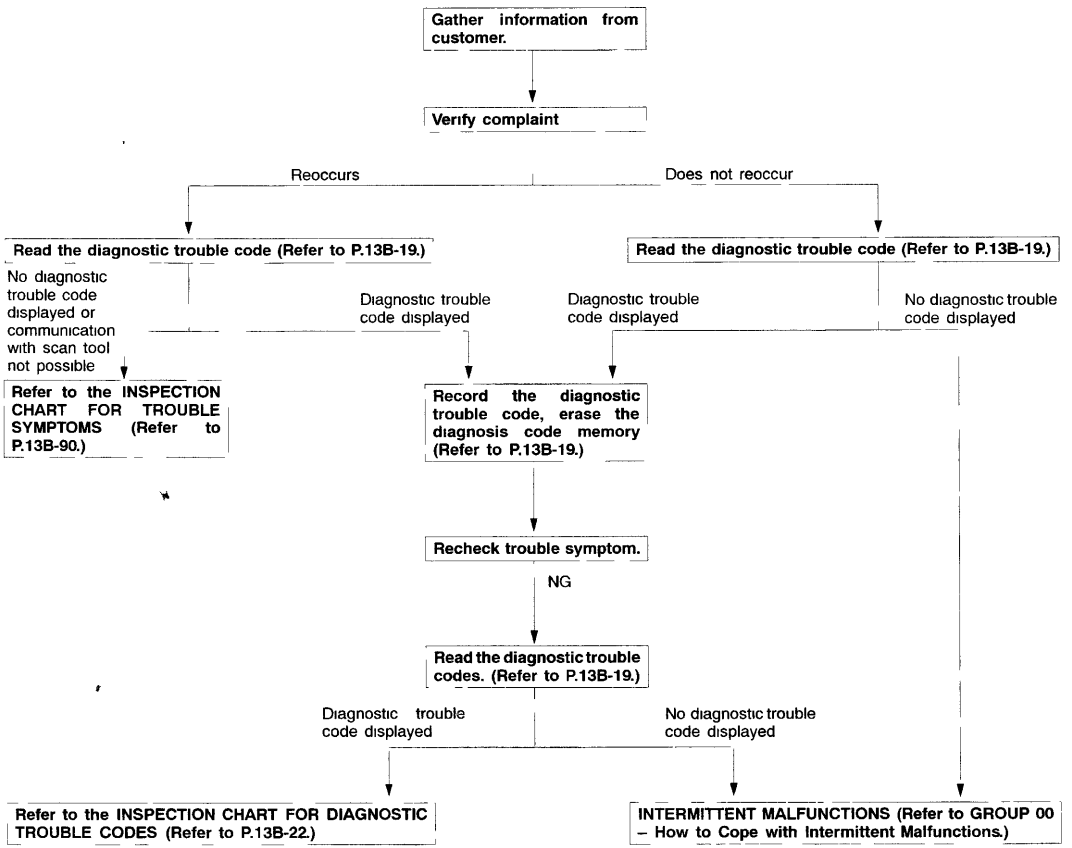
Tool	Tool number and name	Supersession	Application
	MB991502 Scan tool <MUT-II>	MB991496-OD	• Reading diagnostic trouble code • MFI system inspection
	MB991348 Test harness set	MB991348-01	• Adjustment of closed throttle position switch, throttle position sensor • Inspection using an analyzer

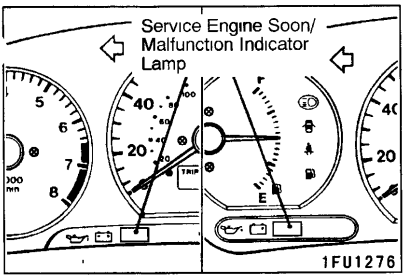
Tool	Tool number and name	Supersession	Application
	MB991709 Test harness set	Tool not available	Inspection using an analyzer
	MB991529 Diagnostic trouble code check harness	Tool not necessary if scan tool <MUT-II> is available	Check for diagnostic trouble codes
	MD998463 Test harness (6 pin, square)	MD998463-01	• Inspection of idle air control motor • Inspection using an analyzer
	MD998464 Test harness (4 pin, square)	MD998464-01	• Inspection of heated oxygen sensor • Inspection using an analyzer
	MD998478 Test harness (3 pin, triangle)	MD998478-01	Inspection using an analyzer
	MD998709 Adaptor hose	MIT210196	Measurement of fuel pressure
	MD998742 Hose adaptor	MD998742-01	Measurement of fuel pressure
 B991637	MB991637 Fuel pressure gauge set	Tool not available	Measurement of fuel pressure

TROUBLESHOOTING

13100850430

DIAGNOSTIC TROUBLESHOOTING FLOW





DIAGNOSTIC TEST MODE

13100860655

SERVICE ENGINE SOON/MALFUNCTION INDICATOR LAMP

Among the on-board diagnostic items, a Service Engine Soon/ Malfunction Indicator Lamp illuminates to notify the driver of an emission control malfunction.
However, when an irregular signal returns to normal and the engine control module judges that it has returned to normal, the Service Engine Soon/Malfunction Indicator Lamp is switched off.
Moreover, when the ignition switch is turned off, the lamp is switched off. Even if the ignition switch is turned on again, the lamp does not illuminate until the malfunction is detected.
Immediately after the ignition switch is turned on, the Service Engine Soon/Malfunction Indicator Lamp is lit for 5 seconds to indicate that the Service Engine Soon/Malfunction Indicator Lamp operates normally.

Items Indicated by the Service Engine Soon/Malfunction Idicator Lamp

DCT No.	Items
–	Engine control module (ECM) malfunction
P0100	Volume air flow circuit malfunction
P0105	Barometric pressure circuit malfunction
P0110	Intake air temperature circuit malfunction
P0115	Engine coolant temperature circuit malfunction
P0120	Throttle position circuit malfunction
P0125★	Excessive time to enter closed loop fuel control
P0130	Heated oxygen sensor circuit malfunction (sensor 1)
P0135	Heated oxygen sensor heater circuit malfunction (sensor 1)
P0136	Heated oxygen sensor circuit malfunction (sensor 2)
P0141	Heated oxygen sensor heater circuit malfunction (sensor 2)
P0170	Fuel trim malfunction
P0201	Injector circuit malfunction cylinder-1
P0202	Injector circuit malfunction cylinder-2
P0203	Injector circuit malfunction cylinder-3
P0204	Injector circuit malfunction cylinder-4
P0300★	Random misfire detected
P0301★	Cylinder 1 misfire detected
P0302★	Cylinder 2 misfire detected
P0303★	Cylinder 3 misfire detected
P0304★	Cylinder 4 misfire detected
P0335	Crankshaft position sensor circuit malfunction
P0340	Camshaft position sensor circuit malfunction
P0400	Exhaust gas recirculation flow malfunction
P0403	Exhaust gas recirculation solenoid malfunction

DCT No.	Items
P0420	Catalyst system efficiency below threshold <Federal>
P0421	Warm up catalyst efficiency below threshold <California>
P0442	Evaporative emission control system leak detected
P0443	Evaporative emission control system purge control valve circuit malfunction
P0446	Evaporative emission control system vent control malfunction
P0450	Evaporative emission control system pressure sensor malfunction
P0455	Evaporative emission control system leak detected (Gross leak)
P0505	Idle control system malfunction
P0510	Closed throttle position switch malfunction
P0551	Power steering pressure sensor circuit range/performance
P0705	Transmission range sensor circuit malfunction (PRND2L input)
P0710	Transmission fluid temperature sensor circuit malfunction
P0715	Input/turbine speed sensor circuit malfunction
P0720	Output speed sensor circuit malfunction
P0725	Engine speed input circuit malfunction
P0740	Torque converter clutch system malfunction
P0750	Shift solenoid A malfunction
P0755	Shift solenoid B malfunction
P0760	Shift solenoid C malfunction
P0765	Shift solenoid D malfunction
P1400	Manifold differential pressure sensor circuit malfunction
P1600	Serial communication link malfunction
P1751	A/T control relay malfunction
P1795	Throttle position input circuit malfunction

NOTE
1. After the Engine Control Module (ECM) detects a malfunction, the Service Engine Soon/malfunction indicator lamp illuminates when the engine is next turned on and the same malfunction is re-detected. However, for items marked with a "*", the Service Engine Soon/Malfunction Indicator Lamp illuminates on the first detection of the malfunction.
2. After the Service Engine Soon/Malfunction Indicator Lamp illuminates, it will be switched off under the following conditions.

- When the ECM monitored the powertrain malfunction three times* and detected no malfunction.
  *: In this case, "one time" indicates from engine start to stop.
- For misfiring or a fuel trim malfunction, when driving conditions (engine speed, engine coolant temperature, etc.) are similar to those when the malfunction was first recorded.

Caution
If the Service Engine Soon/Malfunction Indicator Lamp illuminates because of a malfunction of the ECM, transmission between the scan tool and the ECM cannot occur. In this case, the diagnostic trouble code cannot be read.

ON-BOARD DIAGNOSTICS

The engine control module monitors the input/output signals (some signals all the time and others under specified conditions) of the engine control module.
When a malfunction continues for a specified time or longer after the irregular signal is initially monitored, the engine control module judges that a malfunction has occurred.
After the engine control module first detects a malfunction, a diagnostic trouble code is recorded when the engine is restarted and the same malfunction is re-detected. However, for items marked with a "*", a diagnostic trouble code is recorded on the first detection of the malfunction.
There are 49 diagnostic items. The diagnostic results can be read out with a scan tool.
Since memorization of the diagnostic trouble codes is backed up directly by the battery, the diagnostic results are memorized even if the ignition key is turned off. The diagnostic trouble codes will, however, be erased when the battery terminal or the engine control module connector is disconnected.
In addition, the diagnostic trouble code can also be erased by turning the ignition switch to ON and sending the diagnostic trouble code erase signal from the scan tool to the engine control module.

Caution
If the sensor connector is disconnected with the ignition switch turned on, the diagnostic trouble code is memorized. In this case, send the diagnostic trouble code erase signal to the engine control module in order to erase the diagnostic memory.

The 49 diagnostic items are all indicated sequentially from the smallest code number.
The engine control module records the engine operating condition when the diagnostic trouble code is set. This data is called "Freeze-frame" data. This data can be read by using the scan tool, and can then be used in simulation tests for troubleshooting. Data items are as follows.

Data	Unit
Engine coolant temperature	°C or °F
Engine speed	r/min
Vehicle speed	km/h or mph
Long-term fuel compensation (Long-term fuel trim)	%
Short-term fuel compensation (Short-term fuel trim)	%
Fuel control condition	• Open loop • Closed loop • Open loop-drive condition • Open loop-DTC set • Closed loop-O_2 (rear) failed
Calculation load value	%
Diagnostic trouble code during data recording	–

OBD-II DRIVE CYCLE

All kinds of diagnostic trouble codes can be monitored by carrying out a short drive in accordance with the following 6 drive cycle patterns. In other words, doing such a drive allows to regenerate any kind of trouble which involves illuminating the Service Engine Soon/Malfunction Indicator Lamp and to check the repair procedure has eliminated the trouble (the Service Engine Soon/Malfunction Indicator Lamp is no longer illuminated).

Caution
Two mechanics should always get on the vehicle when carrying out a drive test.

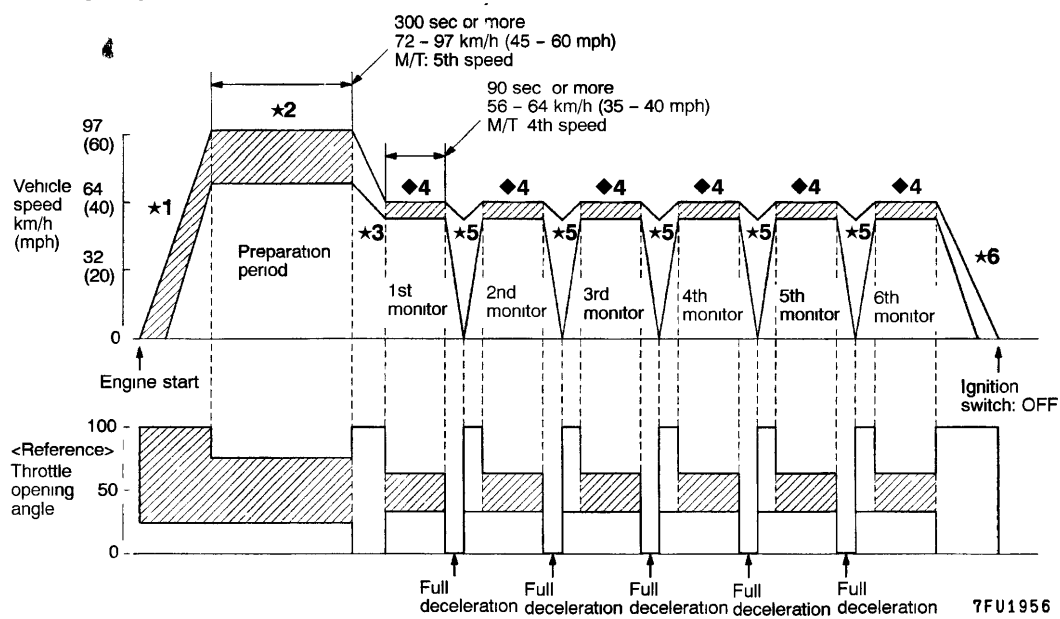
Catalytic converter monitor (P0420, P0421)

Test requirements/procedure

1. All of the following requirements should be met when carrying out a drive test.
   (1) Atmospheric temperature: -10°C (14°F) or more
   (2) Condition of A/T:
   - Selector lever position: D range

   (3) A/C switch: OFF
2. One trip monitor will be completed by driving according to the steps below (from start to switch off). It will take 20 minutes.
   ★1: Start the engine, and accelerate gradually to 72 km/h (45 mph) or more.
   ★2: Preparation period; continue driving between 72 and 97 km/h (45 and 60 mph) for 300 seconds. Brake may be applied for this period if it continues for only a few seconds.
   ★3: Decelerate to 56 - 64 km/h (35 - 40 mph).
   ◆4: Drive between 56 and 64 km/h (35 and 40 mph) at a constant throttle angle (by not moving the throttle pedal as much as possible) for 90 seconds or more during monitor.
   ★5: Decelerate with the throttle valve fully closed (Brake may be applied for this period). After the vehicle is being decelerated for ten seconds, accelerate gradually to 56 - 64 km/h (35 - 40 mph).
   ★6: Decelerate and stop the vehicle. Then turn off the ignition switch.

Drive cycle pattern



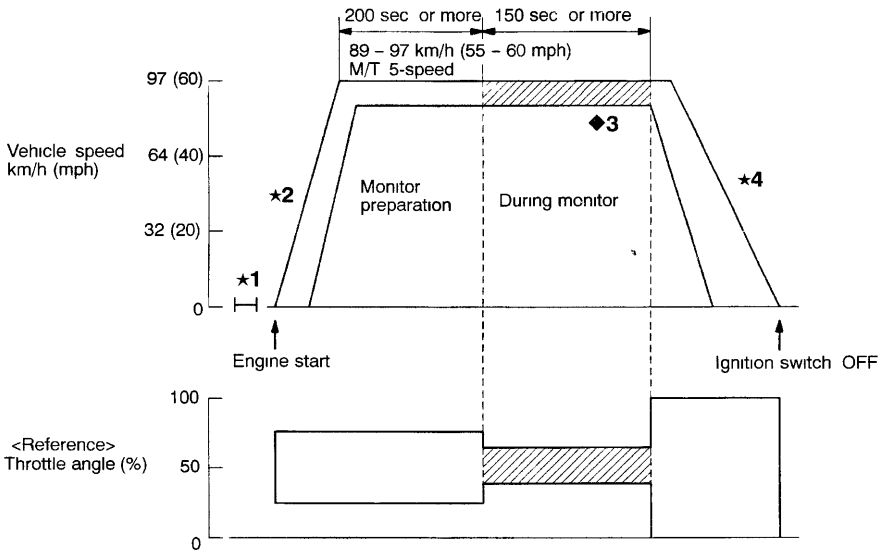
Caution
Vehicle speed and throttle opening angle should be within the shaded rage.

Evaporative emission control system leak monitor (P0422, P0450, P0455)

Test requirements/procedure

1. All of the following requirements should be met when carrying out a drive test.
   (1) Engine coolant temperature: 45°C (113°F) or less (before starting drive test, engine stopped)
   (2) Atmospheric temperature: 5°C (41°F) or more, 45°C (113°F) or less
   (3) Condition of A/T:
   - Selector lever position: D range
   - Overdrive switch: ON
2. One trip monitor will be completed by driving according to the steps below (from start to switch off). (It takes approx. 8 minutes.)
   ★1: Check that both engine coolant temperature and air intake temperature satisfy requirement 1 (engine stopped).
   ★2: Monitor preparation period; Start the engine, and accelerate to 89 – 97 km/h (55 – 60 mph). For this period, acceleration, deceleration, or braking may be carried out.
   Continue driving between 89 and 97 km/h (55 and 60 mph) for 200 seconds or more. For this period, braking or throttle operation may be carried out if vehicle speed is within the specified value.
   ◆3: Drive between 89 and 97 km/h (55 and 60 mph) at a constant throttle angle (by not moving the throttle pedal as much as possible) for 150 seconds or more during monitor. Moreover, do not turn the steering wheel suddenly.
   ★4: Decelerate and stop the vehicle. After stop, turn off the ignition switch.

Drive cycle pattern



7FU1957

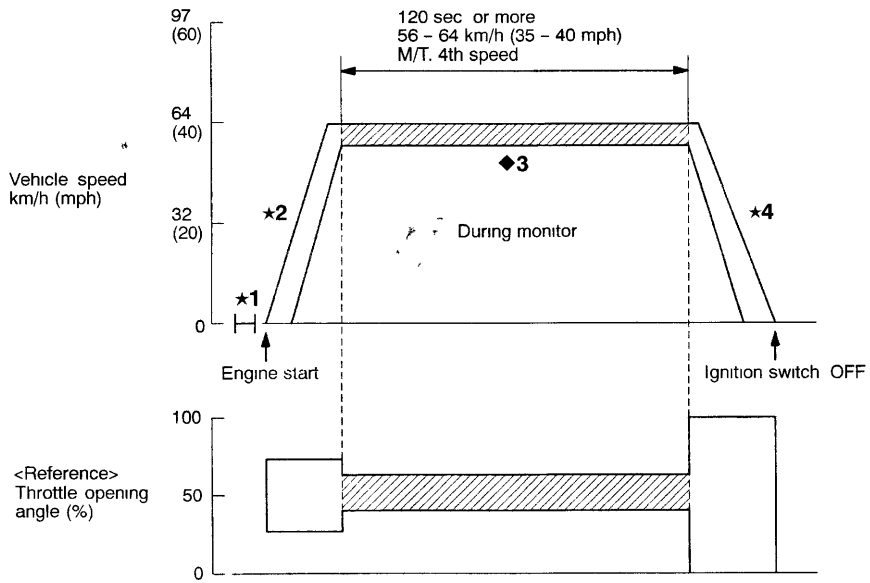
Caution
Drive within the shaded area in the graph above.

Heated oxygen sensor monitor (P0130, P0136)

Test requirements/procedure

1. Test requirements/procedure
   (1) Engine coolant temperature: 80°C (176°F) or more (Engine fully warmed up)
   (2) Atmospheric temperature: −10°C (14°F) or more
   (3) Condition of A/T:
   - Selector lever position: D range
2. One trip monitor will be completed by driving according to the steps below (from start to switch off). It will take 5 minutes.
   ★1: After warming up the engine, turn off the ignition switch.
   ★2: Start the engine, and accelerate to 56 – 64 km/h (35 – 40 mph).
   ◆3: Drive between 56 and 64 km/h (35 and 40 mph) at a constant throttle angle (by not moving the throttle pedal as much as possible) for 120 seconds or more during monitor. Moreover, do not turn the steering wheel suddenly.
   ★4: Decelerate and stop the vehicle. Then turn off the ignition switch.

Drive cycle pattern



7FU1958

Caution
Vehicle speed and throttle opening angle should be within the shaded rage.

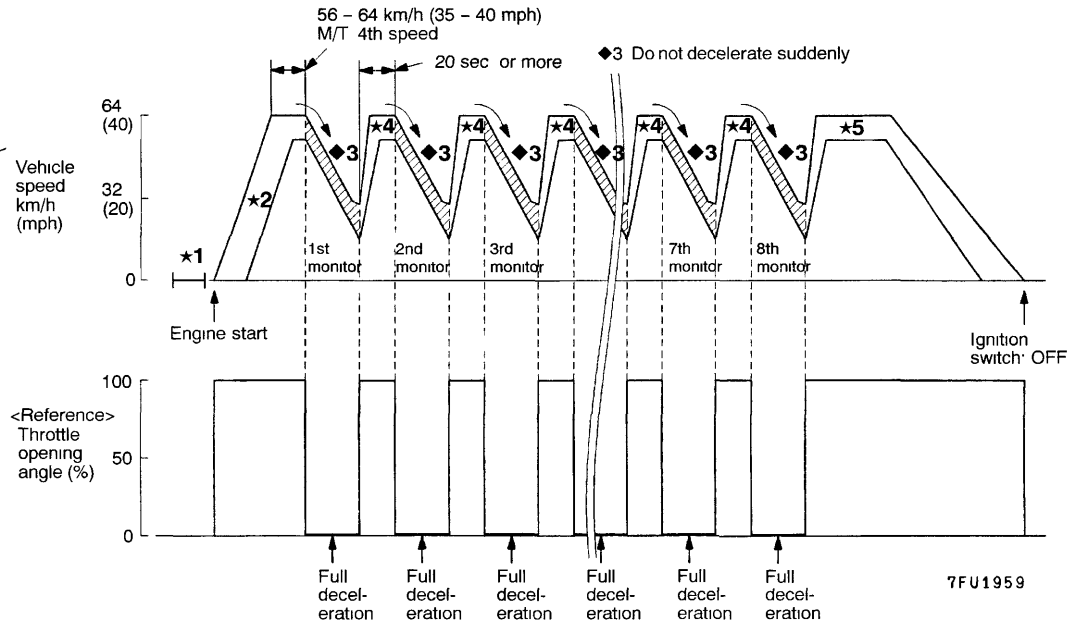
Exhaust gas recirculation (EGR) system monitor (P0400)

Test requirements/procedure

1. All of the following requirements should be met when carrying out a drive test.
   (1) Engine coolant temperature: 80°C (176°F) or more (Engine fully warmed up)
   (2) Atmospheric temperature: 5°C (41°F) or more
   (3) Condition of A/T:
   - Selector lever position: D range

   (4) A/C switch: OFF
2. One trip monitor will be completed by driving according to the steps below (from start to switch off). It will take approx. 10 minutes.
   ★1: After warming up, turn off the ignition switch.
   ★2: Start the engine, and accelerate to 56 – 64 km/h (35 – 40 mph).
   ◆3: Close the throttle fully from 2000 – 3000 r/min with the clutch engaged <M/T>, and then decelerate to 900 r/min without applying brakes. Moreover, do not turn the steering wheel or switch on or off the lights.
   ★4: Accelerate to 56 – 64 km/h (35 – 40 mph), and continue driving for 20 seconds. (After 1st monitor (deceleration), wait for 20 seconds or more until the next monitor (deceleration) starts). Then repeat ◆3 and ★4 steps eight times.
   ★5: Decelerate and stop. Then turn off the ignition switch.

Drive cycle pattern



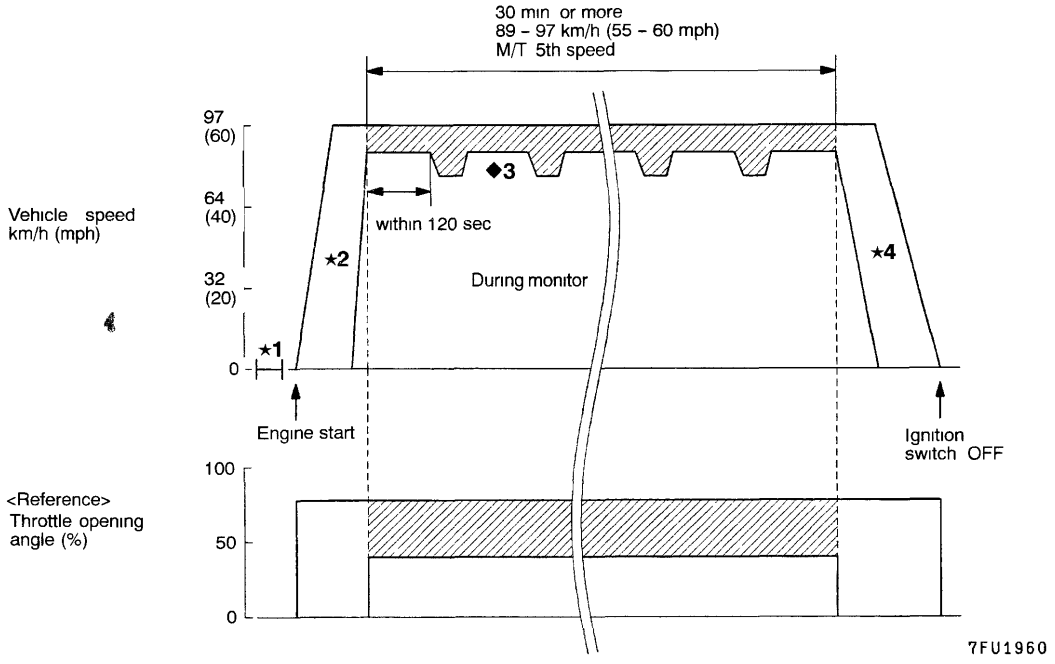
Caution
Vehicle speed should be within the shaded rage.

Fuel trim monitor (P0170)

Test requirements/procedure

1. All of the following requirements should be met when carrying out a drive test.
   (1) Engine coolant temperature: 80°C – 97°C (176 – 207°F) (Engine fully warmed up)
   (2) Atmospheric temperature: –10°C (14°F) or more, 60°C (140°F) or less
   (3) Condition of A/T:
   - Selector lever position: D range
2. One trip monitor will be completed by driving according to the steps below (from start to switch off). It will take 35 minutes.
   ★1: After warming up the engine, turn off the ignition switch.
   ★2: Start the engine, and accelerate to 89 – 97 km/h (55 – 60 mph).
   ◆3: Drive between 89 and 97 km/h (55 and 60 mph) for 30 minutes or more during monitor. Moreover, do not drive the vehicle at the constant speed range for 120 seconds or more. (Accelerate or decelerate lightly within the 120 seconds. Brake may be applied, but avoid decelerating or accelerating suddenly).
   ★4: Decelerate and stop the vehicle. Then turn off the ignition switch.

Drive cycle pattern



Caution
Vehicle speed and throttle opening angle should be within the shaded rage.

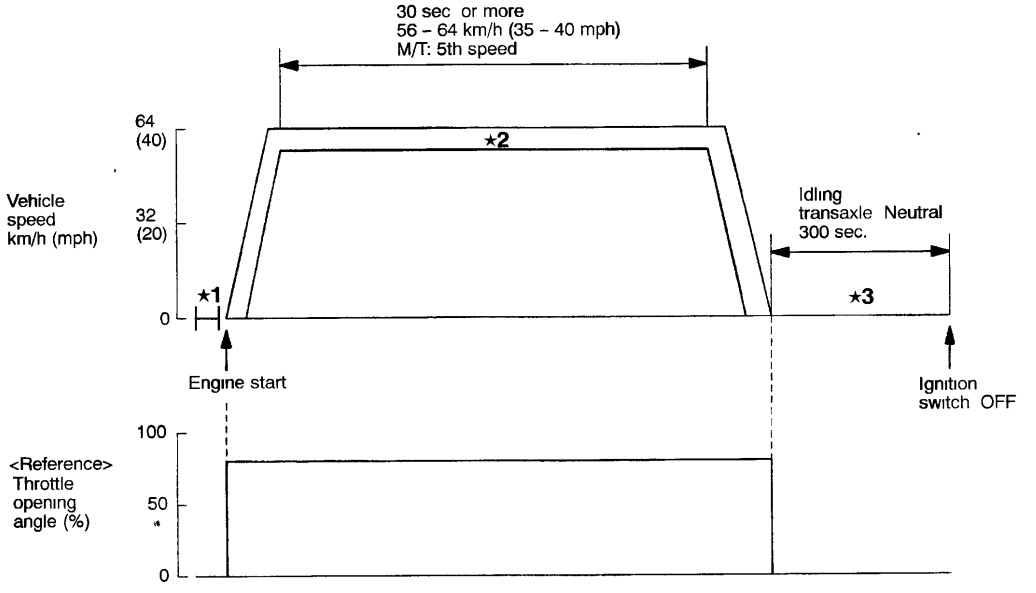
Other monitors

- Misfire (P0300, P0301, P0302, P0303, P0304)
- Evaporative emission control system (P0440)
- Idle air control system (P0505)
- Manifold differential pressure sensor (P1400)
- Excessive time to enter closed loop fuel control (P0125)
- Throttle position sensor (P0120)
- Barometric pressure sensor (P0105)
- Intake air temperature sensor (P0110)
- Serial communication link <A/T> (P1600)
- Crankshaft position sensor (P0335)
- Camshaft position sensor (P0340)
- Volume air flow sensor (P0100)
- Engine coolant temperature sensor (P0115)
- Closed throttle position switch (P0510)
- Generator FR terminal circuit (P1500)
- O_2 sensor circuit (P0130, P0136)
- O_2 sensor heater circuit (P0135, P0141)
- EGR solenoid (P0430)
- Evaporative emission purge solenoid (P0443)
- Injector circuit (P0201, P0202, P0203, P0204)
- Evaporative emission ventilation solenoid (P0446)

Test requirements/procedure

1. All of the following requirements should be met when carrying out a drive test.
   (1) Engine coolant temperature: 80°C (176°F) or more (Engine fully warmed up)
   (2) Atmospheric temperature: 5°C (41°F) or more
   (3) Condition of A/T:
   - Selector lever position: D range
2. One trip monitor will be completed by driving according to the steps below (from start to switch off). It will take approx. 10 minutes.
   ★1: After warming up, turn off the ignition switch.
   ★2: Start the engine, accelerate to 56 – 64 km/h (35 – 40 mph), continue driving for 300 seconds or more at that speed range and stop. Moreover, brake or throttle may be applied for this period.
   ★3: After stopping the vehicle, continue idling for 300 seconds or more, and then turn off the ignition switch. Moreover, the vehicle should be set to the following conditions for idling.
   - A/C switch: OFF
   - Lights, electric cooling fan and all accessories: OFF
   - Transaxle: Neutral (A/T for P range)
   - Steering wheel: Straight-forward position

Drive cycle pattern



NOTE
Drive according to the graph above.

READINESS TEST STATUS

The ECM monitors the following main diagnosis items and records whether the evaluation passing or failing in the past. These records can be read with a scan tool. (When using MUT-II, "Complete" will appear to indicate that the evaluation has been completed.)
These records will all be reset if the battery terminal is disconnected or the DTC are erased, etc.
To complete the readiness test status which has been reset, the "OBD-II Drive Cycle" related to a diagnosis item should be carried out.

NOTE
If the vehicle is normal, the readiness test status will be complete by carrying out the "OBD-II Drive Cycle" once. If the ECM detects a malfunction of the vehicle, the readiness test status will be complete by carrying out the "OBD-II Drive Cycle" twice. In addition, after all readiness test status are complete, a DTC should be interrogated. If a DTC is stored, perform repair by referring to the relevant DTC procedures. Then complete the readiness test status by repeating the "OBD-II Drive Cycle". If a DTC is not stored, no further action will be neede.

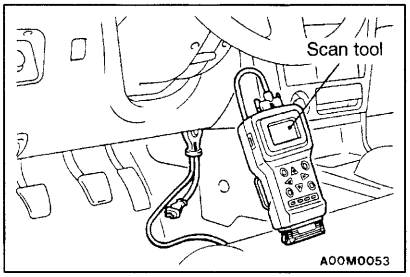
- Catalyst: P0420, P0421
- Evaporative system: P0442, P0455
- Heated oxygen sensor: P0130, P0136
- Heated oxygen sensor heater: P0135, P0141
- EGR system: P0400

HOW TO READ AND ERASE DIAGNOSTIC TROUBLE CODES

Caution

1. **If battery voltage is low, diagnostic trouble codes may not be output. Be sure to check the battery and charging system before continuing.**
2. **If the battery is disconnected or if the engine control module connector is disconnected, the diagnostic trouble code memory will be erased. Do not disconnect the battery or engine control module until after the diagnostic trouble codes are recorded.**
3. **Turn the ignition switch off before connecting or disconnecting the scan tool.**

NOTE
If a DTC is erased, its "freeze frame" data will be also erased and the readiness test status will be reset. If necessary, take a note of the "freeze frame" data before erasing the DTC.



1. Connect the scan tool to the data link connector, and read the diagnostic trouble codes.
2. Repair the malfunction while referring to the INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES.
3. Turn the ignition switch to OFF and then back to ON again.
4. Erase the diagnostic trouble codes using the scan tool.
5. Confirm that the diagnostic trouble code reading show is normal.

PROVISIONAL DTCs [MUT-II OBD-II Test Mode – Results (Mode 5)]

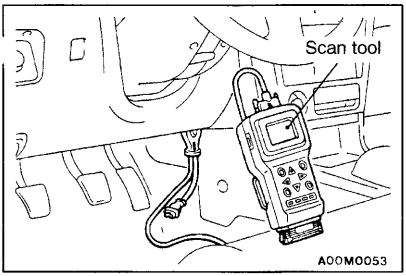
MUT-II will display the Provisional DTCs reported by ECM if the ECM detects some malfunction for "Misfire", "Fuel System" and "Comprehensive" monitoring during a SINGLE Driving Cycle.
The intended use of this data is to assist the technician after a vehicle repair, and after clearing diagnostic information, by reporting test result after a SINGLE Driving Cycle.
Note that the test results reported by this mode do not necessarily indicate a faulty component/system. If test results indicate a failure after ADDITIONAL (consecutive) driving, then the MIL will be illuminated and a DTC will set.

DIAGNOSTIC BY DIAGNOSTIC TEST MODE II (INCREASED SENSITIVITY)

When mode II is selected with MUT-II, the Service Engine Soon/Malfunction Indicator Lamp will light when the ECM first detects the trouble. (Note that this is only for engine related trouble.) At the same time, the relevant diagnostic trouble codes will be registered.
In respect to the comprehensive component electrical faults (opens/shorts), the time for the DTC to be registered after the fault occurrence is shortened (4 sec. → 1 sec.)
With this, the confirmation of the trouble symptom and the confirmation after completing repairs can be reduced.
To return to the normal mode I after mode II has been selected once, the ignition switch must be turned OFF once or mode I must be reselected with the MUT-II. The DTC, readiness test status and freeze frame data, etc., will be erased when mode I is returned to, so record these if necessary.

(1) Using the scan tool, changeover the diagnostic test mode of the engine control module to DIAGNOSTIC TEST MODE II. (INCREASED SENSITIVITY)
(2) Road test the vehicle.
(3) Read the diagnostic trouble code in the same manner as "READ OUT OF DIAGNOSTIC TROUBLE CODE" and repair the malfunctioning part.
(4) Turn OFF the ignition switch.

NOTE
Turning OFF the ignition switch will cause the ECM to changeover from the diagnostic test mode II to the diagnostic test mode I.



INSPECTION USING SCAN TOOL DATA LIST AND ACTUATOR TESTING

1. Carry out inspection by means of the data list and the actuator test function.
   If there is an abnormality, check and repair the chassis harnesses and components.
2. After repairing, re-check using the scan tool and check to be sure that the abnormal input and output have returned to normal as a result of the repairs.
3. Erase the diagnostic trouble code(s).
4. Remove the scan tool.
5. Start the engine again and road test to confirm that the problem is eliminated.

   NOTE
   Refer to P 13B-125 for Data list.
   Refer to P.13B-130 for Actuator tests.

FAIL-SAFE/BACKUP FUNCTION TABLE

13100910213

When the main sensor malfunctions are detected by the diagnostic test mode, the vehicle is controlled by means of the following defaults.

Malfunctioning item	Control contents during malfunction
Volume air flow sensor	1. Uses the throttle position sensor signal and engine speed signal (crankshaft position sensor signal) for basic injector drive time and basic ignition timing from the pre-set mapping 2. Fixes the IAC motor in the appointed position so idle air control is not performed.
Intake air temperature sensor	Controls as if the intake air temperature is 25°C (77°F).
Throttle position sensor (TPS)	No increase in fuel injection amount during acceleration due to the unreliable throttle position sensor signal.
Engine coolant temperature sensor	Controls as if the engine coolant temperature is 80°C (176°F).
Camshaft position sensor	Injects fuel into the cylinders in the order 1-3-4-2 with irregular timing. (After the ignition switch is turned to ON, the No 1 cylinder top dead center is not detected at all.)
Barometric pressure sensor	Controls as if the barometric pressure is 101 kPa (30 in.Hg) (sea level).
Heated oxygen sensor <front>	Air/fuel ratio closed loop control is not performed
Heated oxygen sensor <rear>	Performs the closed loop control of the air/fuel ratio by using only the signal of the heated oxygen sensor (front) installed on the front side of the catalytic converter.
Generator FR terminal	No generator output suppression control is performed for the electrical load (to be operated as an ordinary generator).
Misfire detection	The ECM stops supplying fuel to the cylinder with the highest misfiring rate if a misfiring that could damage the catalytic converter is detected.

INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES (FAULT TREE) 13100870757

DTC No.	Diagnostic items	Check items (Remedy)	Memory	Reference page
P0100	Volume Air Flow Circuit Malfunction	• Harness and connector (If harness and connector are normal, replace volume air flow sensor assembly.)	Retained	13B-26
P0105	Barometric Pressure Circuit Malfunction	• Harness and connector (If harness and connector are normal, replace volume air flow sensor assembly.)	Retained	13B-27
P0110	Intake Air Temperature Circuit Malfunction	• Harness and connector • Intake air temperature sensor	Retained	13B-28
P0115	Engine Coolant Temperature Circuit Malfunction	• Harness and connector • Engine coolant temperature sensor	Retained	13B-29
P0120	Throttle Position Circuit Malfunction	• Harness and connector • Throttle position sensor • Closed throttle position switch	Retained	13B-30
P0125	Excessive Time to Enter Closed Loop Fuel Control*	• O_2 sensor (front) • O_2 sensor harness and connector • Injector	Retained	13B-31
P0130	O_2 Sensor Circuit Malfunction (Sensor 1)	• Harness and connector [If harness and connector are normal, replace O_2 sensor (front)]	Retained	13B-32
P0135	O_2 Sensor Heater Circuit Malfunction (Sensor 1)	• Harness and connector • O_2 sensor (front) heater	Retained	13B-33
P0136	O_2 Sensor Circuit Malfunction (Sensor 2)	• Harness and connector • O_2 sensor (rear)	Retained	13B-34
P0141	O_2 Sensor Heater Circuit Malfunction (Sensor 2)	• Harness and connector • O_2 sensor (rear) heater	Retained	13B-35
P0170	Fuel Trim Malfunction	• Volume air flow sensor output frequency • Injector • Fuel pressure • Intake air leaks • Engine coolant temperature sensor • Intake air temperature sensor • Barometric pressure sensor • O_2 Sensor • Exhaust manifold cracks	Retained	13B-36
P0201	Injector Circuit Malfunction – Cylinder 1	• Harness and connector • Injector	Retained	13B-37
P0202	Injector Circuit Malfunction – Cylinder 2			
P0203	Injector Circuit Malfunction – Cylinder 3			
P0204	Injector Circuit Malfunction – Cylinder 4			

DTC No.	Diagnostic items	Check items (Remedy)	Memory	Reference page
P0300	Random Misfire Detected	• Ignition coil • Ignition power transistor • Spark plug • Ignition circuit • Injector • O_2 Sensor • Compression • Timing belt • Crankshaft position sensor • Air intake • Fuel pressure • Crankshaft position sensor circuit and connector	Retained	13B-38
P0301	Cylinder 1 Misfire Detected	• Ignition coil • Ignition power transistor • Spark plug • Ignition circuit • Injector • O_2 Sensor • Compression • Timing belt • Crankshaft position sensor • Air intake • Fuel pressure • Crankshaft position sensor circuit and connector	Retained	13B-39
P0302	Cylinder 2 Misfire Detected			
P0303	Cylinder 3 Misfire Detected			
P0304	Cylinder 4 Misfire Detected			
P0335	Crankshaft Position Sensor Circuit Malfunction	• Harness and connector (If harness and connector are normal, replace crankshaft position sensor.)	Retained	13B-40
P0340	Camshaft Position Sensor Circuit Malfunction	• Harness and connector (If harness and connector are normal, replace camshaft position sensor.)	Retained	13B-41
P0400	Exhaust Gas Recirculation Flow Malfunction	• Harness and connector • EGR valve • EGR solenoid • EGR valve control vacuum • Manifold differential pressure sensor	Retained	13B-42
P0403	Exhaust Gas Recirculation Solenoid Malfunction	• Harness and connector • EGR solenoid	Retained	13B-43
P0420	Catalyst Efficiency Below Threshold <Federal>	• Exhaust manifold (Replace the catalytic converter if there is no cracks, etc.)	Retained	13B-44
P0421	Warm Up Catalyst Efficiency Below Threshold <California>	• Exhaust manifold (Replace the catalytic converter if there is no cracks, etc.)	Retained	13B-45
P0442	Evaporative Emission Control System Leak Detected	• Harness and connector • Evaporative emission purge solenoid • Evaporative emission ventilation solenoid • Vacuum hoses routing	Retained	13B-46

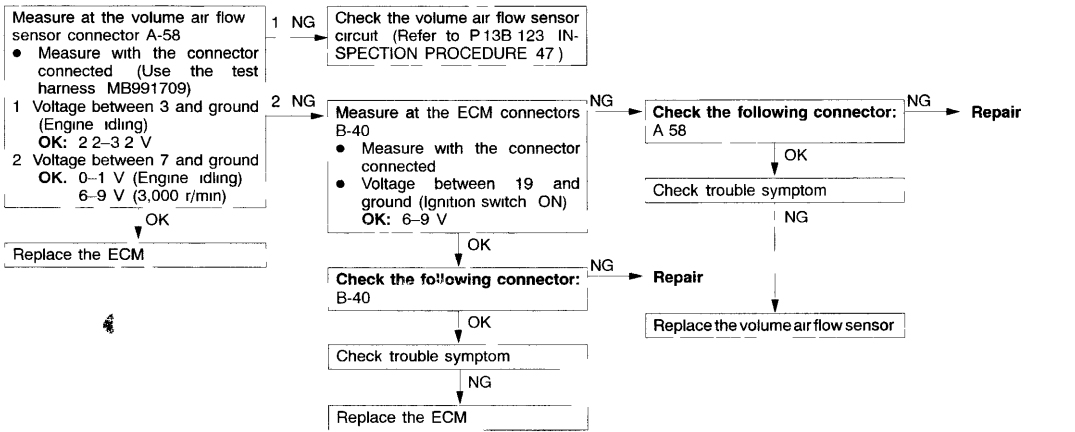
DTC No.	Diagnostic items	Check items (Remedy)	Memory	Reference page
P0443	Evaporative Emission Control System Purge Control Valve Circuit Malfunction	• Harness and connector • Evaporative emission purge solenoid	Retained	13B-56
P0446	Evaporative Emission Control System Vent Control Malfunction	• Harness and connector • Evaporative emission ventilation solenoid	Retained	13B-57
P0450	Evaporative Emission Control System Pressure Sensor Malfunction	• Harness and connector • Fuel tank differential pressure sensor	Retained	13B-58
P0455	Evaporative Emission Control System Leak Detected (Gross Leak)	• Harness and connector • Evaporative emission ventilation solenoid	Retained	13B-70
P0500	Vehicle Speed Sensor Malfunction	• Harness and connector • Vehicle speed sensor	Retained	13B-80
P0505	Idle Control System Malfunction	• Harness connector • Idle air control motor	Retained	13B-81
P0510	Closed Throttle Position Switch Malfunction	• Harness and connector • Closed throttle position switch	Retained	13B-82
P0551	Power Steering Pressure Sensor Circuit Range/Performance	• Harness and connector • Power steering pressure switch	Retained	13B-83
P0705	Transmission Range Sensor Circuit Malfunction (PRND2L Input)	• Harness and connector • Park/Neutral position switch	Retained	13B-83
P0710	Transmission Fluid Temperature Sensor Circuit Malfunction	• Harness and connector • Transaxle fluid temperature sensor	Retained	13B-83
P0715	Input/turbine Speed Sensor Circuit Malfunction	• Harness and connector • Pulse generator	Retained	13B-84
P0720	Output Speed Sensor Circuit Malfunction	• Harness and connector • Pulse generator	Retained	13B-84
P0725	Engine Speed Input Circuit Malfunction	• Harness and connector	Retained	13B-84
P0740	Torque Converter Clutch System Malfunction	• Harness and connector • Torque converter clutch solenoid	Retained	13B-84
P0750	Shift Solenoid A Malfunction	• Harness and connector • Low-reverse solenoid	Retained	13B-84
P0755	Shift Solenoid B Malfunction	• Harness and connector • Underdrive solenoid	Retained	13B-85
P0760	Shift Solenoid C Malfunction	• Harness and connector • Second solenoid	Retained	13B-85
P0765	Shift Solenoid D Malfunction	• Harness and connector • Overdrive solenoid	Retained	13B-85
P1400	Manifold Differential Pressure (MDP) Sensor Circuit Malfunction	• Harness and connector • MDP sensor	Retained	13B-86
P1500	Generator FR Terminal Circuit Malfunction	• Harness and connector	Retained	13B-88
P1600	Serial Communication Link Malfunction	• Harness and connector	Retained	13B-89
P1720	Vehicle Speed Sensor Signal Line Malfunction	• Harness and connector	Retained	13B-89

DTC No.	Diagnostic items	Check items (Remedy)	Memory	Reference page
P1751	A/T Control Relay Malfunction	• Harness and connector • A/T control relay	Retained	13B-89
P1795	Throttle Position Input Circuit Malfunction	• Harness and connector	Retained	13B-89

NOTE
1. Do not replace the engine control module (ECM) until a thorough terminal check reveals there are no short/open circuits.
2. After the ECM detects a malfunction, a diagnostic trouble code is recorded the next time the engine started and the same malfunction is re-detected. However, for items marked with a "★", the diagnostic trouble code is recorded on the first detection of the malfunction.
3. O_2 : Heated oxygen sensor
4. Sensor 1 : indicates sensors which are mounted closest to the engine.
5. Sensor 2 : indicates sensors which are mounted next-closest to the engine.

INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES

Code No. P0100 Volume Air Flow Circuit Malfunction	Probable cause
Background • While the engine is running, the volume air flow sensor outputs a pulse signal which corresponds to the volume of air flow • The engine control module checks whether the frequency of this signal output by the volume air flow sensor while the engine is running at or above the set value Check Area • Engine speed is not lower than 500 r/min Judgment Criteria • Sensor output frequency has continued to be 3 3 Hz or lower for 2 sec Check Area • Throttle position sensor voltage is 2V or lower. • Engine speed is not higher than 2000 r/min Judgment Criteria • Sensor output frequency has continued to be 800 Hz or higher for 2 sec Check Area • Throttle position sensor voltage is 1 5 V or more • Engine speed is 2000 r/min or more Judgment Criteria • Sensor output frequency is 60 Hz or less for 2 seconds	• Volume air flow sensor failed • Open or shorted volume airflow sensor circuit, or loose connector • Engine control module failed



Code No. P0105 Barometric Pressure Circuit Malfunction

Background
- The barometric pressure sensor outputs a voltage which corresponds to the barometric pressure
- The engine control module checks whether this voltage is within a specified range

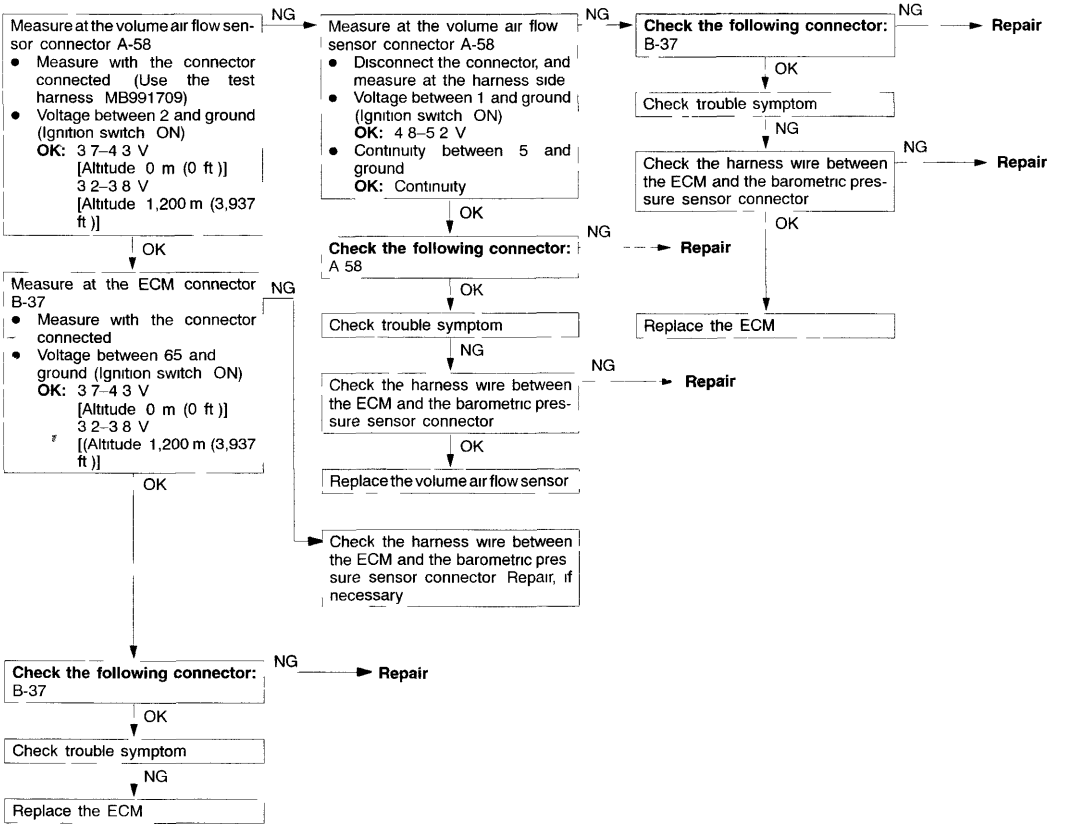
Check Area
- 2 sec or more have passed since the starting sequence was completed
- Battery voltage is not lower than 8V

Judgment Criteria
- Sensor output voltage has continued to be 4 5V or higher [corresponding to a barometric pressure of 114 kPa (17 psi) or higher] for 10 sec,

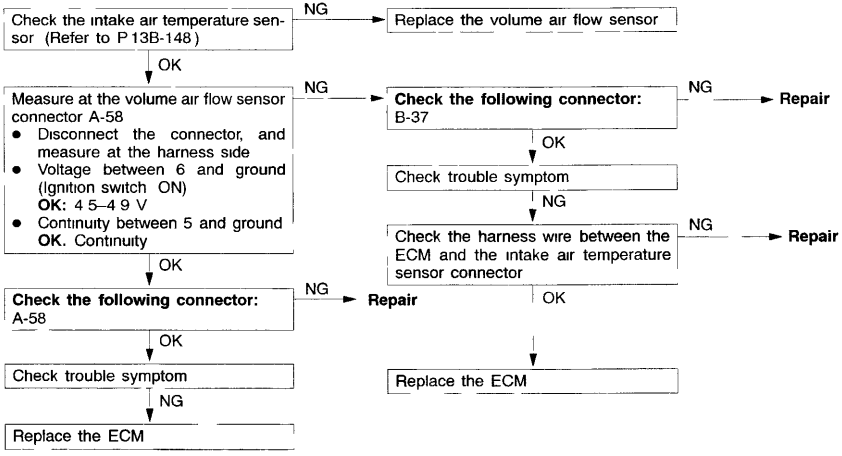
or
- Sensor output voltage has continued to be 0 195V or lower [corresponding to a barometric pressure of 50 kPa (7 4 psi) or lower] for 10 sec

Probable cause

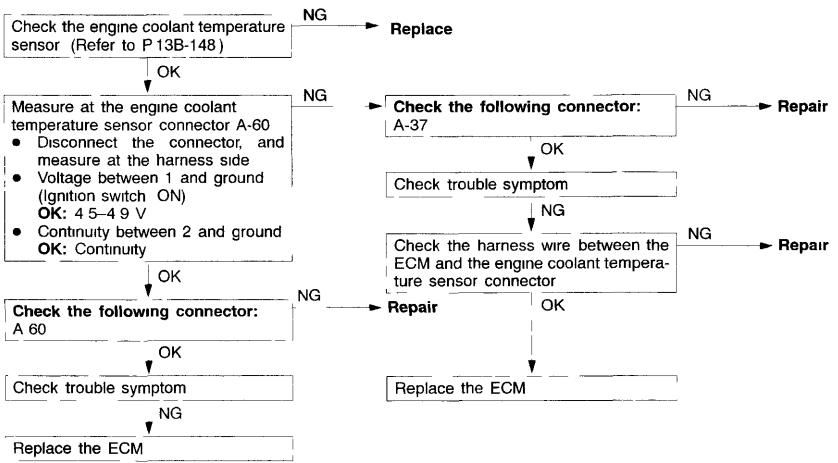
- Barometric pressure sensor failed
- Open or shorted barometric pressure sensor circuit, or loose connector
- Engine control module failed



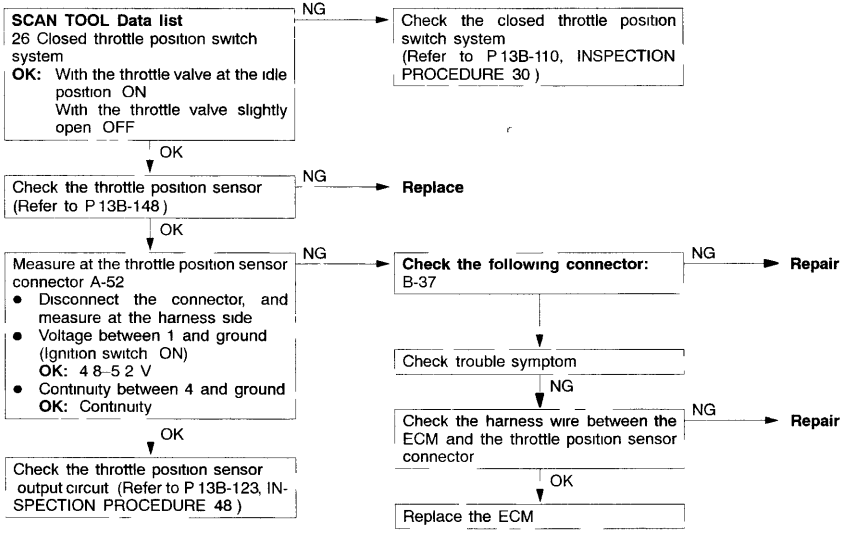
Code No. P0110 Intake Air Temperature Circuit Malfunction	Probable cause
Background • The intake air temperature sensor converts the intake air temperature to a voltage and outputs it • The engine control module checks whether the voltage is within a specified range Check Area • 2 sec or more have passed since the starting sequence was completed Judgment Criteria • Sensor output voltage has continued to be 4.6V or higher [corresponding to an intake air temperature of −45°C (−49°F) or lower] for 2 sec, or • Sensor output voltage has continued to be 0.2V or lower [corresponding to an intake air temperature of 125°C (257°F) or higher] for 2 sec	• Intake air temperature sensor failed • Open or shorted intake air temperature sensor circuit, or loose connector • Engine control module failed



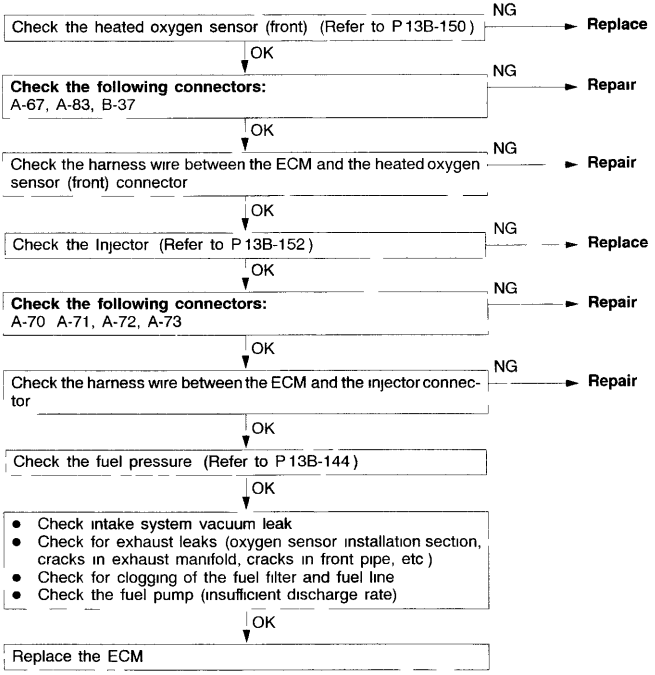
Code No. P0115 Engine Coolant Temperature Circuit Malfunction	Probable cause
Background • The engine coolant temperature sensor converts the engine coolant temperature to a voltage and outputs it • The engine control module checks whether the voltage is within a specified range In addition it checks that the engine coolant temperature (signal) does not drop while the engine is warming up Check Area • At least 2 seconds have passed since the ignition switch was turned on or the starting sequence was completed Judgment Criteria • Sensor output voltage has continued to be 4 6V or higher [corresponding to a coolant temperature of −45°C (−49°F) or lower] for 2 sec, or • Sensor output voltage has continued to be 0 1V or lower [corresponding to a coolant temperature of 140°C (284°F) or higher] for 2 sec Check Area Judgment Criteria • Sensor output voltage increased from a value lower than 1 6V to a value higher than 1 6V [Coolant temperature decreases from a higher than 40°C (104°F) temperature to a lower than 40°C (104°F) temperature] • Then the sensor output voltage has continued to be 1 6V or higher for 5 min Check Area Judgment Criteria • About 5 min or more have passed for the engine coolant temperature to rise to about 40°C (104°F) after starting sequence was completed • Note that time must not be counted when average output frequency of the volume air flow sensor is 70 Hz or lower, or when fuel is being shut off Check Area • Engine coolant temperature was 20°C (68°F) <Federal> or 7°C (44 6°F) <California> or more immediately before the engine was stopped at the last drive • Engine coolant temperature is higher than 20°C (68°F) <Federal> or 7°C (44 6°F) <California> when the engine is started Judgement Criteria • Engine coolant temperature fluctuates within 1°C (1 8°F) after 5 minutes have passed since the engine was started • However, time is not counted in any of the following conditions (1) Intake air temperature is 60°C (140°F) or higher (2) Engine speed is 1,500r/min or higher (3) Volumetric efficiency is 25% or lower (4) During fuel shut-off operation • Monitored only once per trip	• Engine coolant temperature sensor failed • Open or shorted engine coolant temperature sensor circuit, or loose connector • Engine control module failed



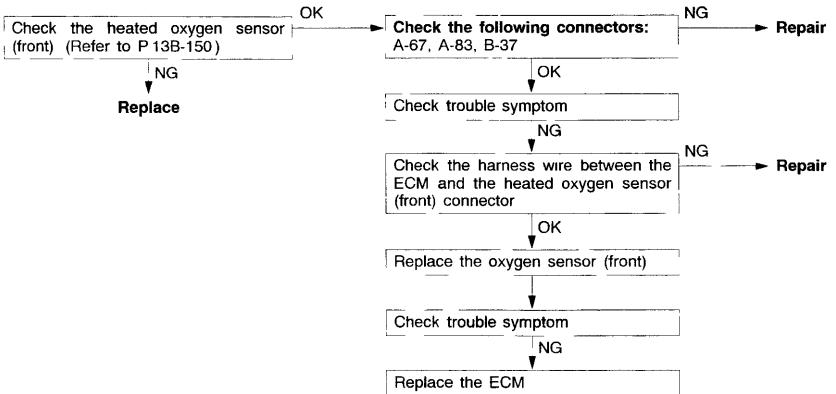
Code No. P0120 Throttle Position Circuit Malfunction	Probable cause
Background • The throttle position sensor outputs a voltage which is proportional to the throttle valve opening angle • The engine control module checks whether the voltage output by the throttle position sensor is within a specified range In addition, it checks that the voltage output does not become too large while the engine is idling Check Area • At least 2 seconds have passed after the engine was started Judgment Criteria • With the close throttle position switch set to ON, the sensor output voltage has continued to be 2V or higher for 2 sec, or • Sensor output voltage has continued to be 0 2V or lower for 2 sec Check Area • At least 2 seconds have passed after the engine was started • Engine speed is 3000 r/min or less • Volume efficiency is 30% or less Judgment Criteria • Sensor output voltage has continued to be 4 6V or higher for 2 sec Check Area • At least 2 seconds have passed after the engine was started • Engine speed is 2000 r/min or more • Volume efficiency is 60 % or more Judgment Criteria • Sensor output voltage is 0 8 V or less for 2 seconds	• Throttle position sensor failed or misadjusted • Open or shorted throttle position sensor circuit or loose connector • Closed throttle position switch malfunction • Closed throttle position switch signal wire shorted • Engine control module failed



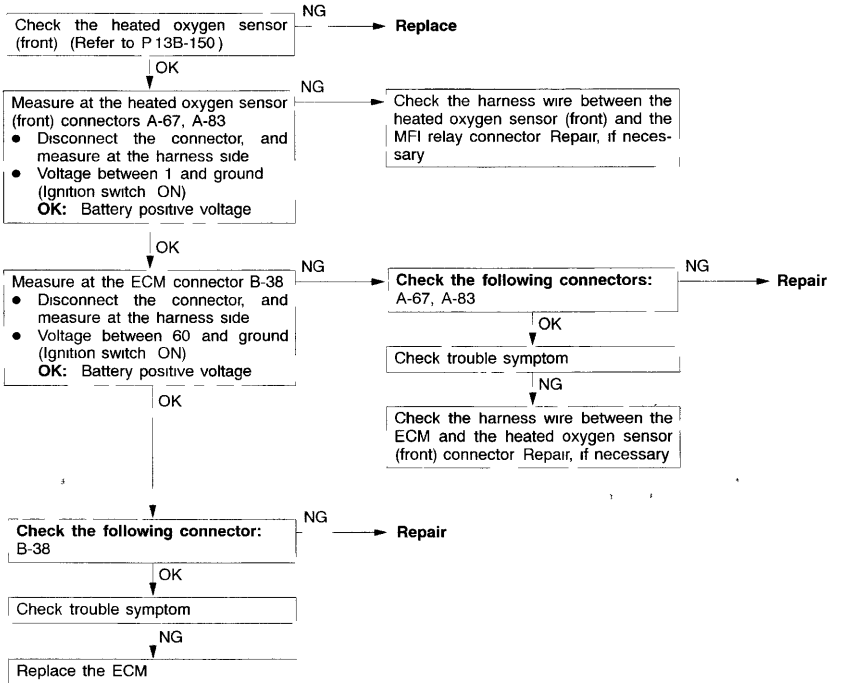
Code No. P0125 Excessive Time to Enter Closed Loop Fuel Control	Probable cause
Background • The MFI system reduces exhaust emissions by means of closed-loop fuel control • The engine control module checks the time taken until closed-loop fuel control commences Check Area • At least 2 seconds have passed after the engine started • Engine coolant temperature is higher than 80°C (176°F) • Engine speed is at between about 1800 and 3500 r/min • Volumetric efficiency is 16% – 62% • Engine operating within the air-fuel ratio feedback zone • Monitoring time 30 sec Judgment Criteria • Multiport fuel injection system doesn't enter the closed loop control within about 30 sec • Monitored only once per trip	• Heated oxygen sensor failed • Injector failed • Fuel pressure regulator failed • Fuel pump failed • Fuel filter is clogged • Intake system vacuum leak • Exhaust leak • Engine control module failed



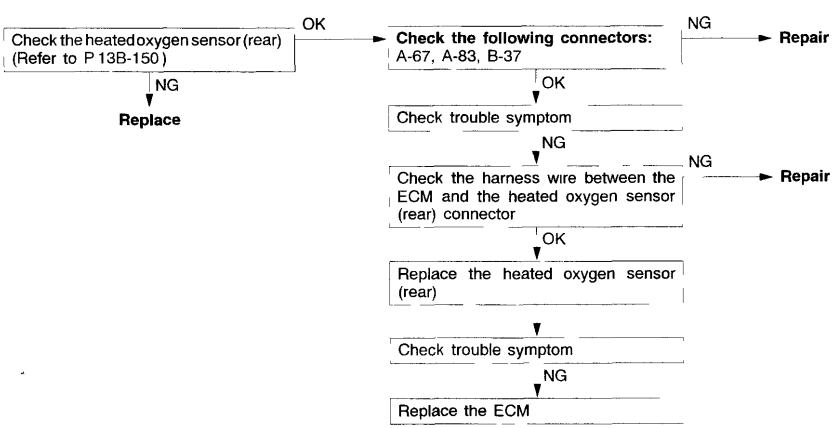
Code No. P0130 Oxygen Sensor Circuit Malfunction (Sensor 1)	Probable cause
Background • When the heated oxygen sensor begins to deteriorate the oxygen sensor signal response becomes poor • The engine control module forcibly varies the air/fuel mixture to make it leaner and richer and checks the response speed of the heated oxygen sensor In addition, the engine control module also checks for an open circuit in the heated oxygen sensor output line Check Area • Coolant temperature sensor normal • Heated oxygen sensor signal voltage has continued to be 0 2V or lower for 3 min or more after the starting sequence was completed • Engine coolant temperature is higher than 80°C (176°F) • Engine speed is higher than 1200 r/min • Volumetric efficiency is not lower than 25% • Monitoring time 7 sec Judgment Criteria • Input voltage supplied to the engine control module interface circuit is not lower than 4 5V when 5V is applied to the heated oxygen sensor output line via a resistor • Monitored only once per trip Check Area • Engine coolant temperature is not lower than 50°C (122°F) • Engine speed is between 1600 and 3000 r/min <M/T> or 1400 and 3000 r/min <A/T> • Volumetric efficiency is 22 – 60% <M/T> or 25 – 60% <A/T> • Intake air temperature is –10°C (14°F) or more • Atmospheric pressure is 76 kPa (11 psi) or more • Under the closed loop air-fuel control • Vehicle speed is 30 km/h (18 7 mph) or higher • Throttle valve opening angle (TPS output voltage) fluctuates within 0 117V every 250 milliseconds • Monitoring Time 5 – 20 sec Judgment Criteria • When the air-fuel ratio is forcibly changed (lean to rich and rich to lean), the heated oxygen sensor signal doesn t provide response within 1 2 sec or • The heated oxygen sensor sends "lean" and "rich" signals alternately nine times or less for ten seconds • Monitored only three times per trip NOTE: If the sensor switch time is longer than the Judgment Criteria due to the MUT-II OBD-II test Mode – H02S Test Results it is assumed that the heated oxygen sensor has deteriorated If it is short, it is assumed that the harness wire is broken or has a short circuit If the heated oxygen sensor signal voltage has not changed even once (lean/rich) after the DTC was erased, the sensor switch time will display as 0 seconds	• Heated oxygen sensor deteriorated • Open circuit in heated oxygen sensor output line • Engine control module failed



Code No. P0135 Oxygen Sensor Heater Circuit Malfunction (Sensor 1)	Probable cause
Background • The engine control module checks whether the heater current is within a specified range when the heater is energized Check Area • Engine coolant temperature is 20°C (68°F) or higher • The heated oxygen sensor heater is on • Battery voltage is between 11 and 16V Judgment Criteria • Heater current of the front heated oxygen sensor heater (Sensor 1) has continued to be 0.2A or lower or 3.5A or higher for 6 sec • Monitored only once per trip	• Open or shorted oxygen sensor heater circuit • Open circuit in oxygen sensor heater • Engine control module failed



Code No. P0136 Oxygen Sensor Circuit Malfunction (Sensor 2)	Probable cause
Background • The engine controls module checks for an open circuit in the heated oxygen sensor output line Check Area • Coolant temperature sensor normal • Heated oxygen sensor signal voltage has continued to be 0.1V or lower for 3 min or more after the starting sequence was completed • Engine coolant temperature is not lower than 80°C (176°F) • Engine speed is higher than 1200 r/min • Volumetric efficiency is not lower than 25% • Monitoring time 7 sec Judgment Criteria • Input voltage supplied to the engine control module interface circuit is not lower than 4.5V when 5V is applied to the heated oxygen sensor output line via a resistor • Monitored only once per trip Check Area • Heated oxygen sensor (rear) signal voltage remains 0.1V or less for at least 3 minutes after the engine is started • Engine coolant temperature is about 80°C (176°F) or higher • Engine speed is about 1,200 rpm or higher • Volumetric efficiency is 25% or higher • Output frequency of the volume air flow sensor is 113 Hz or higher • At least 20 seconds have passed since fuel supply shut-off control was released • Output voltage of the oxygen sensor (front) is 0.5V or higher • Monitoring time 10 seconds Judgement Criteria • Making the air-fuel ratio 15% richer doesn't result in raising the heated oxygen sensor output voltage beyond 0.1V • Monitored only once per trip Check Area • Engine coolant temperature is about 80°C (176°F) or higher • Barometric pressure is 76 kPa (11 psi) or higher • The heated oxygen sensor (front) is operating • The engine runs for at least 10 seconds when air-fuel ratio is rich • The heated oxygen sensor (rear) output voltage is 0.4V or more before fuel shut-off commences • While fuel is being shut off Judgement Criteria • At least 1 second has passed before heated oxygen sensor (rear) output voltage falls to 0.15 – 0.40V or • At least 3 seconds have passed before the heated oxygen sensor (rear) output voltage falls to 0.15V or less	• Heated oxygen sensor failed • Open circuit in heated oxygen sensor output line • Engine control module failed



Code No. P0141 Oxygen Sensor Heater Circuit Malfunction (Sensor 2)

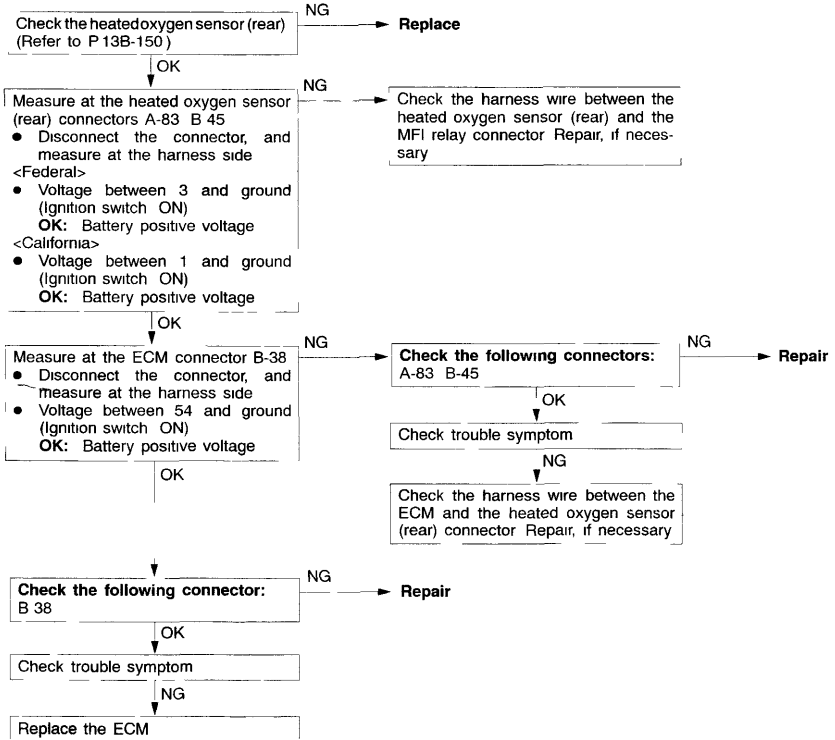
Background
- The engine control module checks whether the heater current is within a specified range when the heater is energized

Check Area
- Engine coolant temperature is 20°C (68°F) or higher
- The heated oxygen sensor heater is on
- Battery voltage is between 11 and 16V

Judgment Criteria
- Heater current of the front heated oxygen sensor heater (Sensor 2) has continued to be 0.2 A or lower or 3.5 A or higher for 6 sec
- Monitored only once per trip

Probable cause

- Open or shorted oxygen sensor heater circuit
- Open circuit in oxygen sensor heater
- Engine control module failed



Code No. P0170 Fuel Trim Malfunction

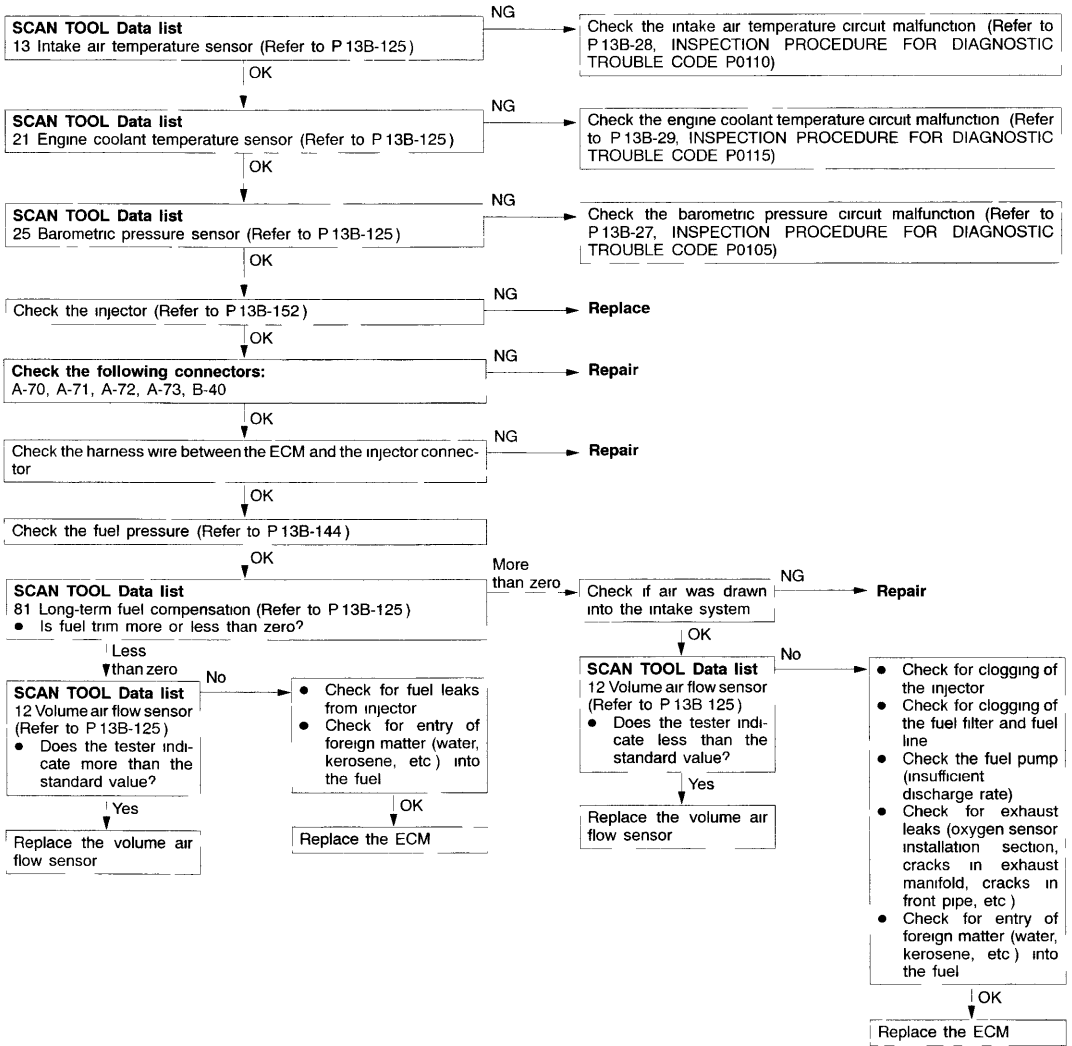
Background
- If a malfunction occurs in the fuel system, the fuel trim value becomes too large or too small
- The engine control module checks whether the fuel trim value is within a specified range

Check Area
- Under the closed loop air-fuel ratio control
- Engine coolant temperature is −10°C (14°F) or higher
- Intake air temperature −10°C (14°F) or more
- Atmospheric pressure is 76 kPa (11 psi) or more
- Output frequency of the volume air flow sensor is 113 Hz or higher

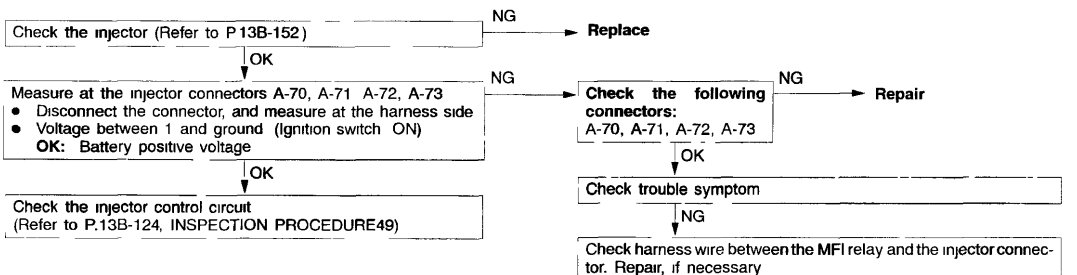
Judgment Criteria
- Long-range fuel correction has continued to be +12.5% or higher or −12.5% or lower for 10 sec
- Short-range fuel correction has continued to be +7.4% or higher −7.4% or lower for 10 sec

Probable cause

- Volume air flow sensor failed
- Injector failed
- Incorrect fuel pressure
- Air drawn in from gaps in gasket seals, etc
- Heated oxygen sensor failed
- Engine coolant temperature sensor failed
- Intake air temperature sensor failed
- Barometric pressure sensor failed
- Exhaust leak
- Use of incorrect fuel
- Engine control module failed



Code No. P0201, P0202, P0203, P0204 Injector Circuit Malfunction (Cylinder-1, Cylinder-2, Cylinder-3, Cylinder-4)	Probable cause
Background • A surge voltage is generated when the injectors are driven and the current flowing to the injector coil is shut off. • The engine control module checks this surge voltage Check Area • Engine speed is between 50 and 1000 r/min • Throttle position sensor output voltage is lower than 1.16V Judgment Criteria • Injector coil surge voltage (more than system voltage +2V) has not been detected for 2 sec.	• Injector failed • Open or shorted injector circuit, or loose connector • Engine control module failed



Code No. P0300 Random Misfire Detected

Background
- If a misfiring occurs while the engine is running, the engine speed suddenly changes
- The engine control module checks for changes in the engine speed

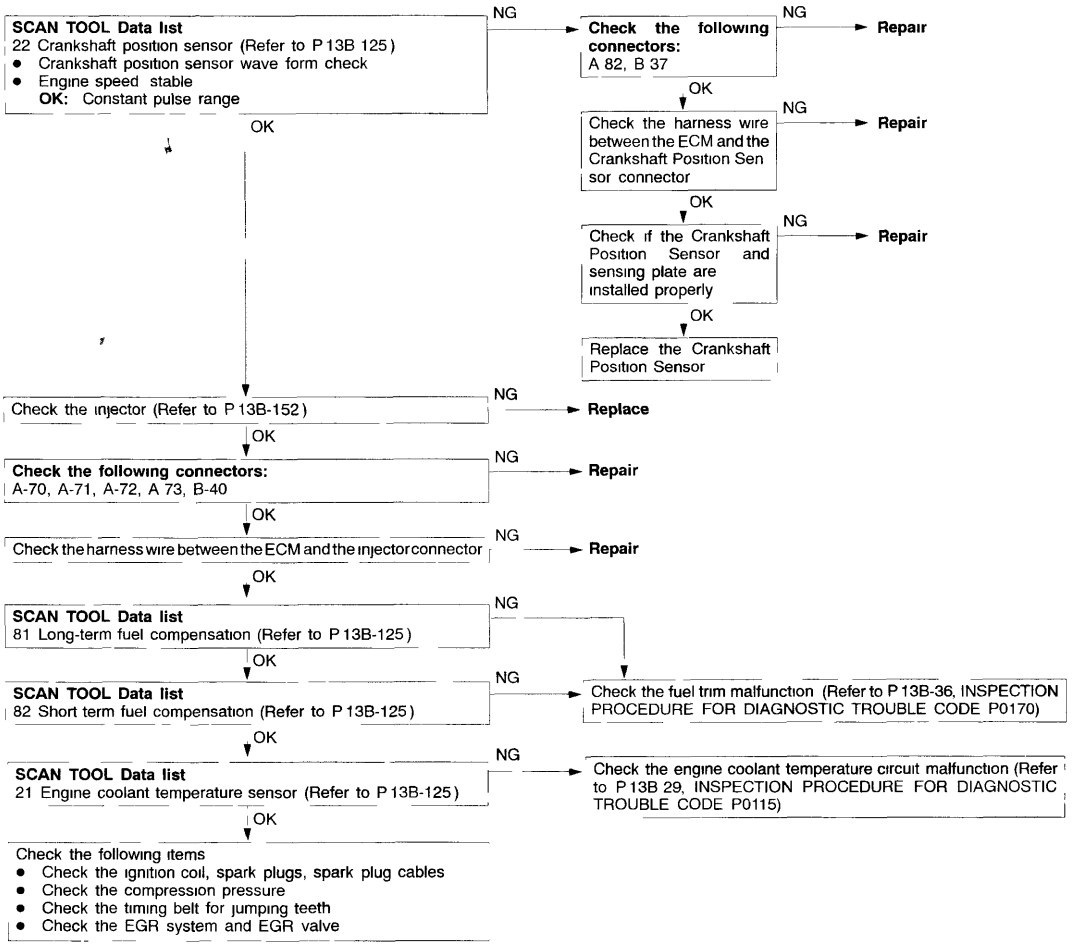
Check Area
- 5 sec or more have passed after the engine was started
- Engine speed is between 500 and 6500 r/min
- Engine coolant temperature is –10°C (14°F) or more
- Intake air temperature –10°C (14°F) or more
- Atmospheric pressure is 76 kPa (11 psi) or more
- Adaptive learning is complete for the vane which generates a crankshaft position signal
- While the engine is running, excluding gear shifting, deceleration, sudden acceleration/deceleration and A/C compressor switching

Judgment Criteria (change in the angular acceleration of the crankshaft is used for misfire detection)
- Misfire has occurred more frequently than the allowed number of times (2%) during 200 motor revolutions [when the catalyst temperature is higher than 950°C (1742°F)]

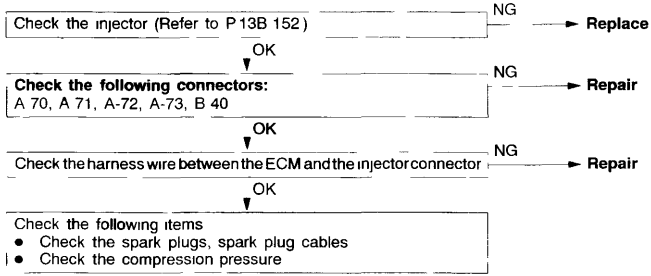
or
- Misfire has occurred more frequently than the allowed number of times (2%) during 1000 motor revolutions (Misfire exceeding 1.5 times the limit of emission standard)

Probable cause

- Ignition system related part(s) failed
- Poor crankshaft position sensor signal
- Incorrect air/fuel ratio
- Low compression pressure
- Engine coolant temperature sensor failed
- Timing belt teeth jumped
- Injector failed
- EGR valve failed
- Engine control module failed



Code No. P0301, P0302, P0303, P0304, Misfire Detected (Cylinder-1, Cylinder-2, Cylinder-3, Cylinder-4)	Probable cause
Background • If a misfiring occurs while the engine is running, the engine speed suddenly changes • The engine control module checks for changes in the engine speed Check Area • 5 sec or more have passed after the engine was started • Engine speed is between 500 and 6500 r/min • Engine coolant temperature is −10°C (14°F) or more • Intake air temperature −10°C (14°F) or more • Atmospheric pressure is 76 kPa (11 psi) or more • Adaptive learning is complete for the vane which generates a crankshaft position signal • While the engine is running, excluding gear shifting, deceleration, sudden acceleration/deceleration and A/C compressor switching Judgment Criteria (change in the augular acceleration of the crankshaft is used for misfire detection) • Misfire has occurred in the engine more than allowed (2.0%) per 200 revolutions [when the catalyst temperature is higher than 950°C (1742°F)] or • Misfire has occurred more frequently that the allowed number of times (2%) during 1000 motor revolutions (Misfire exceeding 1.5 times the limit of emission standard)	• Ignition system related part(s) failed • Low compression pressure • Injector failed • Engine control module failed



Code No. P0335 Crankshaft Position Sensor Circuit Malfunction

Background
- When the engine is running, the crankshaft position sensor outputs a pulse signal
- The engine control module checks whether the pulse signal is input while the engine is cranking

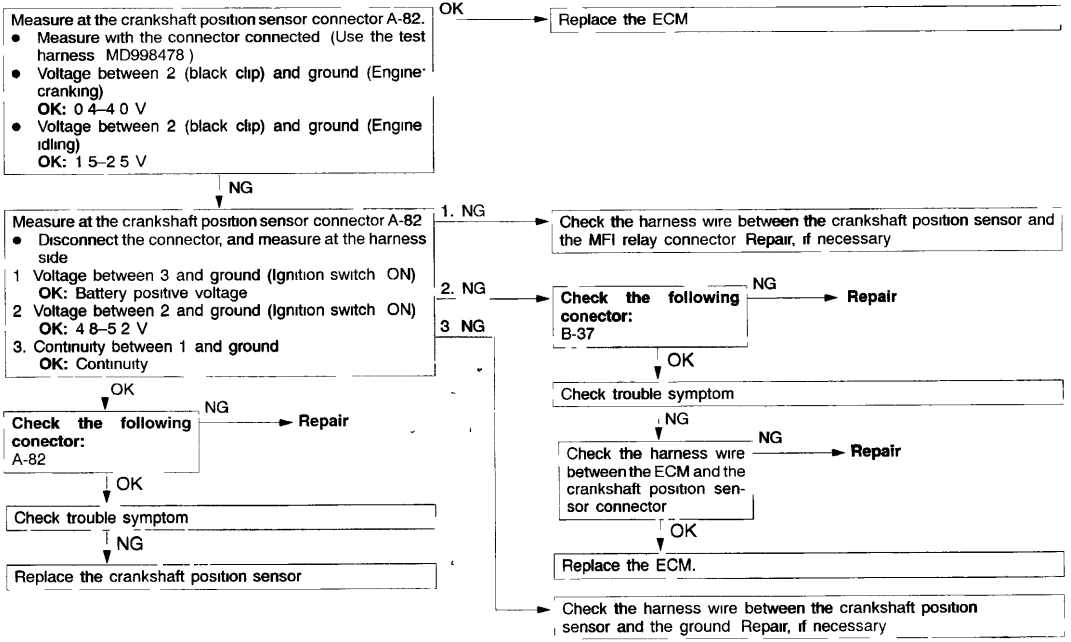
Check Area
- Engine is being cranked

Judgment Criteria
- Sensor output voltage has not changed (no pulse signal is input) for 2 sec.

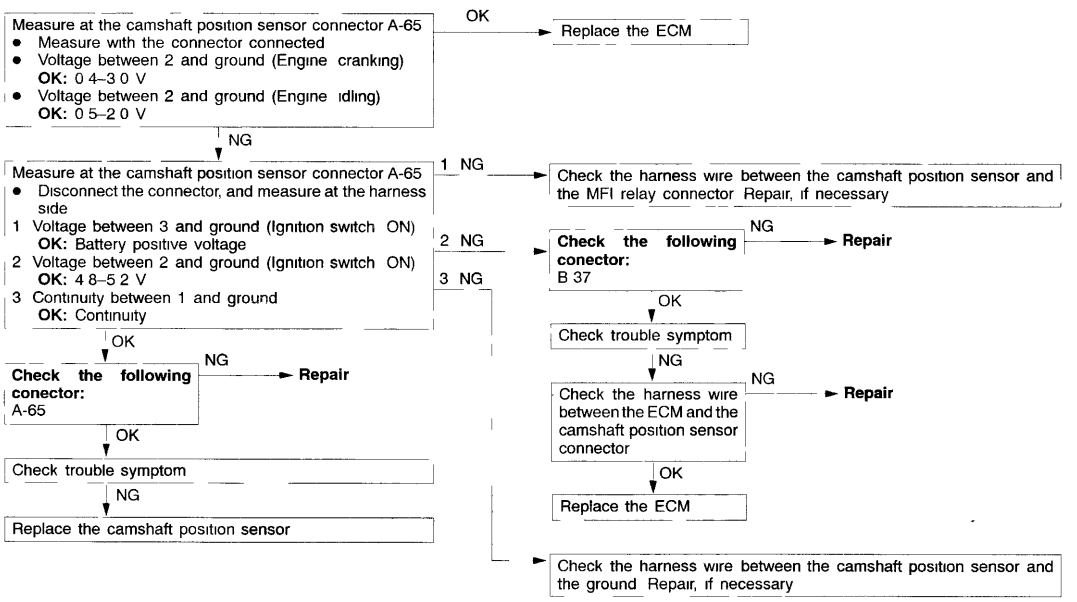
Check Area
- Normal signal pattern has not been input for cylinder identification from the crankshaft position sensor signal and camshaft position sensor signal for 2 sec

Probable cause

- Crankshaft position sensor failed
- Open or shorted crankshaft position sensor circuit, or loose connector
- Engine control module failed



Code No. P0340 Camshaft Position Sensor Circuit Malfunction	Probable cause
Background • When the engine is running, the camshaft position sensor outputs a pulse signal • The engine control module checks whether the pulse signal is input Check Area • Engine speed is about 50r/min or higher Judgment Criteria • Sensor output voltage has not changed (no pulse signal is input) for 2 sec Check Area • Engine speed is about 50r/min or higher Judgment Criteria • Normal signal pattern has not been input for cylinder identification from the crankshaft position sensor and camshaft position sensor signal for 2 sec	• Camshaft position sensor malfunction • Open or shorted camshaft position sensor circuit or loose connector • Engine control module failed



Code No. P0400 Exhaust Gas Recirculation Flow Malfunction

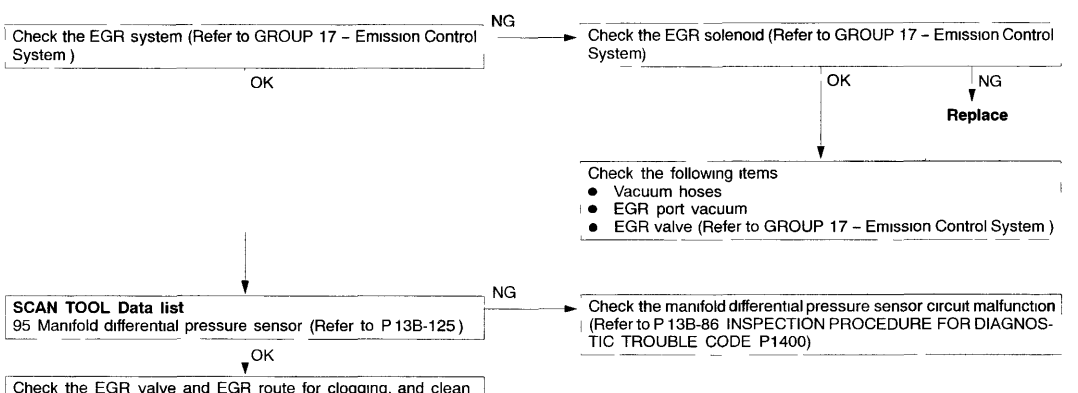
Background
- When the EGR solenoid switches from OFF to ON while the engine is running, EGR gas flows
- The engine control module checks how the EGR gas flow signal changes

Check Area
- At least 20 seconds have passed after the last monitor finished
- Engine coolant temperature is higher than 80°C (176°F)
- Engine speed is between 1000 and 2000 r/min <M/T> or 1000 and 1700 r/min <A/T>
- Intake air temperature is 5°C (41°F) or more
- Atmospheric pressure is 76 kPa (11 psi) or more
- Vehicle speed is 30 km/h (18 7 mph) or higher
- At least ninety seconds have passed since manifold differential pressure sensor output voltage fluctuated 1 5V or more
- Closed throttle position switch ON
- Volumetric efficiency 15% <M/T> or 25% <A/T> or less
- Fuel is being shut off <M/T>
- Monitoring Time 2 sec

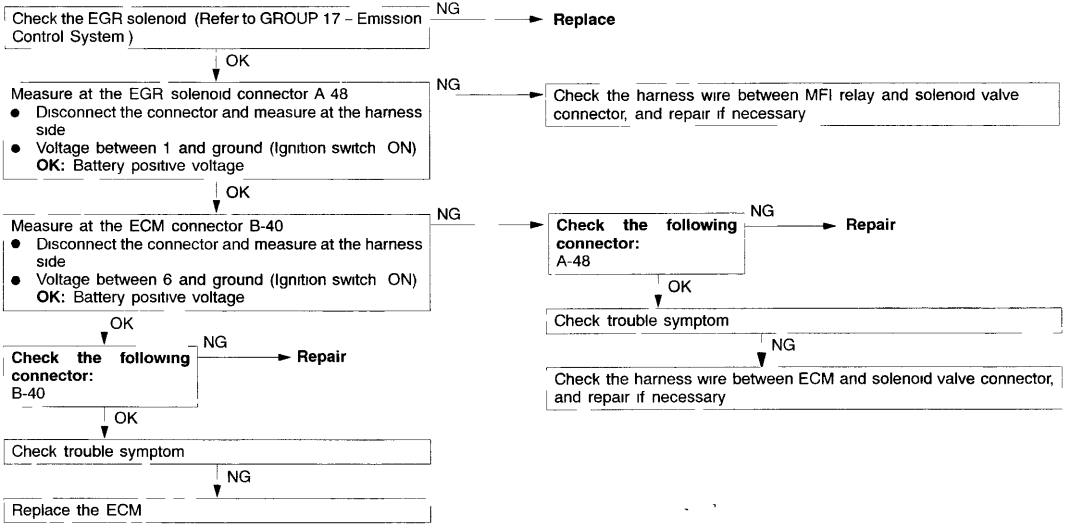
Judgment Criteria
- The fluctuation in the intake system is low when the EGR solenoid is turned ON
- Monitored only three times per trip

Probable cause

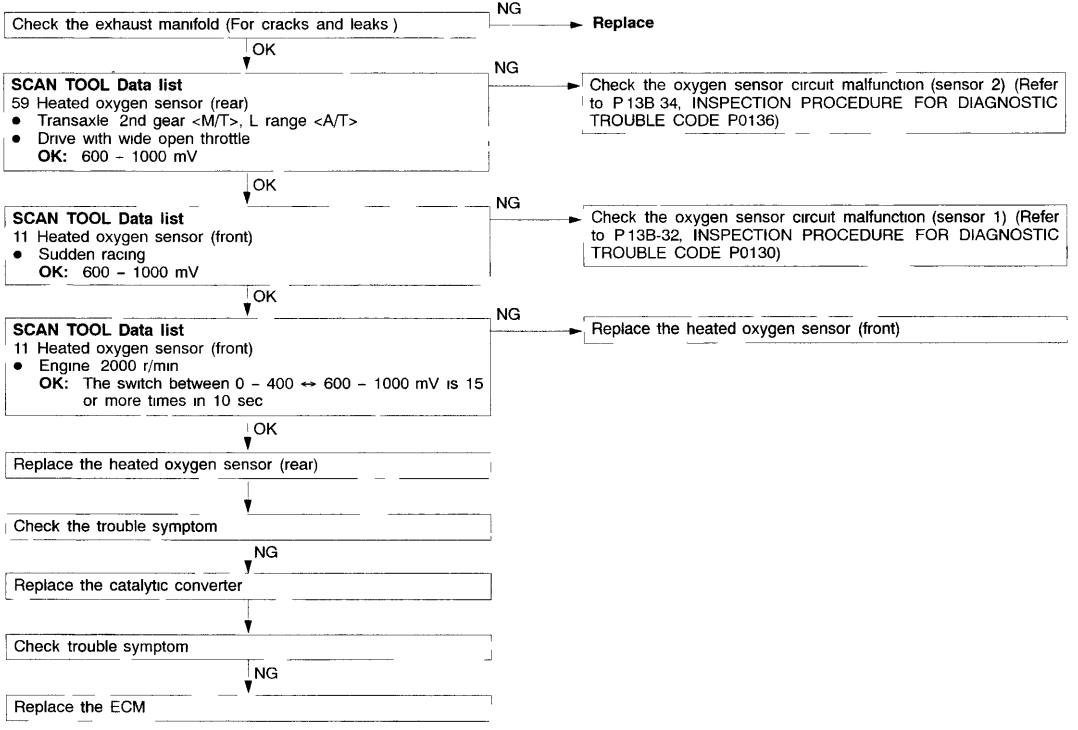
- EGR valve does not open
- EGR control vacuum is too low
- EGR solenoid failed
- Open or shorted EGR solenoid circuit, or loose connector
- Manifold differential pressure sensor failed
- Engine control module failed



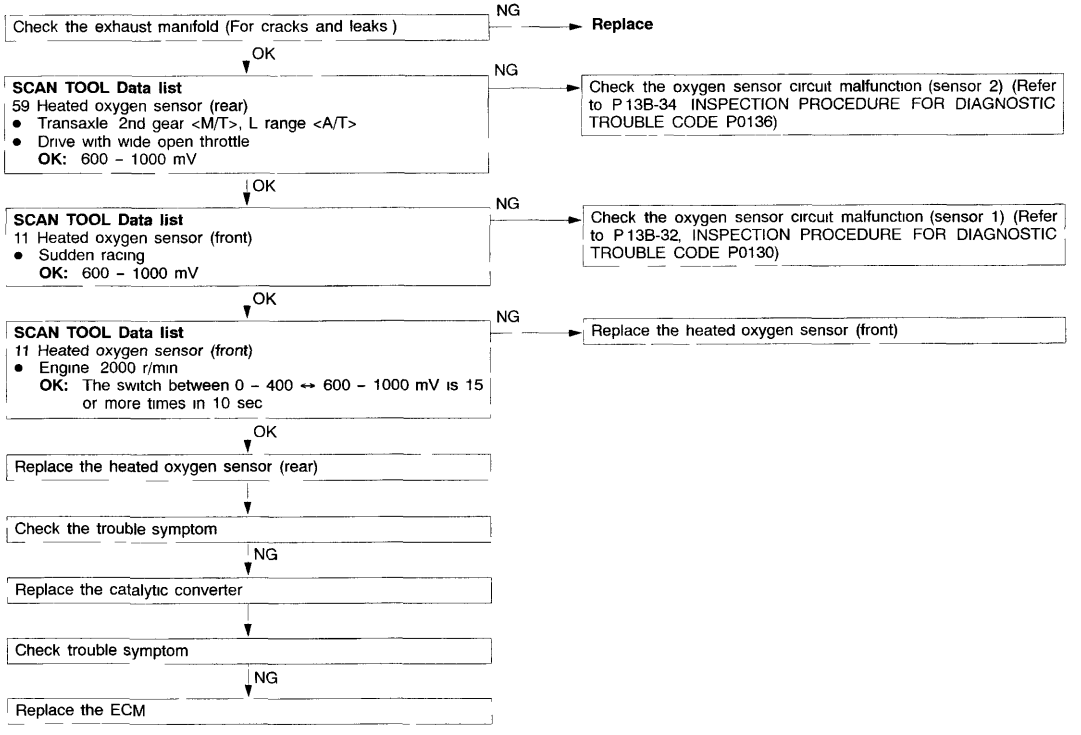
Code No. P0403 Exhaust Gas Recirculation Solenoid Malfunction	Probable cause
Background • The engine control module checks current flows in the EGR solenoid drive circuit when the solenoid is ON and OFF Check Area • Battery voltage is not lower than 10V Judgment Criteria • Solenoid coil surge voltage (more than system voltage +2V) is not detected when the EGR solenoid is turned on/off • Monitored only once per trip	• EGR solenoid failed • Open or shorted evaporative EGR solenoid circuit, or loose connector • Engine control module failed



Code No. P0420 Catalyst System Efficiency Below Threshold	Probable cause
Background • The signal from the heated oxygen sensor which follows the catalytic converter differs from that which precedes the catalytic converter That is because the catalytic converter purifies exhaust gas When the catalytic converter has deteriorated, the signal from the heated oxygen sensor which follows the catalytic converter becomes similar to that which precedes the catalytic converter • The engine control module checks the outputs of the heated oxygen sensor signals Check Area • Engine speed is not higher than 3000 r/min • Volume air flow sensor output frequency is between 69 and 144 Hz • Intake air temperature is –10°C (14°F) or more • Atmospheric pressure is 76 kPa (11 psi) or more • Closed throttle position switch OFF • Under the closed loop air-fuel ratio control • Vehicle speed is 1 5 km/h (0 93 mph) or higher • Monitoring time 140 sec Judgment Criteria • Fault in the oxygen sensor (rear) signal and oxygen sensor (front) signal	• Catalytic converter deteriorated • Heated oxygen sensor failed • Engine control module failed

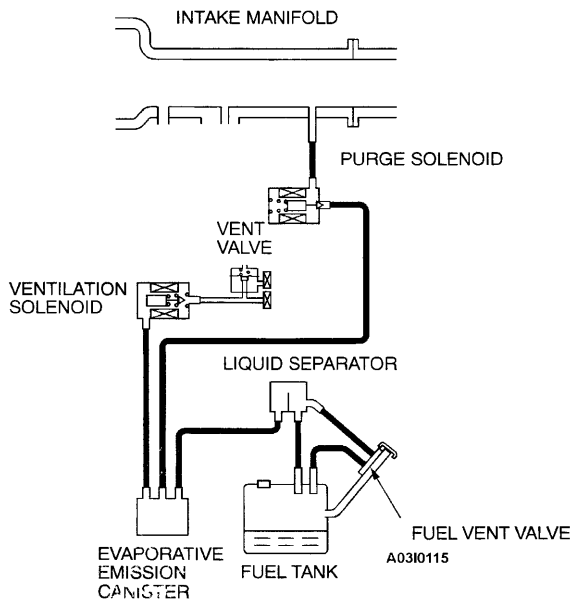


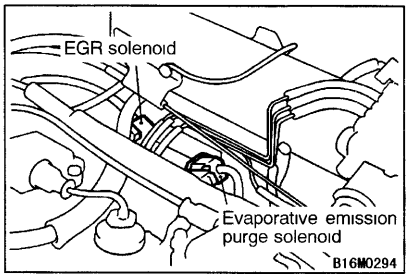
Code No. P0421 Warm Up Catalyst Efficiency Below Threshold	Probable cause
Background • The signal from the heated oxygen sensor which follows the catalytic converter differs from that which precedes the catalytic converter That is because the catalytic converter purifies exhaust gas When the catalytic converter has deteriorated, the signal from the heated oxygen sensor which follows the catalytic converter becomes similar to that which precedes the catalytic converter • The engine control module checks the outputs of the heated oxygen sensor signals Check Area • Engine speed is not higher than 3000 r/min • Volume air flow sensor output frequency is between 69 and 144 Hz • Intake air temperature is –10°C (14°F) or more • Atmospheric pressure is 76 kPa (11 psi) or more • Closed throttle position switch OFF • Under the closed loop air-fuel ratio control • Vehicle speed is 1 5 km/h (0 93 mph) or higher • Monitoring time 140 sec Judgment Criteria • Fault in the heated oxygen sensor (rear) signal and heated oxygen sensor (front) signal	• Catalytic converter deteriorated • Heated oxygen sensor failed • Engine control module failed

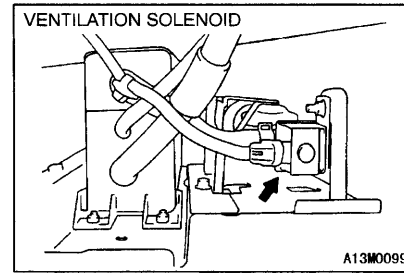


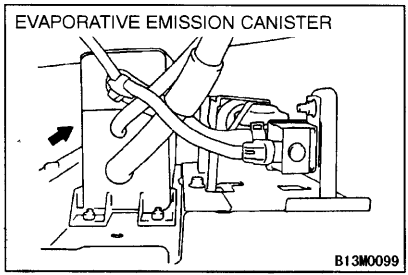
Code No. P0442	Evaporative Emission Control System Leak Detected

System Diagram









TECHNICAL DESCRIPTION

- The ECM turns on the evaporative emission ventilation solenoid which shuts off the evaporative emission canister outlet port. Then the evaporative emission purge solenoid is driven. As a result, the fuel system will be set into a negative pressure.
  When the fuel system reaches negative pressure, the evaporative emission purge solenoid is turned "off," and the fuel system are sealed. As the fuel pressure inside the fuel tank changes, the ECM judges if there is a leak in the fuel system.

DTC SET CONDITIONS

Check Area

- At least sixteen minutes have passed since the starting sequence was completed.
- Engine coolant temperature higher than 60°C (140°F).
- Engine speed is 1,600 r/min or more.
- Power steering pressure switch: "OFF."
- Barometric pressure is higher than 76 kPa (11 psi).
- Volumetric efficiency is at between 20 and 80 percent.
- The engine coolant temperature is 30°C (86°F) or less when the engine is started.
- Intake air temperature is higher than 5°C (41°F).
- The pressure rise when the evaporative emission purge solenoid and evaporative emission ventilation solenoid are closed is less than 451 Pa (0.065 psi).
- The pressure fluctuation width is less than 647 Pa (0.094 psi).
- At least twenty seconds have passed since pressure fluctuation detection commenced.
- Fuel tank differential pressure sensor output voltage is 1 – 4 volts.
- Intake air temperature is 30°C (86°F) or less when the engine started.
- Vehicle speed is 30 km/h (18.7 mph) or more.
- Monitoring time: 75 – 125 seconds

Judgment Criteria

- Internal pressure of the fuel tank has changed more than 843 Pa (0.122 psi) in 20 seconds after the tank and vapor line were closed.

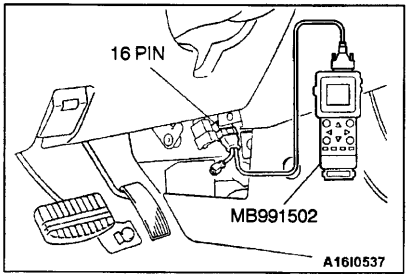
TROUBLESHOOTING HINTS

The most likely causes for this code to be set are:

- Loose fuel cap.
- Fuel cap relief pressure is incorrect.
- Evaporative emission canister seal is faulty.
- Evaporative emission canister is clogged.
- Fuel vent valve failed.
- Purge line or vapor line is clogged.
- Fuel tank, purge line or vapor line seal failed.
- Evaporative emission purge solenoid failed.
- Evaporative emission ventilation solenoid failed.
- Fuel tank differential pressure sensor failed.
- Engine coolant temperature sensor failed.
- Intake air temperature sensor failed.
- Power steering pressure switch failed.
- Use of incorrect fuel.

OVERVIEW OF TROUBLESHOOTING

- To determine the cause of DTC P0442, a performance test is needed. The performance test uses a mechanical vacuum gauge and scan tool MB991502 set on the fuel tank differential pressure sensor (TANK PRS SNSR 73). The mechanical gauge reading is used to verify scan tool MB991502 reading. A comparison of the mechanical gauge to scan tool MB991502 determines the problem in the system.
- Prior to doing the performance test, several simple inspections are needed to exclude some possibilities of the symptom.



DIAGNOSIS

Required Special Tool:
MB991502: Scan Tool (MUT-II)

Caution
To prevent damage to scan tool MB991502, turn the ignition switch off before connecting or disconnecting scan tool MB991502.

In this procedure, scan tool MB991502 should be used in the metric mode (showing the value in kPa). If not, set scan tool MB991502 by selecting the "System Setup" at the main menu.

STEP 1. Check for other DTCs.

If any other DTCs are set, please check those DTCs first then follow the steps below.

STEP 2. Evaporative Emission System Leak Monitor Test using scan tool MB991502.

NOTE: This monitor is carried out at an engine speed of 1,600 r/min or more, transmission is in "N" or "R" position. The engine speed has to be automatically adjusted.

(1) Erase the DTCs using scan tool MB991502. Ensure that the fuel cap is securely tightened.
(2) Select "System Test" and press "YES" key.
(3) Select "Evap Leak Mon" and press "YES" key.
(4) If "Evap Leak Mon" is selected before starting the engine, "Engine must be running." is displayed. In this case, start the engine and then select "Evap Leak Mon" again.
(5) If "Keep the TPS in idle position. during the test." is displayed, the ECM adjusts engine speed automatically. A manual adjustment for engine speed is not needed.
(6) Keep the idling position during the monitor.

NOTE: If the engine speed does not reach 2,000 r/min during the monitor test, adjustment of the Speed Adjusting Screw may be needed. Refer to P.13B-143 for the adjustment procedure.

(7) Item "In Progress" is displayed during the monitor. Keep the engine speed and load within the defined range. Scan tool MB991502 shows these items on the screen. Item "In Progress" will be change from "NO" to "YES" by keeping engine conditions.
(8) Message "Evap Leak Mon. Completed. Test Passed." is displayed when the test has been completed without malfunction. Evaporative emission system is working property at this time. Please explain to customer that improperly tightened fuel cap can cause to MIL turn on. No further steps are needed.
(9) Message "Evap Leak Mon. Completed. Test Failed & DTCs Set." is displayed when a malfunction has been detected during the test. Go to Step 3.

(10) Message "Evap Leak Mon. discontinued. Retest again from the first" is displayed when the monitor was discontinued by a certain reason (input vehicle speed, engine speed and engine load was put of the specified range). Turn the ignition switch off once and start monitoring from the beginning.

NOTE: Monitoring will not start unless turning off the ignition switch is turned off once and the engine restarted.

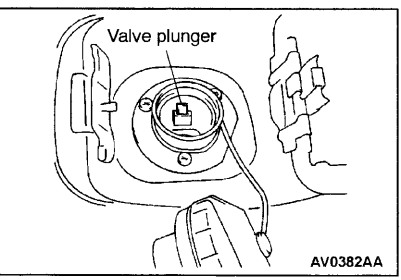
STEP 3. Using scan tool MB991502, check "Fuel tank differential pressure sensor (date list 73)" output.

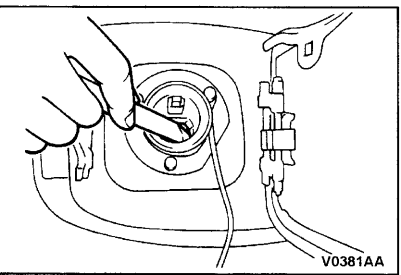
In this step, the fuel tank differential pressure sensor reading is checked to determine if the fuel tank differential pressure sensor output is within the normal range.

(1) Check the MFI data list item: TANK PRS SNSR 73
(2) Watch the sensor reading. This value varies depending on pressure inside the fuel tank.
(3) Remove the fuel cap.

NOTE: If the fuel cap is not securely tightened, it might have the cause of a leak in the EVAP system and set the DTC P0442.

(4) After the fuel cap has been removed, the pressure sensor reading should be between −0.5 kPa (−0.07 psi) and 0.5 kPa (0.07 psi).
- If the reading is between −0.5 kPa (−0.07 psi) and 0.5 kPa (0.07 psi), the fuel tank differential pressure sensor circuit is OK. Therefore, go to Step 4.
- If the reading is not between −0.5 kPa (−0.07 psi) and 0.5 kPa (0.07 psi), the fuel tank differential pressure sensor is not working properly. Replace the fuel tank differential pressure sensor.





STEP 4. Check the fuel vent valve plunger and flapper door operation.

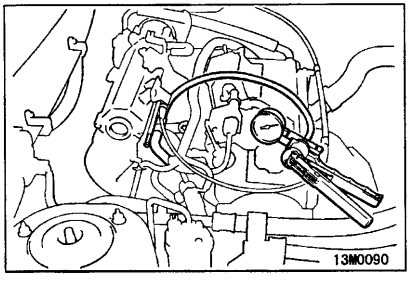
NOTE: When a fuel nozzle is inserted to the fuel tank filler tube and the flapper door is opened, the fuel vent valve is closed (plunger moves towards the top of the neck). When the fuel cap is closed, the fuel cap pushes the plunger back in, which then opens the vent valve. If the flapper door or plunger does not operate properly, the vent valve stays closed even after the fuel cap is closed. This may block the vapor passage. A faulty vent valve plunger may also cause the fuel cap not to seat properly. Either of these conditions can set DTC P0442.

(1) Remove the fuel cap.
(2) Push the flapper in to operate the valve.

NOTE: When the flapper is pushed in, the plunger of the valve should move towards the top.

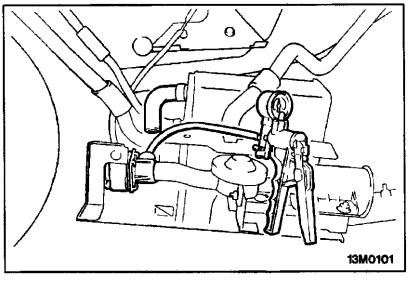
(3) Reinstall and tighten the fuel cap until three clicks are heard.
(4) Remove the cap again and check the protrusion of the plunger to verify if it is pushed back.

(5) Distance between the tip of vent valve plunger and that of fuel tank filler tube should be 28 mm (1.1 inches) or more.
- If the plunger does not return, replace the fuel tank filler tube and securely tighten the cap.
- If the operation is OK, install and securely tighten the fuel cap.



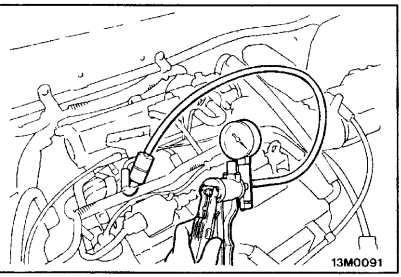
STEP 5. Using scan tool MB991502, actuator test item 08 : Evaporative Emission Purge Solenoid.

(1) Disconnect the hose connected to the evaporative emission canister from the purge solenoid.
(2) Connect a hand vacuum pump to the nipple where the hose is disconnected at the previous step.
(3) The vacuum should be maintained when vacuum is applied and vacuum should leak when the purge solenoid is activated by the actuator test of scan tool MB991502.
- If correct, go to Step 6.
- If not, refer to DTC P0443 (Evaporative Emission Control System Purge Control Valve Circuit Malfunction) on P.13B-56.



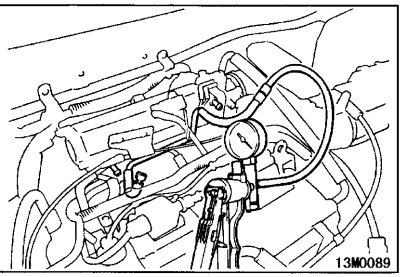
STEP 6. Using scan tool MB991502, actuator test item 29 : evaporative Emission Ventilation Solenoid.

(1) Disconnect the hose connected to the vent solenoid valve from the evaporative emission canister.
(2) Connect a hand vacuum pump to the hose that is disconnected in the previous step.
(3) The vacuum should leak when vacuum is applied, and the vacuum should be maintained when the purge solenoid is activated by the actuator test of scan tool MB991502.
- If correct, go to Step 7.
- If not, refer to DTC P0446 (Evaporative Emission Control System Vent Control Malfunction) on P.13B-57.



STEP 7. Check the purge solenoid-to-air intake plenum hose for blockage.

(1) Disconnect the purge solenoid-to-air intake plenum hose at the purge solenoid side.
(2) Connect a hand vacuum pump to the disconnected hose end.
(3) Apply vacuum, and check if the vacuum is not maintained.
- If not maintained, go to STEP 8.
- If maintained, replace the hose or intake plenum. Then go to STEP 9.



STEP 8. Check the purge solenoid-to-air intake plenum hose for vacuum leakage.

(1) Plug the purge solenoid-to-air intake plenum hose at the purge solenoid side.
(2) Disconnect the purge solenoid-to-air intake plenum hose at the air intake plenum side.
(3) Connect a hand vacuum pump to disconnected hose end.
(4) Apply vacuum, and check if the vacuum is maintained.
- If maintained, go to STEP 9.
- If not maintained, replace the hose. Then go to STEP 9.

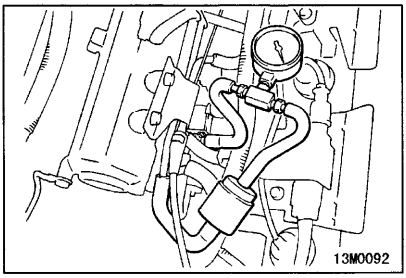
STEP 9. Performance test.

NOTE: Fuel temperature should be lower than 40°C (104°F) during the performance test.

In this step, verify if the EVAP system works properly, or determine which area of the evaporative emission system has a failure.

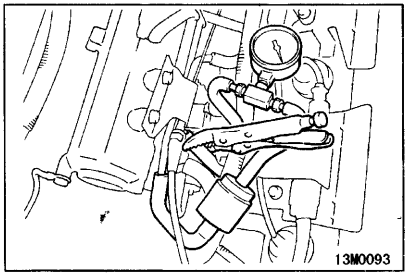
Caution
As a 0 – 6.2 kPa (0 – 0.90 psi) range vacuum gauge is used, the gauge may be broken if excessive vacuum pressure is applied. Do not apply a vacuum of more than 2.9 kPa (0.42 psi).

To achieve the performance test efficiently, a mechanical vacuum gauge [0 – 6.2 kPa (0 – 0.90 psi) range] and scan tool MB991502 should be used, and the engine to generate vacuum.

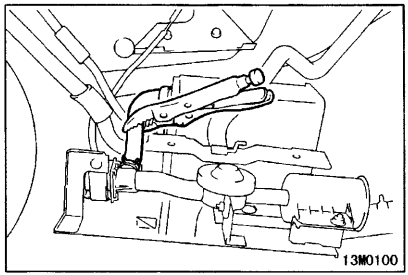


(1) Install a mechanical vacuum gauge [0 – 6.2 kPa (0 – 0.90 psi) range] between the EVAP purge solenoid valve and the purge hose that comes from the evaporative emission canister.
(2) Before starting the performance test, set the vehicle in the following condition.
- Engine coolant temperature: 80 – 90°C (176 – 203°F)
- Lights and all accessories: OFF
- Transmission: "N" or "P" position

(3) Select the item TANK PRS SNSR (data list 73) on scan tool MB991502 to see the differential pressure sensor output.
(4) Run the engine at idle.



(5) Using locking pliers, pinch the hose between the purge solenoid and the intake plenum to close the purge flow, as a preparation of the performance test.



(6) Using another locking pliers, pinch the vent hose between the evaporative emission canister and the vent solenoid. Momentary, remove the locking pliers at the purge hose; this will cause the vacuum build up in the EVAP system.
(7) The engine vacuum comes from the purge port through the purge solenoid.

NOTE: During this operation, the purge solenoid may turn off but will resume operation in about 20 seconds. Operation of the purge solenoid can be checked by needle fluctuation of the mechanical vacuum gauge.

(8) Watch the vacuum reading on the mechanical vacuum gauge and scan tool MB991502.
(9) When the vacuum reading reaches 2.9 kPa (0.42 psi) on the mechanical vacuum gauge and −2.9 kPa (−0.42 psi) on scan tool MB991502, pinch the hose between the purge solenoid and the intake manifold plenum using another locking pliers; this stops the application of vacuum and seals the EVAP system for the leak test.

NOTE: If there is a system failure, either of both vacuum readings may not reach to the above specifications. In this case, it is not necessary to pinch off the purge hose as shown. Refer to the performance test results table below for further steps.

(10) After an elapsed time of 20 seconds, check the fuel tank differential pressure reading on scan tool MB991502.

OK: Change in pressure reading is 0.4 kPa (0.06 psi) or less [holding −2.5 kPa (−0.36 psi) or more vacuum].

Performance test result table:

MECHANICAL VACUUM GAUGE READING	SCAN TOOL MB991502 READING	RESULT	GO TO
Reaches 2.9 kPa (0 42 psi).	Reaches −2.9 kPa (−0.42 psi) and vacuum drops not more than 0.4 kPa (0 06 psi) in 20 seconds.	Satisfactory. No leak nor blockage detected.	Step 10
Reaches 2.9 kPa (0 42 psi).	Does not reach −2.9 kPa (−0 42 psi) *	Blockage in the system or bad differential sensor.	Step 11
Does not reach 2.9 kPa (0.42 psi).	Does not reach −2.9 kPa (−0.42 psi).	Large leak in EVAP system.	Step 13
Reaches 2 9 kPa (0.42 psi)	Reaches −2.9 kPa (−0.42 psi) but vacuum drops more than 0.4 kPa (0.06 psi) in 20 seconds.	Small leak in EVAP system	Step 14

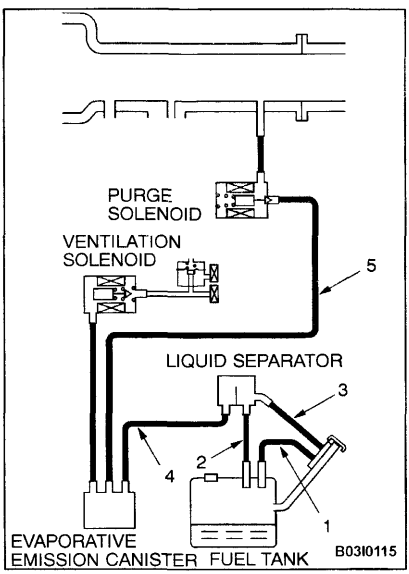
NOTE
*: If there is a blockage, scan tool MB991502 reading can be a positive value (positive pressure) due to the heat of return fuel from the engine.

STEP 10. Vacuum reading on both the mechanical gauge and scan tool MB991502 reaches the specifications and satisfy the specifications after 20 seconds:

EVAP system is properly working at the moment. The cause of DTC might have been a loose fuel cap and the customer may have already tightened fuel cap causing the MIL to turn on. No further steps are needed.

STEP 11. Vacuum reading on the mechanical gauge reaches 2.9 kPa (0.42 psi) but scan tool MB991502 does not reach –2.9 kPa (–0.42 psi) :

(1) If the vacuum reading on the gauge reaches 2.9 kPa (0.42 psi) but the reading on scan tool MB991502 does not reach –2.9 kPa (–0.42 psi), either a system blockage or a bad differential pressure sensor may be the cause.
(2) To determine if there is a blockage in the system, remove the fuel cap.
- If the vacuum reading on the vacuum gauge [at this point 2.9 kPa (0.42 psi)] remains the same, there is a blockage in the system. Go to Step 12.
- If the reading drops to about 0 kPa (0 psi), there is no blockage in the EVAP system. The fuel tank differential pressure sensor needs to be replaced. After replacing the differential pressure sensor, go to Step 15.

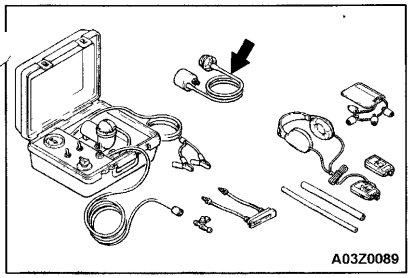


STEP 12. System blockage inspection.

(1) Disconnect the number 1 and 2 hoses shown in the illustration, check the mechanical vacuum gauge reading. If the vacuum reading does not drop, then the blockage is not in the fuel tank.
(2) Disconnect one portion of the EVAP system at a time working towards the front of the vehicle until blockage is found (number 1 to 5 hoses in the illustration).
(3) Repair the location of the blockage and go to Step 15.

STEP 13. Vacuum readings on both the mechanical gauge and scan tool MB991502 do not reach the specifications [2.9 kPa (0.42 psi) and –2.9 kPa (–0.42 psi)]:

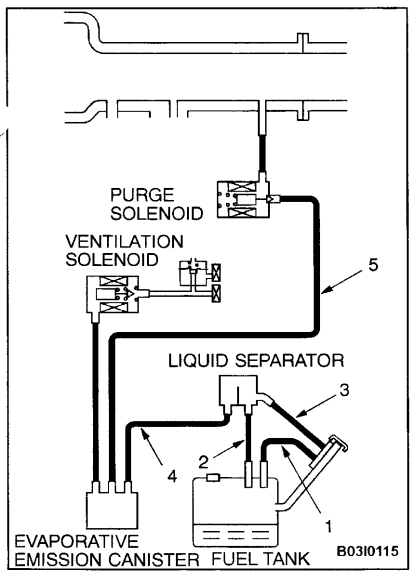
This condition shows that there is a significant leakage in the system. The inspection procedure for the large system leakage is the same as the small leakage test in Step 14.



STEP 14. Vacuum readings on both the mechanical gauge and scan tool MB991502 do not reach the specification [2.9 kPa (0.42 psi) and –2.9 kPa (–0.42 psi)] but do not maintain the vacuum.

This condition shows that there is a slight leakage in the system. Follow the procedure below to locate the source of the leak.

(1) The fuel cap relief valve inspection.
   a. Remove the fuel cap and install the fuel tank filler tube adapter in the emission system tester kit in place of the fuel cap.
   b. Plug the nipple on the fuel tank filler tube adapter.
   c. Repeat the performance test. If the EVAP system holds the vacuum, then the fuel cap is faulty. Replace the fuel cap, and go to Step 15.



(2) To find the vacuum leakage in the system, clamp the number 1 and 2 hoses shown in the illustration. Repeat the performance test. This will determine if the vacuum leak is either in the fuel tank area or in the rest of the system.

NOTE: In this case, as we clamped off the vacuum hose connecting to the fuel tank, scan tool MB991502 reading will not change. Please use the mechanical gauge reading.

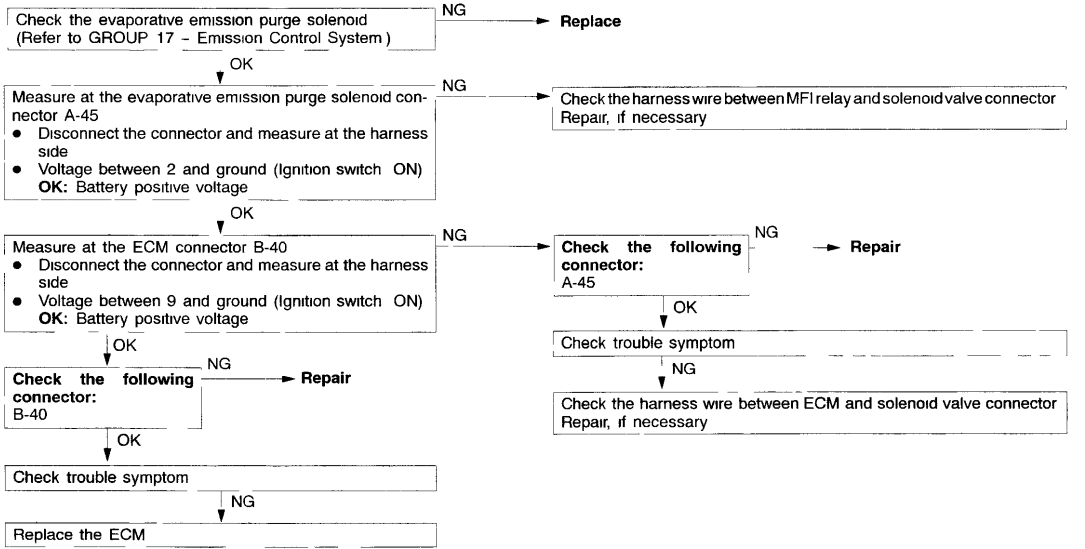
- If the EVAP system hold the vacuum leak is in the fuel tank area. To locate the leakage, pressurize the EVAP system to 3.4 kPa (0.49 psi) and look for leaky area using the ultrasonic leak detector in the Evaporative Emission System Tester. After repairing the leakage, go to Step 15.
- If the vacuum leak still exists, the leak is at other than fuel tank area.

(3) Clamp off the vacuum hose one component at a time working towards the front of the vehicle until leakage is found (number 1 to 5 hoses shown in the illustration).
(4) Repair the leakage at that location and go to Step 15.

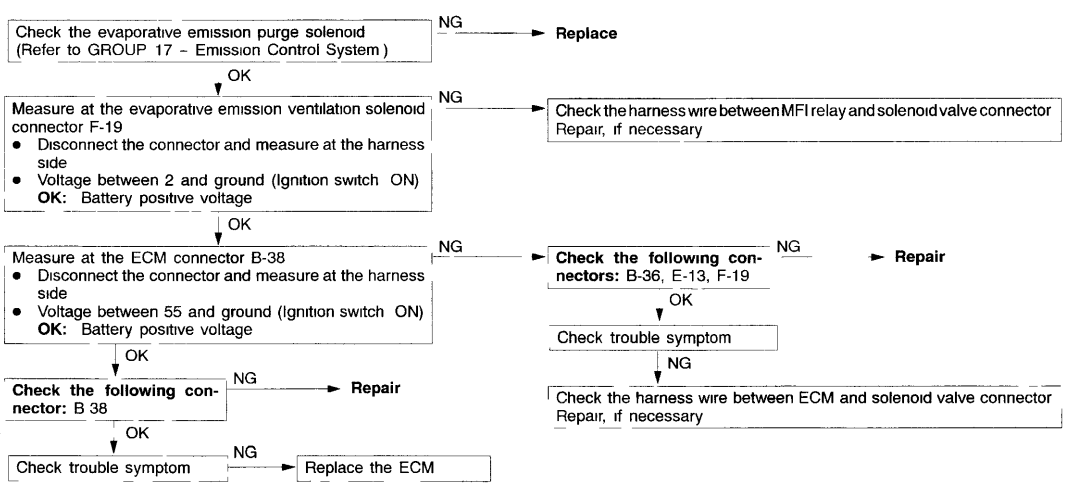
STEP 15. Confirmation test.

After system failures are repaired, repeat the Evaporative Emission System Leak Monitor test (Step 2) to check that the EVAP system operates correctly.

Code No. P0443 Evaporative Emission Control System Purge Control Valve Circuit Malfunction	Probable cause
Background • The engine control module checks current flows in the evaporative emission purge solenoid (No 1) drive circuit when the solenoid is ON and OFF Check Area • Battery voltage is not lower than 10V Judgment Criteria • Solenoid coil surge voltage (more than system voltage +2V) is not detected when the EVAP purge solenoid is turned on/off • Monitored only once per trip	• Evaporative emission purge solenoid failed • Open or shorted evaporative emission purge solenoid circuit, or loose connector • Engine control module failed

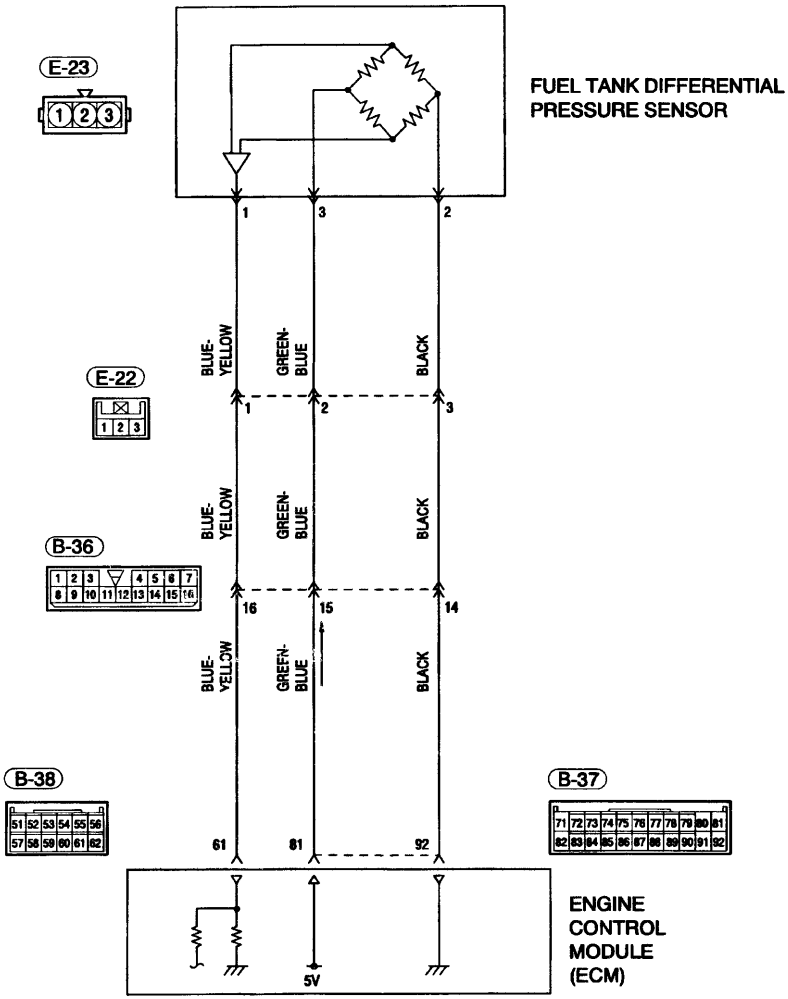


Code No. P0446 Evaporative Emission Control System Vent Control Malfunction	Probable cause
[Comment] Background • The engine control module checks current flows in the evaporative emission ventilation solenoid drive circuit when the solenoid is ON and OFF Check Area • Battery voltage is 10 V or higher Judgment Criteria • Solenoid coil surge voltage (system voltage +2 V) is not detected when the EVAP emission vent solenoid is turned on/off • Monitored only once per trip	• Evaporative emission ventilation solenoid failed • Open or shorted evaporative emission ventilation solenoid circuit, or loose connector • Engine control module failed

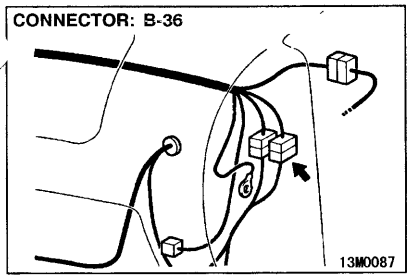


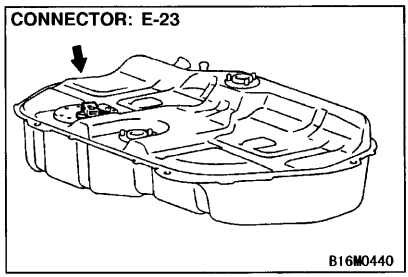
Code No.	Evaporative Emission Control System Pressure Sensor Malfunction
P0450	

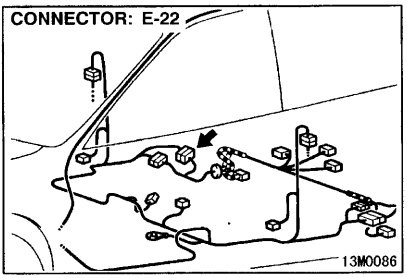
Fuel Tank Differential Pressure Sensor Circuit

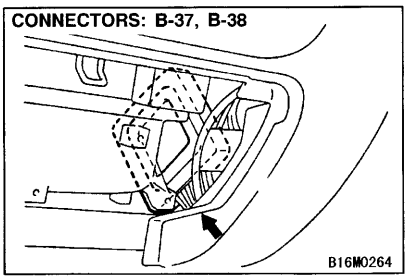


13M0085









CIRCUIT OPERATION

- A 5-volt voltage is supplied to the power terminal of the fuel tank differential pressure sensor (terminal 3) from the ECM (terminal 81). The ground terminal (terminal 2) is grounded with the ECM (terminal 92).
- A voltage proportional to the pressure in the fuel tank is sent from the output terminal of the fuel tank differential pressure sensor (terminal 1) to the ECM (terminal 61).

TECHNICAL DESCRIPTION

- The fuel tank differential pressure sensor outputs the voltage in proportion to the pressure in the fuel tank (differential pressure against the barometric pressure).
- The ECM checks whether the output voltage of the fuel tank differential pressure sensor is with in the specified range.

DTC SET CONDITIONS

Check Area

- Intake air temperature is higher than 5°C (41°F).
- Engine speed is higher than 1,600 r/min.
- Volumetric efficiency is between 20 and 80 percent.

Judgement Criteria

- The sensor output voltage is more than 4 volts for 10 seconds even if the evaporative emission purge solenoid is driven at a 100 percent duty when the intake air temperature is between 5 and 45°C (41 – 113°F).

or

- The sensor output voltage is less than 1 volt for 10 seconds even if the evaporative emission purge solenoid is not driven when the intake air temperature is 5°C (41°F) or more.

Check Area

- The throttle valve is closed.
- Engine speed is 840 r/min or less.
- Vehicle speed is 1.5 km/h (0.93 mph) or less.

Judgement Criteria

- The events are counted 20 times or more that sudden pressure fluctuation of at least 0.2 volts is detected for 25 milliseconds or more.
- The above events are detected continuous eight times during normal driving condition.

NOTE: If the number of the pressure fluctuation does not reach 20 during one engine idling, the count number will be reset to zero. In addition, the count number will be also reset to zero if the ignition switch is turned off.

NOTE: The engine control module determines that the engine has deflected from the idle operation if all of the following conditions are met.

- Engine speed is higher than 2,500 r/min.
- Vehicle speed is 15 km/h (9.3 mph) or more.
- Volumetric efficiency is 55 percent or more.

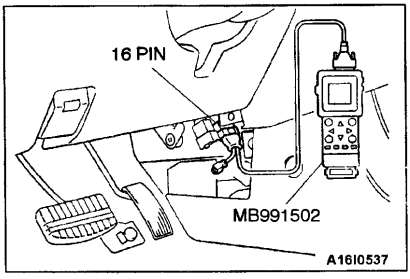
TROUBLESHOOTING HINTS

The most likely causes for this code to be set are:

- Fuel tank differential pressure sensor failed.
- Open or shorted fuel tank differential pressure sensor circuit, or loose connector.
- ECM failed.

OVERVIEW OF TROUBLESHOOTING

- DTC P0450 can be set if either of the following conditions occur:
  1. Faulty fuel tank differential pressure sensor, related circuit, or ECM.
  2. Faulty fuel tank filler tube vent valve or blocked vapor line.
- If the fuel tank filler tube vent valve is faulty and stays closed or the vapor line is blocked, the pressure inside the fuel tank is increased as the evaporative fuel is not purged especially at hot ambient temperatures. Once the pressure inside the fuel tank reaches 6 kPa, the sensor output voltage also reaches and remains 4.5 volts. This will set DTC P0450.
- To check a system blockage, do a performance test which uses a mechanical vacuum gauge and scan tool MB991502 (MUT-II) set on the fuel tank differential pressure sensor (TANK PRS SNSR 73). The mechanical gauge reading is used to verify scan tool MB991502 reading. A comparison of the mechanical gauge to scan tool MB991502 determines the problem in the system.



DIAGNOSIS

Required Special Tool:
MB991502: Scan Tool (MUT-II)

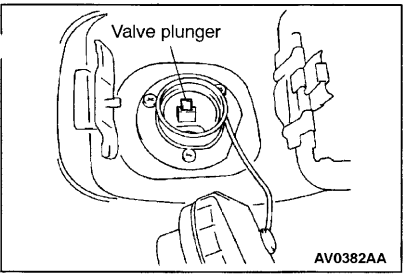
Caution
To prevent damage to scan tool MB991502, turn the ignition switch off before connecting or disconnecting scan tool MB991502.

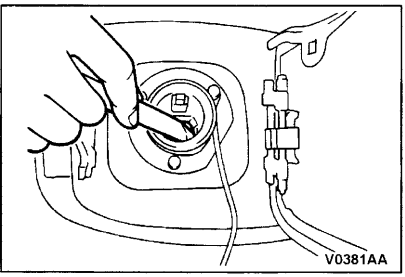
In this procedure, scan tool MB991502 should be used in the metric mode (showing the value in kPa). If not, set scan tool MB991502 by selecting the "System Setup" at the main menu.

STEP 1. Using scan tool MB991502, check "Fuel tank differential pressure sensor (date list 73)" output.

In this step, check the fuel tank differential pressure sensor reading to determine if the fuel tank differential pressure sensor is operating correctly.

(1) Check the MFI data list item: TANK PRS SNSR 73
(2) Watch the sensor reading. This value varies depending on pressure inside the fuel tank.
(3) Remove the fuel cap.
(4) After the fuel cap has been removed, the pressure sensor reading should be between -0.5 kPa (-0.07 psi) and 0.5 kPa (0.07 psi).
    - If the reading is between -0.5 kPa (-0.07 psi) and 0.5 kPa (0.07 psi), the DTC could be caused by an intermittent electrical malfunction, or by a blockage in the EVAP system. Go to step 2.
    - If the reading is not between -0.5 kPa (-0.07 psi) and 0.5 kPa (0.07 psi), there is an electrical malfunction. Go to step 9.





STEP 2. Check the fuel vent valve plunger and flapper door operation.

NOTE: When a fuel nozzle is inserted to the fuel tank filler tube and the flapper door is opened, the fuel vent valve is closed (plunger moves towards the top of the neck). When the fuel cap is closed, the fuel cap pushes the plunger back in, which then opens the vent valve. If the flapper door or plunger does not operate properly, the vent valve stays closed even after the fuel cap is closed. This may block the vapor passage and set the DTC P0450.

(1) Remove the fuel cap.
(2) Push the flapper in to operate the valve.

NOTE: When the flapper is pushed in, the plunger of the valve should move towards the top.

(3) Reinstall and tighten the fuel cap until three clicks are heard.
(4) Remove the cap again and check the protrusion of the plunger to verify if it is pushed back.
(5) The distance between the tip of vent valve plunger and that of fuel tank filler tube should be 28 mm (1.1 inches) or more.
- If the plunger does not return, replace the fuel tank filler tube and securely tighten the cap.
- If the operation is OK, install and securely tighten the fuel cap.
  Go to Step 3.

STEP 3. Evaporative Emission System Leak Monitor Test using scan tool MB991502.

NOTE: This monitor is carried out at an engine speed of 1,600 r/min or more, transmission is in "N" or "R" position. The engine speed has to be automatically adjusted.

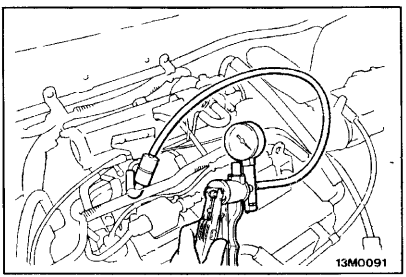
(1) Erase the DTCs using scan tool MB991502. Ensure that the fuel cap is securely tightened.
(2) Select "System Test" and press "YES" key.
(3) Select "Evap Leak Mon" and press "YES" key.
(4) If "Evap Leak Mon" is selected before starting the engine, "Engine must be running." is displayed. In this case, start the engine and then select "Evap Leak Mon" again.
(5) If "Keep the TPS in idle position. during the test." is displayed, the ECM or PCM adjusts engine speed automatically. A manual adjustment for engine speed is not needed.
(6) Keep the idling position during the monitor.

NOTE: If the engine speed does not reach 2,000 r/min during the monitor test, adjustment of the Speed Adjusting Screw may be needed Refer to P.13B-143 for the adjustment procedure.

(7) Item "In Progress" is displayed during the monitor. Keep the engine speed and load within the defined range. Scan tool MB991502 shows these items on the screen.
Item "In Progress" will be change from "NO" to "YES" by keeping engine conditions.

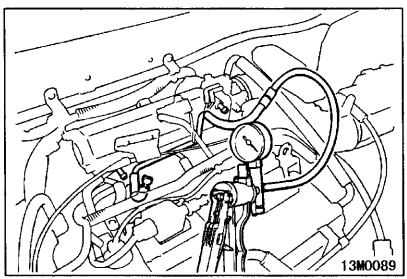
(8) Message "Evap Leak Mon. Completed. Test Passed." is displayed when the test has been completed without malfunction. Evaporative emission system is working property at the moment. Please explain to customer that improperly tightened fuel cap can cause to turn MIL on. No further steps are needed.
(9) Message "Evap Leak Mon. Completed. Test Failed & DTCs Set." is displayed when a malfunction has been detected during the test. Go to Step 4.
(10) Message "Evap Leak Mon. discontinued. Retest again from the first" is displayed when the monitor was discontinued by a certain reason (input vehicle speed, engine speed and engine load was put of the specified range). Turn the ignition switch off once and start the monitor from the beginning.

NOTE: The monitor will not start unless turning off the ignition switch once and restart the engine.



STEP 4. Check the purge solenoid-to-air intake plenum hose for blockage.

(1) Disconnect the purge solenoid-to-air intake plenum hose at the purge solenoid side.
(2) Connect a hand vacuum pump to the disconnected hose end.
(3) Apply vacuum, and check if the vacuum is not maintained.
- If not maintained, go to STEP 5.
- If maintained, replace the hose or intake plenum. Then go to STEP 6.



STEP 5. Check the purge solenoid-to-air intake plenum hose for vacuum leakage.

(1) Plug the purge solenoid-to-air intake plenum hose at the purge solenoid side.
(2) Disconnect the purge solenoid-to-air intake plenum hose at the air intake plenum side.
(3) Connect a hand vacuum pump to disconnected hose end.
(4) Apply vacuum, and check if the vacuum is maintained.
- If maintained, go to STEP 6.
- If not maintained, replace the hose. Then go to STEP

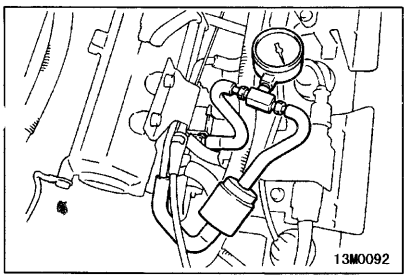
STEP 6. Performance test.

NOTE: Fuel temperature should be lower than 40°C (104°F) during the performance test.

In this step, verify if the EVAP system works properly, or determine which area of the evaporative emission system has a failure.

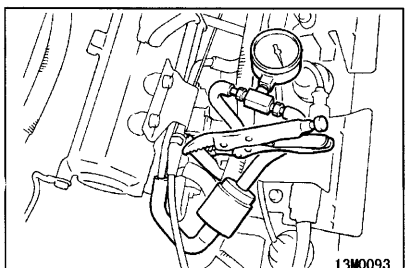
Caution
As a 0 – 6.2 kPa (0 – 0.90 psi) range vacuum gauge is used, the gauge may be broken if excessive vacuum pressure is applied. Do not apply a vacuum of more than 2.9 kPa (0.42 psi).

To achieve the performance test efficiently, a mechanical vacuum gauge [0 – 6.2 kPa (0 – 0.90 psi) range] and scan tool MB991502 should be used, and the engine to generate vacuum.

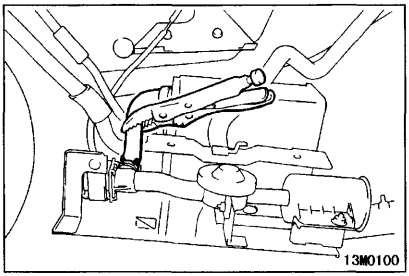

13M0092

(1) Install a mechanical vacuum gauge [0 – 6.2 kPa (0 – 0.90 psi) range] between the EVAP purge solenoid valve and the purge hose that comes from the evaporative emission canister.
(2) Before starting the performance test, set the vehicle in the following condition.
- Engine coolant temperature: 80 – 90°C (176 – 203°F)
- Lights and all accessories: OFF
- Transmission: "N" or "P" position

(3) Select the item TANK PRS SNSR (data list 73) on scan tool MB991502 to see the fuel tank differential pressure sensor output.
(4) Run the engine at idle.


13M0093

(5) Using locking pliers, pinch the hose between the purge solenoid and the intake plenum to close the purge flow, as a preparation of the performance test.



(6) Using another locking pliers, pinch the vent hose between the evaporative emission canister and the vent solenoid. Momentary, remove the locking pliers at the purge hose; this will cause the vacuum build up in the EVAP system.

(7) The engine vacuum comes from the purge port through the purge solenoid.

NOTE: During this operation, the purge solenoid may turn off but will resume in operation in about 20 seconds. Operation of the purge solenoid can be checked by needle fluctuation of the mechanical vacuum gauge.

(8) Watch the vacuum reading on the mechanical vacuum gauge and scan tool MB991502.

(9) When the vacuum reading reaches 2.9 kPa (0.42 psi) on the mechanical vacuum gauge and –2.9 kPa (–0.42 psi) on scan tool MB991502, pinch the hose between the purge solenoid and the intake manifold plenum using another locking pliers; this stops the application of vacuum and seals the EVAP system for the leak test.

NOTE: If there is a system failure, either of both vacuum readings may not reach to the above specifications. In this case, it is not necessary to pinch off the purge hose as shown. Refer to the performance test results table below for further steps.

(10) After an elapsed time of 20 seconds, check the fuel tank differential pressure reading on scan tool MB991502.

OK: Change in pressure reading is 0.4 kPa (0.06 psi) or less [holding –2.5 kPa (–0.36 psi) or more vacuum].

Performance test result table:

MECHANICAL VACUUM GAUGE READING	SCAN TOOL MB991502 READING	RESULT	GO TO
Reaches 2.9 kPa (0.42 psi).	Reaches –2.9 kPa (–0.42 psi) and vacuum drops not more than 0.4 kPa (0.06 psi) in 20 seconds.	Satisfactory. No leak nor blockage detected.	Step 7
Reaches 2.9 kPa (0 42 psi).	Does not reach –2.9 kPa (–0 42 psi).*	Blockage in the system or bad differential pressure sensor.	Step 8
Does not reach 2.9 kPa (0.42 psi).	Does not reach –2 9 kPa (–0 42 psi).	Large leak in EVAP system	Step 11
Reaches 2.9 kPa (0.42 psi).	Reaches –2.9 kPa (–0 42 psi) but vacuum drops more than 0 4 kPa (0 06 psi) in 20 seconds.	Small leak in EVAP system.	Step 12

NOTE

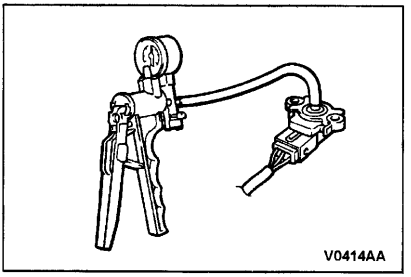
* If there is a blockage, scan tool MB991502 reading can be positive value (positive pressure) due to heat of return fuel from the engine.

STEP 7. Vacuum reading on both the mechanical gauge and scan tool MB991502 reaches the specifications and satisfy the specifications after 20 seconds:

EVAP system is properly working at the moment. The cause is an intermittent electrical wiring problem. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points.

STEP 8. Vacuum reading on the mechanical gauge reaches 2.9 kPa (0.42 psi) but scan tool MB991502 does not reach –2.9 kPa (–0.42 psi) :

(1) If the vacuum reading on the gauge reaches 2.9 kPa (0.42 psi) but the reading on scan tool MB991502 does not reach –2.9 kPa (–0.42 psi), either a system blockage or a bad differential pressure sensor may be the cause.
(2) To determine if there is a blockage in the system, remove the fuel cap.
- If the vacuum reading on the vacuum gauge [at this point 2.9 kPa (0.42 psi)] remain the same, there is a blockage in the system, and go to Step 8.
- If the reading drops to about 0 kPa (0 psi), there is no blockage in the EVAP system. Then the fuel tank differential pressure sensor need to be tested. Go to Step 9.


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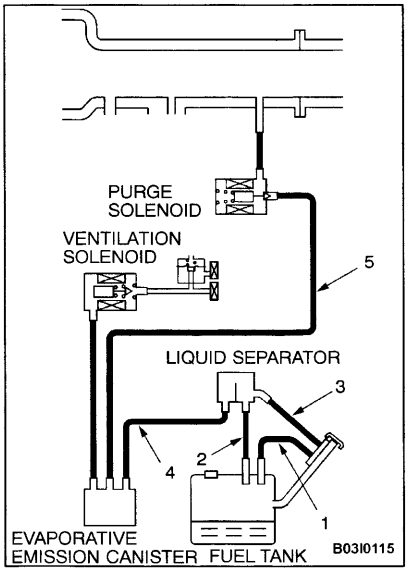
STEP 9. Check the fuel tank differential pressure sensor.

(1) Remove the floor carpet and floor cover.
(2) Remove the fuel tank differential pressure sensor. Do not disconnect the connector at this point.
(3) Connect the fuel tank differential pressure sensor to a hand vacuum pump and mechanical vacuum gauge [0 – 6.2 kPa (0 – 0.90 psi) range].
(4) Turn the ignition switch "ON."
(5) Using the scan tool, check MFI data list item 73: TANK PRS SNSR while applying vacuum.

Applying vacuum (at the gauge)	Scan tool reading	Output voltage (V)
5 0 kPa (0.72 psi)	–5 kPa	1 ± 0.1
No vacuum applied	0 kPa	2.5 ± 0.1

If not correct, go to Step 13.

If correct, it can be assumed that this malfunction is caused by an intermittent electrical wiring problem. Refer to GROUP 00. How to Use Troubleshooting/Inspection Service Points.

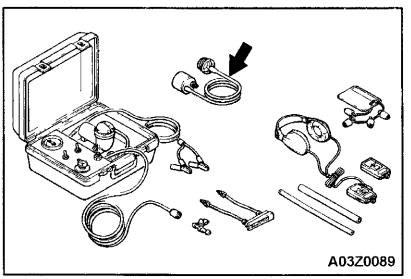


STEP 10. System blockage inspection.

(1) Disconnect the number 1 and 2 hoses shown in the illustration, check the mechanical vacuum gauge reading. If the vacuum reading does not drop, then the blockage is not in the fuel tank.
(2) Disconnect one portion of the EVAP system at a time working towards the front of the vehicle until blockage is found (number 1 to 5 hoses in the illustration).
(3) Repair the location of the blockage and go to Step 12.

STEP 11. Vacuum readings on both the mechanical gauge and scan tool MB991502 do not reach the specifications [2.9 kPa (0.42 psi) and –2.9 kPa (–0.42 psi)]:

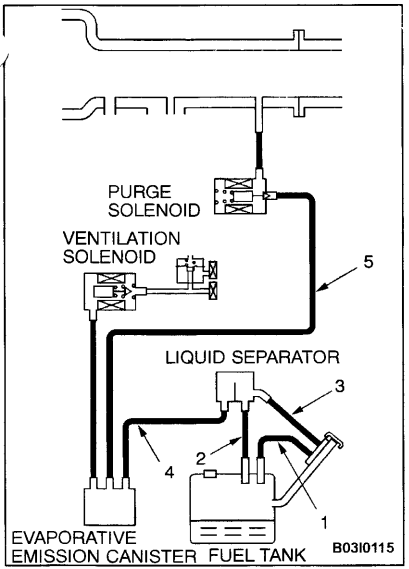
This condition shows that there is a significant leakage in the system. The inspection procedure for the large system leakage is the same as the small leakage test in Step 12.



STEP 12. Vacuum readings on both the mechanical gauge and scan tool MB991502 do not reach the specification [2.9 kPa (0.42 psi) and –2.9 kPa (–0.42 psi)] but do not maintain the vacuum.

This condition shows that there is a slight leakage in the system. Follow the procedure below to locate the source of the leak.

(1) The fuel cap relief valve inspection.
   a. Remove the fuel cap and install the fuel tank filler tube adapter in the emission system tester kit in place of the fuel cap.
   b. Plug the nipple on the fuel tank filler tube adapter.
   c. Repeat the performance test. If the EVAP system holds the vacuum, then the fuel cap is faulty. Replace the fuel cap, and go to Step 18.

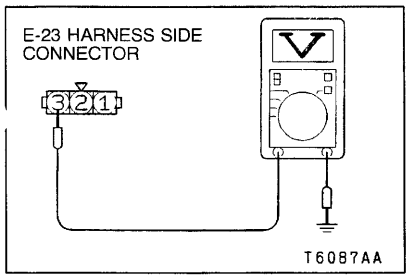


(2) To find the vacuum leakage in the system, clamp the number 1 and 2 hoses shown in the illustration. Repeat the performance test. This will determine if the vacuum leak is either in the fuel tank area or in the rest of the system.

NOTE: In this case, as we clamped off the vacuum hose connecting to the fuel tank, scan tool MB991502 reading will not change. Please use the mechanical gauge reading.

- If the EVAP system hold the vacuum leak is in the fuel tank area. To locate the leakage, pressurize the EVAP system to 3.4 kPa (0.49 psi) and look for leaky area using the ultrasonic leak detector in the Evaporative Emission System Tester. After repairing the leakage, go to Step 18.
- If the vacuum leak still exists, the leak is at other than fuel tank area.

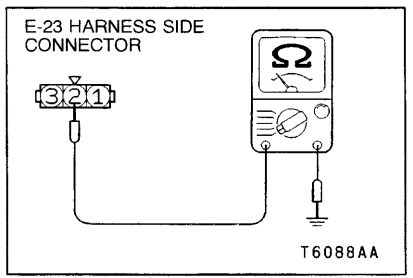
(3) Clamp off the vacuum hose one component at a time working towards the front of the vehicle until leakage is found (number 1 to 5 hoses shown in the illustration).
(4) Repair the location of the leakage and go to Step 18.



STEP 13. Check the circuits at fuel tank differential pressure sensor connector E-23.

(1) Disconnect connector E-23 and measure at the harness side.
(2) Turn the ignition switch "ON."
(3) Measure voltage between terminal 3 and ground.
- Voltage should be between 4.8 and 5.2 volts.

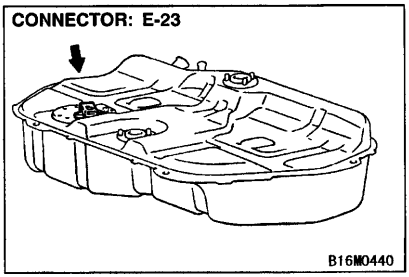
(4) Turn the ignition switch "OFF."



(5) Check for continuity between terminal 2 and ground.
- There should be continuity (0 Ω).

If all checks above meet the specifications, go to Step 14.

If any check above do not meet the specifications, go to Step 16.

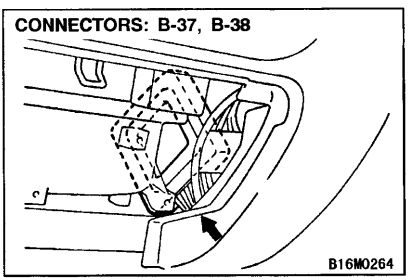


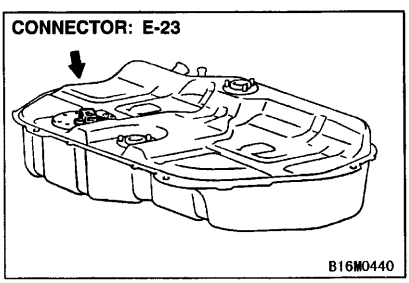
STEP 14. Check the harness wire between fuel tank differential pressure sensor connector E-23 (terminal 1) and ECM connector B-38 (terminal 61).

NOTE: Check the wire after checking intermediate connectors B-36 and E-22. If intermediate connectors B-36 and E-22 are faulty, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection. Then go to Step 18.

If the wire between fuel tank differential pressure sensor connector E-23 (terminal 1) and ECM connector B-38 (terminal 61) is not damaged, go to Step 15.

If the wire between fuel tank differential pressure sensor connector E-23 (terminal 1) and ECM connector B-38 (terminal 61) is damaged, repair it Then go to Step 18.

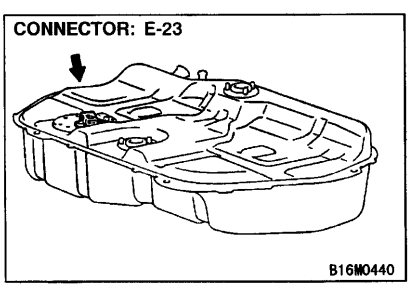




STEP 15. Check harness connector E-23 at the fuel tank differential pressure sensor for damage.

If harness connector E-23 is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection.

If harness connector E-23 is not damaged, check ECM connectors B-37 and B-38, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection. If ECM connectors B-37 and B-38 are in good condition, replace the ECM. Then go to Step 18.

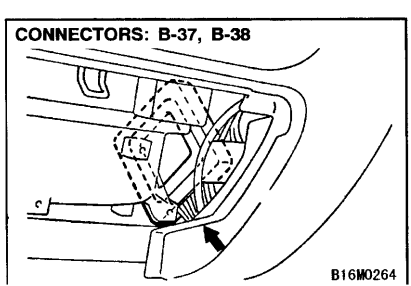


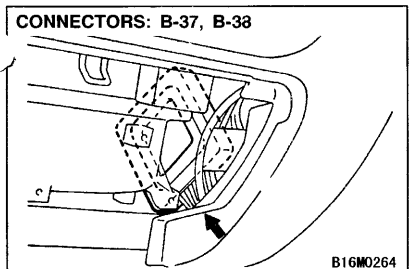
STEP 16. Check the harness wire between fuel tank differential pressure sensor connector E-23 and ECM connectors B-37 and B-38.

NOTE: Check the wire after checking the intermediate connectors B-36 and E-22. If the intermediate connectors B-36 and E-22 are faulty, repair or replace them. Refer to GROUP 00E. Harness Connector Inspection. Then go to Step 18.

If the wire between fuel tank differential pressure sensor connector E-23 and ECM connectors B-37 and B-38 are not damaged, go to Step 17.

If the wire between fuel tank differential pressure sensor connector E-23 and ECM connectors B-37 and B-38 are damaged, repair it. Then go to Step 18.





STEP 17. Check harness connectors B-37 and B-38 at the ECM.

If harness connectors B-37 and B-38 are damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection.

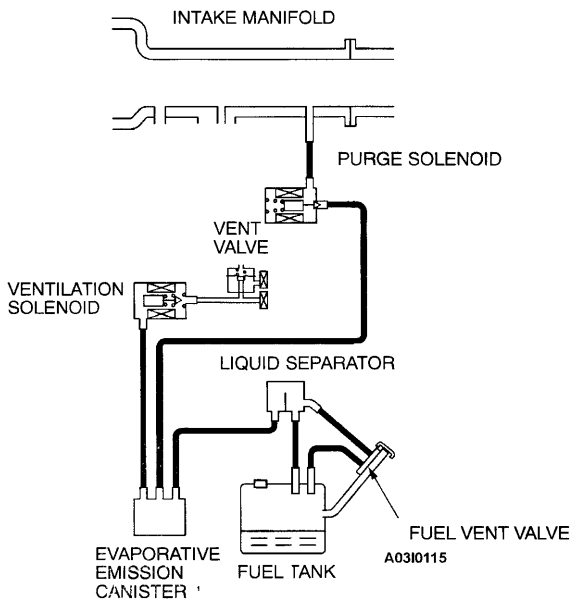
If harness connectors B-37 and B-38 are not damaged, replace the ECM. Then go to Step 18.

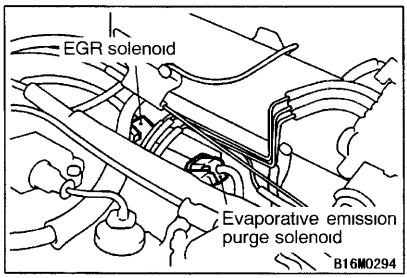
STEP 18. Confirmation test.

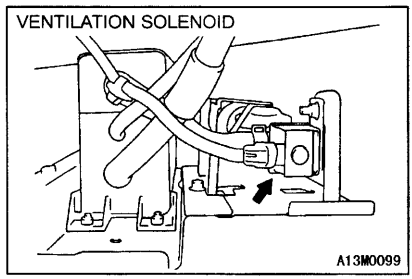
After system failures are repaired, repeat the Evaporative Emission System Leak Monitor test (Step 3) to check that the EVAP system operates correctly.

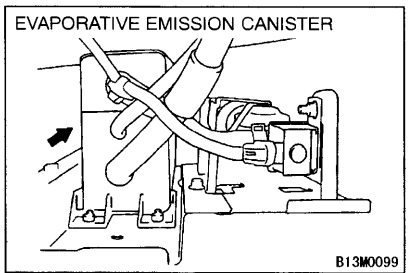
Code No.	Evaporative Emission Control System Leak Detected
P0455	(Gross Leak)

System Diagram









TECHNICAL DESCRIPTION

The ECM turns on the evaporative emission ventilation solenoid which shuts off the evaporative emission canister outlet port. Then the evaporative emission purge solenoid is driven. As a result, the fuel system will be set into a negative pressure.
When the fuel system reaches negative pressure, the evaporative emission purge solenoid is turned "off," and the fuel system are sealed. As the fuel pressure inside the fuel tank changes, the ECM judges if there is a leak in the fuel system.

DTC SET CONDITIONS

Check Area

- At least sixteen minutes have passed since the starting sequence was completed.
- Engine coolant temperature higher than 60°C (140°F).
- Engine speed is 1,600 r/min or more.
- Power steering pressure switch: "OFF."
- Barometric pressure is higher than 76 kPa (11 psi).
- Volumetric efficiency is at between 20 and 80 percent.
- The engine coolant temperature is 30°C (86°F) or less when the engine is started.
- Intake air temperature is higher than 5°C (41°F).
- The pressure rise when the evaporative emission purge solenoid and evaporative emission ventilation solenoid are closed is less than 451 Pa (0.065 psi).
- The pressure fluctuation width is less than 647 Pa (0.094 psi).
- At least twenty seconds have passed since pressure fluctuation detection commenced.
- Fuel tank differential pressure sensor output voltage is 1 - 4 volts.
- Intake air temperature is 30°C (86°F) or less when the engine started.
- Vehicle speed is 30 km/h (18.7 mph) or more.
- Monitoring time: 75 - 125 seconds

Judgment Criteria

- Internal pressure of the fuel tank has changed more than 843 Pa (0.122 psi) in 20 seconds after the tank and vapor line were closed.

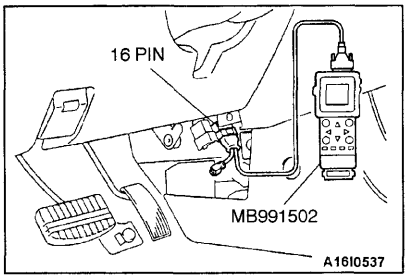
TROUBLESHOOTING HINTS

The most likely causes for this code to be set are:

- Loose fuel cap.
- Fuel cap relief pressure is incorrect.
- Evaporative emission canister seal is faulty.
- Evaporative emission canister is clogged.
- Fuel vent valve failed.
- Purge line or vapor line is clogged.
- Fuel tank, purge line or vapor line seal failed.
- Evaporative emission purge solenoid failed.
- Evaporative emission ventilation solenoid failed.
- Fuel tank differential pressure sensor failed.
- Engine coolant temperature sensor failed.
- Intake air temperature sensor failed.
- Power steering pressure switch failed.
- Use of incorrect fuel.

OVERVIEW OF TROUBLESHOOTING

- To determine the cause of DTC P0442, a performance test is needed. The performance test uses a mechanical vacuum gauge and scan tool MB991502 set on the fuel tank differential pressure sensor (TANK PRS SNSR 73). The mechanical gauge reading is used to verify scan tool MB991502 reading. A comparison of the mechanical gauge to scan tool MB991502 determines the problem in the system.
- Prior to doing the performance test, several simple inspections are needed to exclude some possibilities of the symptom.



DIAGNOSIS

Required Special Tool:
MB991502: Scan Tool (MUT-II)

Caution
To prevent damage to scan tool MB991502, turn the ignition switch off before connecting or disconnecting scan tool MB991502.

In this procedure, scan tool MB991502 should be used in the metric mode (showing the value in kPa). If not, set scan tool MB991502 by selecting the "System Setup" at the main menu.

STEP 1. Check for other DTCs.

If any other DTCs are set, please check those DTCs first then follow the steps below.

STEP 2. Evaporative Emission System Leak Monitor Test using scan tool MB991502.

NOTE: This monitor is carried out at an engine speed of 1,600 r/min or more, transmission is in "N" or "R" position. The engine speed has to be automatically adjusted.

(1) Erase the DTCs using scan tool MB991502. Ensure that the fuel cap is securely tightened.
(2) Select "System Test" and press "YES" key.
(3) Select "Evap Leak Mon" and press "YES" key.
(4) If "Evap Leak Mon" is selected before starting the engine, "Engine must be running." is displayed. In this case, start the engine and then select "Evap Leak Mon" again.
(5) If "Keep the TPS in idle position. during the test." is displayed, the ECM adjusts engine speed automatically. A manual adjustment for engine speed is not needed.
(6) Keep the idling position during the monitor.

NOTE: If the engine speed does not reach 2,000 r/min during the monitor test, adjustment of the Speed Adjusting Screw may be needed. Refer to P.13B-143 for the adjustment procedure.

(7) Item "In Progress" is displayed during the monitor. Keep the engine speed and load within the defined range. Scan tool MB991502 shows these items on the screen. Item "In Progress" will be change from "NO" to "YES" by keeping engine conditions.
(8) Message "Evap Leak Mon. Completed. Test Passed." is displayed when the test has been completed without malfunction. Evaporative emission system is working property at this time. Please explain to customer that improperly tightened fuel cap can cause to MIL turn on. No further steps are needed.
(9) Message "Evap Leak Mon. Completed. Test Failed & DTCs Set." is displayed when a malfunction has been detected during the test. Go to Step 3.

(10) Message "Evap Leak Mon. discontinued. Retest again from the first" is displayed when the monitor was discontinued by a certain reason (input vehicle speed, engine speed and engine load was put of the specified range). Turn the ignition switch off once and start monitoring from the beginning.

NOTE: Monitoring will not start unless turning off the ignition switch is turned off once and the engine restarted.

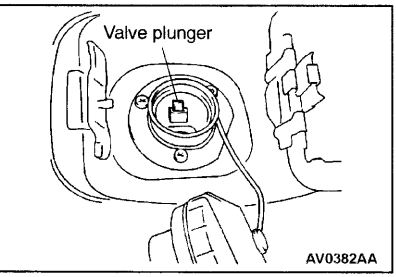
STEP 3. Using scan tool MB991502, check "Fuel tank differential pressure sensor (date list 73)" output.

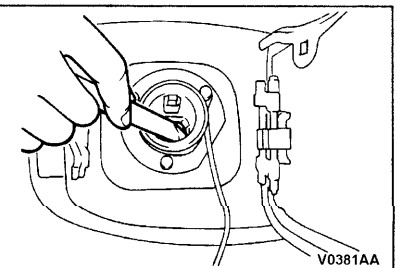
In this step, the fuel tank differential pressure sensor reading is checked to determine if the fuel tank differential pressure sensor output is within the normal range.

(1) Check the MFI data list item: TANK PRS SNSR 73
(2) Watch the sensor reading. This value varies depending on pressure inside the fuel tank.
(3) Remove the fuel cap.

NOTE: If the fuel cap is not securely tightened, it might have the cause of a leak in the EVAP system and set the DTC P0442.

(4) After the fuel cap has been removed, the pressure sensor reading should be between −0.5 kPa (−0.07 psi) and 0 5 kPa (0.07 psi).
- If the reading is between −0.5 kPa (−0.07 psi) and 0.5 kPa (0.07 psi), the fuel tank differential pressure sensor circuit is OK. Therefore, go to Step 4.
- If the reading is not between −0.5 kPa (−0.07 psi) and 0.5 kPa (0.07 psi), the fuel tank differential pressure sensor is not working properly. Replace the fuel tank differential pressure sensor.





STEP 4. Check the fuel vent valve plunger and flapper door operation.

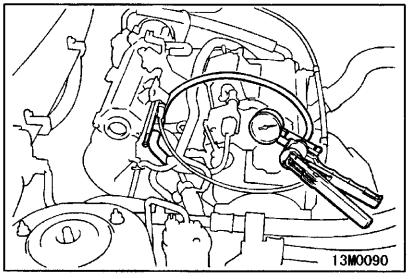
NOTE: When a fuel nozzle is inserted to the fuel tank filler tube and the flapper door is opened, the fuel vent valve is closed (plunger moves towards the top of the neck). When the fuel cap is closed, the fuel cap pushes the plunger back in, which then opens the vent valve. If the flapper door or plunger does not operate properly, the vent valve stays closed even after the fuel cap is closed. This may block the vapor passage. A faulty vent valve plunger may also cause the fuel cap not to seat properly. Either of these conditions can set DTC P0442.

(1) Remove the fuel cap.
(2) Push the flapper in to operate the valve.

NOTE: When the flapper is pushed in, the plunger of the valve should move towards the top.

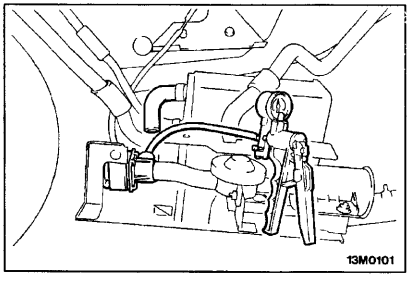
(3) Reinstall and tighten the fuel cap until three clicks are heard.
(4) Remove the cap again and check the protrusion of the plunger to verify if it is pushed back.

(5) Distance between the tip of vent valve plunger and that of fuel tank filler tube should be 28 mm (1.1 inches) or more.
- If the plunger does not return, replace the fuel tank filler tube and securely tighten the cap.
- If the operation is OK, install and securely tighten the fuel cap.



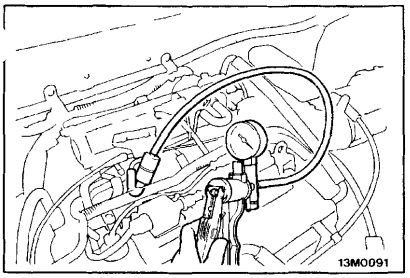
STEP 5. Using scan tool MB991502, actuator test item 08 : Evaporative Emission Purge Solenoid.

(1) Disconnect the hose connected to the evaporative emission canister from the purge solenoid.
(2) Connect a hand vacuum pump to the nipple where the hose is disconnected at the previous step.
(3) The vacuum should be maintained when vacuum is applied and vacuum should leak when the purge solenoid is activated by the actuator test of scan tool MB991502.
- If correct, go to Step 6.
- If not, refer to DTC P0443 (Evaporative Emission Control System Purge Control Valve Circuit Malfunction) on P.13B-56.



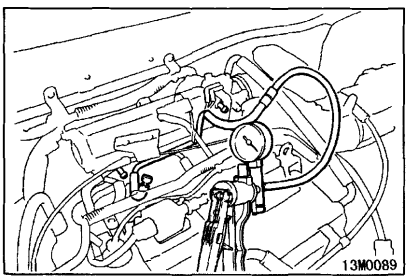
STEP 6. Using scan tool MB991502, actuator test item 29 : evaporative Emission Ventilation Solenoid.

(1) Disconnect the hose connected to the vent solenoid valve from the vent solenoid valve.
(2) Connect a hand vacuum pump to the nipple that is disconnected in the previous step.
(3) The vacuum should leak when vacuum is applied, and the vacuum should be maintained when the purge solenoid is activated by the actuator test of scan tool MB991502.
- If correct, go to Step 7.
- If not, refer to DTC P0446 (Evaporative Emission Control System Vent Control Malfunction) on P.13B-57.



STEP 7. Check the purge solenoid-to-air intake plenum hose for blockage.

(1) Disconnect the purge solenoid-to-air intake plenum hose at the purge solenoid side.
(2) Connect a hand vacuum pump to the disconnected hose end.
(3) Apply vacuum, and check if the vacuum is not maintained.
- If not maintained, go to STEP 8.
- If maintained, replace the hose or intake plenum. Then go to STEP 9.



STBP 8. Check the purge solenoid-to-air intake plenum hose for vacuum leakage.

(1) Plug the purge solenoid-to-air intake plenum hose at the purge solenoid side.
(2) Disconnect the purge solenoid-to-air intake plenum hose at the air intake plenum side.
(3) Connect a hand vacuum pump to disconnected hose end.
(4) Apply vacuum, and check if the vacuum is maintained.
- If maintained, go to STEP 9.
- If not maintained, replace the hose. Then go to STEP 9.

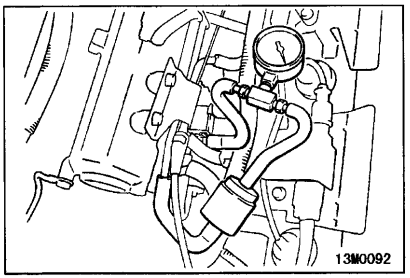
STEP 9. Performance test.

NOTE: Fuel temperature should be lower than 40°C (104°F) during the performance test.

In this step, verify if the EVAP system works properly, or determine which area of the evaporative emission system has a failure.

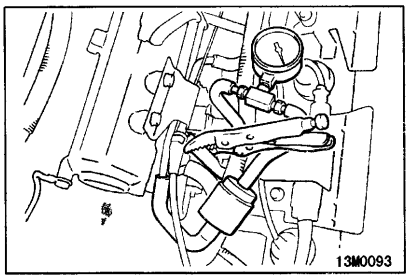
Caution
As a 0 – 6.2 kPa (0 – 0.90 psi) range vacuum gauge is used, the gauge may be broken if excessive vacuum pressure is applied. Do not apply a vacuum of more than 2.9 kPa (0.42 psi).

To achieve the performance test efficiently, a mechanical vacuum gauge [0 – 6.2 kPa (0 – 0.90 psi) range] and scan tool MB991502 should be used, and the engine to generate vacuum.

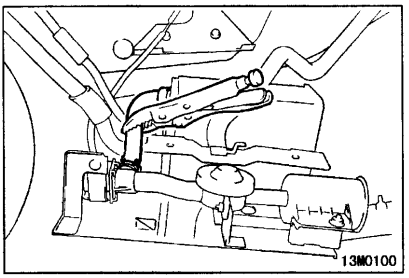


(1) Install a mechanical vacuum gauge [0 – 6.2 kPa (0 – 0.90 psi) range] between the EVAP purge solenoid valve and the purge hose that comes from the evaporative emission canister.
(2) Before starting the performance test, set the vehicle in the following condition.
- Engine coolant temperature: 80 – 90°C (176 – 203°F)
- Lights and all accessories: OFF
- Transmission: "N" or "P" position

(3) Select the item TANK PRS SNSR (data list 73) on scan tool MB991502 to see the differential pressure sensor output.
(4) Run the engine at idle.



(5) Using locking pliers, pinch the hose between the purge solenoid and the intake plenum to close the purge flow, as a preparation of the performance test.



(6) Using another locking pliers, pinch the vent hose between the evaporative emission canister and the vent solenoid. Momentary, remove the locking pliers at the purge hose; this will cause the vacuum build up in the EVAP system.
(7) The engine vacuum comes from the purge port through the purge solenoid.

NOTE: During this operation, the purge solenoid may turn off but will resume operation in about 20 seconds. Operation of the purge solenoid can be checked by needle fluctuation of the mechanical vacuum gauge.

(8) Watch the vacuum reading on the mechanical vacuum gauge and scan tool MB991502.

(9) When the vacuum reading reaches 2.9 kPa (0.42 psi) on the mechanical vacuum gauge and -2.9 kPa (-0.42 psi) on scan tool MB991502, pinch the hose between the purge solenoid and the intake manifold plenum using another locking pliers; this stops the application of vacuum and seals the EVAP system for the leak test.

NOTE: If there is a system failure, either of both vacuum readings may not reach to the above specifications. In this case, it is not necessary to pinch off the purge hose as shown. Refer to the performance test results table below for further steps.

(10) After an elapsed time of 20 seconds, check the fuel tank differential pressure reading on scan tool MB991502.

OK: Change in pressure reading is 0.4 kPa (0.06 psi) or less [holding -2.5 kPa (-0.36 psi) or more vacuum].

Performance test result table:

MECHANICAL VACUUM GAUGE READING	SCAN TOOL MB991502 READING	RESULT	GO TO
Reaches 2.9 kPa (0.42 psi).	Reaches -2.9 kPa (-0 42 psi) and vacuum drops not more than 0 4 kPa (0.06 psi) in 20 seconds	Satisfactory. No leak nor blockage detected.	Step 10
Reaches 2.9 kPa (0 42 psi).	Does not reach -2 9 kPa (-0 42 psi).*	Blockage in the system or bad differential sensor.	Step 11
Does not reach 2.9 kPa (0.42 psi).	Does not reach -2.9 kPa (-0 42 psi).	Large leak in EVAP system.	Step 13
Reaches 2 9 kPa (0.42 psi).	Reaches -2 9 kPa (-0.42 psi) but vacuum drops more than 0.4 kPa (0.06 psi) in 20 seconds.	Small leak in EVAP system.	Step 14

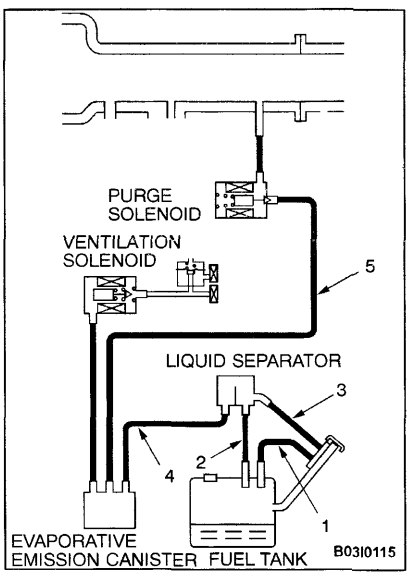
NOTE
*: If there is a blockage, scan tool MB991502 reading can be a positive value (positive pressure) due to the heat of return fuel from the engine.

STEP 10. Vacuum reading on both the mechanical gauge and scan tool MB991502 reaches the specifications and satisfy the specifications after 20 seconds:

EVAP system is properly working at the moment. The cause of DTC might have been a loose fuel cap and the customer may have already tightened fuel cap causing the MIL to turn on. No further steps are needed.

STEP 11. Vacuum reading on the mechanical gauge reaches 2.9 kPa (0.42 psi) but scan tool MB991502 does not reach –2.9 kPa (–0.42 psi) :

(1) If the vacuum reading on the gauge reaches 2.9 kPa (0.42 psi) but the reading on scan tool MB991502 does not reach –2.9 kPa (–0.42 psi), either a system blockage or a bad differential pressure sensor may be the cause.
(2) To determine if there is a blockage in the system, remove the fuel cap.
- If the vacuum reading on the vacuum gauge [at this point 2.9 kPa (0.42 psi)] remains the same, there is a blockage in the system. Go to Step 12.
- If the reading drops to about 0 kPa (0 psi), there is no blockage in the EVAP system. The fuel tank differential pressure sensor needs to be replaced. After replacing the differential pressure sensor, go to Step 15.

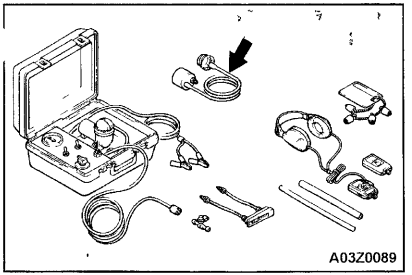


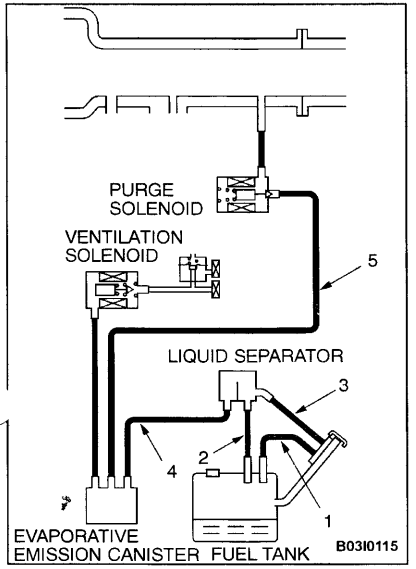
STEP 12. System blockage inspection.

(1) Disconnect the number 1 hose shown in the illustration, check the mechanical vacuum gauge reading. If the vacuum reading does not drop, then the blockage is not in the fuel tank.
(2) Disconnect one portion of the EVAP system at a time working towards the front of the vehicle until blockage is found (number 1 to 3 hoses in the illustration).
(3) Repair the location of the blockage and go to Step 15.

STEP 13. Vacuum readings on both the mechanical gauge and scan tool MB991502 do not reach the specifications [2.9 kPa (0.42 psi) and –2.9 kPa (–0.42 psi)]:

This condition shows that there is a significant leakage in the system. The inspection procedure for the large system leakage is the same as the small leakage test in Step 14.





STEP 14. Vacuum readings on both the mechanical gauge and scan tool MB991502 do not reach the specification [2.9 kPa (0.42 psi) and –2.9 kPa (–0.42 psi)] but do not maintain the vacuum.

This condition shows that there is a slight leakage in the system. Follow the procedure below to locate the source of the leak.

(1) The fuel cap relief valve inspection.
   a. Remove the fuel cap and install the fuel tank filler tube adapter in the emission system tester kit in place of the fuel cap.
   b. Plug the nipple on the fuel tank filler tube adapter.
   c. Repeat the performance test. If the EVAP system holds the vacuum, then the fuel cap is faulty. Replace the fuel cap, and go to Step 15.

(2) To find the vacuum leakage in the system, clamp the number 1 hose shown in the illustration. Repeat the performance test. This will determine if the vacuum leak is either in the fuel tank area or in the rest of the system.

   NOTE: In this case, as we clamped off the vacuum hose connecting to the fuel tank, scan tool MB991502 reading will not change. Please use the mechanical gauge reading.

   - If the EVAP system hold the vacuum leak is in the fuel tank area. To locate the leakage, pressurize the EVAP system to 3.4 kPa (0.49 psi) and look for leaky area using the ultrasonic leak detector in the Evaporative Emission System Tester. After repairing the leakage, go to Step 15
   - If the vacuum leak still exists, the leak is at other than fuel tank area.

(3) Clamp off the vacuum hose one component at a time working towards the front of the vehicle until leakage is found (number 1 to 3 hoses shown in the illustration).

(4) Repair the leakage at that location and go to Step 15.

STEP 15. Confirmation test.

After system failures are repaired, repeat the Evaporative Emission System Leak Monitor test (Step 2) to check that the EVAP system operates correctly.

Code No. P0500 Vehicle Speed Sensor Malfunction

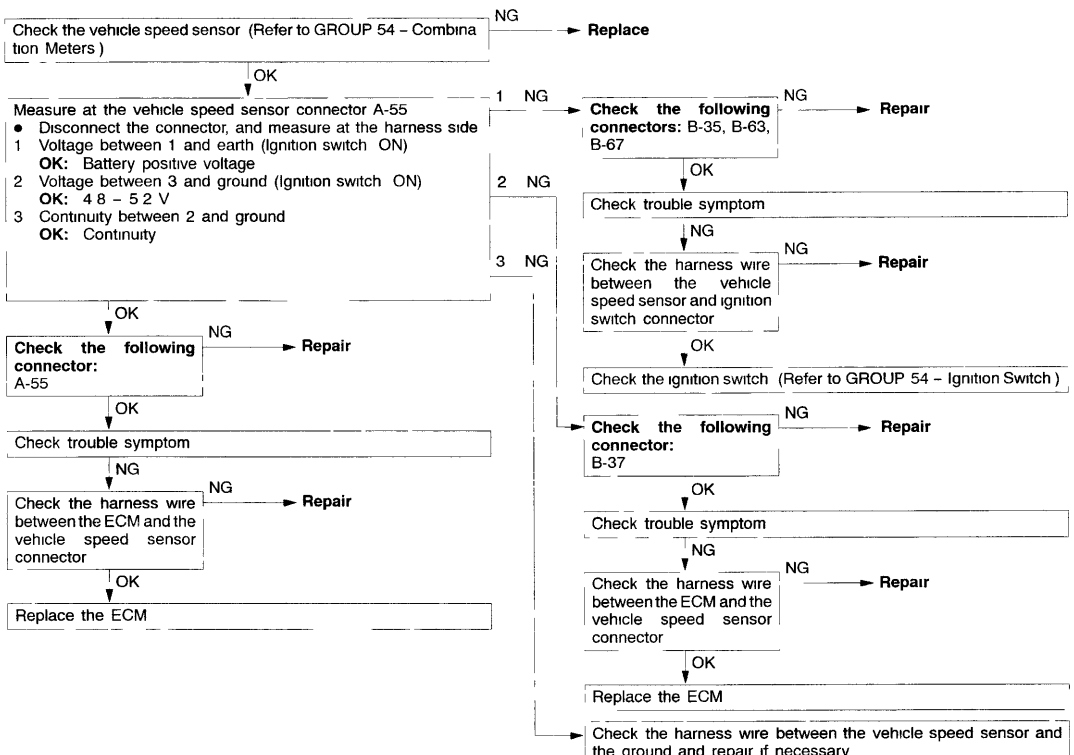
Background
- The vehicle speed sensor outputs a pulse signal while the vehicle is driven
- The engine control module checks whether the pulse signal is output

Check Area
- At least 2 seconds have passed since the engine was started
- Closed throttle position switch OFF
- Engine speed is not lower than 3000 r/min
- Volumetric efficiency is 70% or more

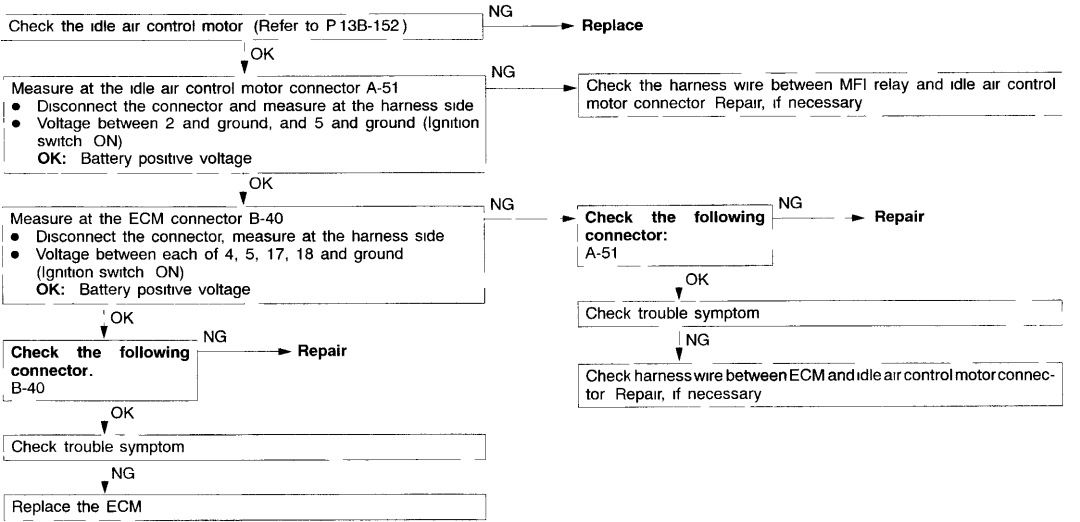
Judgment Criteria
- Sensor output voltage has not changed (no pulse signal is input) for 2 sec

Probable cause

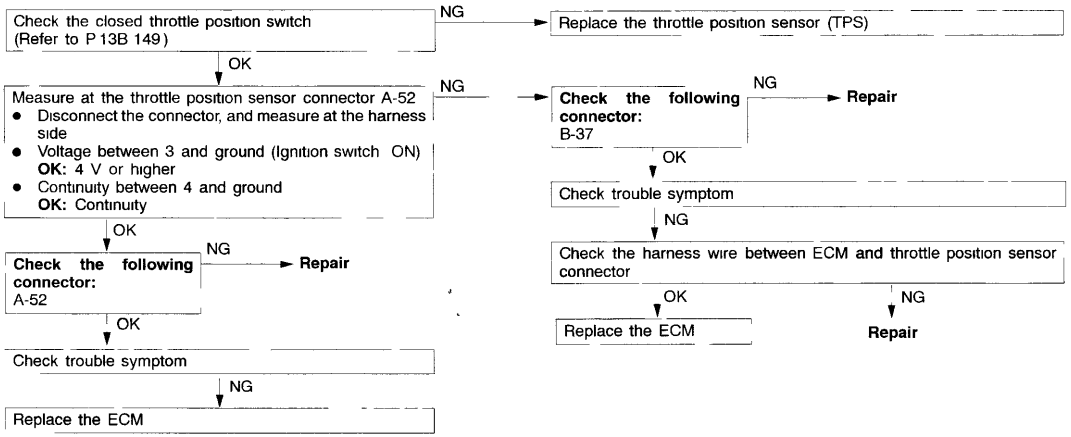
- Vehicle speed sensor failed
- Open or shorted vehicle-speed sensor circuit, or loose connector
- Engine control module failed



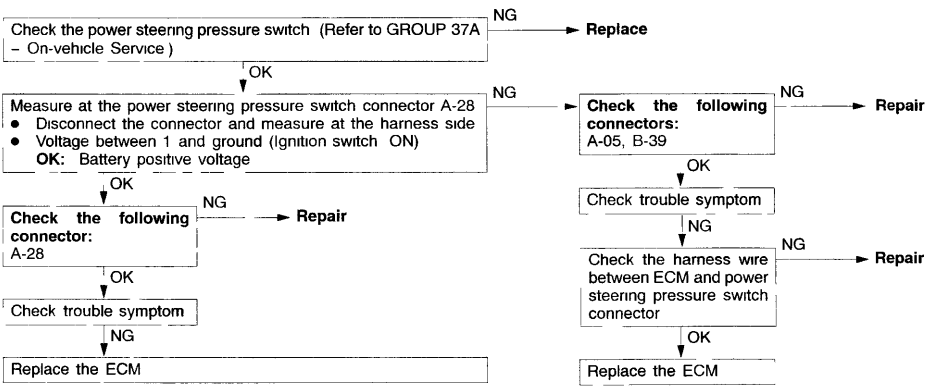
Code No. P0505 Idle Control System Malfunction	Probable cause
Background • If there is a malfunction of the IAC system, the actual engine speed will not be identical to the target engine speed • The engine control module checks the difference between the actual engine speed and the target engine speed Check Area • Vehicle speed has reached 1 5 km/h (0 93 mph) or higher at least once • Under the closed loop idle speed control Judgment Criteria • Actual idle speed has continued to be higher than the target idle speed by 300 r/min or more for 10 sec Check Area • Vehicle speed has reached 1 5 km/h (0 93 mph) or higher at least once • During idle speed closed loop control • The highest temperature at the last drive is 45°C (113°F) or less • Engine coolant temperature is approx 80°C (176°F) or more • Battery voltage is 10 V or more • Atmospheric pressure is 76 kPa (11 psi) or more • Intake air temperature is –10°C (14°F) or more Judgment Criteria • Actual idle speed has been minimum 200 r/min higher than the target idle speed for ten seconds Check Area • During idle speed closed loop control • Engine coolant temperature is about 80°C (176°F) or higher • Battery positive voltage is 10V or higher • Power steering switch is off • Volumetric efficiency is 40% or less • Atmospheric pressure is 76 kPa (11 psi) or more • Intake air temperature is –10°C (14°F) or more Judgment Criteria • Actual idle speed has been minimum 100 r/min higher than the target idle speed for ten seconds	• Idle air control motor failed • Open or shorted idle air control motor circuit, or loose connector • Engine control module failed



Code No. P0510 Closed Throttle Position Switch Malfunction	Probable cause
Background • While the engine is idling without depressing the accelerator pedal, "ON" signal can be input from the closed throttle position switch to the engine control module • The engine control module is used for checking the input signal while the engine is idling Check Area • Throttle position sensor output voltage is 2.0 V or more Judgment Criteria • Closed throttle position switch has been turned on Check Area • Repeat the *1 drive and *2 stop 15 times *1 drive: Engine speed is 1500 r/min or more, air flow sensor output frequency is 70 Hz or less for two seconds or more *2 stop: Vehicle speed is more than 1.5 km/h (0.93 mph) Judgment Criteria • Closed throttle position switch remains off	• Closed throttle position switch failed • Open or shorted closed throttle position switch circuit, or loose connector • Engine control module failed



Code No.P0551 Power Steering Pressure Sensor Circuit Range/Performance	Probable cause
Background • The steering wheel will be set to the straight-ahead position for a while during driving At that time the power steering pressure switch will be turned off • The engine control module checks whether the power steering pressure switch is turned off during drive Check Area • Intake air temperature is –10°C (14°F) or higher • Barometric pressure is 76 kPa (11 psi) or higher • Engine coolant temperature is 10°C (50°F) or more. • Repeat *1 drive and *2 stop ten times or more *1 Engine speed is 2,500 r/min or higher, volumetric efficiency is 55% or higher and vehicle speed is 5 km/h (3 1 mph) or higher for 2 seconds or more *2 Vehicle speed is 1 5 km/h (0 93 mph) or lower Judgment Criteria • Power steering pressure switch remains on	• Power steering pressure switch failed • Open or shorted power steering pressure switch circuit, or loose connector • Engine control module failed



Code No. P0705 Transmission Range Sensor Circuit Malfunction (RPNDL Input)	Probable cause
Background • When a malfunction of the park/neutral position switch is detected, the transaxle control module outputs a malfunction signal to the engine control module Range of Check, Set Conditions • A park/neutral position switch malfunction signal is input to the engine control module from the transaxle control module	• Park/neutral position switch failed • Open or shorted Park/neutral position switch circuit, or loose connector • Engine control module failed

Check the automatic transaxle diagnostic trouble codes (Refer to GROUP 23A – Troubleshooting)

Code No. P0710 Transmission Fluid Temperature Sensor Circuit Malfunction	Probable cause
Background • When a malfunction of the fluid temperature sensor is detected, the transaxle control module outputs a malfunction signal to the engine control module Check Area Judgment Criteria • The signal which indicates the failure of the oil temperature sensor is input from the transaxle control module to the engine control module	• Oil temperature sensor failed • Open or shorted oil temperature sensor circuit, or loose connector • Engine control module failed

Check the automatic transaxle diagnostic trouble codes (Refer to GROUP 23A – Troubleshooting)

Code No. P0715 Input/Turbine Speed Sensor Circuit Malfunction	Probable cause
Background • When a malfunction of the input shaft speed sensor is detected, the transaxle control module outputs a malfunction signal to the engine control module Check Area, Judgment Criteria • Input shaft speed sensor failure signal is input to the engine control module from the transaxle control module	• Input shaft speed sensor filed • Open or shorted input shaft speed sensor circuit or loose connector • Engine control module failed

Check the automatic transaxle diagnostic trouble codes
(Refer to GROUP 23A – Troubleshooting)

Code No. P0720 Output Speed Sensor Circuit Malfunction	Probable cause
Background • When a malfunction of the output shaft speed sensor is detected, the transaxle control module outputs a malfunction signal to the engine control module Check Area, Judgment Criteria • Output shaft speed sensor failure signal is input to the engine control module from the transaxle control module	• Output shaft speed sensor failed • Open or shorted output shaft speed sensor circuit or loose connector • Engine control module failed

Check the automatic transaxle diagnostic trouble codes
(Refer to GROUP 23A – Troubleshooting)

Code No. P0725 Engine Speed Input Circuit Malfunction	Probable cause
Background • When a malfunction of the crankshaft position sensor is detected, the transaxle control module outputs a malfunction signal to the engine control module Check Area, Judgment Criteria • Crankshaft position sensor failure signal is input to the engine control module from the transaxle control module	• Crankshaft position sensor failed • Open or shorted input shaft speed sensor circuit, or loose connector • Engine control module failed

Check the automatic transaxle diagnostic trouble codes
(Refer to GROUP 23A – Troubleshooting)

Code No. P0740 Torque Converter Clutch System Malfunction	Probable cause
Background • When a malfunction of the torque converter clutch or its related system is detected, the transaxle control module outputs a malfunction signal to the engine control module Check Area, Judgment Criteria • Failure signal of the torque converter clutch or its related system is input to the engine control module form the transaxle control module	• Torque converter clutch or its related system failed • Open or shorted torque converter clutch or its related system circuit or loose connector • Engine control module failed

Check the automatic transaxle diagnostic trouble codes
(Refer to GROUP 23A – Troubleshooting)

Code No. P0750 Shift Solenoid A Malfunction	Probable cause
Background • When a malfunction of the shift solenoid A (Low-reverse solenoid) is detected, the transaxle control module outputs a malfunction signal to the engine control module Check Area, Judgment Criteria • Low-reverse solenoid failure signal is input to the engine control module from the transaxle control module	• Low reverse solenoid failed • Open or shorted low-reverse solenoid circuit, or loose connector • Engine control module failed

Check the automatic transaxle diagnostic trouble codes
(Refer to GROUP 23A – Troubleshooting)

Code No. P0755 Shift Solenoid B Malfunction	Probable cause
Background • When a malfunction of the shift solenoid B (Underdrive solenoid) is detected, the transaxle control module outputs a malfunction signal to the engine control module Check Area, Judgment Criteria • Underdrive solenoid failure signal is input to the engine control module from the transaxle control module	• Underdrive solenoid failed • Open or shorted underdrive solenoid circuit, or loose connector • Engine control module failed

Check the automatic transaxle diagnostic trouble codes
(Refer to GROUP 23A – Troubleshooting)

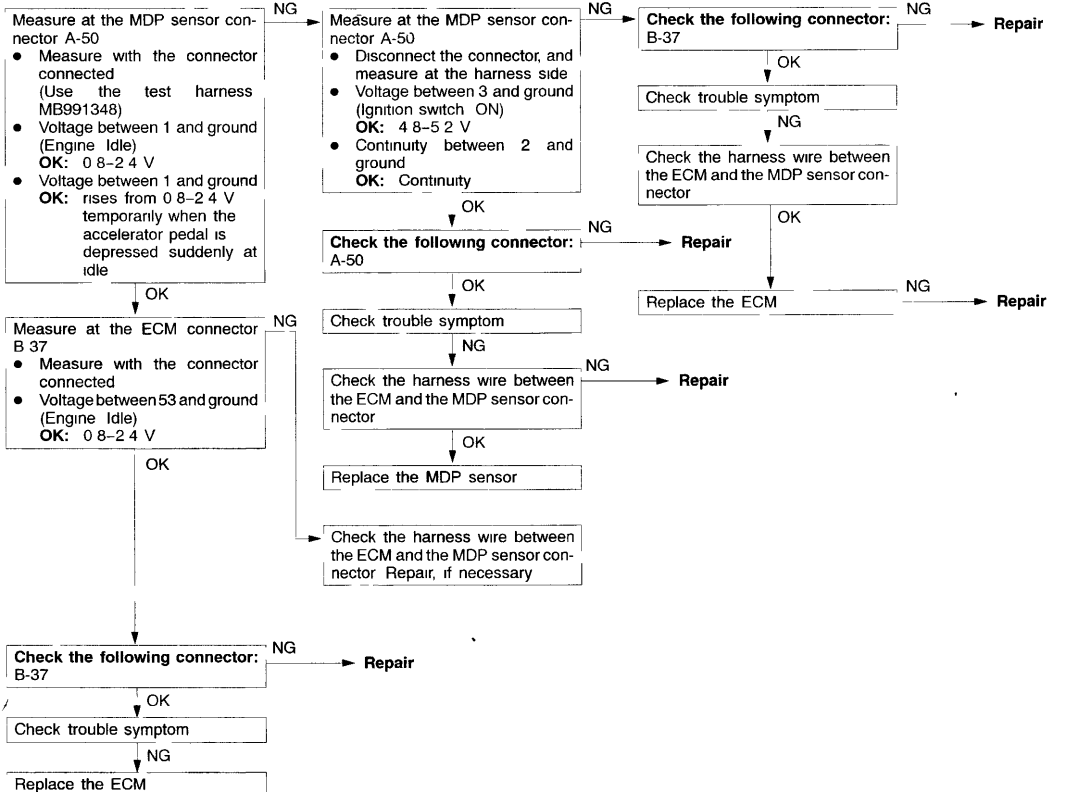
Code No. P0760 Shift Solenoid C Malfunction	Probable cause
Background • When a malfunction of the shift solenoid C (Second solenoid) is detected, the transaxle control module outputs a malfunction signal to the engine control module Check Area, Judgment Criteria • Second solenoid failure signal is input to the engine control module form the transaxle control module	• Second solenoid failed • Open or shorted second solenoid circuit, or loose connector • Engine control module failed

Check the automatic transaxle diagnostic trouble codes
(Refer to GROUP 23A – Troubleshooting)

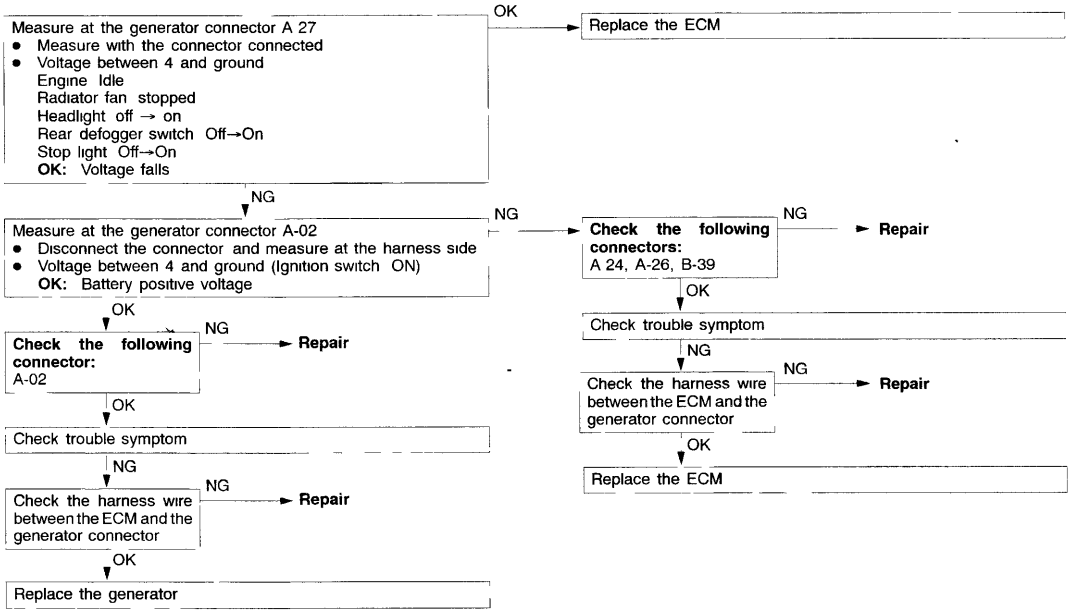
Code No. P0765 Shift Solenoid D Malfunction	Probable cause
Background • When a malfunction of the shift solenoid D (Overdrive solenoid) is detected, the transaxle control module outputs a malfunction signal to the engine control module Check Area, Judgment Criteria • Overdrive solenoid failure signal is input to the engine control module from the transaxle control module	• Overdrive solenoid failed • Open or shorted overdrive solenoid circuit, or loose connector • Engine control module failed

Check the automatic transaxle diagnostic trouble codes
(Refer to GROUP 23A – Troubleshooting)

Code No. P1400 Manifold Differential Pressure Sensor Circuit Malfunction	Probable cause
Background • The manifold differential pressure sensor outputs a voltage which corresponds to the negative pressure in the intake manifold • The engine control module checks whether the voltage output by the manifold differential pressure sensor is within a specified range Check Area • 8 min or more have passed after the engine was started However, only when the engine coolant temperature is 0°C (32°F) or less • Engine coolant temperature is not lower than 45°C (113°F) • Intake air temperature is not lower than 5°C (41°F) • Volumetric efficiency is 30% – 55% Judgment Criteria • Sensor output voltage has continued to be 4 6V [corresponding to an absolute pressure of 118 kPa (17 psi)] or higher for 2 sec or • Sensor output voltage has continued to be 0 1V [corresponding to an absolute pressure of 2 4 kPa (0 3 psi)] or lower for 2 sec Check Area • Eight minutes have passed after the engine started However, only when the engine coolant temperature when starting the engine is 0°C (32°F) or less • Engine coolant temperature is 45°C (113°F) or more • Intake air temperature is 5°C (41°F) or more • Volumetric efficiency is not lower than 30% Judgment Criteria • Sensor output voltage is 4 2 V or more for 2 seconds (Absolute pressure is approx 807 mmHg or more) Check Area • Eight minutes have passed after the engine started However only when the engine coolant temperature when starting the engine is 0°C (32°F) or less • Engine coolant temperature is 45°C (113°F) or more • Intake air temperature is 5°C (41°F) or more • Volumetric efficiency is 70% or more Judgment Criteria • Sensor output voltage is 1 8 V or less for 2 seconds (Absolute pressure is approx 46 kPa (6 7 psi) or less)	• Manifold differential pressure sensor failed • Open or shorted manifold differential pressure sensor circuit, or loose connector • Engine control module failed


Measure at the MDP sensor connector A-50
• Measure with the connector connected (Use the test harness MB991348)
• Voltage between 1 and ground (Engine Idle)
OK: 0.8–2.4 V
• Voltage between 1 and ground
OK: rises from 0.8–2.4 V temporarily when the accelerator pedal is depressed suddenly at idle
NG
Measure at the MDP sensor connector A-50
• Disconnect the connector, and measure at the harness side
• Voltage between 3 and ground (Ignition switch ON)
OK: 4.8–5.2 V
• Continuity between 2 and ground
OK: Continuity
NG
Check the following connector: B-37
NG
Repair
OK
Check trouble symptom
NG
Check the harness wire between the ECM and the MDP sensor connector
OK
Replace the ECM
NG
Repair
OK
Check the following connector: A-50
NG
Repair
OK
Check trouble symptom
NG
Check the harness wire between the ECM and the MDP sensor connector
NG
Repair
OK
Replace the MDP sensor
OK
Measure at the ECM connector B-37
• Measure with the connector connected
• Voltage between 53 and ground (Engine Idle)
OK: 0.8–2.4 V
NG
Check the harness wire between the ECM and the MDP sensor connector Repair, if necessary
OK
Check the following connector: B-37
NG
Repair
OK
Check trouble symptom
NG
Replace the ECM

Code No. P1500 Generator FR Terminal Circuit Malfunction	Probable cause
Background • When the generator field coils is controlled, the generator FR terminal inputs a signal to the engine control module • The engine control module detects the generator output with the input signal, and controls the idle air control motor according to the generator output Check Area • Engine speed is higher than 50 r/min Judgment Criteria • Input voltage from the generator FR terminal has been equal to battery positive voltage for 20 seconds	• Open circuit in generator FR terminal circuit • Engine control module failed



Code No. P1600 Serial Communication Link Malfunction	Probable cause
Background • The engine control module receives various messages from the transaxle control module via communication line • The engine control module monitors an abnormal message signal due to open circuit in communication line and transaxle control module failure Check Area • Two seconds or more have passed immediately after the engine started Judgment Criteria • Abnormal communication line (TCM to ECM) with the transaxle control module (TCM) • Transaxle control module (TCM) failed	• Automatic transaxle control system failed • Open or short circuit, or loose connector in communication line between engine control module and transaxle control module • Transaxle control module failed • Engine control module failed

Check the following connectors:
B 38 B 40
NG → **Repair**
OK ↓
Check trouble symptom
NG ↓
Check the harness wire between the ECM and the transaxle control module connector
NG → **Repair**
OK ↓
Automatic transaxle control system may be defective. Follow the automatic transaxle troubleshooting (Refer to GROUP 23A – Troubleshooting.)
OK ↓
Replace the ECM

Code No. P1720 Vehicle Speed Sensor Signal Line	Probable cause
Background • When a malfunction of the vehicle speed sensor is detected, the transaxle control module outputs a malfunction signal to the engine control module Check Area, Judgment Criteria • Vehicle speed sensor failure signal is input to the engine control module from the transaxle control module	• Vehicle speed sensor failed • Open or shorted output vehicle speed sensor circuit, or loose connector • Engine control module failed

Check the automatic transaxle diagnostic trouble codes (Refer to GROUP 23A – Troubleshooting.)

Code No. P1751 A/T Control Relay Malfunction	Probable cause
Background • When a malfunction of the A/T control relay is detected, the transaxle control module outputs a malfunction signal to the engine control module Check Area, Judgment Criteria • A/T control relay failure signal is input to the engine control module from the transaxle control module	• A/T control relay failed • Open or shorted output A/T control relay circuit, or loose connector • Engine control module failed

Check the automatic transaxle diagnostic trouble codes (Refer to GROUP 23A – Troubleshooting.)

Code No. P1795 Throttle Position Input Circuit Malfunction	Probable cause
Background • When a malfunction of the throttle position sensor is detected, the transaxle control module outputs a malfunction signal to the engine control module Check Area, Judgment Criteria • Throttle position sensor failure signal is input to the engine control module from the transaxle control module	• Throttle position sensor failed • Open or shorted input shaft speed sensor circuit, or loose connector • Engine control module failed

Check the automatic transaxle diagnostic trouble codes (Refer to GROUP 23A – Troubleshooting.)

INSPECTION CHART FOR TROUBLE SYMPTOMS

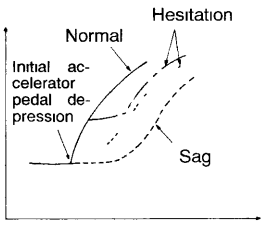
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Trouble symptom		Inspection procedure No.	Reference Page
Communication with scan tool is impossible.	Communication with all systems is not possible.	1	13B-92
	Communication with ECM only is not possible	2	13B-92
Service Engine Soon/ Malfunction Indicator Lamp and related parts	The Service Engine Soon/Malfunction Indicator Lamp does not illuminate right after the ignition switch is turned to the ON position.	3	13B-93
	The Service Engine Soon/Malfunction Indicator Lamp remains illuminated and never goes out.	4	13B-94
Starting	Cranks, won't start	5	13B-94
	Fires up and dies	6	13B-95
	Hard starting	7	13B-96
Idling stability (Improper idling)	Unstable idle. (Rough idle, hunting)	8	13B-97
	Idle speed is high. (Improper idle speed)	9	13B-98
	Idle speed is low (Improper idle speed)	10	13B-99
Idling stability (Engine stalls)	When the engine is cold, it stalls at idle (Die out)	11	13B-100
	When the engine becomes hot, it stalls at idle. (Die out)	12	13B-101
	The engine stalls when accelerating. (Pass out)	13	13B-102
	The engine stalls when decelerating.	14	13B-102
Driving	Hesitation, sag or stumble	15	13B-103
	Acceleration shock	16	13B-103
	Deceleration shock	17	13B-104
	Poor acceleration	18	13B-104
	Surge	19	13B-105
	Knocking	20	13B-105
Dieseling		21	13B-105
Too high CO and HC concentration when idling		22	13B-106
Generator output voltage is low (approx. 12.3V)		23	13B-107
Fans (radiator fan, A/C condenser fan) are inoperative		24	13B-107
IM240 test failure	Transient, mass emission tailpipe test	25	13B-108
	Purge flow test of the evaporative canister	26	13B-109
	Pressure test of the evaporative system	27	13B-109

PROBLEM SYMPTOMS TABLE (FOR YOUR INFORMATION)

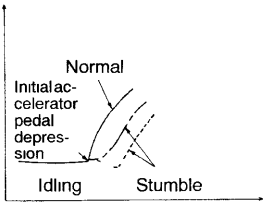
Items		Symptom
Starting	Won't start	The starter is used to crank the engine, but there is no combustion within the cylinders, and the engine won't start.
	Fires up and dies	There is combustion within the cylinders, but then the engine soon stalls.
	Hard starting	Engine starts after cranking a while.
Idling stability	Hunting	Engine speed doesn't remain constant; changes at idle
	Rough idle	Usually, a judgement can be based upon the movement of the tachometer pointer, and the vibration transmitted to the steering wheel, shift lever, body, etc This is called rough idle.
	Incorrect idle speed	The engine doesn't idle at the usual correct speed.
	Engine stall (Die out)	The engine stalls when the foot is taken from the accelerator pedal, regardless of whether the vehicle is moving or not
	Engine stall (Pass out)	The engine stalls when the accelerator pedal is depressed or while it is being used.
Driving	Hesitation Sag	"Hesitation" is the delay in response of the vehicle speed (engine speed) that occurs when the accelerator is depressed in order to accelerate from the speed at which the vehicle is now traveling, or a temporary drop in vehicle speed (engine speed) during such acceleration Serious hesitation is called "sag". (Refer to Fig. 1)
	Poor acceleration	Poor acceleration is inability to obtain an acceleration corresponding to the degree of throttle opening, even though acceleration is smooth, or the inability to reach maximum speed.
	Stumble	Engine speed increase is delayed when the accelerator pedal is initially depressed for acceleration (Refer to Fig. 2)
	Shock	The feeling of a comparatively large impact or vibration when the engine is accelerated or decelerated.
	Surge	This is slight acceleration and deceleration feel usually felt during steady, light throttle cruise Most notable under light loads.
	Knocking	A sharp sound like a hammer striking the cylinder walls during driving and which adversely affects driving
Stopping	Run on ("Dieseling")	The condition in which the engine continues to run after the ignition switch is turned to OFF. Also called "Dieseling".

Fig. 1



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Fig. 2

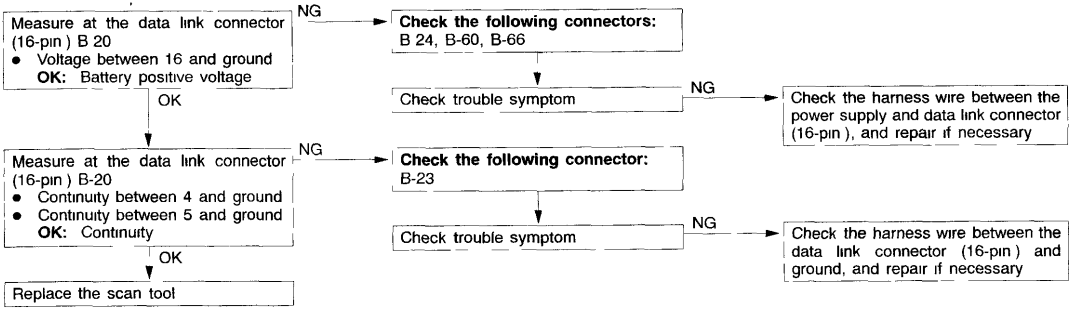


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INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

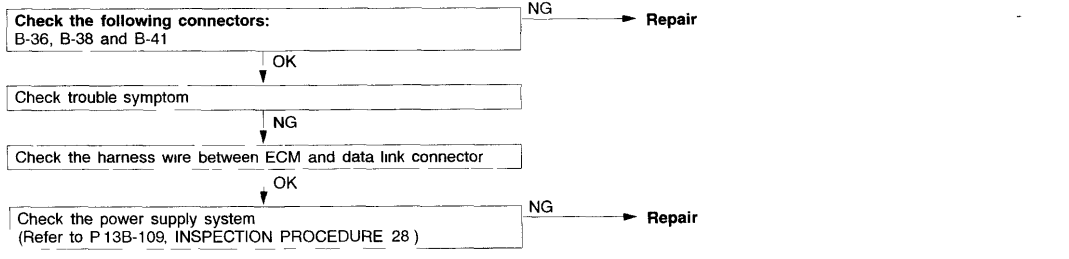
INSPECTION PROCEDURE 1

Communication with scan tool is not possible. (Communication with all systems is not possible.)	Probable cause
The cause is probably a defect in the power supply system (including ground) for the on board diagnostic test mode line	• Malfunction of the connector • Malfunction of the harness wire



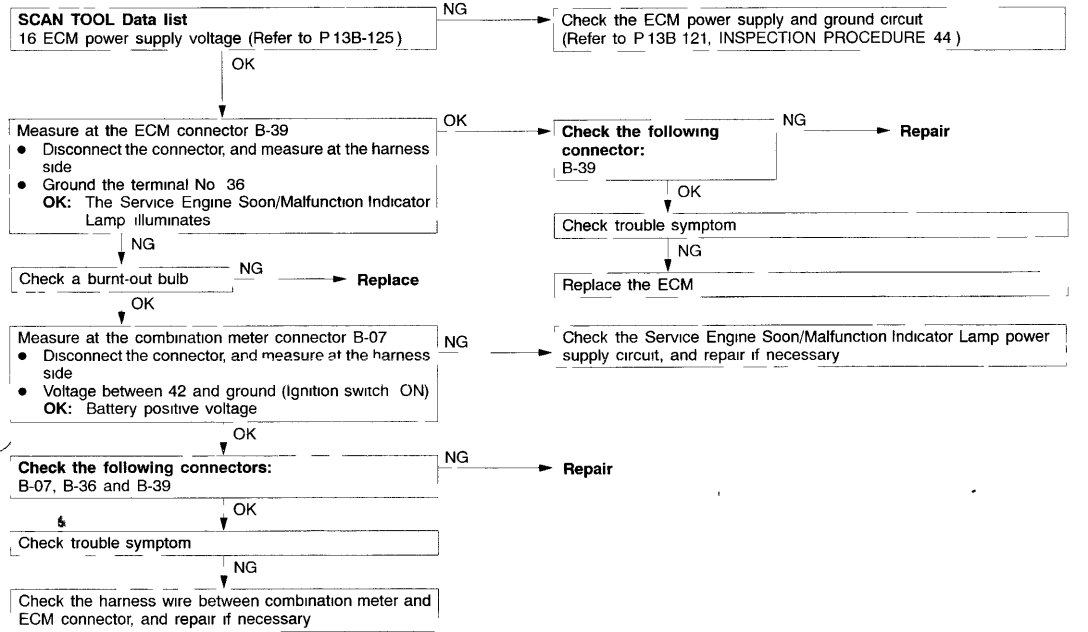
INSPECTION PROCEDURE 2

Scan tool communication with ECM is not possible.	Probable cause
One of the following causes may be suspected • No power supply to ECM • Defective ground circuit of ECM • Defective ECM • Improper communication line between ECM and scan tool	• Malfunction of ECM power supply circuit • Malfunction of the ECM • Open circuit between ECM and data link connector



INSPECTION PROCEDURE 3

The Service Engine Soon/Malfunction Indicator Lamp does not illuminate right after the ignition switch is turned to the ON position.	Probable cause
The ECM causes the Service Engine Soon/Malfunction Indicator Lamp to illuminate for five seconds immediately after the ignition switch is turned to ON If the Service Engine Soon/Malfunction Indicator Lamp does not illuminate immediately after the ignition switch is turned to ON one of the malfunctions listed at right has probably occurred	• Burnt-out bulb • Defective Service Engine Soon/Malfunction Indicator Lamp circuit • Malfunction of the ECM



INSPECTION PROCEDURE 4

The Service Engine Soon/Malfunction Indicator Lamp remains illuminated and never goes out.	Probable cause
In cases such as the above, the cause is probably that the ECM is detecting a problem in a sensor or actuator or that one of the malfunctions listed at right has occurred	• Short-circuit between the Service Engine Soon/Malfunction Indicator Lamp and ECM • Malfunction of the ECM

SCAN TOOL DTC
Are diagnostic trouble codes output?
- YES → Refer to P 13B-22, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES
- NO ↓

Measure at the combination meter connector B-07
- Disconnect the connector, and measure at the harness side
- Disconnect the ECM connector
- Continuity between 53 and ground

OK: No continuity
- NG → Check the harness wire between combination meter and ECM connector, and repair if necessary
- OK ↓

Replace the ECM

INSPECTION PROCEDURE 5

Cranks, won't start	Probable cause
In cases such as the above, the cause is probably no spark, or fuel delivery or fuel quality problems In addition, foreign materials (water, kerosene, etc) may be mixed with the fuel	• Malfunction of the ignition system • Malfunction of the fuel pump system • Malfunction of the injectors • Malfunction of the ECM • Foreign materials in fuel

Check battery positive voltage when cranking
OK: 8 V or higher
- NG → Check the battery (Refer to GROUP 54–Battery)
- OK ↓

Scan tool Inspection of no initial combustion (Refer to P 13B-115, INSPECTION PROCEDURE 36)
- OK ↓

Can any sound be heard from the injectors when cranking? (Refer to P 13B-152)
- NG → Check the injector circuit malfunction (Refer to P 13B-37, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES P0201, P0202 P0203, P0204)
- OK ↓

Ignition system Inspection of no initial combustion (Refer to P 13B-115, INSPECTION PROCEDURE 37)
- OK ↓

Check the following items
- Check the ignition coil, spark plugs, spark plug cables
- Check if the injectors are clogged
- Check if foreign materials (water, alcohol, etc) got into fuel
- Check the compression pressure

INSPECTION PROCEDURE 6

Fires up and dies.	Probable cause
In such cases as the above, the cause is usually improper air/fuel mixture It is possible, though less likely that the spark plugs are generating sparks but the sparks are weak	• Malfunction of the ignition system • Malfunction of the injector system • Foreign materials in fuel • Poor compression • Malfunction of the ECM

Check battery positive voltage when cranking
OK: 8 V or higher
NG → Check the battery (Refer to GROUP 54–Battery)
OK ↓

Scan tool Check if incomplete combustion occurs (Refer to P 13B-116, INSPECTION PROCEDURE 38)
OK ↓

Can any sound be heard from the injectors when cranking? (Refer to P 13B-152.)
NG → Check the injector circuit malfunction (Refer to P 13B-37, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES P0201, P0202, P0203, P0204)
OK ↓

Is starting good if the engine is cranked with the accelerator pedal slightly depressed?
YES → Check idle air control motor for operation sound (Refer to P 13B-152)
NG → Check the idle control system malfunction (Refer to P 13B-81 INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0505)
OK ↓
- Clean the throttle valve area (Refer to P 13B-142)
- Check and adjust the fixed SAS (Refer to P 13B-143)

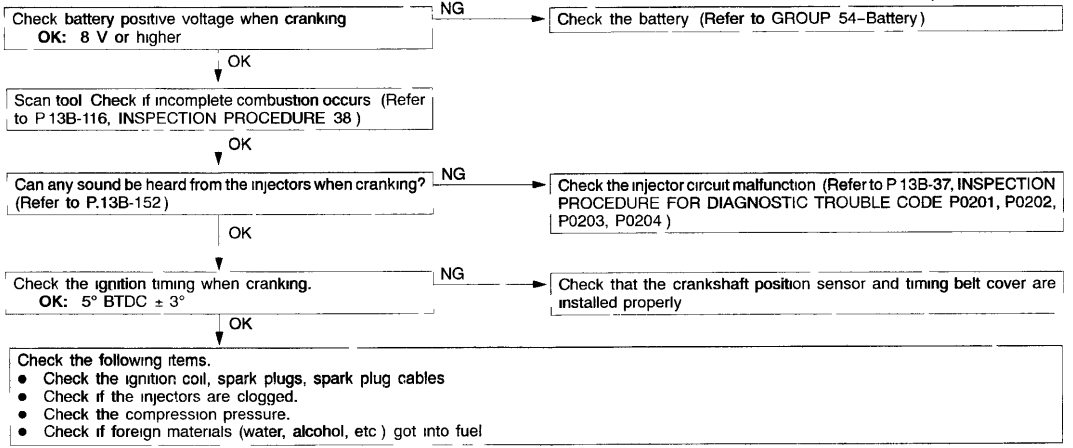
NO ↓

Check the ignition timing when cranking
OK: 5° BTDC ± 3°
NG → Check that the crankshaft position sensor and timing belt cover are installed properly
OK ↓

Check the following items
- Check the ignition coil spark plugs, spark plug cables
- Check if the injectors are clogged
- Check the compression pressure
- Check fuel lines for clogging
- Check if foreign materials (water, alcohol etc) got into fuel

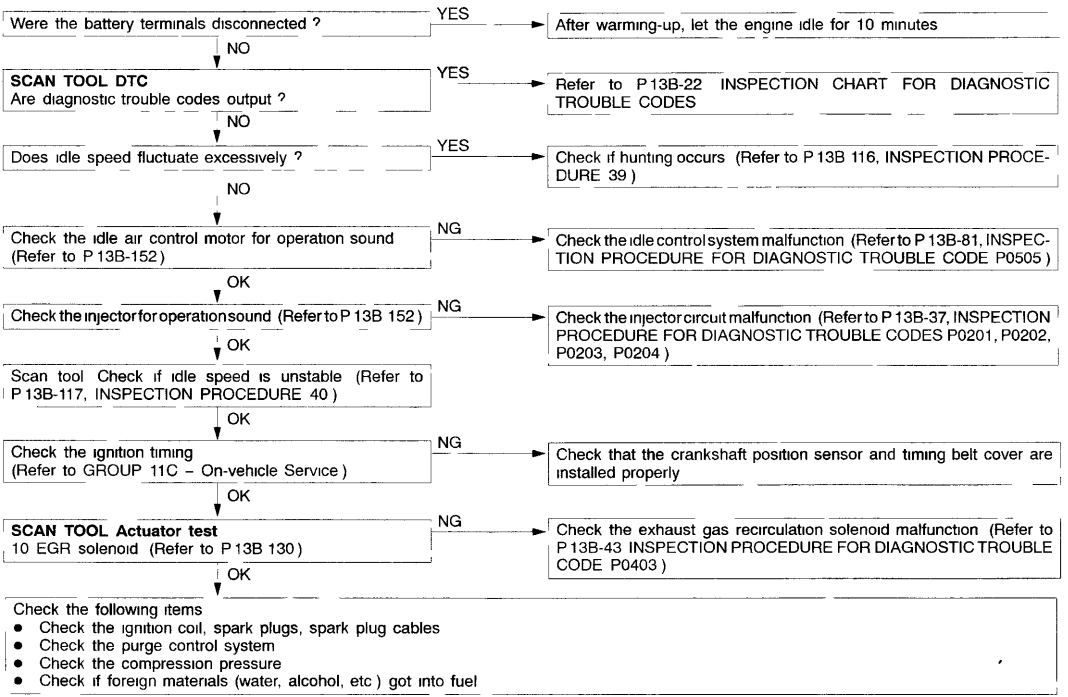
INSPECTION PROCEDURE 7

Hard starting	Probable cause
In cases such as the above, the cause is probably that the spark is weak and ignition is difficult, the initial mixture for starting is not appropriate, or sufficient compression pressure is not being obtained.	• Malfunction of the ignition system • Malfunction of the injector system • Inappropriate fuel quality • Poor compression



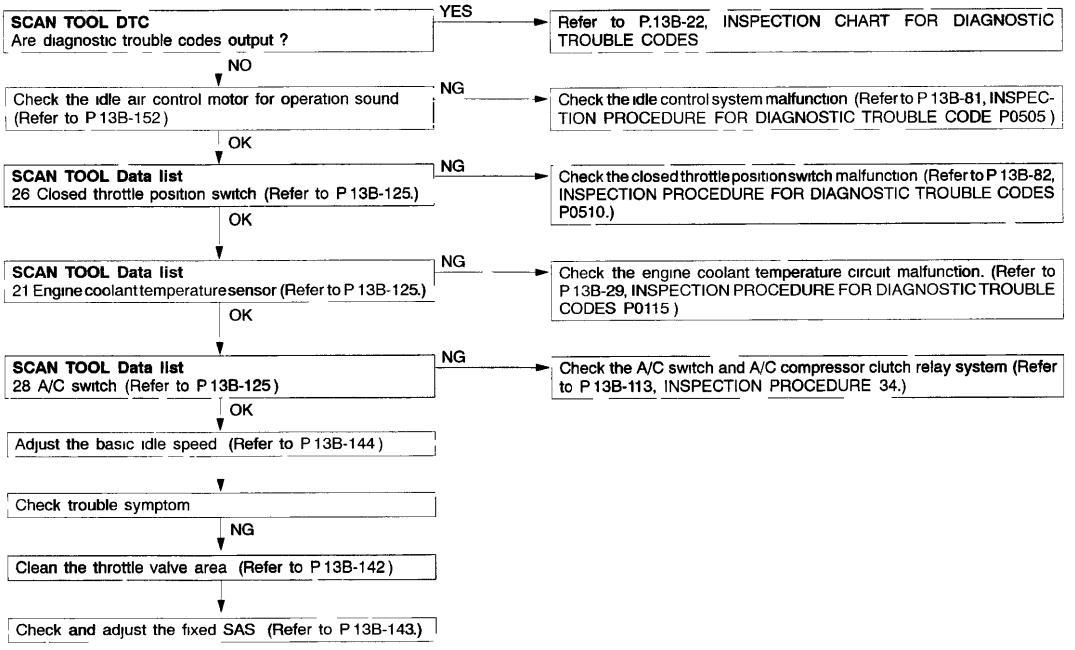
INSPECTION PROCEDURE 8

Unstable idle (Rough idle, hunting)	Probable cause
In cases such as the above, the cause is probably that the ignition system air/fuel mixture, idle air control motor or compression pressure is defective Because the range of possible causes is broad, inspection is narrowed down to simple items	• Malfunction of the ignition system • Malfunction of air-fuel ratio control system • Malfunction of the IAC system • Malfunction of the evaporative emission purge solenoid system • Poor compression • Vacuum leak • Malfunction of the EGR solenoid system



INSPECTION PROCEDURE 9

Idle speed is high. (Improper idle speed)	Probable cause
In such cases as the above, the cause is probably that the intake air volume during idle is too great	• Malfunction of the idle air control motor system • Malfunction of the throttle body



INSPECTION PROCEDURE 10

Idle speed is low. (Improper idle speed)	Probable cause
In cases such as the above, the cause is probably that the intake air volume during idling is too small	• Malfunction of the idle air control motor system • Malfunction of the throttle body

SCAN TOOL DTC
Are diagnostic trouble codes output ?
YES → Refer to P.13B-22, INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES
NO ↓

Check the idle air control motor for operation sound (Refer to P.13B-152)
NG → Check the idle control system malfunction (Refer to P.13B-81, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0505.)
OK ↓

SCAN TOOL Data list
26 Closed throttle position switch (Refer to P.13B-125.)
NG → Check the closed throttle position switch malfunction (Refer to P.13B-82, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES P0510.)
OK ↓

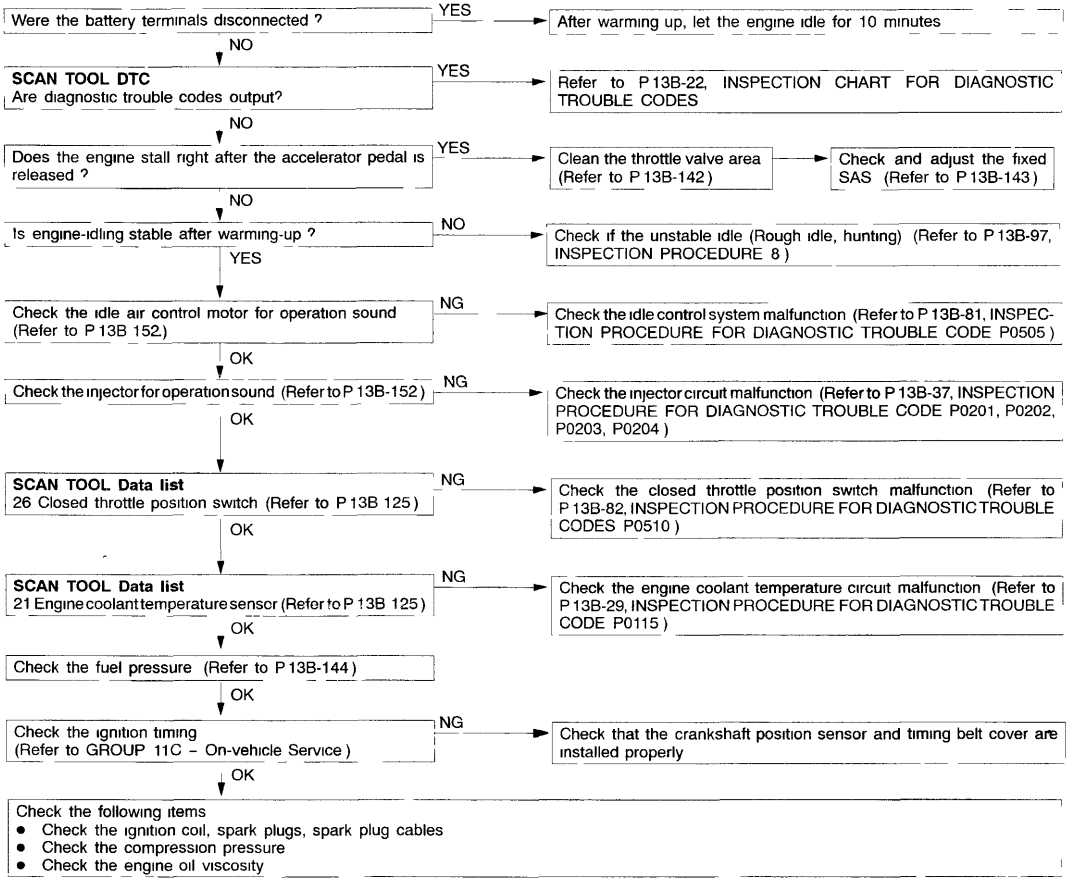
SCAN TOOL Data list
21 Engine coolant temperature sensor (Refer to P.13B-125)
NG → Check the engine coolant temperature circuit malfunction (Refer to P.13B-29, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES P0115)
OK ↓

SCAN TOOL Data list
29 Park/neutral position switch (Refer to P.13B-125)
NG → Check the ignition switch-ST and park/neutral position switch system. (Refer to P.13B-112, INSPECTION PROCEDURE 32)
OK ↓

Adjust the basic idle speed (Refer to P.13B-144)
↓
Check trouble symptom
NG ↓
Clean the throttle valve area (Refer to P.13B-142)
↓
Check and adjust the fixed SAS (Refer to P.13B-143)

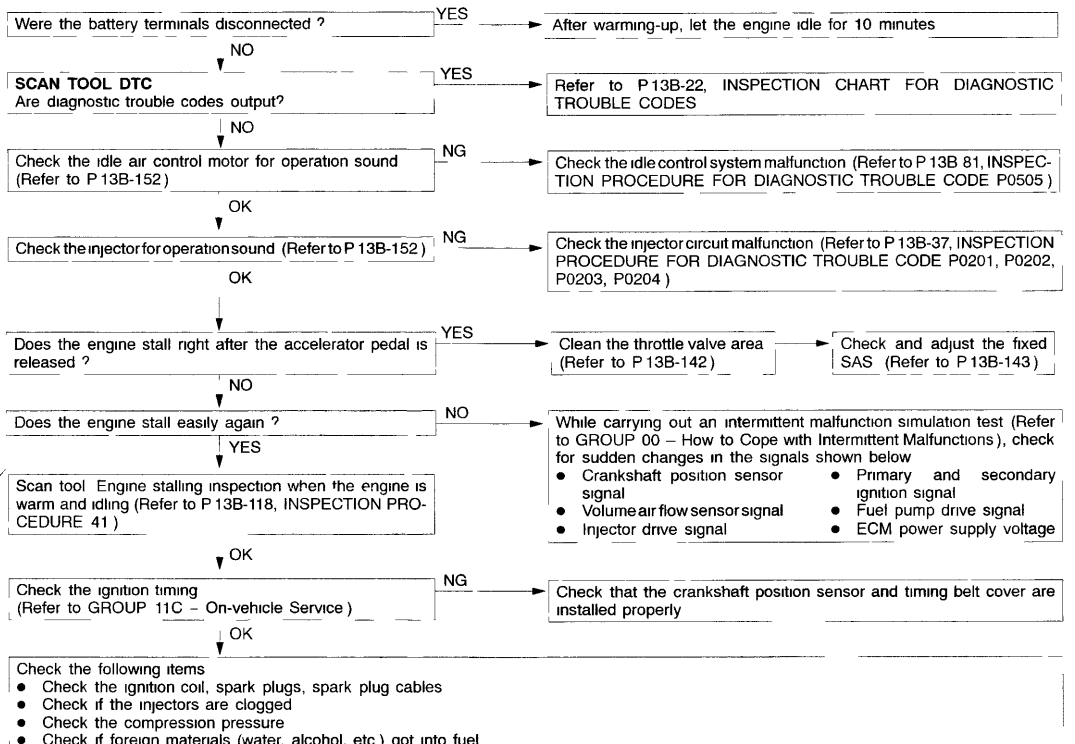
INSPECTION PROCEDURE 11

When the engine is cold, it stalls at idle. (Die out)	Probable cause
In such cases as the above, the cause is probably that the air/fuel mixture is inappropriate when the engine is cold, or that the intake air volume is insufficient	• Malfunction of the idle air control motor system • Malfunction of the throttle body • Malfunction of the injector system • Malfunction of the ignition system



INSPECTION PROCEDURE 12

When the engine is hot, it stalls at idle (Die out)	Probable cause
In cases such as the above, the cause is probably that ignition system air/fuel mixture, idle air control motor or compression pressure is defective In addition, if the engine suddenly stalls the cause may also be a defective connector contact	• Malfunction of the ignition system • Malfunction of air-fuel ratio control system • Malfunction of the IAC system • Vacuum leak • Improper connector contact



INSPECTION PROCEDURE 13

The engine stalls when accelerating. (Pass out)	Probable cause
In cases such as the above the cause is probably misfiring due to a weak spark or an inappropriate air/fuel mixture when the accelerator pedal is depressed	• Vacuum leak • Malfunction of the ignition system

SCAN TOOL DTC
Are diagnostic trouble codes output ?
- YES → Refer to P13B-22, INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES
- NO ↓

SCAN TOOL Actuator test
10 EGR solenoid (Refer to p 13B-130)
- NG → Exhaust gas recirculation solenoid malfunction (Refer to P 13B-43, IN SPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0403)
- OK ↓

Check the following items
- Check the ignition coil, spark plugs, spark plug cables
- Check if air was drawn into the intake system
  - Broken intake manifold gasket
  - Broken or disconnected vacuum hose
  - Improper operation of the PCV valve
  - Broken air intake hose

INSPECTION PROCEDURE 14

The engine stalls when decelerating.	Probable cause
In cases such as the above, the cause is probably that the intake air volume is insufficient due to a defective idle air control motor system	• Malfunction of the IAC system

Were the battery terminals disconnected ?
- YES → After warming-up, let the engine idle for 10 minutes
- NO ↓

SCAN TOOL DTC
Are diagnostic trouble codes output?
- YES → Refer to P13B-22, INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES
- NO ↓

SCAN TOOL Data list
26 Closed throttle position switch (Refer to P 13B-125)
- NG → Check the closed throttle position switch malfunction (Refer to P 13B-82, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES P0510)
- OK ↓

SCAN TOOL Data list
14 Throttle position sensor (Refer to P 13B-125)
- NG → Check the throttle position circuit malfunction (Refer to P 13B-30 IN-SPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0120)
- OK ↓

SCAN TOOL Data list
55 Idle air control valve position sensor
- Is the idle speed control motor position dropped to 0–2 steps when decelerating (engine rpm more than 1,000)?
  - YES → Check the vehicle speed sensor malfunction (Refer to P 13B-80 IN SPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0500)
  - NO ↓

SCAN TOOL Actuator test
10 EGR solenoid (Refer to p 13B-130)
- NG → Exhaust gas recirculation solenoid malfunction (Refer to P 13B-43, IN-SPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0403)
- OK ↓

Check the following items
- Check the ignition coil, spark plugs, spark plug cables
- Clean the throttle valve area
- Check and adjust the fixed SAS

INSPECTION PROCEDURE 15

Hesitation, sag or stumble	Probable cause
In cases such as the above, the cause is probably that ignition system, air/fuel mixture or compression pressure is defective	• Malfunction of the ignition system • Malfunction of air fuel ratio control system • Malfunction of the fuel supply system • Malfunction of the EGR solenoid system • Poor compression

SCAN TOOL DTC
Are diagnostic trouble codes output ?
YES → Refer to P 13B 22 INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES
NO ↓

Check the injectors for operation sound (Refer to P 13B 152)
NG → Check the injector circuit malfunction (Refer to P 13B-37, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0201, P0202, P0203 P0204)
OK ↓

Check the ignition timing
(Refer to GROUP 11C – On-vehicle Service)
NG → Check that the crankshaft position sensor and timing belt cover are installed properly
OK ↓

Scan Tool Check if hesitation, sag, stumble or poor acceleration occur (Refer to P 13B-119, INSPECTION PROCEDURE 42)
OK ↓

Check the fuel pressure (Refer to P 13B-144)
OK ↓

Check the following items
- Check the ignition coil, spark plugs, spark plug cables
- Check the EGR system
- Check the compression pressure
- Check the fuel filter or fuel line for clogging

INSPECTION PROCEDURE 16

Acceleration shock	Probable cause
In cases such as the above, the cause is probably that there is an ignition leak accompanying the increase in the spark plug demand voltage during acceleration	• Malfunction of the ignition system

SCAN TOOL DTC
Are diagnostic trouble codes output ?
YES → Refer to P 13B-22, INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES
NO ↓

Check the following items
- Check the ignition coil, spark plugs, spark plug cables
- Check for occurrence of ignition leak

INSPECTION PROCEDURE 17

Deceleration shock	Probable cause
Malfunction of the IAC system is suspected	• Malfunction of the IAC system

SCAN TOOL DTC
Are diagnostic trouble codes output ?
YES → Refer to P 13B-22, INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES
NO ↓

Check the idle air control motor for operation sound (Refer to P 13B-152)
NG → Check the idle control system malfunction (Refer to P 13B-81, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0505)
OK ↓

SCAN TOOL Data list
14 Throttle position sensor (Refer to P 13B 125)
NG → Check the throttle position circuit malfunction (Refer to P 13B-30, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0120)
OK ↓

SCAN TOOL Data list
26 Closed throttle position switch (Refer to P 13B-125)
NG → Check the closed throttle position switch malfunction (Refer to P 13B-82, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES P0510)
OK ↓

Clean the throttle valve area (Refer to P 13B-142)

INSPECTION PROCEDURE 18

Poor acceleration	Probable cause
Defective ignition system, abnormal air-fuel ratio poor compression pressure, etc are suspected	• Malfunction of the ignition system • Malfunction of air-fuel ratio control system • Malfunction of the fuel supply system • Poor compression • Clogged exhaust system

SCAN TOOL DTC
Are diagnostic trouble codes output ?
YES → Refer to P 13B-22, INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES
NO ↓

Check the injectors for operation sound (Refer to P 13B-152)
NG → Check the injector circuit malfunction (Refer to P 13B-37, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES P0201, P0202, P0203, P0204)
OK ↓

Check the ignition timing (Refer to GROUP 11C – On-vehicle Service)
NG → Check that the crankshaft position sensor and timing belt cover are installed properly
OK ↓

Scan tool Check if hesitation, sag stumble, or poor acceleration occur (Refer to P 13B-119 INSPECTION PROCEDURE 42)
OK ↓

Check the fuel pressure (Refer to P 13B-144)
OK ↓

Check the following items
- Check the ignition coil, spark plugs, spark plug cables
- Check the compression pressure
- Check the fuel filter or fuel line for clogging
- Broken air intake hose
- Clogged air cleaner
- Clogged exhaust system

INSPECTION PROCEDURE 19

Surge	Probable cause
Defective ignition system, abnormal air-fuel ratio, etc are suspected	• Malfunction of the ignition system • Malfunction of air-fuel ratio control system • Malfunction of the EGR solenoid system

SCAN TOOL DTC
Are diagnostic trouble codes output ?
- YES → Refer to P 13B-22, INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES
- NO ↓

Check the injectors for operation sound (Refer to P 13B 152)
- NG → Check the injector circuit malfunction (Refer to P 13B 37, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0201, P0202, P0203, P0204)
- OK ↓

Check the ignition timing (Refer to GROUP 11C – On-vehicle Service)
- NG → Check that the crankshaft position sensor and timing belt cover are installed properly
- OK ↓

Scan Tool Check if surge occurs (Refer to P 13B-120, INSPECTION PROCEDURE 43)
- OK ↓

Check the fuel pressure (Refer to P 13B-144)
- OK ↓

Check the following items
- Check the ignition coil, spark plugs, spark plug cables
- Check the EGR system

INSPECTION PROCEDURE 20

Knocking	Probable cause
In cases such as the above, the cause is probably that the heat value of the spark plug is inappropriate or low fuel quality	• Inappropriate heat value of the spark plug

Check the following items
- Spark plugs
- Fuel quality, octane level
- Check if foreign materials (water, alcohol, etc) got into fuel

INSPECTION PROCEDURE 21

Dieseling	Probable cause
Fuel leakage from injectors is suspected or carbon build up	• Fuel leakage from injectors

Check the injectors for fuel leakage

INSPECTION PROCEDURE 22

Too high CO and HC concentration when idling	Probable cause
Abnormal air-fuel ratio is suspected	• Malfunction of the air-fuel ratio control system • Deteriorated catalyst

SCAN TOOL DTC
Are diagnostic trouble codes output ?
YES → Refer to P 13B-22, INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES
NO ↓

Check the ignition timing
(Refer to GROUP 11C – On-vehicle Service)
NG → Check that the crankshaft position sensor and timing belt cover are installed properly
OK ↓

SCAN TOOL Data list
21 Engine coolant temperature sensor
(Refer to P 13B-125)
NG → Check the engine coolant temperature circuit malfunction (Refer to P 13B-29 INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0115)
OK ↓

SCAN TOOL Data list
13 Intake air temperature sensor (Refer to P 13B-125)
NG → Check the intake air temperature circuit malfunction (Refer to P 13B-28, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0110)
OK ↓

SCAN TOOL Data list
25 Barometric pressure sensor (Refer to P 13B-125)
NG → Check the barometric pressure circuit malfunction (Refer to P 13B-27, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0105)
OK ↓

SCAN TOOL Data list
59 Heated oxygen sensor (rear) (Refer to P 13B-125)
- Transaxle 2nd gear <M/T>, L range <A/T>
- Driving with the throttle wide open
  OK. 600–1,000 mV

NG → Check the oxygen sensor circuit malfunction (sensor 2) (Refer to P 13B-34, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0136)
OK ↓

SCAN TOOL Data list
11 Heated oxygen sensor (front) (Refer to P 13B-125)
OK: 600–1,000 mV when racing suddenly
NG → Check the oxygen sensor circuit malfunction (sensor 1) (Refer to P 13B-32, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0130)
OK ↓

SCAN TOOL Data list
11 Heated oxygen sensor (front) (Refer to P 13B-125)
OK: Repeat 0–400 mV and 600–1,000 mV alternately when idling
OK → Replace the heated oxygen sensor (front)
↓
Check trouble symptom
NG ↓

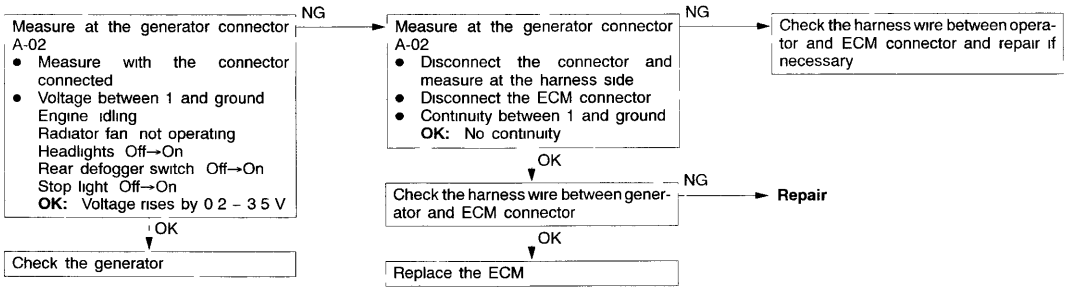
NG ↓
Check the fuel pressure (Refer to P 13B-144)
OK ↓

Check the following items
- Check the injectors for operation sound
- Check the injectors for fuel leakage
- Check the ignition coil spark plugs, spark plug cables
- Check the compression pressure
- Check the positive crankcase ventilation system
- Check the evaporative emission control system
- Check the EGR system

↓
Check trouble symptom
NG ↓
Replace the three-way catalytic converter

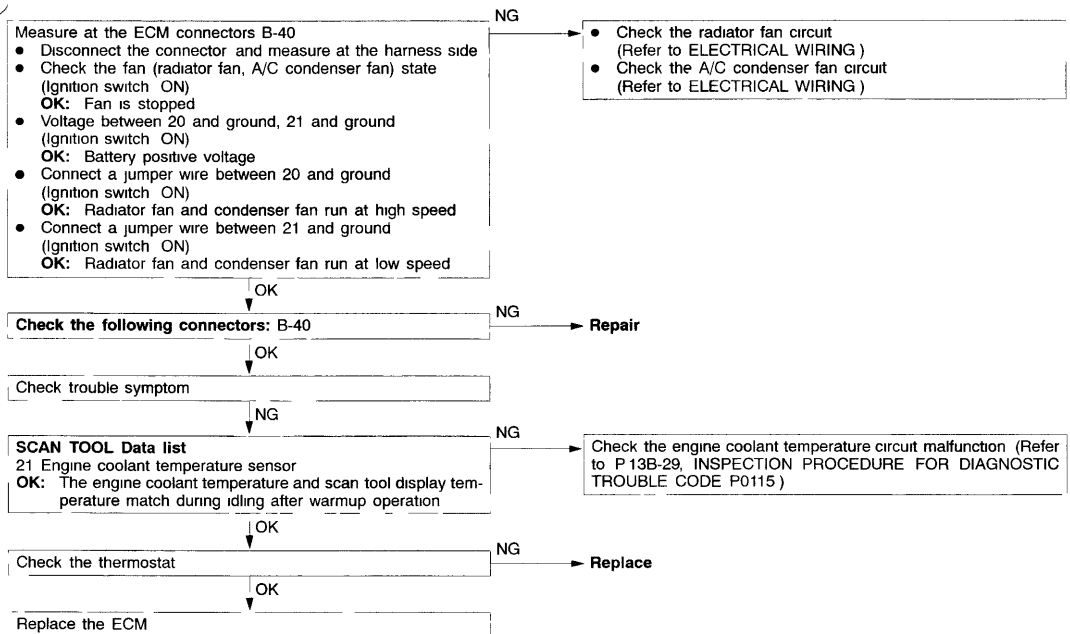
INSPECTION PROCEDURE 23

Low generator output voltage (approx. 12.3 V)	Probable cause
The cause may be a malfunction of the generator or one of the problems listed at right	• Malfunction of charging system • Short circuit in harness between Generator G terminal and engine control module • Malfunction of ECM



INSPECTION PROCEDURE 24

Fans (radiator fan, A/C condenser fan) are inoperative	Probable cause
[Comment] The fan motor relay is controlled by the power transistor inside the PCM turning ON and OFF	• Malfunction of fan motor relay • Malfunction of fan motor • Malfunction of thermostat • Improper connector contact, open circuit or short-circuited harness wire • Malfunction of the PCM



INSPECTION PROCEDURE 25

Transient, mass emission tailpipe test failure	Probable cause
The test is failed when the air-fuel ratio is not controlled to the ideal air-fuel ratio due to the feedback control by O2 sensor signals, or when the EGR flow rate is insufficient, or the catalyst has deteriorated	• Malfunction of the air-fuel ratio control system • Malfunction of the EGR system • Deteriorated catalyst

Has the engine been warmed up sufficiently before checking the → Sufficiently warm up the engine, and then check the exhaust

- Check all vacuum hoses and connectors.
- Check electrical wires and connectors for obvious problems.
- Check the exhaust system for missing or damaged parts

→ **Repair**

SCAN TOOL DTC
Are diagnostic trouble code output? → Refer to P.13B-22, INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODE.

NO

Check the ignition timing. (Refer to GROUP 11C – On-vehicle Service.) NG → Check that the crankshaft position sensor and timing belt cover are installed properly.

OK

SCAN TOOL Data list
21 Engine coolant temperature sensor (Refer to P.13B-125.) NG → Check the engine coolant temperature sensor circuit malfunction. (Refer to P.13B-29, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0115)

OK

SCAN TOOL Data list
13 Intake air temperature sensor (Refer to P.13B-125.) NG → Check the intake air temperature sensor circuit malfunction (Refer to P.13B-26, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0110)

OK

SCAN TOOL Data list
25 Barometric pressure sensor (Refer to P.13B-125.) NG → Check the barometric pressure sensor circuit malfunction. (Refer to P.13B-27, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0105)

OK

SCAN TOOL Data list
59 Heated oxygen sensor (rear)
- Transaxle: 2nd gear <M/T>, L range <A/T>
- Drive with wide open throttle

OK: 600 – 1000 mV

NG → Check the oxygen sensor circuit malfunction (sensor 2). (Refer to P.13B-34, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0136)

OK

SCAN TOOL Data list
11 Heated oxygen sensor (front)
OK: 600 – 1000 mV when racing suddenly NG → Check the oxygen sensor circuit malfunction (sensor 1). (Refer to P.13B-32, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0130)

SCAN TOOL Data list
11 Heated oxygen sensor (front)
OK: 0 – 400 mV ↔ 600 – 1000 mV alternately when idling and 2500 r/min

→ Check the EGR system (Refer to GROUP 17 – Emission Control System.)

OK

Measure the CO concentration during idling. NG → Replace the heated oxygen sensor (front)
OK: 0.5% or less

OK

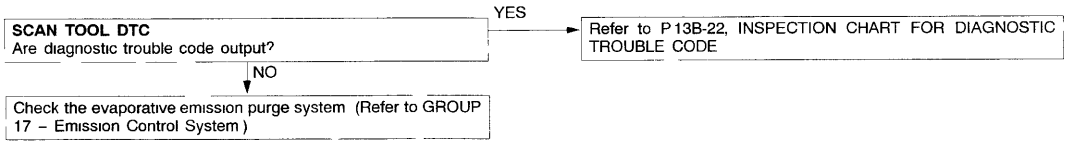
Check the following items. OK → Check trouble symptom.
- Check the injectors for operation sound.
- Check the injectors for fuel leakage.
- Check the ignition coil, spark plugs, spark plug cables.
- Check the compression pressure.
- Check the positive crankcase ventilation system.
- Check the evaporative emission control system.

NG

→ Replace the three-way catalytic converter.

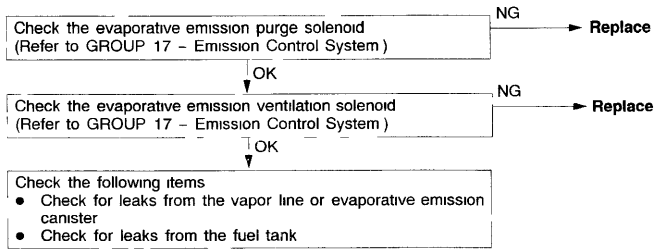
INSPECTION PROCEDURE 26

Evaporative canister purge flow test failure	Probable cause
The test fails when the purge line or purge port is clogged or if the evaporative emission purge solenoid fails	• Purge line or purge port is clogged • Malfunction of evaporative emission purge solenoid • Evaporative emission canister is clogged



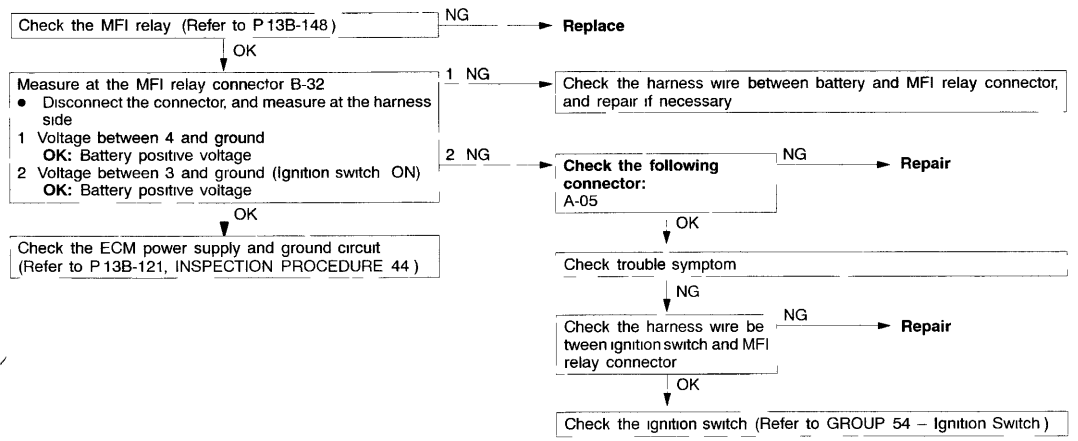
INSPECTION PROCEDURE 27

Evaporative system pressure test failure	Probable cause
The test fails if there is a leak from the fuel tank or vapor line	• Improper tightening of fuel tank filler tube cap clamp • Broken seal in fuel tank, vapor line evaporative emission canister



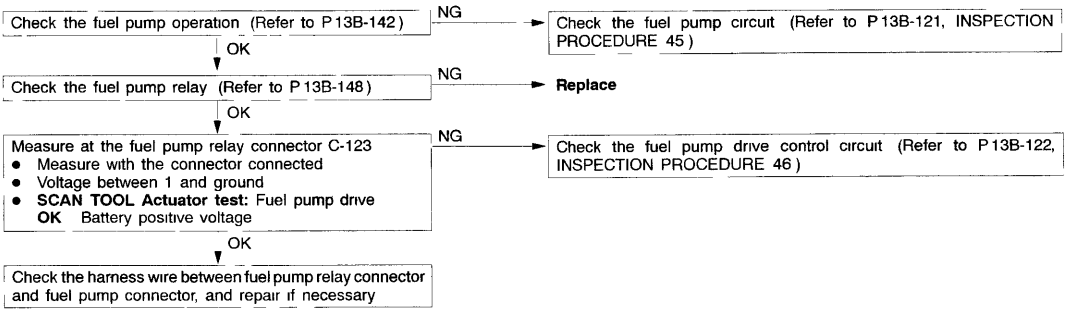
INSPECTION PROCEDURE 28

Power supply system	Probable cause
While the ignition switch is ON, battery power is supplied to ECM, injectors, volume air flow sensor, etc through MFI relay	• Malfunction of the MFI relay • Improper connector contact, open circuit or short-circuited harness wire • Disconnected ECM ground wire • Malfunction of the ECM



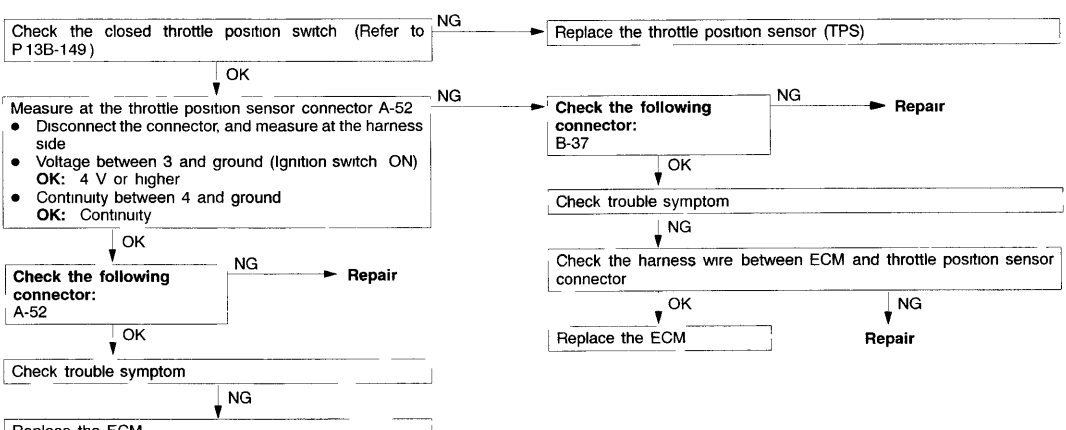
INSPECTION PROCEDURE 29

Fuel pump system	Probable cause
The ECM turns the fuel pump relay ON when the engine is cranking or running, and this supplies power to drive the fuel pump	• Malfunction of the fuel pump relay • Malfunction of the fuel pump • Improper connector contact, open circuit or short circuited harness wire • Malfunction of the ECM



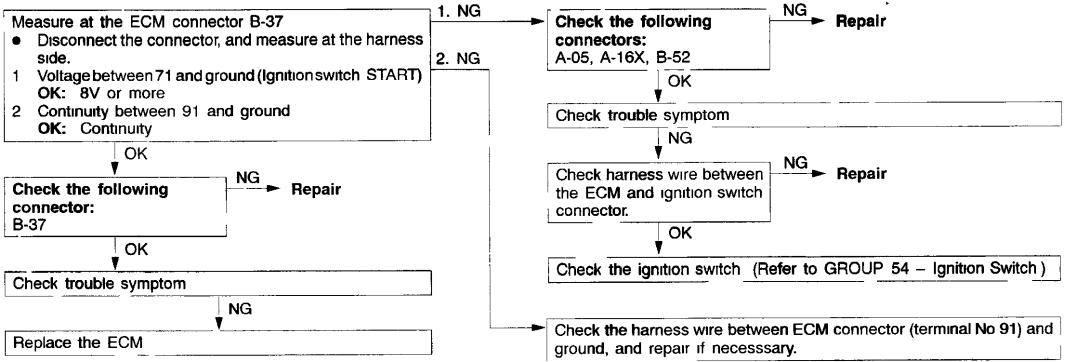
INSPECTION PROCEDURE 30

Closed throttle position switch system	Probable cause
The closed throttle position switch inputs the condition of the accelerator pedal, i e whether it is depressed or released (HIGH/LOW) to the ECM The ECM controls the idle air control motor based on this input	• Misadjustment of the accelerator pedal • Misadjustment of the fixed SAS • Misadjustment of the closed throttle position switch and throttle position sensor • Improper connector contact, open circuit or short-circuited harness wire • Malfunction of the ECM



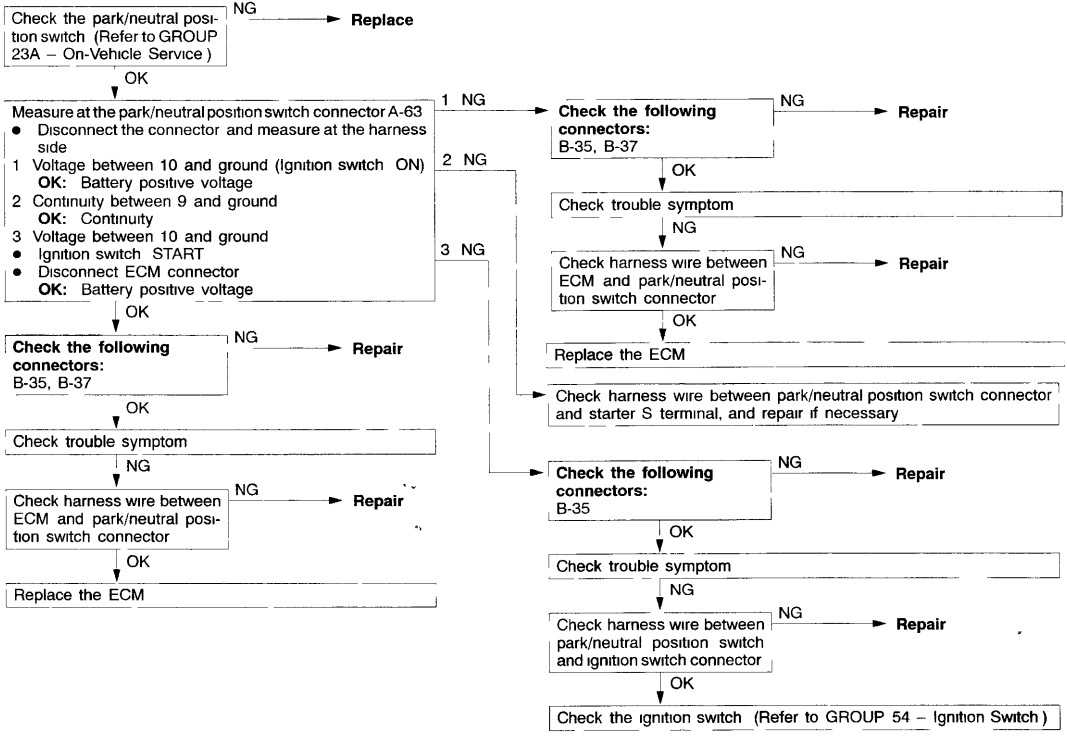
INSPECTION PROCEDURE 31

Ignition switch-ST system	Probable cause
The ignition switch – ST inputs a HIGH signal to the ECM while the engine is cranking. The ECM controls fuel injection, etc. during starting based on this input.	• Malfunction of ignition switch • Improper connector contact, open circuit or short-circuited harness wire • Malfunction of the ECM



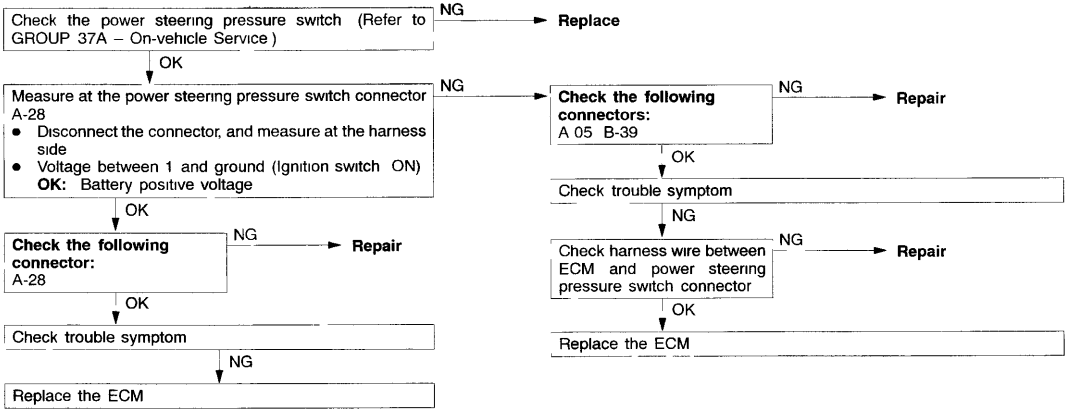
INSPECTION PROCEDURE 32

Ignition switch-ST and park/neutral position switch system <A/T>	Probable cause
• The ignition switch – ST inputs a HIGH signal to the ECM while the engine is cranking The ECM controls fuel injection, etc during starting based on this input • The park/neutral position switch inputs the condition of the select lever, i e whether it is in P or N range or in some other range, to the ECM The ECM controls the idle air control motor using this input	• Malfunction of ignition switch • Malfunction of park/neutral position switch • Improper connector contact, open circuit or short-circuited harness wire • Malfunction of the ECM



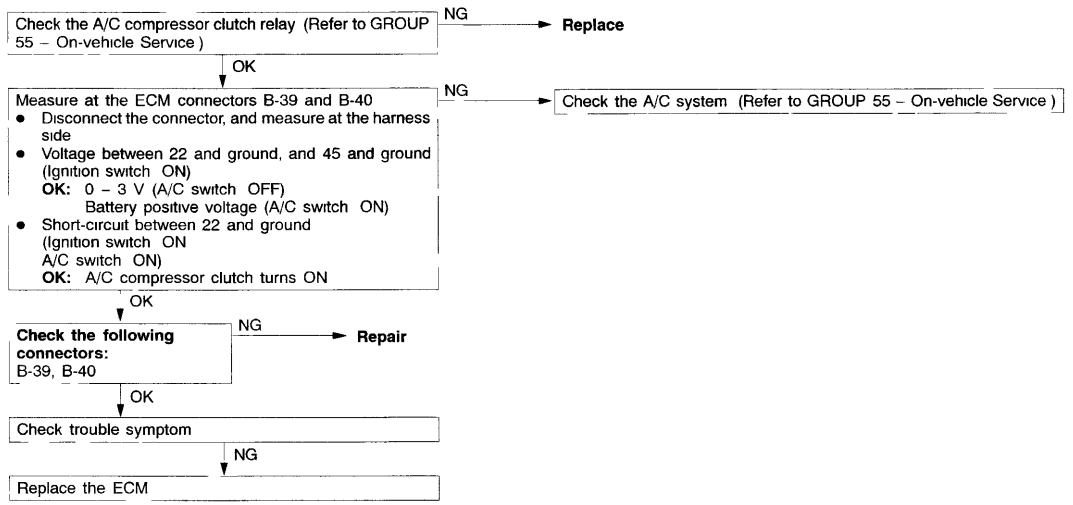
INSPECTION PROCEDURE 33

Power steering pressure switch system	Probable cause
The presence or absence of power steering load is input to the ECM The ECM controls the idle air control motor using this input	• Malfunction of power steering pressure switch • Improper connector contact open circuit or short-circuited harness wire • Malfunction of the ECM



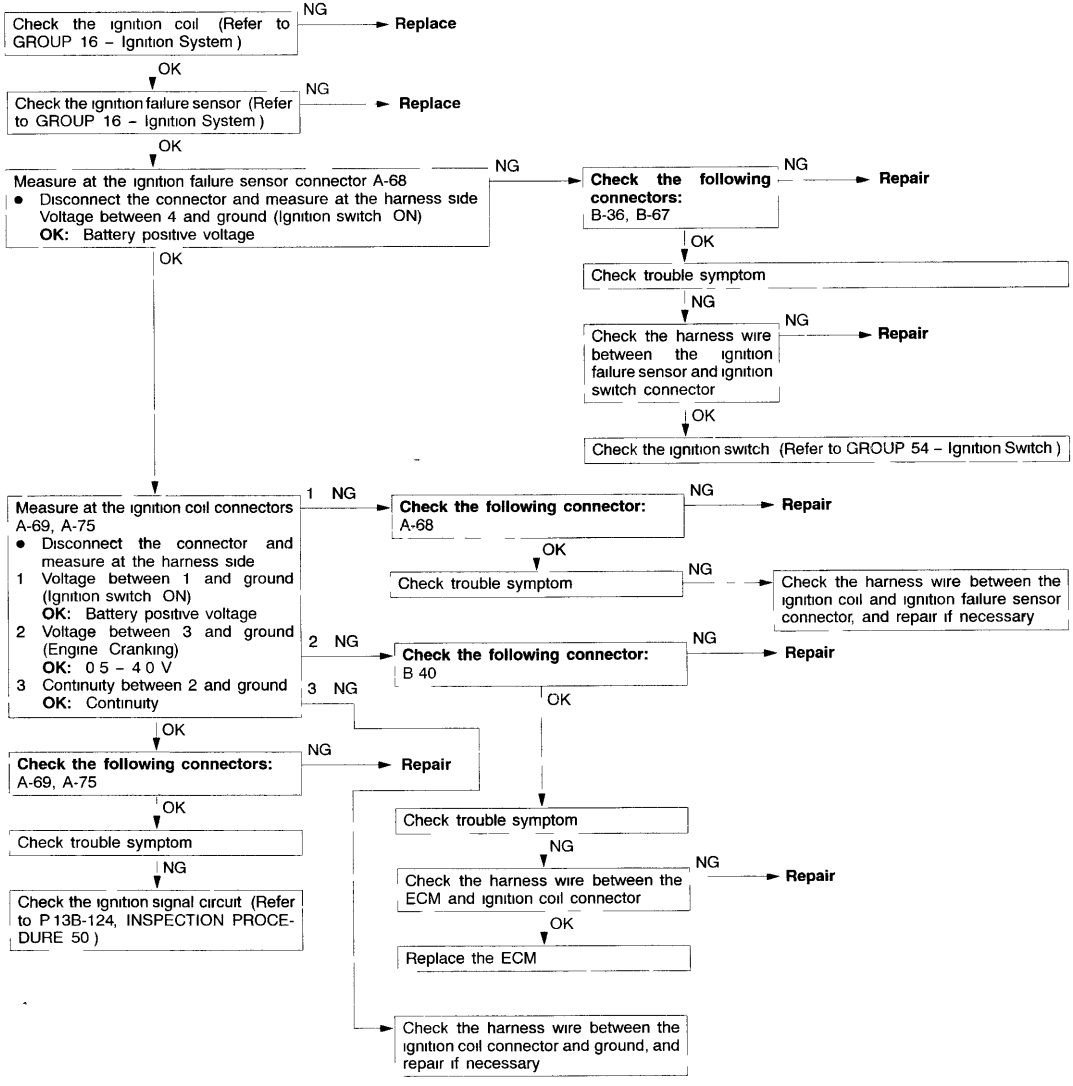
INSPECTION PROCEDURE 34

A/C switch and A/C compressor clutch relay system	Probable cause
When an A/C ON signal is input to the ECM, the ECM carries out control of the idle air control motor, and also operates the A/C compressor magnetic clutch	• Malfunction of A/C control system • Malfunction of A/C switch • Improper connector contact open circuit or short-circuited harness wire • Malfunction of ECM



INSPECTION PROCEDURE 35

Ignition circuit system	Probable cause
The ECM interrupts the ignition coil primary current by turning the ignition power transistor inside the ECM ON and OFF	• Malfunction of ignition coil • Malfunction of ignition power transistor unit • Malfunction of the ignition failure sensor • Improper connector contact, open circuit or short-circuited harness wire • Malfunction of the ECM



INSPECTION PROCEDURE 36

Scan tool: Inspection of no initial combustion

SCAN TOOL Data list
16 Voltage of ECM power source (Refer to P 13B-125)
- NG → Check the power supply system (Refer to P 13B 109, INSPECTION PROCEDURE 28)
- OK ↓

Does the camshaft rotate at the engine cranking ? (When oil filler cap is removed)
- NO → Check timing belt for breakage
- YES ↓

SCAN TOOL DTC
Are the diagnostic trouble codes output ?
- YES → INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES (Refer to P 13B-22)
- NO ↓

SCAN TOOL Data list
22 Crankshaft position sensor
OK: Cranking speed is displayed
- NG → Check the crankshaft position circuit malfunction (Refer to P 13B-40, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES P0335)
- OK ↓

SCAN TOOL Actuator test
07 Fuel pump (Refer to P 13B-130)
- NG → Check the fuel pump system (Refer to P 13B-110, INSPECTION PROCEDURE 29)
- OK ↓

SCAN TOOL Data list
21 Engine coolant temperature sensor (Refer to P 13B-125)
- NG → Check the engine coolant temperature circuit malfunction (Refer to P 13B 29 INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES P0115)

INSPECTION PROCEDURE 37

Ignition system: Inspection of no initial combustion

Measure at the ignition coil connectors A-69, A-75
- Measure with the connector connected (Use test harness MB991348)
- Connect a primary voltage detection – type tachometer to terminal (1) of each connector in turn
  OK: Each terminal displays a speed on the engine tachometer that is 1/2 of the cranking speed
- NG → Check the ignition circuit system (Refer to P 13B-114, INSPECTION PROCEDURE 35)
- OK ↓

Check the ignition timing when cranking
OK: 5° BTDC ±3°
- NG → Check for the correct installation condition of crankshaft position sensor and timing belt cover

INSPECTION PROCEDURE 38

Scan tool: Check if incomplete combustion occurs.

SCAN TOOL DTC
Are diagnostic trouble code output ?
- YES → INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODE (Refer to P 13B-22)
- NO ↓

SCAN TOOL Actuator test
07 Fuel pump (Refer to P 13B-130)
- NG → Check the fuel pump system (Refer to P 13B-110, INSPECTION PROCEDURE 29)
- OK ↓

SCAN TOOL Data list
21 Engine coolant temperature sensor (Refer to P 13B-125)
- NG → Check the engine coolant temperature circuit malfunction (Refer to P 13B-29, INSPECTION PROCEDURES FOR DIAGNOSTIC TROUBLE CODE P0115)
- OK ↓

SCAN TOOL Data list
18 Ignition switch-ST (Refer to P 13B-125)
- NG → Check the ignition switch-ST system<M/T> (Refer to P 13B-111, INSPECTION PROCEDURE 31)
  Check the ignition switch-ST and park/neutral position switch system<A/T> (Refer to P 13B-112, INSPECTION PROCEDURE 32)

INSPECTION PROCEDURE 39

Check if hunting occurs.

Clean the throttle body (Refer to P 13B-142)
↓
Check and adjust the fixed SAS (Refer to P 13B-143)
↓
Check trouble symptom
- NG ↓

Inspect for vacuum leak
- Broken intake manifold gasket
- Broken air intake hose
- Broken vacuum hose
- Positive crankcase ventilation valve does not operate

INSPECTION PROCEDURE 40

Scan tool: Check if idle speed is unstable.

SCAN TOOL Data list
26 Closed throttle position switch (Refer to P.13B-125)
NG → Check the closed throttle position switch malfunction (Refer to P.13B-82, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0510)
OK ↓

SCAN TOOL Data list
13 Intake air temperature sensor (Refer to P.13B-125)
NG → Check the intake air temperature circuit malfunction (Refer to P.13B-28, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0110)
OK ↓

SCAN TOOL Data list
25 Barometric pressure sensor (Refer to P.13B-125)
NG → Check the barometric pressure circuit malfunction (Refer to P.13B-27, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0105)
OK ↓

SCAN TOOL Data list
21 Engine coolant temperature sensor (Refer to P.13B-125)
NG → Check the engine coolant temperature circuit malfunction (Refer to P.13B-29, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0115)
OK ↓

SCAN TOOL Actuator test
08 Evaporative emission purge solenoid
(Refer to P.13B-130)
NG → Check the evaporative emission control system purge control valve circuit malfunction (Refer to P.13B-56, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0443)
OK ↓

SCAN TOOL Actuator test
10 EGR solenoid
(Refer to P.13B-130)
NG → Exhaust gas recirculation solenoid malfunction (Refer to P.13B-43 INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0403)
OK ↓

SCAN TOOL Data list
59 Heated oxygen sensor (rear) (Refer to P.13B-125)
- Transaxle 2nd gear <M/T>, L range <A/T>
- Drive with wide open throttle

OK: 600–1,000 mV
NG → Check the O_2 sensor circuit malfunction (Sensor2) (Refer to P.13B-34, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0136)
OK ↓

SCAN TOOL Data list
11 Heated oxygen sensor (front) (Refer to P.13B-125)
OK: 600–1 000 mV during sudden racing
NG → Check the O_2 sensor circuit malfunction (Sensor1) (Refer to P.13B-32, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0130)
OK ↓

SCAN TOOL Data list
11 Heated oxygen sensor (front) (Refer to P.13B-125)
OK: Changes between 0–400 mV and 600–1,000 mV during idling
NG → Check the fuel pressure (Refer to P.13B-144)
OK → 1 Inspect the for vacuum leak
- Broken intake manifold gasket
- Broken vacuum hose
- PCV valve does not operate
- Broken air intake hose

2 Check the injector for clog
OK ↓

SCAN TOOL Data list
27 Power steering pressure switch (Refer to P.13B-125)
NG → Check the power steering pressure switch system (Refer to P.13B-113, INSPECTION PROCEDURE 33)
OK ↓

SCAN TOOL Data list
28 A/C switch (Refer to P.13B-125)
NG → Check the A/C switch and A/C relay system (Refer to P.13B-113, INSPECTION PROCEDURE 34)
OK ↓

SCAN TOOL Data list
29 Park/neutral position switch (Refer to P.13B-125)
NG → Check the ignition switch-ST and park/neutral position switch system (Refer to P.13B-112, INSPECTION PROCEDURE 32)
OK ↓

SCAN TOOL Data list
55 Idle air control valve position sensor
(Refer to P.13B-125)
NG → Adjust the basic idle speed (Refer to P.13B-144)

INSPECTION PROCEDURE 41

Scan tool: Engine stalling inspection when the engine is warm and idling.

SCAN TOOL Data list
26 Closed throttle position switch (Refer to P 13B-125)
NG → Check the closed throttle position switch malfunction (Refer to P 13B-82, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0510)
OK ↓

SCAN TOOL Data list
13 Intake air temperature sensor (Refer to P 13B-125)
NG → Check the intake air temperature circuit malfunction (Refer to P 13B-28, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0110)
OK ↓

SCAN TOOL Data list
25 Barometric pressure sensor (Refer to P 13B-125)
NG → Check the barometric pressure circuit malfunction (Refer to P 13B-27, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0105)
OK ↓

SCAN TOOL Data list
21 Engine coolant temperature sensor (Refer to P 13B-125)
NG → Check the engine coolant temperature circuit malfunction (Refer to P 13B-29, INSPECTION PROCEDURE FOR DIAGNOSTIC CODE P0115)
OK ↓

SCAN TOOL Actuator test
10 EGR solenoid
(Refer to P 13B-130)
NG → Exhaust gas recirculation solenoid malfunction (Refer to P 13B-43, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0403)
OK ↓

SCAN TOOL Data list
59 Heated oxygen sensor (rear) (Refer to P 13B-125)
- Transaxle 2nd gear <M/T>, L range <A/T>
- Drive with wide open throttle
  OK: 600–1,000 mV

NG → Check the O_2 sensor circuit malfunction (Sensor2) (Refer to P 13B-34, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0136)
OK ↓

SCAN TOOL Data list
11 Heated oxygen sensor (front) (Refer to P 13B-125)
OK: Changes between 600–1,000 mV during sudden racing
NG → Check the O_2 sensor circuit malfunction (Sensor1) (Refer to P 13B-32, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0130)
OK ↓

SCAN TOOL Data list
11 Heated oxygen sensor (front) (Refer to P 13B-125)
OK: Changes between 0–400 mV and 600–1,000 mV during idling
NG → Check the fuel pressure (Refer to P 13B-144)
OK → 1 Inspect for vacuum leak
- Broken intake manifold gasket
- Broken vacuum hose
- PCV valve does not operate
- Broken air intake hose

2 Check the injector for clog
OK ↓

SCAN TOOL Data list
27 Power steering pressure switch (Refer to P 13B-125)
NG → Check the power steering pressure switch system (Refer to P 13B-113, INSPECTION PROCEDURE 33)
OK ↓

SCAN TOOL Data list
28 A/C switch (Refer to P 13B-125)
NG → Check the A/C switch and A/C compressor clutch relay system (Refer to P 13B-113, INSPECTION PROCEDURE 34)
OK ↓

SCAN TOOL Data list
29 Park/neutral position switch (Refer to P 13B-125)
NG → Check the ignition switch ST and park/neutral position switch system (Refer to P 13B-112, INSPECTION PROCEDURE 32)
OK ↓

SCAN TOOL Data list
34 Volume air flow sensor reset signal (Refer to P 13B-125)
NG → Check the volume air flow circuit malfunction (Refer to P 13B-26, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0100)
OK ↓

SCAN TOOL Data list
55 Idle air control valve position sensor
(Refer to P 13B 125)
NG → Adjust the basic idle speed (Refer to P 13B-144)

INSPECTION PROCEDURE 42

Scan tool: Check if hesitation, sag, stumble, or poor acceleration occurs.

SCAN TOOL Data list
26 Closed throttle position switch (Refer to P 13B-125)
NG → Check the closed throttle position switch malfunction (Refer to P 13B-82, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0510)
OK ↓

SCAN TOOL Data list
13 Intake air temperature sensor (Refer to P 13B-125)
NG → Check the intake air temperature circuit malfunction (Refer to P 13B-28, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0110)
OK ↓

SCAN TOOL Data list
25 Barometric pressure sensor (Refer to P 13B 125)
NG → Check the barometric pressure circuit malfunction (Refer to P 13B-27, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0105)
OK ↓

SCAN TOOL Data list
21 Engine coolant temperature sensor (Refer to P 13B 125)
NG → Check the engine coolant temperature circuit malfunction (Refer to P 13B-29 INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0115)
OK ↓

SCAN TOOL Data list
14 Throttle position sensor (Refer to P 13B-125)
NG → Check the throttle position circuit malfunction (Refer to P 13B-30, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0120)
OK ↓

SCAN TOOL Actuator test
10 EGR solenoid (Refer to P 13B-130)
NG → Exhaust gas recirculation solenoid malfunction (Refer to P 13B-43, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0403)
OK ↓

SCAN TOOL Data list
59 Heated oxygen sensor (rear) (Refer to P 13B-125)
- Transaxle 2nd gear <M/T>, L range <A/T>
- Drive with wide open throttle

OK: 600–1,000 mV
NG → Check the O_2 sensor circuit malfunction (Sensor 2) (Refer to P 13B-34, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0136)
OK ↓

SCAN TOOL Data list
11 Heated oxygen sensor (front) (Refer to P 13B 125)
OK: Changes between 600–1,000 mV during sudden racing
NG → Check the O_2 sensor circuit malfunction (Sensor 1) (Refer to P 13B 32, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0130)
OK ↓

SCAN TOOL Data list
11 Heated oxygen sensor (front) (Refer to P 13B-125)
OK: Changes between 0–400 mV and 600–1,000 mV during idling
NG → Check the fuel pressure (Refer to P 13B-144)
OK →
1 Inspect for vacuum leak
- Broken intake manifold gasket
- Broken vacuum hose
- PCV valve does not operate
- Broken air intake hose

2 Check the injector for clog

INSPECTION PROCEDURE 43

Scan tool: Check if surge occurs.

SCAN TOOL Data list
26 Closed throttle position switch (Refer to P 13B-125)
NG → Check the closed throttle position switch malfunction (Refer to P 13B-82, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0510)
OK ↓

SCAN TOOL Data list
13 Intake air temperature sensor (Refer to P 13B 125)
NG → Check the intake air temperature circuit malfunction (Refer to P 13B-28, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0110)
OK ↓

SCAN TOOL Data list
25 Barometric pressure sensor (Refer to P 13B-125)
NG → Check the barometric pressure circuit malfunction (Refer to P 13B-27, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0105)
OK ↓

SCAN TOOL Data list
21 Engine coolant temperature sensor (Refer to P 13B-125)
NG → Check the engine coolant temperature circuit malfunction (Refer to P 13B-29 INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0115)
OK ↓

SCAN TOOL Data list
14 Throttle position sensor (Refer to P 13B-125)
NG → Check the throttle position circuit malfunction (Refer to P 13B-30, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0120)
OK ↓

SCAN TOOL Actuator test
10 EGR solenoid (Refer to P 13B-130)
NG → Exhaust gas recirculation solenoid malfunction (Refer to P 13B-43, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0403)
OK ↓

SCAN TOOL Data list
59 Heated oxygen sensor (rear) (Refer to P 13B-125)
- Transaxle 2nd gear <M/T>, L range <A/T>
- Drive with wide open throttle
  OK: 600–1,000 mV

NG → Check the O_2 sensor circuit malfunction (Sensor 2) (Refer to P 13B-34, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0136)
OK ↓

SCAN TOOL Data list
11 Heated oxygen sensor (front) (Refer to P 13B-125)
OK: Changes between 600–1,000 mV during sudden racing

NG → Check the O_2 sensor circuit malfunction (Sensor 1) (Refer to P 13B-32 INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0130)
OK ↓

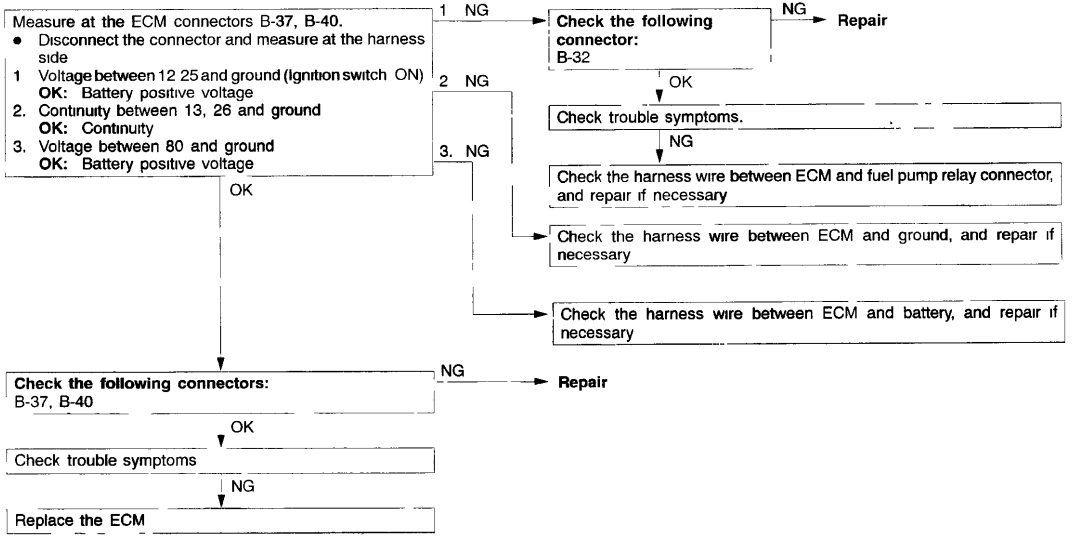
SCAN TOOL Data list
11 Heated oxygen sensor (front) (Refer to P 13B-125)
OK: Changes between 0–400 mV and 600–1,000 mV during idling

NG → Check the fuel pressure (Refer to P 13B-144)
OK →
1 Inspect for vacuum leak
- Broken intake manifold gasket
- Broken vacuum hose
- PCV valve does not operate
- Broken air intake hose

2 Check the injector for clog

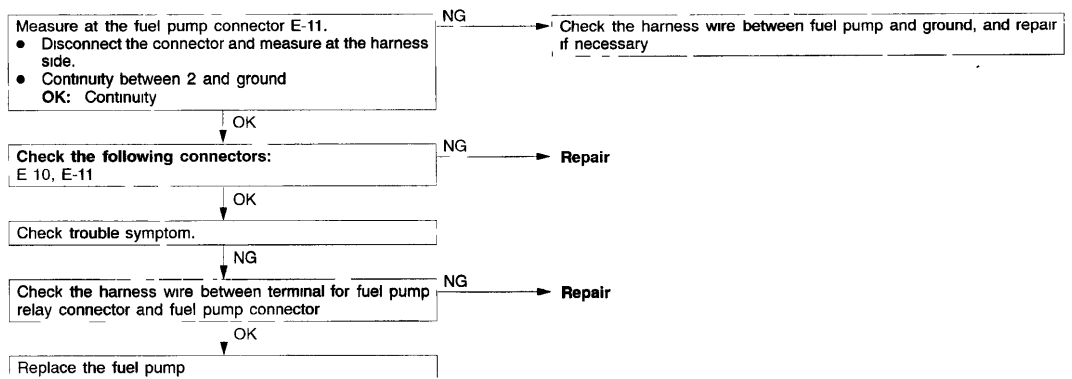
INSPECTION PROCEDURE 44

Check the ECM power supply and ground circuit.



INSPECTION PROCEDURE 45

Check fuel pump circuit.



INSPECTION PROCEDURE 46

Check the fuel pump drive control circuit.

Measure at the fuel pump relay connector B-33
- Disconnect the connector and measure at the harness side
- Voltage between 3 4 and ground (Ignition switch ON)

OK: Battery positive voltage

NG → **Check the following connector:** B 36, B-37 — NG → **Repair**

OK → Check trouble symptom

NG → Check the harness wire between fuel pump relay and ignition switch connector — NG → **Repair**

OK → Check the ignition switch (Refer to GROUP 54–Ignition Switch)

OK →

Measure at the ECM connector B-40
- Disconnect the connector and measure at the harness side
- Voltage between 8 and ground (Ignition switch ON)

OK: Battery positive voltage

NG → **Check the following connector:** B 33 — NG → **Repair**

OK → Check trouble symptom

NG → Check the harness wire between ECM and fuel pump relay connector, and repair if necessary

OK →

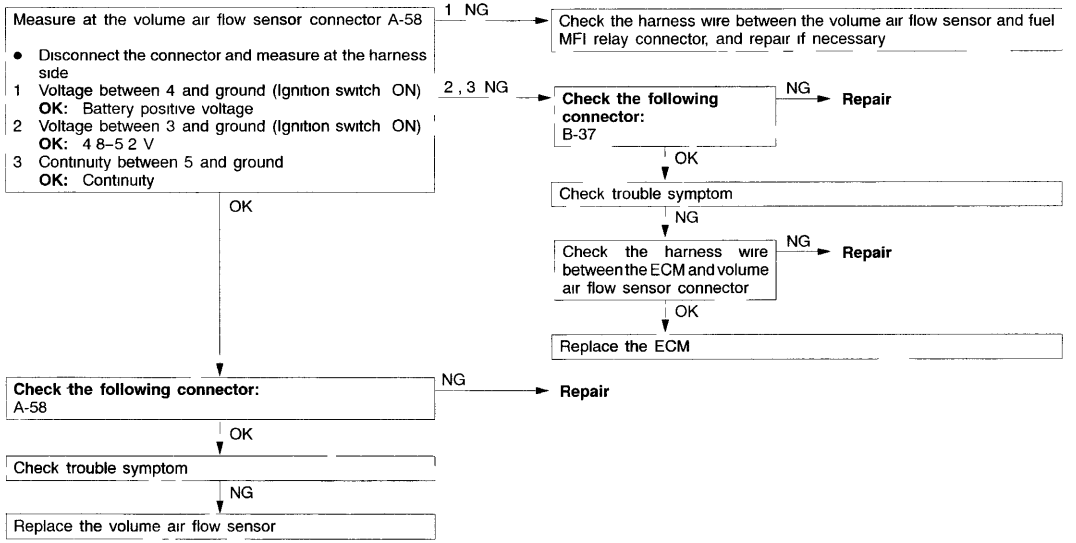
Check the following connector: B-40 — NG → **Repair**

OK → Check trouble symptom

NG → Replace the ECM

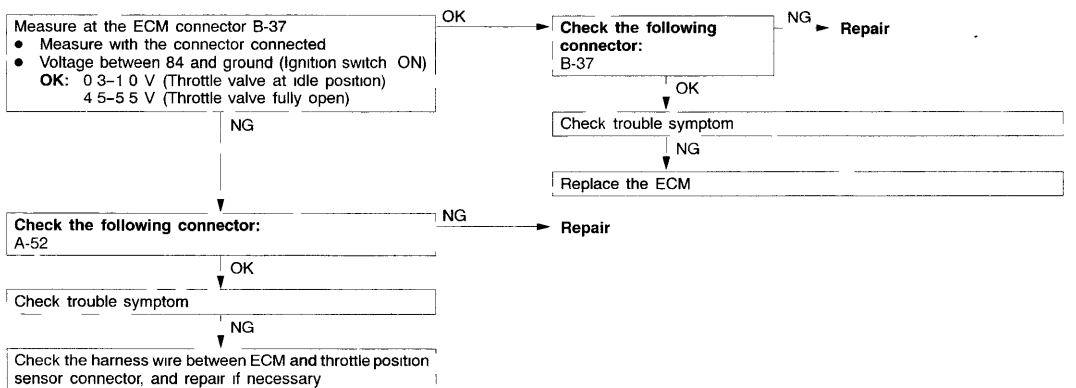
INSPECTION PROCEDURE 47

Check volume air flow sensor control circuit.



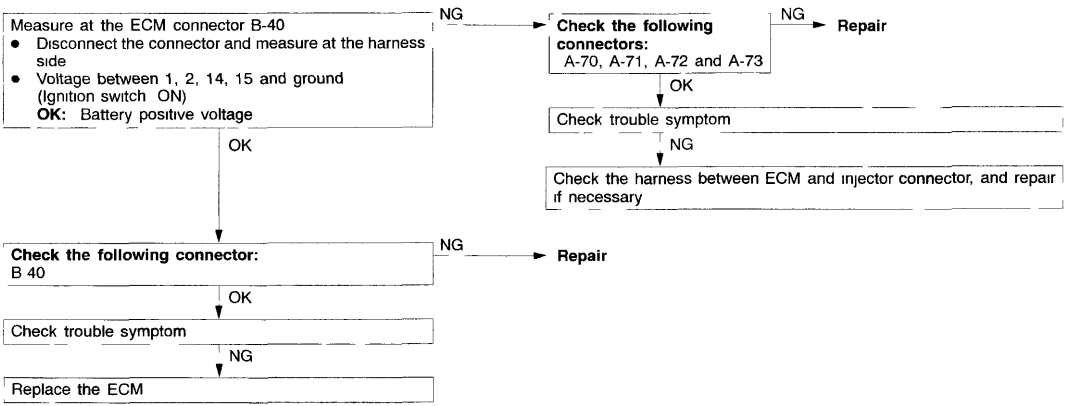
INSPECTION PROCEDURE 48

Check throttle position sensor (TPS) output circuit.



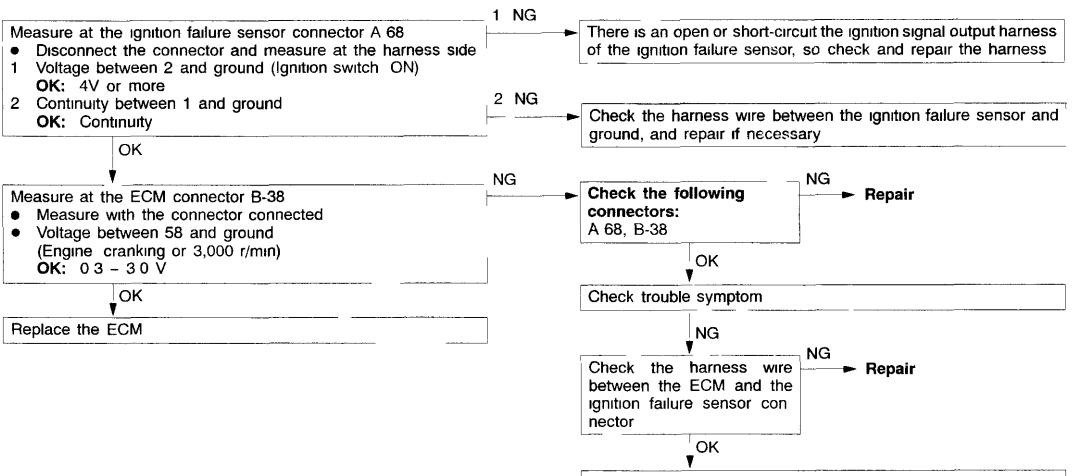
INSPECTION PROCEDURE 49

Check injector control circuit



INSPECTION PROCEDURE 50

Check ignition signal circuit.



DATA LIST REFERENCE TABLE

13100890555

The scan tool (MUT-II) has two operation modes: the general scan mode and the scan tool (MUT-II) mode.
The data list which can be read in either mode is shown in the table below.

Item No.	Inspection item	General scan tool model	Scan tool (MUT-II) mode
11	Heated oxygen sensor (Front)	×	×
12	Volume air flow sensor	×	×
13	Intake air temperature sensor	×	×
14	Throttle position sensor	×	×
16	Power supply voltage	–	×
18	Cranking signal (Ignition switch-ST)	–	×
21	Engine coolant temperature sensor	×	×
22	Crankshaft position sensor	×	×
24	Vehicle speed sensor	×	–
25	Barometric pressure sensor	–	×
26	Closed throttle position switch	–	×
27	Power steering pressure switch	–	×
28	A/C switch	–	×
29	Park/Neutral position switch <A/T>	–	×
41	Injectors	–	×
44	Ignition coils and ignition power transistor	–	×
45	Idle air control position	–	×
49	A/C compressor clutch relay	–	×
59	Heated oxygen sensor (Rear)	×	×
73	Fuel tank differential pressure sensor	×	×
81	Long-term fuel compensation	×	–
82	Short-term fuel compensation	×	–
87	Calculation load	×	–
88	Fuel control condition	×	–
95	Manifold differential pressure sensor	×	×

Caution

1. **When shifting the select lever to D range, the brakes should be applied so that the vehicle does not move forward.**
2. **Driving tests always reguire another person.**

NOTES FOR DATA LIST ITEM BELOW

*1: In a new vehicle [driven approximately 500 km (300 mile) or less], the volume air flow sensor output frequency is sometimes 10% higher than the standard frequency

*2: When idling to warm up from an engine coolant temperature of approx. –20°C (–4°F), if the idlling speed is lower than the standard value even when the IAC motor is fully opened, the air volume limiter built in the throttle body could be defective.

*3: The closed throttle position switch normally turns off when the voltage of the throttle position sensor is 50 – 100mV higher than the voltage at the idle position. If the closed throttle position switch turns back on after the throttle position sensor voltage has risen by 100mV and the throttle valve has opened, the closed throttle position switch and the throttle position sensor need to be adjusted.

*4: The injector drive time represents the time when the cranking speed is at 250 r/min or below when the power supply voltage is 11 V.

*5: In a new vehicle [driven approximately 500 km (300 mile) or less], the injector drive time is sometimes 10% longer than the standard time.

*6: In a new vehicle [driven approximately 500 km (300 mile) or less], the servo valve position is sometimes 20 steps greater than the standard value.

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
11	Heated oxygen sensor (front)	Engine: Warm (Air/fuel mixture is made leaner when decelerating, and is made richer when racing.)	When at 4,000 r/min, engine is suddenly decelerated	200 mV or less	Code No. P0130	P 13B-32
			When engine is suddenly raced	600–1,000 mV		
		Engine: Warm (The heated oxygen sensor signal is used to check the air/fuel mixture ratio, and control condition is also checked by the ECM.)	Engine is idling	400 mV or less ↔ 600–1,000 mV (Changes)		
			2,500 r/min			
12	Volume air flow sensor (Mass air flow rate)*1	• Engine coolant temperature: 80–95°C (176–203°F) • Lights, electric cooling fan and all accessories: OFF • Transaxle: Neutral (A/T: P range)	Engine is idling	18 – 44 Hz (1.5 – 3.7 g/s)	–	–
			2,500 r/min	68 – 108 Hz (5.8 – 9.4 g/s)		
			Engine is raced	Frequency increases in response to racing		
13	Intake air temperature sensor	Ignition switch: ON or with engine running	When intake air temperature is –20°C (–4°F)	–20°C (–4°F)	Code No. P0110	P 13B-28
			When intake air temperature is 0°C(32°F)	0°C(32°F)		
			When intake air temperature is 20°C(68°F)	20°C (68°F)		
			When intake air temperature is 40°C (104°F)	40°C(104°F)		
			When intake air temperature is 80°C(176°F)	80°C(176°F)		

Item No	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
14	Throttle position sensor	Ignition switch ON	Set to idle position	300–1,000 mV (6–20%)	Code No. P0120	P 13B-30
			Gradually open	Increases in proportion to throttle opening angle		
			Open fully	4,500–5,500 mV (80–100%)		
16	Power supply voltage	Ignition switch. ON		Battery positive voltage	Procedure No 28	P.13B-109
18	Cranking signal (ignition switch-ST)	Ignition switch: ON	Engine Stopped	OFF	Procedure No. 31 <M/T> Procedure No. 32 <A/T>	P.13B-111 <M/T> P 13B-112 <A/T>
			Engine: Cranking	ON		
21	Engine coolant temperature sensor	Ignition switch· ON or with engine running	When engine coolant temperature is –20°C (–4°F)	–20°C (–4°F)	Code No. 0115	P.13B-29
			When engine coolant temperature is 0°C (32°F)	0°C (32°F)		
			When engine coolant temperature is 20°C (68°F)	20°C (68°F)		
			When engine coolant temperature is 40°C (104°F)	40°C (104°F)		
			When engine coolant temperature is 80°C (176°F)	80°C (176°F)		
22	Crankshaft position sensor*2	• Engine: Cranking • Tachometer: Connected	Compare the rpm of the tachometer with the one of the scan tool.	Identical	Code N0. P0335	P.13B-40
		• Engine· Idling • Closed throttle position switch: ON	When engine coolant temperature is –20°C (–4°F)	1400 – 1600 r/min		
			When engine coolant temperature is 0°C (32°F)	1300 – 1500 r/min		
			When engine coolant temperature is 20°C (68°F)	1250 – 1450 r/min		
			When engine coolant temperature is 40°C (104°F)	1000 – 1200 r/min		
			When engine coolant temperature is 80°C (176°F)	600 – 800 r/min		
24	Vehicle speed sen-	Drive at 40 km/h (25 miles/h)		Approx 40 km/h	Code No. P0500	P 13B-80

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
25	Barometic pressure sensor	Ignition switch: ON	At altitude of 0 m (0 ft.)	101 kPa	Code N0. P0105	P 13B-27
			At altitude of 600m (1,969 ft)	95 kPa		
			At altitude of 1,200 m(3,937ft.)	88 kPa		
			At altitude of 1,800 m (5,906 ft.)	81 kPa		
26	Closed throttle position switch	Ignition switch· ON Check by operating accelerator pedal repeatedly	Throttle valve Set to idle position	ON	Code N0. P0510	P.13B-82
			Throttle valve: Slightly open	OFF*3		
27	Power steering pressure switch	Engine Idling	Steering wheel stationary	OFF	Code N0. P0551	P 13B-83
			Steering wheel turning	ON		
28	A/C switch	Engine: Idling (When A/C switch is ON, A/C compressor should be operating.)	A/C switch: OFF	OFF	Procedure No. 34	P.13B-113
			A/C switch: ON	ON		
29	Park/Neutral positon switch <A/T>	Ignition switch ON	P or N	P or N	Procedure No. 32	P.13B-112
			D, 2, L or R	D, 2, L or R		
41	Injectors *4	Engine Cranking	When engine coolant temperature is 0°C (32°F) (injection is carried out for all cylinders simultaneously)	15 – 22 ms	–	–
			When engine coolant temperature is 20°C (68°F)	31 – 46 ms		
			When engine coolant temperature is 80°C (176°F)	7.2 – 10.8 ms		
	Injectors *5	• Engine coolant temperature: 80–95°C (176–203°F) • Lights, electric cooling fan and all accessories: OFF • Transaxle. Neutral (A/T : P range)	Engine is idling	2 0 – 3.2 ms		
			2,500 r/min	1 7 – 2.9 ms		
			When engine is suddenly raced	Increases		
44	Ignition coils and ignition power transistors	• Engine: After having warmed up • Timing light is set (The timing light is set in order to check actual ignition timing.)	Engine is idling	0 – 13 °BTDC	–	–
			2,500 r/min	22 – 42 °BTDC		

Item No	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
49	A/C compressor clutch relay	Engine: After warm up /Engine is idling	A/C switch: OFF	OFF (Compressor clutch is not operating)	Procedure No. 34	P.13B-113
			A/C switch· ON	ON (Compressor clutch is operating)		
45	Idle air control (stepper) position*6	• Engine coolant temperature: 80 – 95°C (176–203°F) • Lights, electric cooling fan and all accessories: OFF • Transaxle: Neutral (A/T : P range) • Closed throttle position switch: ON • Engine Idling (When A/C switch is ON, A/C compressor should be operating)	A/C switch: OFF	Increases by 2–25 steps	–	–
			A/C switch: OFF → ON	Increases by 10–70 steps		
			• A/C switch· OFF • Select lever. N range → D range	Increases by 5–50 steps		
59	Heated oxygen sensor (rear)	• Transaxle: 2nd gear <M/T> L range <A/T> • Drive with wide open throttle	3,500 r/min	600–1,000 mV	Code No. P0136	P 13B-34
73	Fuel tank differential pressure sensor	• Ignition switch: ON • Fuel tank filler tube cap removal		–3.3 – 3.3 kPa	–	–
81	Long-term fuel compensation	Engine: Warm, 2,500 r/min without any load (during closed loop)		–12.5 – +12.5 %	Code No. P0170	P.13B-36
82	Short-term fuel compensation	Engine: Warm, 2,500 r/min without any load (during closed loop)		–17–+17 %	Code No. P0170	P 13B-36
87	Calculation load value	Engine: Warm	Engine is idling	12 – 30 %	–	–
			2,500 r/min	13 – 21 %		
88	Fuel control condition	Engine: Warm	2,500 r/min	Closed loop	Code No. P0125	P.13B-31
			When engine is suddenly raced	Open loop – drive condition		
95	Manifold differential pressure sensor	Engine Warm, idle		28 – 42 kPa	Code No. P1400	P 13B-86

ACTUATOR TEST REFERENCE TABLE

13100900630

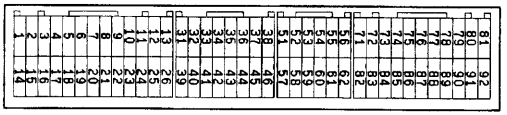
Item No.	Drive contents	Inspection item	Inspection contents	Normal condition	Inspection procedure No.	Reference page
01	Injectors	Cut fuel to No. 1 injector	Engine: Warm, idle (Cut the fuel supply to each injector in turn and check cylinders which don't affect idling.)	Idle speed drops equally for each injector	Code No. P0201, P0202, P0203, P0204,	P.13B-37
02		Cut fuel to No. 2 injector				
03		Cut fuel to No. 3 injector				
04		Cut fuel to No. 4 injector				
07	Fuel pump	Fuel pump operates and fuel is recirculated.	• Engine: Cranking • Fuel pump: Activated Inspect according to both the above conditions. — Pinch the return hose with fingers to feel the pulse of the fuel being recirculated.	Pulse is felt.	Procedure No. 29	P 13B-110
			Listen near the fuel tank for the sound of fuel pump operation.	Typical electric fuel pump whine.		
08	Evaporative emission purge solenoid	Solenoid valve turns from OFF to ON.	Ignition switch: ON	Clicks when solenoid valve is driven.	Code No. P0443	P 13B-56
10	EGR solenoid	Solenoid valve turns from OFF to ON.	Ignition switch: ON	Clicks when solenoid valve is driven.	Code No. P0403	P.13B-43
17	Basic ignition timing	Set to ignition timing adjustment mode	Engine: Idle Timing light is set	5°BTDC	–	–
20	Radiator fan (Hi) Condenser fan (Hi)	Drive the fan motors (radiator and condenser).	Ignition switch: ON A/C switch: ON	Fan motor operates at high speed.	Procedure No. 24	P.13B-107
21	Radiator fan (Hi) Condenser fan (Low)	Drive the fan motors (radiator and condenser).	Ignition switch: ON A/C switch ON	Fan motor operates at low speed	Procedure No. 24	P 13B-107
29	Evaporative emission ventilation solenoid	Solenoid valve turns from OFF to ON.	Ignition switch: ON	Clicks when solenoid valve is driven.	Code No. P0446	P.13B-57

CHECK AT THE ENGINE CONTROL MODULE (ECM)

13100920568

TERMINAL VOLTAGE CHECK CHART

Engine Control Module (ECM) Connector Terminal Arrangement



9FU0393

Terminal No.	Check item	Check condition (Engine condition)	Normal condition
1	No. 1 injector	While engine is idling after having warmed up, suddenly depress the accelerator pedal.	From 11–14 V, momentarily drops slightly
14	No. 2 injector		
2	No. 3 injector		
15	No. 4 injector		
4	Stepper motor coil <A1>	Engine: Soon after the warmed up engine is started	B +↔ 0 V (Changes repeatedly)
17	Stepper motor coil <A2>		
5	Stepper motor coil <B1>		
18	Stepper motor coil <B2>		
6	EGR solenoid	Ignition switch: ON	B +
		While engine is idling, suddenly depress the accelerator pedal	From B +, momentarily drops
8	Fuel pump relay	Ignition switch ON	B +
		Engine: Idle speed	0 – 3 V
9	Evaporative emission purge solenoid	Ignition switch: ON	B +
		Running at 3,000 r/min while engine is warming up after having been started.	0 – 3 V
10	Ignition coil – No 1, No. 4 (Ignition power transistor)	Engine r/min: 3,000 r/min	0.3 – 3.0 V
23	Ignition coil – No. 2, No 3 (Ignition power transistor)		
12	Power supply	Ignition switch· ON	B +
25			

Terminal No.	Check item	Check condition (Engine condition)		Normal condition
19	Volume air flow sensor reset signal	Engine Idle speed		0 – 1 V
		Engine r/min: 3,000 r/min		6 – 9 V
20	Condenser fan motor relay	Condenser fan is not operating [Engine coolant temperature is 90°C (194°F) or less]		B +
		Condenser fan is operating [Engine coolant temperature is 105°C (221°F) or more]		0 – 3 V
21	Radiator fan motor relay	Radiator fan is not operating [Engine coolant temperature is 90°C (194°F) or less]		B +
		Radiator fan is operating [Engine coolant temperature is 90 – 105°C (194 – 221°F)]		0 – 3 V
22	A/C relay	• Engine: Idle speed • A/C switch: OFF → ON (A/C compressor is operating)		B + or momentarily 6 V or more → 0 – 3 V
33	Generator G terminal	• Engine: Warm, idle (radiator fan: OFF) • Headlamp: OFF to ON • Rear defogger switch: OFF to ON • Stop light: OFF to ON		Voltage rises.
41	Generator FR terminal	• Engine: Warm, idle (radiator fan: OFF) • Headlamp: OFF to ON • Rear defogger switch: OFF to ON • Stop light. OFF to ON		Voltage falls
36	Service Engine Soon/Malfunction Indicator Lamp	Ignition switch: OFF → ON		0 – 3 V → 9 – 13 V (After several seconds have elapsed)
37	Power steering pressure switch	Engine: Idling after warming up	When steering wheel is stationary	B +
			When steering wheel is turned	0 – 3 V
38	MFI relay (Power supply)	Ignition switch: OFF		B +
		Ignition switch ON		0 – 3 V
45	A/C switch	Engine: Idle speed	Turn the A/C switch OFF	0 – 3 V
			Turn the A/C switch ON (A/C compressor is operating)	B +
54	Heated oxygen sensor heater (Rear)	Engine: Idling after warming up		0 – 3 V
		Engine r/min. 5,000 r/min		B +

Terminal No.	Check item	Check condition (Engine condition)		Normal condition
55	Evaporative emission ventilation solenoid	Ignition switch: ON		B +
		After the engine has warmed up, drive the vehicle at a constant speed 88 km/h (55 mph) (OBD-II monitoring conditions).		Momentarily 0 – 3 V
58	Engine ignition signal	Engine r/min: 3,000 r/min		0.3 – 3.0 V
60	Heated oxygen sensor heater (Front)	Engine: Idling after warming up		0 – 3 V
		Engine r/min: 5,000r/min.		B +
61	Fuel tank differential pressure sensor	Engine: Idle		1.2 – 3.8 V
71	Ignition switch – ST	Engine: Cranking		8 V or more
72	Intake air temperature sensor	Ignition switch: ON	When intake air temperature is 0°C (32°F)	3.2 – 3.8 V
			When intake air temperature is 20°C (68°F)	2.3 – 2.9 V
			When intake air temperature is 40°C (104°F)	1.5 – 2.1 V
			When intake air temperature is 80°C (176°F)	0.4 – 1.0 V
73	Manifold differential pressure sensor	Engine: Idle		0.8 – 2.4 V
		• Engine: Idle • Suddenly depress the accelerator pedal		rises from 0.8 – 2.4 V suddenly
75	Heated oxygen sensor (Rear)	• Transaxle 2nd <M/T>, L range <A/T> • Driving with the throttle open wide • Engine: 3,500 r/min or more		0.6 – 1.0 V
76	Heated oxygen sensor (Front)	Engine: Running at 2,500 r/min after warmed up (Check using a digital type voltmeter)		0 ↔ 0.8V (Changes repeatedly)
80	Backup power supply	Ignition switch: OFF		B +
81	Sensor impressed voltage	Ignition switch: ON		4.5 – 5.5 V
82	Ignition switch – IG	Ignition switch: ON		B +

Terminal No.	Check item	Check condition (Engine condition)		Normal condition
83	Engine coolant temperature sensor	Ignition switch: ON	When engine coolant temperature is 0°C (32°F)	3.2 – 3.8 V
			When engine coolant temperature is 20°C (68°F)	2.3 – 2.9 V
			When engine coolant temperature is 40°C (104°F)	1.3 – 1.9 V
			When engine coolant temperature is 80°C (176°F)	0.3–0.9V
84	Throttle position sensor	Ignition switch: ON	Set throttle valve to idle position	0.3 – 1.0 V
			Fully open throttle valve	4.5 – 5.5 V
85	Barometric pressure sensor	Ignition switch: ON	When altitude is 0m	3.7 – 4.3 V
			When altitude is 1,200m	3.2 – 3.8 V
86	Vehicle speed sensor	• Ignition switch: ON • Move the vehicle slowly forward		0 ↔ 5 V (Changes repeatedly)
87	Closed throttle position switch	Ignition switch: ON	Set throttle valve to idle position	0 – 1 V
			Slightly open throttle valve	4 V or more
88	Camshaft position sensor	Engine: Cranking		0.4 – 3.0 V
		Engine: Idle speed		0.5 – 2.0 V
89	Crankshaft position sensor	Engine: Cranking		0.4 – 4.0 V
		Engine: Idle speed		1.5 – 2.5 V
90	Volume air flow sensor	Engine: Idle speed		2.2 – 3.2 V
		Engine r/min 2,500r/min		
91	Park/Neutral position switch <A/T>	Ignition switch: ON	Set selector lever to P or N	0 – 3 V
			Set selector lever to R, D, 2, or L	8 – 14 V

TERMINAL RESISTANCE AND CONTINUITY CHECK

1. Turn the ignition switch to OFF.
2. Disconnect the ECM connector.
3. Measure the resistance and check for continuity between the terminals of the ECM harness-side connector while referring to the check chart.

NOTE
1. When measuring resistance and checking continuity, use a harness for checking contact pin pressure instead of inserting a test probe.
2. Checks do not have to be carried out in the order given in this chart.

Caution
If resistance or continuity checks are performed on the wrong terminals, damage to the vehicle wiring, sensors, ECM, and/or ohmmeter may occur. Use care to prevent this!

4. If the ohmmeter shows any deviation from the normal condition, check the corresponding sensor, actuator and related electrical wiring, and then repair or replace.
5. After repair or replacement, recheck with the ohmmeter to confirm that the repair or replacement has corrected the problem.

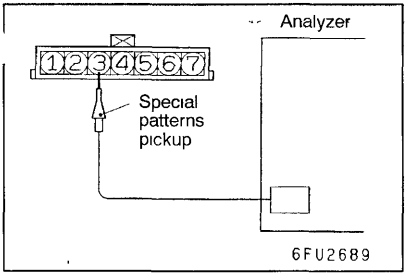
ECM Harness Side Connector Terminal Arrangement



9FU0392

Terminal No.	Inspection item	Normal condition (Check condition)
1–12	No. 1 injector	13–16 Ω [At 20°C (68°F)]
14–12	No 2 injector	
2–12	No. 3 injector	
15–12	No. 4 injector	
4–12	Stepper motor coil (A1)	28–33 Ω [At 20°C (68°F)]
17–12	Stepper motor coil (A2)	
5–12	Stepper motor coil (B1)	
18–12	Stepper motor coil (B2)	
6–12	EGR solenoid	36–44 Ω [At 20°C (68°F)]
9–12	Evaporative emission purge solenoid	36–44 Ω [At 20°C (68°F)]

Terminal No.	Inspection item	Normal condition (Check condition)
13–Body ground	ECM ground	Continuity (0Ω)
26–Body ground	ECM ground	
54 – 12	Heated oxygen sensor heater (Rear)	11 – 18 Ω [At 20°C (68°F)]
55 – 12	Evaporative emission ventilation solenoid	36 – 44 Ω [At 20°C (68°F)]
60–12	Heated oxygen sensor heater (Front)	11 – 18 Ω [At 20°C (68°F)] <Vehicles for Federal> 4.5 – 8.0 Ω [At 20°C (68°F)] <Vehicles for California>
72–92	Intake air temperature sensor	5.3–6 7 kΩ [When intake air temperature is 0°C (32°F)]
		2 3–3.0 kΩ [When intake air temperature is 20°C (68°F)]
		1.0–1.5 kΩ [When intake air temperature is 40°C (104°F)]
		0.30–0.42 kΩ [When intake air temperature is 80°C (176°F)]
83–92	Engine coolant temperature sensor	5.1–6.5 kΩ [When coolant temperature is 0°C (32°F)]
		2.1–2 7 kΩ [When coolant temperature is 20°C (68°F)]
		0 9–1 3 kΩ [When coolant temperature is 40°C (104°F)]
		0.26–0.36 kΩ [When coolant temperature is 80°C (176°F)]
87–92	Closed throttle position switch	Continuity (when throttle valve is at idle position)
		No continuity (when throttle valve is slightly open)
91–Body ground	Park/Neutral position switch <A/T>	Continuity (when select lever is at P or N)
		No continuity (when select lever is at D, 2, L or R)



INSPECTION PROCEDURE USING AN ANALYZER

13100930387

VOLUME AIR FLOW SENSOR

Measurement Method

1. Disconnect the volume air flow sensor connector, and connect the special tool (test harness: MB991709) in between (All terminals should be connected.)
2. Connect the analyzer special patterns pickup to volume air flow sensor connector terminal 3.

Alternate method (Test harness not available)

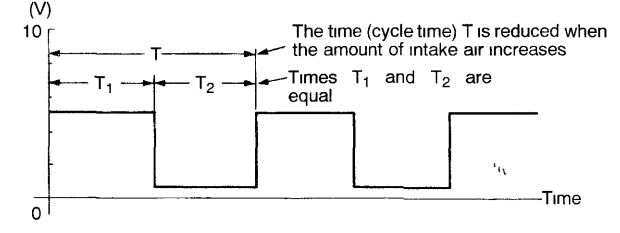
1. Connect the analyzer special patterns pickup to ECM terminal 90.

Standard Wave Pattern

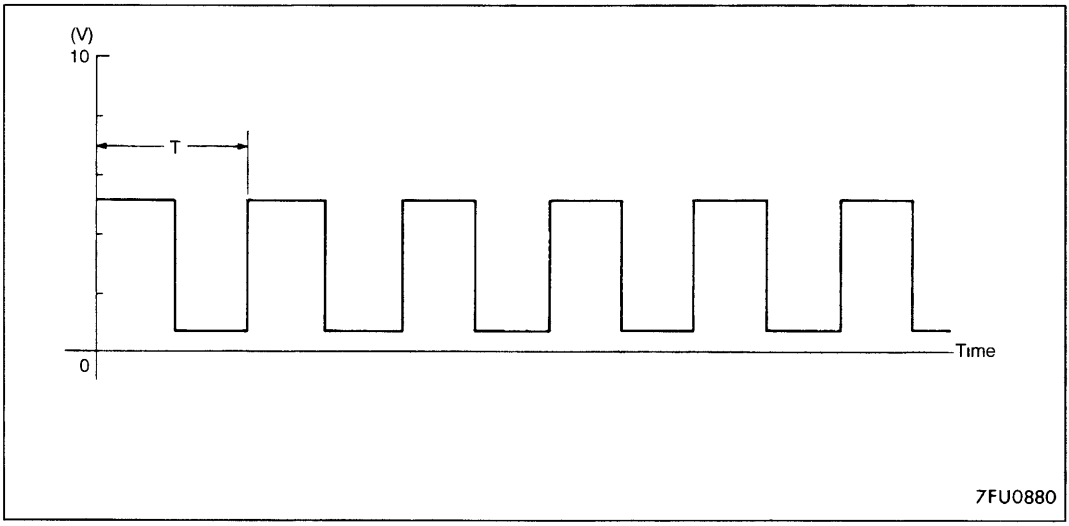
Observation conditions

Function	Special patterns
Pattern height	Low
Pattern selector	Display
Engine r/min	Idle

Standard wave pattern

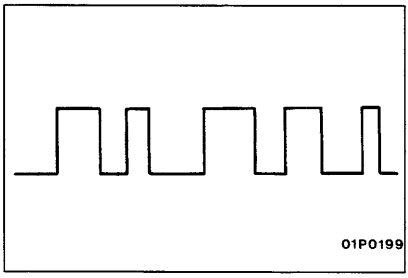


Observation Conditions (pattern changes with engine speed changes.)



Wave Pattern Observation Points

Check to be sure that cycle time T becomes shorter and the frequency increases when the engine speed is increased.



Examples of Abnormal Wave Patterns

- Example 1

  CAUSE OF PROBLEM

  Sensor interface malfunction

  WAVE PATTERN CHARACTERISTICS

  Rectangular wave pattern is output even when the engine is not started.

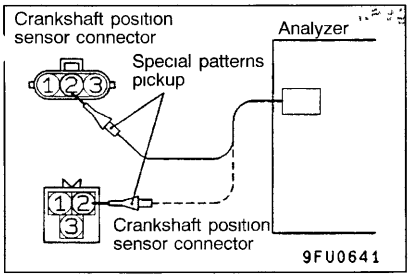
- Example 2

  CAUSE OF PROBLEM

  Damaged rectifier or vortex generation column

  WAVE PATTERN CHARACTERISTICS

  Unstable wave pattern with non-uniform frequency. However, when an ignition leak occurs during acceleration, the wave pattern will be distorted temporarily, even if the volume air flow sensor is normal.



CAMSHAFT POSITION SENSOR AND CRANKSHAFT POSITION SENSOR

Measurement Method

1. Connect the analyzer special patterns pickup to camshaft position sensor connector terminal 2.
2. Disconnect the crankshaft position sensor connector and connect the special tool (test harness: MD998478) in between.
3 Connect the analyzer special patterns pickup to crankshaft position sensor connector terminal 2.

Alternate method (Test harness not available)

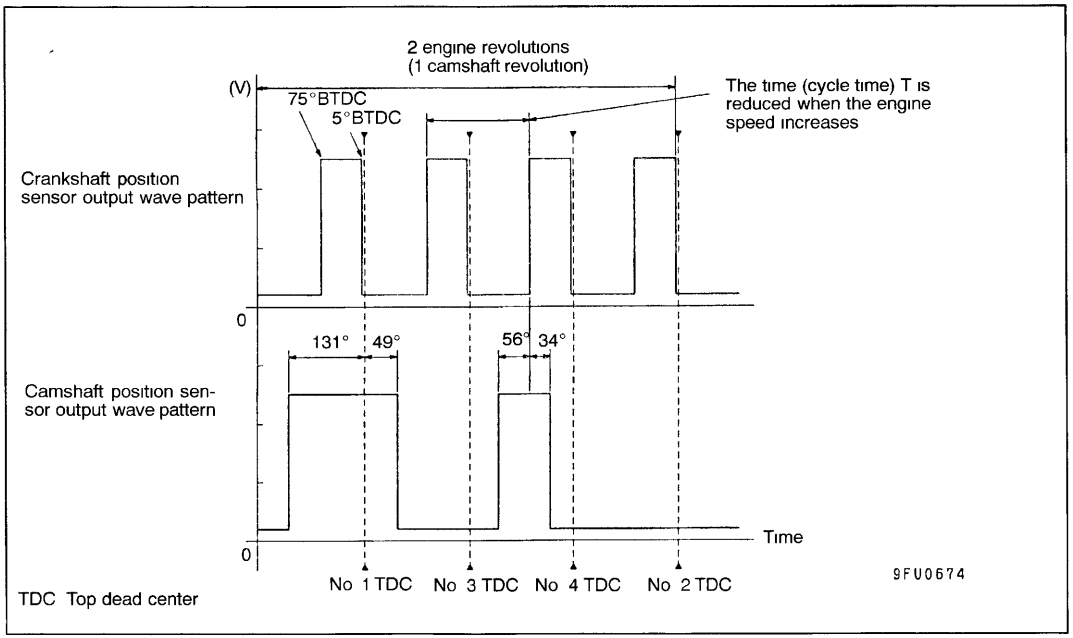
1. Connect the analyzer special patterns pickup to ECM terminal 88. (When checking the camshaft position sensor signal wave pattern)
2. Connect the analyzer special patterns pickup to ECM terminal 89. (When checking the crankshaft position sensor signal wave pattern)

Standard Wave Pattern

Observation conditions

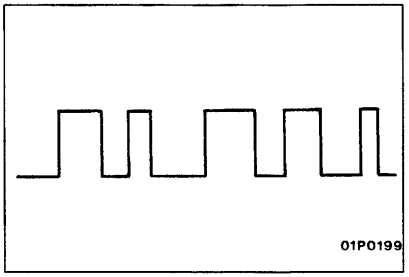
Function	Special patterns
Pattern height	Low
Pattern selector	Display
Engine r/min	Idle

Standard wave pattern



Wave Pattern Observation Points

Check to be sure that cycle time T becomes shorter when the engine speed increases.



Examples of Abnormal Wave Patterns

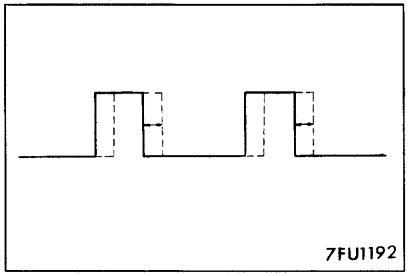
- Example 1

  CAUSE OF PROBLEM

  Sensor interface malfunction

  WAVE PATTERN CHARACTERISTICS

  Rectangular wave pattern is output even when the engine is not started.



- Example 2

  CAUSE OF PROBLEM

  Loose timing belt
  Abnormality in sensor disk

  WAVE PATTERN CHARACTERISTICS

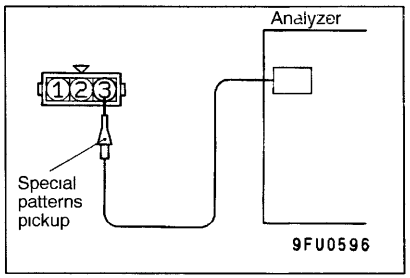
  Wave pattern jumps to the left or right.

INJECTOR

Refer to GROUP 13A – On-vehicle Service.

IDLE AIR CONTROL (STEPPER) MOTOR

Refer to GROUP 13A – On-vehicle Service.



IGNITION COIL AND IGNITION POWER TRANSISTOR

Ignition power transistor control signal

Measurement Method

1. Disconnect the ignition coil connector, and connect the special tool (test harness: MB991348) in between. (All terminals should be connected.)
2. Connect the analyzer special patterns pickup to ignition coil connector terminal 3.

Alternate method (Test harness not available)

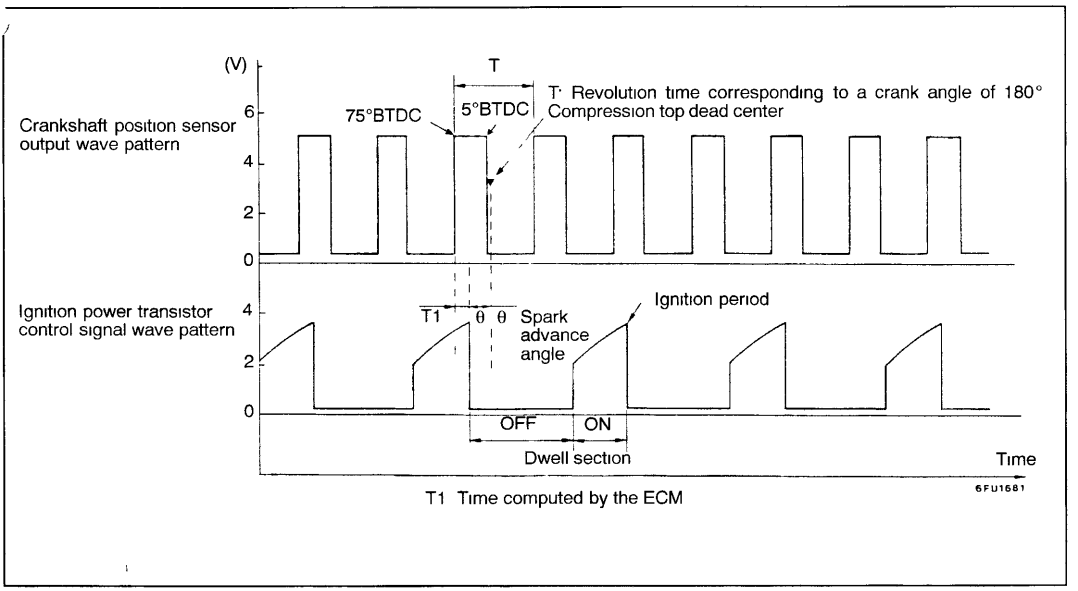
1. Connect the analyzer special patterns pickup to ECM terminal 10(No.1 – No.4), terminal 23 (No.2 – No.3) respectively.

Standard Wave Pattern

Observation conditions

Function	Special patterns
Pattern height	Low
Pattern selector	Display
Engine r/min	Approx. 1,200 r/min

Standard wave pattern

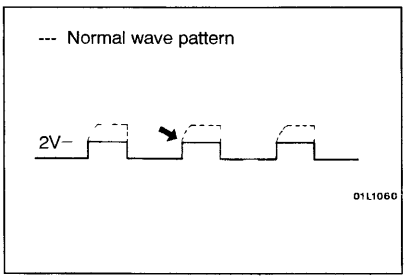


T1 Time computed by the ECM

Wave Pattern Observation Points

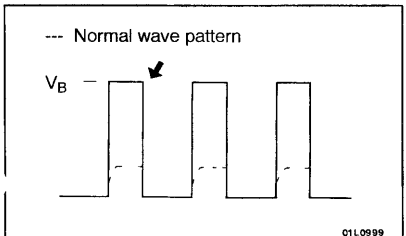
Point: Condition of wave pattern build-up section and maximum voltage (Refer to abnormal wave pattern examples 1 and 2.)

Condition of wave pattern build-up section and maximum voltage	Probable cause
Rises from approx. 2V to approx. 4.5V at the top-right	Normal
2V rectangular wave	Open-circuit in ignition primary circuit
Rectangular wave at power voltage	Ignition power transistor malfunction



Examples of Abnormal Wave Patterns

- Example 1
  Wave pattern during engine cranking
  CAUSE OF PROBLEM
  Open-circuit in ignition primary circuit
  WAVE PATTERN CHARACTERISTICS
  Top-right part of the build-up section cannot be seen, and voltage value is too low, approximately 2V.



- Example 2
  Wave pattern during engine cranking
  CAUSE OF PROBLEM
  Malfunction in ignition power transistor
  WAVE PATTERN CHARACTERISTICS
  Power voltage results when the ignition power transistor is ON.

ON-VEHICLE SERVICE

13100100481

THROTTLE BODY (THROTTLE VALVE AREA) CLEANING

Refer to GROUP 13A – On-vehicle Service.

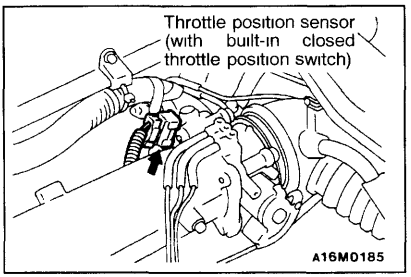
CLOSED THROTTLE POSITION SWITCH AND THROTTLE POSITION SENSOR ADJUSTMENT <Vehicles without auto-cruise control system>

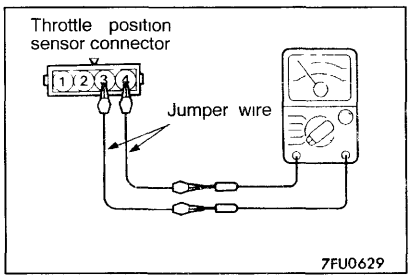
13100130404

Refer to GROUP 13A – On-vehicle Service.

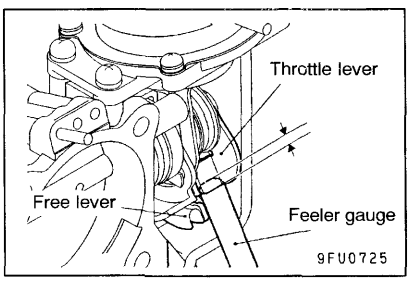
CLOSED THROTTLE POSITION SWITCH AND THROTTLE POSITION SENSOR ADJUSTMENT <Vehicles with auto-cruise control system>

13100130213





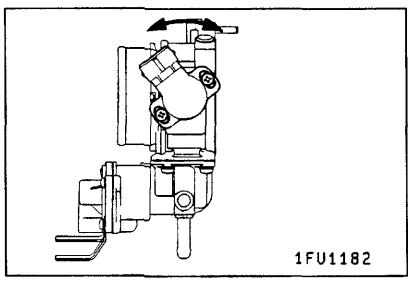
1. Connect the scan tool to the data link connector. When not using the scan tool, proceed as follows.
   (1) Disconnect the connector of the throttle position sensor.
   (2) Connect an ohmmeter between terminal 3 (closed throttle position switch) and 4 (sensor ground) by using jumper wires.

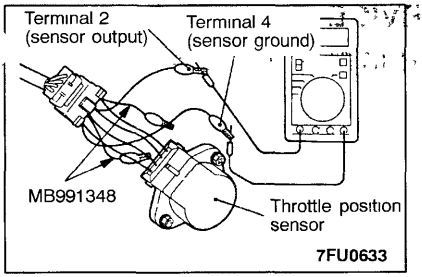


2. Insert the tip of a 1.4mm (.055 in.) thick (including clearance amount compensation) feeler gauge approximately 3mm (.12 in.) between the levers shown in the left illustration.

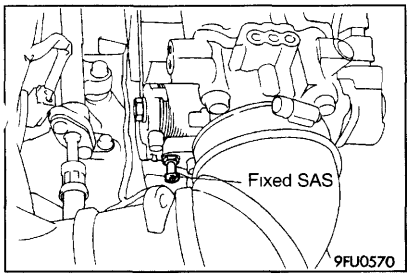
   NOTE
   The throttle lever opening will widen larger than the set opening if the feeler gauge is inserted more than 3mm (.12 in.), and adjustment will be impossible.

3. When using the scan tool, turn the ignition switch ON. (Do not start engine.) Observe operation of the closed throttle position switch.
4. Loosen the throttle position sensor mounting bolt; then turn the throttle position sensor body fully counter-clockwise.
5. In this condition, make sure that the closed throttle position switch is ON.
6. Slowly turn the throttle position sensor clockwise until the point at which the idle switch is turned OFF is found. Tighten the throttle position sensor installation bolt at that position. Procced to step 8.





7. When not using the scan tool, proceed as follows:
   (1) Connect the special tool (test harness set) between the throttle position sensor connectors which have been disconnected. (Connect all terminals taking care not to mistake the terminal No.)
   (2) Connect a digital voltmeter between the throttle position sensor terminal 2 (sensor output) and terminal 4 (sensor ground)
   (3) Turn the ignition switch ON (but do not start the engine).
8. Check the throttle position sensor output voltage.
   Standard value: 400 – 1,000 mV
9. If there is a deviation from the standard value, check the throttle position sensor and the related harness.
10. Remove the feeler gauge.
11. Switch OFF the ignition switch.



FIXED SAS ADJUSTMENT

13100150448

NOTE
1. The fixed SAS should not be moved unnecessarily; it has been precisely adjusted by the manufacturer.
2. If the adjustment is disturbed for any reason, readjust as follows.

1. Loosen the tension of the accelerator cable sufficiently.
2. Back out the fixed SAS lock nut.
3. Turn the fixed SAS counterclockwise until it is sufficiently backed out, and fully close the throttle valve.
4. Turn the fixed SAS clockwise until the throttle lever is touched (i.e., the point at which the throttle valve begins to open).
   From that point, turn the fixed SAS clockwise another 1-1/4 turn.
5. While holding the fixed SAS so that it doesn't move, tighten the lock nut securely.
6. Adjust the tension of the accelerator cable.
7. Adjust the basic idle speed.
8. Adjust the closed throttle position switch and the throttle position sensor (Vehicles without auto-cruise control system: Refer to P.13B-142.) (Vehicles with auto-cruise control system: Refer to P.13B-142.)

BASIC IDLE SPEED ADJUSTMENT

13100180546

Refer to GROUP 13A – On-vehicle Service.

FUEL PRESSURE TEST

13100190495

Refer to GROUP 13A – On-vehicle Service.

FUEL PUMP CONNECTOR DISCONNECTION (HOW TO REDUCE PRESSURIZED FUEL LINES)

13100090177

Refer to GROUP 13A – On-vehicle Service.

FUEL PUMP OPERATION CHECK

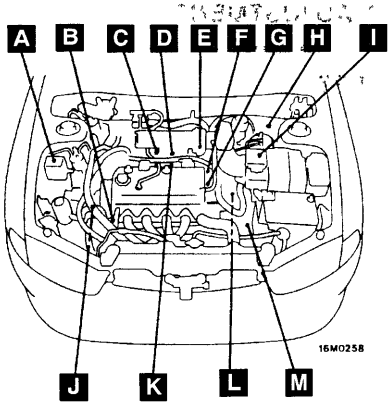
13100200341

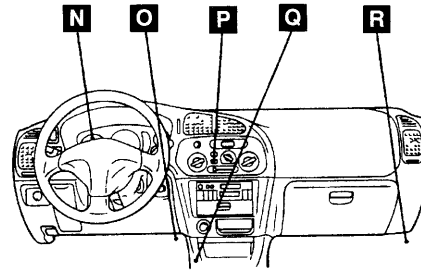
Refer to GROUP 13A – On-vehicle Service.

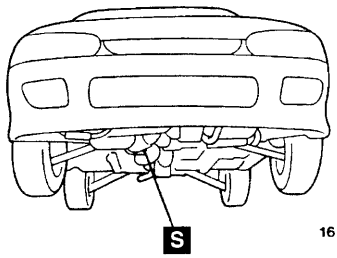
COMPONENT LOCATION

13100210634

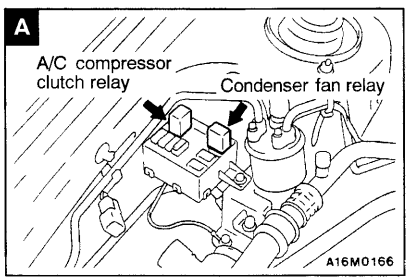
Name		Symbol	Name	Symbol
Air conditioning compressor clutch relay		A	Idle air control motor	E
Air conditioning switch		P	Ignition coil (with built-in ignition power transistor)	K
Camshaft position sensor		F	Ignition failure sensor	F
Crankshaft position sensor		J	Injector	K
Data link connector		O	Manifold differential pressure sensor	D
EGR Solenoid		C	Multiport fuel injection (MFI) relay/Fuel pump relay	Q
Engine control module		R	Park/Neutral position switch	M
Engine coolant temperature sensor		G	Power steering pressure switch	B
Evaporative emission purge solenoid		C	Service Engine Soon/Malfunction Indicator Lamp	N
Fuel pump check connector		H	Throttle position sensor (with built-in closed throttle position switch)	E
Heated oxygen sensor <California>	Front	S	Vehicle speed sensor	L
	Rear	S	Volume air flow sensor (with built-in intake air temperature sensor and barometric pressure sensor)	I
Heated oxygen sensor <Federal>	Front	S		
	Rear	S		

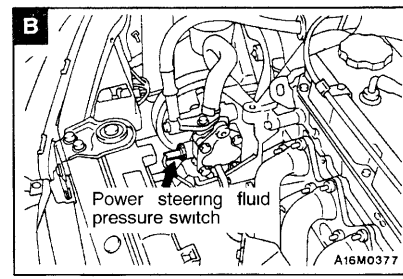

A
B
C
D
E
F
G
H
I
J
K
L
M
16M0258

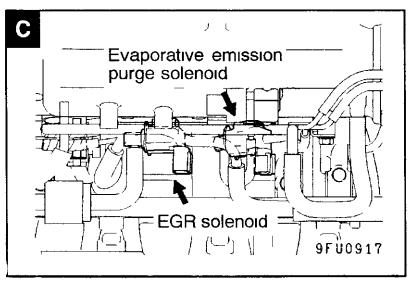

N
O
P
Q
R
16M0259

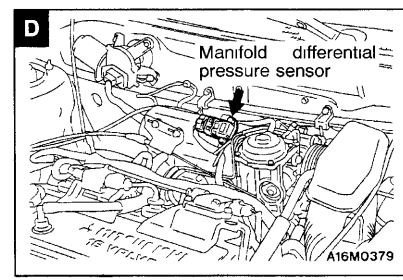

S
16M0345

9FU0726

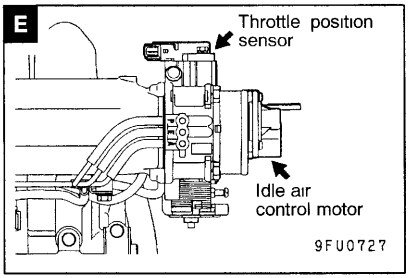

A
A/C compressor clutch relay
Condenser fan relay
A16M0166


B
Power steering fluid pressure switch
A16M0377

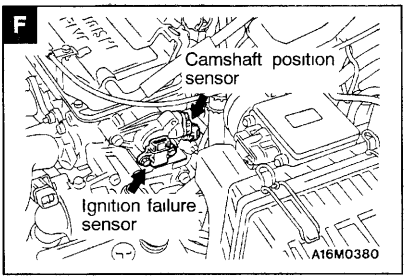

C
Evaporative emission purge solenoid
EGR solenoid
9FU0917


D
Manifold differential pressure sensor
A16M0379

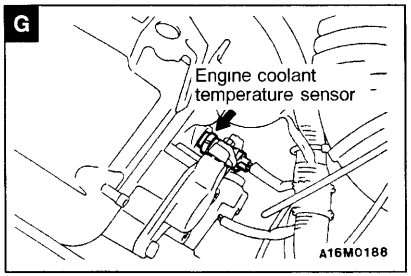
E


Throttle position sensor
Idle air control motor
9FU0727

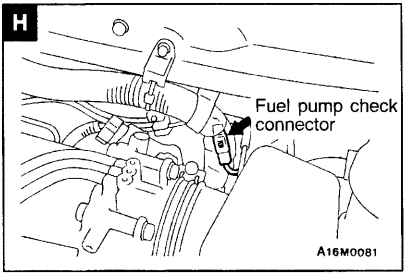
F


Camshaft position sensor
Ignition failure sensor
A16M0380

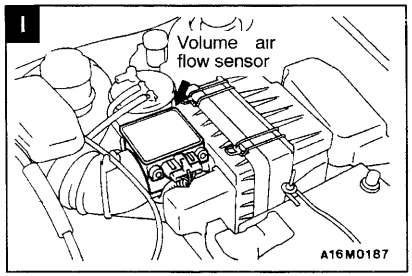
G


Engine coolant temperature sensor
A16M0188

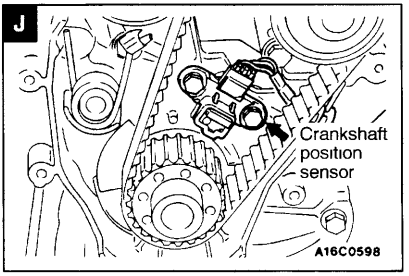
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Fuel pump check connector
A16M0081

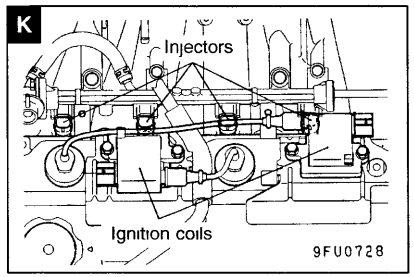
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Volume air flow sensor
A16M0187

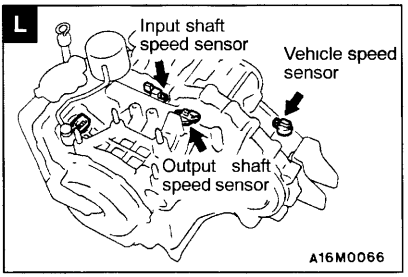
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Crankshaft position sensor
A16C0598

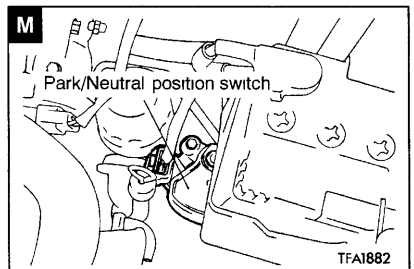
K


Injectors
Ignition coils
9FU0728

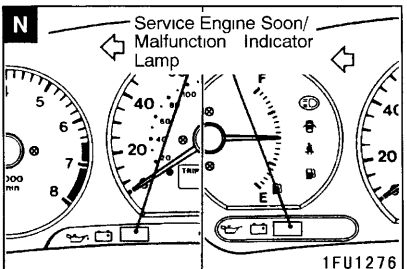
L


Input shaft speed sensor
Vehicle speed sensor
Output shaft speed sensor
A16M0066

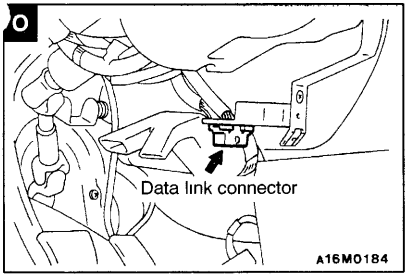
M


Park/Neutral position switch
TFA1882

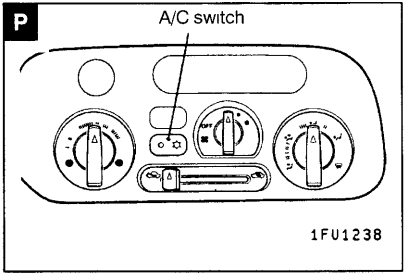
N


Service Engine Soon/ Malfunction Indicator Lamp
1FU1276

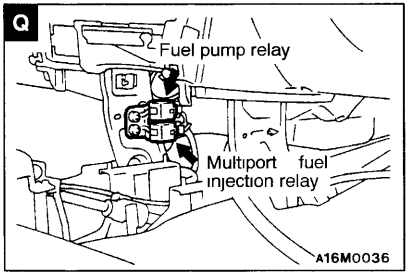
O



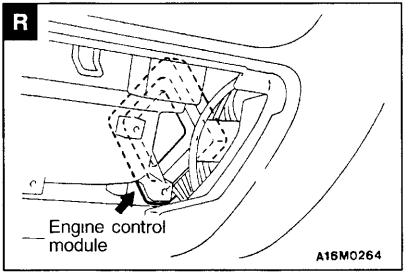
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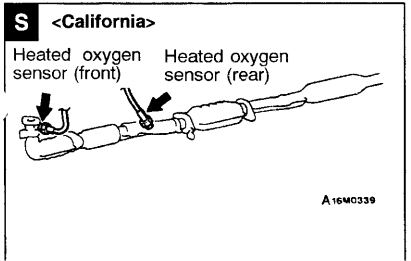
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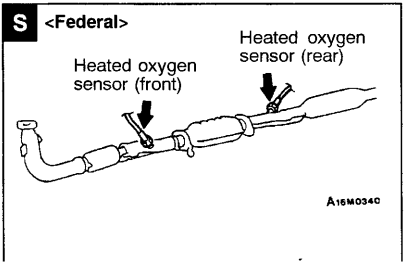
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S <California>



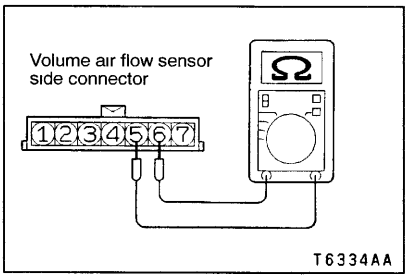
S <Federal>



MULTIPORT FUEL INJECTION (MFI) RELAY AND FUEL PUMP RELAY CONTINUITY CHECK

13100990255

Refer to GROUP 13A – On-vehicle Service.

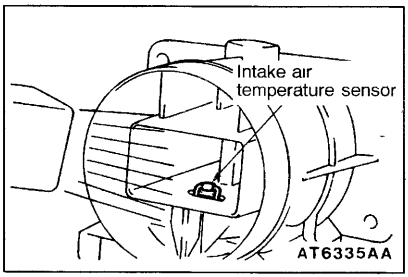


INTAKE AIR TEMPERATURE SENSOR CHECK

13100280307

1. Disconnect the volume air flow sensor connectors.
2. Measure resistance between terminals 5 and 6.

Standard value:
2.3 – 3.0 kΩ [at 20°C (68°F)]
0.30 – 0.42 kΩ [at 80°C (176°F)]



3. Measure resistance while heating the sensor using a hair dryer.

Normal condition:

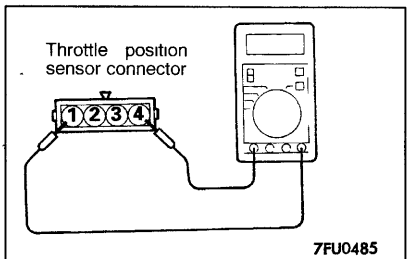
Temperature	Resistance
Higher	Smaller

4. If resistance does not decrease as heat increases the resistance remains unchanged, replace the volume air flow sensor assembly.

ENGINE COOLANT TEMPERATURE SENSOR CHECK

13100310310

Refer to GROUP 13A – On-vehicle Service.

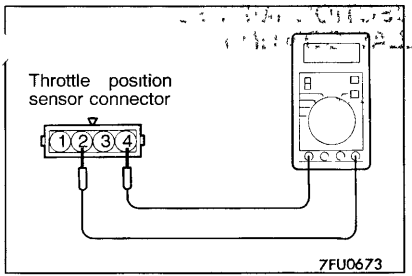


THROTTLE POSITION SENSOR CHECK

13100320443

1. Disconnect the throttle position sensor connector.
2. Measure the resistance between the throttle position sensor side connector terminal 1 and terminal 4.

Standard value: 3.5 – 6.5 kΩ



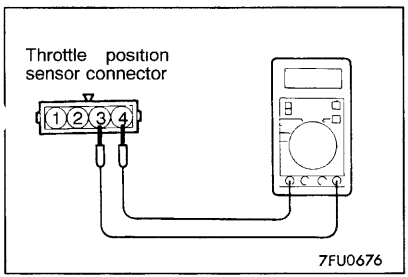
3. Measure the resistance between the throttle position sensor side connector terminal 2 and terminal 4.

Normal condition:

Throttle valve slowly open until fully open from the idle position	Changes smoothly in proportion to the opening angle of the throttle valve

4. If the resistance is outside the standard value, or if it doesn't change smoothly, replace the throttle position sensor.

NOTE
After replacement, the throttle position sensor should be adjusted. (Vehicles without auto-cruise control system: auto-cruise control system: Refer to P.13B-142.) (Vehicles with auto-cruise control system Refer to P.13B-142.)



CLOSED THROTTLE POSITION SWITCH CHECK

13100330422

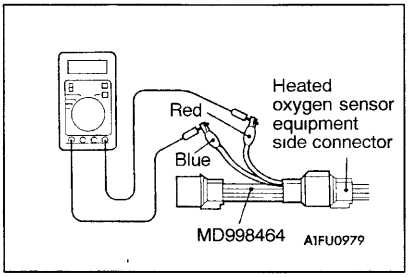
1. Disconnect the throttle position sensor connector.
2. Check the continuity between the throttle position sensor connector side terminal 3 and terminal 4.

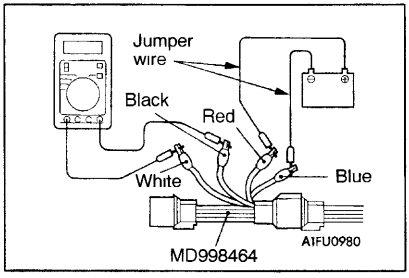
Normal condition:

Accelerator pedal	Continuity
Depressed	Non-conductive
Released	Conductive

3. If out of specification, replace the throttle position sensor.

NOTE
After replacement, the closed throttle position switch and throttle position sensor should be adjusted. (Vehicles without auto-cruise control system: Refer to P.13B-142.) (Vehicles with auto-cruise control system: Refer to P.13B-142.)





HEATED OXYGEN SENSOR CHECK

13100500311

<Heated oxygen sensor (front)>

When using Scan tool, observe HO_2S reading. If values are unsatisfactory, or if Scan tool is not available, use the following procedure:

1. Disconnect the heated oxygen sensor connector and connect the special tool (test harness) to the connector on the heated oxygen sensor side.
2. Make sure that there is continuity* between terminal 1 (red clip of special tool) and terminal 3 (blue clip of special tool) on the heated oxygen sensor connector.

   NOTE
   *: 11 – 18 Ω at 20°C (68°F) <Vehicles for Federal>,
   4.5 – 8.0 Ω at 20°C (68°F) <Vehicles for California>
3. If there is no continuity, replace the heated oxygen sensor.
4. Warm up the engine until engine coolant is 80°C (176°F) or higher.
5. Use the jumper wires to connect terminal 1 (red clip) of the heated oxygen sensor connector to the battery (+) terminal and terminal 3 (blue clip) to the battery (–) terminal.

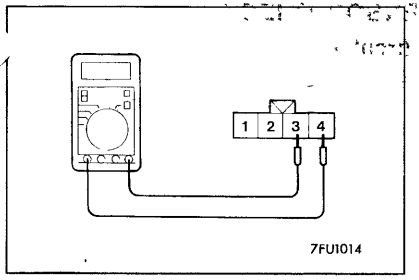
   Caution
   Be very careful when connecting the jumper wires; incorrect connection can damage the heated oxygen sensor.
6. Connect a digital voltage meter between terminal 2 (black clip) and terminal 4 (white clip).
7. While repeatedly racing the engine, measure the heated oxygen sensor output voltage.

   Standard value:

Engine	Heated oxygen sensor output voltage	Remarks
When racing engine	0.6–1.0V	If you make the air/fuel ratio rich by racing the engine repeatedly, a normal heated oxygen sensor will output a voltage of 0.6–1 0V.

8. If the sensor is defective, replace the heated oxygen sensor.

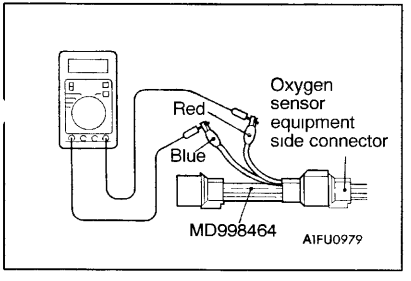
   NOTE
   For removal and installation of the heated oxygen sensor, refer to GROUP 15 – Exhaust Pipe and Main Muffler.



<Heated oxygen sensor (rear): Vehicles for Federal>

1. Disconnect the heated oxygen sensor connector.
2. Make sure that there is continuity [11 – 18 Ω at 20°C (68°F)] between terminal 3 and terminal 4 on the heated oxygen sensor connector.
3. If there is no continuity, replace the heated oxygen sensor.

NOTE
1. If the scan tool does not display the standard value although no abnormality is found by the above mentioned continuity test and harness check, replace the heated oxygen sensor (rear).
2. For removal and installation of the oxygen sensor, refer to GROUP 15 – Exhaust Pipe and Main Muffler.



<Heated oxygen sensor (rear): Vehicles for California>

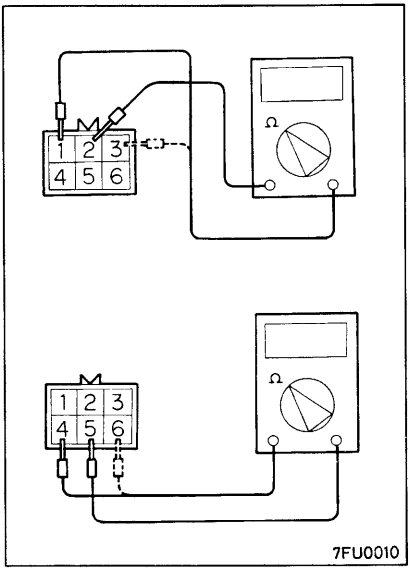
1. Disconnect the heated oxygen sensor connector and connect the special tool (test harness) to the connector on the heated oxygen sensor side.
2. Make sure that there is continuity [11 – 18 Ω at 20°C (68°F)] between terminal 1 (red clip of special tool) and terminal 3 (blue clip of special tool) on the heated oxygen sensor connector.
3. If there is no continuity, replace the heated oxygen sensor.

NOTE
1. If the scan tool does not display the standard value although no abnormality is found by the above mentioned continuity test and harness check, replace the heated oxygen sensor (rear).
2. For removal and installation of the oxygen sensor, refer to GROUP 15 – Exhaust Pipe and Main Muffler.

INJECTOR CHECK

13100520416

Refer to GROUP 13A – On-vehicle Service.



IDLE AIR CONTROL MOTOR (STEPPER MOTOR) CHECK

13100540399

Checking the Operation Sound

1. Check that the engine coolant temperature is 20°C (68°F) or below.

   NOTE
   Disconnecting the engine coolant temperature sensor connector and connecting the harness-side of the connector to another engine coolant temperature sensor that is at 20°C (68°F) or below is okay for this test.
2. Check that the operation sound of the stepper motor can be heard after the ignition is switched ON. (but without starting the motor.)
3. If the operation sound cannot be heard, check the stepper motor's activation circuit.
   If the circuit is normal, it is probable that there is a malfunction of the stepper motor or of the engine control module.

Checking the Coil Resistance

1. Disconnect the idle air control motor connector and connect the special tool (test harness).
2. Measure the resistance between terminal 2 (white clip of the special tool) and either terminal 1 (red clip) or terminal 3 (blue clip) of the connector at the idle air control motor side.

   Standard value: 28 – 33 Ω [at 20°C (68°F)]
3. Measure the resistance between terminal 5 (green clip of the special tool) and either terminal 6 (yellow clip) or terminal 4 (black clip) of the connector at the idle air control motor side.

   Standard value: 28 – 33 Ω [at 20°C (68°F)]

EVAPORATIVE EMISSION PURGE SOLENOID CHECK

13100560289

Refer to GROUP 17 – Emission Control System.

EGR SOLENOID CHECK

13100570145

Refer to GROUP 17 – Emission Control System.

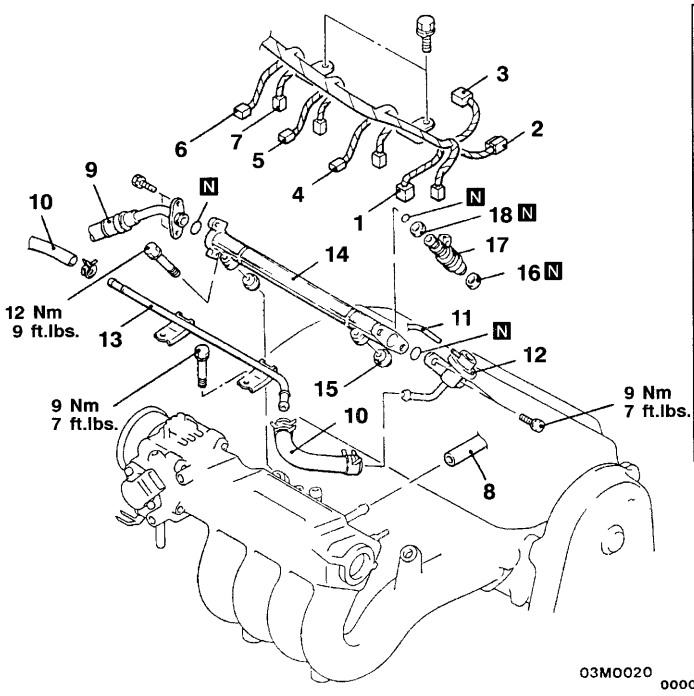
INJECTOR

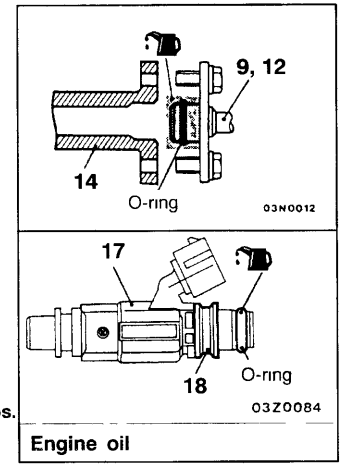
13100710196

REMOVAL AND INSTALLATION

Pre-removal Operation
(1) Fuel Discharge Prevention (Refer to P.13B-144)
(2) Air Cleaner Removal

Post-installation Operation
(1) Air Cleaner Installation
(2) Fuel Leakage Checking





Removal steps

1. Heated oxygen sensor connector
2. Crank angle sensor connector
3. Ignition coil connector
4. Evaporative emission purge solenoid connector
5. EGR solenoid connector
6. Manifold differential pressure sensor connector
7. Injector connector
8. PCV hose connection

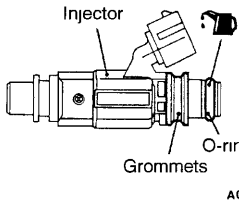
◀A▶ 9. Fuel high-pressure hose connection
10. Fuel return hose connection
11. Vacuum hose connection
◀A▶ 12. Fuel pressure regulator
13. Fuel return pipe
◀A▶ 14. Fuel rail
15. Insulators
16. Insulators
◀A▶ ◀A▶ 17. Injectors
18. Grommets

REMOVAL SERVICE POINT

◀A▶ FUEL RAIL/INJECTOR REMOVAL

Remove the fuel rail (with the injectors attached to it).

Caution
Care must be taken, when removing the fuel rail, not to drop the injector.

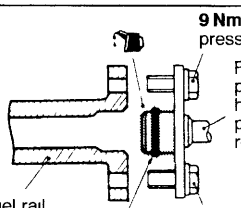


INSTALLATION SERVICE POINT

▶A◀ INJECTOR/FUEL PRESSURE REGULATOR/FUEL HIGH-PRESSURE HOSE INSTALLATION

1. Apply a drop of new engine oil to the O-ring.

   Caution
   Be sure not to let engine oil enter the fuel rail.



2. While turning the injector, fuel high-pressure hose and fuel pressure regulator to the right and left, install the fuel rail. Be careful not to damage the O-ring. After installing, check that the hose turns smoothly.
3. If it does not turn smoothly, the O-ring may be trapped, remove the fuel pressure regulator and then re-insert it into the fuel rail and check once again.
4. Tighten the fuel high-pressure hose to the standard torque, and tighten the fuel pressure regulator to the specified torque.

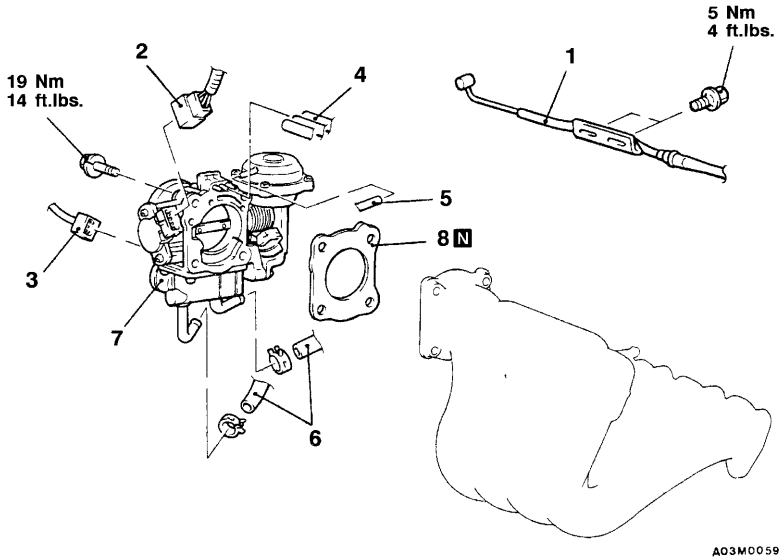
THROTTLE BODY

13100770385

REMOVAL AND INSTALLATION

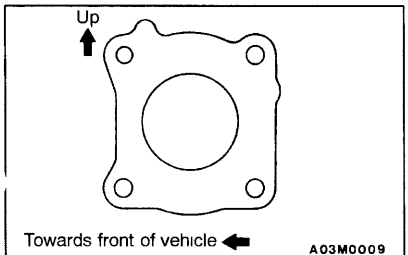
Pre-removal Operation
(1) Engine Coolant Draining (Refer to GROUP 00 – Maintenance Service)
(2) Air Cleaner Removal

Post-Installation Operation
(1) Air Cleaner Installation
(2) Engine Coolant Supplying (Refer to GROUP 00 – Maintenance Service)
(3) Accelerator Cable Adjustment (Refer to GROUP 17 – On-vehicle Service)



Removal steps

1. Accelerator cable connection
2. Throttle position sensor connector
3. Idle speed control servo connector
4. Vacuum hose connection
5. Vacuum hose connection <Vehicles with auto-cruise control>
6. Water hose connection
7. Throttle body
▶A◀ 8. Throttle body gasket



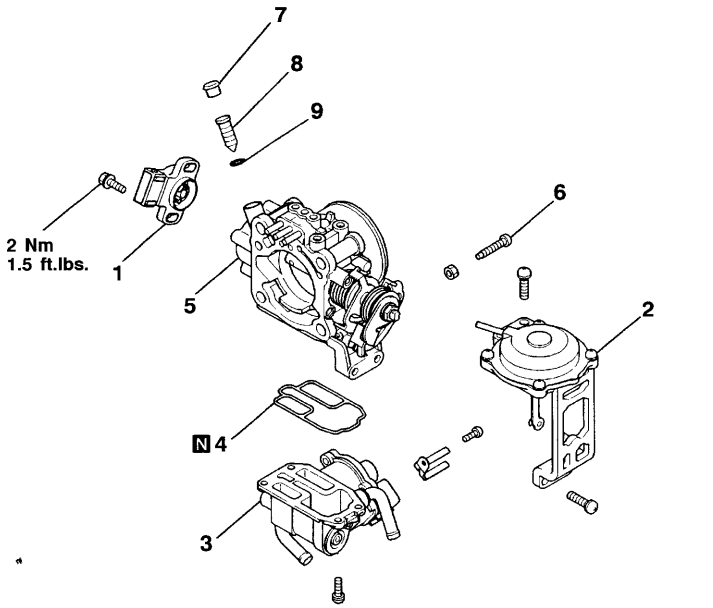
INSTALLATION SERVICE POINT

▶A◀ THROTTLE BODY GASKET INSTALLATION

Place the gasket so that the projecting part is positioned as shown in the illustration, and then install it between the intake manifold and the throttle body.

DISASSEMBLY AND REASSEMBLY

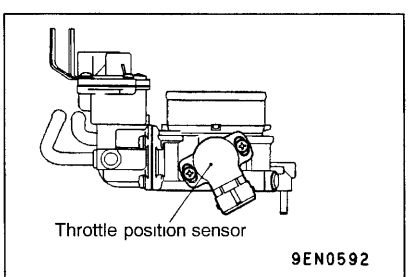
13100970433



Disassembly steps

▶A◀ 1. Throttle position sensor
2. Accelerator lever body assembly
3 Idle speed control body assembly
4. O-ring
5. Throttle body
6. Fixed SAS
7 Cap
8. Speed adjusting screw
9. O-ring

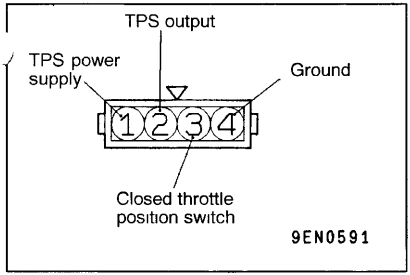
NOTE
1. The fixed SAS is correctly adjusted at the factory and should not be removed
2. If the fixed SAS should happen to have been removed, carry out fixed SAS adjustment. (Refer to page 13B-143)
3 If the speed adjusting screw should happen to have been removed, carry out speed adjusting screw adjustment. (Refer to page 13B-144.)



REASSEMBLY SERVICE POINT

▶A◀ THROTTLE POSITION SENSOR (TPS) INSTALLATION

1. Install the TPS so that it faces as shown in the illustration, and then tighten it with the screw.
2. Connect a multimeter between terminal (1) (TPS power supply) and terminal (2) (TPS output) of the TPS connector, and check that the resistance increases gradually as the throttle valve is opened slowly to the fully-open position.



3. Check the continuity between terminal (3) (closed throttle position switch) and terminal (4) (ground) of the TPS connector when the throttle valve is fully closed and fully open.

Normal condition:

Throttle valve condition	Continuity
Fully closed	Continuity
Fully open	No continuity

If there is no continuity when the throttle valve is fully closed, turn the TPS body counter-clockwise and then check again.

4. If there is an abnormality, replace the TPS.

FUEL SUPPLY

CONTENTS

13509000104

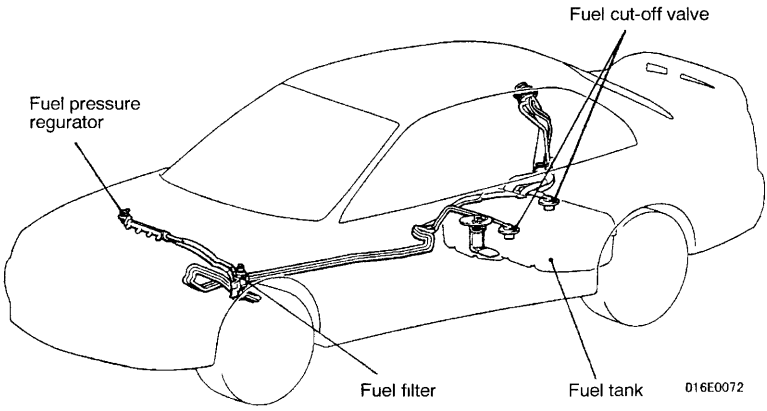
FUEL TANK 3
GENERAL INFORMATION 2
SEALANT 2
TROUBLESHOOTING 2

GENERAL INFORMATION

13500010199

(1) The fuel tank is located under the floor below the rear seats to provide increased safety and a wider luggage space.

(2) A fuel cut-off valve has been adopted to prevent fuel from leaking out in the event of a collision.



SEALANT

13500050030

Item	Specified sealant
Plug and floor pan	3M 8513 Grommeted windshield sealer (Black)

TROUBLESHOOTING

13500070012

Symptom	Probable cause	Remedy
Engine malfunctions due to insufficient fuel supply	Bent or kinked fuel pipe or hose	Repair or replace
	Clogged fuel pipe or hose	Clean or replace
	Clogged fuel filter or in-tank fuel filter	Replace
	Water in fuel filter	Replace the fuel filter or clean the fuel tank and fuel line
	Dirty or rusted fuel tank interior	Clean or replace
	Malfunctioning fuel pump (Clogged filter in the pump)	Replace
Evaporative emission control system malfunctions (When tank filler tube cap is removed, pressure releasing noise is heard)	Mispiping of vapor line	Correct
	Disconnected vapor line piping joint	Correct
	Folded, bent, cracked or clogged vapor line	Replace
	Faulty fuel tank filler tube cap	Replace
	Malfunctioning fuel tank pressure control valve	Replace

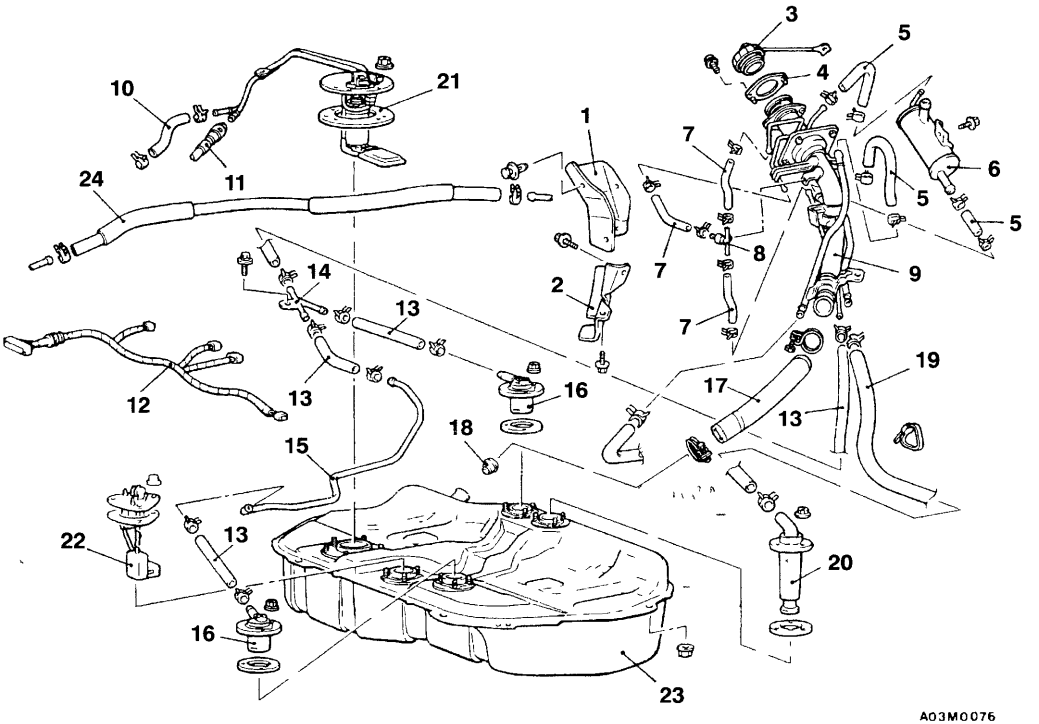
FUEL TANK

13500190374

REMOVAL AND INSTALLATION

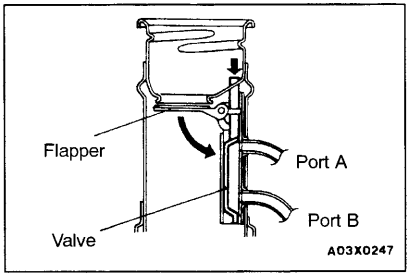
Pre-removal Operation
(1) Draining Fuel
(2) Reduce the Inner Pressure of Fuel Line and Hose (Refer to GROUP 13A – On-vehicle Service)

Post-installation Operation
(1) Refilling Fuel
(2) Checking for Fuel Leaks



Removal steps

1. Filler neck protector A
2. Filler neck protector B
3. Fuel filler cap
4. Packing
5. Vapor hose
6. Separator assembly
7. Vapor hose
8. Fuel check valve assembly
9. Fuel filler neck assembly
10. Return hose
11. High-pressure fuel hose
    - Rear seat cushion (Refer to GROUP 52A – Rear Seat.)
12. Harness connector
13. Vapor hose
14. Pipe assembly
15. Vapor pipe
16. Fuel cut-off valve assembly
17. Filler hose
18. Fuel shut-off valve
19. Leveling hose
20. Leveling valve assembly
21. Fuel pump
22. Fuel gauge unit assembly
23. Fuel tank
24. Purge hose

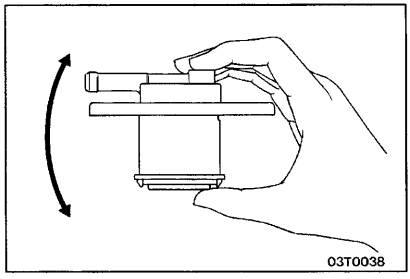


INSPECTION

13500450038

FUEL TANK FILLER NECK ASSEMBLY CHECK

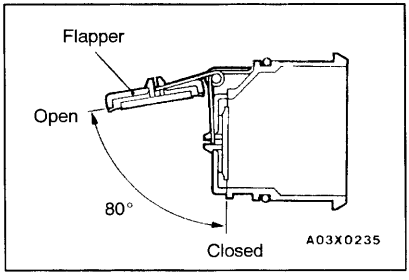
(1) Connect a clean rubber hose to the port A of the fuel tank filler neck assembly.
(2) Use a screwdriver or similar tool to push the flapper in order to close the valve, and then blow air into the hose. Check that the air does not flow out of the port B.
(3) Use a screwdriver or similar tool to push the portion A shown in the illustration in order to open the valve, and then blow air into the hose. Check that the air flows out of the port B.



FUEL CUT OFF VALVE CHECK

13500300135

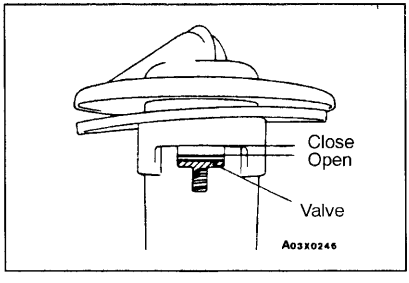
If the sound of the float valve moving (knocking sound) can be heard when the valve assembly is gently shaken up and down, then the valve is okay.



FUEL SHUT-OFF VALVE CHECK

13500440035

Check that the flapper and valve open and close as shown in the illustration.



LEVELING VALVE CHECK

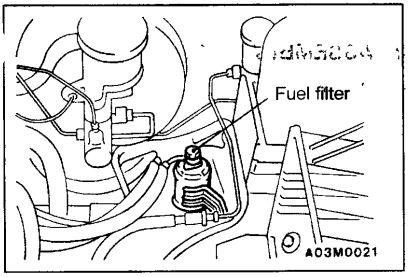
13500430025

(1) Check that the leveling valve is at the open position when it is held vertically.
(2) Check that the leveling valve is at the close position when it is tilted.

FUEL GAUGE UNIT CHECK

13500310060

Refer to GROUP 54, Combination Meter.

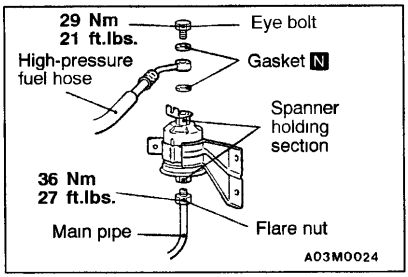


FUEL FILTER REPLACEMENT

13500130079

1. Bleed the residual pressure from inside the fuel line. (Refer to GROUP 13A – On-vehicle Service.)
2. Remove the air intake hose and canister.
3. Hold the fuel filter with an adjustable wrench and remove the eye bolt. Then remove the high-pressure fuel hose.

Caution
As there will be some pressure remaining in the fuel pipe line, cover it with a rag to prevent fuel from spraying out.

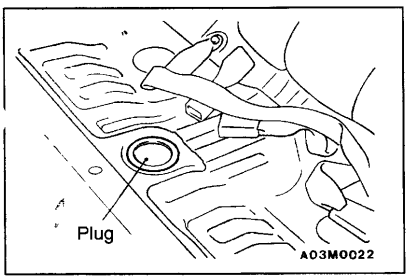


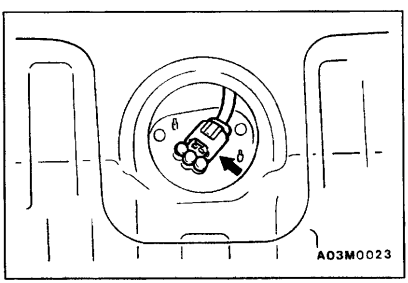
4. Hold the fuel filter with an adjustable wrench and loosen the flare nut. Then disconnect the main pipe connection.
5. Remove the fuel filter.
6. When installing the fuel filter, use a new gasket, and tighten the flare nut of the high-pressure fuel hose and the main pipe to the specified torque.
7. After installation, check that there are no fuel leaks.
   (1) Apply battery voltage to the fuel pump drive terminal to operate the fuel pump. (Refer to GROUP 13A – On-vehicle Service.)
   (2) Check for leaks when fuel pressure is applied.

FUEL GAUGE UNIT REPLACEMENT

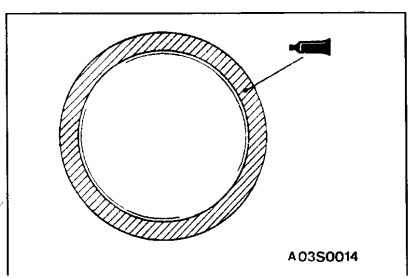
13500160108

1. Remove the rear seat cushion. (Refer to GROUP 52A – Rear Seat.)
2. Remove the plug.





3. Disconnect the fuel gauge unit connector and remove the fuel gauge unit.



4. Apply the specified sealant to the contact surfaces of the plug and the floor pan, and install the plug.

   Specified sealant:
   3M ATD Part No. 8513 or equivalent

5. Install the rear seat cushion. (Refer to GROUP 52A – Rear Seat.)

ENGINE COOLING

CONTENTS

14109000123

GENERAL INFORMATION 2

LUBRICANT 2

ON-VEHICLE SERVICE 5

- Engine Coolant Concentration Test 5
- Engine Coolant Leak Checking 5
- Engine Coolant Replacment 5
- Radiator Cap Valve Opening Pressure Check .. 5

RADIATOR 6

SEALANTS 3

SERVICE SPECIFICATIONS 2

THERMOSTAT 9

TROUBLESHOOTING 3

WATER HOSE AND WATER PIPE

- <1.5L ENGINE> 13
- <1.8L ENGINE> 15

WATER PUMP

- <1.5L ENGINE> 11
- <1.8L ENGINE> 12

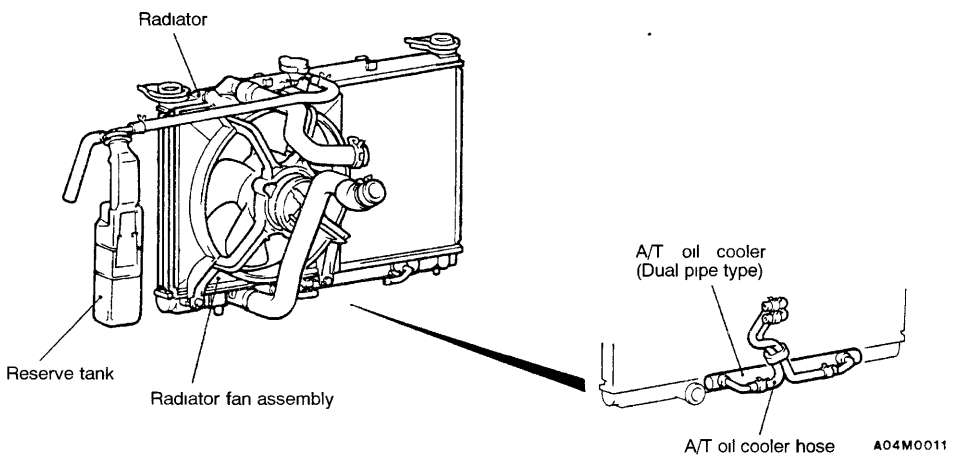
GENERAL INFORMATION

14100010118

The cooling system is designed to keep every part of the engine at appropriate temperature in whatever condition the engine may be operated. The cooling method is of the water-cooled, pressure forced circulation type in which the water pump pressurizes coolant and circulates it throughout the engine. If the coolant temperature exceeds the prescribed temperature, the thermostat opens to circulate the coolant through the radiator as well so that the heat absorbed by the coolant may be radiated into the air.

The water pump is of the centrifugal type and is driven by the timing belt or drive belt from the crankshaft.
The radiator is the corrugated fin, down flow type and is cooled by the electrical radiator fan.
The electrical radiator fan is controlled by the engine control module in accordance with the engine running condition.

CONSTRUCTION DIAGRAM



SERVICE SPECIFICATIONS

14100030114

Items		Standard value	Limit
High-pressure valve opening pressure of radiator cap kPa (psi)		74 - 103 (11 - 15)	64 (9.2)
Thermostat	Valve opening temperature of thermostat °C (°F)	82 ± 1.5 (180 ± 3)	-
	Full-opening temperature of thermostat °C (°F)	95 (203)	-
	Valve lift [at 95 °C (203 °F)] mm (in)	8 5 (33) or more	-

LUBRICANT

14100040094

Items		Quantity dm^3 (qts.)
HIGH QUALITY ETHYLENE GLYCOL ANTIFREEZE COOLANT	1.5L Engine	5 (5.3)
	1.8L Engine	6 (6 3)

SEALANTS

14100050103

Items	Specified sealant
Water pump, thermostat case <1.8L Engine>	Mitsubishi Genuine Parts No. MD970389 or equivalent

TROUBLESHOOTING

14100070086

TROUBLE SYMPTOM

Overheat

Probable cause		Remedy
Inoperative electric cooling fan	Faulty electrical motor	Replace
	Faulty radiator fan relay	Replace
Water leaks	Damaged radiator core joint	Replace
	Corroded or cracked hoses (radiator hose, heater hose, etc)	Replace
	Faulty radiator cap valve or setting of spring	Replace
	Cracked intake manifold	Replace
	Cracked thermostat housing	Replace
	Loose bolts or leaking gasket in water outlet fitting	Torque bolts again or replace gasket
	Loose bolts or leaking gasket in water inlet fitting	Torque bolts again or replace gasket
	Loose water pump mounting bolts or leaking gasket	Torque bolts again or replace gasket
	Loose thermostat housing bolts or leaking gasket	Torque bolts again or replace gasket
Faulty A/T oil cooler operation	Blocked or collapsed hose and pipe	Replace
	Loose hose and pipe connection	Correct
Others	Insufficient engine coolant	Fill
	Too high an anti-freeze concentration	Correct anti-freeze concentration
	Loose or broken drive belt	Replace
	Damaged or blocked (insufficiently ventilated) radiator fins	Correct
	Faulty thermostat operation	Replace
	Faulty water pump operation	Replace
	Water passage clogged with slime or rust deposit or foreign substance	Clean

No Rise in Temperature

Probable cause	Remedy
Faulty thermostat	Replace

TROUBLESHOOTING HINTS

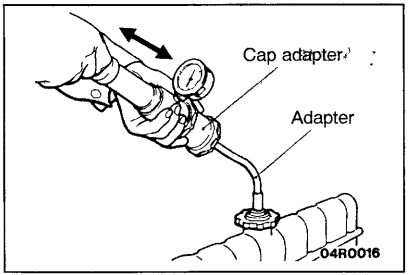
1. Radiator fan only does not operate.
   - Check fusible link No.5.
   - Check the radiator fan motor relay.
   - Check the engine control module.
   - Check the radiator fan motor.
2. Condenser fan only does not operate.
   - Check fusible link No.2.
   - Check dedicated fuse No.1.
   - Check the condenser fan motor.
   - Check the condenser fan motor relay.
   - Check the engine control module.

Fan Operating Mode

3. Neither radiator fan nor condenser fan operates.
   - Check fusible link No.2, 5.
   - Check dedicated fuse No.1.
   - Check the condenser fan motor or radiator fan motor.
   - Check the condenser fan motor relay or radiator fan motor relay.
   - Check the engine control module.

Fan Operating mode

A/C switch	Engine coolant temperature [°C (°F)]	Power transistor [Radiator fan]	Power transistor [Condenser fan]	Radiator fan operation	Condenser fan operation
OFF	Approx. 95 (203) or less	OFF	OFF	Stopped	Stopped
	Approx 95 - 105 (203 - 221)	ON	OFF	Rotated	Stopped
	Approx. 105 (203) or more	ON	ON	Rotated	Rotated
ON	-	ON	ON	Rotated	Rotated



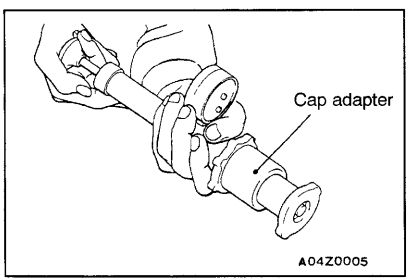
ON-VEHICLE SERVICE 14100100020

ENGINE COOLANT LEAK CHECK

1. Check that the coolant level is up to the filler neck. Install a radiator cap tester and apply 160 kPa (23 psi) pressure, and then check for leakage from the radiator hose or connections.

   Caution
   1. **Be sure to completely clean away any moisture from the places checked.**
   2. **When the tester is taken out, be careful not to spill any coolant from it.**
   3. **Be careful, when installing and removing the tester and when testing, not to deform the filler neck of the radiator.**

2. If there is leakage, repair or replace the appropriate part.



RADIATOR CAP VALVE OPENING PRESSURE CHECK 14100130104

1. Use a cap adapter to attach the cap to the tester.
2. Increase the pressure until the indicator of the gauge stops moving.

   Limit: 64 kPa (9.2 psi)

   Standard value: 74 - 103 kPa (11 - 15 psi)

3. Replace the radiator cap if the reading does not remain at or above the limit.

   NOTE

   Be sure that the cap is clean before testing, since rust or other foreign material on the cap seal will cause an improper indication.

ENGINE COOLANT REPLACEMENT 14100120309

Refer to GROUP 00 - Maintenance Service.

ENGINE COOLANT CONCENTRATION TEST 14100110276

Refer to GROUP 00 - RECOMMENDED LUBRICANTS AND LUBRICANT CAPACITIES TABLE.

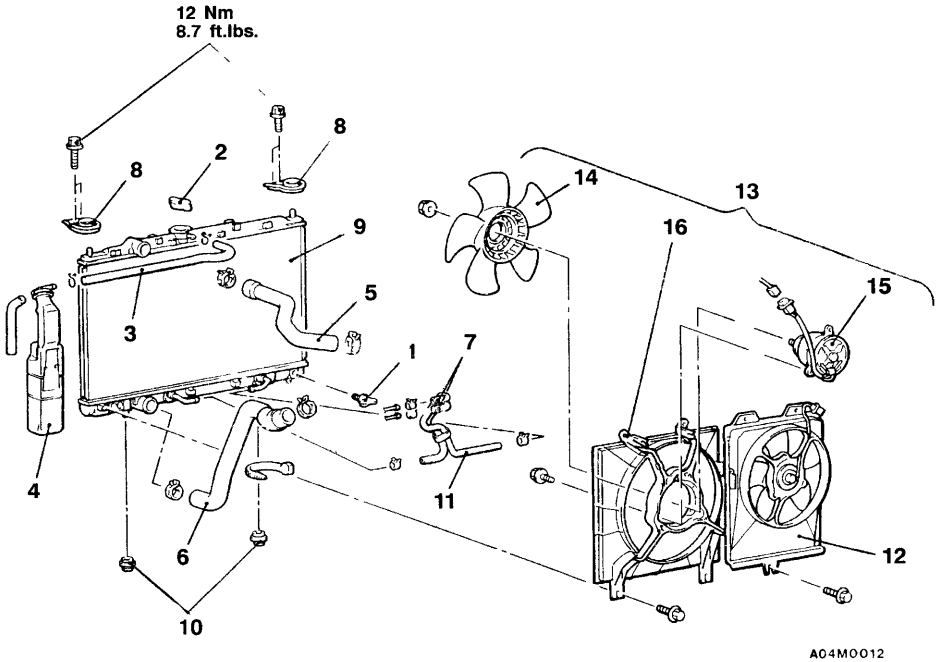
RADIATOR

14100150360

REMOVAL AND INSTALLATION

Pre-removal operation
(1) Engine Coolant Draining
(Refer to GROUP 00 - Maintenance Service)
(2) Air Cleaner Removal <1 5L Engine>

Post-installation Operation
(1) Engine Coolant Supplying
(Refer to GROUP 00 - Maintenance Service)
(2) A/T Fluid Supplying and Checking
(Refer to GROUP 00 - Maintenance Service)
(3) Air Cleaner Installation <1 5L Engine>

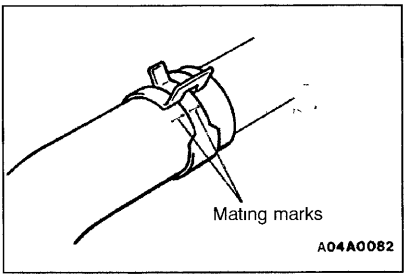


Radiator removal steps

1. Drain plug
2. Radiator cap
3. Overflow hose
4. Reserve tank
◀A▶ ▶A◀ 5. Radiator upper hose
◀A▶ ▶A◀ 6. Radiator lower hose
◀B▶ 7. A/T oil cooler hose connection
8. Upper insulator
9. Radiator assembly
10. Lower insulator
11. A/T oil cooler hose assembly
12. Condenser fan motor assembly
<Vehicle with A/C>
13. Radiator fan motor assembly

Radiator fan motor removal steps

1. Drain plug
2. Radiator cap
3. Overflow hose
◀A▶ ▶A◀ 5. Radiator upper hose
12. Condenser fan motor assembly
<Vehicles with A/C>
14. Fan
15. Radiator fan motor
16. Shroud



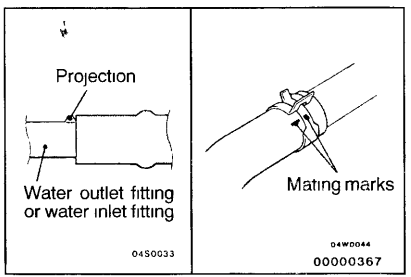
REMOVAL SERVICE POINTS

◀A▶ RADIATOR UPPER HOSE/RADIATOR LOWER HOSE DISCONNECTION

After making mating marks on the radiator hose and the hose clamp, disconnect the radiator hose.

◀B▶ A/T OIL COOLER HOSE REMOVAL

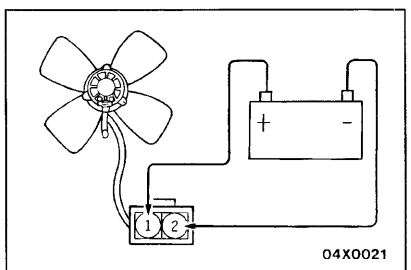
After removing the hose from the radiator, plug the hose and the radiator nipple to prevent dust or foreign particles from getting in.



INSTALLATION SERVICE POINT

▶A◀ RADIATOR LOWER HOSE/RADIATOR UPPER HOSE CONNECTION

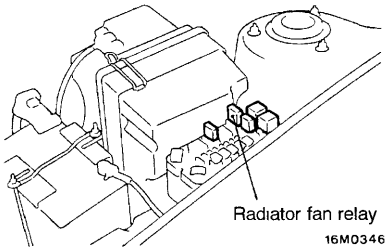
1. Insert each hose as far as the projection of the water inlet fitting.
2. Align the mating marks on the radiator hose and hose clamp, and then connect the radiator hose.

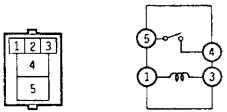


INSPECTION 14100190119

RADIATOR FAN MOTOR CHECK

1. Check to be sure that the radiator fan rotates when battery voltage is applied between terminals (as shown in the figure).
2. Check to see that abnormal noises are not produced while the motor is turning.





00004756

RADIATOR FAN RELAY CONTINUITY CHECK 14100440115

Battery voltage	Terminal No.			
	1	3	4	5
Not supplied	○	○		
Supplied	⊕	⊖	○	○

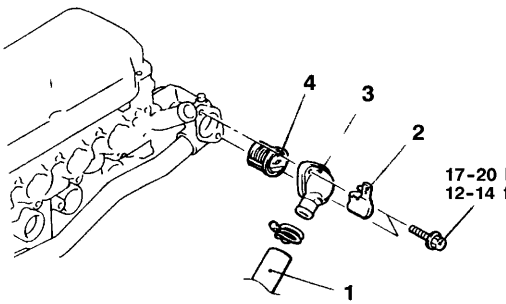
THERMOSTAT

14100240333

REMOVAL AND INSTALLATION

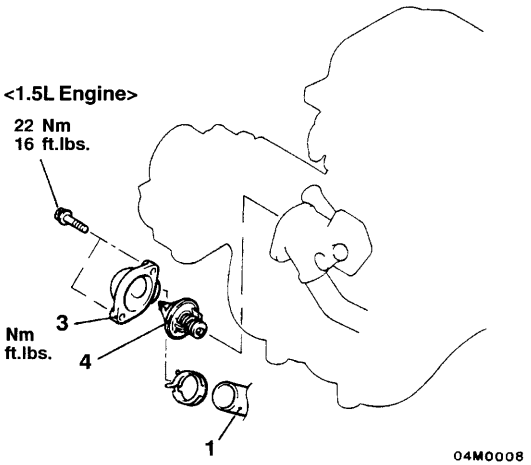
Pre-removal and Post-installation Operation
(1) Engine Coolant Draining and Supplying (Refer to GROUP 00 - Maintenance Service)
(2) Air Cleaner Removal and Installation <1.5L Engine>

<1.8L Engine>



04M0009

<1.5L Engine>

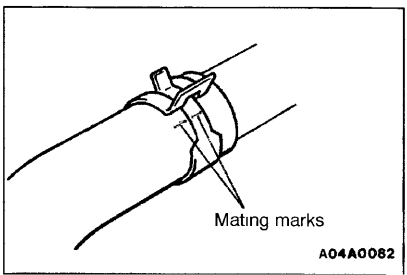


04M0008

00004472

Removal steps

◀A▶ ▶B◀ 1. Radiator lower hose connection
2. Connector bracket <Vehicles for California>
3. Water inlet fitting
▶A◀ 4. Thermostat

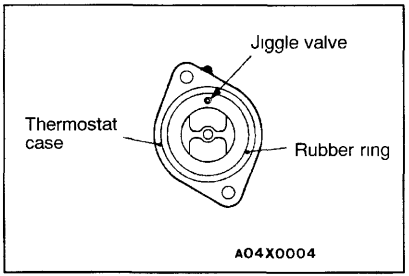


A04A0082

REMOVAL SERVICE POINT

◀A▶ RADIATOR LOWER HOSE DISCONNECTION

After making mating marks on the radiator hose and the hose clamp, disconnect the radiator hose.



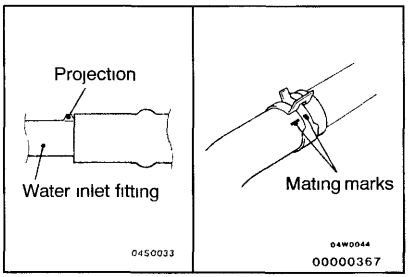
INSTALLATION SERVICE POINTS

▶A◀ THERMOSTAT INSTALLATION

Install the thermostat so that the jiggle valve is facing straight up.

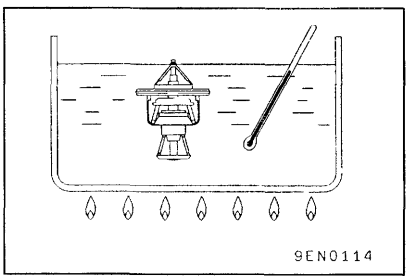
Caution

Make absolutely sure that no oil adhears to the rubber ring of the thermostat. In addition, be careful not to fold over or scratch the rubber ring when inserting. If the rubber ring is damaged, replace the thermostat.



▶B◀ RADIATOR LOWER HOSE CONNECTION

1. Insert each hose as far as the projection of the water inlet fitting.
2. Align the mating marks on the radiator hose and hose clamp, and then connect the radiator hose.



INSPECTION

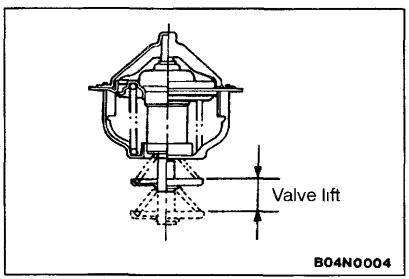
14100250176

THERMOSTAT CHECK

1. Immerse the thermostat in water, and heat the water while stirring. Check the thermostat valve opening temperature.

   Standard value:

   Valve opening temperature: 82±1.5°C (180 ± 3°F)



2. Check that the amount of valve lift is at the standard value when the water is at the full-opening temperature.

   Standard value:

Full-opening temperature °C (°F)	Amount of valve lift mm
95 (203)	8.5 (.33) or more

NOTE

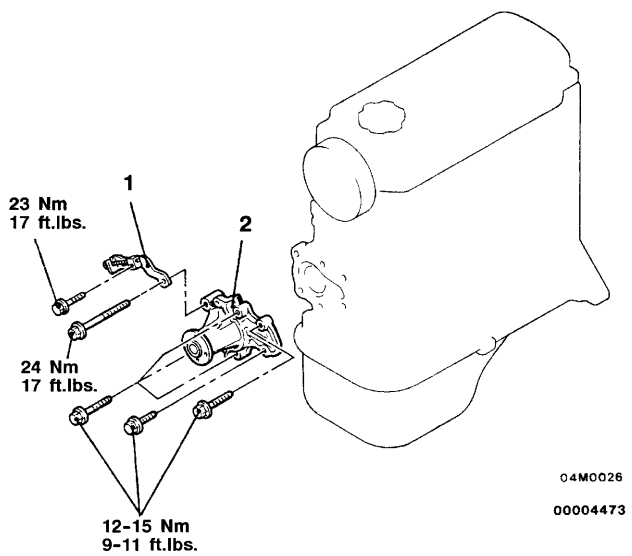
Measure the valve height when the thermostat is fully closed, and use this measurement to calculate the valve height when the thermostat is fully open.

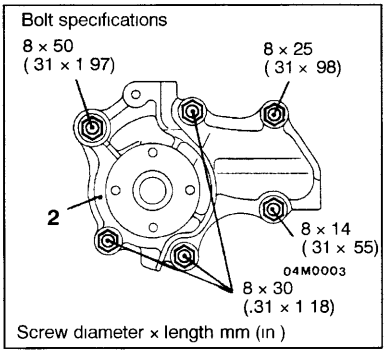
WATER PUMP <1.5L Engine>

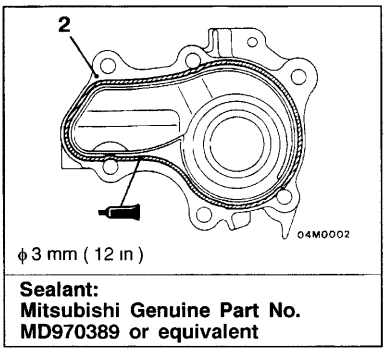
14100270486

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
(1) Engine Coolant Draining and Supplying
(Refer to GROUP 00 - Maintenance Service)
(2) Timing Belt and Taiming Belt Tensioner Removal and Installation
(Refer to GROUP 11A)

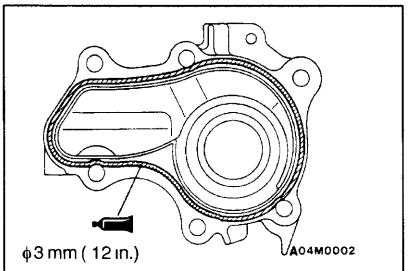






Sealant:
Mitsubishi Genuine Part No. MD970389 or equivalent

Removal steps
1. Generator brace
▶A◀ 2 Water pump



INSTALLATION SERVICE POINT

▶A◀ WATER PUMP INSTALLATION

Squeeze out the sealant from the tube evenly and apply it so that there is not too much sealant and no places without sealant.

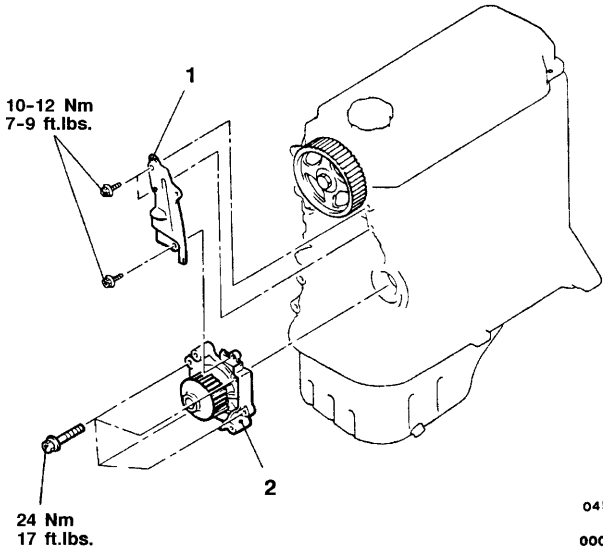
Specified Sealant:
Mitsubishi Genuine Part No. MD970389 or equivalent

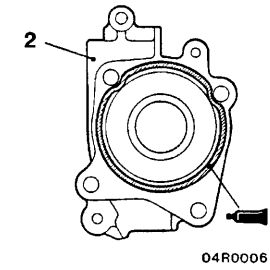
WATER PUMP <1.8L ENGINE>

14100270493

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
(1) Engine Coolant Draining and Supplying
(Refer to GOUP 00 - Maintenance Service)
(2) Timing Belt Removal and Installation
(Refer to GROUP 11B)

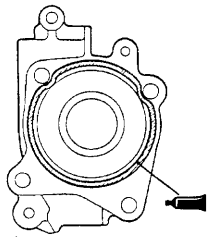




ϕ3 mm (12 in)

Sealant:
Mitsubishi Genuine Part No. MD970389 or equivalent

Removal steps
1. Timing belt rear cover
▶A◀ 2. Water pump



ϕ3 mm (.12 in)

INSTALLATION SERVICE POINT

▶A◀ WATER PUMP INSTALLATION

Squeeze out the sealant from the tube evenly and apply it so that there is not too much sealant and no places without sealant.

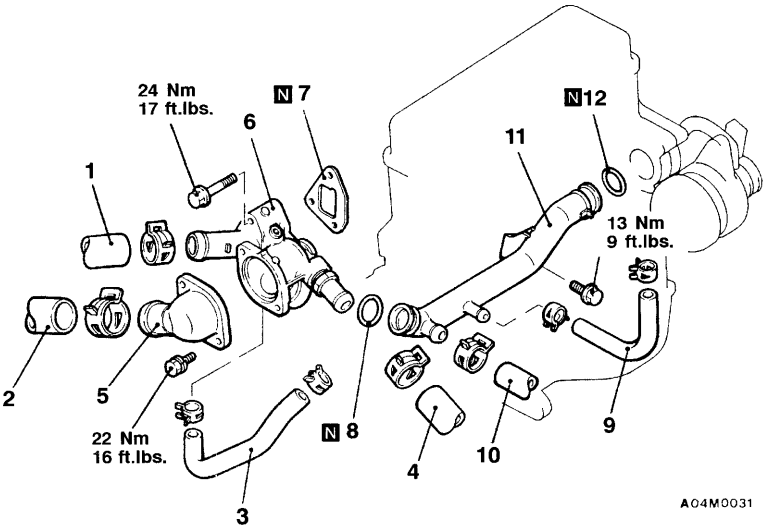
Specified Sealant:
Mitsubishi Genuine Part No. MD970389 or equivalent

WATER HOSE AND WATER PIPE <1.5L ENGINE>

14100330375

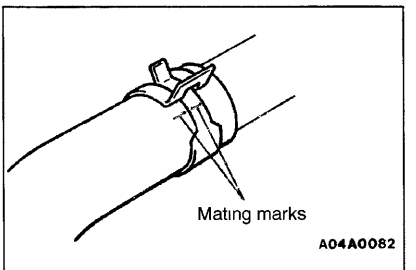
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
(1) Engine Coolant Draining and Suppling
(Refer to GROUP 00 - Maintenance Service)
(2) Air Cleaner Removal and Installation



Removal steps

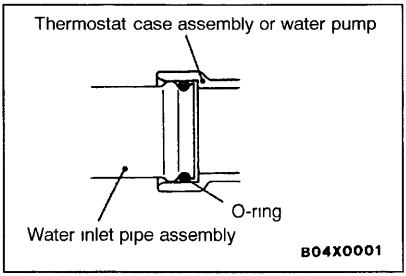
◀A▶ ▶B◀ 1. Radiator upper hose connection
◀A▶ ▶B◀ 2. Radiator lower hose connection
3. Water hose
4 Heater hose connection
5 Water inlet fitting
6. Thermostat case assembly
7. Gasket
▶A◀ 8. O-ring
9. Water hose
10. Heater hose connection
11. Water inlet pipe assembly
▶A◀ 12. O-ring



REMOVAL SERVICE POINT

◀A▶ RADIATOR UPPER HOSE/RADIATOR LOWER HOSE DISCONNECTION

After making mating marks on the radiator hose and the hose clamp, disconnect the radiator hose.

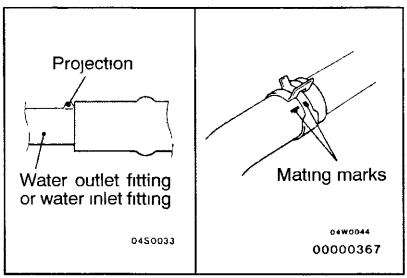


INSTALLATION SERVICE POINTS

▶A◀ O-RING INSTALLATION

Insert the O-ring to the water inlet pipe assembly, and coat the outer portion of the O-ring with water or engine coolant.

Caution
Do not allow engine oil or other grease to adhere to the O-ring.



▶B◀ RADIATOR UPPER HOSE/RADIATOR LOWER HOSE CONNECTION

1. Insert each hose as far as the projection of the water inlet fitting.
2. Align the mating marks on the radiator hose and hose clamp, and then connect the radiator hose.

INSPECTION

14100340101

WATER PIPE AND HOSE CHECK

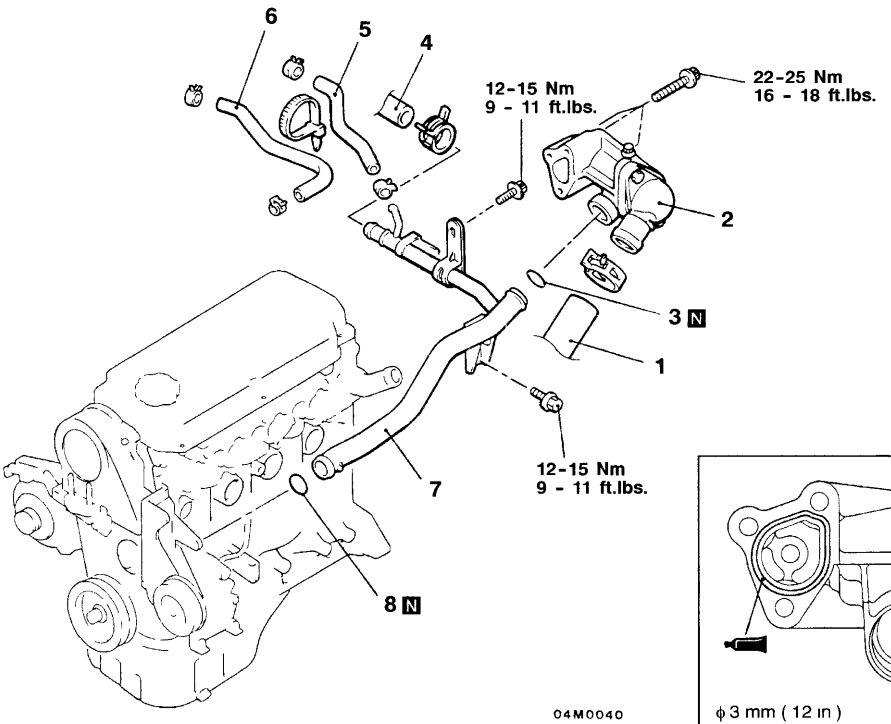
Check the water pipe and hose for cracks, damage and clogs. Replace them if necessary.

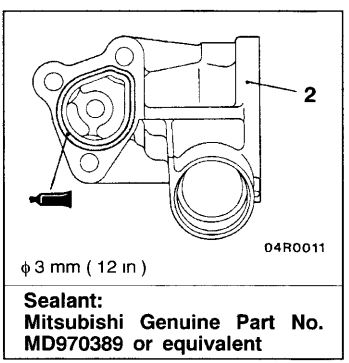
WATER HOSE AND WATER PIPE <1.8L ENGINE>

14100330382

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
(1) Engine Coolant Draining and Supplying (Refer to GROUP 00 - Maintenance Service)
(2) Air Cleaner Removal and Installation
(3) Distributor Removal and Installation (Refer to GROUP 16)

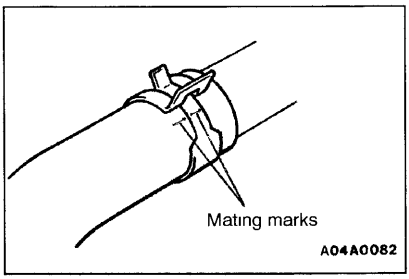




Sealant:
Mitsubishi Genuine Part No. MD970389 or equivalent

Removal steps

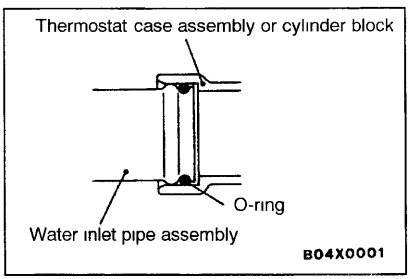
◀A▶ ▶C◀ 1. Radiator lower hose connection
▶B◀ 2 Thermostat case assembly
▶A◀ 3 O-ring
4 Heater hose connection
5 Water hose
6 Water hose
7. Water inlet pipe assembly
▶A◀ 8 O-ring



REMOVAL SERVICE POINT

◀A▶ RADIATOR LOWER HOSE DISCONNECTION

After making mating marks on the radiator hose and the hose clamp, disconnect the radiator hose.

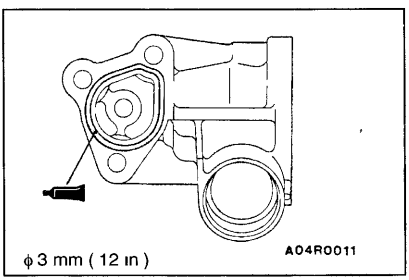


INSTALLATION SERVICE POINTS

▶A◀ O-RING INSTALLATION

Insert the O-ring to the water inlet pipe assembly, and coat the outer circumference of the O-ring with water or engine coolant.

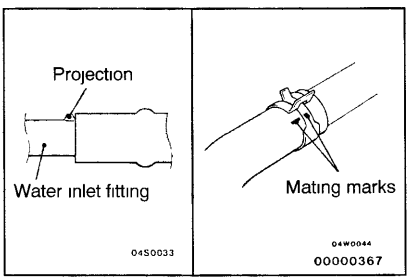
Caution
Do not allow engine oil or other greases to adhere to the O-ring



▶B◀ THERMOSTAT CASE ASSEMBLY INSTALLATION

Squeeze out the sealant from the tube evenly and apply it so that there is not too much sealant and no places without sealant.

Specified Sealant:
Mitsubishi Genuine Parts No. MD970389 or equivalent



▶C◀ RADIATOR LOWER HOSE CONNECTION

1. Insert each hose as far as the projection of the water inlet fitting.
2. Align the mating marks on the radiator hose and hose clamp, and then connect the radiator hose.

INSPECTION

14100340118

WATER PIPE AND HOSE CHECK

Check the water pipe and hose for cracks, damage and clogs. Replace them if necessary.

INTAKE AND EXHAUST

CONTENTS

15109000137

EXHAUST MANIFOLD 6

EXHAUST PIPE AND MAIN MUFFLER 8

GENERAL INFORMATION 2

INTAKE MANIFOLD 3

ON-VEHICLE SERVICE 2

Intake Manifold Vacuum Check 2

SERVICE SPECIFICATION 2

SPECIAL TOOL 2

TROUBLESHOOTING 2

GENERAL INFORMATION

15100010092

The intake manifold is made of an aluminium alloy. The shape provides an increased intake inertia effect and has good volumetric efficiency.

For 1.8L engine, the exhaust manifold is made of stainless steel. The exhaust pipe is divided into four parts for California and three parts for Federal, respectively.

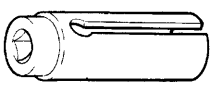
SERVICE SPECIFICATIONS

15100030098

Items		Standard value	Limit
Intake manifold	Distortion of the installation surface mm (in.)	0.15 (.006) or less	0.20 (.008)

SPECIAL TOOL

15100060097

Tool	Tool number and name	Supersession	Application
	MD998770 Oxygen sensor wrench		Removal/Installation of heated oxygen sensor

TROUBLESHOOTING

15100070014

Symptom	Probable cause	Remedy
Exhaust gas leakage	Loose joints	Retighten
	Broken pipe or muffler	Repair or replace
Abnormal noise	Broken separator in muffler	Replace
	Broken rubber hangers	Replace
	Interference of pipe or muffler with vehicle body	Correct
	Broken pipe or muffler	Repair or replace

ON-VEHICLE SERVICE

15100180120

INTAKE MANIFOLD VACUUM CHECK

1.5L Engine: Refer to GROUP 11A - On-vehicle Service.
1.8L Engine: Refer to GROUP 11C - On-vehicle Service.

INTAKE MANIFOLD

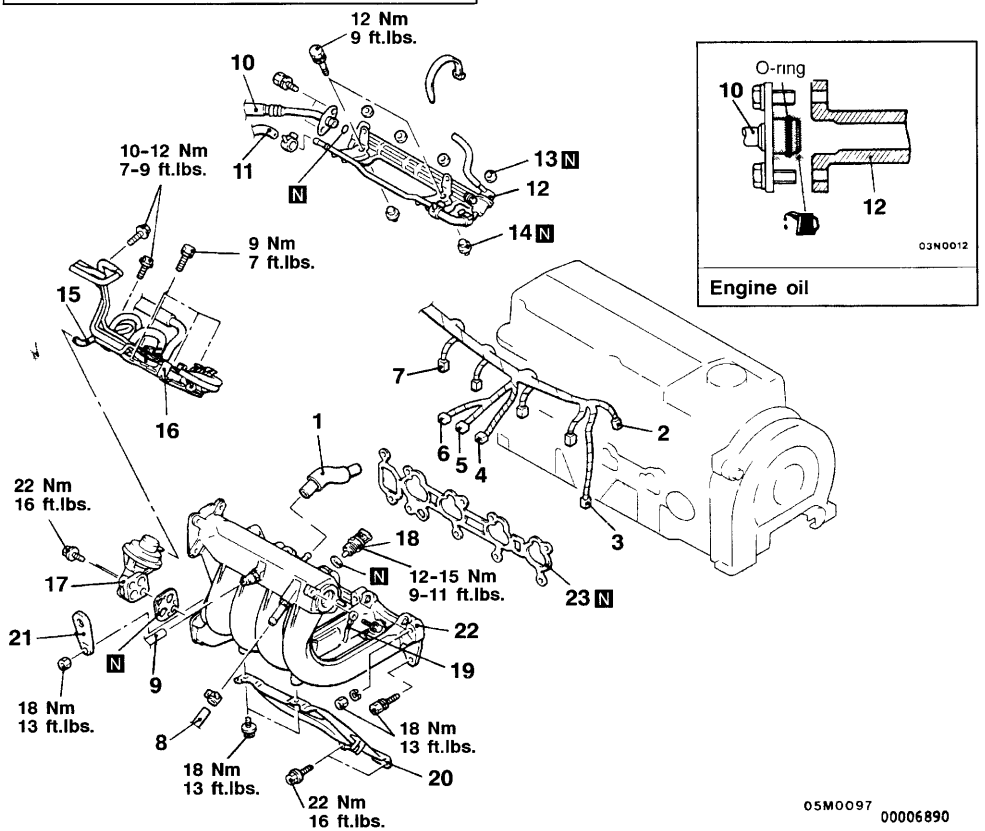
15100300496

REMOVAL AND INSTALLATION

<1.5L Engine>

Pre-removal Operation
(1) Fuel Discharge Prevention
(Refer to GROUP 13A - On-vehicle Service)
(2) Thermostat Case Assembly Removal
(Refer to GROUP 14 - Water Hose and Water Pipe)
(3) Throttle Body Removal (Refer to GROUP 13A)

Post-installation Operation
(1) Throttle Body Installation (Refer to GROUP 13A)
(2) Thermostat Case Assembly Installation
(Refer to GROUP 14 - Water Hose and Water Pipe)



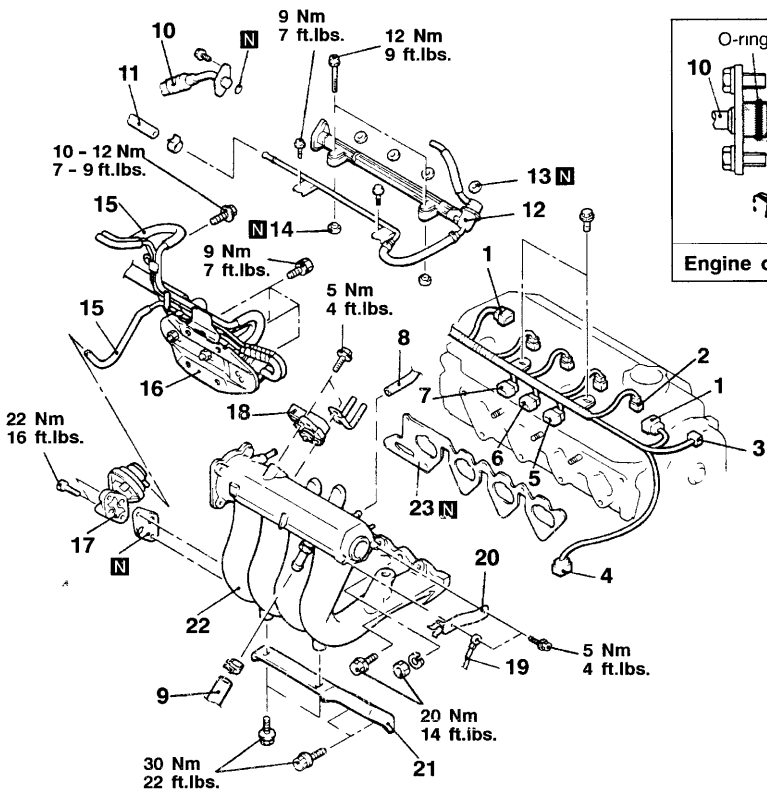
Removal steps

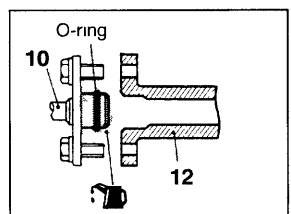
1. PCV hose
2. Crank angle sensor connector
3. Heated oxygen sensor connector
4. Intake air temperature sensor connector
5. Evaporative emission purge solenoid connector
6. EGR solenoid connector
7. Injector connector
8. Brake booster vacuum hose connection
9. Vacuum hose connection
- ▶A◀ 10. High-pressure fuel hose connection
11. Fuel return hose connection
- ◀A▶ 12. Fuel rail, injector and pressure regulator assembly
13. Insulator
14. Insulator
15. Vacuum hose connection
16. Solenoid valve and vacuum hose assembly
17. EGR valve
18. Intake air temperature sensor
19. Ground cable
20. Intake manifold stay
21. Engine hanger
22. Intake manifold
23. Intake manifold gasket

<1.8L Engine>

Pre-removal Operation
(1) Fuel Discharge Prevention
(Refer to GROUP 13A - On-vehicle Service)
(2) Engine Coolant Draining
(Refer to GROUP 00 - Maintenance Service)
(3) Throttle Body Removal (Refer to GROUP 13A)

Post-installation Operation
(1) Throttle Body Installation (Refer to GROUP 13A)
(2) Engine Coolant Supplying
(Refer to GROUP 00 - Maintenance Service)





00006891

Removal steps

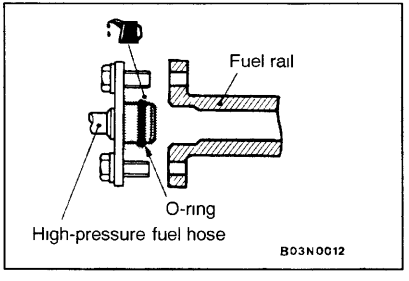
1. Ignition coil connector
2. Injector connector
3. Crank angle sensor connector
4. Heated oxygen sensor connector
5. Evaporative emission purge solenoid connector
6. EGR solenoid connector
7. Manifold differential pressure sensor connector
8. PCV hose connection
9. Brake booster vacuum hose connection
- ▶A◀ 10. High-pressure fuel hose connection
11. Fuel return hose connection
- ◀A▶ 12. Fuel rail, injector and pressure regulator assembly
13. Insulator
14. Insulator
15. Vacuum hose connection
16. Solenoid valve and vacuum hose assembly
17. EGR valve
18. Manifold differential pressure sensor
19. Ground cable
20. Bracket <vehicles with auto-cruise control system>
21. Intake manifold stay
22. Intake manifold
23. Intake manifold gasket

REMOVAL SERVICE POINT

◀A▶ FUEL RAIL, INJECTOR AND PRESSURE REGULATOR REMOVAL

Remove the fuel rail (with the injectors and pressure regulator attached to it).

Caution
Care must be taken when removing the fuel rail not to drop the injector.



INSTALLATION SERVICE POINT

▶A◀ HIGH-PRESSURE FUEL HOSE INSTALLATION

1. When connecting the high-pressure fuel hose to the fuel rail, apply a small amount of new engine oil to the O-ring and then insert the high-pressure fuel hose, being careful not to damage the O-ring.

   Caution
   Be careful not to let any engine oil get into the fuel rail.

2. While turning the high-pressure fuel hose to the left and right, install it to the fuel rail.
3. Check to be sure that the injector turns smoothly. If it does not turn smoothly, the O-ring may be pinched, remove the high-pressure fuel hose and then re-insert it into the fuel rail and check again.

INSPECTION 15100310208

Check the following points; replace the part if a problem is found.

INTAKE MANIFOLD CHECK

1. Check for damage or cracking of any part.
2. Check for obstruction of the negative pressure (vacuum) outlet port, and for obstruction of the water passage or gas passage.
3. Using a straight edge and feeler gauge, check for distortion of the cylinder head installation surface.

   Standard value: 0.15 mm (.006 in.) or less

   Limit: 0.20 mm (.008 in.)

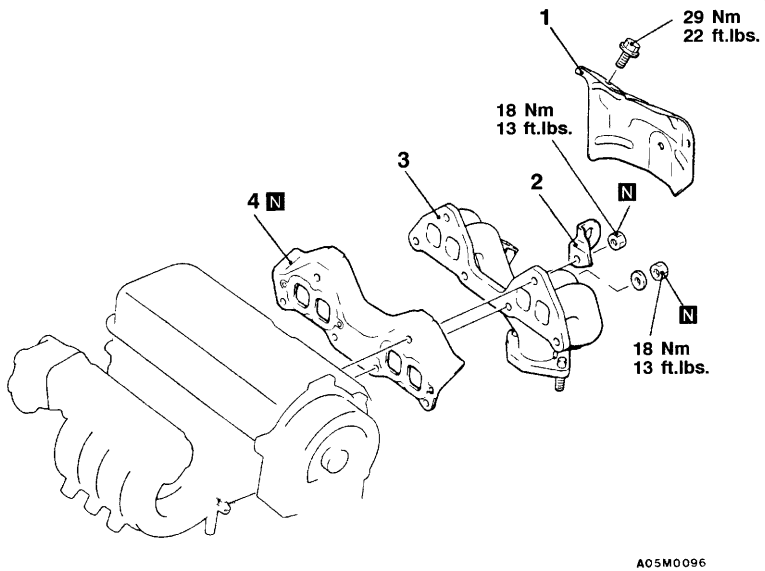
EXHAUST MANIFOLD

15100330468

REMOVAL AND INSTALLATION

<1.5L Engine>

Pre-removal and Post-installation Operation
- Front Exhaust Pipe Removal and Installation (Refer to P15-8)

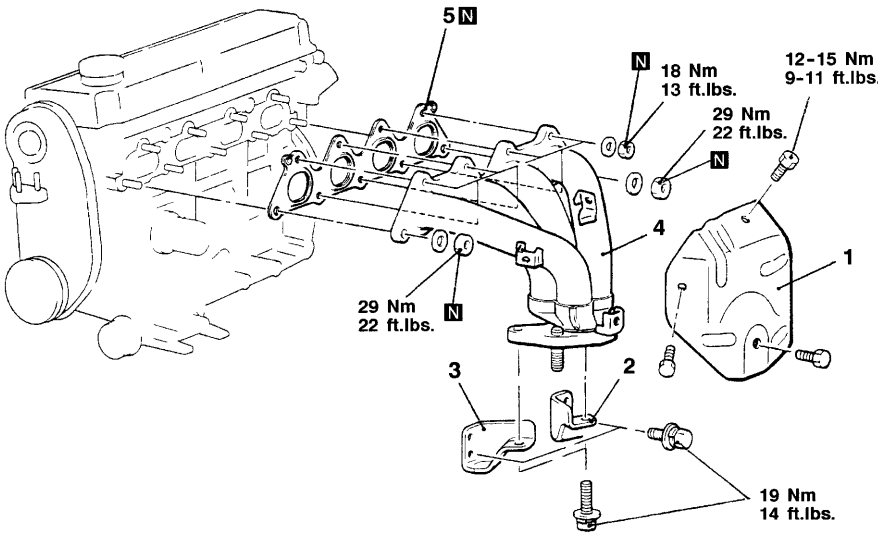


Removal steps

1 Exhaust manifold cover
2. Engine hanger
3 Exhaust manifold
4 Exhaust manifold gasket

<1.8L Engine>

Pre-removal and Post-installation Operation
- Front Exhaust Pipe Removal and Installation (Refer to P15-8)



Removal steps
1. Exhaust manifold cover
2. Exhaust manifold bracket (A)
3. Exhaust manifold bracket (B)
4. Exhaust manifold
5. Exhaust manifold gasket

INSPECTION

15100340078

EXHAUST MANIFOLD CHECK

1. Check for damage or cracking of any part.
2. Using a straight edge and feeler gauge, check for distortion of the cylinder head installation surface.

Standard value: 0.15 mm (.006 in.) or less

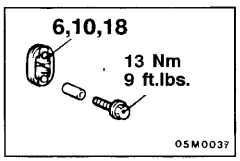
Limit: 0.20 mm (.008 in.)

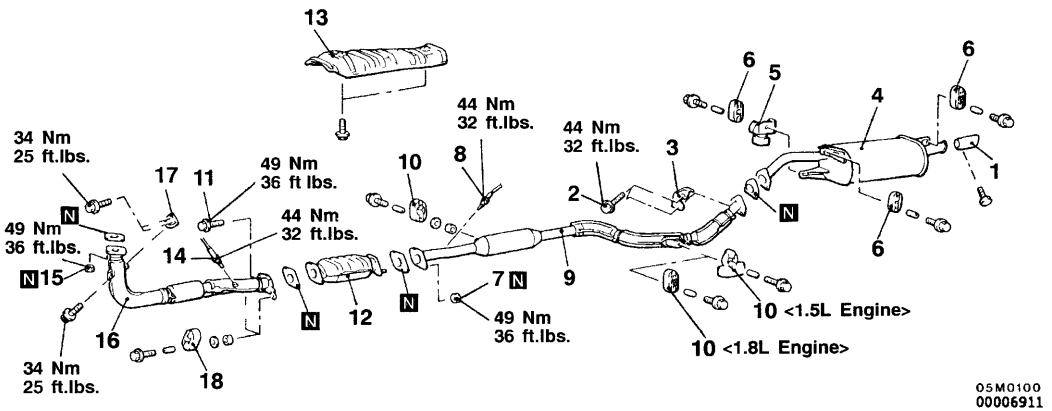
EXHAUST PIPE AND MAIN MUFFLER

15100540409

REMOVAL AND INSTALLATION

<Vehicles for Federal>





Main muffler removal steps

1. Muffler cutter <1.8L Engine>
2. Bolt
3. Protector
4. Main muffler
5. Dynamic damper <1.8L Engine>
6. Hanger

Center exhaust pipe removal steps

2. Bolt
3. Protector
7. Self-locking nuts

◀A▶ ▶A◀ 8. Heated oxygen sensor

9. Center exhaust pipe
10. Hanger
11. Bolts
12. Catalytic converter
13. Front floor heat protector panel

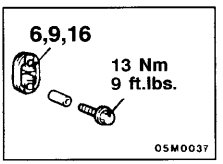
Front exhaust pipe removal steps

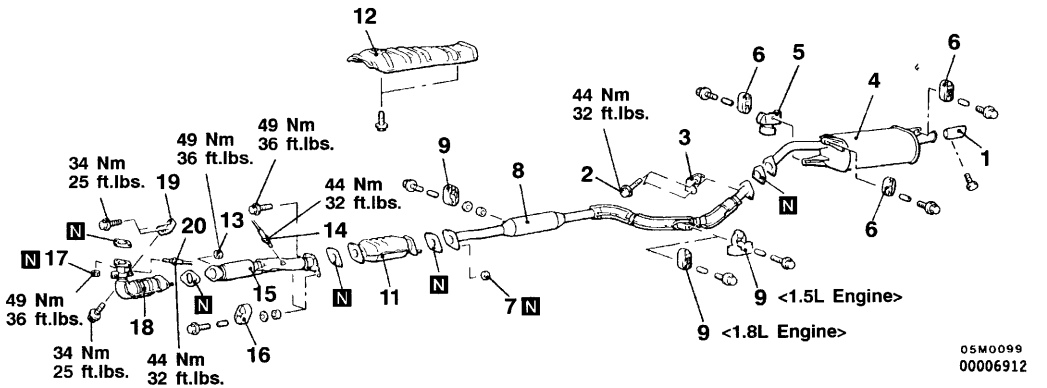
11. Bolts

◀A▶ ▶A◀ 14. Heated oxygen sensor

15. Self-locking nuts
16. Front exhaust pipe
17. Front exhaust pipe bracket
18. Hanger

<Vehicles for California>





Main muffler removal steps

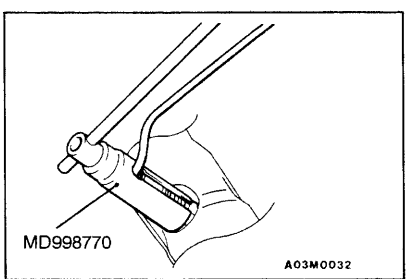
1. Muffler cutter <1.8L Engine>
2. Bolt
3. Protector
4. Main muffler
5. Dynamic damper <1.8L Engine>
6. Hanger

Center exhaust pipe removal steps

2. Bolt
3. Protector
7. Self-locking nuts
8. Center exhaust pipe
9. Hanger
10. Bolts
11. Catalytic converter
12. Front floor heat protector panel

Front exhaust pipe removal steps

10. Bolts
13. Self-locking nuts
◀A▶ ▶A◀ 14. Heated oxygen sensor
15. Front exhaust pipe
16. Hanger
17. Self-locking nuts
18. Front catalytic converter
19. Front exhaust pipe bracket
◀A▶ ▶A◀ 20. Heated oxygen sensor



REMOVAL SERVICE POINT

◀A▶ HEATED OXYGEN SENSOR REMOVAL

INSTALLATION SERVICE POINT

◀A▶ HEATED OXYGEN SENSOR INSTALLATION

ENGINE ELECTRICAL

CONTENTS

16109000301

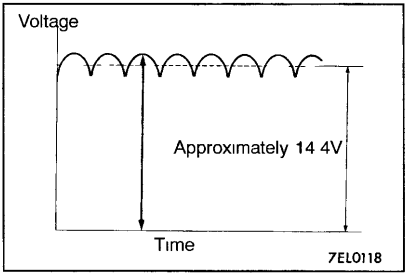
CHARGING SYSTEM 2
GENERAL INFORMATION 2
GENERATOR 13
ON-VEHICLE SERVICE 6
Generator Output Line Voltage Drop Test .. 6
Output Current Test 7
Regulated Voltage Test 9
Waveform Check Using an Analyzer 11
SERVICE SPECIFICATIONS 3
TROUBLESHOOTING 4
IGNITION SYSTEM 31
CAMSHAFT POSITION SENSOR AND CRANKSHAFT POSITION SENSOR 50
DISTRIBUTOR <1.5L engine> 49
GENERAL INFORMATION 31
IGNITION SYSTEM
<1.5L engine> 47
<1.8L engine> 48
ON-VEHICLE SERVICE 35
Camshaft Position Sensor and Crankshaft Position Sensor Check 38
Ignition Coil Check <1.5L engine> 35
Ignition Coil (With Built-in Ignition Power Transistor) Check <1.8L engine> 36
Ignition Failure Sensor Check <1.8L engine> 37
Ignition Power Transistor Continuity Check <1.5L engine> 36
Ignition Primary Voltage Waveform Check 43
Ignition Secondary Voltage Waveform Check 38
Spark Plug Cable Test 35
Spark Plug Cable Resistance Check 37
Spark Plug Check and Cleaning 37
Spark Plug Test 35
SERVICE SPECIFICATIONS 33
SPECIAL TOOLS 34
TROUBLESHOOTING 34
STARTING SYSTEM 19
GENERAL INFORMATION 19
ON-VEHICLE SERVICE 21
Starter Relay Continuity Check <M/T> 21
SERVICE SPECIFICATIONS 20
STARTER MOTOR 22
TROUBLESHOOTING 20

CHARGING SYSTEM

16100010419

GENERAL INFORMATION

The charging system is a system which charges the battery with the generator output to keep the battery charged at a constant level during varying electrical load.



Operation

Rotation of the excited field coil generates AC voltage in the stator.
This alternating current is rectified through diodes to DC voltage having a waveform shown in the illustration at left.
The average output voltage fluctuates slightly with the generator load condition.

When the ignition switch is turned on, current flows and excites the field coil initially.
When the stator coil begins to generate power after the engine is started, the field coil is excited by the output current of the stator coil.
The generator output voltage rises as the field current increases and it falls as the field current decreases. When the battery voltage (generator S terminal voltage) reaches a regulated voltage of approximately 14.4V, the field current is cut off.
When the battery voltage drops below the regulated voltage, the voltage regulator regulates the output voltage to a constant level by controlling the field current.
In addition, when the field current is constant, the generator output voltage rises as the engine speed increases.

CHARGING WARNING LIGHT OPERATION

When engine is stopped

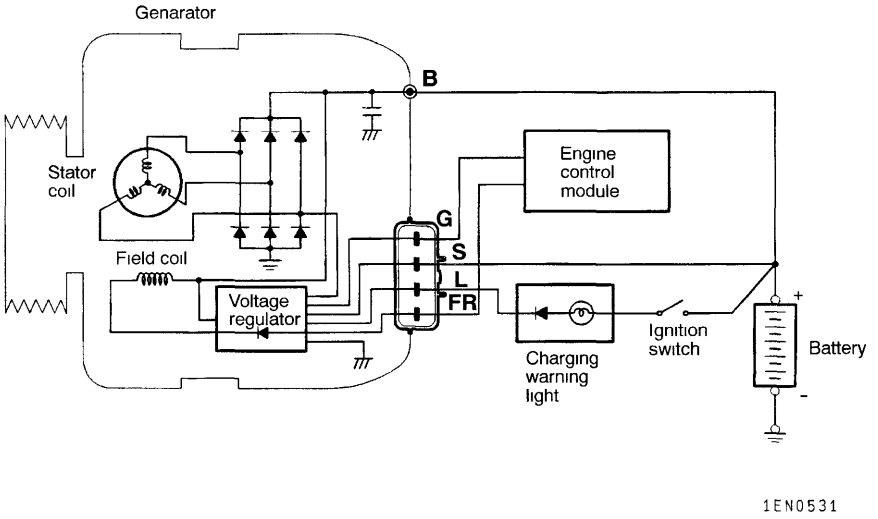
When the ignition switch is switched to the "ON" position, electricity flows from the "L" terminal of the generator to the rotor coil (field coil), and at the same time the charging warning light illuminates.

When engine is being started/has started

When the engine is started, charging voltage is applied to the "L" terminal of the generator, with the result that the charging warning light is extinguished.
In addition, because battery voltage is applied to the "S" terminal of the generator, this battery voltage is monitored at the IC voltage regulator, thus switching ON and OFF the current to the rotor coil (field coil) and thereby controlling the output voltage of the generator.
Power is supplied to each load from the "B" terminal of the generator.

NOTE
The generator relay functions as a back-up for the flow of electricity to the rotor coil (field coil) if there is a disconnection or damaged wiring of the charging warning light.

SYSTEM DIAGRAM



GENERATOR SPECIFICATIONS

Items	1 5L Engine	1.8L Engine
Type	Battery voltage sensing	Battery voltage sensing
Identification No.	A2TA5191	A2TA5391
Part No.	MD325696	MD317862
Rated output V/A	12/80	12/90
Voltage regulator	Electronic built-in type	Electronic built-in type

SERVICE SPECIFICATIONS

16100030132

Items		Standard value	Limit
Regulated voltage (Ambient temp. at voltage regulator) V	-20°C (-4°F)	14.2-15 4	-
	20°C (68°F)	13.9-14.9	-
	60°C (140°F)	13.4-14.6	-
	80°C (176°F)	13.1-14.5	-
Rotor coil resistance Ω		Approximately 3-5	-
Generator output line voltage drop (at 30A)V		-	max 0 3
Output current		-	70% of nominal output current

TROUBLESHOOTING

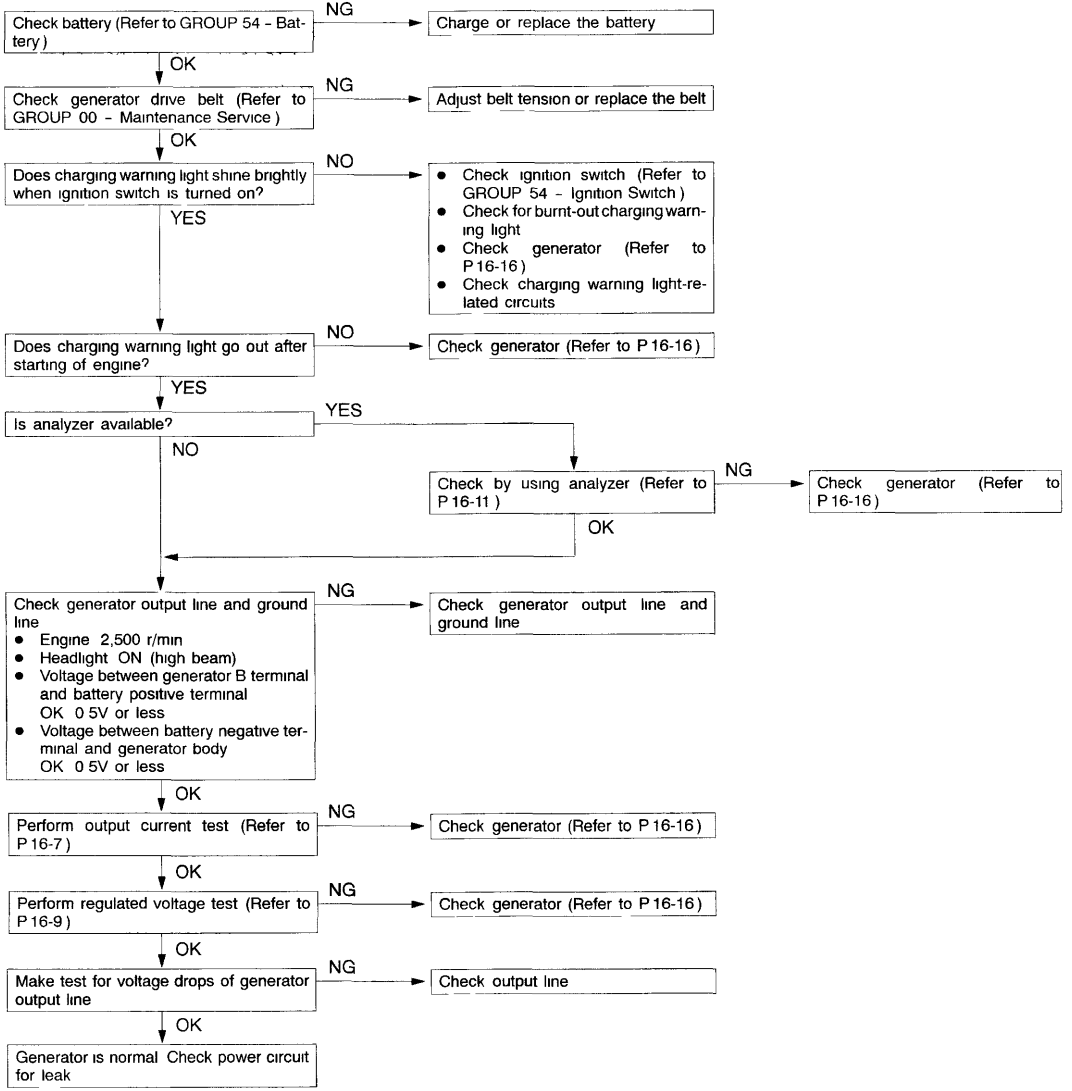
16100070271

TROUBLESHOOTING HINTS

1. Charging warning light does not go on when the ignition switch is turned to "ON", before the engine starts.
   - Check the bulb.
2. Charging warning light fails to go off once the engine starts.
   - Check the IC voltage regulator (located inside the generator).
3. Discharged or overcharged battery.
   - Check the IC voltage regulator (located inside the generator).
4. The charging warning light illuminates dimly.
   - Check the diode (within the combination meter) for a short-circuit.

TROUBLESHOOTING GUIDE

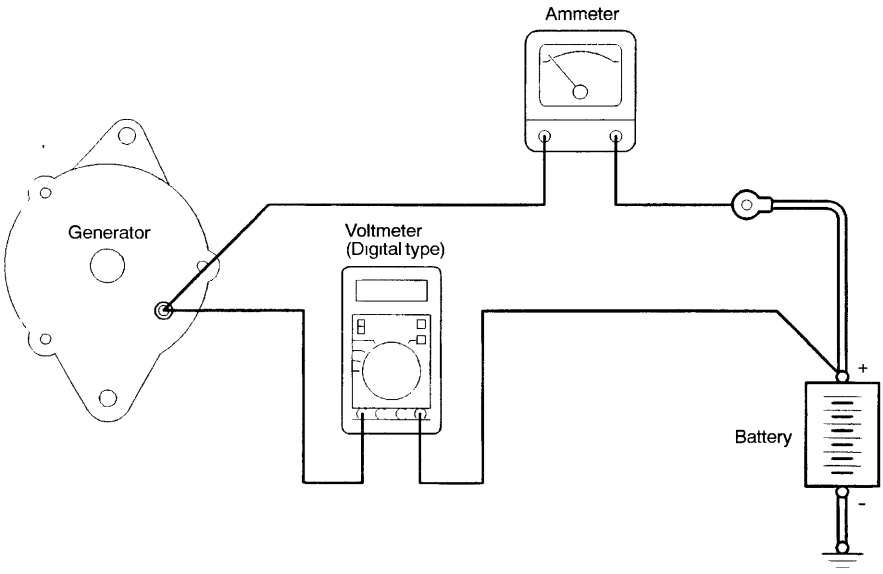
The charging system troubleshooting guide is shown in the following chart.



ON-VEHICLE SERVICE

16100090468

GENERATOR OUTPUT LINE VOLTAGE DROP TEST



This test determines the condition of the wiring from the generator "B" terminal to the battery (+) terminal (including the fusible link).

(1) Be sure to check the following before testing:
- Generator installation and wiring connections
- Generator drive belt tension (Refer to GROUP 00 - Maintenance Service.)
- Fusible link
- Abnormal noise from the generator while the engine is running

(2) Turn the ignition switch to the OFF position.

(3) Disconnect the negative battery cable.

(4) Disconnect the generator output wire from the generator "B" terminal. Connect a DC test ammeter with a range of 0 - 100 A in series between the "B" terminal and the disconnected output wire. (Connect the (+) lead of the ammeter to the "B" terminal. Connect the (-) lead of the ammeter to the disconnected output wire.)

NOTE
An inductive-type ammeter which enables measurements to be taken without disconnecting the generator output wire is recommended.
Using this equipment will lessen the possibility of a voltage drop caused by a loose "B" terminal connection.

(5) Connect a digital-type voltmeter between the generator "B" terminal and the battery (+) terminal. (Connect the (+) lead of the voltmeter to the "B" terminal. Connect the (-) lead of the voltmeter to the battery (+) cable.)

(6) Reconnect the negative battery cable.
(7) Connect a tachometer or the scan tool.
(8) Leave the hood open and connect a tachometer.
(9) Start the engine.
(10) With the engine running at approx. 2500 r/min, turn the headlights and other lights on and off to adjust the generator load on the ammeter slightly above 30 A.
Decrease the engine speed gradually until the value displayed on the ammeter is 30 A. Take a reading of the value displayed on the voltmeter at this time.

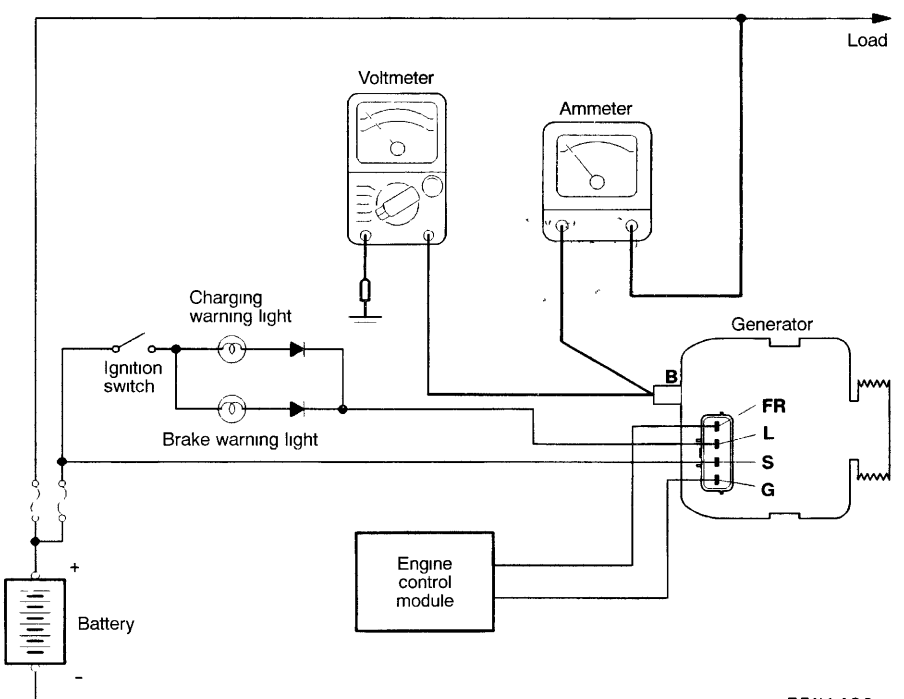
Limit: max. 0.3 V

NOTE
When the generator output is high and the value displayed on the ammeter does not decrease until 30A, set the value to 40A. Read the value displayed on the voltmeter.
In this case the limit becomes max. 0.4V.

(11) If the value displayed on the voltmeter is still above the limit, a malfunction in the generator output wire may exist. Check the wiring between the generator "B" terminal and the battery (+) terminal (including fusible link).
If a terminal is not sufficiently tight or if the harness has become discolored due to overheating, repair, then test again.
(12) After the test, run the engine at idle.
(13) Turn off all lights and turn the ignition switch to the OFF position.
(14) Disconnect the tachometer or the scan tool.
(15) Disconnect the negative battery cable.
(16) Disconnect the ammeter and voltmeter.
(17) Connect the generator output wire to the generator "B" terminal.
(18) Connect the negative battery cable.

OUTPUT CURRENT TEST

16100100451



This test determines if the generator output current is normal.

(1) Before testing, be sure to check the following:
- Generator installation and wiring connections
- Battery (Refer to GROUP 54 - Battery.)

NOTE
The battery used should be slightly discharged. The load needed by a fully-charged battery is insufficient for an accurate test.

- Generator drive belt tension (Refer to GROUP 00 - Maintenance Service.)
- Fusible link
- Abnormal noise from the generator while the engine is running

(2) Turn the ignition switch to the OFF position.
(3) Disconnect the negative battery cable.
(4) Disconnect the generator output wire from the generator "B" terminal. Connect a DC test ammeter with a range of 0-100 A in series between the "B" terminal and the disconnected output wire. (Connect the (+) lead of the ammeter to the "B" terminal. Connect the (-) lead of the ammeter to the disconnected output wire.)

WARNING
Never use clips to connect the line. Loose connections (e.g. using clips) will lead to a serious accident because of high current.

NOTE
An inductive-type ammeter which enables measurements to be taken without disconnecting the generator output wire is recommended.

(5) Connect a voltmeter with a range of 0-20 V between the generator "B" terminal and the ground. (Connect the (+) lead of the voltmeter to the "B" terminal, and then connect the (-) lead of the voltmeter to the ground.)
(6) Connect the negative battery cable.
(7) Connect a tachometer or the scan tool.
(8) Leave the hood open.
(9) Check that the reading on the voltmeter is equal to battery voltage.

NOTE
If the voltage is 0 V, the cause is probably an open circuit in the wire or fusible link between the generator "B" terminal and the battery (+) terminal.

(10) Start the engine, and turn the headlights on.
(11) Switch the headlights to high beam, turn the heater blower switch to High, increase the engine speed to approximately 2,500 r/min, and read the maximum current output displayed on the ammeter.

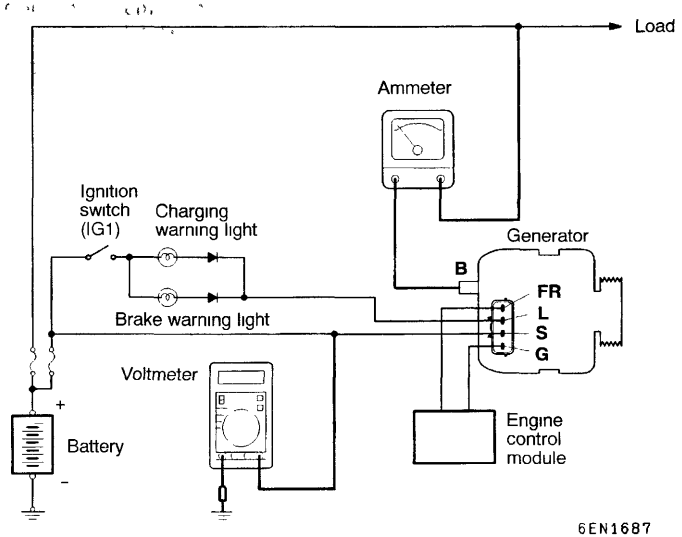
Limit: 70% of nominal output current

NOTE
- For the nominal current output, refer to the Generator Specifications.
- Because the current from the battery will soon drop after the engine is started, Steps (10) and (11) should be carried out as quickly as possible in order to obtain the maximum current output value.
- The current output value will depend on the electrical load and the temperature of the generator body.
- If insufficient electrical load is used while testing, the specified level of current may not be output even though the generator is normal. In such cases, increase the electrical load by leaving the headlights on with the engine off to discharge the battery before testing.
- The specified level of current also may not be output if the temperature of the generator body and/or ambient temperature is too high. In such cases, allow the generator to cool before testing.

(12) The reading on the ammeter should be above the limit value. If the reading is below the limit value and the generator output wire is normal, remove the generator from the engine and check the generator.
(13) Run the engine at idle speed after the test.
(14) Turn the ignition switch to the OFF position.
(15) Disconnect the tachometer or the scan tool.
(16) Disconnect the negative battery cable.
(17) Disconnect the ammeter and voltmeter.
(18) Connect the generator output wire to the generator "B" terminal.
(19) Connect the negative battery cable.

REGULATED VOLTAGE TEST

16100110454



This test determines if the voltage regulator is correctly controlling the generator output voltage.

(1) Be sure to check the following:
- Generator installation and wiring connections
- Battery fully charged. (Refer to GROUP 54 - Battery.)
- Generator drive belt tension (Refer to GROUP 00 - Maintenance Service.)
- Fusible link
- Abnormal noise from the generator while the engine is running

(2) Turn the ignition switch to the OFF position.
(3) Disconnect the negative battery cable.
(4) Connect a digital-type voltmeter between the generator "S" terminal and the ground. (Connect the (+) lead of the voltmeter to the "S" terminal. Connect the (-) lead of the voltmeter to a secure ground or to the battery (-) terminal.)
(5) Disconnect the generator output wire from the generator "B" terminal.
(6) Connect a DC test ammeter with a range of 0-100A in series between the "B" terminal and the disconnected output wire. (Connect the (+) lead of the ammeter to the "B" terminal. Connect the (-) lead of the ammeter to the disconnected output wire.)
(7) Reconnect the negative battery cable.
(8) Connect a tachometer or the scan tool.
(9) Turn the ignition switch to the ON position and check that the reading on the voltmeter is equal to the battery voltage.

NOTE
If the voltage is 0 V, the cause is probably an open circuit in the wire or fusible link between the generator "S" terminal and the battery (+) terminal.

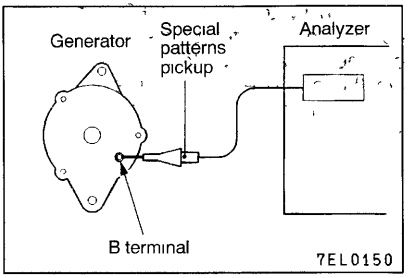
(10) Make sure all lights and accessories are off.
(11) Start the engine.
(12) Increase the engine speed to approx. 2,500 r/min.
(13) Read the voltmeter when the current output by the generator becomes 10 A or less.
(14) If the voltage reading conforms to the value in the voltage regulation table, the voltage regulator is operating normally.
If the voltage is not within the standard value, a malfunction of the voltage regulator or of the generator exists.

NOTE
If the output current is 12.3 V, the terminal G may be grounded. Refer to GROUP 13A - Troubleshooting to check the generator "G" terminal related circuit.

(15) After the test, lower the engine speed to the idle speed.
(16) Turn the ignition switch to the OFF position.
(17) Disconnect the tachometer or the scan tool.
(18) Disconnect the negative battery cable.
(19) Disconnect the ammeter and voltmeter.
(20) Connect the generator output wire to the generator "B" terminal.
(21) Connect the negative battery cable.

Voltage Regulation Table

Battery ambient temperature °C (°F)	Standard value V
-20 (-4)	14.2-15.4
20 (68)	13.9-14.9
60 (140)	13.4-14.6
80 (176)	13.1-14.5



WAVEFORM CHECK USING AN ANALYZER

16100120136

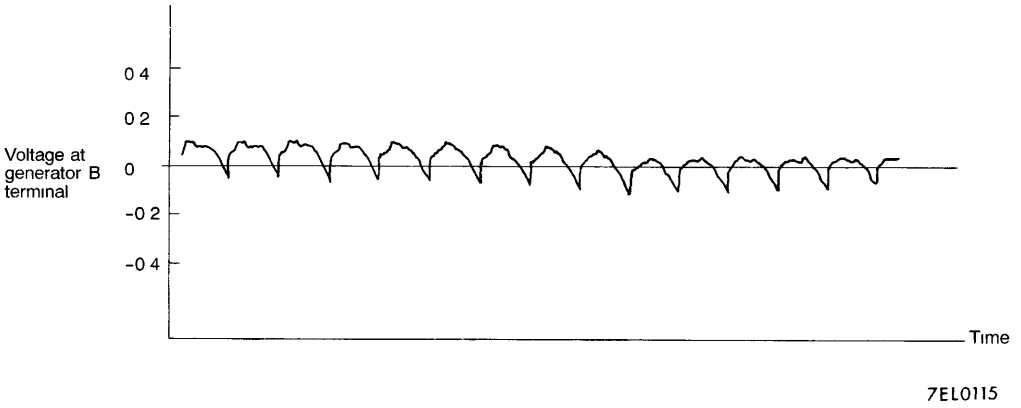
MEASUREMENT METHOD

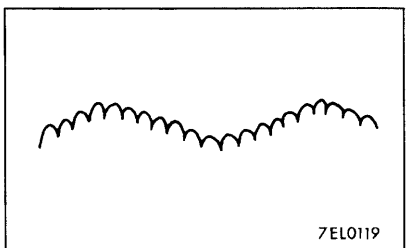
Connect the analyzer special patterns pick-up to the generator B terminal.

STANDARD WAVEFORM

Observation Conditions

FUNCTION	SPECIAL PATTERNS
PATTERN HEIGHT	VARIABLE
VARIABLE knob	Adjust while viewing the waveform
PATTERN SELECTOR	RASTER
Engine speed	Curb idle speed





NOTE

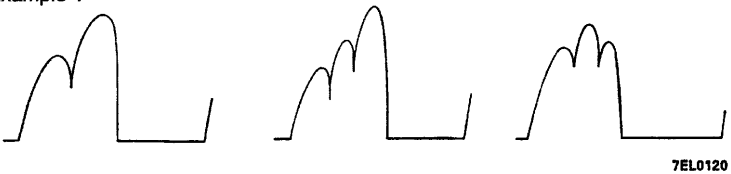
The voltage waveform of the generator B terminal can undulate as shown at left. This waveform is produced when the regulator operates according to fluctuations in the generator load (current), and is normal for the generator.

In addition, if the ripples are abnormally high (more than approximately 2 V when the engine is idling), the cause is probably an open circuit between the generator B terminal and the battery due to a blown fuse, and the generator itself is usually okay.

ABNORMAL WAVEFORMS EXAMPLES

NOTE

1. The size of the waveform patterns differs largely, depending on the adjustment of the analyzer's variable knob.
2. Identification of abnormal waveforms is easiest with a large output current (regulator not operating). These waveforms can be observed when the headlights are on.
3. Check the condition of the charging warning light (illuminated/not illuminated). Also, check the condition of all charging system components.

Abnormal waveforms	Problem cause
Example 1  7EL0120	Open diode
Example 2  7EL0121	Short in diode
Example 3  7EL0122	Broken wire in stator coil
Example 4  7EL0123	Short in stator coil
Example 5  Charging warning light is illuminated. 7EL0124	Open supplementary diode

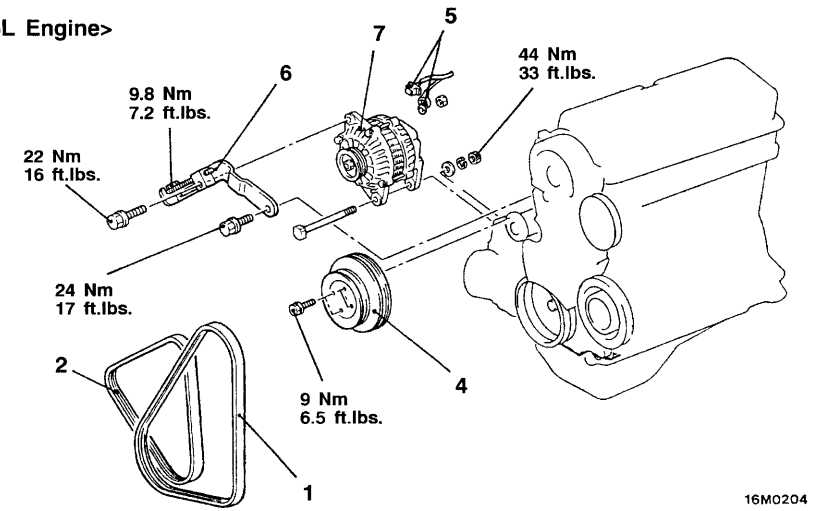
GENERATOR

16100140446

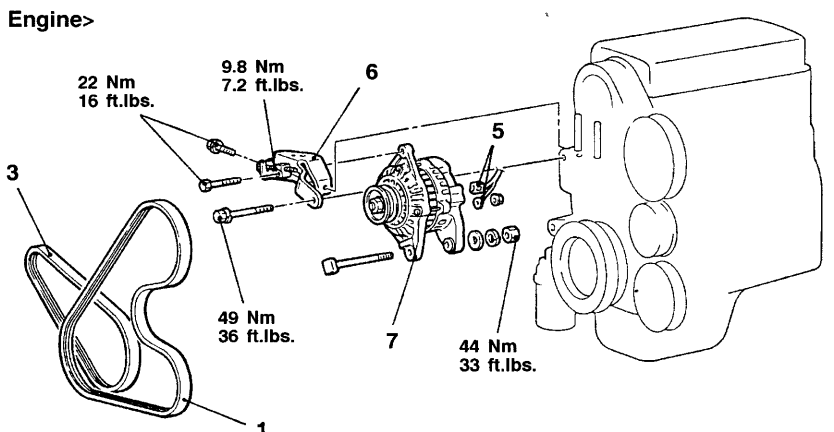
REMOVAL AND INSTALLATION

Post-installation Operation
- Adjustment of Drive Belt Tension (Refer to GROUP 00 - Maintenance Service)

<1.5L Engine>



<1.8L Engine>

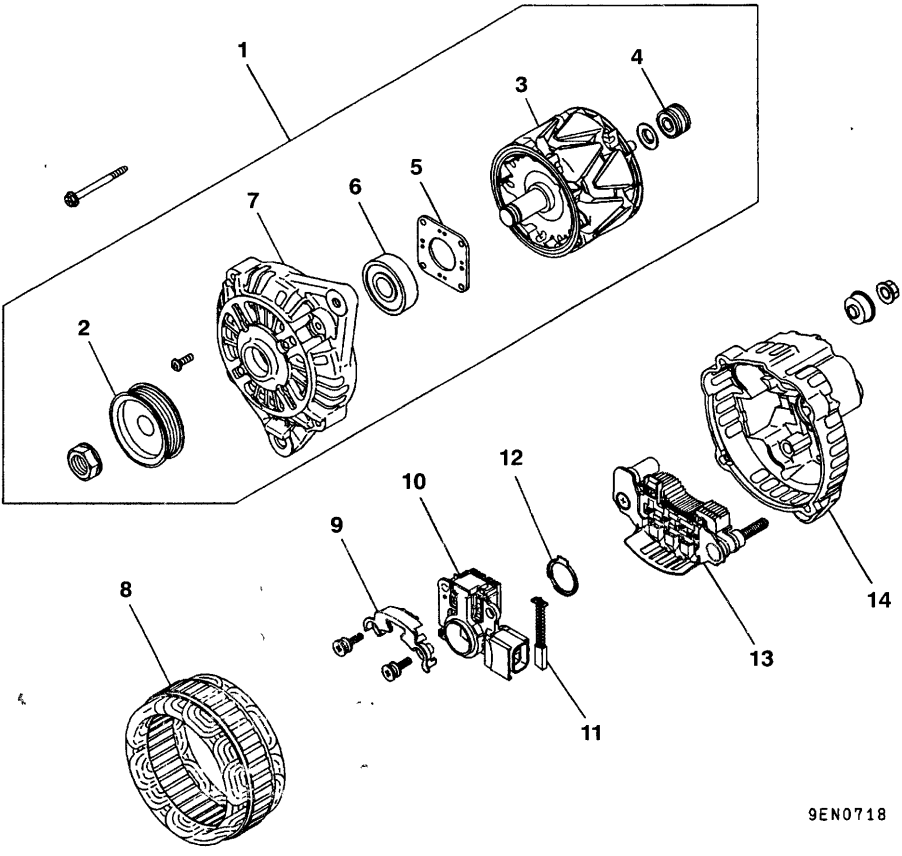


Removal steps

1. Drive belt (Air conditioning compressor and power steering oil pump)
2. Drive belt (Generator and water pump) <1.5L Engine>
3. Drive belt (Generator) <1.8L Engine>
4. Water pump pulley <1.5L Engine>
5. Generator connector
6. Generator brace
7. Generator

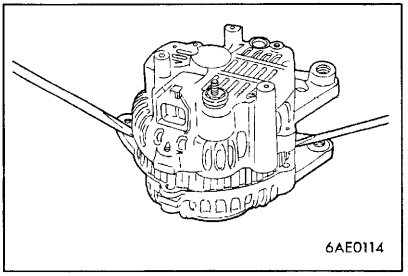
DISASSEMBLY AND REASSEMBLY

16100160275



Disassembly steps

◀A▶ ◀B▶ 1. Front bracket assembly
2. Generator pulley
▶B◀ 3. Rotor
4. Rear bearing
5. Bearing retainer
6. Front bearing
7. Front bracket
◀C▶ 8. Stator
9. Plate
◀C▶ ▶A◀ 10. Regulator assembly
11. Brush
12. Slinger
13. Rectifier
14. Rear bracket

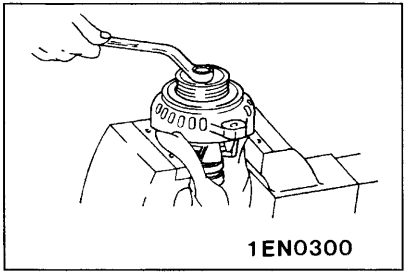


DISASSEMBLY SERVICE POINTS

◀A▶ FRONT BRACKET REMOVAL

Insert a flat tip screwdriver, etc., in the clearance between the front bracket assembly and stator core, to pry open and separate the stator and front bracket.

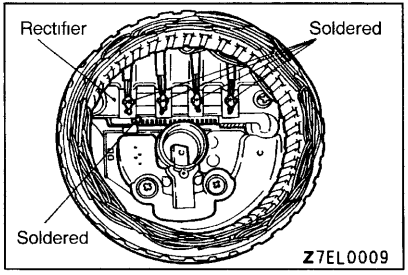
Caution
The stator coil could be damaged so do not insert the screwdriver too far.



◀B▶ PULLEY REMOVAL

Face the pulley side upward, fix the rotator with a work bench and remove the pulley.

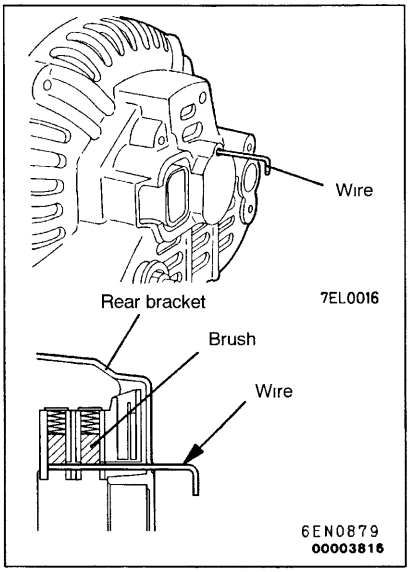
Caution
Use care so that the rotor is not damaged.



◀C▶ STATOR/REGULATOR ASSEMBLY REMOVAL

(1) Use a soldering iron (180 to 250 W) to unsolder the stator. This work should complete within approximately four seconds to prevent heat from transferring to the diode.
(2) When removing the rectifier from the regulator assembly, remove the soldered sections of the rectifier.

Caution
1. **Use care to make sure that the heat of the soldering iron is not transmitted to the diodes for a long period.**
2. **Use care that no undue force is exerted to the lead wires of the diode.**

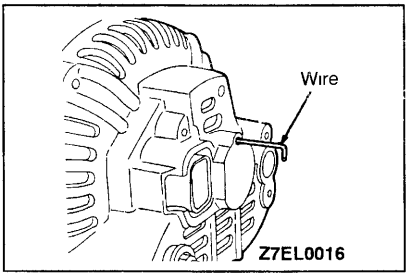


REASSEMBLY SERVICE POINTS

▶A◀ REGULATOR ASSEMBLY INSTALLATION

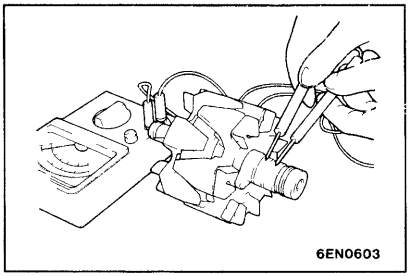
After installing the regulator assembly, insert a wire into the hole provided on the rear bracket while pressing in the brush to fix the brush.

NOTE
The brush is fixed when a wire is inserted, making rotor installation easier.



▶B◀ ROTOR INSTALLATION

After installing the rotor, remove the wire used to fix the brush.



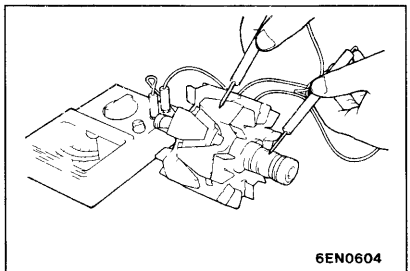
INSPECTION

16100170155

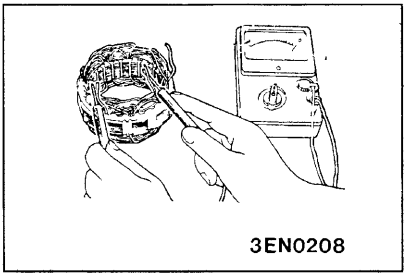
ROTOR CHECK

(1) Check the continuity between the rotor coil slip rings, and replace the rotor if the resistance value is not at the standard value.

Standard value: 3 - 5 Ω

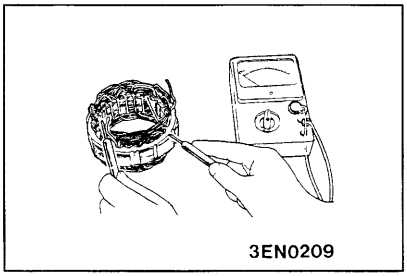


(2) Check the continuity between the slip ring and core, and if there is continuity, replace the rotor.

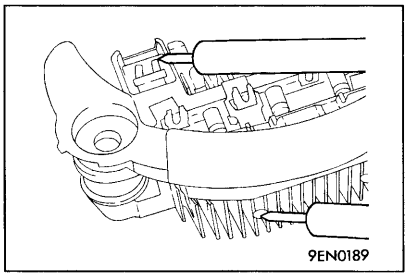

3EN0208

STATOR CHECK

(1) Check the continuity between the coil leads, and if there is continuity, replace the stator.

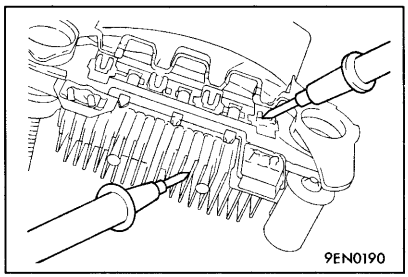

3EN0209

(2) Check the continuity between the coil and core, and if there is continuity, replace the stator.

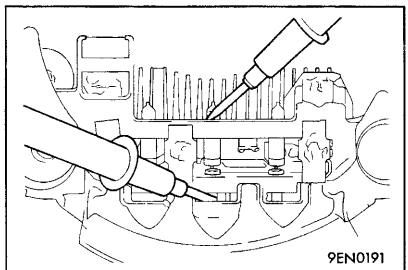

9EN0189

RECTIFIER CHECK

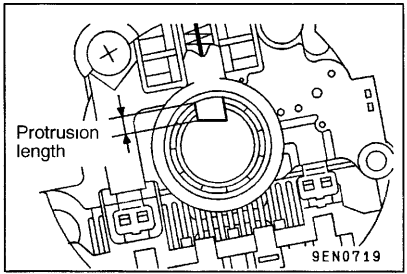
(1) Inspect the (+) heat sink by checking the continuity between the (+) heat sink and stator coil lead wire connection terminal using a tester probe.
If there is a continuity at both, the diode is short circuited, so replace the rectifier.


9EN0190

(2) Inspect the (-) heat sink by checking the continuity between the (-) heat sink and stator coil lead wire connection terminal using a tester probe.
If there is a continuity at both, the diode is short circuited, so replace the rectifier.


9EN0191

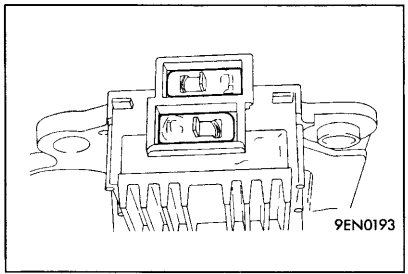
(3) Check the diode trio by connecting an ohmmeter to both ends of each diode and check the continuity of the three diodes.
If there is a continuity at both ends, or if there is no continuity, the diode is damaged so replace the rectifier.



BRUSH CHECK

(1) Measure the length of the brush protrusion shown in the illustration, and replace the brush if the measured value is below the limit value.

Limit: 2 mm (.8 in) or less



(2) The brush can be removed if the solder of the brush lead wire is removed.
(3) When installing a new brush, insert the brush into the holder as shown in the illustration, and then solder the lead wires.

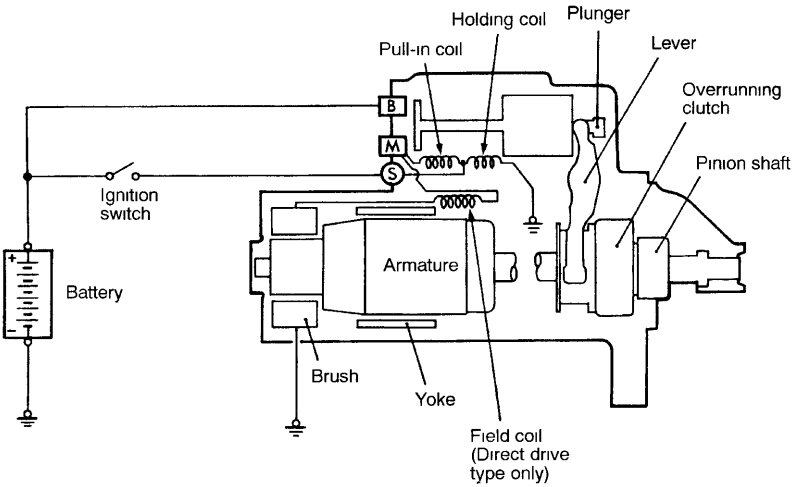
STARTING SYSTEM

16200010351

GENERAL INFORMATION

If the ignition switch is turned to the "START" position, current flows in the coil provided inside magnetic switch, attracting the plunger. When the plunger is attracted, the lever connected to the plunger is actuated to engage the starter clutch. On the other hand, attracting the plunger will turn on the magnetic switch, allowing the B terminal and M terminal to conduct. Thus, current flows to engage the starter motor.

When the ignition switch is returned to the "ON" position after starting the engine, the starter clutch is disengaged from the ring gear.
An overrunning clutch is provided between the pinion and the armature shaft, to prevent damage to the starter.



1EN0532

STARTER MOTOR SPECIFICATIONS

Items	1.5L Engine	1.5L Engine - M/T★	1.8L Engine
Type	Direct drive	Direct drive	Reduction drive with planetary gear
Identification No.	M3T44081	M2T44781	M0T81284
Part No	MD301348	MD301350	MD360368
Rated output kW/V	0 9/12	0.7/12	1.2/12
No. of pinion teeth	8	8	8

★ Engines for use in regions other than cold climates

OPERATION

- For models equipped with the M/T, the clutch pedal position switch contact is switched OFF when the clutch pedal is depressed. When the ignition switch is then switched to the"ST" position, electricity flows to the starter relay and the starter motor, the contact (magnetic switch) of the starter is switched ON, and the starter motor is activated.

  NOTE
  If the ignition switch is switched to the "ST" position without the clutch pedal being depressed, electricity flows to the starter relay (coil), the clutch pedal position switch (contacts) and to ground, with the result that the contacts of the starter relay are switched OFF. Because the power to the starter motor is thereby interrupted, the starter motor in not activated.
- For models equipped with the A/T, when the ignition switch is switched to the "ST" position while the selector lever is at the "P" or "N" position, the contact (magnetic switch) of the starter is switched ON and the starter motor is activated.

SERVICE SPECIFICATIONS

16200030135

Direct drive type

Items		Standard value	Limit
Free running characteristics	Terminal voltage V	11.5	-
	Current A	60 or less	-
	Speed r/min	6,000 or more	-
Pinion gap mm (in.)		0.5 - 2 0 (.020 - .079)	-
Commutator runout mm (in.)		-	0.05 (.0002)
Commutator diameter mm (in.)		32 0 (1.260)	31.4 (1.220)
Undercut depth mm (in.)		0.5 (020)	0.2 (.008)

Reduction drive type

Items		Standard value	Limit
Free running characteristics	Terminal voltage V	11	-
	Current A	90 or less	-
	Speed r/min	2,800 or more	-
Pinion gap mm (in.)		0.5 - 2.0 (.020 - .079)	-
Commutator runout mm (in.)		-	0 05 (.0002)
Commutator diameter mm (in)		29.4 (1 158)	28.8 (1.118)
Undercut depth mm (in.)		0 5 (020)	0.2 (.008)

TROUBLESHOOTING

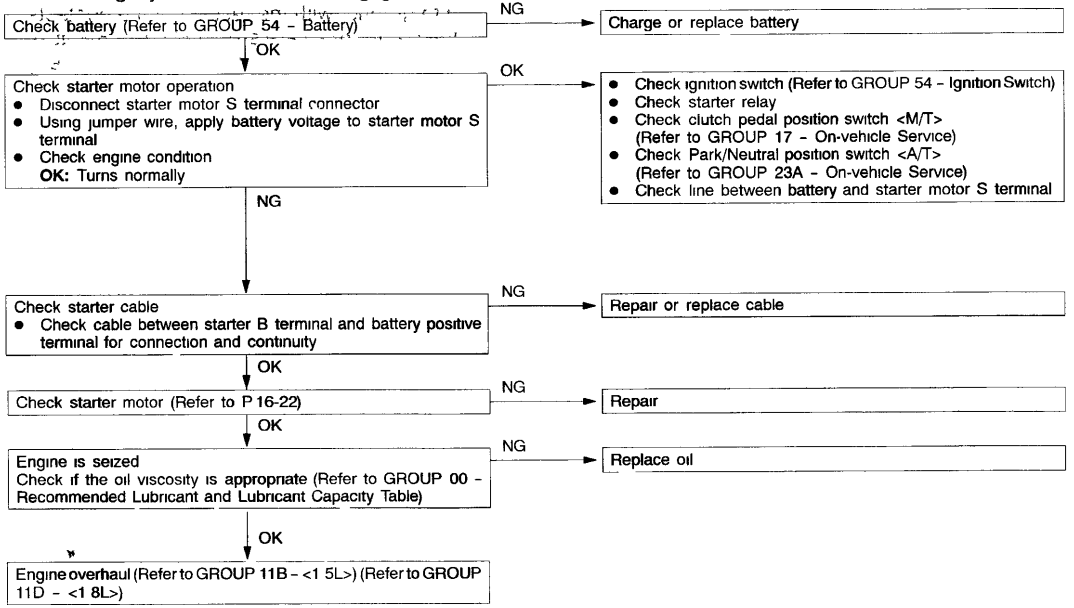
16200070182

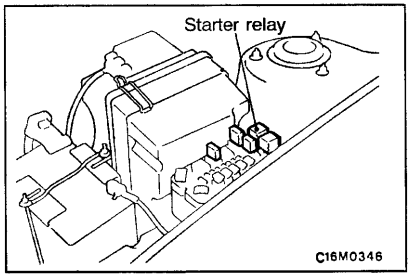
TROUBLESHOOTING HINTS

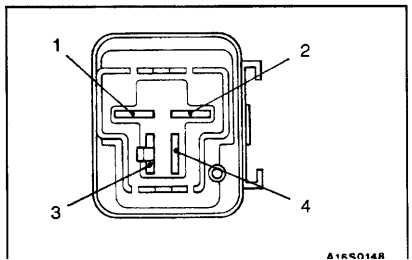
1. The starter motor does not operate at all
   - Check the starter (coil).
   - Check for poor contact at the battery terminals and starter.
   - Check park/neutral position switch. <A/T>
   - Check starter relay. <M/T>
   - Check clutch pedal position switch <M/T>
2. The starter motor doesn't stop
   - Check the starter (magnetic switch).

TROUBLESHOOTING GUIDE

The starting system troubleshooting guide is shown in the following chart.







ON-VEHICLE SERVICE

16200140081

STARTER RELAY CONTINUITY CHECK <M/T>

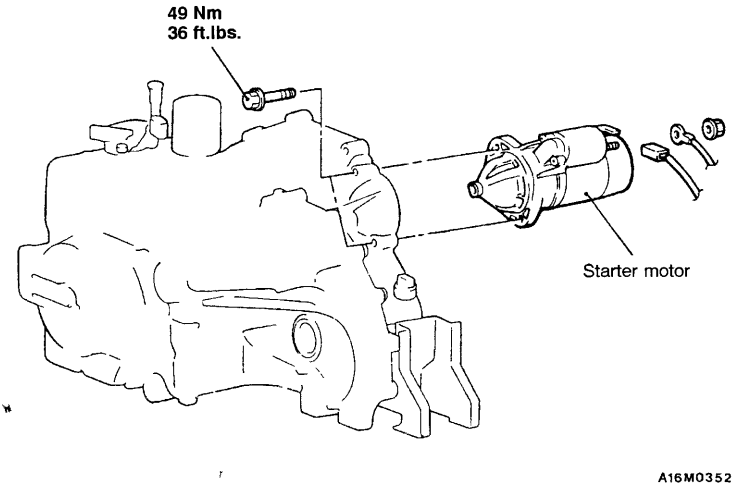
1. Remove the starter relay from the relay box inside the engine compartment.
2. Set an ohmmeter, and check that there is continuity when the (+) terminal of the tester is connected to terminal 4 of the starter relay and the (-) terminal is connected to terminal 2.
3. Next, check that there is no continuity when the (+) terminal is connected to terminal 2 and the (-) terminal is connected to terminal 4.
4. If the continuity checks in step 2 and 3 show a defect, replace the starter relay.

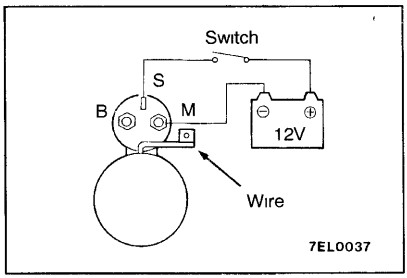
STARTER MOTOR

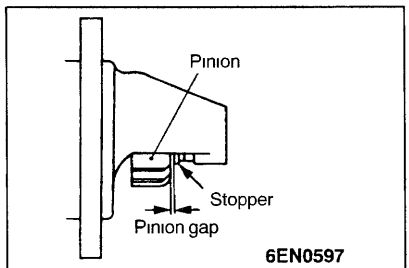
16200100096

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
Air Cleaner Removal and Installation







INSPECTION

16200110167

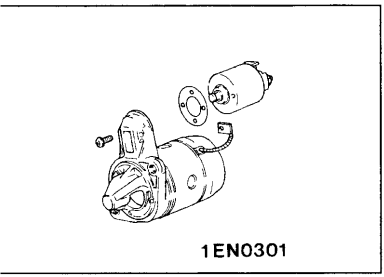
PINION GAP ADJUSTMENT

(1) Disconnect the wire from the M-terminal of the magnetic switch.
(2) Connect a 12V battery between the S-terminal and the M-terminal.
(3) Set the switch to "ON", and the pinion will move out.

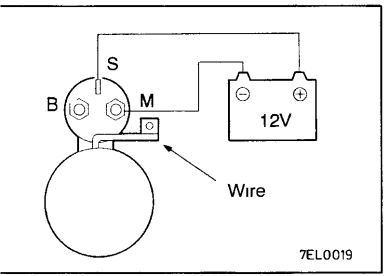
Caution
This test must be performed quickly (in less than 10 seconds) to prevent the coil from burning.

(4) Check pinion to stopper clearance (pinion gap) with a feeler gauge.

Standard value: 0.5-2.0 mm (.020-.079 in.)


1EN0301

(5) If the pinion gap is out of specification, adjust by adding or removing the gaskets between the magnetic switch and the front bracket.

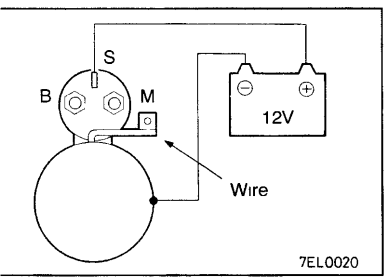


MAGNETIC SWITCH PULL-IN TEST

(1) Disconnect the wire from the M-terminal of the magnetic switch.
(2) Connect a 12V battery between the S-terminal and the M-terminal.

Caution
This test must be performed quickly (in less than 10 seconds) to prevent coil from burning.

(3) If the pinion moves out, the pull-in coil is good. If it doesn't, replace the magnetic switch.

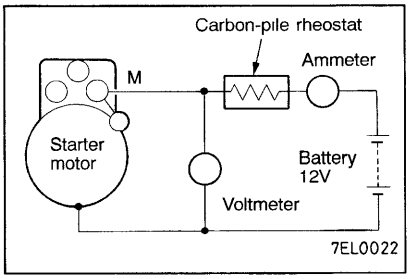


MAGNETIC SWITCH HOLD-IN TEST

(1) Disconnect the wire from the M-terminal of the magnetic switch.
(2) Connect a 12V battery between the S-terminal and the body.

Caution
This test must be performed quickly (in less than 10 seconds) to prevent coil from burning.

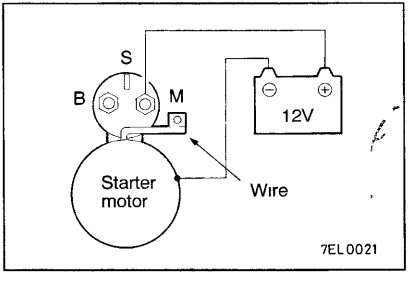
(3) Draw out the pinion to the pinion stopper by hand.
(4) If the pinion remains out, everything is operating properly. If the pinion moves in, hold-in circuit is open. Replace the magnetic switch.



FREE RUNNING TEST

(1) Place the starter motor in a vise equipped with soft jaws and connect a fully-charged 12-volt battery to starter motor as follows.
(2) Connect a test ammeter (100-ampere scale) and carbon pile rheostat in series between the positive battery terminal and starter motor terminal.
(3) Connect a voltmeter (15-volt scale) across the starter motor.
(4) Rotate carbon pile to the full-resistance position.
(5) Connect the battery cable from the negative battery terminal to the starter motor body.
(6) Adjust the rheostat until the battery voltage shown by the voltmeter is 11.5 V (for the direct drive type) or 11 V (for reduction drive type).
(7) Confirm that the maximum amperage is within the specifications and that the starter motor turns smoothly and freely.

Standard value:
60 A or less (Direct drive type)
90 A or less (Reduction drive type)



MAGNETIC SWITCH RETURN TEST

(1) Disconnect the wire from the M-terminal of the magnetic switch.
(2) Connect a 12V battery between the M-terminal and the body.

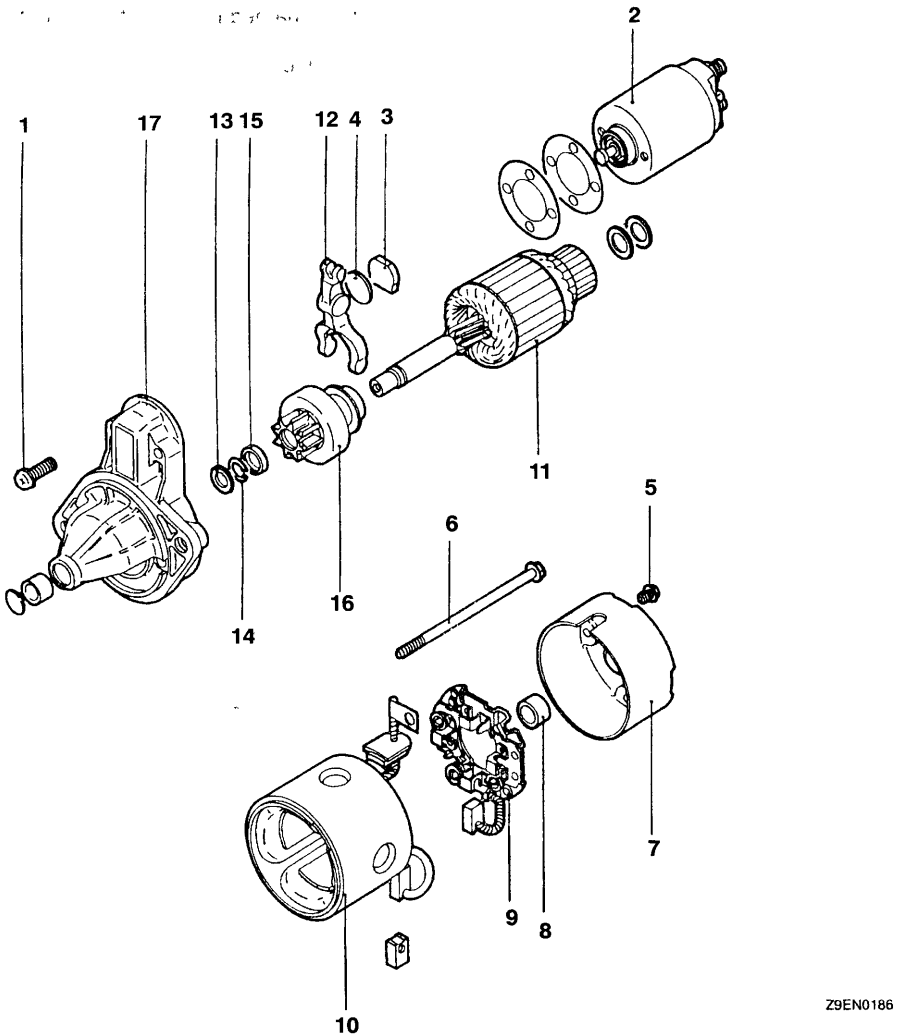
Caution
This test must be performed quickly (in less than 10 seconds) to prevent coil from burning.

(3) Pull the pinion out and release. If the pinion quickly returns to its original position, everything is operating properly. If it doesn't, replace the magnetic switch.

Caution
Be careful not to pinch your finger when drawing out the pinion.

DISASSEMBLY AND REASSEMBLY <DIRECT DRIVE TYPE>

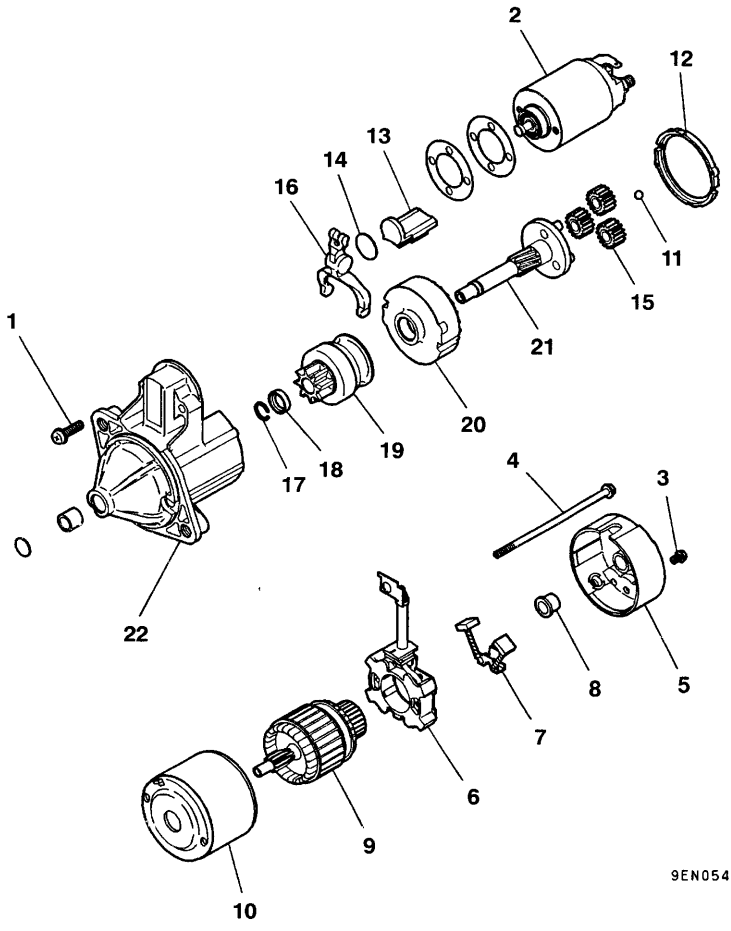
16200120207



Disassembly steps

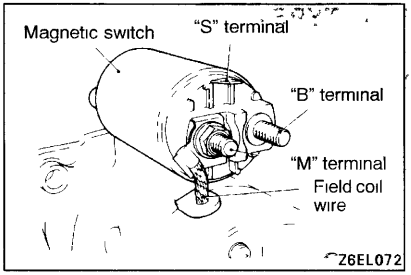
1. Screw
◀A▶ 2 Magnetic switch
3. Packing
4. Plate
5. Screw
6. Through bolt
7 Rear bracket
8 Rear bearing
9 Brush holder assembly
10 Yoke assembly
11. Armature
12 Lever
13. Washer
◀C▶ ▶A◀ 14. Snap ring
◀C▶ ▶A◀ 15 Stop ring
16. Overrunning clutch
17. Front bracket

DISASSEMBLY AND REASSEMBLY <REDUCTION DRIVE TYPE>



Disassembly steps

1. Screw
◀A▶ 2. Magnetic switch
3. Screw
4. Screw
5. Rear bracket
6. Brush holder
7. Brush
8. Rear bearing
◀B▶ 9. Armature
10. Yoke assembly
◀B▶ 11. Ball
12. Packing A
13. Packing B
14. Plate
15. Planetary gear
16. Lever
◀C▶ ▶A◀ 17. Snap ring
◀C▶ ▶A◀ 18. Stop ring
19. Overrunning clutch
20. Internal gear
21. Planetary gear holder
22. Front bracket



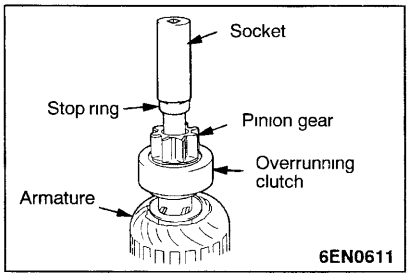
DISASSEMBLY SERVICE POINTS

◀A▶ MAGNETIC SWITCH REMOVAL

Disconnect field coil wire from "M" terminal of magnetic switch.

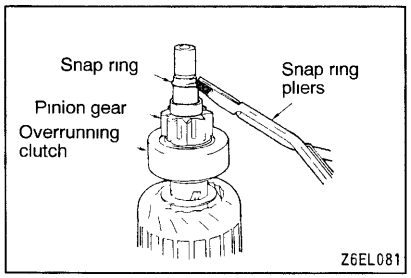
◀B▶ ARMATURE/BALL REMOVAL

Caution
When removing the armature, take care not to lose the ball (which is used as a bearing) in the armature end.



◀C▶ SNAP RING / STOP RING REMOVAL

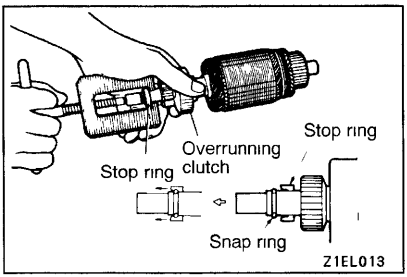
(1) Using an appropriate long socket wrench, tap the stop ring to remove it from the pinion gear side.



(2) Remove snap ring with snap ring pliers and then remove stop ring and overrunning clutch.

STARTER MOTOR PART CLEANING

1. Do not immerse parts in cleaning solvent. Immersing the yoke and field coil assembly and/or armature will damage insulation. Wipe these parts with a cloth only.
2. Do not immerse drive unit in cleaning solvent. Overrunning clutch is pre-lubricated at the factory and solvent will wash lubrication from clutch.
3. The drive unit may be cleaned with a brush moistened with cleaning solvent and wiped dry with a cloth.



REASSEMBLY SERVICE POINTS

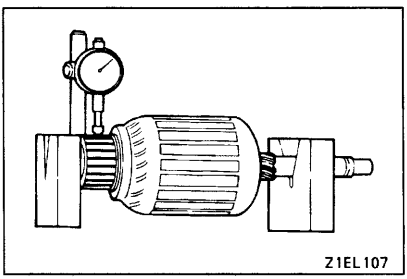
▶A◀ STOP RING/SNAP RING INSTALLATION

Uding a suitable pulling tool, pull overrunning clutch stop ring over snap ring.

INSPECTION

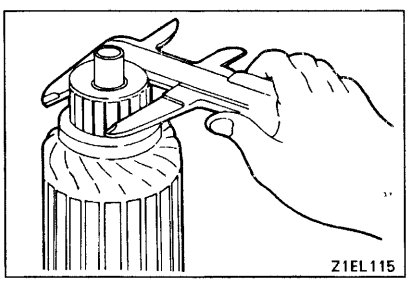
16200130279

COMMUTATOR



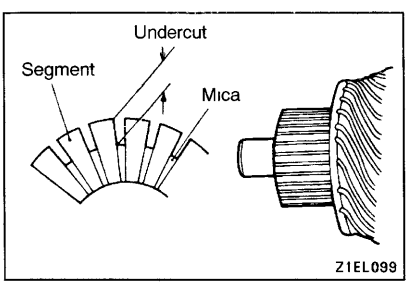
(1) Place the armature in a pair of "V" blocks and check the runout with a dial indicator.

Standard value: 0.05 mm (.002 in.)
Limit: 0.1 mm (.004 in.)



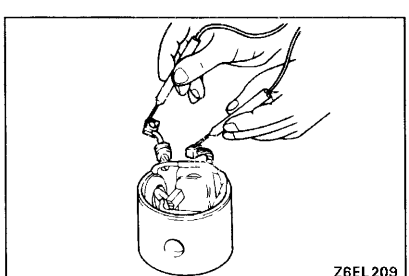
(2) Measure the commutator outer diameter.

<Direct drive type>
Standard value: 32.0 mm (1.260 in.)
Limit: 31.0 mm (1.220 in.)
<Reduction drive type>
Standard value: 29.4 mm (1.158 in.)
Limit: 28.8 mm (1.118 in.)



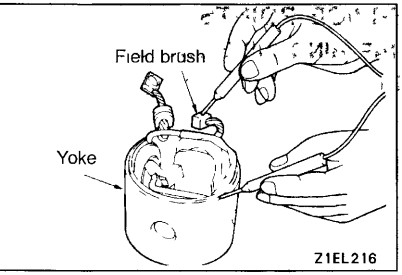
(3) Check the undercut depth between segments.

Standard value: 0.5 mm (.020 in.)



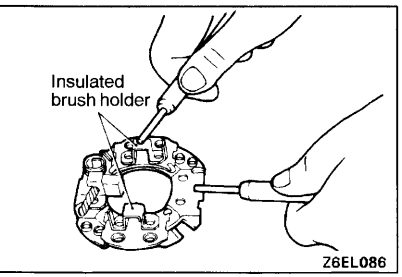
FIELD COIL OPEN-CIRCUIT TEST (Direct drive type only)

Check the continuity between field brushes. If there is continuity, the field coil is in order.



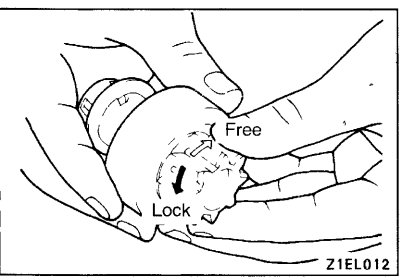
FIELD COIL GROUND TEST (Direct drive type only)

Check the continuity between field coil brush and yoke. If there is no continuity, the field coil is free from grounding.



BRUSH HOLDER CHECK

Check the continuity between brush holder plate and brush holder.
If there is no continuity, the brush holder is in order.

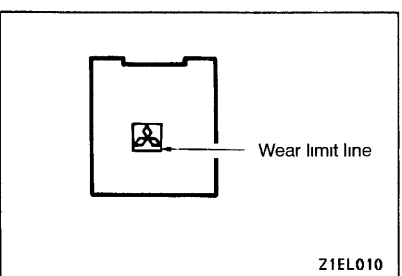


OVERRUNNING CLUTCH

1. While holding clutch housing, rotate the pinion. Drive pinion should rotate smoothly in one direction, but should not rotate in opposite direction. If clutch does not function properly, replace overrunning clutch assembly.
2. Inspect pinion for wear or burrs. If pinion is worn or burred, replace overrunning clutch assembly. If pinion is damaged, also inspect ring gear for wear or burrs.

FRONT AND REAR BRACKET BUSHING

Inspect bushing for wear or burrs. If bushing is worn or burred, replace front bracket assembly or rear bracket assembly.



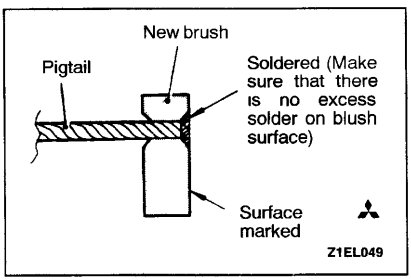
BRUSH AND SPRING REPLACEMENT

<REDUCTION DRIVE TYPE>

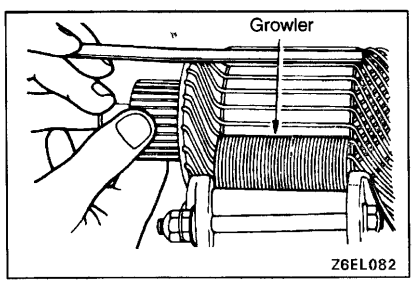
(1) Bushes that are worn beyond wear limit line, or oil-soaked, should be replaced.
(2) When replacing ground brush, side the brush from brush holder by prying retaining spring back.

<DIRECT DRIVE TYPE>

1. Brushes that are worn beyond wear limit line, or are oil-soaked, should be replaced.
2. When replacing field coil brushes, crush worn brush with pliers, taking care not to damage pigtail.



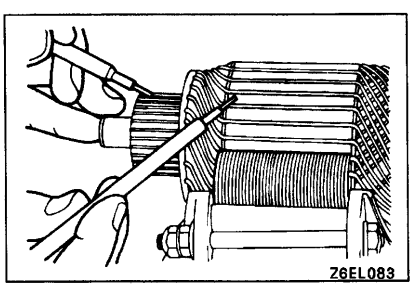
3. Sand pigtail end with sandpaper to ensure good soldering.
4. Insert pigtail into hole provided in new brush and solder it.
   Make sure that pigtail and excess solder do not come out onto brush surface.
5. When replacing ground brush, slide the brush from brush holder by prying retaining spring back.



ARMATURE TEST

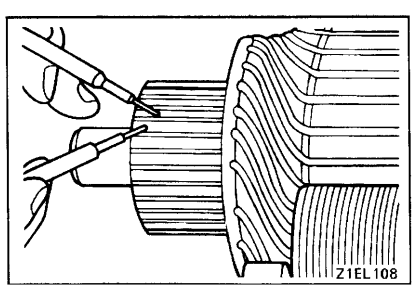
ARMATURE SHORT-CIRCUIT TEST

1. Place armature in a growler.
2. Hold a thin steel blade parallel and just above while rotating armature slowly in growler. A shorted armature will cause blade to vibrate and be attracted to the core. Replace shorted armature.



ARMATURE COIL GROUND TEST

Check the insulation between each commutator segment and armature coil core.
If there is no continuity, the insulation is in order.



ARMATURE COIL OPEN-CIRCUIT INSPECTION

Check the continuity between segments. If there is continuity, the coil is in order.

IGNITION SYSTEM

16300010378

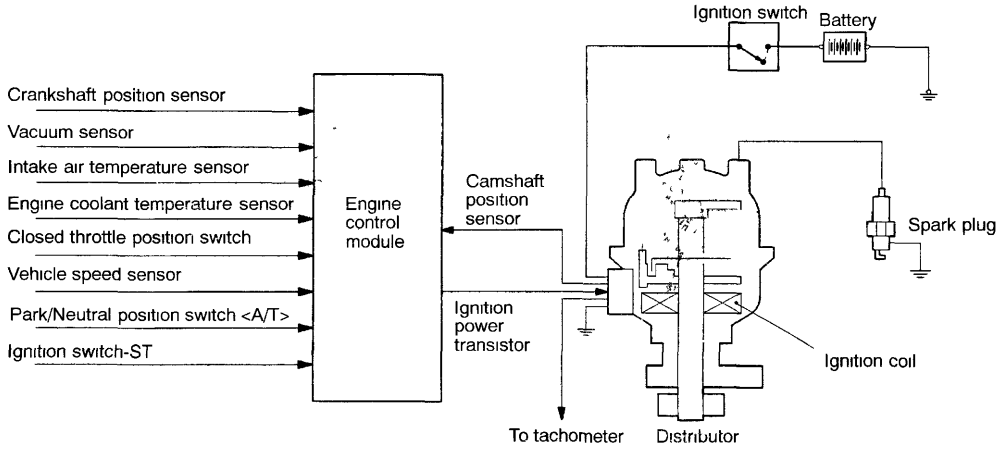
GENERAL INFORMATION

<1.5L Engine>

Interruption of the primary current flowing in the primary side of the ignition coil generates high voltage in the secondary side of the ignition coil. The high voltage thus generated is directed by the distributor to the applicable spark plug. The engine firing order is 1 - 3 - 4 - 2 cylinders.
On application of high voltage, the spark plug generates a spark to ignite the compressed air fuel mixture in the combustion chamber.
The engine control module makes and breaks the primary current of the ignition coil to regulate the ignition timing.

The engine control module detects the crankshaft position by the crankshaft position sensor installed at the front end of the crankshaft to provide ignition at the most appropriate timing for the engine operating condition.
When the engine is cold, the ignition timing is slightly advanced to provide optimum performance to the operating condition.

SYSTEM DIAGRAM

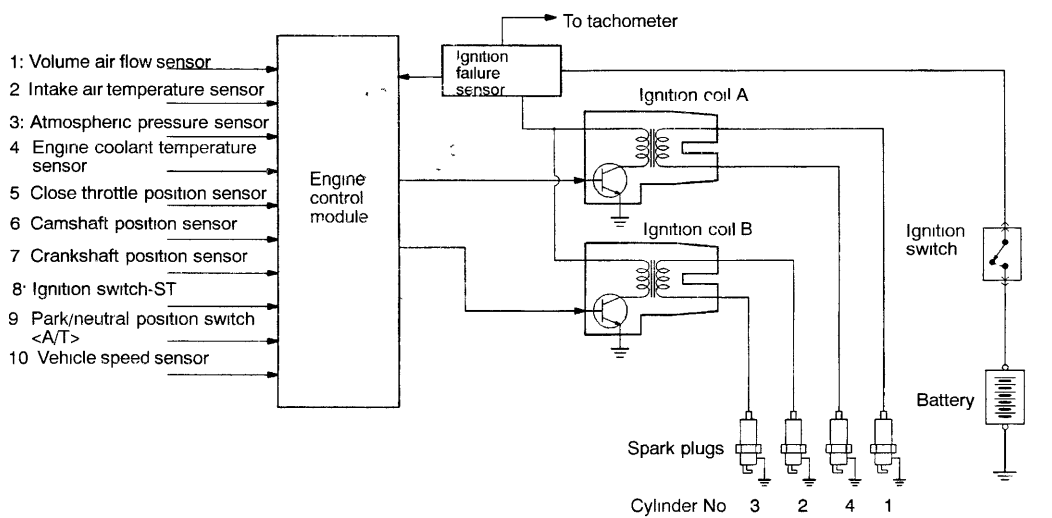


<1.8L Engine>

This system is provided with two ignition coils (A and B) with built-in ignition power transistors for the No. 1 and No. 4 cylinders, and No. 2 and No. 3 cylinders respectively.
Interruption of the primary current flowing in the primary side of ignition coil A generates a high voltage in the secondary side of ignition coil A. The high voltage thus generated is applied to the spark plugs of No. 1 and No. 4 cylinders to generate sparks. At the time that the sparks are generated at both spark plugs, if one cylinder is at the compression stroke, the other cylinder is at the exhaust stroke, so that ignition of the compressed air/fuel mixture occurs only for the cylinder which is at the compression stroke.
In the same way, when the primary current flowing in ignition coil B is interrupted, the high voltage thus generated is applied to the spark plugs of No. 2 and No. 3 cylinders.

The engine control module controls the two ignition power transistors to turn them alternately ON and OFF. This causes the primary currents in the ignition coils to be alternately interrupted and allowed to flow to fire the cylinders in the order 1 - 3 - 4 - 2.
The engine control module determines which ignition coil should be controlled by means of the signals from the camshaft position sensor which is incorporated in the camshaft and from the crankshaft position sensor which is incorporated in the crankshaft. It also detects the crankshaft position in order to provide ignition at the most appropriate timing in response to the engine operation conditions.
When the engine is cold or operated at high altitudes, the ignition timing is slightly advanced to provide optimum performance.

SYSTEM DIAGRAM



9EN0716

DISTRIBUTOR SPECIFICATIONS

Items	1.5L Engine
Type	Contact pointless with built-in ignition coil
Advance mechanism	Electronic
Firing order	1-3-4-2

IGNITION COIL SPECIFICATION

Items	1.5L Engine	1.8L Engine
Type	Molded single-coil with a built-in distributor	Molded 2-coil

SPARK PLUG SPECIFICATION

Items		1.5L Engine	1.8L Engine
Type	NGK	BPR5ES-11	BKR5E-11
	DENSO	W16EPR11	K16PR-U11
	CHAMPION	RN11YC4	RC10YC4

OPERATION

<1.5L Engine>

- Turn ignition switch to "ON" position, and battery positive voltage will be applied to primary winding of ignition coil (incovported into the distributor).
- When the crankshaft position sensor signal is input to engine control module, ON-OFF control of ignition power transistor is performed by engine control module.
- When ignition power transistor is turned on, current flows from the ignition coil (primary winding) to ground through the ignition power transistor.
- When the ignition power transistor is turned off, high voltage is generated in the primary winding of ignition coil which induces even higher voltage in the secondary winding, causing a spark at the spark plug(s).

<1.8L Engine>

- When the crankshaft position sensor signal is input into the engine control module, the engine control module turns each ignition power transistor ON-OFF, one by one.
- When the ignition power transistor A, (incorporated in the ignition coil 1) is turned from ON to OFF, the spark plugs of No.1 and No.4 cylinders spark. Turning ignition power transistor B, (incorporated in the ignition coil 2) from ON to OFF will produce sparking in spark plugs of No.2 and No.3 cylinders.
- The rest of the operation is the same as described for 1.5L engine.

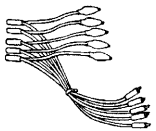
SERVICE SPECIFICATIONS

16300030329

Items			Standard value	Limit
Ignition coil	Primary coil resistance Ω	1.5L Engine	0.5 - 0.7	-
		1.8L Engine	-	-
	Secondary coil resistance kΩ	1.5L Engine	15 - 22	-
		1.8L Engine	14 - 21	-
Ignition failure sensor resistance Ω		1.8L Engine	0.1 or less	-
Spark plug gap mm (in.)			1.0 - 1.1 (.039 - .043)	-
Spark plug cable resistance kΩ			-	max. 22

SPECIAL TOOLS

16300060144

Tool	Tool number and name	Supersession	Application
	MB991348 Test harness set	Tool not available	Inspection of ignition primary voltage (connection of ignition coil connector)

TROUBLESHOOTING

16300070062

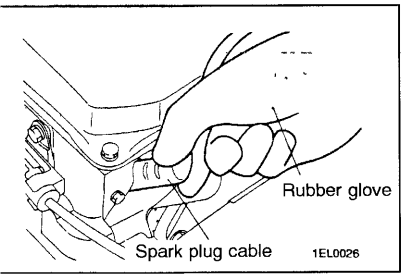
TROUBLESHOOTING HINTS

1. Engine cranks, but does not start.
   (1) Spark is insufficient or does not occur at all (on spark plug).
   - Check ignition coil.
   - Check distributor. <1.5L Engine>
   - Check crankshaft position sensor. <1.8L Engine>
   - Check spark plugs.
   - Check spark plug cable.

   (2) Spark is good.
   - Check ignition timing.

2. Engine idles roughly or stalls.
   - Check spark plugs.
   - Check ignition timing.
   - Check ignition coil.
   - Check spark plug cable.

3. Poor acceleration
   - Check ignition timing.
   - Check spark plug cable.
   - Check ignition coil.



ON-VEHICLE SERVICE

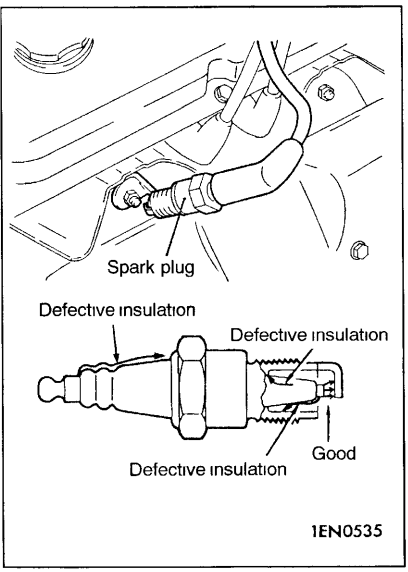
16300090099

SPARK PLUG CABLE TEST <1.5L Engine>

1. Disconnect, one at a time, each of the spark plug cables while the engine is idling to check whether the engine's running performance changes or not.

   Caution
   Wear rubber gloves and rubber-soled shoes while working on the ignition system.

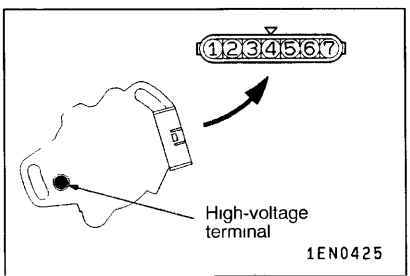
2. If the engine performance does not change, check the resistance of the spark plug cable, and check the spark plug itself.



SPARK PLUG TEST <1.5L Engine>

16300150193

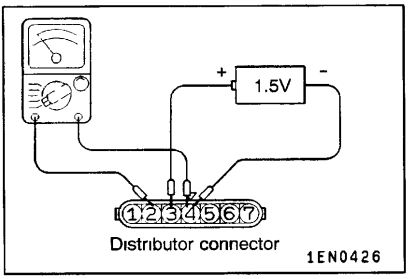
1. Remove the spark plug from the engine and connect it to the spark plug cable boot.
2. Ground the spark plug outer electrode (body), and crank the engine. Check for spark across the electrodes.
3. Remove the spark plug from the boot and visually inspect it for cracks in its insulation.
4. Replace the spark plug if it has a weak spark and/or detective insulation.



IGNITION COIL CHECK <1.5L Engine>

16300120217

1. Measurement of the primary coil resistance
   Measure the resistance between connector terminal 1 and 2 of the distributor.
   Standard value: 0.5 - 0.7 Ω
2. Measurement of secondary coil resistance
   Measure the resistance between the high-voltage terminal and connector terminal 1.
   Standard value: 15 - 22 kΩ



IGNITION POWER TRANSISTOR CONTINUITY CHECK <1.5L Engine>

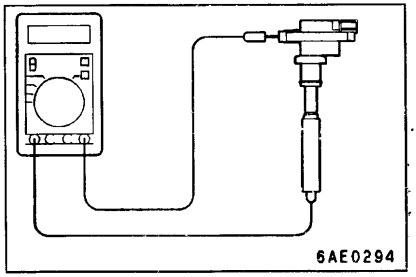
16300130142

NOTE
1. An analog-type ohmmeter should be used.
2. Connect the negative (-) probe of the ohmmeter to terminal 2.

Caution
This test must be performed quickly (in less than 10 seconds) to prevent coil from burning and ignition power transistor from breaking.

Voltage: 1.5V	Terminal No		
	2	3	4
When current is flowing	○	⊕ ○	⊖
When current is not flowing			

Replace the ignition power transistor if there is a malfunction.



IGNITION COIL (WITH BUILT-IN IGNITION POWER TRANSISTOR) CHECK <1.8L Engine>

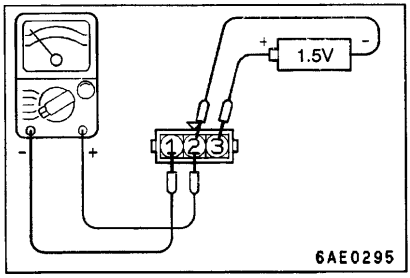
16300120392

Check by the following procedure, and replace if there is a malfunction.

SECONDARY COIL RESISTANCE CHECK

Measure the resistance between the high-voltage terminals of the ignition coil.

Standard value: 14 - 21 kΩ

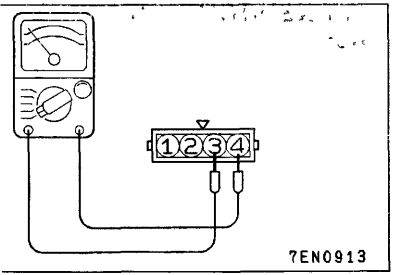


PRIMARY COIL AND IGNITION POWER TRANSISTOR CONTINUITY CHECK

NOTE
1. An analog-type ohmmeter should be used.
2. Connect the negative (-) probe of the ohmmeter to terminal 1.

Caution
This test must be performed quickly (in less than 10 seconds) to prevent coil from burning and ignition power transistor from breaking.

Voltage: 1.5V	Terminal No.		
	1	2	3
When current is flowing	○	⊖ ○	⊕
When current is not flowing			

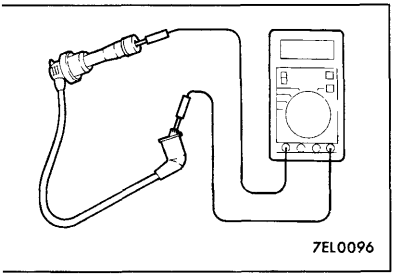


IGNITION FAILURE SENSOR CHECK <1.8L Engine>

16300300031

NOTE
An analog-type ohmmeter should be used.
Check that the resistance between terminals 3 and 4 is at the standard value.

Standard value: 0.1 Ω or less



SPARK PLUG CABLE RESISTANCE CHECK

16300140077

Measure the resistance of the all spark plug leads.
(1) Check cap and coating for cracks.
(2) Measure resistance.

Limit: max. 22 kΩ

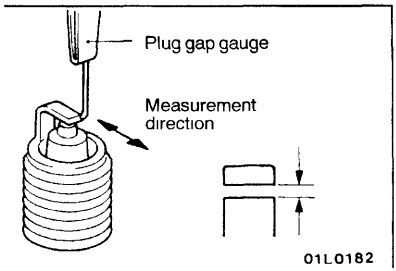
SPARK PLUG CHECK AND CLEANING

16300150209

1. Remove the spark plug cables.

   Caution
   When pulling the spark plug cable boot from the plug, always hold the boot, not the cable.

2. Remove the spark plugs.
3. Check for a burned-out electrode or damaged insulator. Check for even burning.
4. Remove carbon deposits with wire brush or plug cleaner. Remove sand from plug screw with compressed air.



5. Use a gap gauge to check the plug gap.

   Standard value: 1.0 - 1.1 mm (.039 - .043 in.)

   If the plug gap is not within the standard value range, adjust by bending the ground electrode.
6. Clean the engine plug holes.

   Caution
   Do not allow foreign matter to enter the cylinders.

7. Install the spark plugs.

CAMSHAFT POSITION SENSOR AND CRANKSHAFT POSITION SENSOR CHECK

16300260667

<4G15 Engine>

Refer to GROUP 13A - Troubleshooting.

<4G93 Engine>

Refer to GROUP 13B - Troubleshooting.

IGNITION SECONDARY VOLTAGE WAVEFROM CHECK

16300170250

<1.5L Engine>

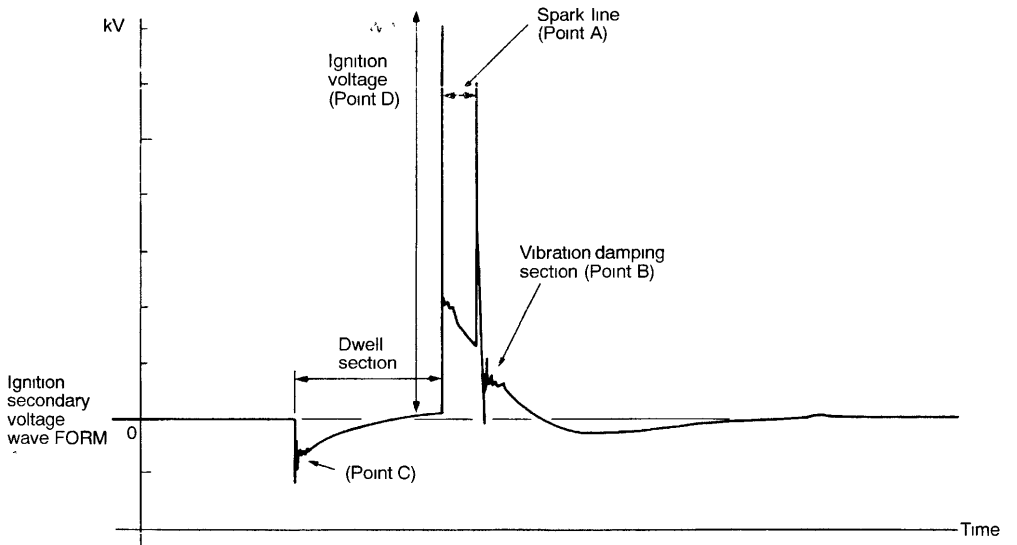
MEASUREMENT METHOD

1. Clamp the spark plug cable of the No.1 cylinder with the secondary pickup and check the waveforms for each cylinder.
2. Connect the secondary pickup to the other cylinder in turn and check the waveforms for each cylinder.

STANDARD WAVEFROM

Observation conditions

FUNCTION	SECONDARY
PATTERN HEIGHT	HIGH (or LOW)
PATTERN SELECTOR	RASTER
Engine Speed	Curb idle speed



WAVEFORM OBSERVATION POINTS

Point A: The height, length and slope of the spark line (refer to Abnormal Waveform Examples 1, 2, 3 and 4) show the following trends.

Spark line		Plug gap	Condition of electrode	Compression force	Concentration of air mixture	Ignition timing	Spark plug cable
Length	Long	Small	Normal	Low	Rich	Advanced	Leak
Length	Short	Large	Large wear	High	Lean	Retarded	High resistance
Height	High	Large	Large wear	High	Lean	Retarded	High Resistance
Height	Low	Small	Normal	Low	Rich	Advanced	Leak
Slope		Large	Plug is fouled	-	-	-	-

Point B: Number of vibration in reduction vibration section (Refer to Abnormal Waveform Example 5)

Number of vibrations	Coil and condenser
Three or more	Normal
Except above	Abnormal

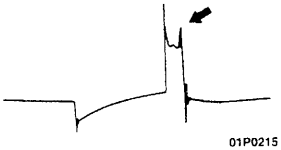
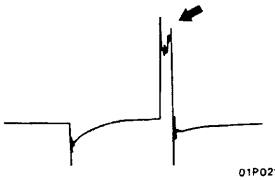
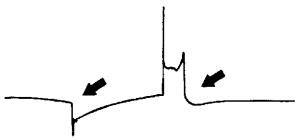
Point C: Number of vibrations at beginning of dwell section (Refer to Abnormal Waveform Example 5)

Number of vibrations	Coil
5-6 or higher	Normal
Except above	Abnormal

Point D: Ignition voltage height (distribution per each cylinder) shows the following trends.

Ignition voltage	Plug gap	Condition of electrode	Compression force	Concentration of air mixture	Ignition timing	Spark plug cable
High	Large	Large wear	High	Lean	Retarded	High resistance
Low	Small	Normal	Low	Rich	Advanced	Leak

ABNORMAL WAVEFORMS EXAMPLES

Abnormal waveform	Wave characteristics	Cause of problem
Example 1  01P0215	Spark line is high and short.	Spark plug gap is too large
Example 2  01P0216	Spark line is low and long, and is sloping. Also, the second half of the spark line is distorted. This could be a result of misfiring.	Spark plug gap is too small
Example 3  01P0217	Spark line is low and long, and is sloping. However, there is almost no spark line distortion.	Spark plug gap is fouled.
Example 4  01P0218	Spark line is high and short. Difficult to distinguish between this and abnormal wave pattern example 1.	Spark plug cable is nearly falling off. (Causing a dual ignition)
Example 5  01P0219	No waves in wave damping section	Layer short in ignition coil

<1.8L Engine>

MEASUREMENT METHOD

1. Clamp the SECONDARY PICKUP around the spark plug cable.

   NOTE
   1. The peak ignition voltage will be reversed when the spark cables No.2 and No.4, or No.1 and No.3 cylinders are clamped.
   2. Because of the two-cylinder simultaneous ignition system, the waveforms for two cylinders in each group appear during wave form observation (No.1 cylinder - No.4 cylinder, No.2 cylinder - No.3 cylinder). However, wave form observation is only applicable for the cylinder with the spark plug cable clamped by the secondary pickup.
   3. Identifying which cylinder waveform pattern is displayed can be difficult. For reference, remember that the wave form pattern of the cylinder attached to the secondary pickup will be displayed as stable.

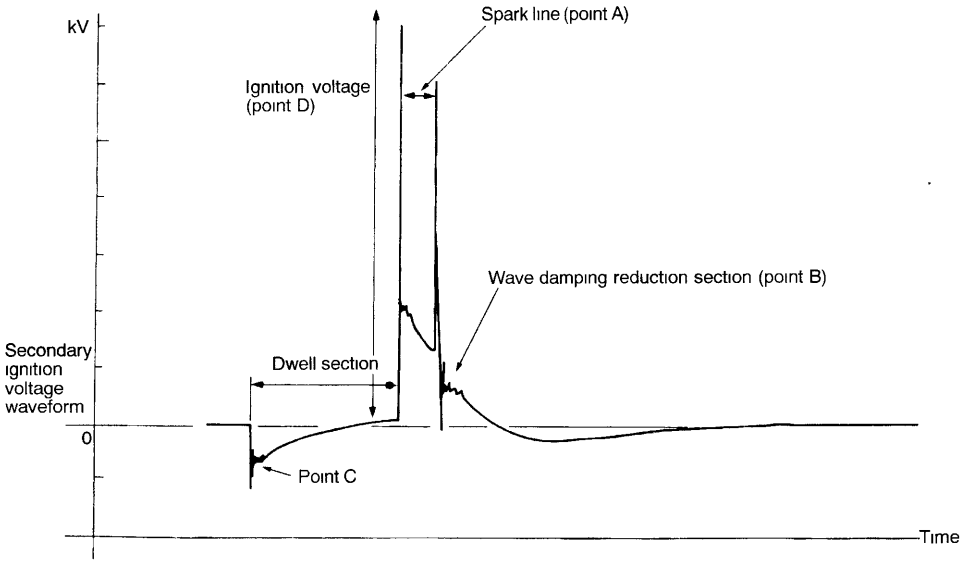
2. Clamp the spark plug cable with the Trigger pickup.

   NOTE
   Clamp the trigger pickup to the same spark plug cable clamped by the secondary pickup.

STANDARD WAVEFORM

Observation Conditions

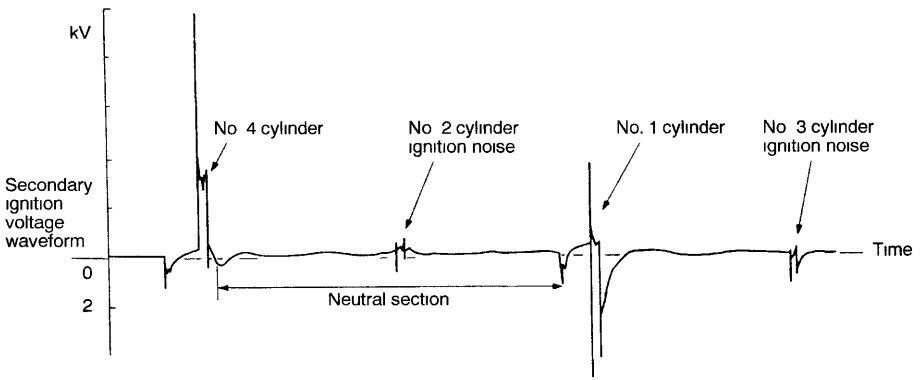
FUNCTION	SECONDARY
PATTERN HEIGHT	HIGH (or LOW)
PATTERN SELECTOR	RASTER
Engine revolutions	Curb idle speed



7EL0147

Observation Condition (The only change from above condition is the pattern selector.)

PATTERN SELECTOR	DISPLAY



6EL0183

WAVEFORM OBSERVATION POINTS

For waveform observation points, refer to P.16-39.

ABNORMAL WAVEFORMS EXAMPLES

For examples of abnormal waveforms, refer to P.16-40.

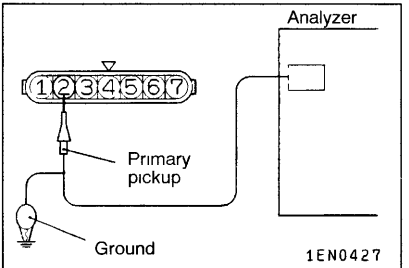
IGNITION PRIMARY VOLTAGE WAVEFROM CHECK

16300170267

<1.5L Engine>

MEASUREMENT METHOD

1. Disconnect the distributor connector and connect the special tool (test harness: MB991348) in between. (All of the terminals should be connected.)



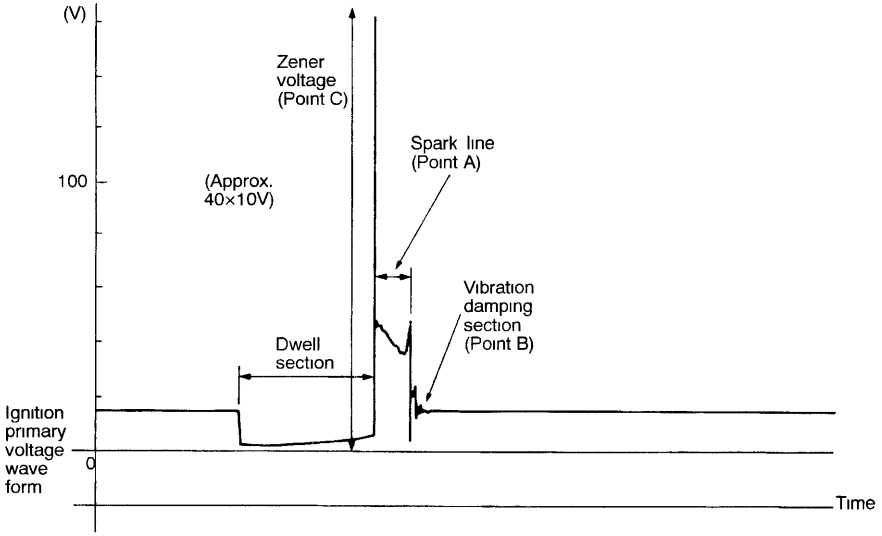
2. Connect the analyzer primary pickup to the distributor connector terminal 2.
3. Connect the primary pickup ground terminal.
4. Clamp the spark plug cable with the trigger pickup.

NOTE
The waveform of the cylinder clamped to the trigger pickup will appear at the left edge of the screen.

STANDARD WAVEFROM

Observation conditions

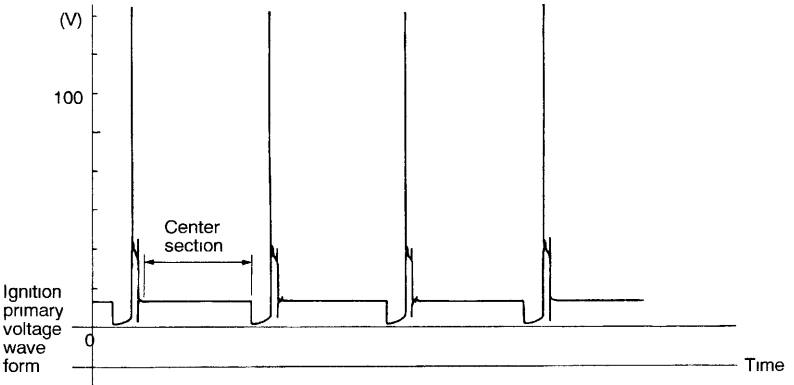
FUNCTION	PRIMARY
PATTERN HEIGHT	HIGH (or LOW)
PATTERN SELECTOR	RASTER
Engine Speed	Curb idle speed



Observation conditions

(Only the pattern selector shown below changes from the previous conditions)

PATTERN SELECTOR	DISPLAY



WAVEFORM OBSERVATION POINTS

Point A:

The height, length and slope of the spark line (refer to Abnormal Waveform Examples 1, 2, 3 and 4) show the following trends.

Spark line		Plug gap	Condition of electrode	Compression force	Concentration of air mixture	Ignition timing	Spark plug cable
Length	Long	Small	Normal	Low	Rich	Advanced	Leak
Length	Short	Large	Large wear	High	Lean	Retarded	High resistance
Height	High	Large	Large wear	High	Lean	Retarded	High Resistance
Height	Low	Small	Normal	Low	Rich	Advanced	Leak
Slope		Large	Plug is fouled	-	-	-	-

Point B:

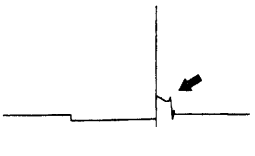
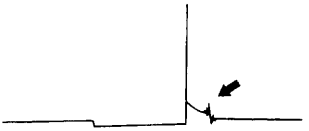
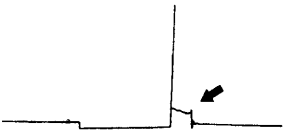
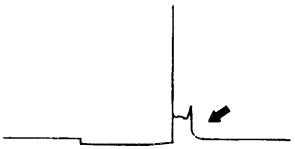
Number of vibration in reduction vibration section (Refer to Abnormal Waveform Example 5)

Number of vibrations	Coil, condenser
3 or higher	Except above
Normal	Abnormal

Point C: Height of Zener voltage

Height of Zener voltage	Probable cause
High	Problem in Zener diode
Low	Abnormal resistance in primary coil circuit

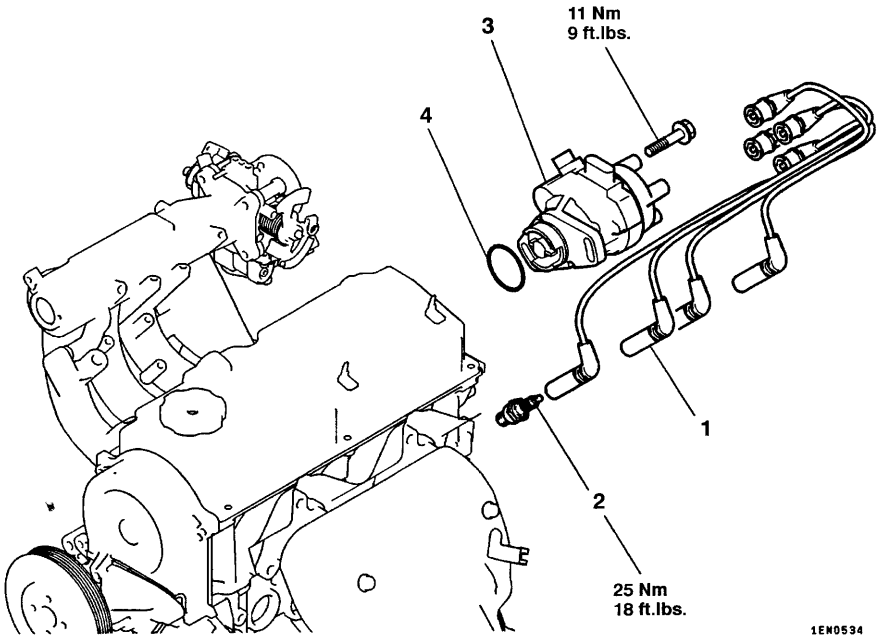
ABNORMAL WAVEFORM EXAMPLES

Abnormal waveform	Wave characteristics	Cause of problem
Example 1  01P0210	Spark line is high and short.	Spark plug gap is too large.
Example 2  01P0211	Spark line is low and long, and is sloping. Also, the second half of the spark line is distorted. This could be a result of misfiring	Spark plug gap is too small
Example 3  01P0212	Spark line is low and long, and is sloping. However, there is almost no spark line distortion.	Spark plug gap is fouled.
Example 4  01P0213	Spark line is high and short.	Spark plug cable is nearly falling off. (Causing a dual ignition)
Example 5  01P0214	No waves in wave damping section	Layer short in ignition coil

IGNITION SYSTEM <1.5L Engine>

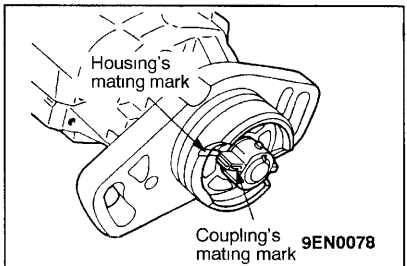
16300200126

REMOVAL AND INSTALLATION



Removal steps

1. Spark plug cable
2. Spark plug
▶A◀ 3. Distributor
4. O-ring



INSTALLATION SERVICE POINT

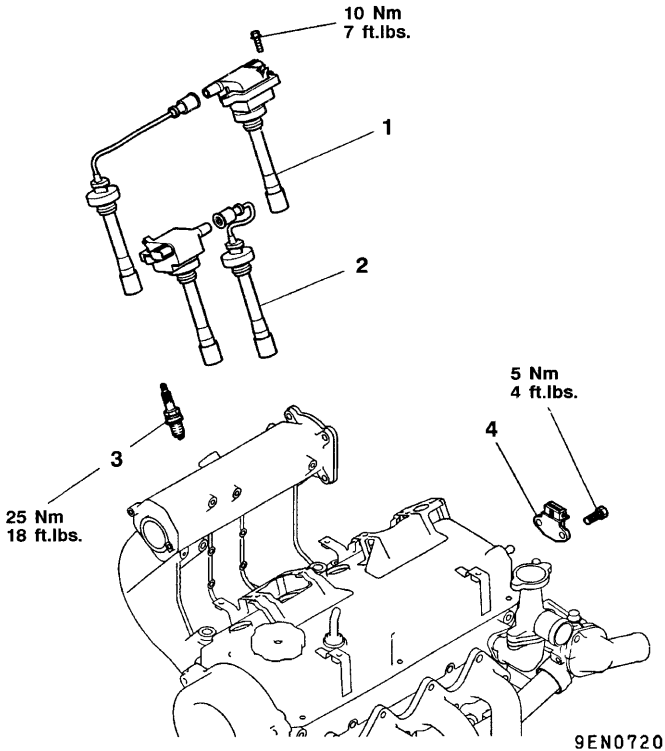
▶A◀ DISTRIBUTOR INSTALLATION

(1) Turn the crankshaft so that the No. 1 cylinder is at top dead center.
(2) Installation the distributor to the engine while aligning the distributor housing and coupling mating marks.

IGNITION SYSTEM <1.8L Engine>

6300200133

REMOVAL AND INSTALLATION



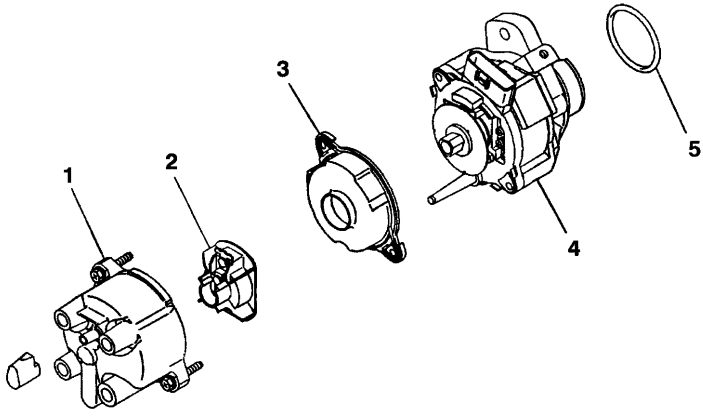
Removal steps

1. Ignition coil
2. Spark plug cable
3. Spark plug
4. Ignition failure sensor

DISTRIBUTOR <1.5L Engine>

16300220139

DISASSEMBLY AND REASSEMBLY



1EN0536

Disassembly steps

1. Distributor cap
2. Rotor
3. Cover
4. O-ring
5. Distributor housing

INSPECTION

16300230088

Check the following points; repair or replace if a problem is found.

CAP ROTOR

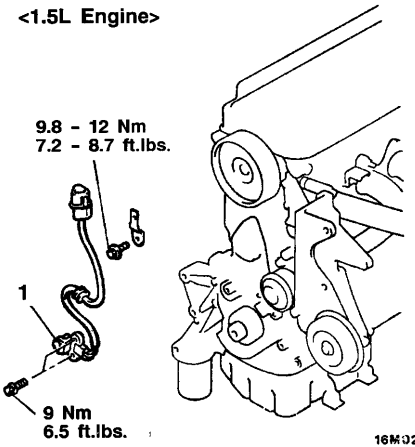
(1) There must be no cracking in the cap.
(2) There must be no damage to the cap's electrode or the rotor's electrode.
(3) Clean away any dirt from the cap and rotor.

CAMSHAFT POSITION SENSOR AND CRANKSHAFT POSITION SENSOR

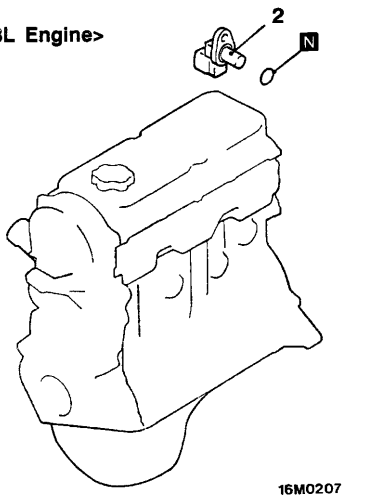
16300250138

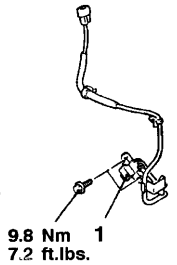
REMOVAL AND INSTALLATION

<1.5L Engine>



<1.8L Engine>





00004735

1. Crankshaft position sensor
2. Camshaft position sensor

INSPECTION

16300260681

CAMSHAFT POSITION SENSOR, CRANKSHAFT POSITION SENSOR CHECK

Refer to GROUP 13A - Troubleshooting <1.5L Engine>, GROUP 13B - Troubleshooting <1.8L Engine - Crankshaft position sensor>, or GROUP 13B - Troubleshooting <1.8L Engine - Camshaft position sensor>.

ENGINE AND EMISSION CONTROL

CONTENTS

17109000247

AUTO-CRUISE CONTROL SYSTEM 6

AUTO-CRUISE CONTROL* 27

GENERAL INFORMATION 6

ON-VEHICLE SERVICE 23

Auto-cruise Control Component Check 25

Auto-cruise Control System Operation Check 23

SERVICE SPECIFICATIONS 6

SPECIAL TOOLS 6

TROUBLESHOOTING 7

EMISSION CONTROL SYSTEM 29

CATALYTIC CONVERTER 46

General Information 46

EVAPORATIVE EMISSION CANISTER/AIR FILTER/EVAPORATIVE VENTILATION SOLENOID 48

EVAPORATIVE EMISSION CONTROL SYSTEM 37

Air Conditioning Switch Check 40

Component Location 37

Engine Coolant Temperature Sensor and Intake Air Temperature Sensor Check 40

Evaporative Emission Purge Solenoid Check 39

CONTINUED ON NEXT PAGE

WARNINGS REGARDING SERVICING OF SUPPLEMENTAL RESTRAINT SYSTEM (SRS) EQUIPPED VEHICLES

WARNING!

(1) Improper service or maintenance of any component of the SRS, or any SRS-related component, can lead to personal injury or death to service personnel (from inadvertent firing of the air bag) or to the driver and passenger (from rendering the SRS inoperative).

(2) Service or maintenance of any SRS component or SRS-related component must be performed only at an authorized MITSUBISHI dealer.

(3) MITSUBISHI dealer personnel must thoroughly review this manual, and especially its GROUP 52B - Supplemental Restraint System (SRS) and GROUP 00 - Maintenance Service, before beginning any service or maintenance of any component of the SRS or any SRS-related component.

NOTE

The SRS includes the following components: SRS-ECU, SRS warning light, air bag module, clock spring, and interconnecting wiring. Other SRS-related components (that may have to be removed/installed in connection with SRS service or maintenance) are indicated in the table of contents by an asterisk (*).

General Information 37
Purge Control System Check 38
Purge Port Vacuum Check 39
Volume Air Flow Sensor, Engine Coolant Temperature Sensor and Intake Air Temperature Sensor Check 40

EXHAUST GAS RECIRCULATION (EGR) SYSTEM 41
Component Location 42
EGR Port Vacuum Check 44
EGR Solenoid Check 44
EGR System Check 42
EGR Valve Check 43
General Information 41
Vacuum Control Valve Check 43

GENERAL INFORMATION 29

POSITIVE CRANKCASE VENTILATION SYSTEM 35
Component Location 36
Crankcase Ventilation System Check 36
General Information 35
Positive Crankcase Ventilation (PCV) Valve Check 36

SERVICE SPECIFICATIONS 29

SPECIAL TOOLS 29

TROUBLESHOOTING 30

VACUUM HOSES 31
Vacuum Circuit Diagram 33
Vacuum Hose Check 35
Vacuum Hose Installation 35
Vacuum Hose Routing 31

ENGINE CONTROL SYSTEM 3

ACCELERATOR CABLE AND PEDAL 5

GENERAL INFORMATION 3

ON-VEHICLE SERVICE 4
Accelerator Cable Check and Adjustment .. 4

SERVICE SPECIFICATIONS 3

TROUBLESHOOTING 3

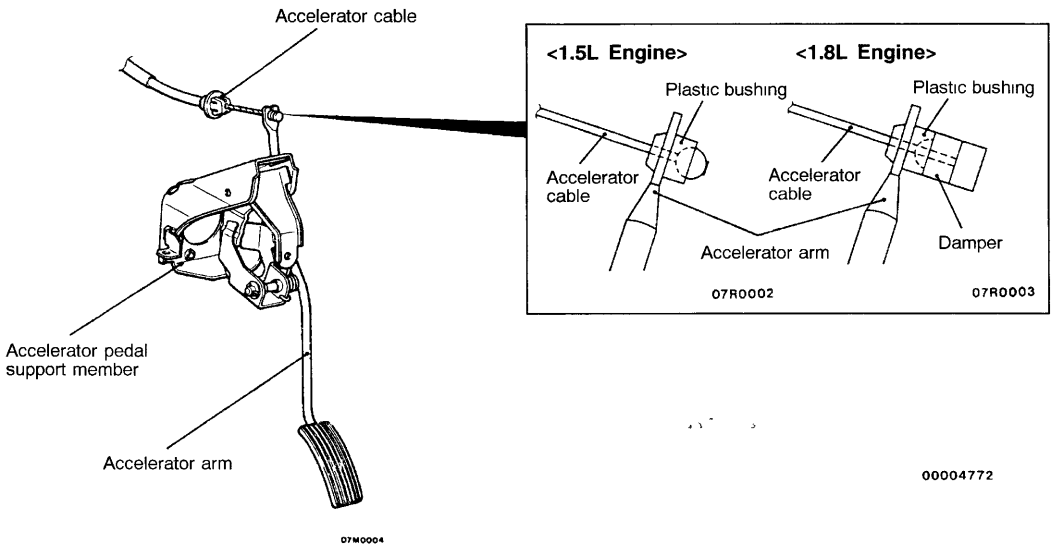
ENGINE CONTROL SYSTEM

17100010065

GENERAL INFORMATION

The accelerator system consists of a cable and pedal. The accelerator pedal side end of the cable has a plastic bushing and damper <1.8L Engine>. They effectively suppress the noise that would result from direct contact of the cable and the accelerator arm.

CONSTRUCTION DIAGRAM



SERVICE SPECIFICATIONS

17100030092

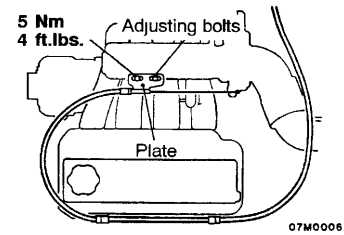
Items		Standard value
Accelerator cable play mm (in)		1-2 (04 - 08)
Engine idle speed r/min	1.5L Engine	750 ± 100
	1.8L Engine	800 ± 100

TROUBLESHOOTING

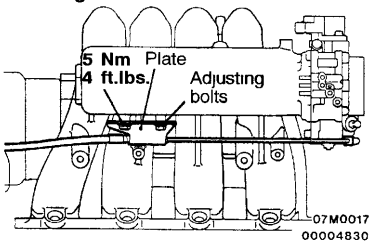
17100070018

Symptom	Probable cause	Remedy
Throttle valve will not fully open or close	Misadjusted accelerator cable	Adjust
	Misadjusted auto-cruise control cable	Adjust
	Broken return spring	Replace
	Throttle lever malfunction	Replace
Accelerator pedal operation not smooth (over acceleration)	Accelerator pedal wrongly tightened	Repair
	Misinstalled accelerator cable	Repair
	Accelerator cable requires lubrication	Lubricate or replace

<1.5L Engine>



<1.8L Engine>



ON-VEHICLE SERVICE

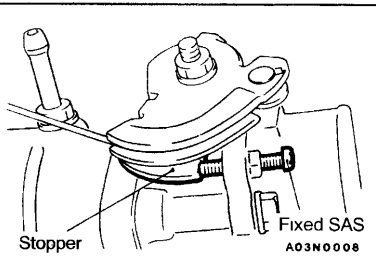
17100090151

ACCELERATOR CABLE CHECK AND ADJUSTMENT

1. Turn off the air conditioning and all lights. Inspect and adjust at no load.
2. Start the engine and allow to idle until it reaches normal operating temperature.
3. Confirm idle speed is at standard value.

   Standard value:
   <1.5L Engine> 750 ± 100 r/min
   <1.8L Engine> 800 ± 100 r/min
4. Stop engine (ignition switch OFF).
5. Confirm there are no sharp bends in accelerator cable.
6. Check inner cable for correct slack.

   Standard value: 1 - 2 mm (.04 - .08 in.)
7. If there is too much slack or no slack, adjust the calble as follows:
   (1) Loosen the adjusting bolt to release the cable.
   (2) Move the plate until the inner cable play is at the standard value, and then tighten the adjusting bolt to the specified torque.



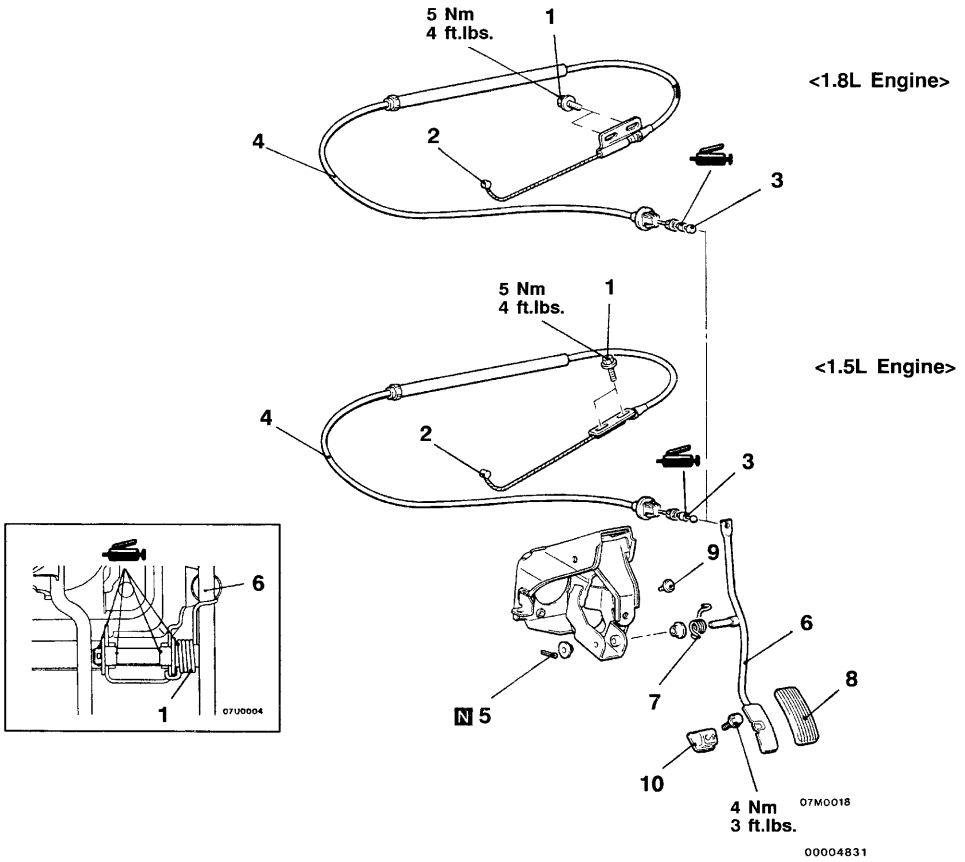
8. Adjust accelerator cable play and confirm throttle lever stopper touches the fixed SAS.

ACCELERATOR CABLE AND PEDAL

17100120157

REMOVAL AND INSTALLATION

Post-installation Operation
- Adjusting the Accelerator Cable (Refer to P17-4)



Removal steps

1 Adjusting bolts
2 Inner cable connection (Throttle body side)
3 Inner cable connection (Accelerator pedal side)
4. Accelerator cable
5. Cotter pin
6. Accelerator pedal
7. Spring
8. Pedal pad
9 Stopper
10. Accelerator pedal stopper

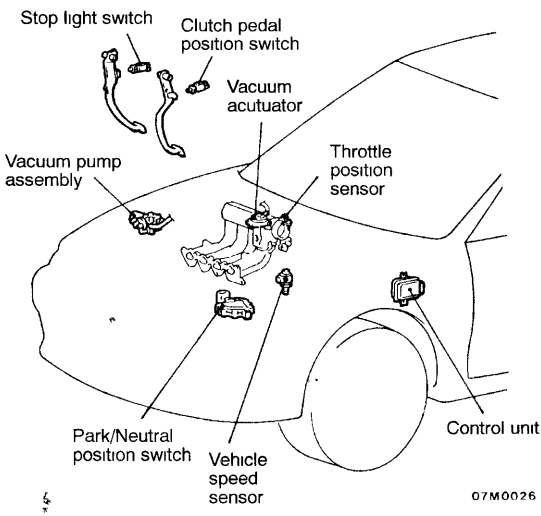
AUTO-CRUISE CONTROL SYSTEM

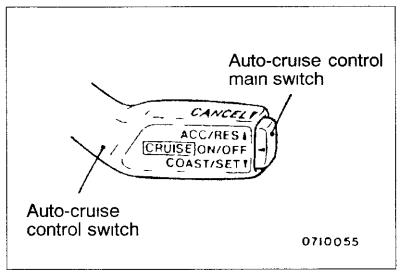
17200010204

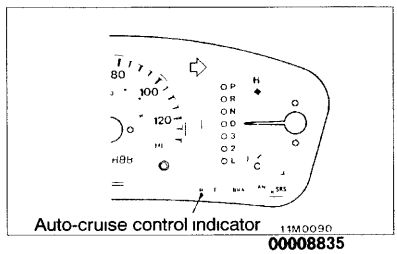
GENERAL INFORMATION

By using the auto-cruise control, the driver can select and maintain a desired cruising speed [approximately 40 km/h (25 mph) or more] without depressing the accelerator pedal.

CONSTRUCTION DIAGRAM







00008835

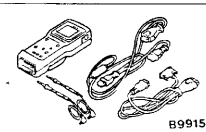
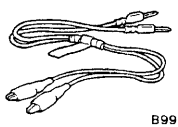
SERVICE SPECIFICATIONS

17200030101

Items	Standard value
Accelerator cable play mm (in.)	1 - 2 (.04 - .08)

SPECIAL TOOLS

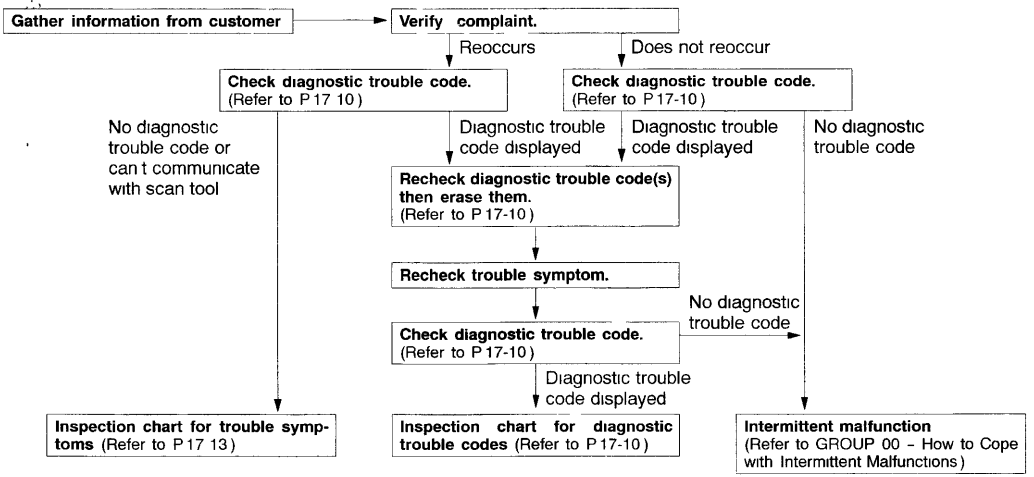
17200060117

Tool	Tool number and name	Supersession	Application
 B991502	MB991502 Scan tool (MUT-II)	MB991496-OD	Diagnostic trouble code check.
 B991529	MB991529 Diagnostic trouble code check harness	Tool not necessary if scan tool <MUT-II> is available	

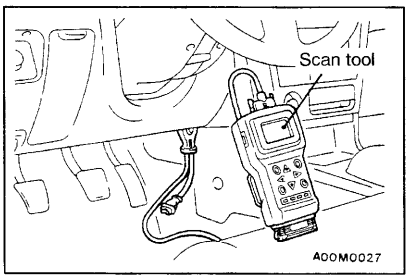
TROUBLESHOOTING

17200200250

DIAGNOSTIC TROUBLESHOOTING FLOW



NOTE
Before carrying out trouble diagnosis, check to be sure that all of the following items are normal.
1. Is the vacuum hose installed correctly, and is the hose not damaged?
2. Is the accelerator cable play at the standard value?



DIAGNOSTIC FUNCTION

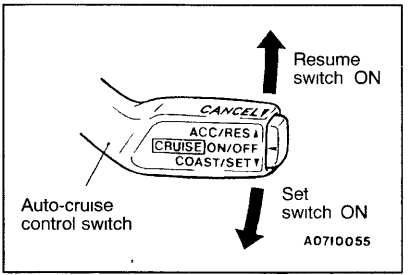
17200210260

METHOD OF READING THE DIAGNOSTIC TROUBLE CODES

Using the scan tool

Caution
To prevent damaged to the scan tool, make sure the ignition switch is "OFF" before connecting or disconnecting the scan tool.

1. Turn the ignition switch "OFF."
2. Connect the scan tool to the data link connector.
3. Use the scan tool to check for auto-cruise control system diagnostic trouble codes.
4. Turn the ignition switch "OFF."
5. Disconnect the scan tool.

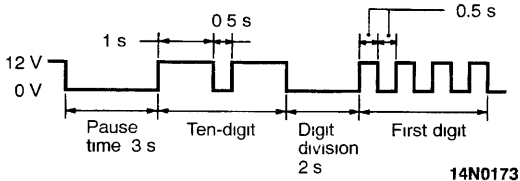


Using a auto-cruise control indicator light

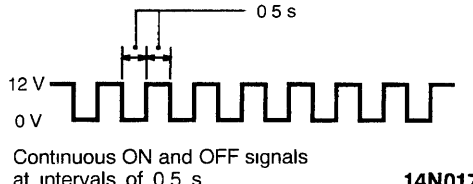
1. Push the main switch to "ON."
2. With the "SET" switch at the "ON position, turn the ignition switch "ON," and within one second after this, turn the "RESUME" switch to "ON."
3. Take a reading of a diagnostic trouble code based on the flashing of the auto-cruise control indicator light in the combination meter.

DIAGNOSTIC RESULT DISPLAY METHOD WHEN USING THE AUTO-CRUISE CONTROL INDICATOR LIGHT

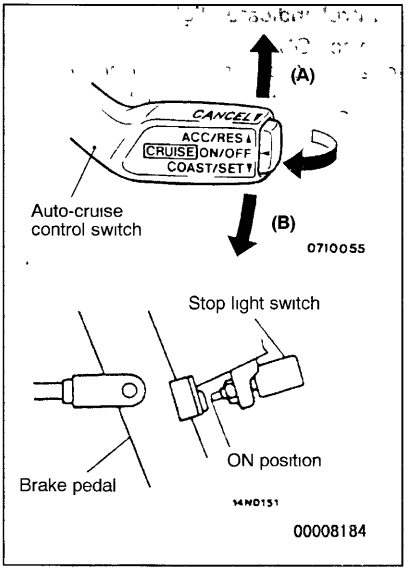
When the diagnostic trouble code No.24 is output



When no diagnostic trouble code is output



NOTE
Other diagnosis items are also output as voltage waveforms corresponding to diagnosis code numbers.



METHOD OF ERASING DIAGNOSTIC TROUBLE CODES

Erase the diagnostic trouble codes with the following procedure.

NOTE
The diagnostic trouble codes will not be erased even if the battery (-) terminal is disconnected.

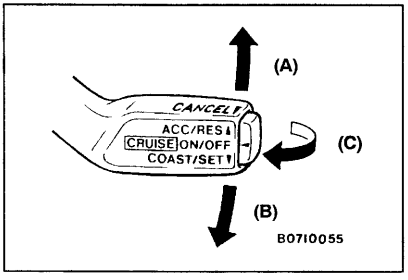
Using the scan tool

Caution
To prevent damage to the scan tool, make sure the ignition switch is "OFF" before connecting or disconnecting the scan tool.

1. Turn the ignition switch "OFF."
2. Connect scan tool to the data link connector.
3. Use scan tool to check for auto-cruise control system diagnostic trouble codes.
4. Turn the ignition switch "OFF."
5. Disconnect the scan tool.

Without using the scan tool

1. Turn the ignition switch "ON."
2. Push the auto-cruise control switch in the direction of arrow (B) in the illustration, and within one second after doing this, push the auto-cruise control switch back in the direction of arrow (A).
3. Push the auto-cruise control switch again in the direction of arrow (B) in the illustration. While holding the switch in this position, press the stop light switch to the "ON" position, for five seconds or more.



INPUT SWITCH CODE CHECK METHOD

1. Connect the scan tool to the data link connector (16-pin) under the instrument panel under cover.
2. Turn the ignition switch to ON.
3. After pushing the auto-cruise control switch in the direction of arrow (B) in the illustration, press the cruise control main switch to the ON position, and within 1 second after doing this, push the cruise control switch back in the direction of arrow (A).
4. Operate each switch listed in the input check table and take a reading of the input switch codes with the scan tool.

Input Inspection Table

Code No	Input operation	Operation judgement
21	SET switch ON	Auto-cruise control-ECU judges that SET switch is ON
22	RESUME switch ON	Auto-cruise control-ECU judges that RESUME switch is ON
23	Stop light switch (ON when brake pedal depressed)	Auto-cruise control-ECU judges that stop light switch is ON
24	Vehicle speed signal	Auto-cruise control-ECU judges that vehicle speed is 40 km/h (25 mph) or higher
25		Auto-cruise control-ECU judges that vehicle speed is lower than 40 km/h (25 mph)
26	• Clutch pedal position switch <M/T> (ON when clutch pedal depressed) • Park/neutral position switch <A/T> (ON when select lever in N range)	Auto-cruise control-ECU judges that clutch pedal position switch <M/T> or park/neutral position switch <A/T> is ON
27	CANCEL switch ON	Auto-cruise control-ECU judges that CANCEL switch is ON
28	Throttle position sensor signal	Auto-cruise control-ECU judges that throttle position sensor voltage is 1.5 V or more
29	Closed throttle position switch	Auto-cruise control-ECU judges that closed throttle position switch is OFF

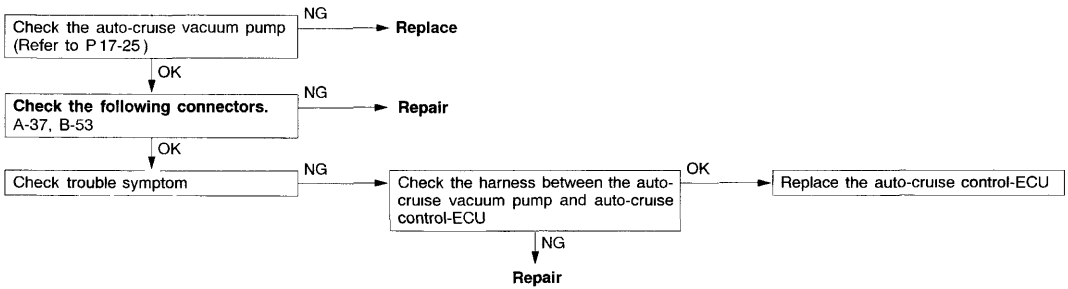
INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES

17200220300

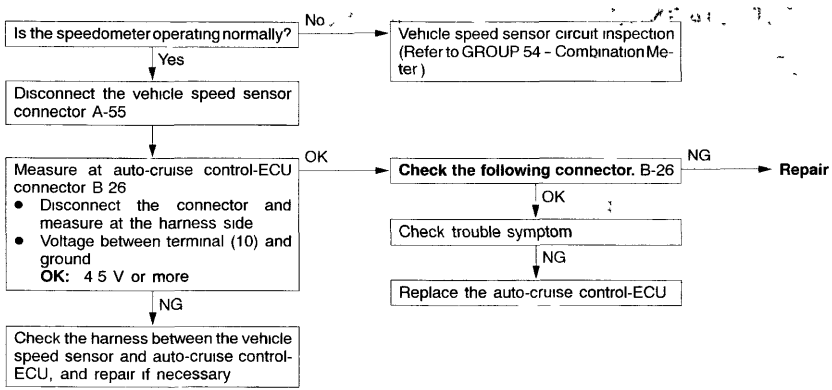
Code No	On-board diagnostic items	Reference page
11	Auto-cruise vacuum pump drive system	17-11
12	Vehicle speed sensor system	17-11
14	Auto-cruise vacuum pump power supply system	17-12
15	Auto-cruise control switch	17-12
16	Auto-cruise control-ECU	17-12
17	Throttle position sensor system	17-13

INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES

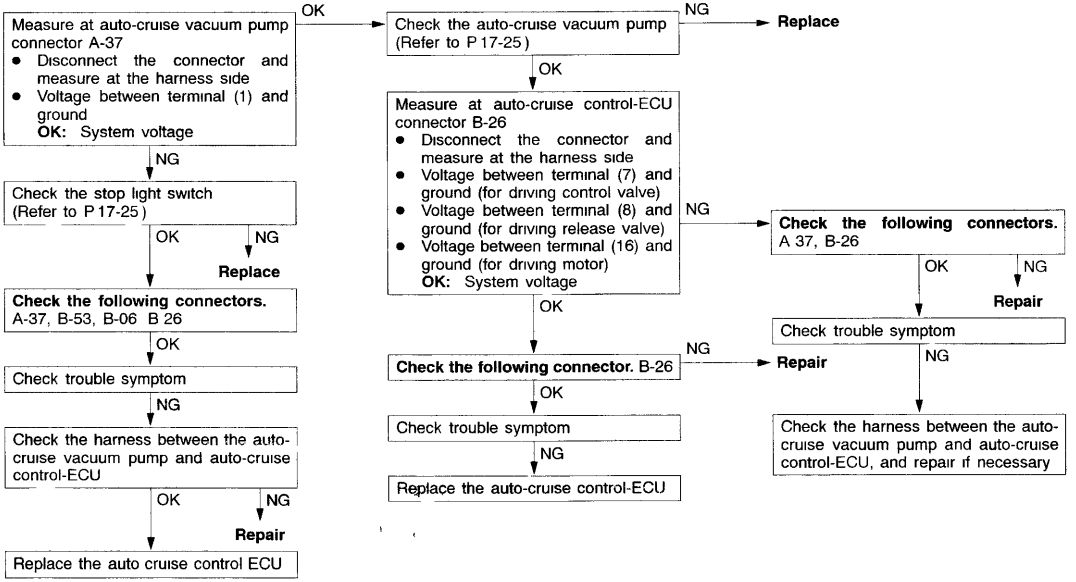
Code No. 11 Auto-cruise vacuum pump drive system	Probable cause
This diagnostic trouble code is output if the release valve, control valve or motor drive signals from the auto-cruise vacuum pump are not input to the auto-cruise control ECU	• Malfunction of the auto-cruise vacuum pump • Malfunction of the connector • Malfunction of the harness • Malfunction of the auto-cruise control ECU



Code No. 12 Vehicle speed signal system	Probable cause
This diagnostic trouble code is output if the vehicle speed signals from the vehicle speed sensor are not input to the auto-cruise control ECU when the vehicle speed is 40 km/h or more	• Malfunction of the vehicle speed sensor • Malfunction of the connector • Malfunction of the harness • Malfunction of the auto-cruise control-ECU



Code No. 14 Auto-cruise vacuum pump power supply system	Probable cause
This diagnostic trouble code is output when none of the drive signals from the release valve, control valve and motor of the auto-cruise vacuum pump are input to the auto-cruise control-ECU	• Malfunction of the stop light switch • Malfunction of the connector • Malfunction of the harness • Malfunction of the auto-cruise control-ECU • Malfunction of the auto-cruise vacuum pump



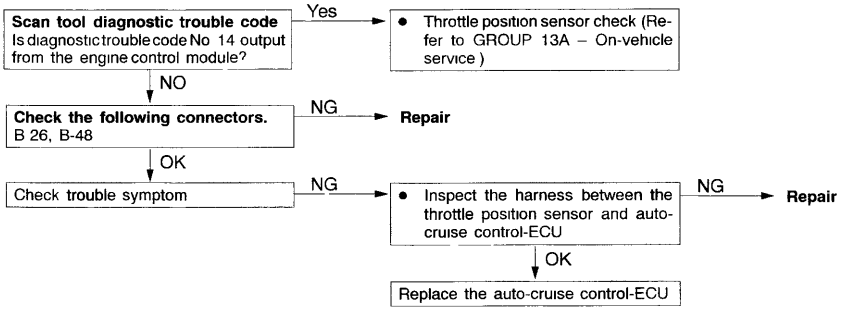
Code No. 15 Auto-cruise control switch	Probable cause
This diagnostic trouble code is output if the cruise control RESUME switch, SET switch or CANCEL switch remains ON	• Malfunction of the auto-cruise control switch

Replace the auto-cruise control switch

Code No. 16 Auto-cruise control ECU	Probable cause
This diagnostic trouble code is output if there is an abnormality in the CANCEL hold circuit or the microprocessor monitor circuit in the auto-cruise control-ECU	• Malfunction of the auto-cruise control-ECU

Replace the auto-cruise control-ECU

Code No.17 Throttle position sensor system	Probable cause
This diagnostic trouble code is output if a voltage of 1 5 V or more (when the closed throttle position switch is ON) or 0 2 V or less (when the closed throttle position switch is OFF) is output for a continuous period of 4 seconds or more	• Malfunction of the throttle position sensor • Malfunction of the connector • Malfunction of the harness • Malfunction of the auto-cruise control-ECU



INSPECTION CHART FOR TROUBLE SYMPTOMS

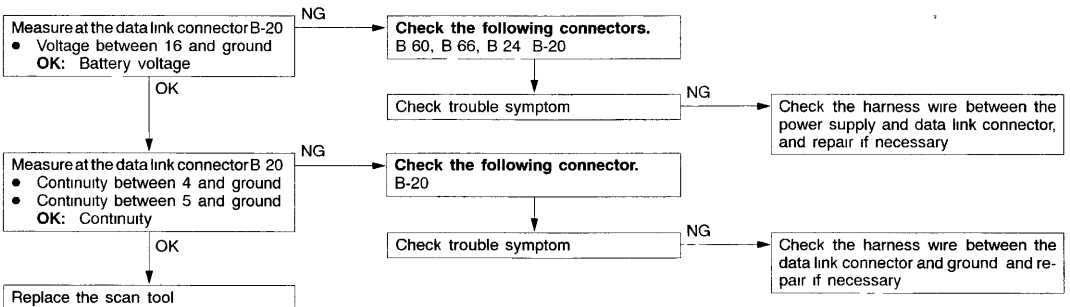
17200230372

Trouble symptom		Inspection procedure No.	Reference page
Communication with scan tool is not possible.	Communication with all systems is not possible.	1	17-13
	Communication with auto-cruise control-ECU only is not possible.	2	17-14
Input switch inspection using the scan tool is not possible. (However, diagnosis inspection is possible)		3	17-15
Auto-cruise control is not cancelled.	Even if brake pedal is depressed	4	17-16
	Even if clutch pedal is depressed <M/T>	5	17-17
	Even if select lever is set to N range <A/T>	6	17-17
	Even if CANCEL switch is set to ON	7	17-18
Auto-cruise control cannot be set.		9	17-19
Hunting (repeated acceleration and deceleration) occurs at the set vehicle speed.		10	17-19
Auto-cruise control indicator light inside combination meter does not illuminate. (However, auto-cruise control is normal)		11	17-21

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

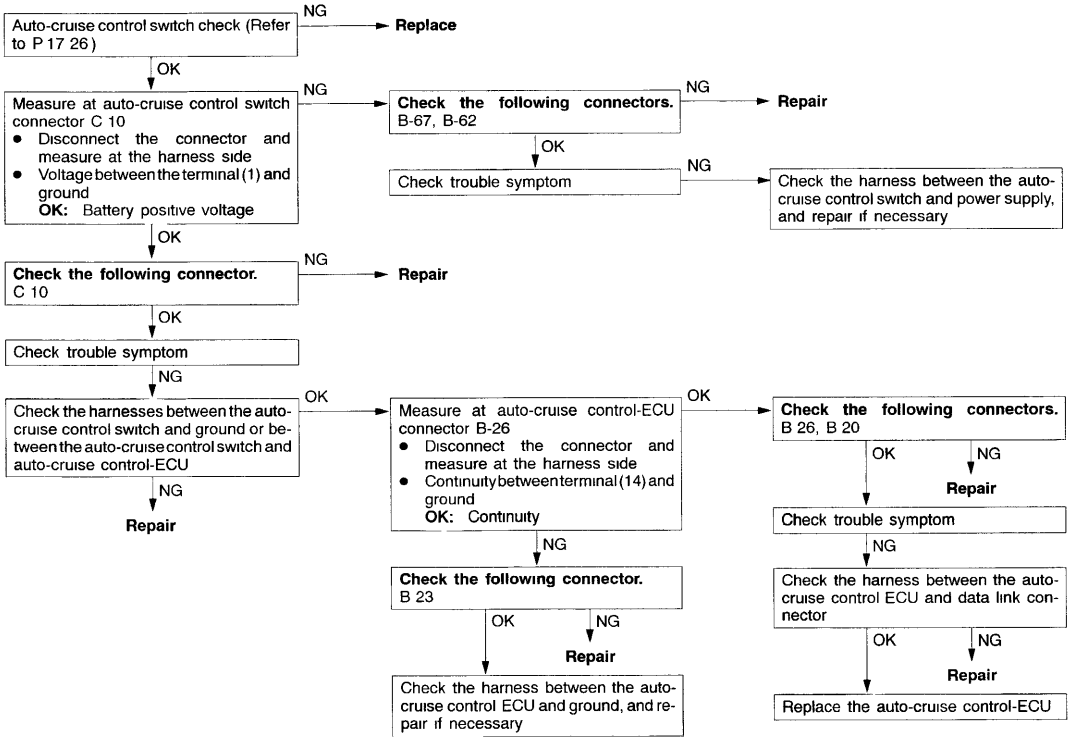
INSPECTION PROCEDURE 1

Communication with scan tool is not possible. (Communication with all systems, is not possible.)	Probable cause
The reason is probably a defect in the power supply system (including ground) for the diagnosis line	• Malfunction of the connector • Malfunction of the harness



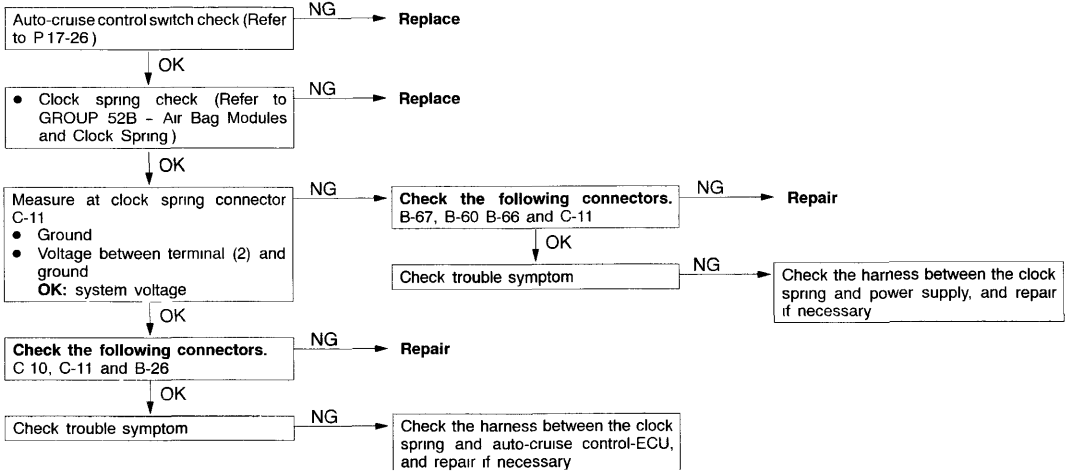
INSPECTION PROCEDURE 2

Communication with scan tool is not possible (Communication with auto-cruise control-ECU only is not possible.)	Probable cause
The cause is probably a malfunction of the auto-cruise control switch circuit or a malfunction of the auto cruise control-ECU ground circuit	• Malfunction of the auto-cruise control switch • Malfunction of the connector • Malfunction of the harness • Malfunction of the auto-cruise control ECU



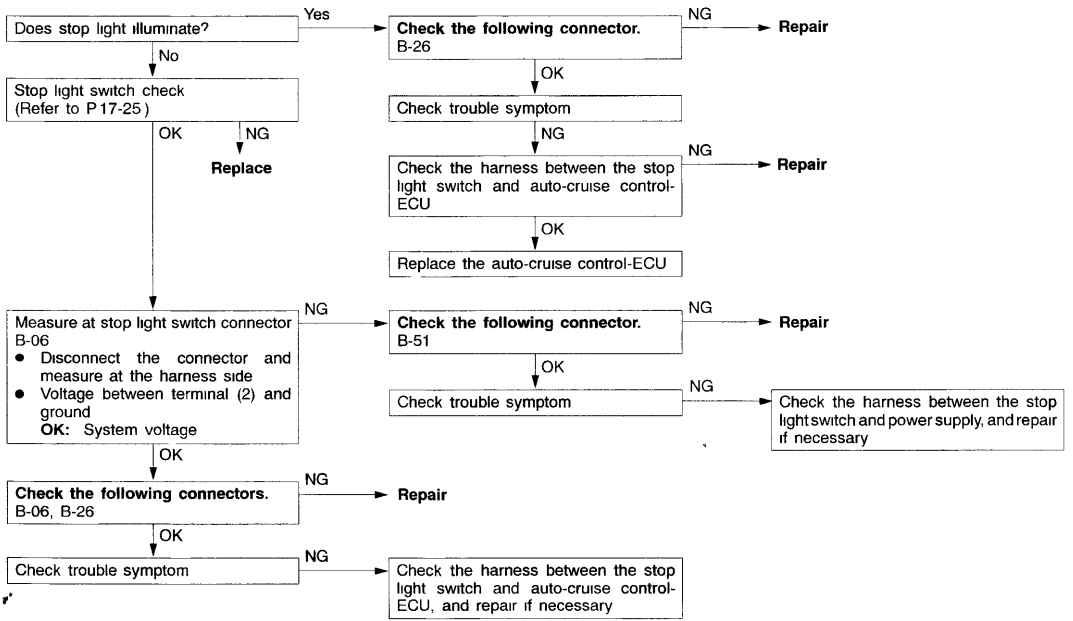
INSPECTION PROCEDURE 3

Input switch inspection using the scan tool is not possible. (However, diagnosis inspection is possible.)	Probable cause
The cause is probably a malfunction of auto-cruise control switch circuit system	• Malfunction of the auto-cruise control switch • Malfunction of the clock spring • Malfunction of the connector • Malfunction of the harness



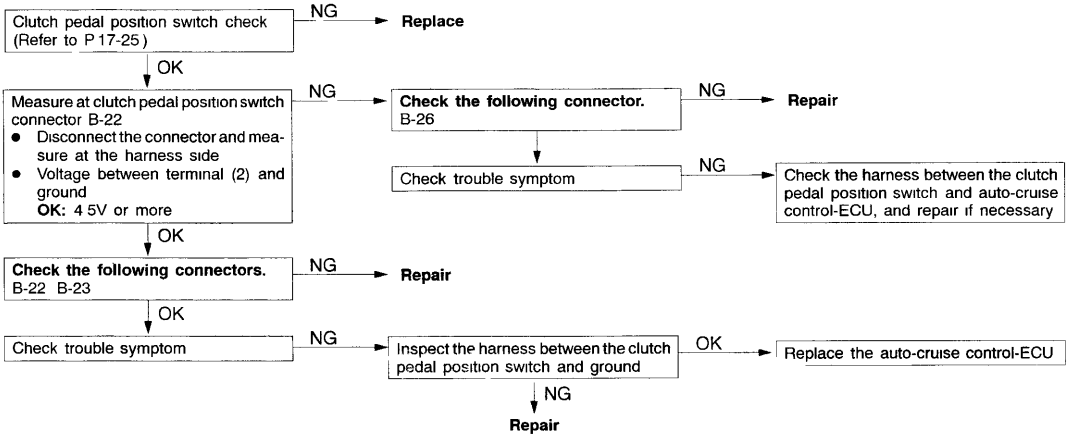
INSPECTION PROCEDURE 4

Even if brake pedal is depressed, auto-cruise control is not cancelled.	Probable cause
The cause is probably a malfunction of stop light switch or a malfunction of stop light circuit	• Malfunction of the stop light switch • Malfunction of the connector • Malfunction of the harness • Malfunction of the auto-cruise control-ECU



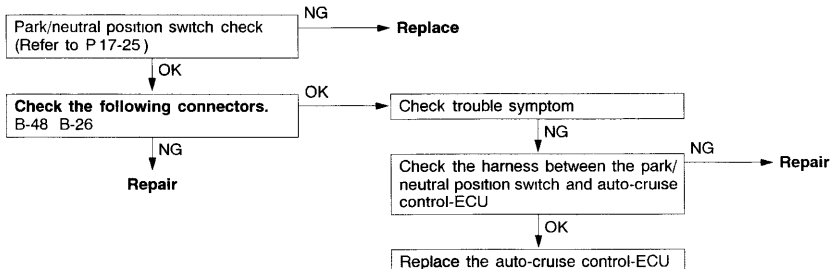
INSPECTION PROCEDURE 5

Even if clutch pedal is depressed, auto-cruise control is not cancelled. <M/T>	Probable cause
The cause is probably a malfunction of clutch pedal position switch or clutch circuit	• Malfunction of the clutch pedal position switch • Malfunction of the connector • Malfunction of the harness • Malfunction of the auto-cruise control ECU



INSPECTION PROCEDURE 6

Even if select lever is set to N range, auto-cruise control is not cancelled. <A/T>	Probable cause
The cause is probably an open-circuit in the output signal circuit in N range	• Malfunction of the park/neutral position switch • Malfunction of the connector • Malfunction of the harness • Malfunction of the auto-cruise control-ECU



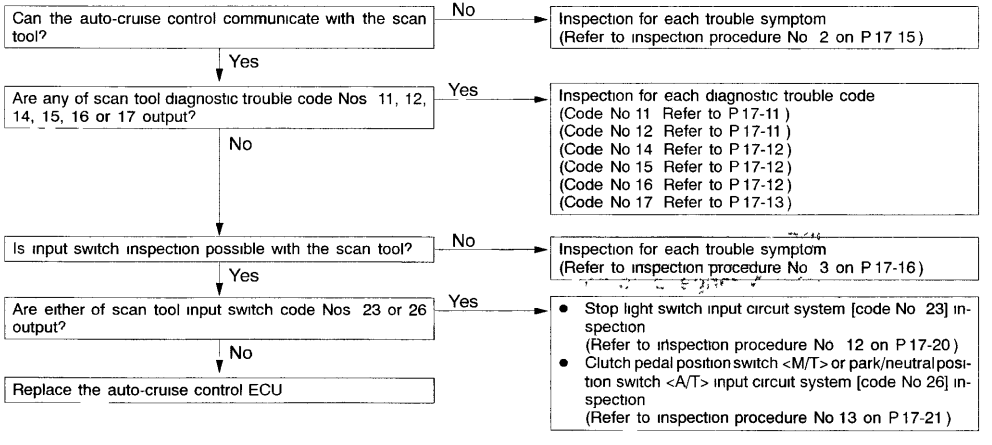
INSPECTION PROCEDURE 7

Even if auto-cruise control CANCEL switch is set to ON, auto-cruise control is not cancelled.	Probable cause
The cause is probably an open-circuit in the circuit inside the CANCEL switch	• Malfunction of the auto-cruise control switch

Replace the auto cruise control switch

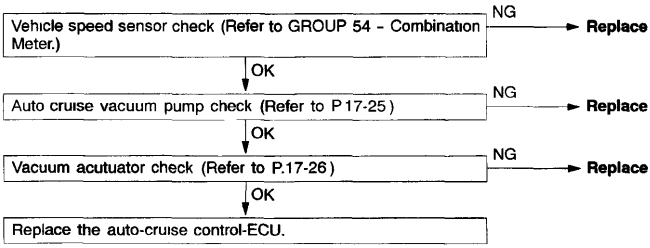
INSPECTON PROCEDURE 9

Auto-cruise control cannot be set.	Probable cause
The cause is probably that the fail-safe function is cancelling auto-cruise control In this case, the scan tool can be used to check the trouble symptoms in each system by inspecting the diagnostic trouble codes The scan tool can also be used to check if the circuits of each input switch are normal or not by inspecting the input switch codes	• Malfunction of the auto-cruise control switch • Malfunction of the clock spring • Malfunction of the harnesses or connectors • Malfunction of the clutch pedal position switch <M/T> • Malfunction of the park/neutral position switch <A/T> • Malfunction of the auto-cruise control-ECU



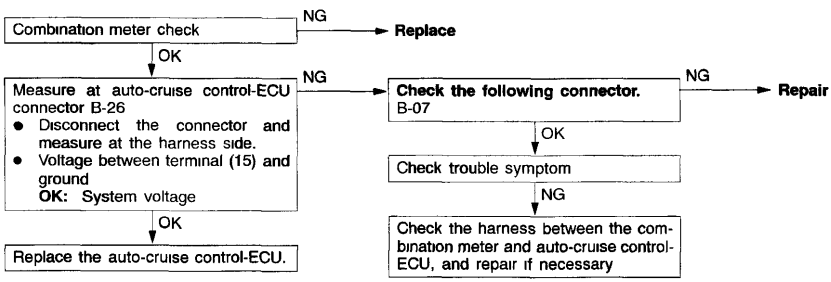
INSPECTION PROCEDURE 10

Hunting (repeated acceleration and deceleration) occurs at the set vehicle speed.	Probable cause
The cause is probably a malfunction of vehicle speed sensor or incorrect vacuum in the motor-driven vacuum pump or actuator	• Malfunction of the vehicle speed sensor • Malfunction of the motor-driven vacuum pump • Malfunction of the actuator • Malfunction of the auto-cruise control-ECU



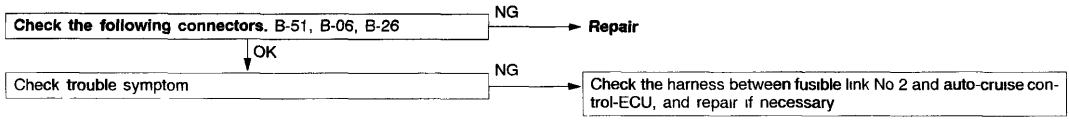
INSPECTION PROCEDURE 11

Auto-cruise control indicator lamp inside combination meter does not illuminate. (However, auto-cruise control is normal.)	Probable cause
The cause is probably a malfunction of the valve or a malfunction of the connector or harness.	• Malfunction of the valve • Malfunction of the harness • Malfunction of the connector • Malfunction of the auto-cruise control-ECU



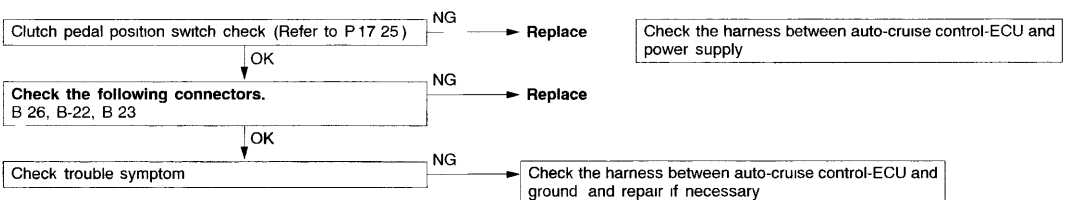
INSPECTION PROCEDURE 12

Stop light switch input circuit system inspection (Code No. 23)



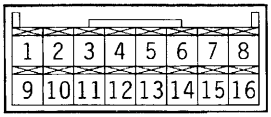
INSPECTION PROCEDURE 13

Clutch pedal position switch <M/T> or park/neutral position switch <A/T> input circuit system inspection (Code No. 26)



CHECK AT THE ECU TERMINALS

17200270206



07I0059

Terminal No	Check item	Check conditions		Normal condition
1	Throttle position sensor input	When accelerator pedal is fully depressed		4.5 - 5.5V
		When accelerator pedal is released		0.3 - 1.0V
2	Closed throttle position switch output	When accelerator pedal is depressed	When closed throttle position switch is OFF	4.5 - 5.5V
		When accelerator pedal is not depressed	When closed throttle position switch is ON	0V
3	A/T control output	No OD-OFF request		System voltage
		OD-OFF request		0V
4	Stop light switch input	When brake pedal is depressed	When stop light switch is "ON"	System voltage
		When brake pedal is not depressed	When stop light switch is "OFF"	0V
5	Pump power supply	Ignition switch : ON Stop light switch : OFF		System voltage
6	ECU power supply	Ignition switch : ON		System voltage
7	Auto-cruise vacuum pump release valve and control valve input	When decelerating with the SET switch while driving at constant speed	Control valve open	System voltage
8			Release valve open	0V
7		When cancelling constant speed driving with the CANCEL switch	Control valve open	System voltage
8			Release valve open	System voltage
9	Auto-cruise control switch input	When main switch ON		Approximately 9.0 V
		When input switch has not been operated	When all switches are OFF	Approximately 4.5 V
		When input switch is pushed down	When SET switch is ON	Approximately 1 5 V
		When input switch is pushed up	When RESUME switch is ON	Approximately 3 0 V
		When input switch is pulled forward	When CANCEL switch is ON	Approximately 0 V
10	Vehicle speed sensor input	When vehicle is moved forwards and backwards, sensor turns ON and OFF repeatedly	When sensor is ON	0V
			When sensor is OFF	4.5V or more
11	Diagnosis control input	When ignition switch is ON		4V or more

Terminal No.	Check item	Check conditions		Normal condition
12	ACC power supply	When ignition switch is in ACC position Main switch ON		System voltage
13	Clutch pedal position switch input <M/T>	When pedal is not depressed	When clutch pedal position switch is OFF	4 5V or more
		When pedal is depressed	When clutch pedal position switch is ON	0V
	Park/neutral position switch input <A/T>	When select lever is in a position other than N range	When park/neutral position switch is OFF	System voltage
		When select lever is in N range	When park/neutral position switch is ON	0V
14	Ground	At any time		Continuity
15	Indicator input (inside combination meter)	When driving at constant speed	When indicator is illuminated	0V
		When constant-speed driving is cancelled	When indicator is switched off	System voltage
16	Auto-cruise vacuum pump motor input	When driving at constant speed using the SET switch	Motor stopped/running	System voltage/0V
		When accelerating with the RESUME switch while driving at constant speed	Motor stopped/running	System voltage/0V
		When decelerating with the SET switch while driving at constant speed	Motor stopped	System voltage
		When cancelling constant speed driving with the CANCEL switch	Motor stopped	System voltage



D0710055

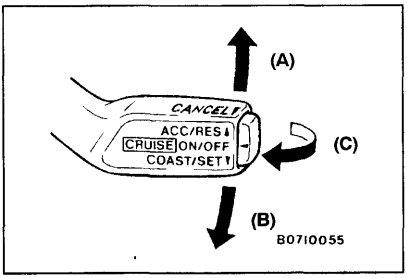
ON-VEHICLE SERVICE

17200160145

AUTO-CRUISE CONTROL SYSTEM OPERATION CHECK

AUTO-CRUISE CONTROL SWITCH INDICATOR LIGHT

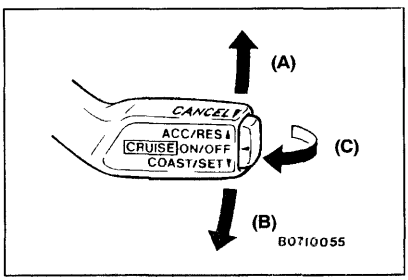
1. Turn the ignition switch to "ON".
2. Check that the indicator light within the combination meter illuminates when the main switch is turned to "ON".



AUTO-CRUISE CONTROL SETTING

1. Switch ON the main switch.
2. Drive at the desired speed, above approximately 40 km/h. (25 mph)
3. Push the auto-cruise control switch in the direction of arrow (B).
4. Check to be sure that when the switch is released the speed is the desired constant speed.

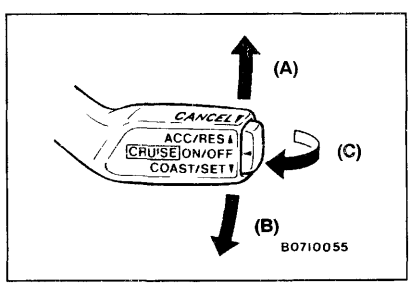
NOTE
If the vehicles speed decreases to approximately 15 km/h (9 mph) below the set speed because of climbing a hill for example, the auto-cruise control will be cancelled.



SPEED-INCREASE SETTING

1. Set to the desired speed.
2. Push the auto-cruise control switch in the direction of arrow (A).
3. Check to be sure that acceleration continues while the switch is held, and that when it is released the constant speed at the time when it was released becomes the driving speed.

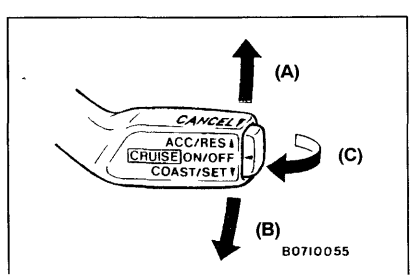
NOTE
Acceleration can be continued even if the vehicle speed has passed the high-speed limit [approximately 200 km/h (124 mph)]. But the speed when the auto-cruise control switch is released will be recorded as the high-speed limit.



SPEED-REDUCTION SETTING

1. Set to the desired speed.
2. Push the auto-cruise control switch in the direction of arrow (B).
3. Check to be sure that deceleration continues while the switch is pressed, and that when it is released the constant speed at the time when it was released becomes the driving speed.

NOTE
When the vehicle speed reaches the low limit [approximately 40 km/h (25 mph)] during deceleration, the auto-cruise control will be cancelled.



RETURN TO THE SET SPEED BEFORE CANCELLATION AND AUTO-CRUISE CONTROL CANCELLATION

1. Set the auto-cruise speed control.
2. When any of the following operations are performed while at constant speed during auto-cruise control, check if normal driving is resumed and deceleration occurs.
   a. The auto-cruise control switch is pushed in the direction of arrow (C).
   b. The brake pedal is depressed.
   c. The clutch pedal is depressed. (M/T)
   d. The selector lever is moved to the "N" range. (A/T)

3 At a vehicle speed of 40 km/h (25 mph) or higher, check if when the RESUME switch is switched ON, vehicle speed returns to the speed before auto-cruise control driving was cancelled, and constant speed driving occurs.
4. When the main switch is turned to OFF while driving at constant speed, check if normal driving is resumed and deceleration occurs.

AUTO-CRUISE CONTROL COMPONENT CHECK

17200170339

STOP LIGHT SWITCH

Refer to GROUP 35A - On vehicle Service.

CLUTCH PEDAL POSITION SWITCH <M/T>

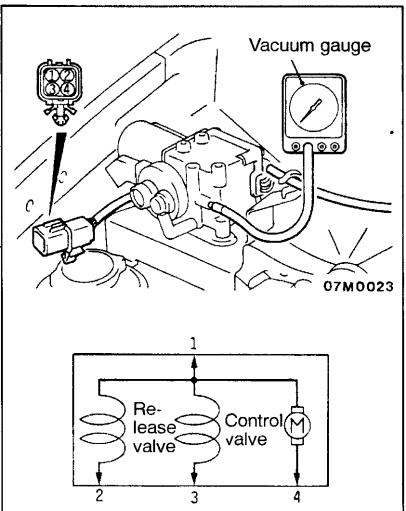
Refer to GROUP 21 - On-vehicle Service.

PARK/NEUTRAL POSITION SWITCH ("N" POSITION)

Refer to GROUP 23A - On-vehicle Service.

THROTTLE POSITION SENSOR

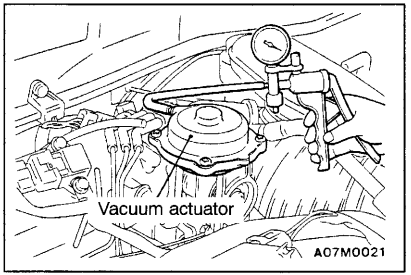
Refer to GROUP 13A - On-vehicle Service.



AUTO-CRUISE VACUUM PUMP

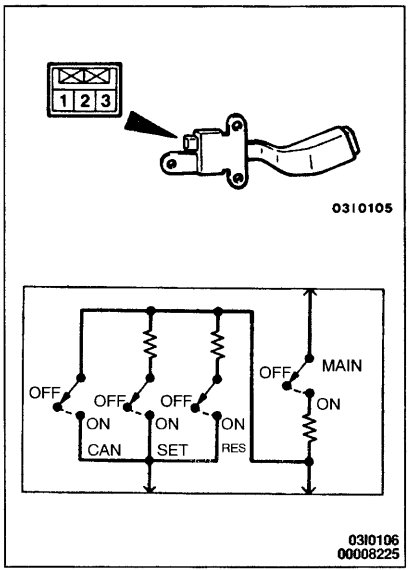
1. Disconnect the vacuum hose from the auto-cruise vacuum pump and connect a vacuum gauge to the vacuum pump.
2. Disconnect the vacuum pump connector.
3. Check that the reading on the vacuum gauge matches the values in the table below when the battery is connected to each connector terminal.

Terminal No.				Valve condition	Vacuum gauge kPa (mm Hg, in Hg)
1	2	3	4		
⊕	⊖	⊖	⊖	Release valve closed Control valve closed	53 (398, 15.7) or more
⊕		⊖	⊖	Release valve open	20 (150, 5.9) or less
⊕	⊖		⊖	Control valve open	



VACUUM ACTUATOR

1. Disconnect the vacuum hose from the vacuum actuator, and connect a hand vacuum pump to the actuator.
2. Check that the throttle lever operates when applying vacuum, and the vacuum is kept.



AUTO-CRUISE CONTROL CHECK

Measure the resistance between the terminals when each of the "SET," "RESUME," "CANCEL" and "MAIN" switches is pressed. If the values measured at the time correspond to those in the tale below, then there is no problem.

Switch position	Resistance between terminals	
Switch "OFF"	No continuity	
"CANCEL" switch "ON"	Terminals 1 and 3	Approximately 3.9 kΩ
	Terminals 2 and 3	Approximately 0 Ω
"RESUME" switch "ON"	Terminals 1 and 3	Approximately 4 8 kΩ
	Terminals 2 and 3	Approximately 910 Ω
"SET" switch "ON"	Terminals 1 and 3	Approximately 4.1 kΩ
	Terminals 2 and 3	Approximately 220 Ω
"MAIN" switch "ON"	Terminals 1 and 2	Approximately 3.9 kΩ

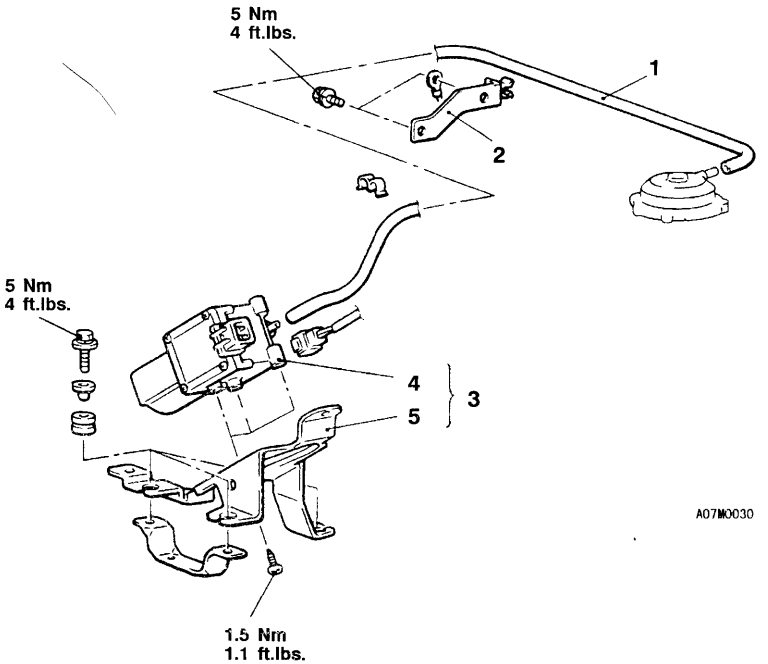
VEHICLE SPEED SENSOR CHECK

Refer to GROUP 54 - Combination meters.

AUTO-CRUISE CONTROL

17200140378

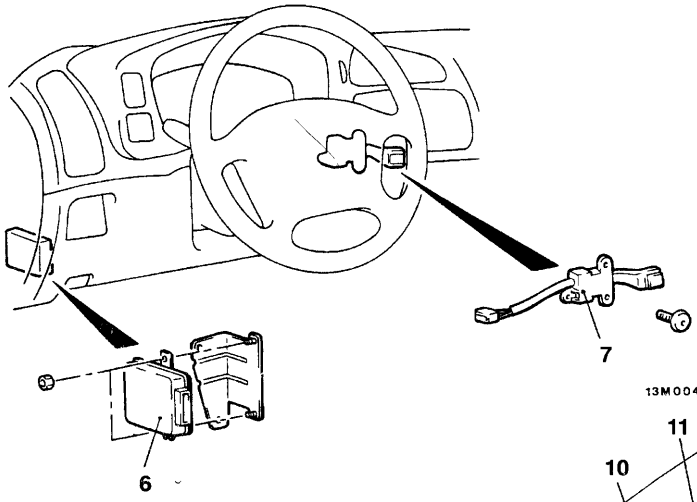
REMOVAL AND INSTALLATION



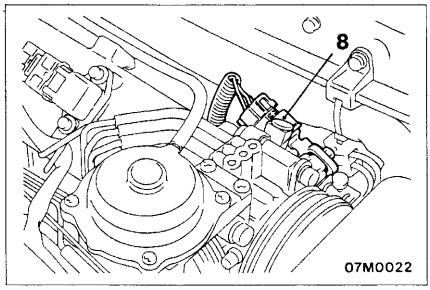
Auto-cruise vacuum pump removal steps

1. Vacuum hose
2. Bracket
3. Auto-cruise vacuum pump and bracket assembly
4. Auto-cruise vacuum pump assembly
5. Pump bracket

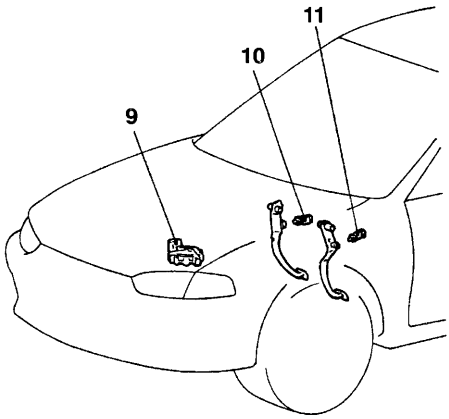
CAUTION: SRS
Before removal of the air bag module, refer to the following groups:
GROUP 52B - SRS Service Precautions.
GROUP 52B - Air Bag Modules and Clock Spring.



13M0048



07M0022



07M0025

00004837

Control unit removal

6 Auto-cruise control-ECU
Control switch removal

Control switch removal

- Air bag module (Refer to GROUP 52B.)

7. Control switch

Sensor removal

8 Throttle position sensor
9 Park/neutral position switch <A/T>
10 Stop light switch
11. Clutch pedal position switch <M/T>

EMISSION CONTROL SYSTEM

17300010177

GENERAL INFORMATION

The emission control system consists of the following subsystems:

- Positive crankcase ventilation system
- Evaporative emission control system
- Exhaust emission control system

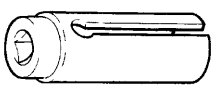
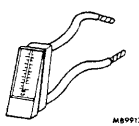
SERVICE SPECIFICATIONS

17300030166

Items	Specification
Evaporative emission purge solenoid coil resistance [at 20°C (68°F)] Ω	36-44
EGR solenoid coil resistance [at 20°C (68°F)] Ω	36-44

SPECIAL TOOLS

17300060110

Tool	Tool number and name	Supersession	Application
	MD998770 Oxygen sensor wrench	MD998770-01 or general service tool	Removal/Installation of heated oxygen sensor
	MB995061 Purge flow indicator		Inspection of purge control system

TROUBLESHOOTING

17"00070014

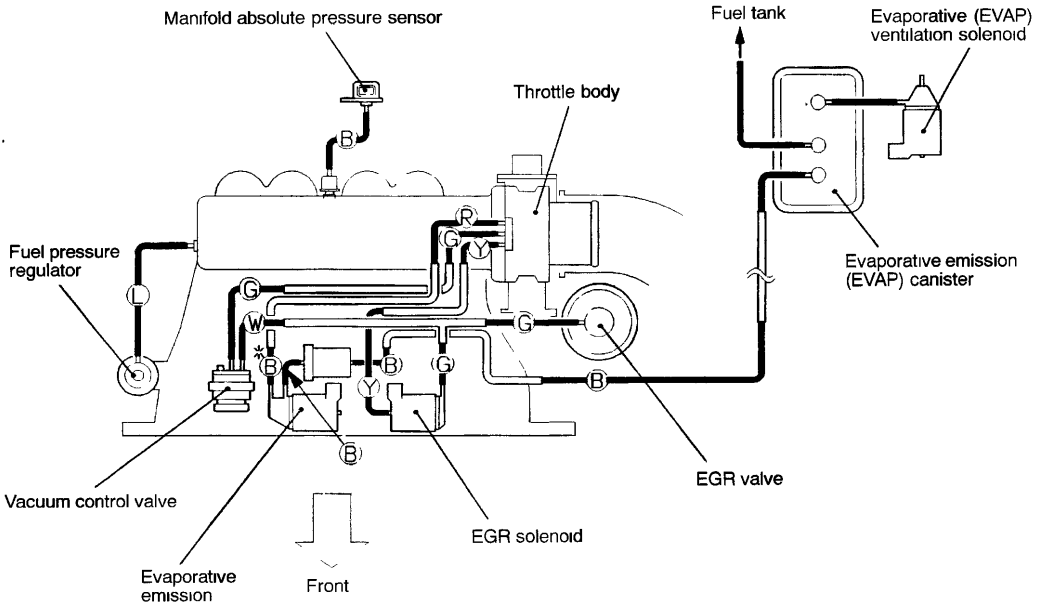
Symptom	Probable cause	Remedy
Engine will not start or hard to start	Vacuum hose disconnected or damaged	Repair or replace
	The EGR valve is not closed	Repair or replace
	Malfunction of the evaporative emission purge solenoid	Repair or replace
Rough idle or engine stalls	The EGR valve is not closed.	Repair or replace
	Vacuum hose disconnected or damaged.	Repair or replace
	Malfunction of the positive crankcase ventilation valve	Replace
	Malfunction of the purge control system	Check the system; if there is a problem, check its component parts.
Engine hesitates or poor acceleration	Malfunction of the exhaust gas recirculation system	Check the system; if there is a problem, check its component parts.
Excessive oil consumption	Positive crankcase ventilation line clogged	Check positive crankcase ventilation system
Poor fuel mileage	Malfunction of the exhaust gas recirculation system	Check the system; if there is a problem, check its component parts.

VACUUM HOSES

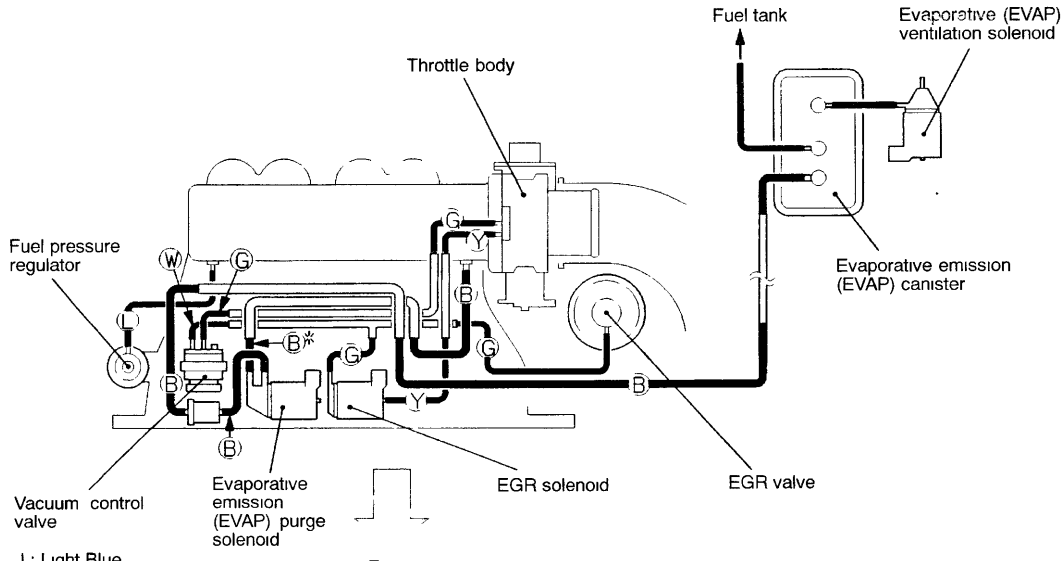
17300090485

VACUUM HOSE ROUTING

<1.5L Engine>

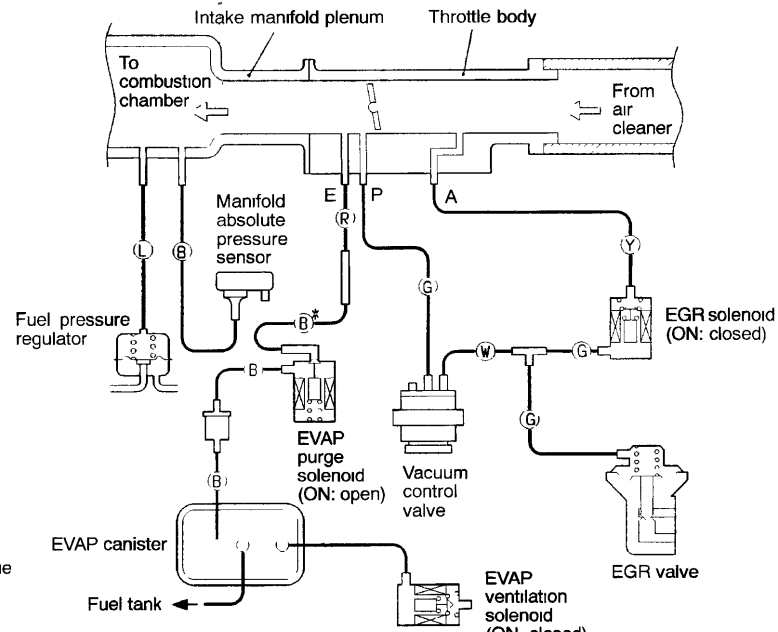


<1.8L Engine>

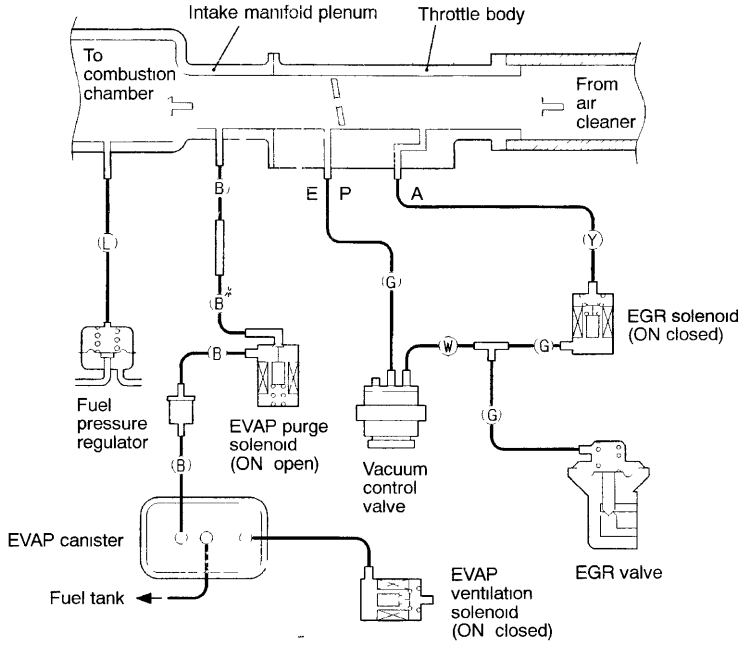

Fuel tank
Evaporative (EVAP) ventilation solenoid
Throttle body
Fuel pressure regulator
Evaporative emission (EVAP) canister
Vacuum control valve
Evaporative emission (EVAP) purge solenoid
EGR solenoid
EGR valve
Front
L: Light Blue
B Black
G Green
Y Yellow
W White
* With red-paint mark
9EM0262

VACUUM CIRCUIT DIAGRAM

<1.5L Engine>



<1.8L Engine>


Intake manifold plenum
Throttle body
To combustion chamber
From air cleaner
B
E
P
A
L
Y
B*
G
EGR solenoid (ON closed)
B
W
G
Fuel pressure regulator
EVAP purge solenoid (ON open)
B
G
Vacuum control valve
EVAP canister
EGR valve
Fuel tank
EVAP ventilation solenoid (ON closed)
L: Light Blue
B Black
G Green
Y Yellow
W White
* With red-paint mark
9EM0263

VACUUM HOSE INSTALLATION

1. When connecting the vacuum hoses, they should be securely inserted onto the nipples.
2. Connect the hoses correctly, using the VACUUM HOSE ROUTING as a guide.

VACUUM HOSE CHECK

1. Using the VACUUM HOSE ROUTING as a guide, check that the vacuum hoses are correctly connected.
2. Check the connection of the vacuum hoses, (removed, loose, etc.) and check that there are no blends or damage.

POSITIVE CRANKCASE VENTILATION SYSTEM

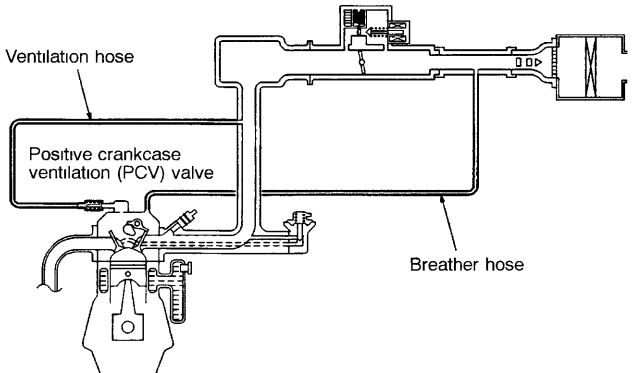
17300500179

GENERAL INFORMATION

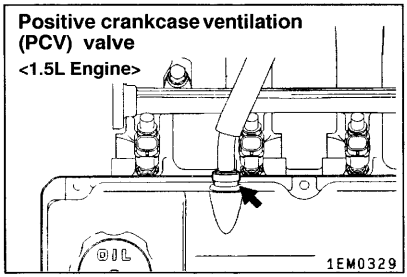
The positive crankcase ventilation system is a system for preventing the escape of blow-by gases from inside the crankcase into the atmosphere.
Fresh air is sent from the cleaner into the crankcase through the breather hose to be mixed with the blow-by gas inside the crankcase.
The blow-by gas inside the crankcase is drawn into the intake manifold through the positive crankcase ventilation (PCV) valve.

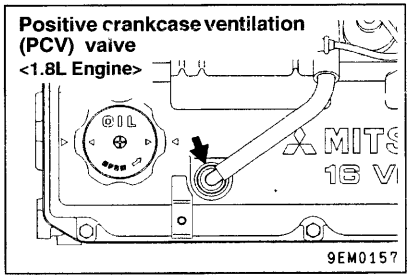
The PCV valve is designed to lift the plunger according to the intake manifold vacuum so as to regulate the flow of blow-by gas properly.
In other words, the blow-by gas flow is regulated during low load engine operation to maintain engine stability, while the flow is increased during high load operation to improve the ventilation performance.

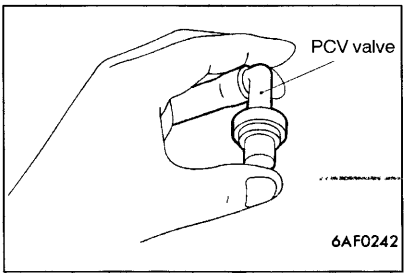
SYSTEM DIAGRAM



COMPONENT LOCATION







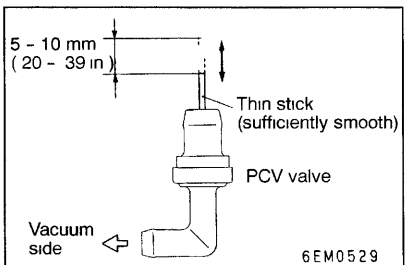
CRANKCASE VENTILATION SYSTEM CHECK

17300110181

(1) Remove the positive crankcase ventilation (PCV) valve from the rocker cover, then reconnect the PCV valve to the vacuum supply hose.
(2) With the engine idling, put finger on the open end of the PCV valve, and check for negative pressure (vacuum) with finger.

NOTE
At this time, the plunger in the PCV valve should move back and forth as the open end is covered and uncovered.

(3) If negative pressure is not felt, clean or replace the PCV valve. Inspect the vacuum supply hose and its port for restriction or plugged condition.



POSITIVE CRANKCASE VENTILATION (PCV) VALVE CHECK

17300120160

(1) Hold the PCV valve with the vacuum side down. Using light pressure, depress the PCV valve spring with the thin stick 5 - 10 mm (.20 - .39 in.). Release pressure on the stick to see if the PCV valve spring will lift the stick to its original position.
(2) If the stick returns quickly to its original position, the PCV valve is OK. If the stick does not return quickly, clean or replace the PCV valve.

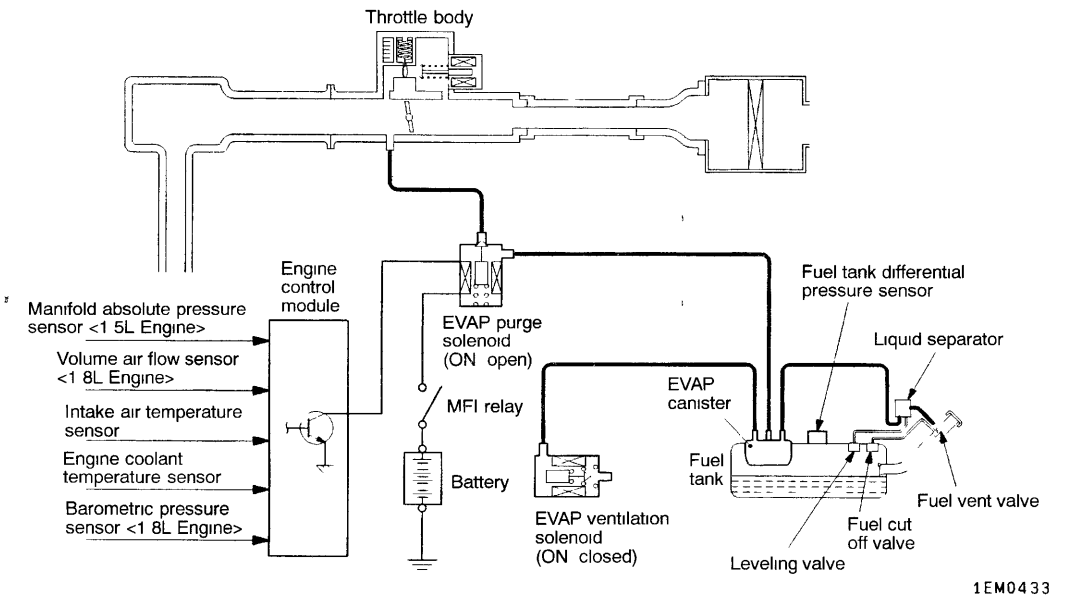
EVAPORATIVE EMISSION CONTROL SYSTEM

17300510547

GENERAL INFORMATION

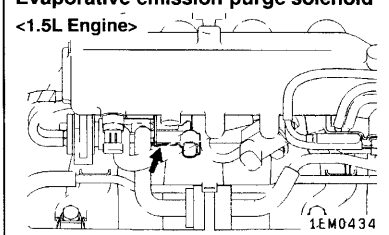
The evaporative control system prevents fuel vapors generated in the fuel tank from escaping into the atmosphere.
Fuel vapors from the fuel tank flow through the fuel tank pressure control valve and vapor pipe/hose to be stored temporarily in the EVAP canister.
When the vehicle is in operation, fuel vapors stored in the EVAP canister flow through the EVAP purge solenoid and purge port and go into the intake manifold plenum to be sent to the combustion chamber.
When the engine coolant temperature is low or when the intake air quantity is small (when the engine is at idle, for example), the engine control module brings the EVAP purge solenoid into the OFF state to shut off the fuel vapor flow to the intake manifold plenum. This does not only ensure the driveability when the engine is cold or running under low load but also stabilize the emission level.
In addition, the EVAP ventilation solenoid is provided between the EVAP canister and atmospheric air to carry out OBD-II EVAP leak monitor.
This solenoid valve is always off, but if OBD-II EVAP leak monitor is being carried out, the valve will be turned on to prevent atmospheric air from entering the EVAP canister.
Moreover, the fuel vent valve is provided to the fuel filler tube to prevent excessive fuel from entering the fuel tank.

SYSTEM DIAGRAM

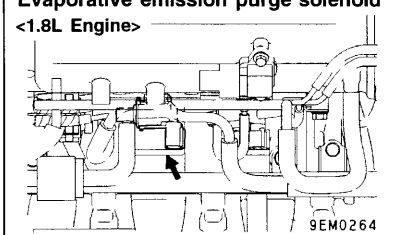


COMPONENT LOCATION

Evaporative emission purge solenoid
<1.5L Engine>

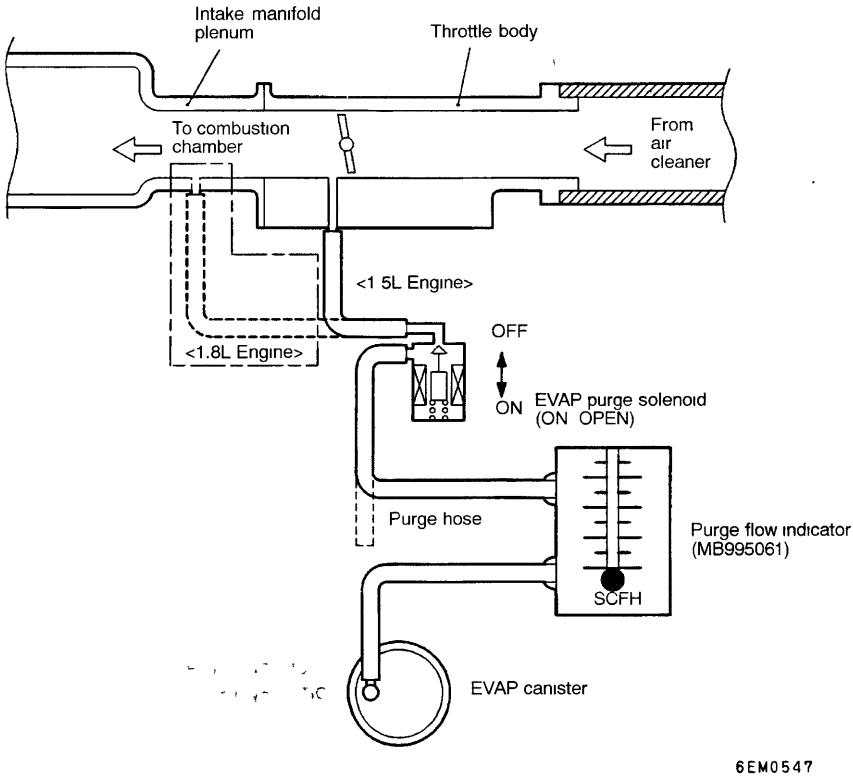


Evaporative emission purge solenoid
<1.8L Engine>



PURGE CONTROL SYSTEM CHECK (PURGE FLOW CHECK)

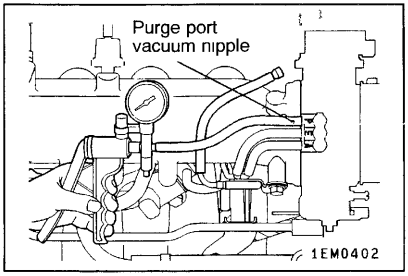
17300140432



1. Disconnect the purge hose from the evaporative emission (EVAP) canister, and connect the special tool (purge flow indicator) between the EVAP canister and the purge hose.
2. The vehicle should be prepared as follows before the inspection and adjustment.
   - Engine coolant temperature: 80 - 95°C (176 - 203°F)
   - Lights, cooling fan and accessories: OFF
   - Transaxle: Neutral (A/T for P range)
3. Let the engine run at idle for at least four minutes.
4. Race the engine suddenly several times and check the purge flow rate.

   Standard value:
   momentarily 20 cm^3 (2.5 SCFH) or more

5. If the purge flow rate is below the standard value, disconnect the vacuum hose from the EVAP canister, and check the purge flow rate again.
   If the purge flow rate is below the standard value, check the vacuum port and hose for blockage, or the emission purge solenoid.
   In addition, replace the EVAP canister when the purge flow rate is at the standard value.

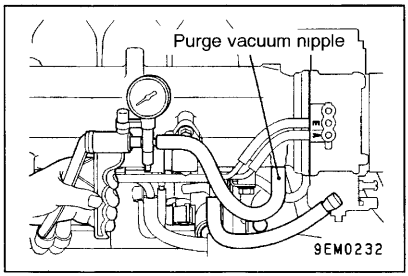


PURGE PORT VACUUM CHECK

17300150343

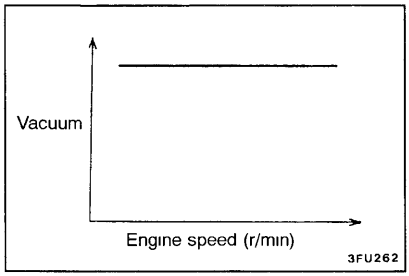
<1.5L Engine>

1. Disconnect the vacuum hose (red strip) from the throttle body purge vacuum nipple and connect a hand vacuum pump to the nipple.



<1.8L Engine>

Disconnect the vacuum hose (black) from the intake air plenum vacuum nipple and connect a hand vacuum pump to the nipple.



2. Start the engine and check to see that, after raising the engine speed by racing the engine, purge vacuum is kept constant regardless of the increased engine speed.

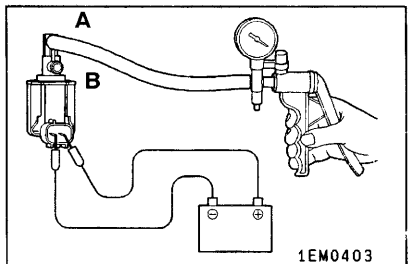
   NOTE
   If there is no vacuum created, it is possible that the intake air plenum port may be clogged and require cleaning.

EVAPORATIVE EMISSION PURGE SOLENOID CHECK

17300170318

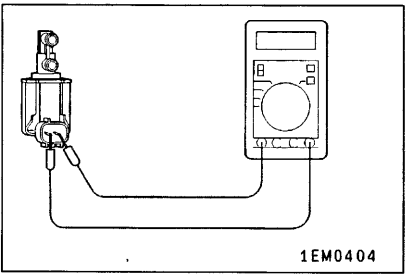
NOTE
When disconnecting the vacuum hose, always make a mark so that it can be reconnected at its original position.

1. Disconnect thevacuum hose (black, red stripe) from the solenoid valve.
2. Disconnect the harness connector.



3. Connect a hand vacuum pump to nipple to nipple (A) of the solenoid valve (refer to the illustration at left).
4. Check airtightness by applying a vacuum with voltage applied directly from the battery to the purge control solenoid valve and without applying voltage.

Battery voltage	Normal condition
Applied	Vacuum leaks
Not applied	Vacuum maintained



5. Measure the resistance between the terminals of the solenoid valve.

   Standard value: 36 - 44 Ω [at 20°C (68°F)]

ENGINE COOLANT TEMPERATURE SENSOR AND INTAKE AIR TEMPERATURE SENSOR CHECK <1.5L Engine>

17300180304

To check these parts, refer to GROUP 13A - On-vehicle Service.

VOLUME AIR FLOW SENSOR, ENGINE COOLANT TEMPERATURE SENSOR AND INTAKE AIR TEMPERATURE SENSOR CHECK <1.8L Engine>

17300180311

To inspect these parts, refer to GROUP 13A - On-vehicle Service.

AIR CONDITIONING SWITCH CHECK

17300200086

To inspect the conditioning switch, refer to GROUP 55 - Air Conditioning Switch.

EXHAUST GAS RECIRCULATION (EGR) SYSTEM

17300520410

GENERAL INFORMATION

The exhaust gas recirculation (EGR) system lowers the nitrogen oxide (NOx) emission level. When the air/fuel mixture combustion temperature is high, a large quantity of nitrogen oxides (NOx) is generated in the combustion chamber. Therefore, this system recirculates part of emission gas from the exhaust port of the cylinder head to the combustion chamber through the intake manifold to decrease the air/fuel mixture combustion temperature, resulting in reduction of NOx.
The EGR flow rate is controlled by the EGR valve so as not to decrease the driveability.

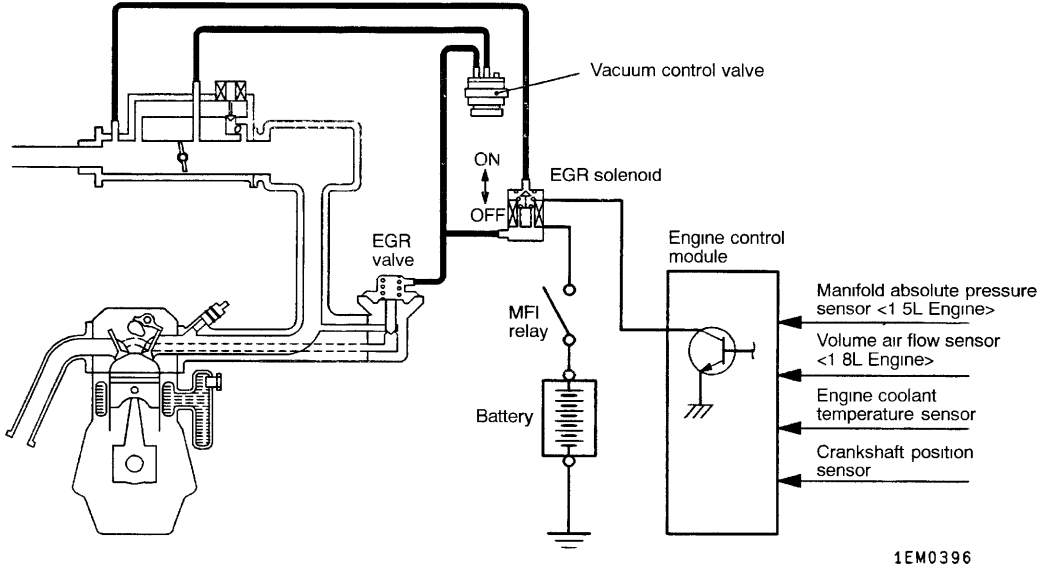
OPERATION

When the engine coolant temperature is low, when the engine is at idle or when a wide open throttle operation is performed, the EGR valve is kept closed, achieving no EGR.

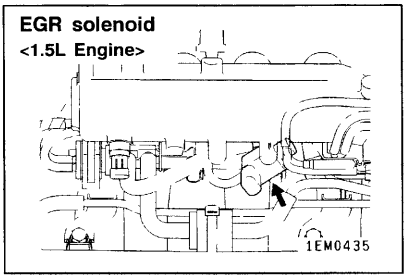
After warming up of the engine, EGR valve is opened.

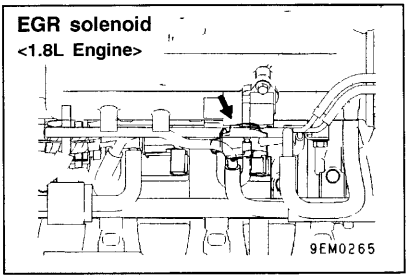
The engine control module monitors the EGR system and illuminates the check engine/malfunction indicator lamp to indicate that there is a malfunction.

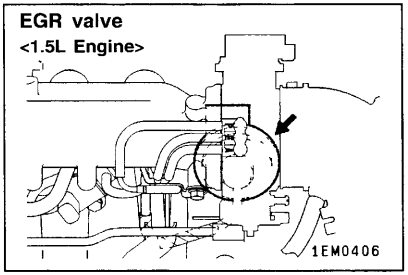
SYSTEM DIAGRAM

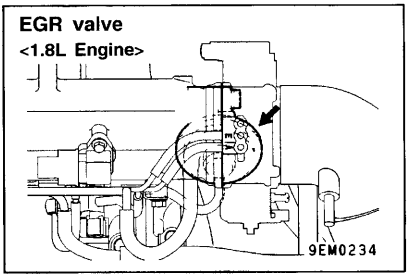


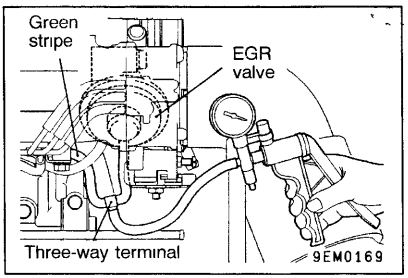
COMPONENT LOCATION











EGR SYSTEM CHECK

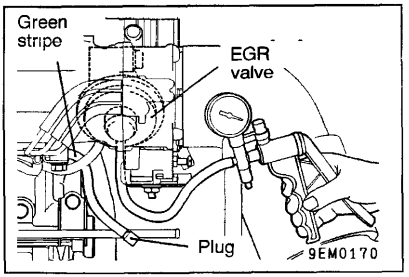
17300260213

1. Disconnect the vacuum hose (green stripe) from the EGR valve, and then connect a hand vacuum pump via the three-way terminal.
2. Regarding the engine in cold and hot conditions, check the condition of vacuum when engine rpm is increased by opening the throttle valve quickly.

When engine is cold

[Engine coolant temperature: 20°C (68°F) or less]

Throttle valve	Normal vacuum condition
Open quickly	No vacuum will generate (remained as barometric pressure).

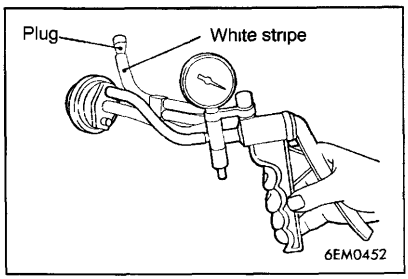


When engine is hot

[Engine coolant temperature: 80°C (176°F) or less]

Throttle valve	Normal vacuum condition
Open quickly	If will momentarily rise over 13kPa (3.9 in. Hg)

3. Disconnect the three-way terminal.
4. Connect the hand vacuum pump directly to the EGR valve.
5. Check whether the engine stalls or the idling is unstable when a vacuum of 29kPa (8.7 in.Hg) or higher is applied during idling.



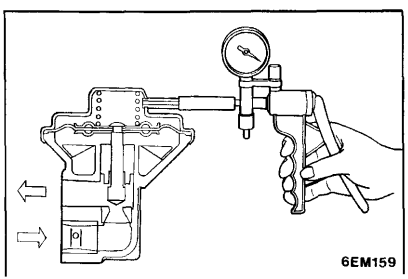
VACUUM CONTROL VALVE CHECK 17300270032

1. Disconnect the vacuum hose (white stripe) from the vacuum control valve and connect the hand vacuum pump to the vacuum control valve
2. Plug the end of the removed vacuum hose.
3. Start the engine and run at idle.
4. Check the vacuum condition.

Engine condition	Normal vacuum condition
Idling	Approx. 23kPa (6.7 in.Hg)

EGR VALVE CHECK 17300280073

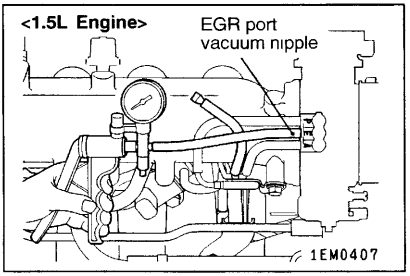
1. Removal the EGR valve and inspect for sticking, carbon deposits, etc. If found, clean with a suitable solvent so that the valve seats correctly.



2. Connect a hand vacuum pump to the EGR valve.
3. Apply 67kPa (20 in.Hg) of vacuum, and check to be sure that the vacuum is maintained.
4. Apply a vacuum and check the passage of air by blowing through one side of the EGR passage.

Vacuum	Passage of air
5.3kPa (1.6 in.Hg) or less	Air is not blown out
29kPa (8 7 in.Hg) or more	Air is blown out

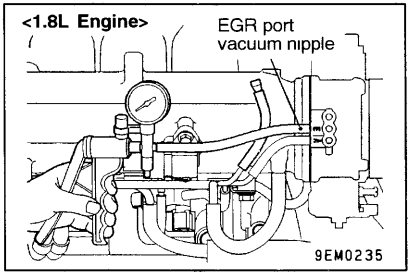
5. Reinstall the EGR valve, using a new gasket, and tighten to the specified torque.
   Tightening torque: 22 Nm (16 ft.lbs.)

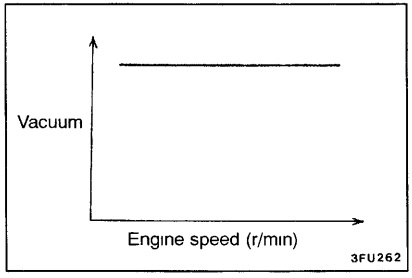


EGR PORT VACUUM CHECK

17300290250

1. Disconnect the vacuum hose (green stripe) from the throttle body EGR vacuum nipple and connect a hand vacuum pump to the nipple.





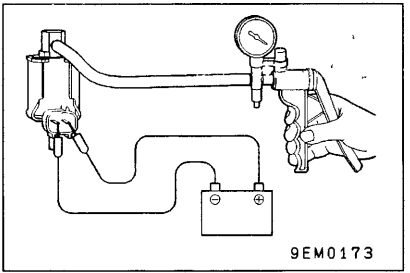
2. Start the engine and check to see that, after rapidly increasing engine rpm, vacuum remains fairly constant.

EGR SOLENOID CHECK

17300310178

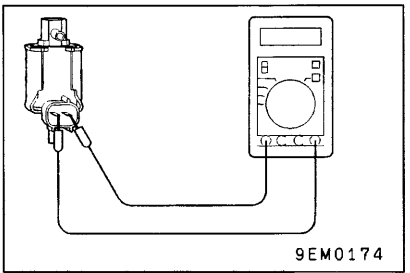
NOTE
When disconnecting the vacuum hose, always make so that it can be reconnected at original position.

1. Disconnect the vacuum hose (yellow stripe, white stripe) from the solenoid valve.
2. Disconnect the harness connector.



3. Connect a hand vacuum pump to the nipple to which the white-striped vacuum hose was connected.
4. Check airtightness by applying a vacuum with voltage applied directly from the battery to the EGR control solenoid valve and without applying voltage.

Battery voltage	Normal condition
Not applied	Vacuum leaks
Applied	Vacuum maintained



5. Measure the resistance between the terminals of the solenoid valve.

Standard value: 36 - 44 Ω [at 20°C (68°F)]

CATALYTIC CONVERTER

17300530116

GENERAL INFORMATION

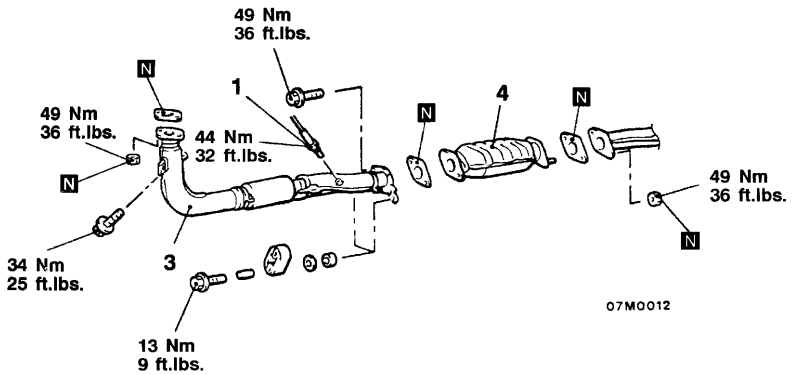
The three-way catalytic converter, together with the closed loop air-fuel ratio control based on the oxygen sensor signal, oxidizes carbon monoxides (CO) and hydrocarbons (HC) and reduces nitrogen oxides (NOx).

When the mixture is controlled at stoichiometric air-fuel ratio, the three-way catalytic converter provides the highest purification against the three constituents, namely, CO, HC and NOx.

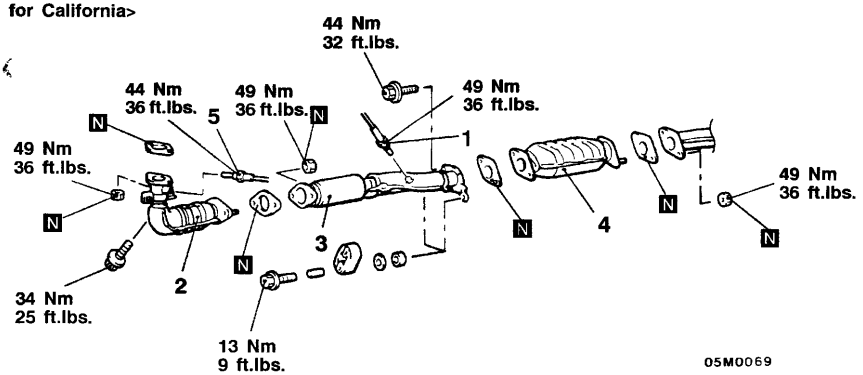
REMOVAL AND INSTALLATION

17300390134

<Vehicles for Federal>

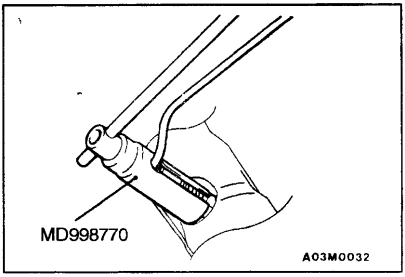


<Vehicles for California>



Removal steps

◀A▶ ▶A◀ 1. Heated oxygen sensor
2. Front catalytic converter
3 Front exhaust pipe
4. Rear catalytic converter
◀A▶ ▶A◀ 5. Heated oxygen sensor



REMOVAL SERVICE POINT

◀A▶ HEATED OXYGEN SENSOR REMOVAL

INSTALLATION SERVICE POINT

▶A◀ HEATED OXYGEN SENSOR REMOVAL

INSPECTION

17300400011

Inspect for damage, cracking or deterioration. Replace if faulty.

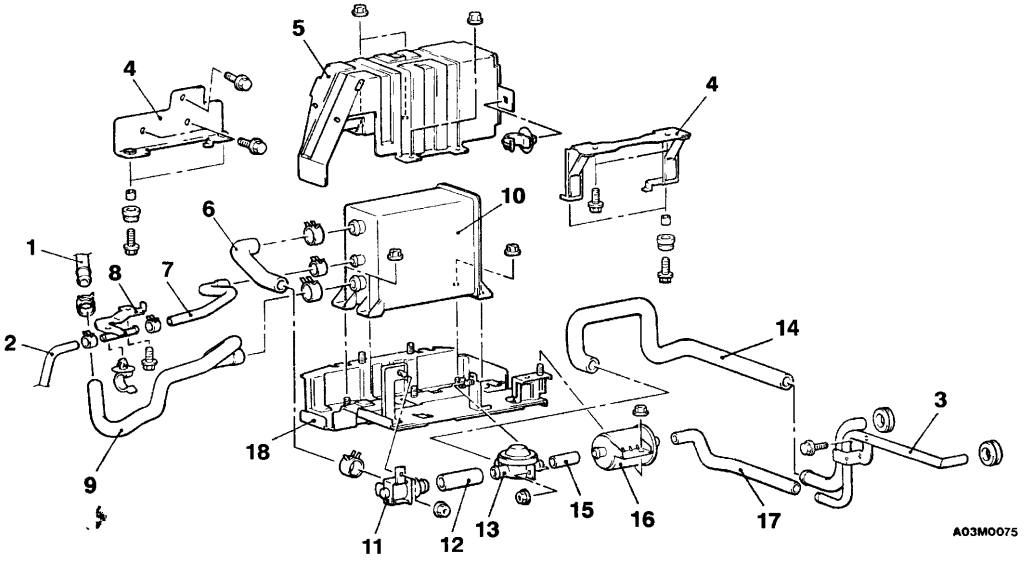
Caution

1. **Stop the engine immediately if engine misfiring occurs, otherwise an abnormally hot exhaust system will damage the catalytic converter or other underbody parts.**
2. **Correct and repair the ignition or fuel system if there are malfunctions, otherwise engine misfiring may occur which will damage the catalytic converter.**
3. **Observe manufacturer's specifications when doing service work.**

EVAPORATIVE EMISSION CANISTER/AIR FILTER/EVAPORATIVE VENTILATION SOLENOID

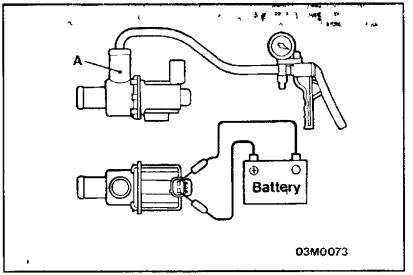
17300480251

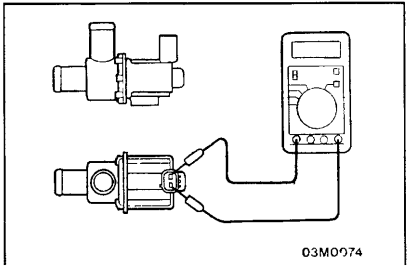
REMOVAL AND INSTALLATION



Removal steps

1. Leveling pipe connection
2. Purge hose connection
3. Vent pipe
4. Canister bracket
5. Canister upper cover
6. Vent hose A
7. Purge hose
8. Purge pipe assembly
9. Vapor hose
10. Evaporative emission canister assembly
11. Evaporative emission ventilation solenoid
12. Vent hose B
13. Vent valve
14. Vent hose C
15. Vent hose D
16. Air filter
17. Vent hsoe E
18. Canister lower cover





INSPECTION

17300460101

EVAPORATIVE EMISSION VENTILATION SOLENOID CHECK

(1) Connect a hand vacuum pump to nipple (A) of the solenoid.

(2) Check airtightness by applying a vacuum with voltage applied directly from the battery to the evaporative emission ventilation solenoid and without applying voltage.

Battery voltage	Normal condition
Applied	Vacuum maintained
Not applied	Vacuum leaks

(3) Measure the resistance between the terminals of the solenoid.

Standard value: 17 - 21 Ω [at 20°C (68°F)]

CLUTCH

CONTENTS

21109000060

CLUTCH 21A

CLUTCH OVERHAUL 21B

CLUTCH

CONTENTS

21109000022

CLUTCH CONTROL 9

CLUTCH PEDAL 8

GENERAL INFORMATION 3

LUBRICANTS 4

ON-VEHICLE SERVICE 5

Bleeding 7

Clutch Pedal Check and Adjustment 5

Interlock Switch Check and Adjustment 7

Interlock Switch Operating Check 6

SERVICE SPECIFICATIONS 4

TROUBLESHOOTING 4

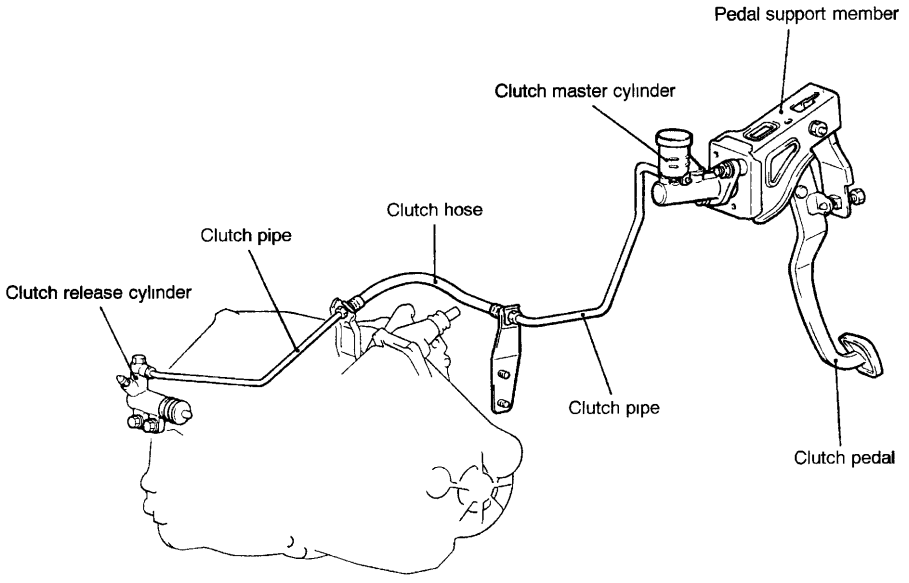
GENERAL INFORMATION

21100010109

The clutch is a dry single-disc, diaphragm type; hydraulic pressure is used for the clutch control.

Items		Specifications
Clutch operating method		Hydraulic type
Clutch disc type		Single dry disc type
Clutch disc facing diameter O.D.×I.D. mm (in.)	1.5L Engine	200×130 (7.8×5.1)
	1.8L Engine	215×140 (8.4×5.5)
Clutch cover type		Diaphragm spring strap drive type
Clutch cover setting load N (lbs.)		4,600 (1,014)
Clutch release cylinder I.D. mm (in.)		20.64 (13/16)
Clutch master cylinder I.D. mm (in.)		15.87 (10/16)

CONSTRUCTION DIAGRAM



SERVICE SPECIFICATIONS

21100030105

Items	Standard value
Clutch pedal height mm (in.)	163.5 - 166.5 (6.43 - 6.55)
Clutch pedal clevis pin play mm (in.)	1 - 3 (.04 - .12)
Clutch pedal free play mm (in.)	6 - 13 (.24 - .51)
Distance between the clutch pedal and the firewall when the clutch is disengaged mm (in.)	70 (2.7) or more

LUBRICANTS

21100040016

Items	Specified lubricants	Quantity
Clutch fluid	Brake fluid DOT3 or DOT4	As required
Push rod assembly	Rubber grease	As required
Boot		
Release cylinder push rod	MITSUBISHI genuine grease Part No. 0101011	As required

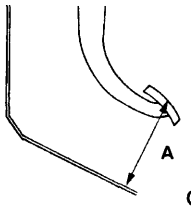
TROUBLESHOOTING

21100070015

Symptom	Probable cause	Remedy
Clutch slips	Insufficient clutch pedal play	Adjust
	Excessive wear of clutch disc facing	Replace
	Hardening of clutch disc facing, or adhesion of oil	Replace
	Clutch release fork catching	Repair or replace parts
	Weak or damaged diaphragm spring	Replace
	Clogging of hydraulic system	Repair or replace parts
Gear shift malfunction	Excessive clutch pedal play	Adjust
	Distorted clutch disc, excessive oscillation	Replace
	Clutch cover assembly worn	Replace
	Clutch disc spline worn or corroded	Replace
	Clutch disc facing peeling	Replace
	Clutch release bearing worn	Replace
	Damaged pressure plate or flywheel	Replace
	Leakage, air mix or clogging of hydraulic system	Repair or replace parts

Symptom	Probable cause	Remedy
Clutch noise	Insufficient clutch pedal play	Adjust
	Improper installation of clutch cover assembly	Repair or replace parts
	Excessive wear of clutch disc facing	Replace
	Clutch release fork catching	Repair or replace parts
	Clutch release bearing worn	Replace
	Weak or damaged torsion spring	Replace
	Damaged pilot bushing	Replace
	Insufficient lubrication of bearing sleeve sliding surface	Repair
Clutch pedal feels "heavy"	Insufficient lubrication of clutch pedal	Repair
	Insufficient lubrication of clutch disc spline	Repair
	Clutch release fork catching	Repair or replace parts
	Insufficient lubrication of bearing sleeve sliding surface	Repair
Worn or damaged clutch disc facing	Worn or damaged clutch disc facing	Replace
	Oil adhered to clutch disc facing	Replace
	Uneven height of diaphragm spring	Repair or replace parts
	Weak or damaged torsion spring	Replace
	Damaged pressure plate or flywheel	Replace
	Loose or damaged mounting	Replace or tighten mounting

Clutch pedal height



C14W0001

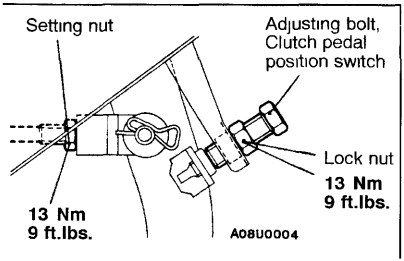
ON-VEHICLE SERVICE

21100090110

CLUTCH PEDAL CHECK AND ADJUSTMENT

1. Turn back the carpet, etc. under the clutch pedal.
2. Measure the clutch pedal height.

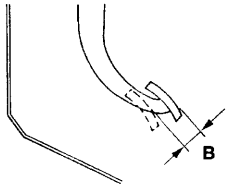
   Standard value (A):
   163.5 - 166.5 mm (6.43 - 6.55 in.)



3. If the height of the clutch pedal is not within the standard value, loosen the lock nut and adjust the pedal height to the standard value using the adjusting bolt (Vehicles without auto-cruise control system) or clutch pedal position switch (Vehicles with auto-cruise control system) or push rod.

   Caution
   Do not push in the master cylinder push rod at this time.

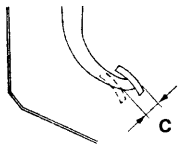
Clutch pedal clevis pin play



A14W0002

4. Measure the clutch pedal play.
   Standard value (B): 1 - 3 mm (.04 - .12 in.)
5. If the clutch pedal play is not within the standard value, loosen the setting nut and move the push rod to adjust.
   Caution
   Do not push in the master cylinder push rod at this time.

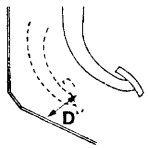
Clutch pedal free play



14W0002

6. After completing the adjustments, confirm that the clutch pedal free play (measured at the face of the pedal pad) and the distance between the clutch pedal (the face of the pedal pad) and the firewall when the clutch is disengaged are within the standard value ranges.
   Standard value (C; including the clevis pin play): 6-13 mm (.24 - .51 in.)
   Standard value (D): 70 mm (2.7 in.) or more
7. If the clutch pedal free play and the distance between the clutch pedal and the firewall when the clutch is disengaged do not agree with the standard values, it is probably the result of either air in the hydraulic system or a faulty master cylinder, release cylinder or clutch. Bleed the air, or disassemble and inspect the master cylinder, release cylinder or clutch.
8. Put back the carpet, etc.

Distance between the clutch pedal and the firewall when the clutch is disengaged

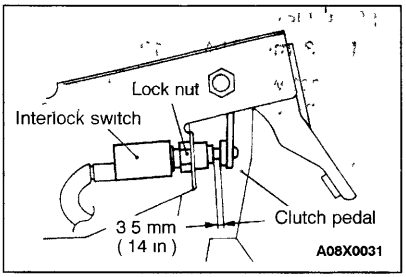


14W0003
00003373

INTERLOCK SWITCH OPERATING CHECK

21100100011

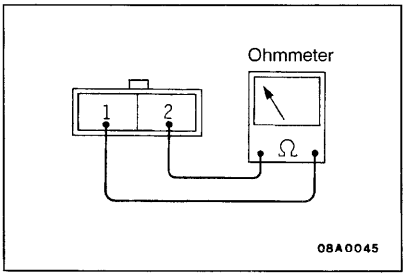
1. Lock the front wheels, apply the parking brake and put the shift lever in the 5th gear.
2. After normally adjusting the clutch pedal, check the interlock switch operation as follows:
   (1) The engine should not start even if the ignition switch is turned to "START" position unless the clutch pedal is depressed. If the engine should start, check the interlock switch and the harness.
   (2) The engine should start after the clutch has completely disengaged while the clutch pedal is depressed with the ignition switch turned to "START" position.
   If the engine should start before the clutch is disengaged or the engine does not start even if the clutch pedal is depressed, adjust the interlock switch.



INTERLOCK SWITCH CHECK AND ADJUSTMENT

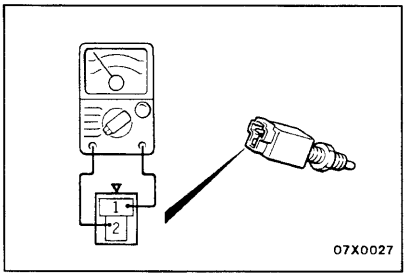
21100110052

1. Adjust the clutch pedal. (Refer to P.21A-5.)
2. Check to be sure that the interlock switch is as shown in the illustration when the clutch pedal is depressed at its full stroke [143 mm (5.6 in.)]. If necessary, loosen the lock nut and adjust.



3. Connect an ohmmeter to the interlock switch connector, and then check for continuity when the clutch pedal is fully depressed and when it is released outward.

Pedal position	Terminal No.	
	1	2
fully depressed		
released	○	○

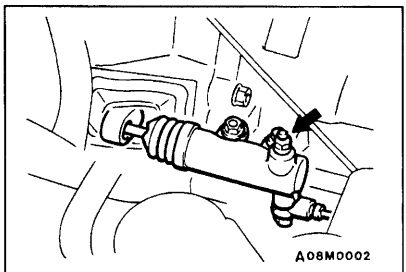


CLUTCH PEDAL POSITION SWITCH CONTINUITY CHECK

21100310018

1. Adjust the clutch pedal. (Refer to P.21A-5.)
2 Operate the clutch pedal, and check continuity between the terminals.

Measurement conditions	Terminal No.	
	1	2
When clutch pedal depressed	○	○
When clutch pedal not depressed		



BLEEDING

21100140099

Specified fluid: Brake fluid DOT 3 or DOT 4

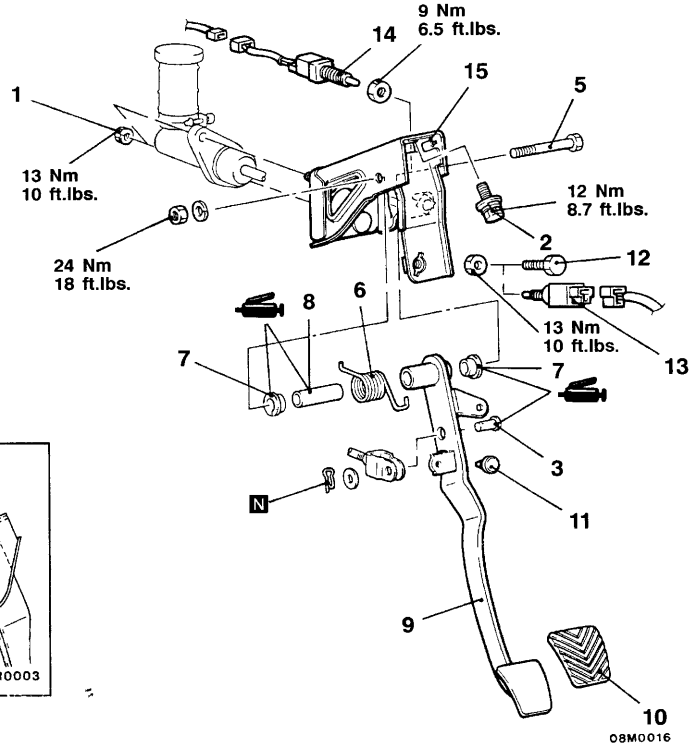
Caution
Use the specified brake fluid. Avoid using a mixture of the specified fluid and other fluid.

CLUTCH PEDAL

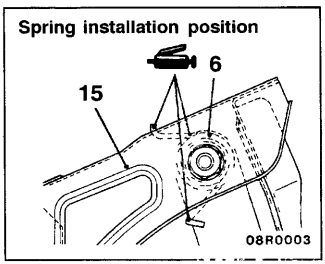
21100150156

REMOVAL AND INSTALLATION

Post-installation Operation
Clutch Pedal Adjustment (Refer to P21A-5)



00004773



Removal steps

1. Clutch master cylinder installation nut
2. Master cylinder member bracket installation nut
3. Clevis pin
4. Pedal support member and clutch pedal assembly
5. Bolt
6. Return spring
7. Bushing
8. Pipe
9. Clutch pedal
10. Pedal pad
11. Stopper
12. Adjusting bolt
13. Clutch switch <Vehicles with auto-cruise control system>
14. Interlock switch
15. Pedal support member

INSPECTION

21100170074

- Check the pedal shaft and bushing for wear.
- Check the clutch pedal for bend or torsion.
- Check the return spring for damage or deterioration.
- Check the pedal pad for damage or wear.

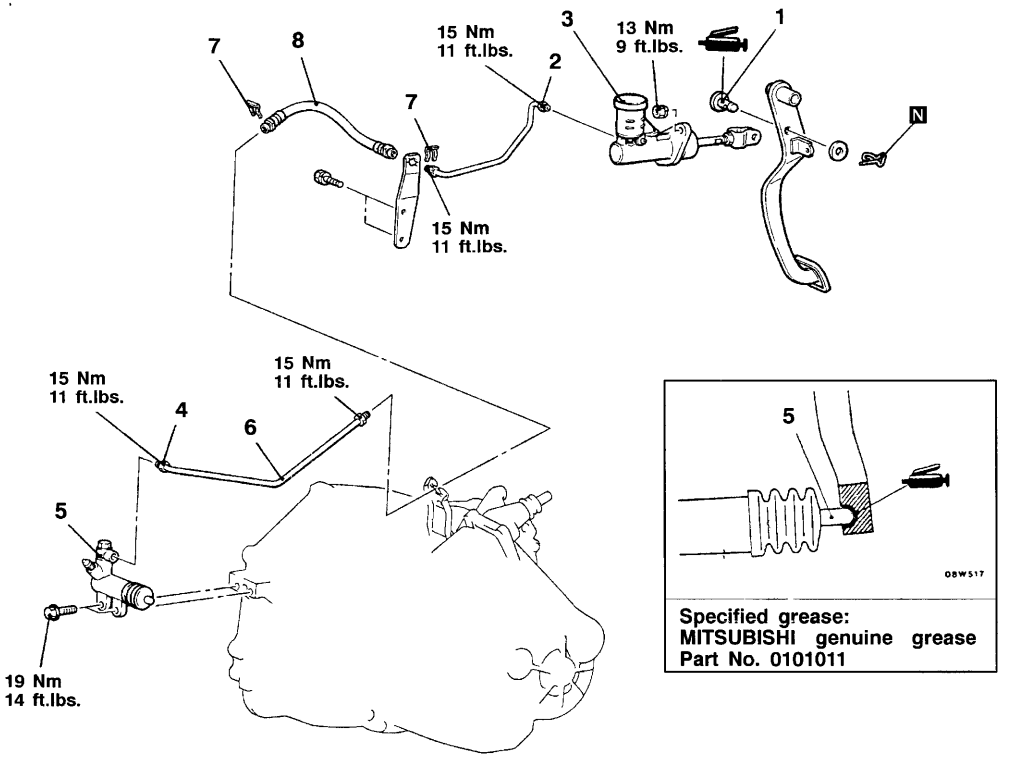
CLUTCH CONTROL

21100190148

REMOVAL AND INSTALLATION

Pre-removal Operation
- Clutch Fluid Draining
- Air Cleaner Removal

Post-installation Operation
- Air Cleaner Installation
- Clutch Fluid Supplying
- Clutch Line Bleeding (Refer to P21A-7)
- Clutch Pedal Adjustment (Refer to P21A-5)



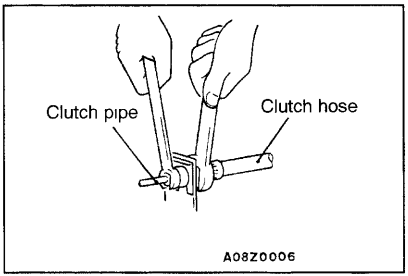
Specified grease:
MITSUBISHI genuine grease
Part No. 0101011

08M0016 00004774

Clutch master cylinder removal steps
1. Clevis pin
2. Clutch pipe connection
3. Clutch master cylinder

Clutch release cylinder removal steps
4. Clutch pipe connection
5. Clutch release cylinder

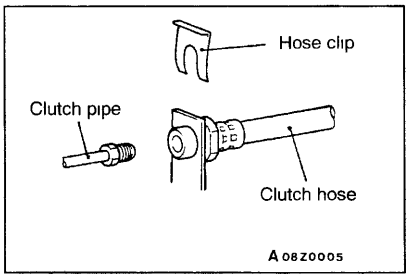
Clutch line removal steps
◀A▶ ▶A◀ 6. Clutch pipe
7. Hose clip
◀A▶ ▶A◀ 8. Clutch hose



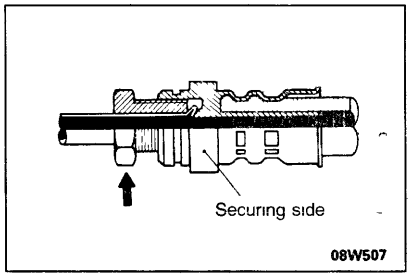
REMOVAL SERVICE POINTS

◀A▶ CLUTCH PIPE/CLUTCH HOSE DISCONNECTION

1. Secure the nut on the clutch hose and loosen the flare nut on the clutch pipe.



2. Remove the hose clip from the clutch hose to remove clutch hose from bracket.



INSTALLATION SERVICE POINT

▶A◀ CLUTCH HOSE/CLUTCH PIPE INSTALLATION

1. Temporarily tighten the clutch pipe flare nut by hand, and then tighten it to the specified torque. Being careful that the clutch hose does not become twisted.
2. After tightening the clutch pipe flare nut and eye bolt, check to be sure there is no leakage of the clutch fluid.

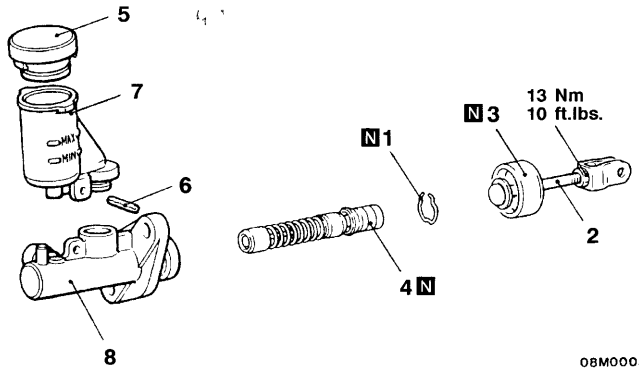
INSPECTION

21100200049

- Check the pedal shaft bushing for wear.
- Check the pedal arm for bend or torsion.
- Check the master cylinder or clutch hose for fluid leakage.
- Check the clutch hose or pipe for cracks or clogging.

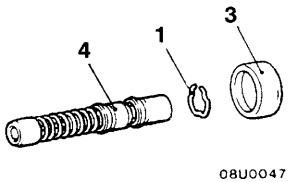
CLUTCH MASTER CYLINDER
DISASSEMBLY AND REASSEMBLY

21100210110



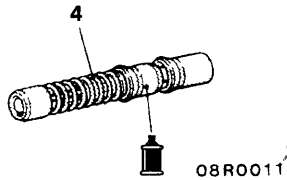
08M0003

00004610



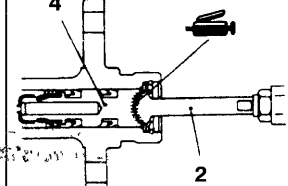
08U0047

Piston repair kit



08R0011

Clutch fluid:
Brake fluid DOT3 or DOT4



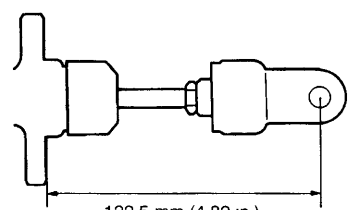
08R0007

Grease: Rubber grease

Disassembly steps

1. Piston stopper ring
▶A◀ 2. Push rod assembly
3 Boot
4 Piston assembly
5 Reservoir cap
6 Spring pin
7. Reservoir tank
8. Clutch master cylinder body

Caution
Do not disassemble the piston assembly.



08Z0004

INSTALLATION SERVICE POINT

◀A▶ PUSH ROD ASSEMBLY INSTALLATION

Set the length of the push rod assembly to the shown dimension to make the adjustment of the clutch pedal easier.

INSPECTION

21100220052

- Check the inside cylinder body for rust or scars.
- Check the piston cup for wear or deformation.
- Check the piston for rust or scars.
- Check the clutch pipe connection for clogging.

CLUTCH OVERHAUL

CONTENTS

21209000100

CLUTCH **3**

CLUTCH RELEASE CYLINDER **7**

SPECIFICATIONS **2**

General Specifications 2
Lubricants 2
Service Specifications 2
Torque Specifications 2

SPECIFICATIONS

21200020020

GENERAL SPECIFICATIONS

Items	F5M41	F5M42
Clutch operating method	Hydraulic type	Hydraulic type
Clutch disc type	Single dry disc type	Single dry disc type
Clutch disc size O.D. × I D. mm (in)	200 × 130 (7 87 × 5.12)	215 × 140 (8.46 × 5.51)
Clutch cover type	Diaphragm spring type	Diaphragm spring type
Clutch cover setting load N (lbs.)	4193 (937)	4539 (1014)
Clutch release cylinder I D. mm (in)	20 64 (13/16)	20 64 (13/16)

SERVICE SPECIFICATIONS

21200030085

Items	Specifications (limit)
Clutch disc facing rivet sink mm (in.)	0 3 (0 012)
Diaphragm spring end height difference mm (in.)	0.5 (0 020)
Release cylinder I.D. to piston O.D. clearance mm	0.15 (0.0059)

TORQUE SPECIFICATIONS

21200180032

Items	Nm	ft.lbs.
Clutch tube flare nut	15	11
Clutch fluid line bracket	18	14
Clutch release cylinder union bolt	22	17
Clutch release cylinder air bleeder	11	8
Clutch release cylinder mounting bolt	18	14
Fulcrum	35	26

LUBRICANTS

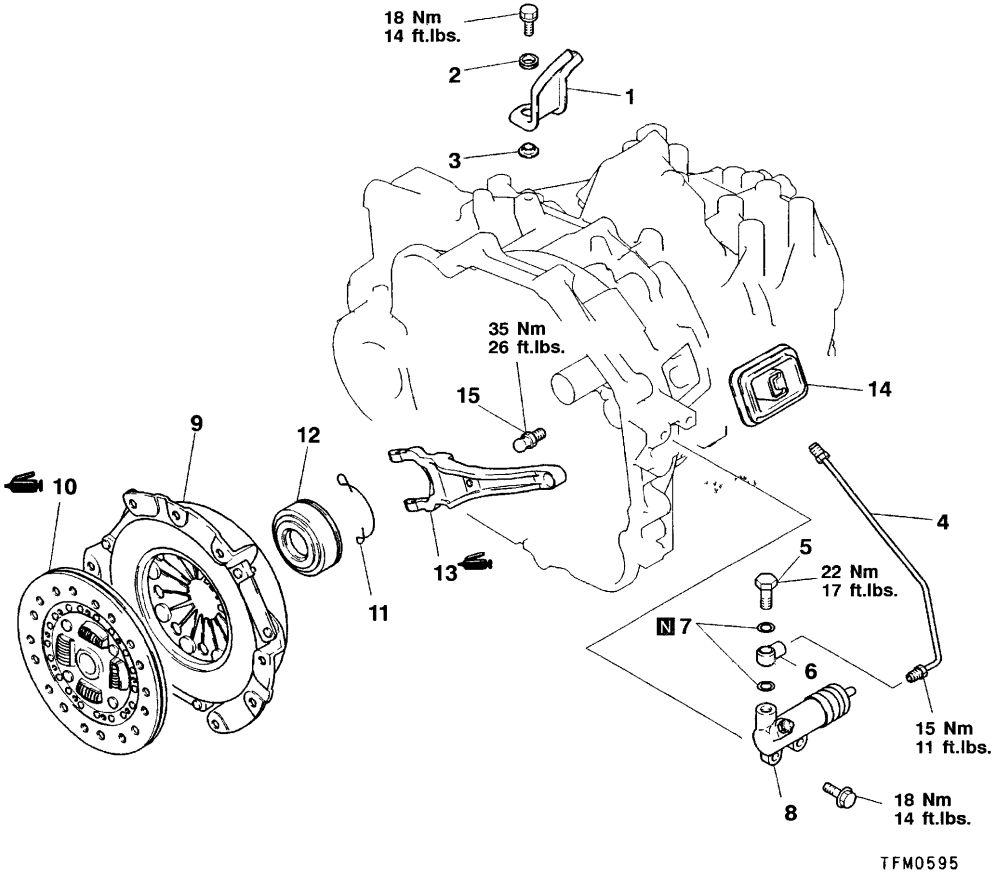
21200040071

Items	Specified lubricants
Release fork and fulcrum contact surface	MITSUBISHI genuine grease Part No 0101011 or equivalent
Release fork and release cylinder push rod contact surface	
Release fork and release bearing contact surface	
Piston and piston cup O D.	Brake fluid SAE J1703 (DOT3)
Release cylinder I D.	

CLUTCH

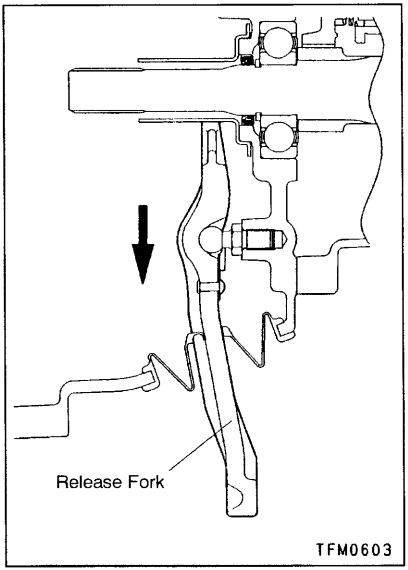
21200100090

REMOVAL AND INSTALLATION



Removal steps

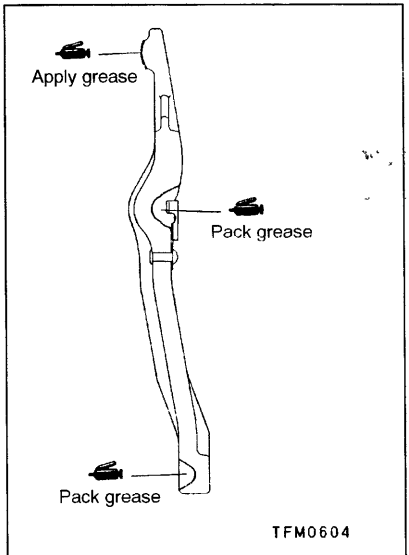
1. Clutch fluid line bracket
2. Insulator
3. Washer
4. Clutch tube
5. Union bolt
6. Union
7. Gasket
8. Clutch release cylinder
9. Clutch cover
▶B◀ 10. Clutch disc
11. Return clip
12. Clutch release bearing
◀A▶ ▶A◀ 13. Release fork
14. Release fork boot
15. Fulcrum



REMOVAL SERVICE POINT

◀A▶ RELEASE FORK REMOVAL

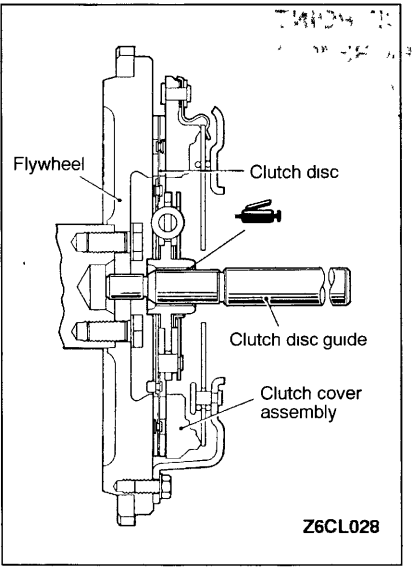
(1) Move the release fork in the direction shown to remove the clip from the fulcrum.



INSTALLATION SERVICE POINTS

▶A◀ GREASE APPLICATION TO RELEASE FORK

Specified grease:
MITSUBISHI genuine grease part No.0101011 or equivalent



▶B◀ CLUTCH DISC INSTALLATION

(1) Apply the specified grease to the clutch disc splines and rub it in the splines with a brush.

Specified grease:
MITSUBISHI genuine grease part No.0101011 or equivalent

(2) Using the clutch disc guide to position the clutch disc on the flywheel.

INSPECTION

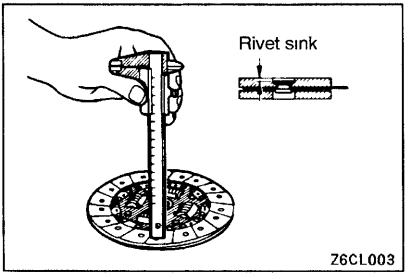
21200110062

CLUTCH COVER

(1) Check the diaphragm spring end for wear and uneven height. Replace if wear is evident or height difference exceeds the limit.

Limit: 0.5 mm (0.020 in.)

(2) Check the pressure plate surface for wear, cracks and discoloration.
(3) Check the rivets of the strap plate for looseness. If loose, replace the clutch cover.



CLUTCH DISC

Caution
Don't immerse and clean the clutch disc in a cleaning solvent.

(1) Check the facing for loose rivets, uneven contact, evidence of seizure, or deposited oils and greases. If defective, replace the clutch disc.
(2) Measure the rivet sink and replace the clutch disc if it is out of specification.

Limit: 0.3 mm (0.012 in.)

(3) Check the torsion spring for looseness and damage. If defective, replace the clutch disc.
(4) Combine the clutch disc with the input shaft and check for sliding condition and play in the rotating direction. If poor sliding condition is evident, clean, reassemble, and recheck.
If excessive looseness is evident, replace the clutch disc and/or input shaft.

CLUTCH RELEASE BEARING

Caution
Release bearing is packed with grease. Therefore, do not immerse and clean it in a cleaning solvent.

(1) Check for seizure, damage, noise or improper rotation.
(2) Check for wear on the surface which contacts with the diaphragm spring.
(3) Check for wear on the surface which contacts with release fork. If abnormally worn, replace.

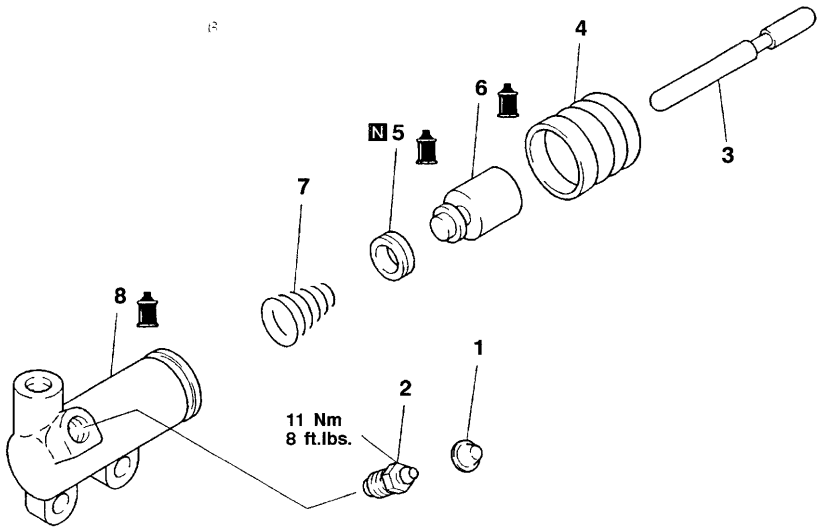
RELEASE FORK

If the surface which contacts with the bearing is abnormally worn, replace.

CLUTCH RELEASE CYLINDER

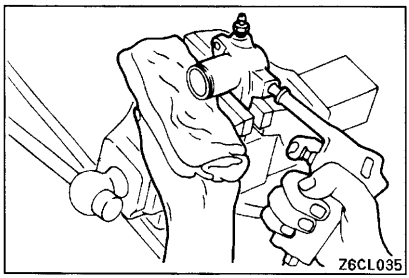
21200150088

DISASSEMBLY AND REASSEMBLY



Disassembly steps

1 Cap
2 Air bleeder
3. Push rod
4 Boot
◀A▶ ▶A◀ 5. Piston cup
◀A▶ ▶A◀ 6. Piston
7. Conical spring
8 Release cylinder



DISASSEMBLY SERVICE POINT

◀A▶ PISTON CUP/PISTON REMOVAL

(1) Remove the piston from the release cylinder using compressed air.

Caution

1. **Cover with shop towel to prevent the piston from popping out.**
2. **Apply compressed air slowly to prevent brake fluid from splashing.**

REASSEMBLY SERVICE POINT

▶A◀ PISTON/PISTON CUP INSTALLATION

(1) Apply brake fluid to the bore of the release cylinder, and immerse the piston and piston cup in a brake fluid.
(2) Insert the piston and piston cup into the cylinder.

Specified brake fluid:
Brake fluid SAE J1703 (DOT3)

INSPECTION

21T20160067

(1) Check the bore of the release cylinder for rust, scratches or damage.
(2) Using a cylinder gauge, measure the inside diameter of the release cylinder at about three positions (the deepest, middle and trim positions). If the clearance from the outside diameter of the piston exceeds the limit, replace the release cylinder as an assembly.

Limit: 0.15 mm (0.0059 in.)

MANUAL TRANSAXLE

CONTENTS

22109000111

MANUAL TRANSAXLE 22A

MANUAL TRANSAXLE OVERHAUL 22B

MANUAL TRANSAXLE

CONTENTS

22109000180

GENERAL INFORMATION 3
LUBRICANT 6
ON-VEHICLE SERVICE 7
Transmission Oil Level Check 7
Transmission Oil Replacement 7
SERVICE SPECIFICATION 6
SPECIAL TOOLS 6
TRANSAXLE ASSEMBLY 11
TRANSAXLE CONTROL* 8
Shift Lever Assembly 10
TROUBLESHOOTING 7

WARNINGS REGARDING SERVICING OF SUPPLEMENTAL RESTRAINT SYSTEM (SRS) EQUIPPED VEHICLES

WARNING!

(1) **Improper service or maintenance of any component of the SRS, or any SRS-related component, can lead to personal injury or death to service personnel (from inadvertent firing of the air bag) or to the driver and passenger (from rendering the SRS inoperative).**
(2) **Service or maintenance of any SRS component or SRS-related component must be performed only at an authorized MITSUBISHI dealer.**
(3) **MITSUBISHI dealer personnel must thoroughly review this manual, and especially its GROUP 52B - Supplemental Restraint System (SRS) and GROUP 00 - Maintenance Service, before beginning any service or maintenance of any component of the SRS or any SRS-related component.**

NOTE

The SRS includes the following components:, SRS-ECU, SRS warning light, air bag module, clock spring, and interconnecting wiring Other SRS-related components (that may have to be removed/installed in connection with SRS service or maintenance) are indicated in the table of contents by an asterisk (*)

GENERAL INFORMATION

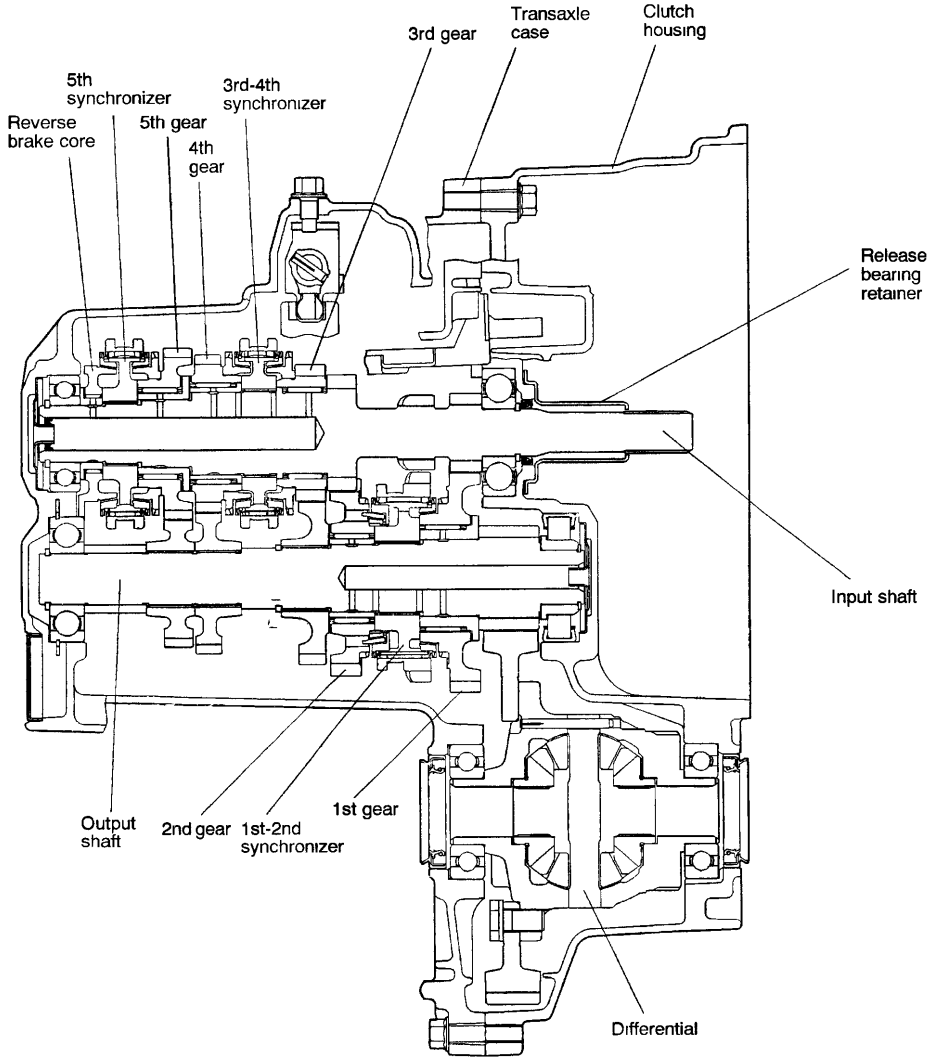
22100010182

The new F5M41 and F5M42 manual transaxles are used. These quieter units have high performance, high reliability, and are smooth shifting.

Item		Specifications	
Model		F5M41-1-F8A4	F5M42-1-F8A7
Applicable engine		4G15	4G93
Type		5-speed floor shift	5-speed floor shift
Gear ratio	1st	3.583	3.583
	2nd	1 947	1 947
	3rd	1.343	1.379
	4th	0.976	1.030
	5th	0 804	0 767
	Reverse	3.416	3.363
Final gear ratio		3 714	3.722
Speedometer gear ratio (driven/drive)		31/36	31/36

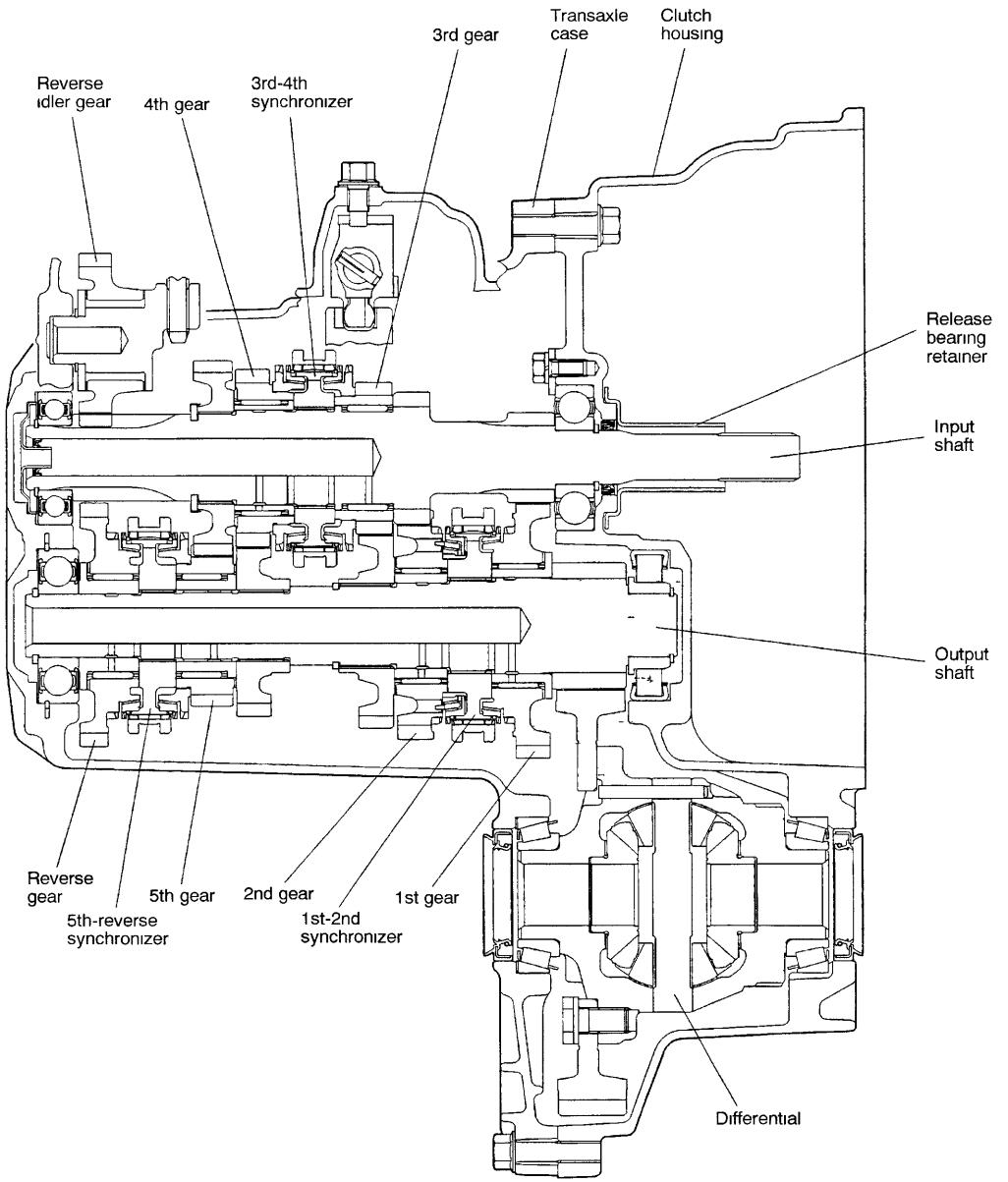
SECTIONAL VIEW

F5M41



SECTIONAL VIEW

F5M42



SERVICE SPECIFICATION

22100030034

Item	Standard value
Protruding length of stabilizer bar mounting bolt mm (in.)	22 (87)

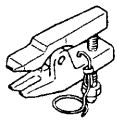
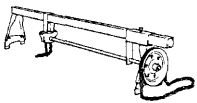
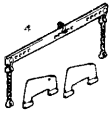
LUBRICANT

22100040136

Item	Specified lubricant	Quantity dm^3 (qts.)
Transmission oil	API classification GL-4, SAE 75W - 90 or 75W - 85W	2.1 (2.2) <F5M41>
		2.1 (2 3) <F5M42>

SPECIAL TOOLS

22100060118

Tool	Tool number and name	Supersession	Application
 B991113	MB991113 Steering linkage puller	MB991113-01	Tie rod end and lower arm disconnection
 Z203827	GENERAL SERVICE TOOL MZ203827 Engine lifter	General service tool	Supporting the engine assembly during removal and installation of the transaxle
 B991453	MB991453 Engine hanger		

TROUBLESHOOTING

22100070050

Symptom	Probable cause	Remedy
Vibration, noise	a. Loose or damaged transaxle and engine mounts	a Tighten or replace mounts
	b. Inadequate shaft end play	b. Correct the end play
	c. Worn or damaged gears	c. Replace gears
	d. Use of inadequate grade of oil	d. Replace with specified oil
	e Low oil level	e. Refill
	f. Inadequate engine idle speed	f. Adjust the idle speed
Oil leakage	a. Broken or damaged, oil seal or O-ring	a. Replace the oil seal or O-ring
Hard shift	a. Faulty control cable	a. Replace the control cable
	b. Poor contact or wear of synchronizer ring and gear cone	b. Correct or replace
	c. Weakened synchronizer spring	c. Replace synchronizer spring
	d Use of inadequate grade of oil	d Replace with the specified oil
Jumps out of gear	a. Worn gear shift fork or broken poppet spring	a. Replace the shift fork or poppet spring
	b. Synchronizer hub to sleeve spline clearance too large	b. Replace the synchronizer hub and sleeve

ON-VEHICLE SERVICE

22100090261

TRANSMISSION OIL LEVEL CHECK

Refer to GROUP 00 - Maintenance Service.

TRANSMISSION OIL REPLACEMENT

22100100261

Refer to GROUP 00 - Maintenance Service.

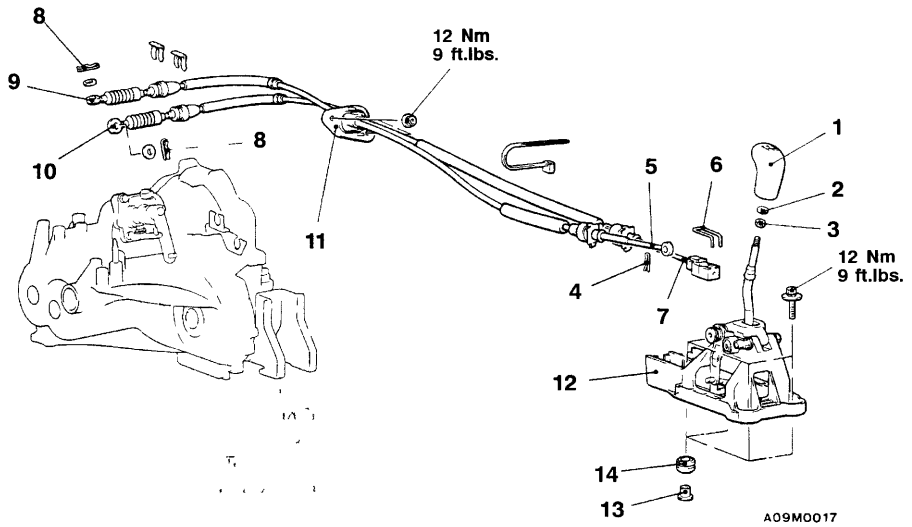
TRANSAXLE CONTROL

22100380122

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
Air Cleaner Assembly Removal and Installation

Caution: SRS
Be careful not to subject the SRS-ECU to any shocks during removal and installation of the shift cable and select cable assembly.

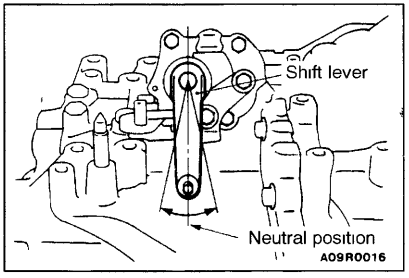


Shift cable and select cable assembly removal steps

- ▶B◀ 1. Shift knob
- ▶B◀ 2. Spring washer
- ▶B◀ 3. Nut
  - Front floor console (Refer to GROUP 52A.)
- 4. Snap pin
- 5 Select cable connection (Shift lever side)
- 6 Clip
- 7 Shift cable connection (Shift lever side)
- 8. Snap pin
- ▶A◀ 9 Select cable connection (Transaxle side)
- ▶A◀ 10. Shift cable connection (Transaxle side)
- ▶A◀ 11 Shift cable and select cable assembly

Shift lever assembly removal steps

- ▶B◀ 1 Shift knob
- ▶B◀ 2 Spring washer
- ▶B◀ 3. Nut
  - Front floor console (Refer to GROUP 52A.)
- 4. Snap pin
- 5. Select cable connection (Shift lever side)
- 6. Clip
- 7. Shift cable connection (Shift lever side)
- 12. Shift lever assembly
- 13. Distance piece
- 14. Bushing



INSTALLATION SERVICE POINTS

▶A◀ SHIFT CABLE AND SELECT CABLE ASSEMBLY/ SHIFT CABLE CONNECTION/SELECT CABLE CONNECTION

(1) Set the transaxle side shift lever and the passenger compartment side shift lever to the neutral position.

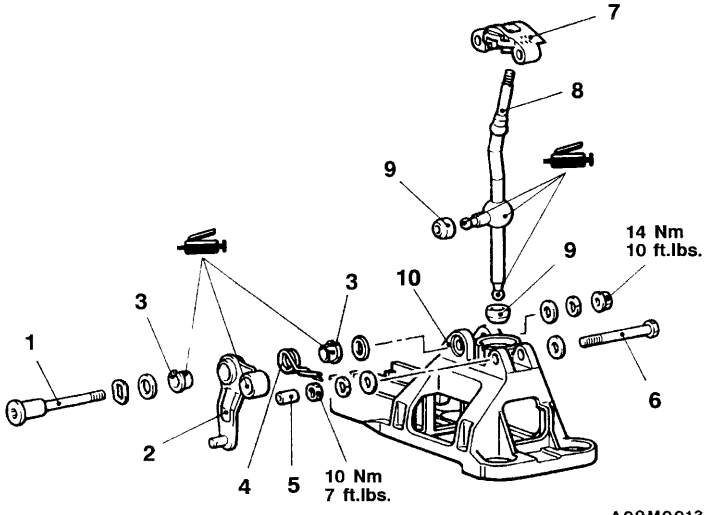
(2) For the transaxle side, the white and yellow paint marks on the shift and select cable ends should face the snap pins.
(3) Move the shift lever to all positions and check for smooth operation.

▶B◀ NUT/SPRING WASHER/SHIFT KNOB INSTALLATION

(1) Screw in the nut all the way by hand, turn back half a turn, and then insert the spring washer.
(2) Screw in the shift knob until it touches the spring washer, and make one more turn. Then turn more to adjust the shift pattern on the shift knob.
(3) If the above steps are impossible, you can turn the shift knob back by no more than one turn (after screwing in all the way) to adjust the shift pattern.

SHIFT LEVER ASSEMBLY DISASSEMBLY AND REASSEMBLY

22100A00088



Disassembly steps

1. Bolt
2. Select lever
3. Bushing
4. Return spring
5. Collar
6. Bolt
7. Cap
8. Shift lever
9. Shift lever bushing
10. Base block

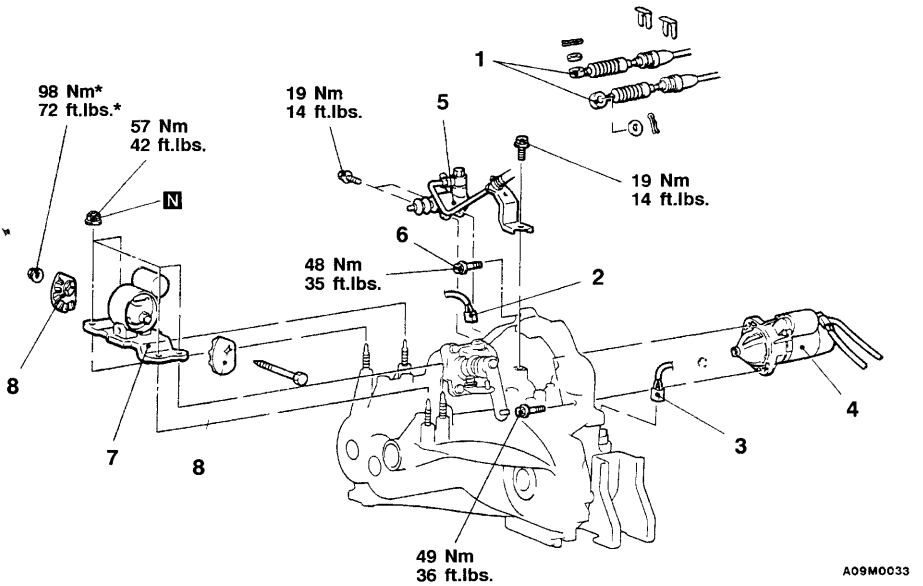
TRANSAXLE ASSEMBLY

22100270351

REMOVAL AND INSTALLATION

Pre-removal Operation
(1) Transaxle Oil Draining
(Refer to GROUP 00 - Maintenance Service)
(2) Under Cover Removal
(3) Battery and Battery Tray Removal
(4) Air Cleaner Assembly Removal

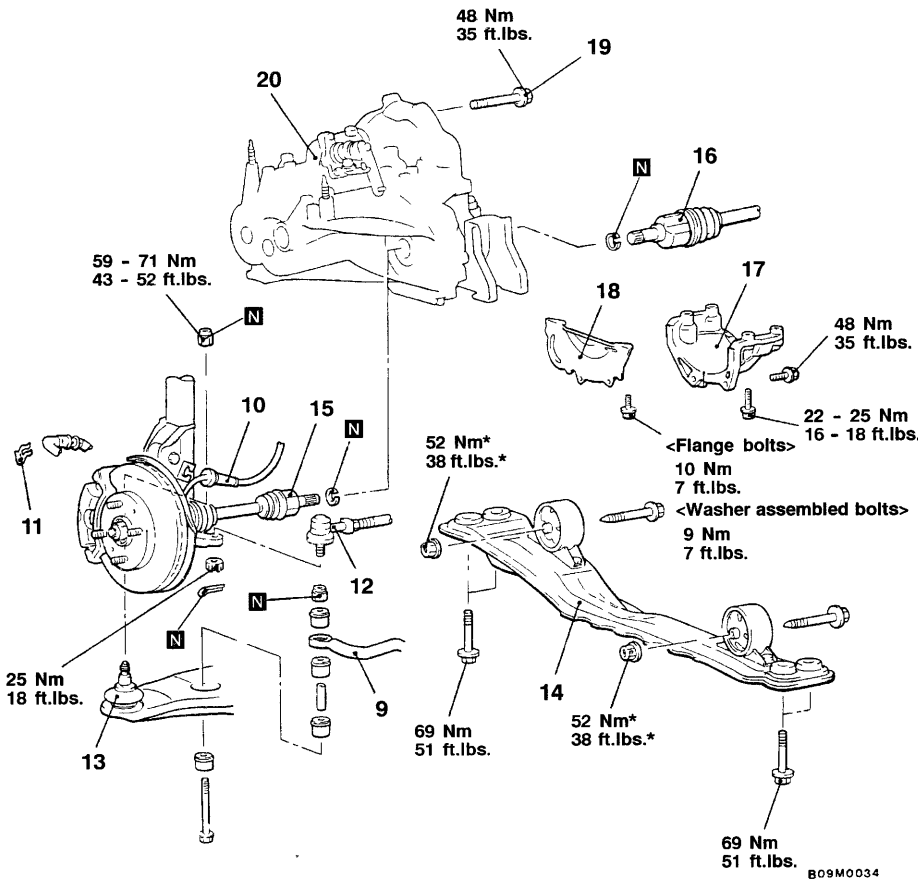
Post-installation Operation
(1) Air Cleaner Assembly Installation
(2) Battery and Battery Tray Installation
(3) Under Cover Installation
(4) Transaxle Oil Supplying
(Refer to GROUP 00 - Maintenance Service)
(5) Shift Lever Operation Check
(6) Speedometer Operation Check
(7) Press the dust cover with a finger to check whether the dust cover is cracked or damaged



Removal steps

1. Shift cable and select cable connection (Refer to P 22A-8)
2. Backup light switch connector
3. Vehicle speed sensor connector
◀A▶ 4. Starter motor
◀B▶ 5. Clutch release cylinder connection
6. Transaxle assembly upper part coupling bolts
◀C▶ 7. Transaxle mount bracket
▶B◀ 8. Transaxle mount stopper
◀D▶ • Engine assembly supporting

Caution
Mounting locations marked by * should be provisionally tightened, and then fully tightened when the body is supporting the full weight of the engine.



Lifting up of the vehicle

▶A◀ 9. Stabilizer bar connection
10. Wheel speed sensor cable connection <Vehicles with ABS>
11 Brake hose clamp
◀E▶ 12. Tie rod end connection
◀E▶ 13. Lower arm ball joint connection
14. Centermember assembly
◀F▶ 15 Drive shaft <LH> connection
◀F▶ 16. Drive shaft <RH> connection
17 Transaxle stay <Except 1.5L engine>
18. Bell housing cover
19. Transaxle assembly lower part coupling bolts
◀G▶ 20 Transaxle assembly

Caution
Mounting locations marked by * should be provisionally tightened, and then fully tightened when the body is supporting the full weight of the engine.

REMOVAL SERVICE POINTS

◀A▶ STARTER MOTOR REMOVAL

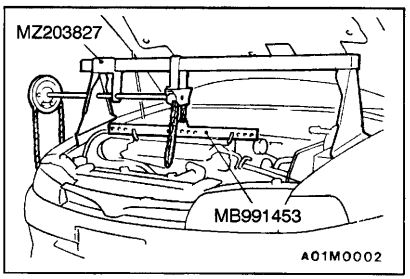
Remove the starter motor with the starter motor harness still connected and secure it inside the engine compartment.

◀B▶ CLUTCH RELEASE CYLINDER REMOVAL

Remove the clutch release cylinder without disconnecting the oil line connection, and fix it to the vehicle chassis.

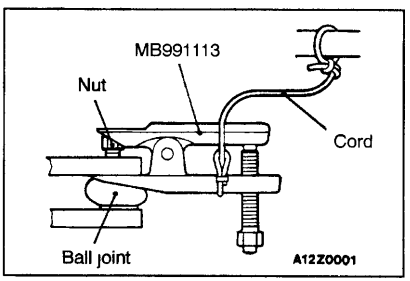
◀C▶ TRANSAXLE MOUNT BRACKET REMOVAL

Jack up the transaxle assembly gently with a garage jack, and then remove the transaxle mount bracket.



◀D▶ ENGINE ASSEMBLY SUPPORTING

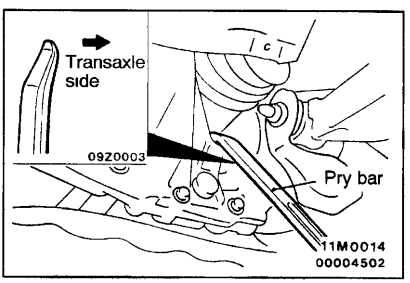
Set the special tool to the vehicle to support the engine assembly.



◀E▶ TIE ROD END/LOWER ARM BALL JOINT DISCONNECTION

Caution

1. **Use the special tool to loosen the tie-rod end mounting nut. Only loosen the nut; do not remove it from the ball joint.**
2. **Support the special tool with a cord, etc. So it will not come off.**



◀F▶ DRIVE SHAFT <LH>/DRIVE SHAFT <RH> DISCONNECTION

(1) Insert a pry bar between the transaxle case and the drive shaft as shown to remove the drive shaft.

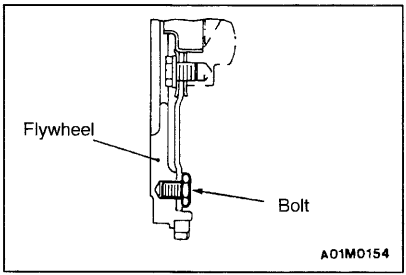
NOTE

Do not remove the hub and knuckle from the drive shaft.

Caution

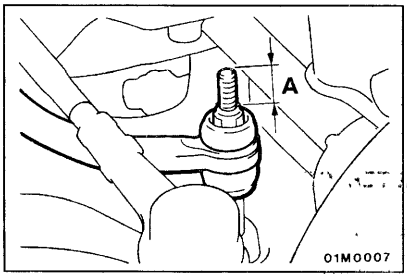
Always use a pry bar, or the TJ will be damaged.

(2) Suspend the removed drive shaft with a wire so that there are no sharp bends in any of the joints.
(3) Use a shop towel to cover the transaxle case so foreign material will not get into it.



◀G▶ TRANSAXLE ASSEMBLY REMOVAL

Caution
Do not remove the flywheel mounting bolt shown by the arrow. If this bolt is removed, the flywheel will become out of balance and damaged.

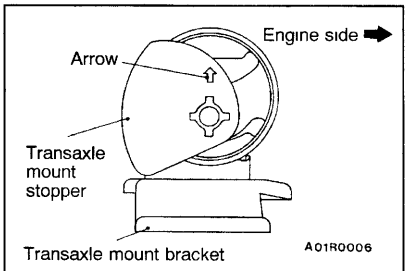


INSTALLATION SERVICE POINTS

▶A◀ STABILIZER BAR INSTALLATION

Tighten the self-locking nut so that the stabilizer bar mounting bolt protrudes as shown.

Standard value (A): 22 mm (.87 in.)



▶B◀ TRANSAXLE MOUNT STOPPER INSTALLATION

Install the transaxle mount stopper so that the arrow points as shown in the illustration.

MANUAL TRANSAXLE OVERHAUL

CONTENTS

22209000121

CLUTCH HOUSING 54

CONTROL HOUSING 51

DIFFERENTIAL 59

GENERAL INFORMATION 2

INPUT SHAFT 26

OUTPUT SHAFT 36

REVERSE IDLER GEAR <F5M42> 48

SELECT LEVER 50

SPECIAL TOOLS 8

SPECIFICATIONS 4

- General Specifications 4
- Lubricants 5
- Sealants and Adhesives 5
- Service Specifications 4
- Snap Rings, Spacers and Thrust Plate for Adjustment 5
- Torque Specifications 7

SPEEDOMETER GEAR 49

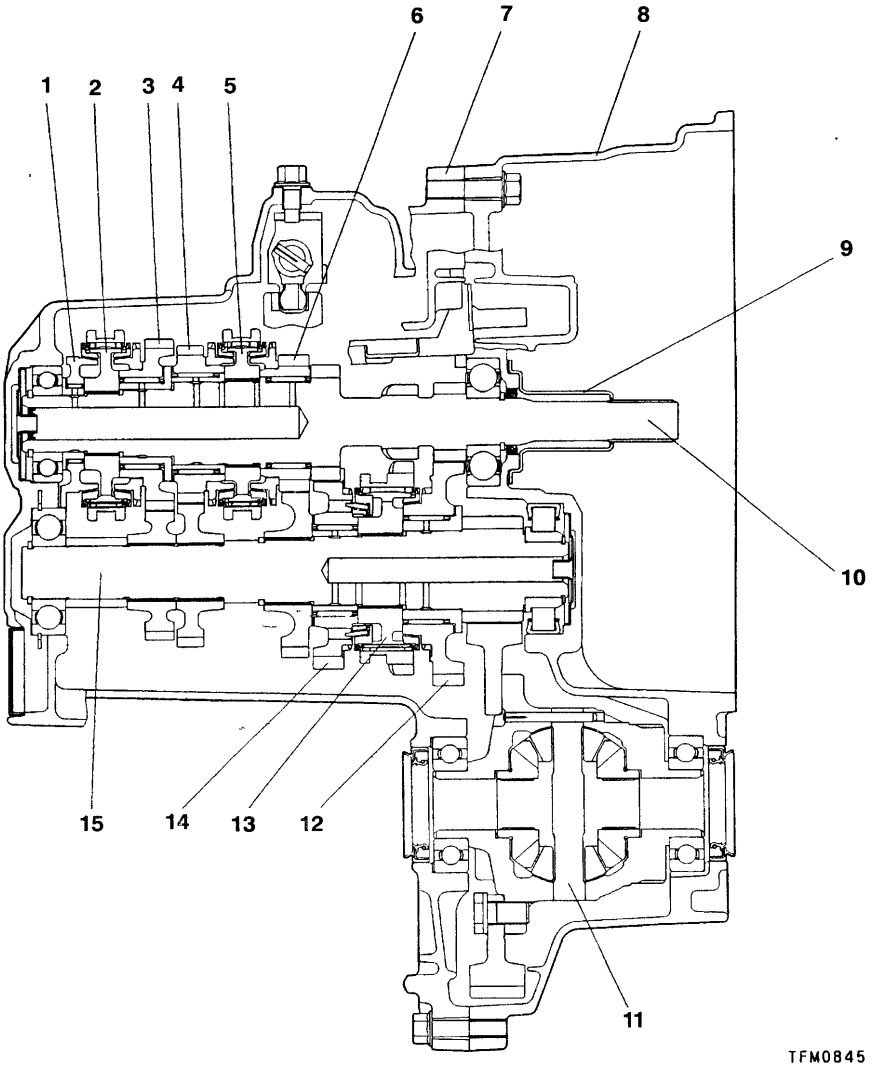
TRANSAXLE 11

TRANSAXLE CASE 57

GENERAL INFORMATION

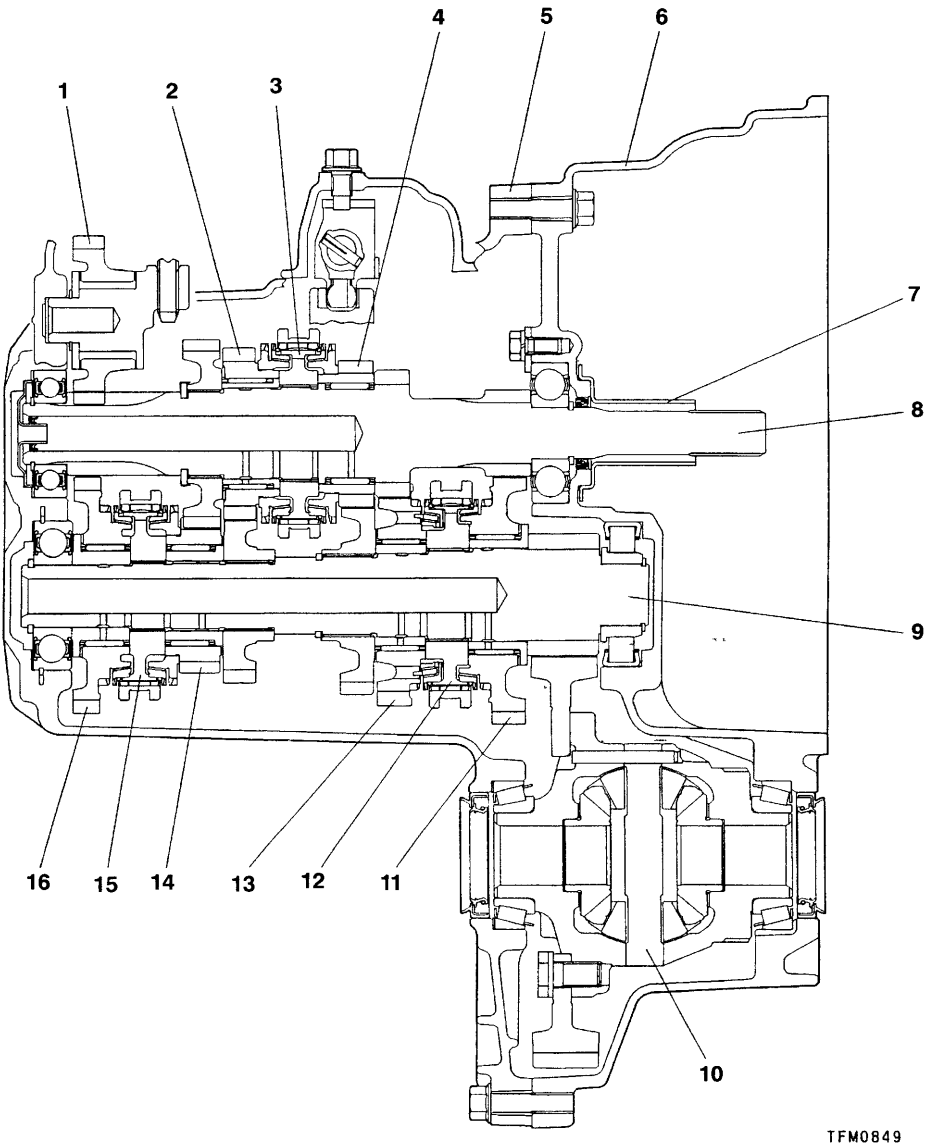
22200010109

F5M41



1. Reverse brake device
2. 5th speed-reverse synchronizer
3. 5th speed gear
4. 4th speed gear
5. 3rd-4th speed synchronizer
6. 3rd speed gear
7. Transaxle case
8. Clutch housing
9. Release bearing retainer
10. Input shaft
11. Differential
12. 1st speed gear
13. 1st-2nd speed synchronizer
14. 2nd speed gear
15. Output shaft

F5M42



1. Reverse idler gear
2. 4th speed gear
3. 3rd-4th speed synchronizer
4. 3rd speed gear
5. Transaxle case
6. Clutch housing
7. Release bearing retainer
8. Input shaft
9. Output shaft
10. Differential
11. 1st speed gear
12. 1st-2nd speed synchronizer
13. 2nd speed gear
14. 5th speed gear
15. 5th speed-reverse synchronizer
16. Reverse gear

SPECIFICATIONS

22200020126

GENERAL SPECIFICATIONS

Items		Specifications	
Model		F5M41	F5M42
Applicable engine		4G15	4G93
Type		5-speed transaxle floor shift	
Gear ratio	1st	3.583	3.583
	2nd	1.947	1.947
	3rd	1.343	1.379
	4th	0 976	1.030
	5th	0.804	0.767
	Reverse	3 416	3.363
Final reduction ratio		3 714	3 722
Speedometer gear ratio (driven/drive)		31/36	31/36

SERVICE SPECIFICATIONS

22200030099

Items	Allowable range	Limit
Input shaft front bearing clearance mm (in.)	-0.01 to 0.12 (-0 0004 to 0.0047)	-
Input shaft rear bearing clearance <F5M41> mm (in)	-0 01 to 0.09 (-0.0004 to 0 0035)	-
Input shaft rear bearing clearance <F5M42> mm (in)	0 to 0.12 (0 to 0.0047)	-
Input shaft 5th speed gear end play mm (in.)	-0 01 to 0 09 (-0.0004 to 0.0035)	-
Output shaft front bearing clearance mm (in.)	0 to 0.12 (0 to 0.0047)	-
Output shaft rear bearing clearance mm (in.)	-0 01 to 0.09 (-0.0004 to 0.0035)	-
Output shaft 3rd speed gear end play mm (in)	-0 01 to 0 09 (-0.0004 to 0.0035)	-
Differential case end play <F5M41> mm (in.)	0 05 to 0.17 (0.0020 to 0.0067)	-
Differential case preload <F5M42> mm (in)	0.05 to 0 11 (0.0020 to 0.0043)	-
Differential case pinion backlash mm (in)	0.025 to 0.150 (0 0010 to 0.0059)	-
Synchronizer ring back surface to gear clearance mm (in.)	-	0.5 (0.020)

NOTE: Standard play = 0 mm (0 in.)

SEALANTS AND ADHESIVES

22200050040

Items	Specified sealants and adhesives
Clutch housing-transaxle case mating surface	MITSUBISHI Genuine sealant part No MD997740 or equivalent
Control housing-transaxle case mating surface	
Under cover-transaxle case mating surface <F5M42>	
Air breather	3M SUPER WEATHERSTRIP No.8001 or equivalent
Differential drive gear bolt	3M Stud Locking No.4170 or equivalent
Front bearing retainer bolt (countersunk head bolt) <F5M41>	

LUBRICANTS

22200040061

Items	Specified lubricants
Drive shaft oil seal lip area	Hypoid gear oil SAE 75W-90 or 75W-85W conforming to API classification GL-4
Input shaft oil seal lip area	
Control shaft oil seal lip area	
Select lever shoe	MITSUBISHI genuine grease part No 0101011 or equivalent

SNAP RINGS, SPACERS AND THRUST PLATE FOR ADJUSTMENT

22201200048

Snap ring (For adjustment of input shaft front bearing clearance)

Thickness mm (in.)	Identification symbol	Part No.	Thickness mm (in.)	Identification symbol	Part No.
2.24 (0.0882)	None	MD706537	2 38 (0.0937)	Brown	MD706539
2.31 (0.0909)	Blue	MD706538			

Snap ring

(For adjustment of input shaft rear bearing clearance)

(For adjustment of output shaft rear bearing clearance ..... F5M42)

Thickness mm (in)	Identification symbol	Part No.	Thickness mm (in)	Identification symbol	Part No.
2.31 (0.0909)	Black (2)	MD747149	2 55 (0.1004)	Yellow	MD746566
2.35 (0.0925)	None	MD746561	2 59 (0 1020)	Black	MD746567
2 39 (0.0941)	Blue	MD746562	2.63 (0.1035)	Orange	MD746568
2 43 (0.0957)	Brown	MD746563	2.67 (0.1051)	Blue	MD746569
2 47 (0.0972)	Green	MD746564	2 71 (0 1067)	Brown	MD746570
2.51 (0 0988)	White	MD746565			

Thrust plate <F5M42>

(For adjustment of input shaft 5th speed gear end play)

Thickness mm (in.)	Identification symbol	Part No.	Thickness mm (in.)	Identification symbol	Part No.
2.82 (0.1110)	0	MD748015	2.98 (0.1173)	6	MD748019
2.86 (0.1126)	2	MD748016	3.02 (0.1189)	7	MD748020
2.90 (0.1142)	3	MD748017	3.06 (0.1205)	8	MD748021
2.94 (0.1157)	5	MD748018	3.10 (0.1220)	9	MD748022

Snap ring (For adjustment of output shaft front bearing clearance)

Thickness mm (in.)	Identification symbol	Part No.	Thickness mm (in.)	Identification symbol	Part No.
1.43 (0.0563)	Green (2)	MD746708	1.59 (0.0626)	Yellow (2)	MD746710
1.51 (0.0594)	White (2)	MD746709			

Snap ring <F5M41>

(For adjustment of output shaft rear bearing clearance)

Thickness mm (in.)	Identification symbol	Part No.	Thickness mm (in.)	Identification symbol	Part No.
2.31 (0.0909)	Black (2)	MD748800	2.55 (0.1004)	Yellow	MD748806
2.35 (0.0925)	None	MD748801	2.59 (0.1020)	Black	MD748807
2.39 (0.0941)	Blue	MD748802	2.63 (0.1035)	Orange	MD748808
2.43 (0.0957)	Brown	MD748803	2.67 (0.1051)	Blue	MD748809
2.47 (0.0972)	Green	MD748804	2.71 (0.1067)	Brown	MD748810
2.51 (0.0988)	White	MD748805			

Snap ring <F5M41>

(For adjustment of output shaft 3rd speed gear end play)

Thickness mm (in.)	Identification symbol	Part No.	Thickness mm (in.)	Identification symbol	Part No.
2.81 (0.1106)	Green	MD748782	2.97 (0.1169)	Orange	MD748786
2.85 (0.1122)	White	MD849783	3.01 (0.1185)	Red	MD748787
2.89 (0.1138)	Yellow	MD748784	3.05 (0.1201)	Pink	MD748788
2.93 (0.1154)	Black	MD748785	3.09 (0.1217)	Blue	MD748789

Snap ring <F5M42>

(For adjustment of output shaft 3rd speed gear end play)

Thickness mm (in.)	Identification symbol	Part No.	Thickness mm (in.)	Identification symbol	Part No.
2.81 (0.1106)	Green	MD745799	2.97 (0.1169)	Orange	MD745803
2.85 (0.1122)	White	MD745800	3.01 (0.1185)	Red	MD745804
2.89 (0.1138)	Yellow	MD745801	3.05 (0.1201)	Pink	MD745805
2.93 (0.1154)	Black	MD745802	3.09 (0.1217)	Blue	MD745806

Spacer <F5M41>

(For adjustment of differential case end play)

Thickness mm (in.)	Identification symbol	Part No.	Thickness mm (in.)	Identification symbol	Part No.
1.04 (0.0409)	04	MD720944	1.22 (0 0480)	G	MD700271
1.13 (0.0445)	D	MD700270	1 31 (0 0516)	E	MD706574

Spacer <F5M42>

(For adjustment of differential case preload)

Thickness mm (in.)	Identification symbol	Part No.	Thickness mm (in)	Identification symbol	Part No.
0 80 (0.0315)	80	MD727661	1.04 (0.0409)	04	MD720944
0.83 (0.0367)	83	MD720937	1.07 (0.0421)	07	MD720945
0.86 (0.0339)	86	MD720938	1.10 (0.0433)	J	MD710454
0.89 (0.0350)	89	MD720939	1.13 (0.0445)	D	MD700270
0 92 (0 0362)	92	MD720940	1.16 (0.0457)	K	MD710455
0.95 (0.0374)	95	MD720941	1.19 (0.0469)	L	MD710456
0 98 (0 0386)	98	MD720942	1.22 (0 0480)	G	MD700271
1 01 (0 0398)	01	MD720943	1 25 (0 0492)	M	MD710457

Spacer (For adjustment of differential case backlash)

Thickness mm (in.)	Identification symbol	Part No.	Thickness mm (in.)	Identification symbol	Part No
0 75 to 0.82 (0.0295 to 0.0323)	-	MA180862 MA180861	1.01 to 1.08 (0.0398 to 0.0425)	-	MA180875 MA180876
0.83 to 0.92 (0.0327 to 0 0362)	-	MA180860	1.09 to 1.16 (0.0429 to 0 0457)	-	
0 93 to 1 00 (0 0366 to 0.0394)	-				

TORQUE SPECIFICATIONS

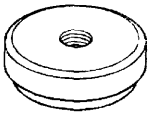
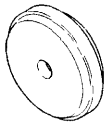
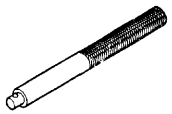
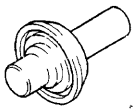
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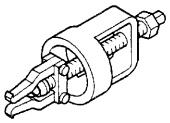
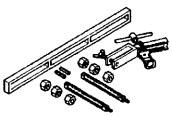
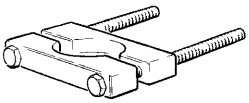
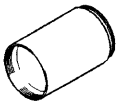
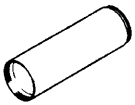
Items	Nm	ft.lbs.
Under cover mounting bolt <F5M42>	6.9	5
Interlock plate bolt	30	22
Clutch housing-transaxle case mounting bolt	44	33
Clutch release bearing retainer mounting bolt	9.8	7
Control housing mounting bolt	18	14
Shift cable bracket mounting bolt	18	14
Speedometer gear mounting bolt	3 9	3
Stopper bracket mounting bolt	18	14
Select lever mounting bolt	18	14
Select lever mounting nut	11	9
Differential drive gear mounting bolt	132	98

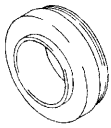
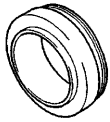
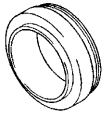
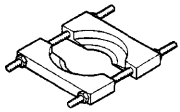
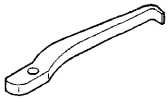
Items	Nm	ft.lbs.
Back-up light switch	32	24
Front bearing retainer mounting bolt	18	14
Poppet spring	32	24
Restrict ball <F5M41>	32	24
Reverse idler gear shaft mounting bolt	48	35
Reverse shift lever mounting bolt <F5M41>	18	14
Roll stopper bracket mounting bolt	69	51

SPECIAL TOOLS

22200060104

Tool	Tool number and name	Supersession	Application
	MB990926 Installer adapter	-	Installation of clutch housing input shaft oil seal
	MB990927 Installer adapter	-	Installation of sealing cap
	MB990934 Installer adapter	MB990934-01	Installation of roller bearing outer race
	MB990935 Installer adapter	-	Installation of differential case taper roller bearing outer race
	MB990938 Handle	MB990938-01	Use with Installer adapter
	MD998325 Differential oil seal installer	MD998325-01	Installation of differential oil seal

Tool	Tool number and name	Supersession	Application
	MD998346 Bearing outer race remover	MD998346-01	Removal of roller bearing outer race
	MD998772 Valve spring compressor	GENERAL SERVICE TOOL	Removal of roller bearing outer race
	MD998801 Bearing remover	MD998348-01	Installation and removal of gears, bearings and sleeves
	MD998812 Installer cap	GENERAL SERVICE TOOL	Use with Installer and Installer adapter
	MD998813 Installer-100	GENERAL SERVICE TOOL	Use with Installer cap and Installer adapter
	MD998814 Installer-200	MIT304180	Use with Installer cap and Installer adapter
	MD998816 Installer adapter (30)	GENERAL SERVICE TOOL	Installation of input shaft front bearing <F5M42>
	MD998817 Installer adapter (34)	MD998817-01	Installation of input shaft front bearing <F5M41>, output shaft rear bearing <F5M41>
	MD998818 Installer adapter (38)	MD998818	Installation of input shaft rear bearing, roller bearing inner race, reverse gear, needle roller bearing, reverse gear bearing sleeve <F5M42> and reverse bearing sleeve <F5M41>, reverse brake sleeve <F5M41>, output shaft rear bearing <F5M42>

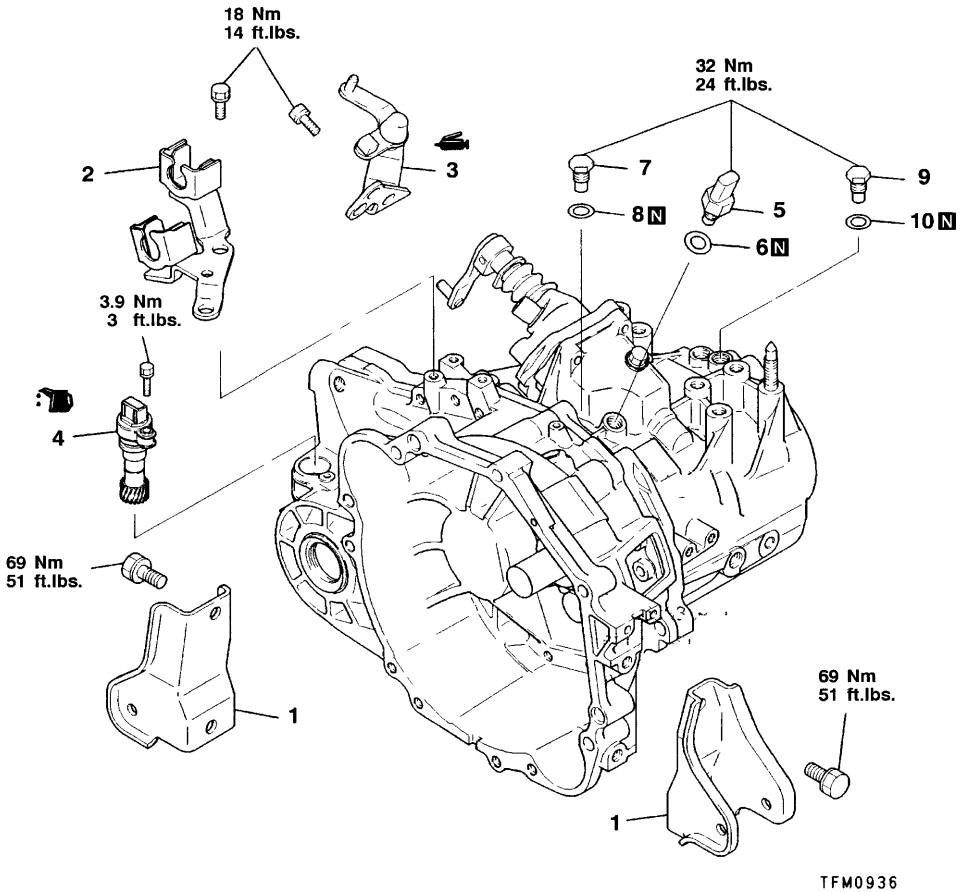
Tool	Tool number and name	Supersession	Application
	MD998819 Installer adapter (40)	MD998819	Installation of 5th speed-reverse synchronizer hub, differential case bearing, 4th speed gear and 5th speed gear sleeve <F5M42>
	MD998820 Installer adapter (42)	MIT215013	Installation of 5th speed gear sleeve, 2nd speed gear sleeve <F5M41>
	MD998822 Installer adapter (46)	MD998822-01	Installation of 1st speed gear sleeve, 1st-2nd speed synchronizer hub <F5M41>, 2nd speed gear sleeve and 3rd speed gear <F5M42>
	MD998823 Installer adapter (48)	-	Installation of differential case taper roller bearing inner race <F5M42>
	MD998824 Installer adapter (50)	GENERAL SERVICE TOOL	Installation of 4th speed gear sleeve and 5th speed gear <F5M42>
	MD998825 Installer adapter (52)	GENERAL SERVICE TOOL	Installation of 1st-2nd speed synchronizer hub, 3rd-4th speed synchronizer hub and 1st speed gear sleeve <F5M42>
	MD998826 Installer adapter (54)	-	Installation of 3rd-4th speed synchronizer hub <F5M41>
	MD998917 Bearing remover	MD998917-01	Installation and removal of gear, bearing and sleeve
	MD999566 Claw	GENERAL SERVICE TOOL	Removal of differential case taper roller bearing outer race <F5M42>

TRANSAXLE

22200100165

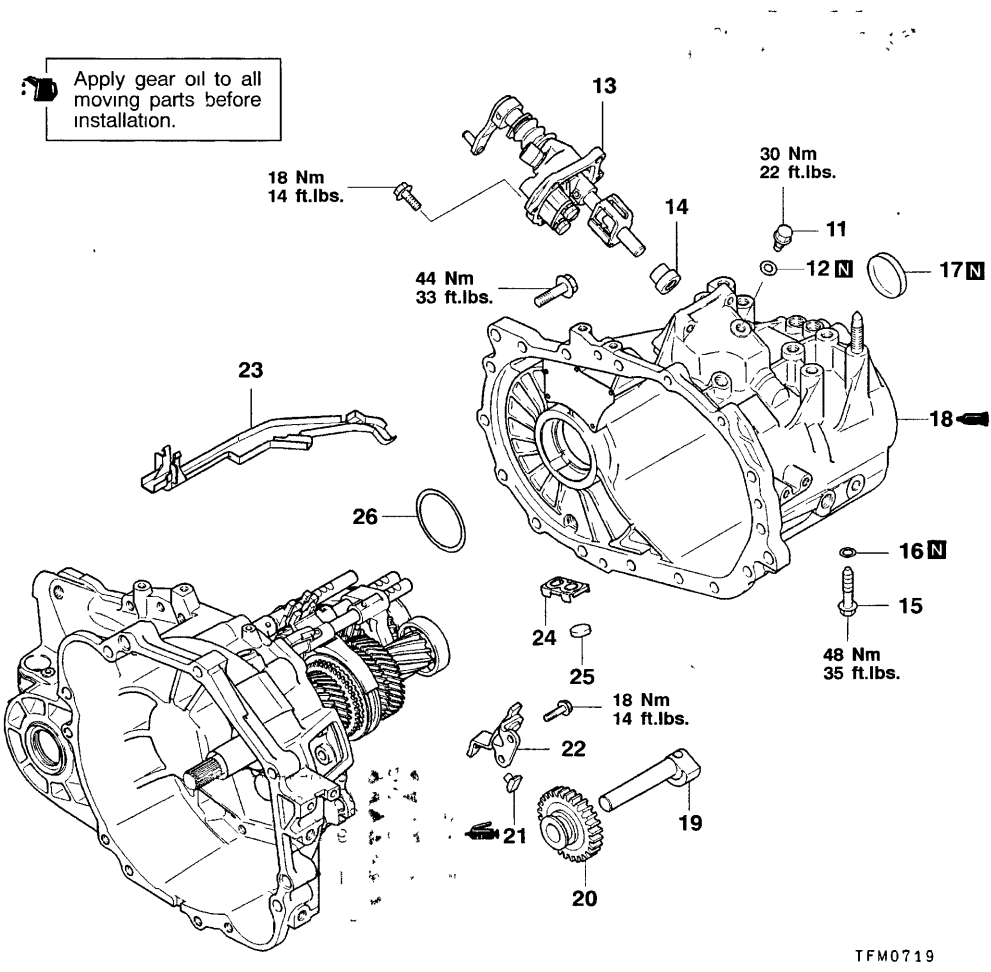
DISASSEMBLY AND REASSEMBLY

<F5M41>



Disassembly steps

1. Roll stopper bracket
2. Shift cable bracket
- ▶Q◀ 3. Select lever
- ▶P◀ 4. Speedometer gear
5. Back-up light switch
6. Gasket
7. Restrict ball
8. Gasket
9. Poppet spring
10. Gasket

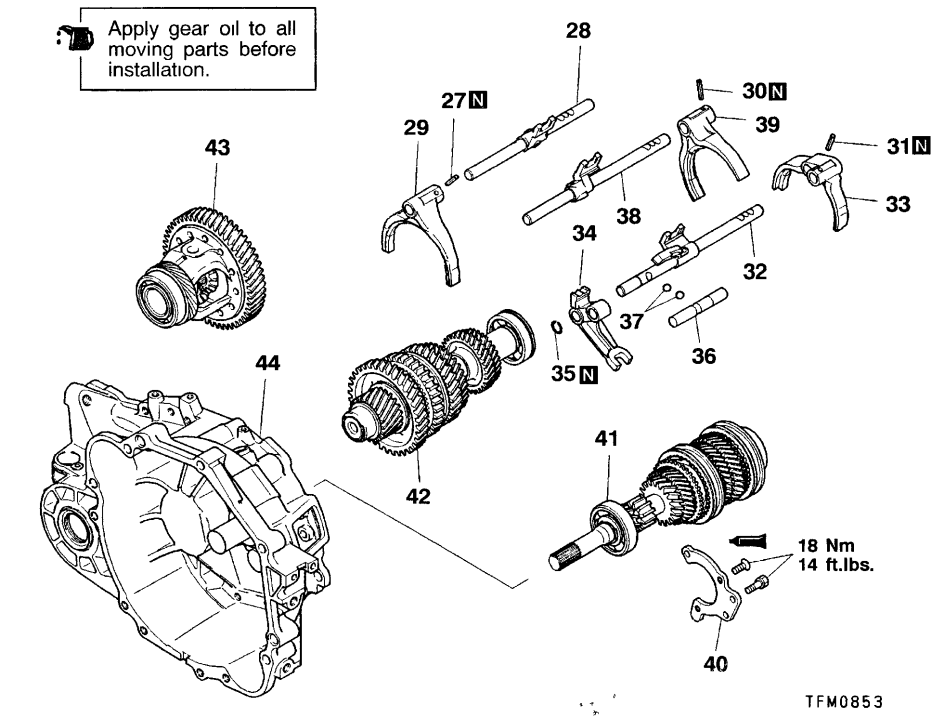


Disassembly steps

- 11 Interlock plate bolt
- 12. Gasket
- ▶O◀ 13. Control housing
- 14. Neutral return spring
- ▶M◀ 15. Reverse idler gear shaft bolt
- 16. Gasket
- ◀A▶ ▶L◀ 17. Sealing cap
- ◀B▶ ▶K◀ 18. Transaxe case
- ◀C▶ ▶I◀ 19. Reverse idler gear shaft
- 20 Reverse idler gear
- 21. Reverse shift lever shoe
- 22. Reverse shift lever
- ▶H◀ 23. Oil guide
- 24. Magnet holder
- 25. Magnet
- ▶G◀ 26. Spacer

Caution

If it is necessary to disassemble transaxle assembly further than step 18, perform adjustment as described under "ADJUSTMENT BEFORE REASSEMBLY" on P.22B-18. Then perform transaxle reassembly.

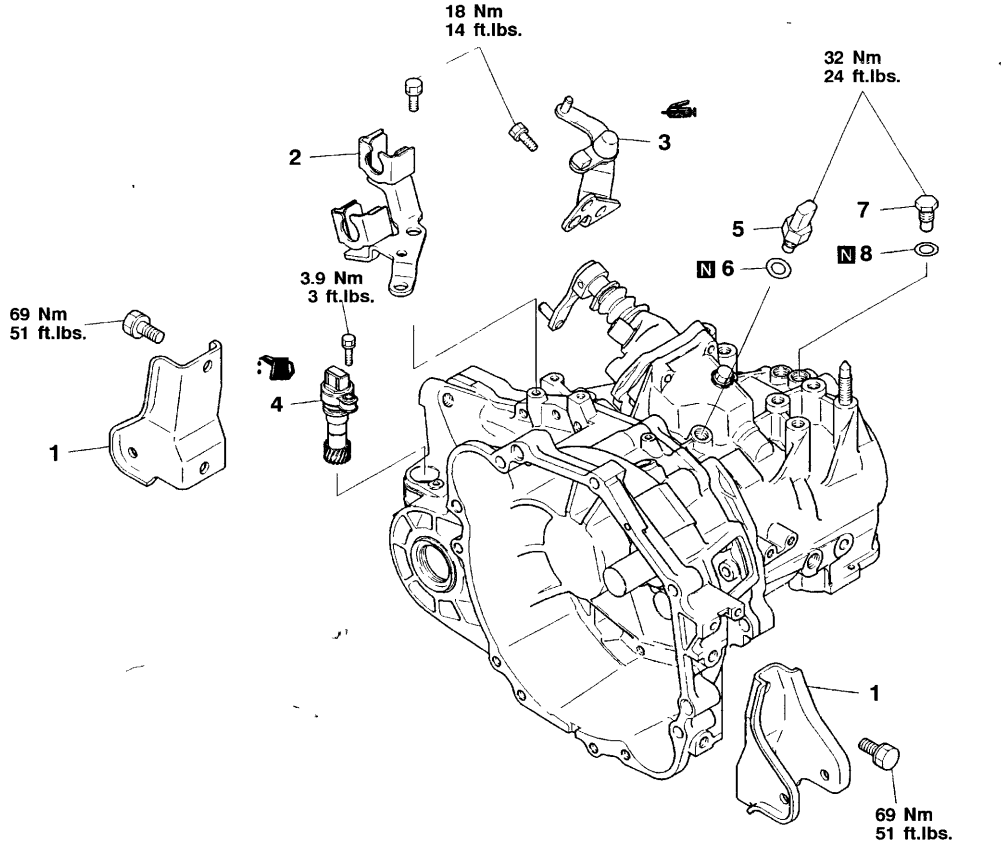


Disassembly steps

- ▶F◀ 27. Spring pin
- 28. 1st-2nd speed shift rail
- 29. 1st-2nd speed shift fork
- ▶F◀ 30. Spring pin
- ▶F◀ 31. Spring pin
- ◀D▶ ▶D◀ 32. 5th speed shift rail
- ◀D▶ ▶D◀ 33. 5th speed shift fork
- ◀D▶ ▶D◀ 34 Reverse shift lug
- ◀D▶ ▶D◀ 35. Snap ring
- ◀D▶ ▶D◀ 36. Reverse interlock rail
- ◀D▶ ▶D◀ 37. Steel ball
- ◀D▶ ▶D◀ 38. 3rd-4th speed shift rail
- ◀D▶ ▶D◀ 39. 3rd-4th speed shift fork
- ▶C◀ 40. Front bearing retainer
- ◀F▶ ▶A◀ 41. Input shaft
- ◀F▶ ▶A◀ 42. Output shaft
- 43 Differential
- 44 Clutch housing

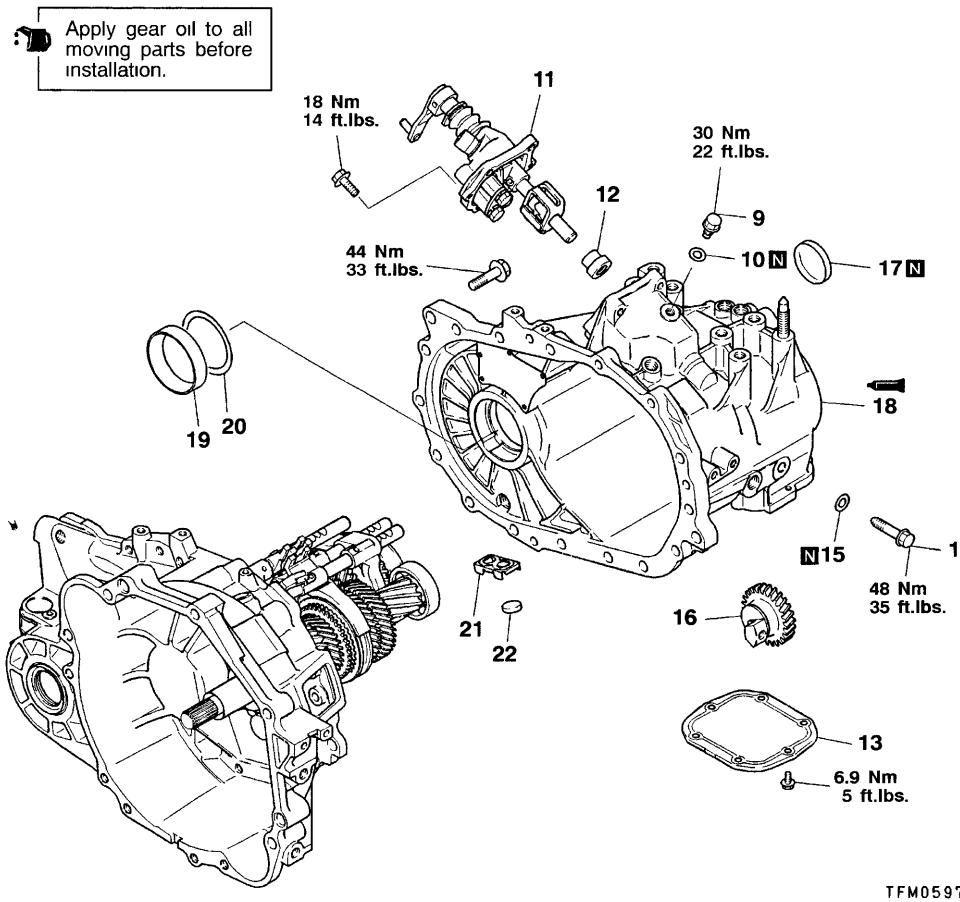
DISASSEMBLY AND REASSEMBLY

<F5M42>



Disassembly steps

1. Roll stopper bracket
2. Shift cable bracket
▶Q◀ 3. Select lever
▶P◀ 4. Speedometer gear
5. Back-up light switch
6. Gasket
7. Poppet spring
8. Gasket

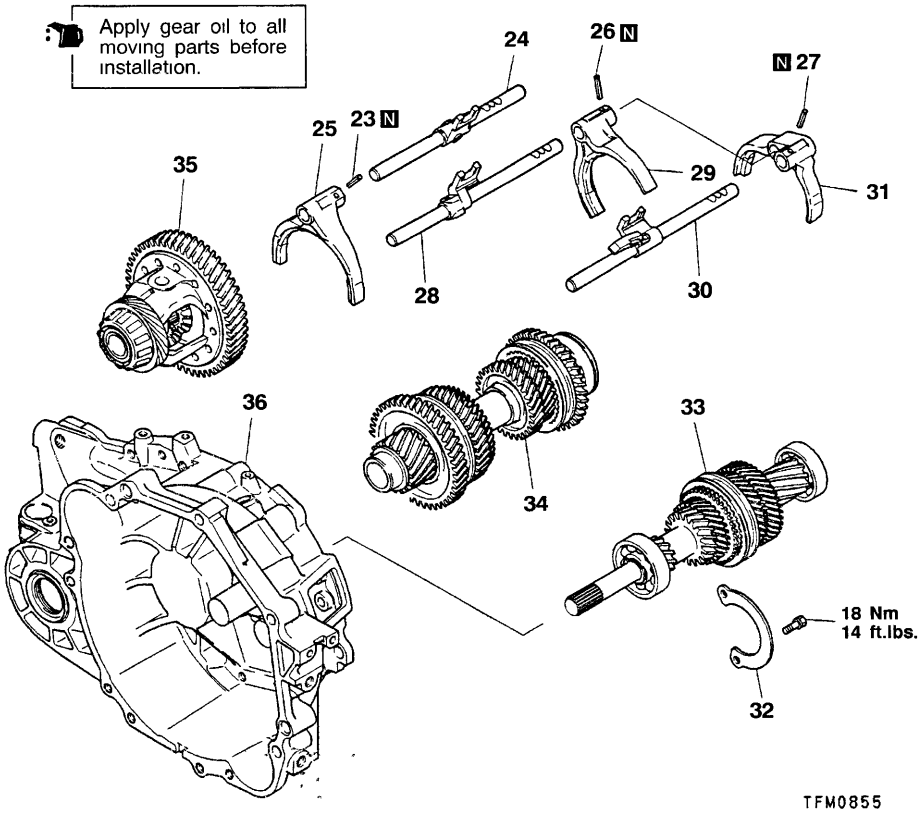


Disassembly steps

- 9 Interlock plate bolt
- 10 Gasket
- ▶O◀ 11 Control housing
- 12 Neutral return spring
- ▶N◀ 13 Under cover
- 14 Reverse idler gear shaft bolt
- 15 Gasket
- 16 Reverse idler gear
- ◀A▶ ▶L◀ 17 Sealing cap
- ◀B▶ ▶K◀ 18 Transaxle case
- ▶J◀ 19 Outer race
- ▶G◀ 20 Spacer
- 21 Magnet holder
- 22 Magnet

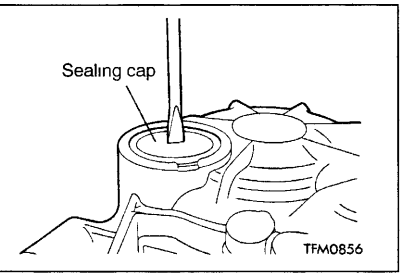
Caution

If it is necessary to disassemble transaxle assembly further than step 18, perform adjustment as described under "ADJUSTMENT BEFORE REASSEMBLY" on P.22B-19. Then reassemble the transaxle.



Disassembly steps

- ▶F◀ 23. Spring pin
- 24. 1st-2nd speed shift rail
- 25. 1st-2nd speed shift fork
- ▶F◀ 26. Spring pin
- ▶F◀ 27 Spring pin
- ◀E▶ ▶E◀ 28. 3rd-4th speed shift rail
- ◀E▶ ▶E◀ 29 3rd-4th speed shift fork
- ◀E▶ ▶E◀ 30. 5th speed-reverse shift rail
- ◀E▶ ▶E◀ 31. 5th speed-reverse shift fork
- 32. Front bearing retainer
- ◀F▶ ▶B◀ 33 Input shaft
- ◀F▶ ▶B◀ 34 Output shaft
- 35. Differential
- 36. Clutch housing

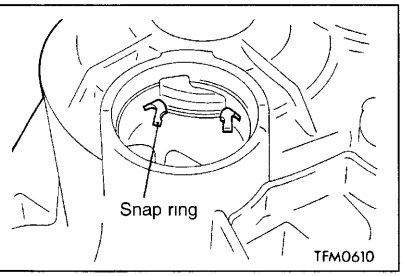


DISASSEMBLY SERVICE POINTS

◀A▶ SEALING CAP REMOVAL

(1) Tap a chisel or screwdriver into the center of the sealing cap. Do not tap it in deeper than necessary.
Next, push over the chisel or screwdriver to remove the cap.

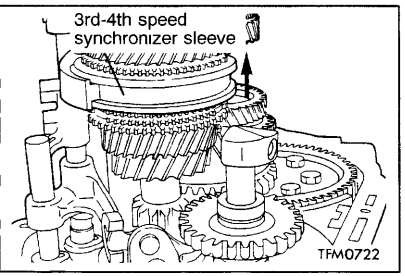
Caution
Do not tap the chisel or screwdriver between the cap and case.



◀B▶ TRANSAXLE CASE REMOVAL

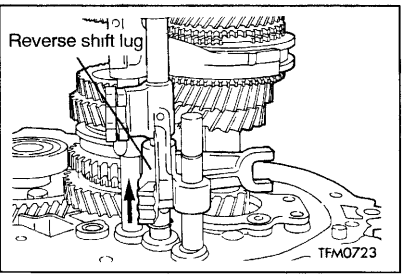
Expand the snap ring to remove it from the snap ring groove of the ball bearing.

NOTE
Expanding the snap ring causes the snap ring groove to move out of position because of the output shaft's own weight.



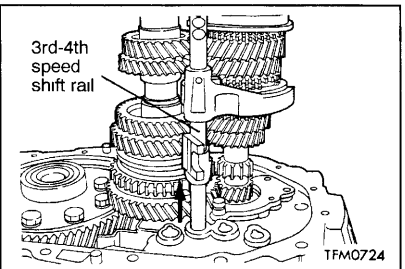
◀C▶ REVERSE IDLER GEAR SHAFT REMOVAL

Shift the 3rd-4th speed synchronizer sleeve toward the 4th speed side.

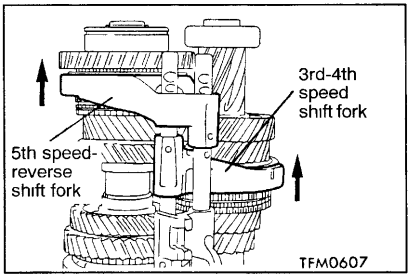


◀D▶ 3RD-4TH SPEED SHIFT RAIL/3RD-4TH SPEED SHIFT FORK/5TH SPEED SHIFT FORK/SNAP RING/REVERSE SHIFT LUG/5TH SPEED SHIFT RAIL/STEEL BALL/REVERSE INTERLOCK RAIL REMOVAL

(1) While sliding the reverse shift lug in the direction shown, remove the 5th speed shift fork, 5th speed shift rail, reverse shift lug, snap ring, steel ball and reverse interlock rail.

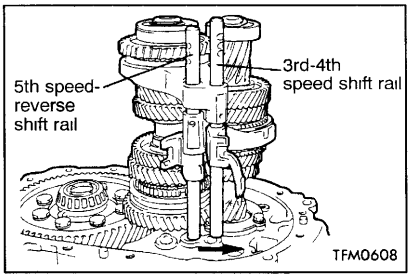


(2) While sliding the 3rd-4th speed shift rail in the direction shown, remove it together with the shift fork.

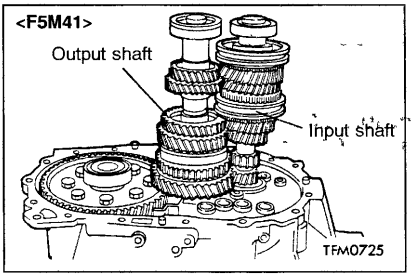


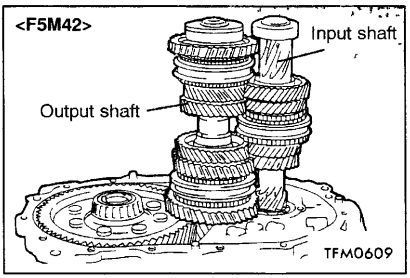
◀E▶ 3RD-4TH SPEED SHIFT RAIL/3RD-4TH SPEED SHIFT FORK/5TH SPEED-REVERSE SHIFT RAIL/5TH SPEED-REVERSE SHIFT FORK REMOVAL

(1) Shift the 3rd-4th speed shift fork and 5th speed-reverse shift fork in the direction shown.



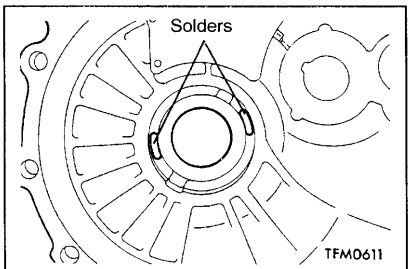
(2) Slide the 3rd-4th speed shift rail and 5th speed-reverse shift rail in the direction shown and remove them together with the shift fork.





◀F▶ INPUT SHAFT/OUTPUT SHAFT REMOVAL

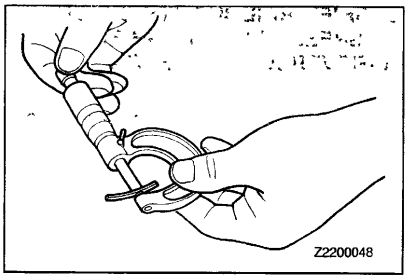
Remove the input and output shafts together.



ADJUSTMENT BEFORE REASSEMBLY

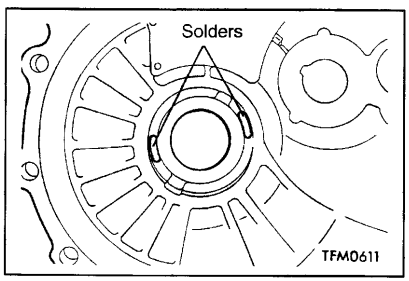
SPACER SELECTION FOR DIFFERENTIAL CASE END PLAY ADJUSTMENT <F5M41>

(1) Put solders [about 10 mm (0.39 in.) long, 1.6 mm (0.063 in.) in diameter] in the illustrated positions of the transaxle case and install the differential.
(2) Install the clutch housing and tighten the bolts to the specified torque.
(3) If the solders are not crushed, put larger diameter solders and repeat Steps (1) and (2).



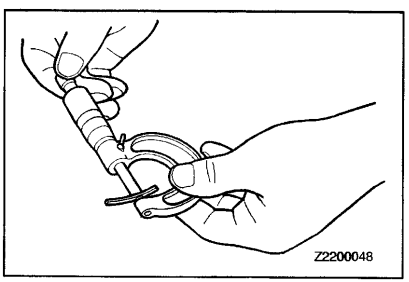
(4) Measure the thickness (T) of the crushed solder with a micrometer and select a spacer according to the following equation.

Spacer thickness:
[T - 0.05 mm (0.0020 in.)] to
[T - 0.17 mm (0.0067 in.)]



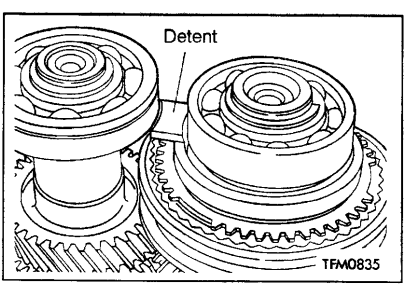
SPACER SELECTION FOR DIFFERENTIAL CASE PRELOAD ADJUSTMENT <F5M42>

(1) Put solders [about 10 mm (0.39 in.) long, 1.6 mm (0.063 in.) in diameter] in the illustrated positions of the transaxle case and install the bearing outer race and differential.
(2) Install the clutch housing and tighten the bolts to the specified torque.
(3) If the solders are not crushed, put larger diameter solders and repeat Steps (1) and (2).



(4) Measure the thickness (T) of the crushed solder with a micrometer and select a spacer according to the following equation.

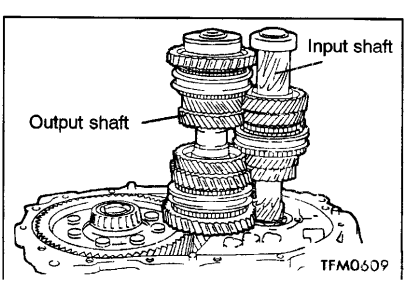
Spacer thickness:
[T + 0.05 mm (0.0020 in.)] to
[T + 0.11 mm (0.0043 in.)]



REASSEMBLY SERVICE POINTS

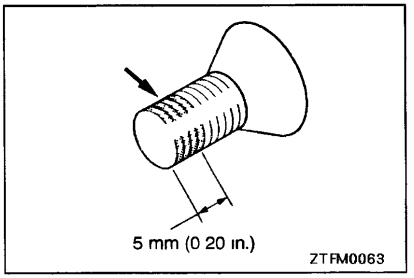
▶A◀ OUTPUT SHAFT/INPUT SHAFT INSTALLATION

While placing the reverse brake cone detent in the position shown, install the input and output shafts together.



▶B◀ OUTPUT SHAFT/INPUT SHAFT INSTALLATION

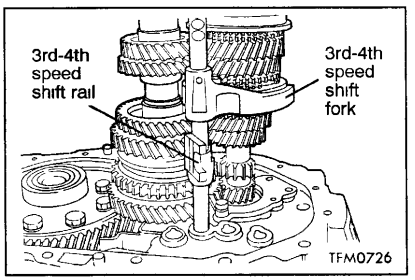
Install the input and output shafts together.



▶C◀ FRONT BEARING RETAINER INSTALLATION

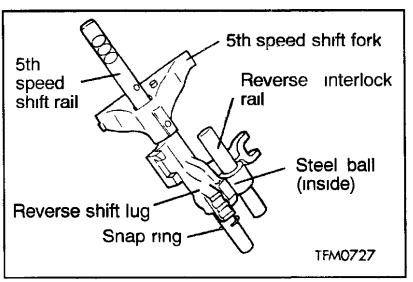
Apply a sealant to the front bearing retainer mounting bolts (countersunk bolts only).

Specified sealant:
3M STUD Locking No.4170 or equivalent

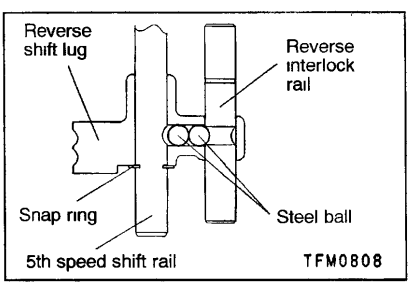


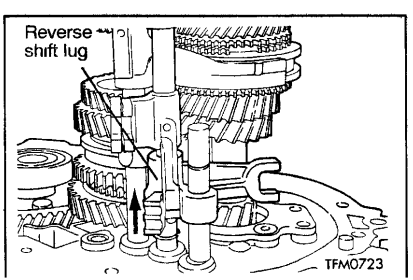
▶D◀ REVERSE INTERLOCK RAIL/STEEL BALL/5TH SPEED SHIFT RAIL/REVERSE SHIFT LUG/SNAP RING/5TH SPEED SHIFT FORK/3RD-4TH SPEED SHIFT FORK/3RD-4TH SPEED SHIFT RAIL INSTALLATION

(1) Install the 3rd-4th shift rail and fork.

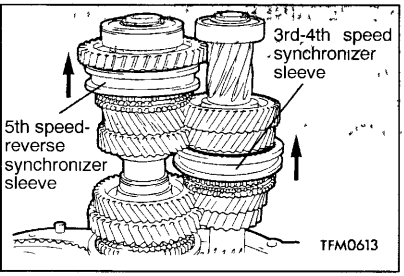


(2) Install the reverse interlock rail, steel ball, 5th speed shift rail, 5th speed shift fork, reverse shift lug and snap ring in the illustrated positions.



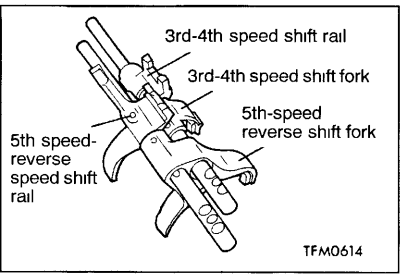


(3) While sliding the reverse shift lug in the direction shown, install the 5th speed shift fork, 5th speed shift rail, reverse shift lug, snap ring, steel ball and reverse interlock rail.

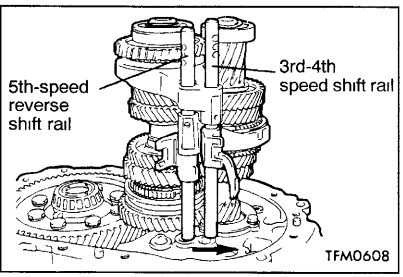


▶E◀ 5TH SPEED-REVERSE SHIFT FORK/5TH SPEED-REVERSE SHIFT RAIL/3RD-4TH SPEED SHIFT FORK/3RD-4TH SPEED SHIFT RAIL INSTALLATION

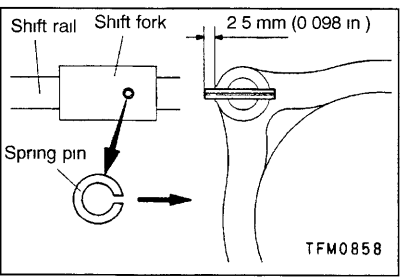
(1) Shift the 3rd-4th speed synchronizer sleeve and 5th speed-reverse synchronizer sleeve in the direction shown.



(2) Install the 3rd-4th speed shift rail and fork and the 5th speed-reverse shift rail and fork.



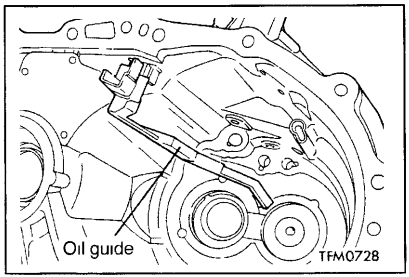
(3) While fitting each shift fork in the sleeve, slide the shift rails in the direction shown and install.



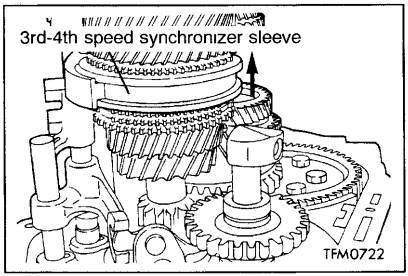
▶F◀ SPRING PIN INSTALLATION

▶G◀ SPACER INSTALLATION

Install the spacer selected in the section "ADJUSTMENT BEFORE REASSEMBLY."

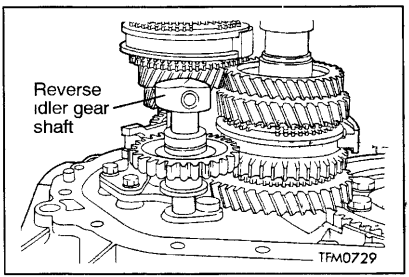


▶H◀ OIL GUIDE INSTALLATION

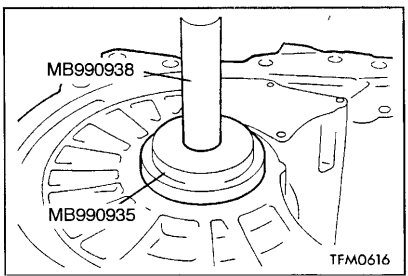


▶I◀ REVERSE IDLER GEAR SHAFT INSTALLATION

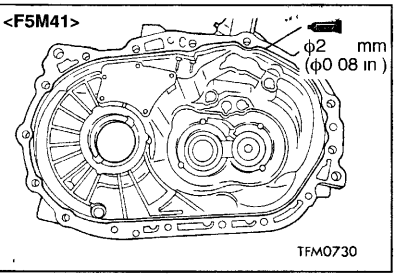
(1) Shift the 3rd-4th speed synchronizer sleeve toward the 4th speed side.

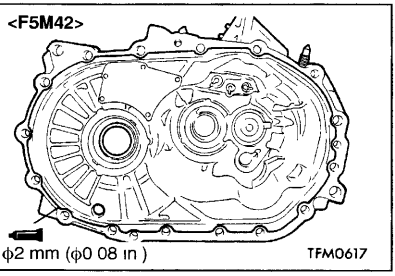


(2) Face the threaded hole of the reverse idler gear shaft toward the direction shown.



▶J◀ OUTER RACE INSTALLATION



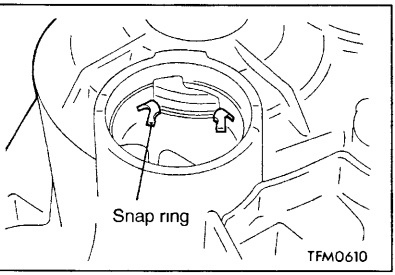


▶K◀ TRANSAXLE CASE INSTALLATION

(1) Apply sealant to the mating surface of the transaxle case. Be sure to install the transaxle within 15 minutes after applying sealant.

Specified sealant:
MITSUBISHI genuine sealant part No.MD997740 or equivalent

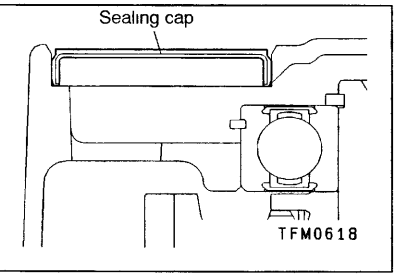
Caution
Squeeze out the sealant uniformly, while making sure that it is not broken or excessively applied.



(2) Install the transaxle case and expand the snap ring.
(3) Tighten the transaxle case mounting bolts to the specified torque.

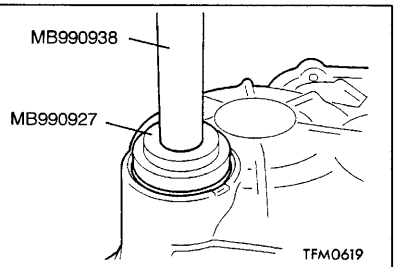
NOTE
Place the transaxle upside down and let the snap ring fit in the groove by taking advantage of the output shaft's own weight.

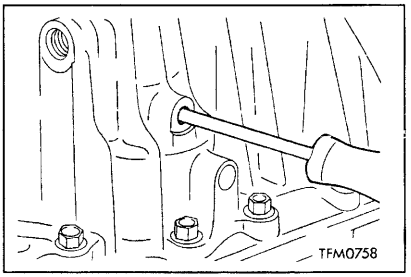
(4) After installation, wait at least one hour. Never run the transaxle or let transmission oil touch the adhesion surface during that time.



▶L◀ SEALING CAP INSTALLATION

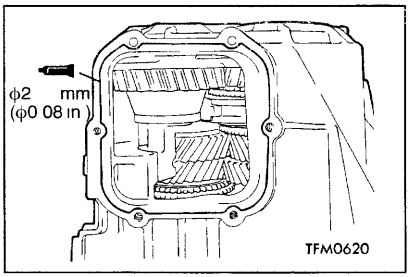
Press-fit the new sealing cap all the way up to the illustrated position.





▶M◀REVERSE IDLER GEAR SHAFT BOLT INSTALLATION

Using a Phillips screwdriver [8 mm (0.31 in.) in shank diameter] center the bolt hole.



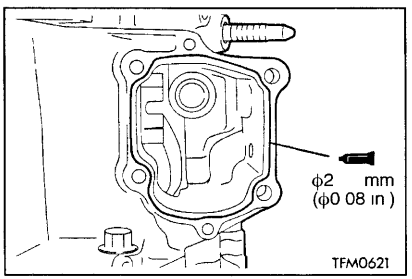
▶N◀UNDER COVER INSTALLATION

(1) Apply the sealant to the mating surface of the transaxle case. Be sure to install the under cover within 15 minutes after applying sealant.

Specified sealant:
MITSUBISHI genuine sealant part No.MD997740 or equivalent

Caution
Squeeze out the sealant uniformly, while making sure that it is not broken or excessively applied.

(2) After installation, wait at least one hour. Never run the transaxle or let transmission oil touch the adhesion surface during that time.



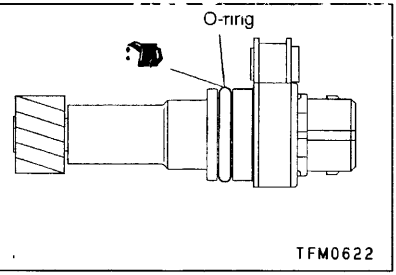
▶O◀CONTROL HOUSING INSTALLATION

(1) Apply sealant to the mating surface of the transaxle case. Be sure to install the control housing within 15 minutes after applying sealant.

Specified sealant:
MITSUBISHI genuine sealant part No.MD997740 or equivalent

Caution
Squeeze out the sealant uniformly, while making sure that it is not broken or excessively applied.

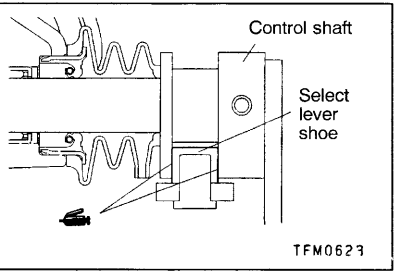
(2) After installation, wait at least one hour. Never run the transaxle or let transmission oil touch the adhesion surface during that time.



▶P◀ SPEEDOMETER GEAR INSTALLATION

Apply transmission oil to the O-ring of the speedometer gear.

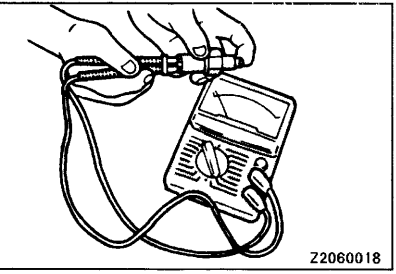
Transmission oil:
Hypoid gear oil SAE 75W-90 or 75W-85W conforming to API classification GL-4



▶Q◀ SELECT LEVER INSTALLATION

Apply grease to the control shaft sliding portion of the select lever shoe.

Specified grease:
MITSUBISHI genuine grease part No.0101011 or equivalent



INSPECTION

22200110021

BACK-UP LIGHT SWITCH

Check for continuity between terminals.

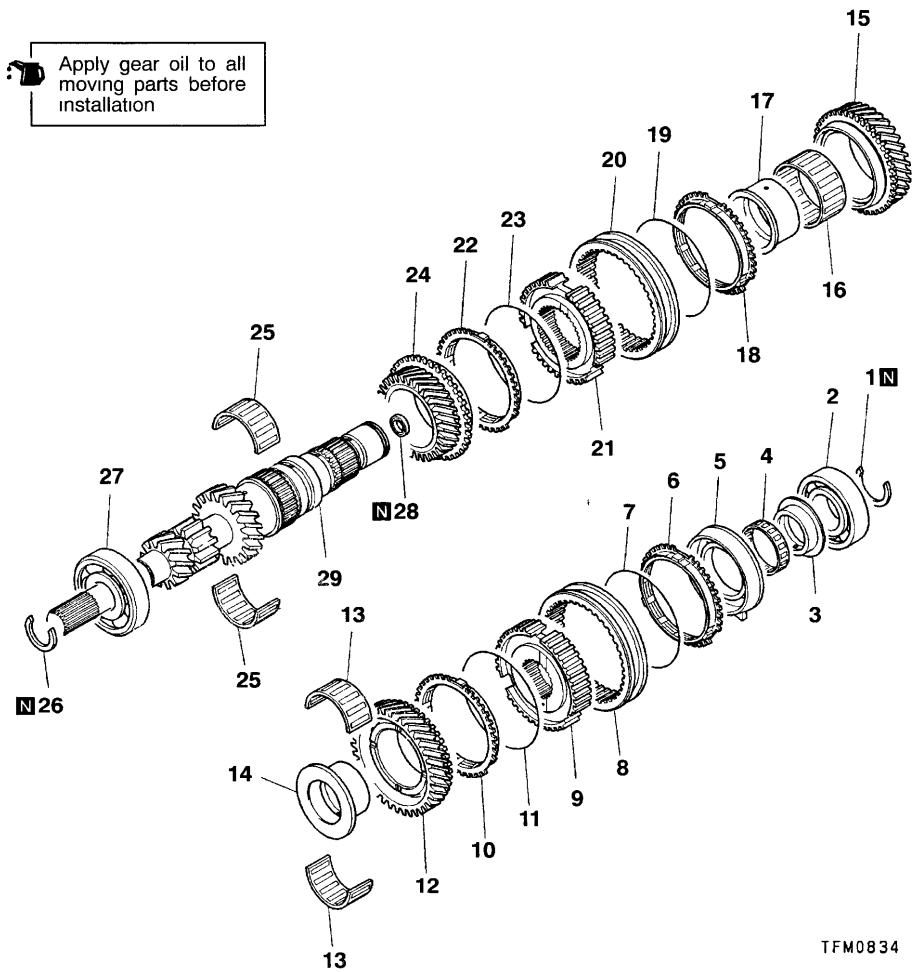
Switch condition	Continuity (Resistance)
Pressed	Not continuity (Infinity)
Released	Continuity (approx. zero)

INPUT SHAFT

22200160071

DISASSEMBLY AND REASSEMBLY

<F5M41>

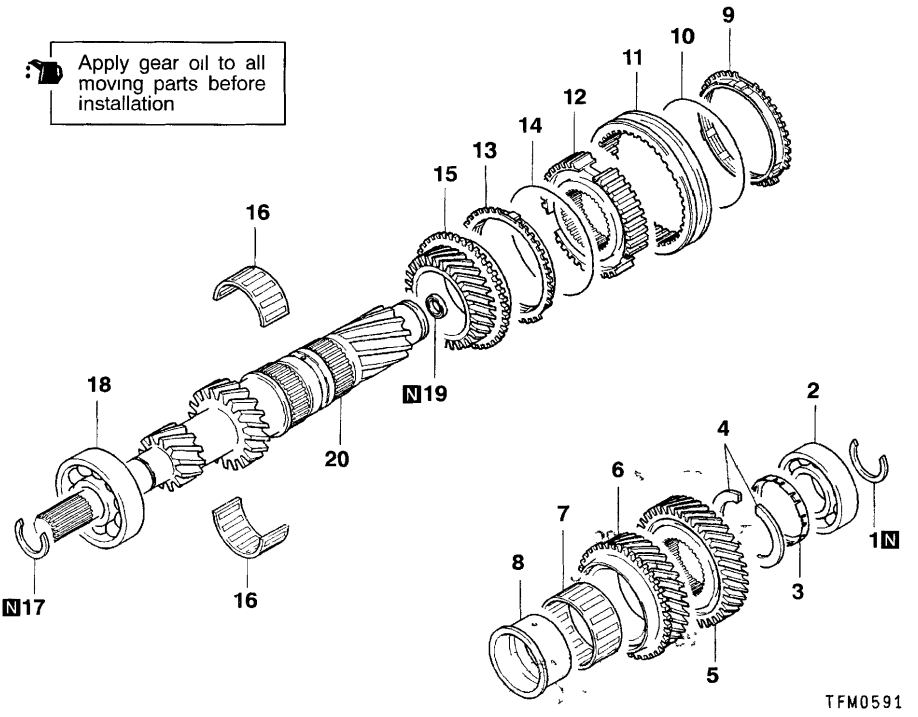


Disassembly steps

- ▶P◀ 1 Snap ring
- ◀A▶ ▶O◀ 2 Ball bearing
- ◀B▶ ▶M◀ 3. Reverse brake sleeve
- 4. Needle roller bearing
- 5. Reverse brake cone
- 6. Reverse brake ring
- ▶D◀ 7. Synchronizer spring
- ▶K◀ 8. Synchronizer sleeve
- ▶J◀ 9 5th speed-reverse synchronizer hub
- 10. Synchronizer ring
- ▶D◀ 11 Synchronizer spring
- 12. 5th speed gear
- 13 Needle roller bearing
- ◀D▶ ▶H◀ 14 5th speed gear sleeve
- 15. 4th speed gear
- 16. Needle roller bearing
- ◀F▶ ▶G◀ 17. 4th speed gear sleeve
- 18. Synchronizer ring
- ▶D◀ 19. Synchronizer spring
- ▶F◀ 20 Synchronizer sleeve
- ▶E◀ 21 3rd-4th speed synchronizer hub
- 22. Synchronizer ring
- ▶D◀ 23 Synchronizer spring
- 24. 3rd speed gear
- 25. Needle roller bearing
- ▶C◀ 26 Snap ring
- ◀G▶ ▶B◀ 27. Ball bearing
- ▶A◀ 28 Oil seal
- 29 Input shaft

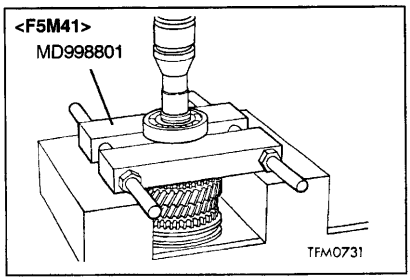
DISASSEMBLY AND REASSEMBLY

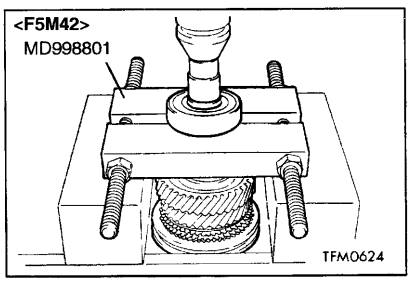
<F5M42>



Disassembly steps

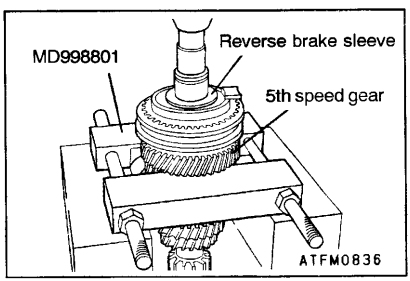
	▶P◀	1. Snap ring
◀A▶	▶O◀	2. Ball bearing
	▶N◀	3. Thrust plate stopper
	▶L◀	4 Thrust plate
◀C▶	▶I◀	5 5th speed gear
		6. 4th speed gear
		7 Needle roller bearing
◀E▶	▶G◀	8 4th speed gear sleeve
		9. Synchronizer ring
	▶D◀	10. Synchronizer spring
	▶F◀	11. Synchronizer sleeve
	▶E◀	12. 3rd-4th speed synchronizer hub
		13 Synchronizer ring
	▶D◀	14 Synchronizer spring
		15. 3rd speed gear
		16 Needle roller bearing
	▶C◀	17 Snap ring
◀G▶	▶B◀	18. Ball bearing
	▶A◀	19 Oil seal
		20 Input shaft





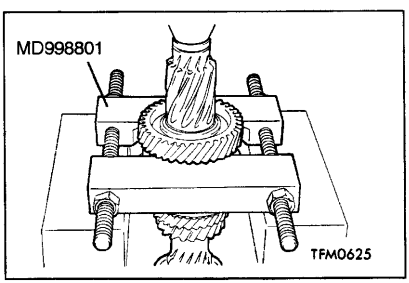
DISASSEMBLY SERVICE POINTS

◀A▶ BALL BEARING REMOVAL

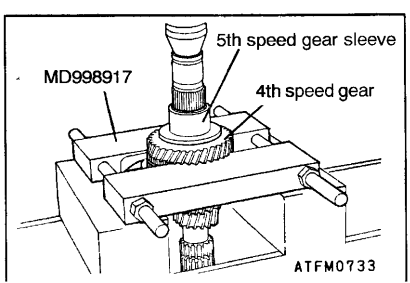


◀B▶ REVERSE BRAKE SLEEVE REMOVAL

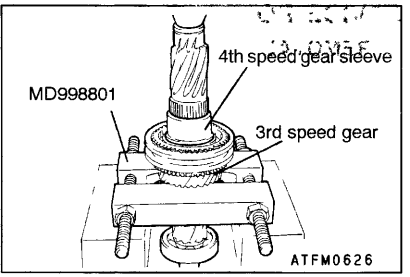
Mount the special tool on the 5th speed gear and remove the reverse brake sleeve.



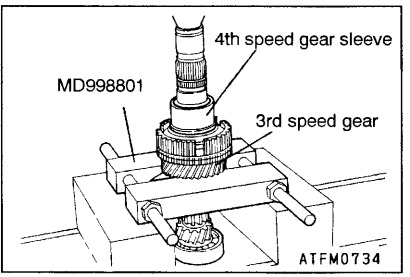
◀C▶ 5TH SPEED GEAR REMOVAL



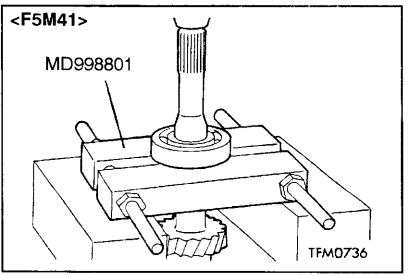
◀D▶ 5TH SPEED GEAR SLEEVE REMOVAL



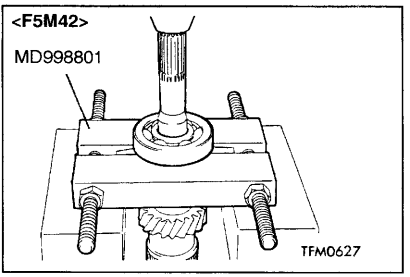
◀E▶ 4TH SPEED GEAR SLEEVE REMOVAL

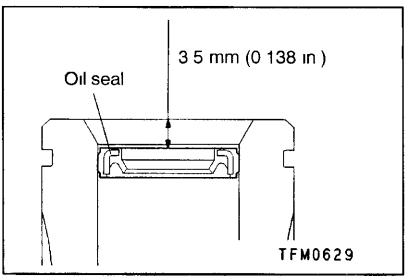


◀F▶ 4TH SPEED GEAR SLEEVE REMOVAL



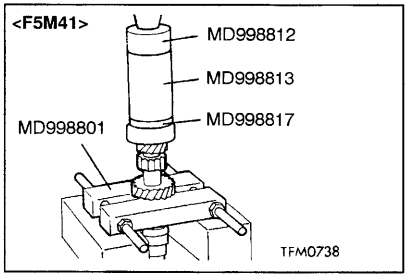
◀G▶ BALL BEARING REMOVAL



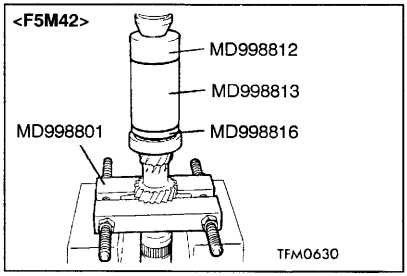


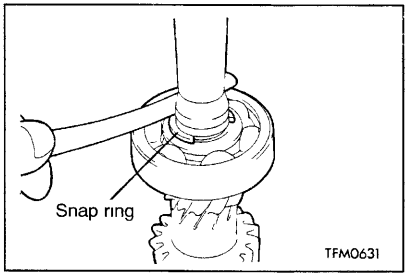
REASSEMBLY SERVICE POINTS

▶A◀ OIL SEAL INSTALLATION



▶B◀ BALL BEARING INSTALLATION

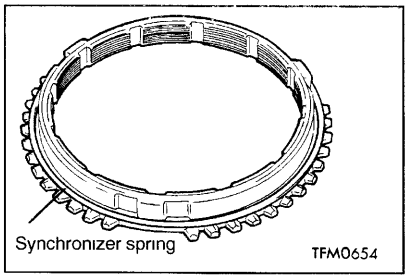




▶C◀ SNAP RING INSTALLATION

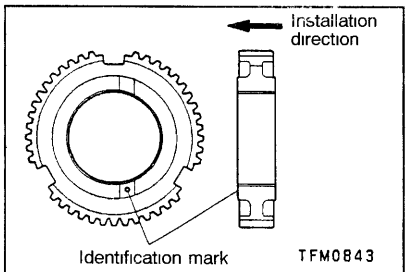
Select and install a snap ring so that the input shaft front bearing clearance will have the standard value.

Standard value:
-0.01 to 0.12 mm (-0.0004 to 0.0047 in.)



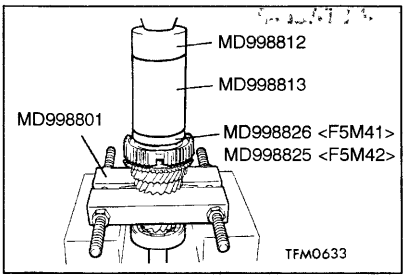
▶D◀ SYNCHRONIZER SPRING INSTALLATION

Install the synchronizer spring to the illustrated position of the synchronizer ring.

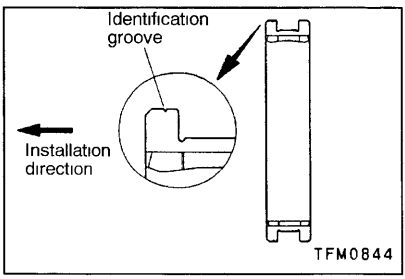


▶E◀ 3RD-4TH SPEED SYNCHRONIZER HUB INSTALLATION

Install the 3rd-4th speed synchronizer hub so that it will be oriented in the direction shown.

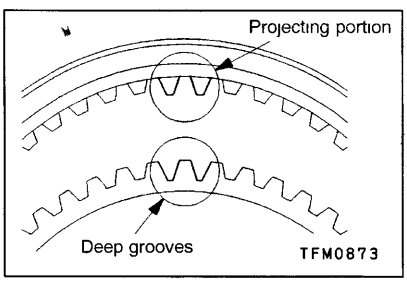


Caution
When installing the hub, check that the synchronizer ring is not caught.

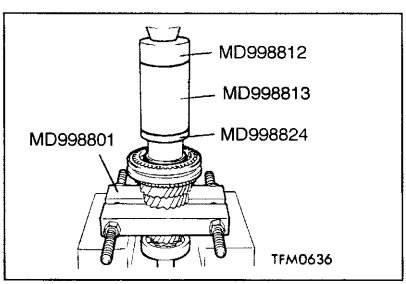


▶F◀ SYNCHRONIZER SLEEVE INSTALLATION

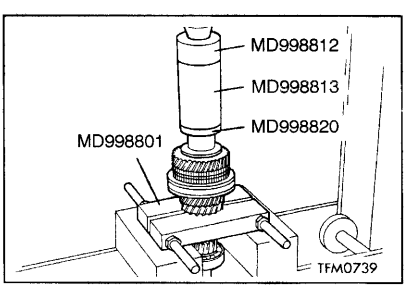
(1) Install the synchronizer sleeve so that it will be oriented in the direction shown.



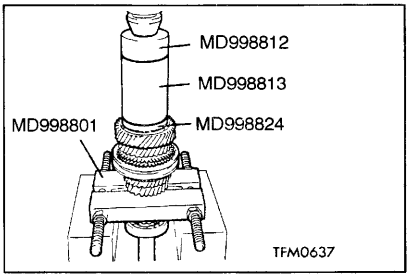
(2) When the synchronizer sleeve is installed, check that the deep groove portion of the synchronizer hub is aligned with the projecting portion of the sleeve.



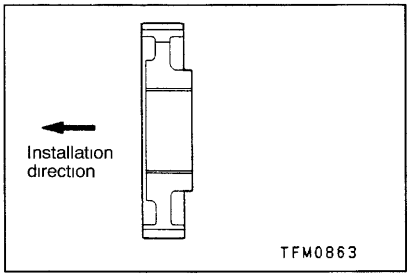
▶G◀ 4TH SPEED GEAR SLEEVE INSTALLATION



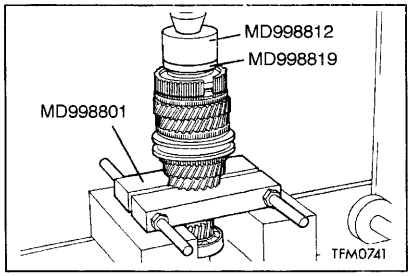
▶H◀ 5TH SPEED GEAR SLEEVE INSTALLATION



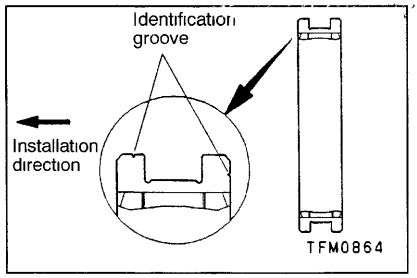
▶I◀ 5TH SPEED GEAR INSTALLATION



▶J◀ 5TH SPEED-REVERSE SYNCHRONIZER HUB INSTALLATION

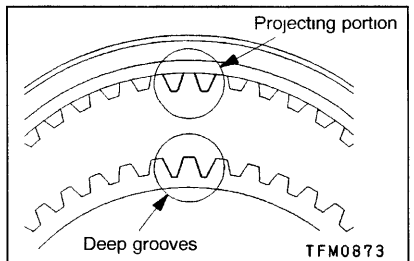


Caution
When installing the 5th-reverse speed synchronizer hub, check that the synchronizer ring is not caught.

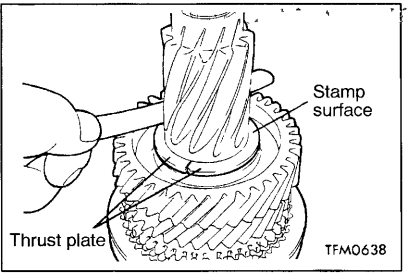


▶K◀ SYNCHRONIZER SLEEVE INSTALLATION

(1) Install the synchronizer sleeve so that the identification grooves are oriented in the direction shown.



(2) When the synchronizer sleeve is installed, check that the deep groove portion of the synchronizer hub is aligned with the projecting portion of the sleeve.

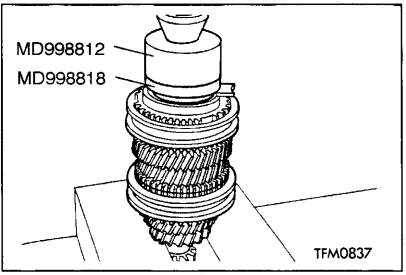


▶L◀ THRUST PLATE INSTALLATION

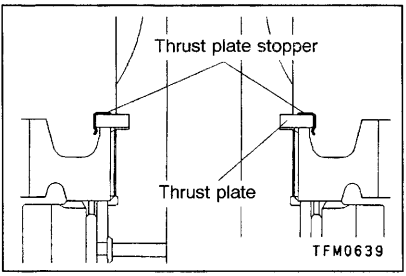
Select and install a thrust plate so that the input shaft 5th speed gear end play has the standard value.

Standard value:
-0.01 to 0.09 mm (-0.0004 to 0.0035 in.)

Caution
Assemble with the identification stamp surface on the thrust plate stopper side.

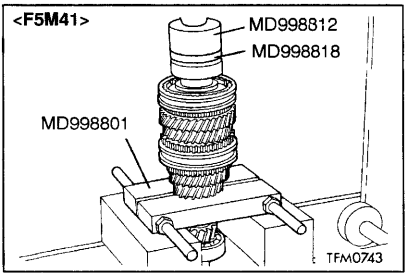


▶M◀REVERSE BRAKE SLEEVE INSTALLATION

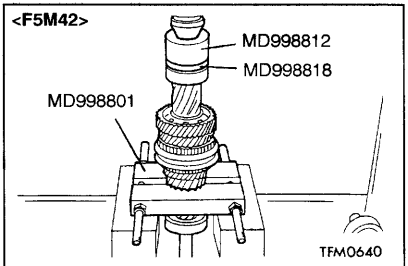


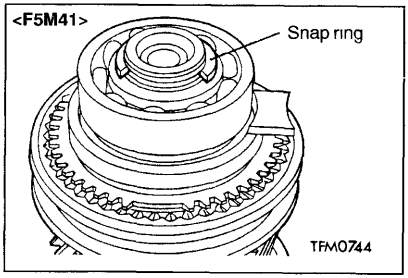
▶N◀ THRUST PLATE STOPPER INSTALLATION

When the thrust plate is installed, check that it is not tilted.



▶O◀BALL BEARING INSTALLATION



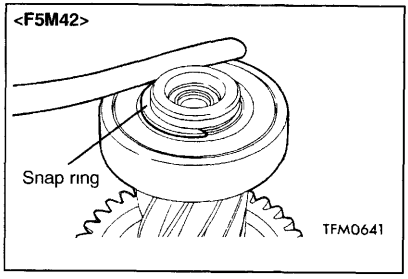


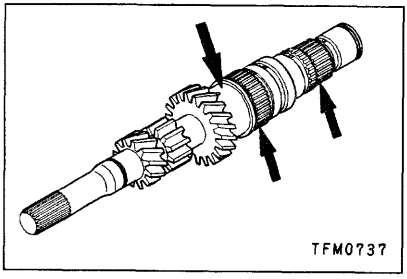
▶P◀ SNAP RING INSTALLATION

Select and install a snap ring so that the input shaft rear bearing clearance will have the standard value.

Standard value:

-0.01 to 0.09 mm (-0.0004 to 0.0035 in.) <F5M41>
0 to 0.12 mm (0 to 0.0047 in.) <F5M42>





INSPECTION

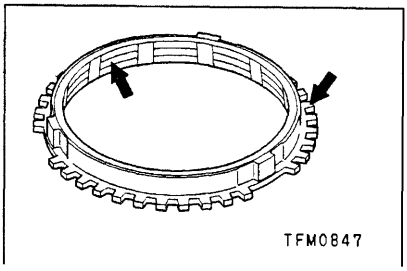
22200170050

INPUT SHAFT

(1) Check the outside diameter of the needle bearing mounting portion for damage, abnormal wear and seizure.
(2) Check the splines for damage and wear.

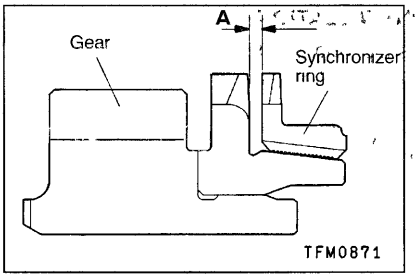
NEEDLE ROLLER BEARING

(1) Check that when the input shaft, sleeve and gear are combined and made to rotate, they rotate smoothly without noise.
(2) Check to ensure that the cage is not deformed.



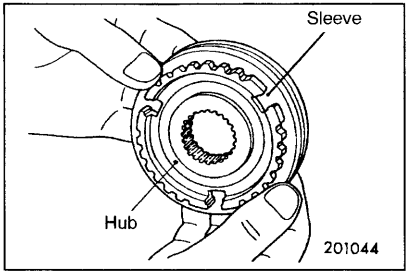
SYNCHRONIZER RING

(1) Check to ensure that the clutch gear tooth surfaces are not damaged and broken.
(2) Check to ensure that the cone inside diameter is not damaged or worn and that the threads are not crushed.



(3) Press the synchronizer ring against the gear and check clearance "A." If "A" is less than the limit, replace.

Limit: 0.5 mm (0.020 in.)



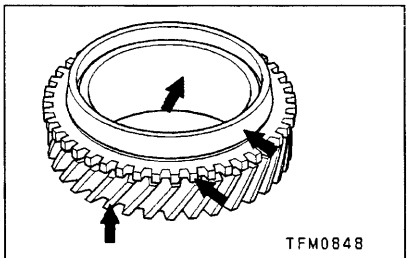
SYNCHRONIZER SLEEVE AND HUB

(1) Check that when the synchronizer sleeve and hub are combined and made to slide, they slide smoothly without binding.
(2) Check to ensure that the front and rear ends of the sleeve inside surface are not damaged.

Caution
When replacement of either the synchronizer sleeve or hub is necessary, check that the synchronizer sleeve and hub are replaced as a set.

SYNCHRONIZER SPRING

Check to ensure that the spring is not sagging, deformed or broken.



SPEED GEARS

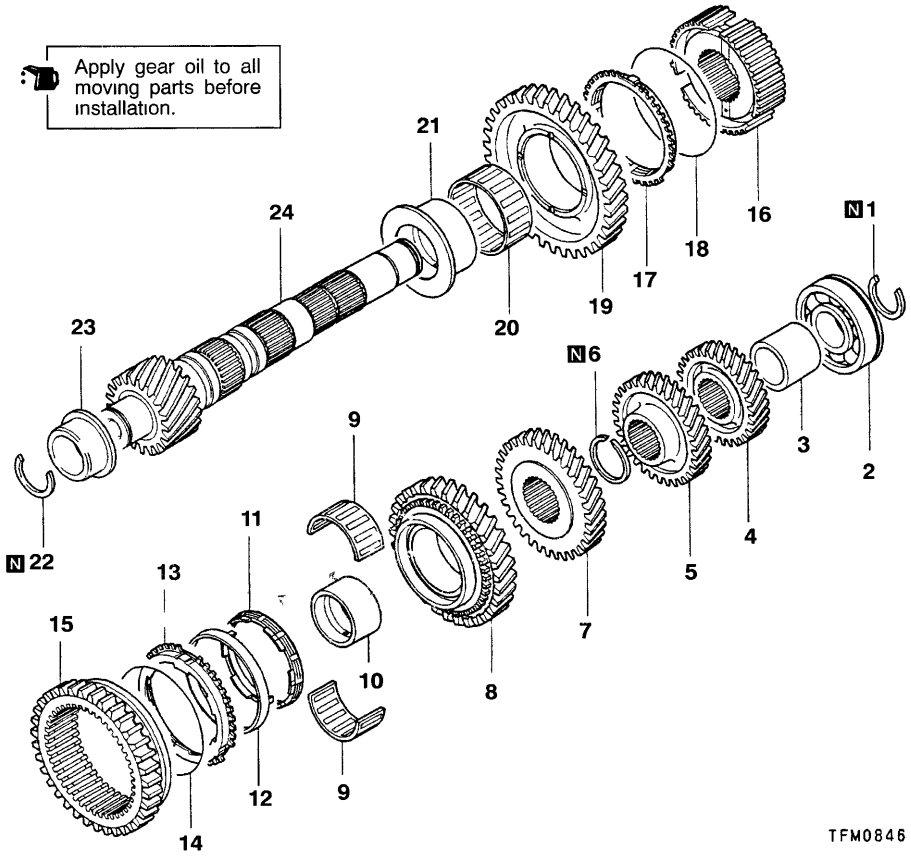
(1) Check to ensure that the helical and clutch gear tooth surfaces are not damaged or worn.
(2) Check to ensure that the synchronizer cone surfaces are not roughened, damaged or worn.
(3) Check to ensure that the gear inside diameter and front and rear surfaces are not damaged and worn.

OUTPUT SHAFT

22200220083

DISASSEMBLY AND REASSEMBLY

<F5M41>

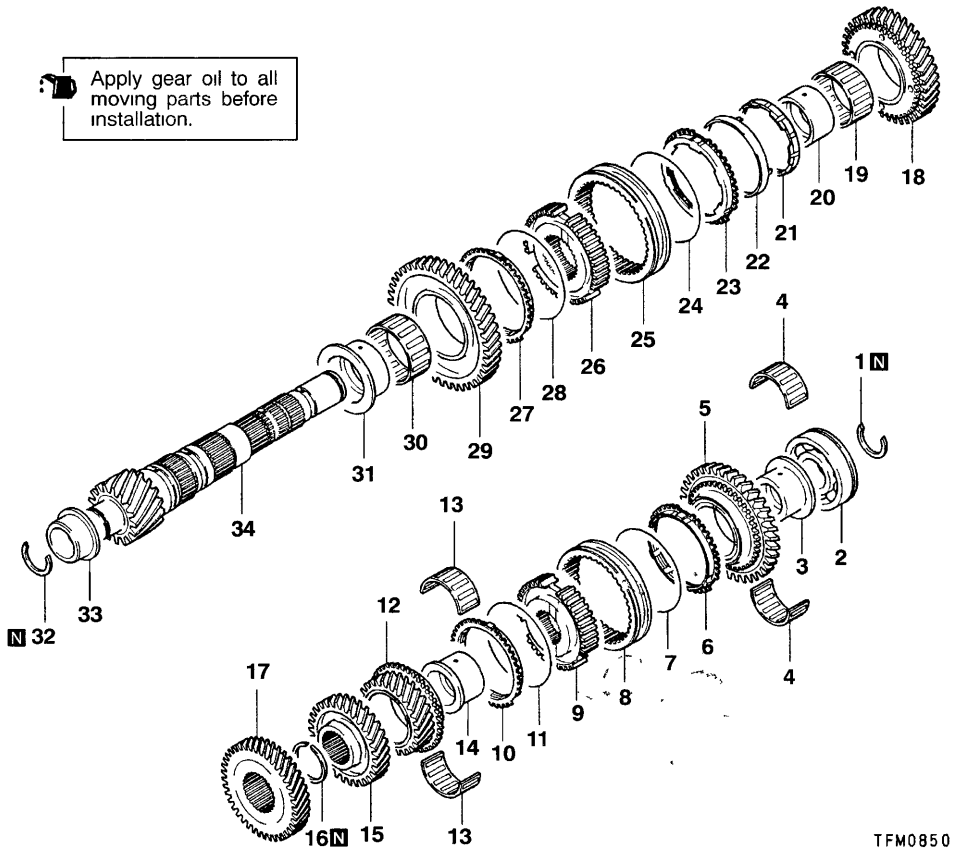


Disassembly steps

- ▶P◀ 1. Snap ring
- ◀A▶ ▶O◀ 2. Ball bearing
- 3. Collar
- 4. 5th speed gear
- 5. 4th speed gear
- ▶J◀ 6. Snap ring
- 7. 3rd speed gear
- 8. 2nd speed gear
- 9. Needle roller bearing
- ◀B▶ ▶H◀ 10. 2nd speed gear sleeve
- 11. Inner synchronizer ring
- 12. Synchronizer cone
- 13. Outer synchronizer ring
- ▶G◀ 14. Synchronizer spring
- ▶F◀ 15. Synchronizer sleeve
- ▶E◀ 16. 1st-2nd speed synchronizer hub
- 17. Synchronizer ring
- ▶D◀ 18. Synchronizer spring
- 19. 1st speed gear
- 20. Needle roller bearing
- ◀F▶ ▶C◀ 21. 1st speed gear sleeve
- ▶B◀ 22. Snap ring
- ◀G▶ ▶A◀ 23. Roller bearing inner race
- 24. Output shaft

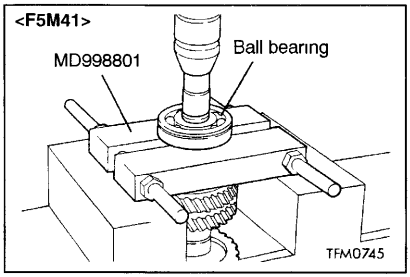
DISASSEMBLY AND REASSEMBLY

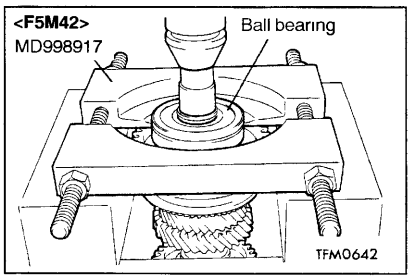
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Disassembly steps

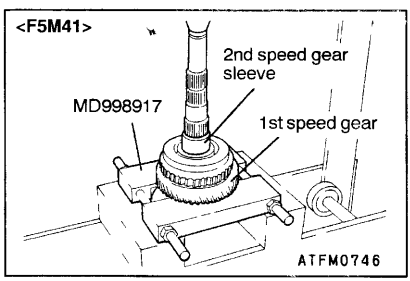
	▶P◀	1. Snap ring
◀A▶	▶O◀	2. Ball bearing
◀C▶	▶N◀	3 Reverse gear bearing sleeve
	▶N◀	4. Needle roller bearing
	▶N◀	5. Reverse gear
		6. Synchronizer ring
	▶D◀	7 Synchronizer spring
	▶F◀	8. Synchronizer sleeve
◀D▶	▶M◀	9. 5th-reverse speed synchronizer hub
		10 Synchronizer ring
	▶D◀	11. Synchronizer spring
		12 5th speed gear
		13 Needle roller bearing
	▶L◀	14. 5th speed gear sleeve
	▶K◀	15 4th speed gear
	▶J◀	16 Snap ring
◀E▶	▶I◀	17. 3rd speed gear
		18. 2nd speed gear
		19. Needle roller bearing
◀B▶	▶H◀	20. 2nd speed gear sleeve
		21 Inner synchronizer ring
		22. Synchronizer cone
		23. Outer synchronizer ring
	▶G◀	24 Synchronizer spring
	▶F◀	25 Synchronizer sleeve
	▶E◀	26. 1st-2nd speed synchronizer hub
		27. Synchronizer ring
	▶D◀	28. Synchronizer spring
		29. 1st speed gear
		30 Needle roller bearing
◀F▶	▶C◀	31. 1st speed gear sleeve
	▶B◀	32. Snap ring
◀G▶	▶A◀	33. Roller bearing inner race
		34. Output shaft



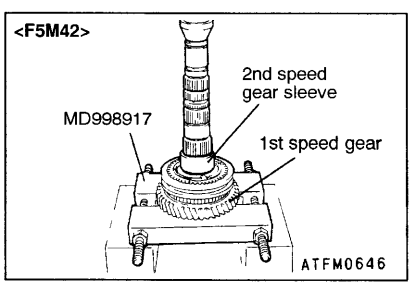


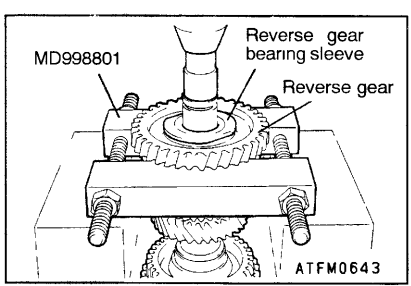
DISASSEMBLY SERVICE POINTS

◀A▶ BALL BEARING REMOVAL

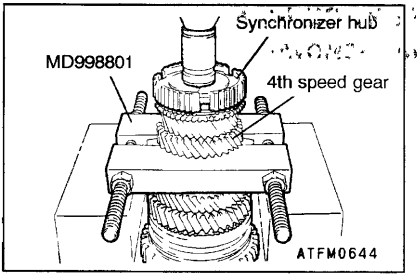


◀B▶ 2ND SPEED GEAR SLEEVE REMOVAL

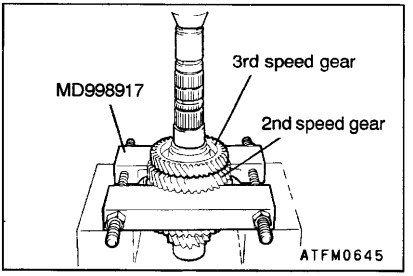




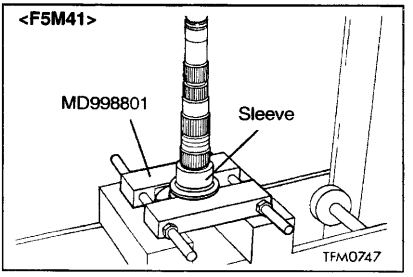
◀C▶ REVERSE GEAR BEARING SLEEVE REMOVAL



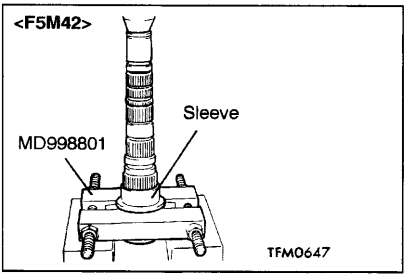
◀D▶ 5TH-REVERSE SPEED SYNCHRONIZER HUB REMOVAL

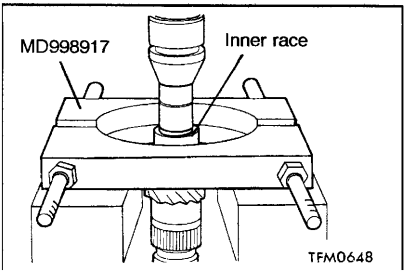


◀E▶ 3RD SPEED GEAR REMOVAL

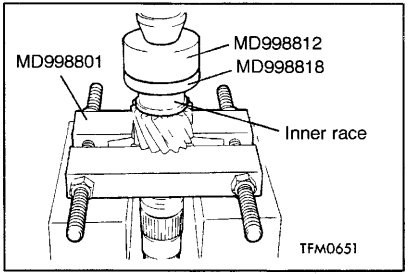


◀F▶ 1ST SPEED GEAR SLEEVE REMOVAL



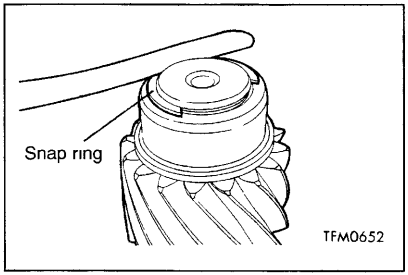


◀G▶ ROLLER BEARING INNER RACE REMOVAL



REASSEMBLY SERVICE POINTS

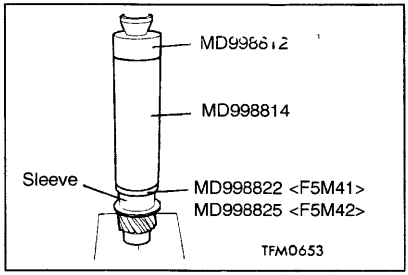
▶A◀ ROLLER BEARING INNER RACE INSTALLATION



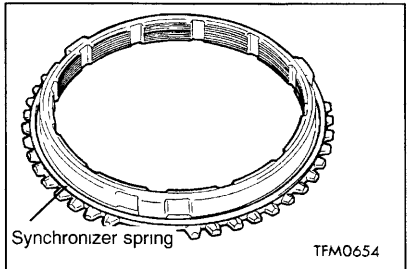
▶B◀ SNAP RING INSTALLATION

Select and install a snap ring so that the output shaft front bearing clearance will have the standard value.

Standard value:
0 to 0.12 mm (0 to 0.0047 in.)

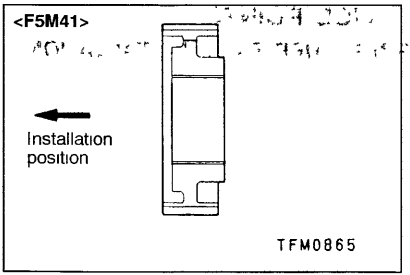


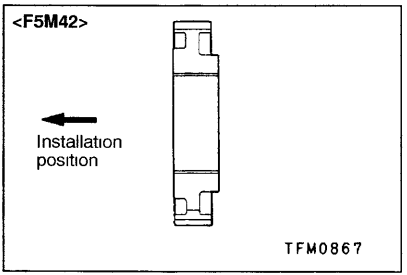
▶C◀ 1ST SPEED GEAR SLEEVE INSTALLATION



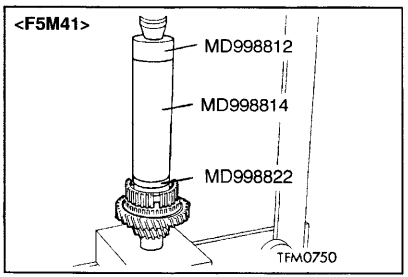
▶D◀ SYNCHRONIZER SPRING INSTALLATION

Install the synchronizer spring to the illustrated position of the synchronizer ring.

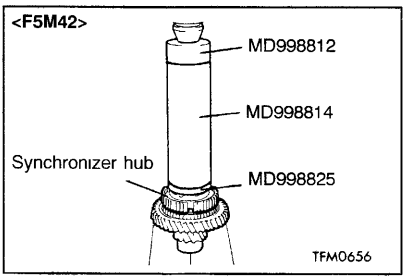


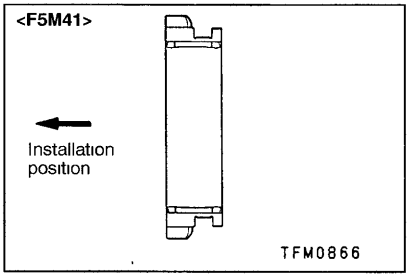


▶E◀ 1ST-2ND SPEED SYNCHRONIZER HUB INSTALLATION



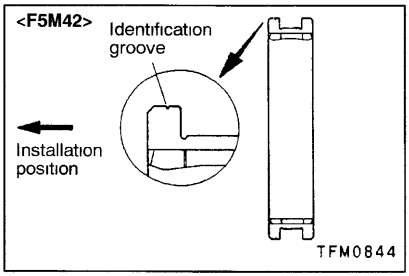
Caution
When installing the hub, check that the synchronizer ring is not caught.

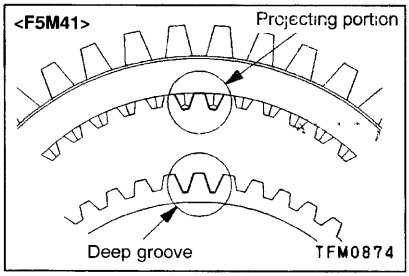




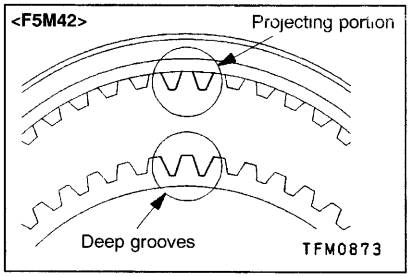
▶F◀ SYNCHRONIZER SLEEVE INSTALLATION

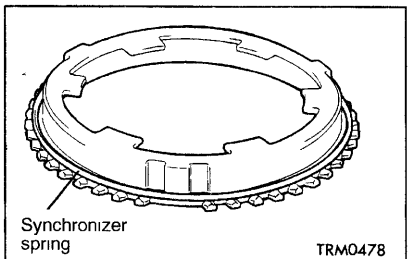
(1) Install the synchronizer sleeve so that the identification grooves are oriented in the direction shown. <F5M42>





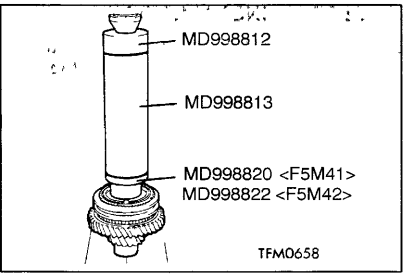
(2) When the synchronizer sleeve is installed, check that the deep groove portion of the synchronizer hub is aligned with the projecting portion of the sleeve.



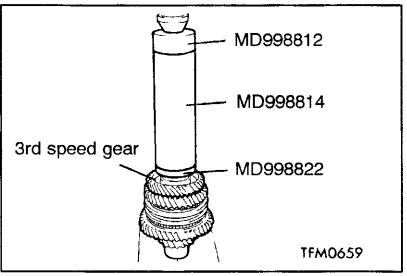


◀G▶ SYNCHRONIZER SPRING INSTALLATION

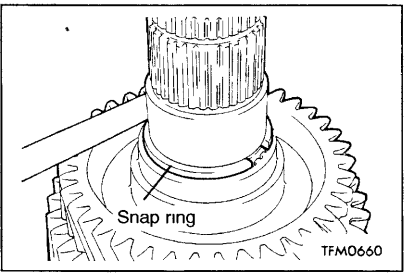
Install the synchronizer spring to the illustrated position of the outer synchronizer ring.



▶H◀ 2ND SPEED GEAR SLEEVE INSTALLATION



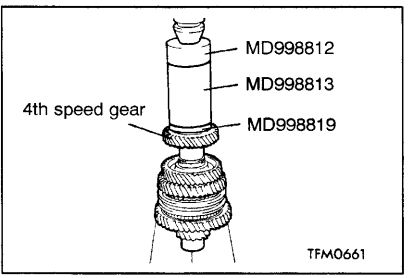
◀I▶ 3RD SPEED GEAR INSTALLATION



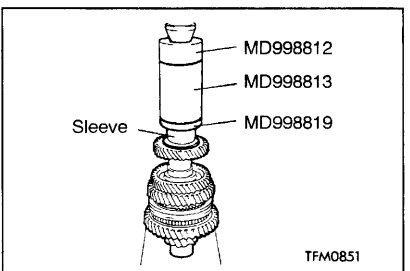
▶J◀ SNAP RING INSTALLATION

Select and install a snap ring so that the output shaft 3rd speed gear end play will have the standard value.

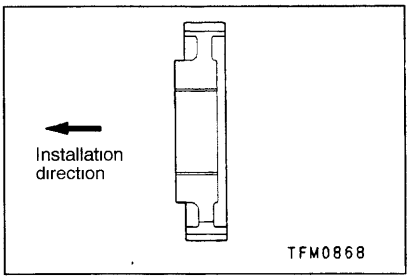
Standard value:
-0.01 to 0.09 mm (-0.0004 to 0.0035 in.)



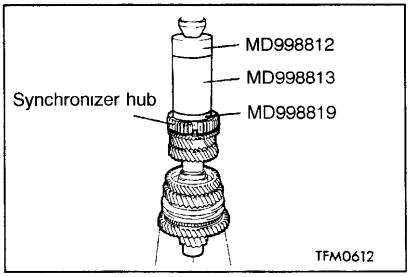
◀K▶ 4TH SPEED GEAR INSTALLATION



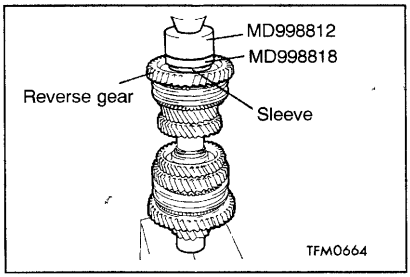
▶L◀ 5TH SPEED GEAR SLEEVE INSTALLATION



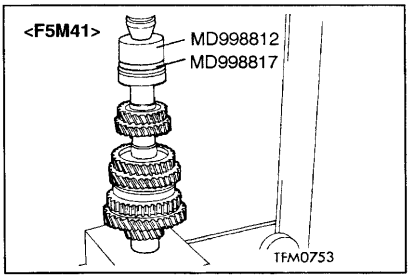
▶M◀5TH SPEED-REVERSE SYNCHRONIZER HUB INSTALLATION



Caution
When the 5th speed-reverse synchronizer hub is installed, check that the synchronizer ring is not caught.

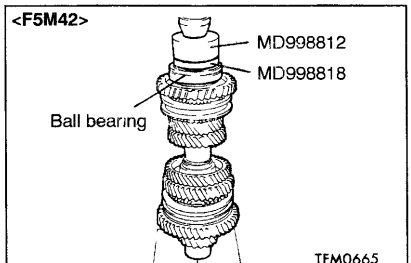


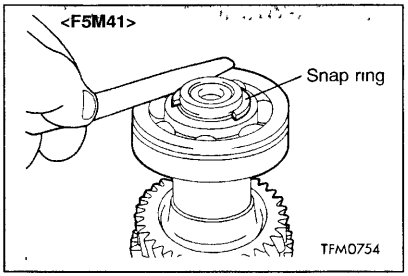
◀N▶ REVERSE GEAR/NEEDLE ROLLER BEARING/REVERSE GEAR BEARING SLEEVE INSTALLATION



▶O◀BALL BEARING INSTALLATION

NOTE
Install the ball bearings so that the groove on the bearing snap ring faces upward.

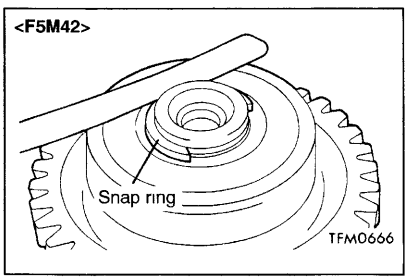


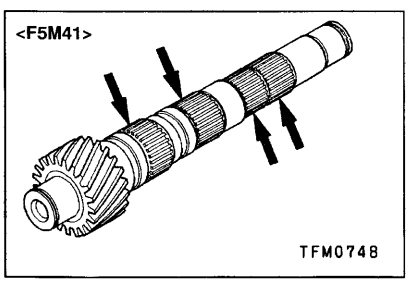


◀P▶ SNAP RING INSTALLATION

Select and install a snap ring so that the output shaft rear bearing clearance will have the standard value.

Standard value:
-0.01 to 0.09 mm (-0.0004 to 0.0035 in.)



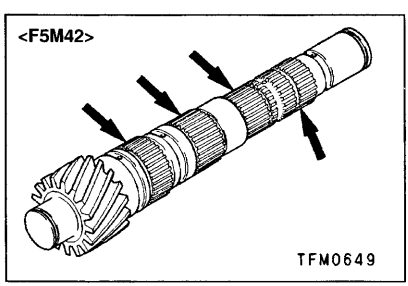


INSPECTION

22200230017

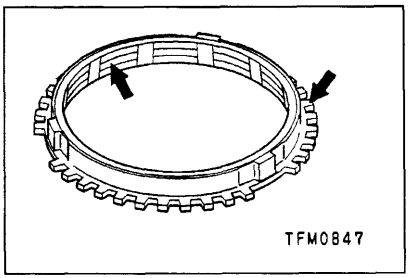
OUTPUT SHAFT

Check the splines for damage and wear.



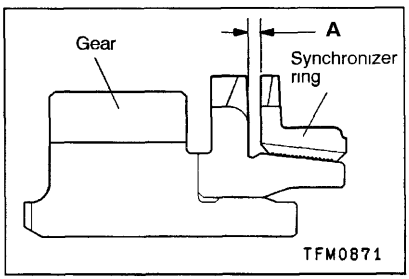
NEEDLE ROLLER BEARING

(1) Check that when the bearing sleeve and gear are combined and made to rotate, they rotate smoothly without looseness and noise.
(2) Check to ensure that the cage is not deformed.

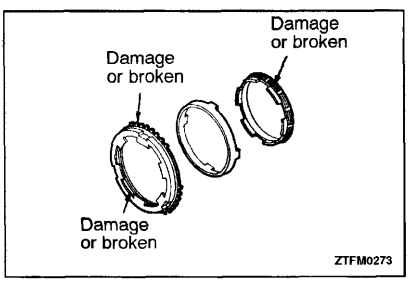


SYNCHRONIZER RING

(1) Check to ensure that the clutch gear tooth surfaces are not damaged and broken.
(2) Check to ensure that the cone inside diameter is not damaged or worn and that the threads are not crushed.

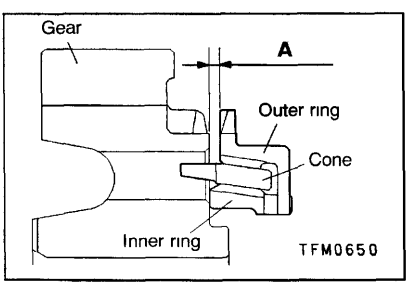


(3) Press the synchronizer ring against the gear and check clearance "A." If "A" is less than the limit, replace.
Limit: 0.5 mm (0.020 in.)



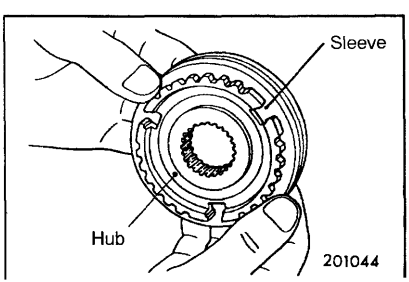
OUTER SYNCHRONIZER RING/INNER SYNCHRONIZER RING/SYNCHRONIZER CONE

(1) Check to ensure that the clutch gear tooth surfaces and cone surfaces are not damaged and broken.



(2) Install the outer ring, inner ring and cone, press them against the gear, and check clearance "A." If "A" is less than the limit, replace.
Limit: 0.5 mm (0.020 in.)

Caution
When the outer ring, inner ring or cone has to be replaced, check that the outer ring, inner ring and cone are replaced as a set.



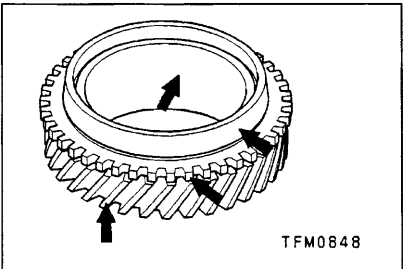
SYNCHRONIZER SLEEVE AND HUB

(1) Check that when the synchronizer sleeve and hub are combined and made to slide, they slide smoothly without binding.
(2) Check to ensure that the front and rear ends of the sleeve inside surface are not damaged.

Caution
When replacement of either the synchronizer sleeve or hub is necessary, check that the synchronizer sleeve and hub are replaced as a set.

SYNCHRONIZER SPRING

Check to ensure that the spring is not sagging, deformed or broken.



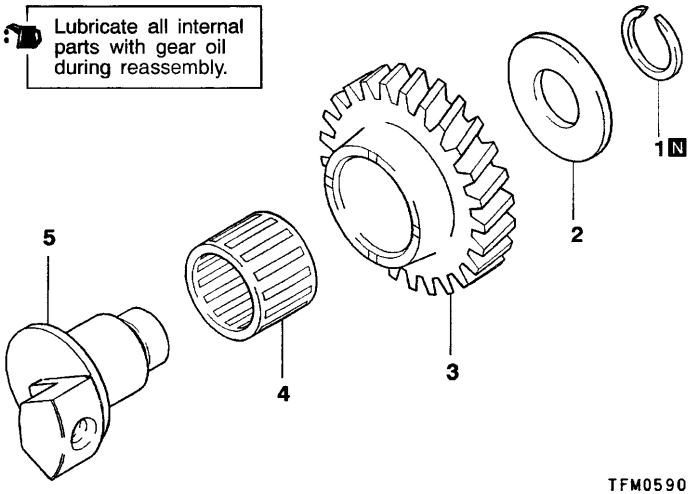
SPEED GEARS

(1) Check to ensure that the helical and clutch gear tooth surfaces are not damaged or worn.
(2) Check to ensure that the synchronizer cone surfaces are not roughened, damaged or worn.
(3) Check to ensure that the gear inside diameter and front and rear surfaces are not damaged and worn.

REVERSE IDLER GEAR <F5M42>

22201250012

DISASSEMBLY AND REASSEMBLY



Disassembly steps

1. Snap ring
2. Thrust washer
3. Reverse idler gear
4. Needle roller bearing
5. Reverse idler gear shaft

INSPECTION

22201240019

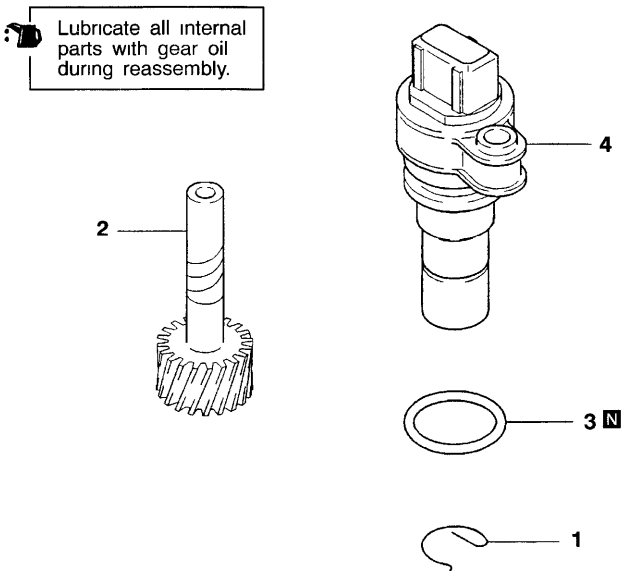
NEEDLE ROLLER BEARING

(1) Check that when the shaft and gear are combined and made to rotate, they rotate smoothly without looseness and noise.
(2) Check to ensure that the cage is not deformed.

SPEEDOMETER GEAR

22200340079

DISASSEMBLY AND REASSEMBLY



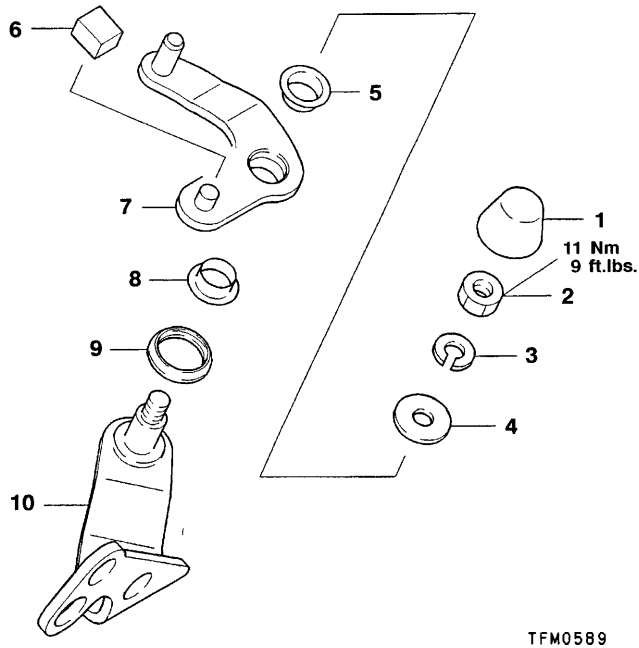
Disassembly steps

1 e-clip
2. Speedometer driven gear
3. O-ring
4 Sleeve

SELECT LEVER

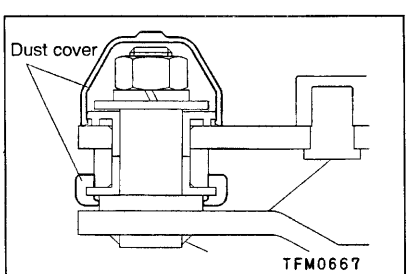
22201230011

DISASSEMBLY AND REASSEMBLY



Disassembly steps

▶A◀ 1. Dust cover
2. Nut
3 Spring washer
4. Washer
5. Select lever bushing
6. Select lever shoe
7. Select lever
8 Select lever bushing
▶A◀ 9 Dust cover
10. Select lever shaft



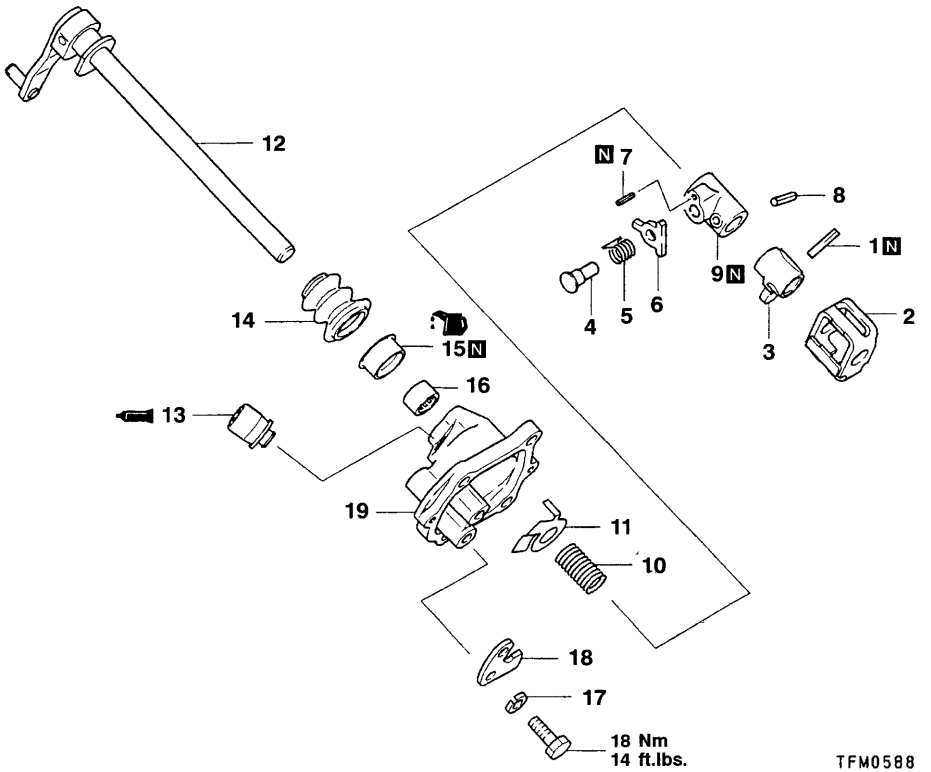
REASSEMBLY SERVICE POINT

▶A◀ DUST COVER INSTALLATION

CONTROL HOUSING

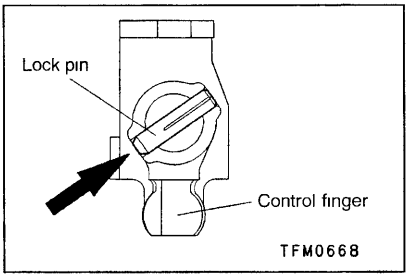
22201310017

DISASSEMBLY AND REASSEMBLY



Disassembly steps

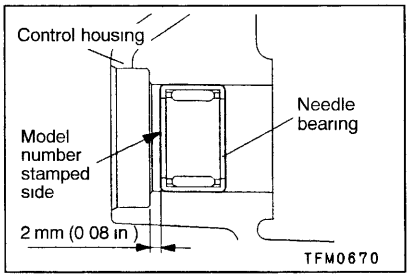
◀A▶ ▶F◀ 1. Lock pin
2. Interlock plate
3. Control finger
4. Pin
5. Return spring
6. Stopper plate
▶E◀ 7. Spring pin
▶D◀ 8. Spring pin
9. Stopper body
10. Neutral return spring
11. Spacer
12. Control shaft
▶C◀ 13. Air breather
14. Control shaft boot
▶B◀ 15. Oil seal
▶A◀ 16. Needle bearing
17. Spring washer
18. Stopper bracket
19. Control housing



DISASSEMBLY SERVICE POINT

◀A▶ LOCK PIN REMOVAL

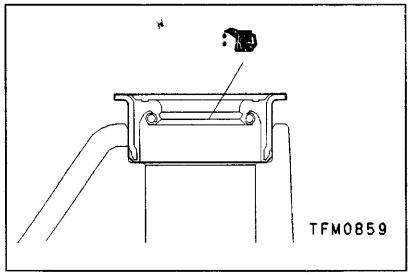
Drive the lock pin out of position from the direction shown.



REASSEMBLY SERVICE POINTS

▶A◀ NEEDLE BEARING INSTALLATION

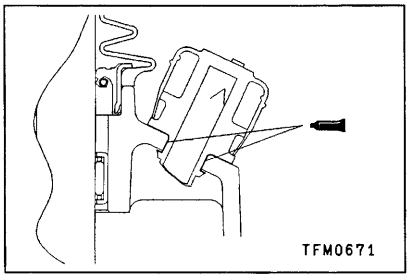
Press fit the needle bearing up the illustrated dimension, while making sure that the model number stamped side is oriented towards the control housing side.



▶B◀ OIL SEAL INSTALLATION

Apply transmission oil to the oil seal lip area.

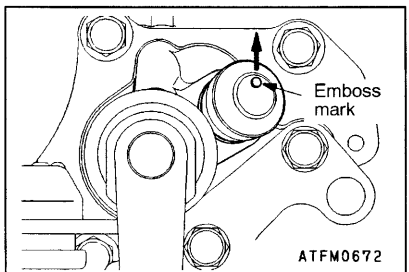
Specified oil:
Hypoid gear oil SAE 75W-90 or 75W-85W conforming to API classification GL-4



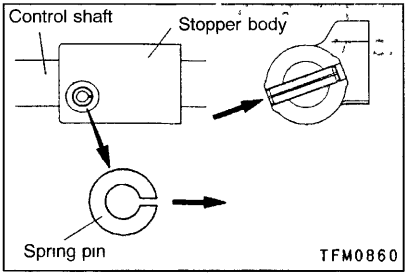
▶C◀ AIR BREATHER INSTALLATION

(1) Apply sealant to the inserting portion of the air breather.

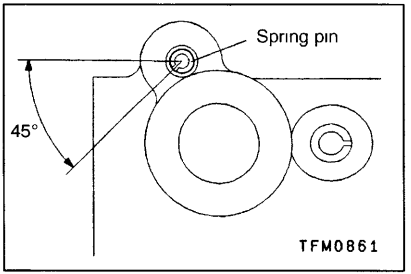
Specified sealant:
3M SUPER WEATHERSTRIP No.8001 or equivalent



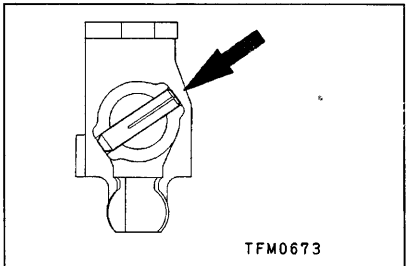
(2) Install the air breather so that the emboss mark is oriented in the direction shown.



▶D◀ SPRING PIN INSTALLATION



▶E◀ SPRING PIN INSTALLATION



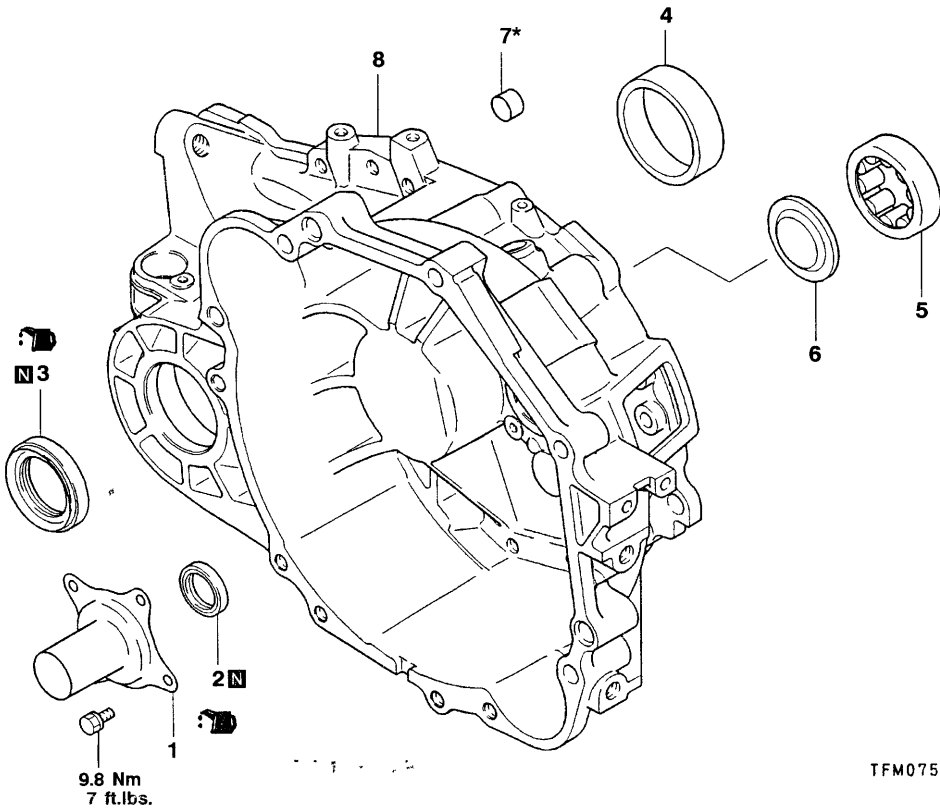
▶F◀ LOCK PIN INSTALLATION

Knock the lock pin in from the direction shown in the illustration.

CLUTCH HOUSING

22200370061

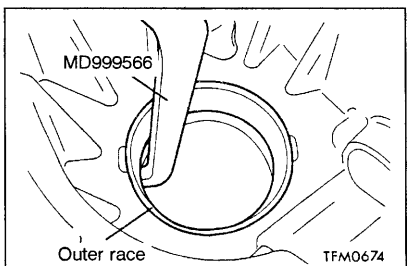
DISASSEMBLY AND REASSEMBLY



Disassembly steps

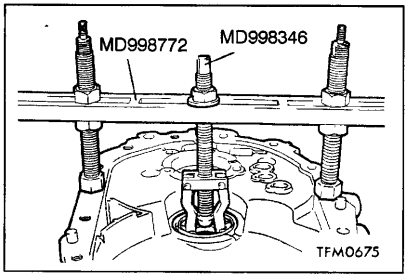
1 Clutch release bearing retainer
▶E◀ 2 Oil seal
▶D◀ 3. Oil seal
◀A▶ ▶C◀ 4. Outer race <F5M42>
◀B▶ ▶B◀ 5. Outer race
6. Oil guide <F5M41>
▶A◀ 7. Bushing*
8. Clutch housing

NOTE
*: Refer to the bushing installation procedures only when replacing the clutch housing.

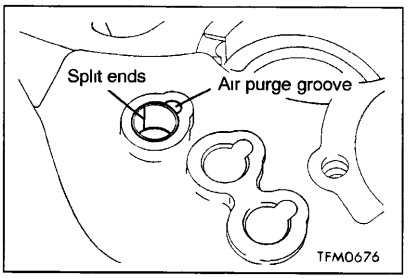


DISASSEMBLY SERVICE POINTS

◀A▶ OUTER RACE REMOVAL



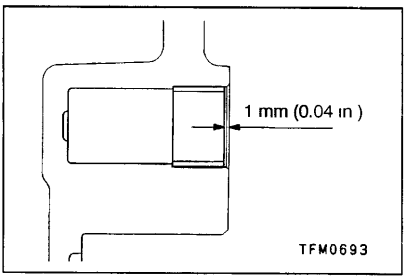
◀B▶ OUTER RACE REMOVAL



REASSEMBLY SERVICE POINTS

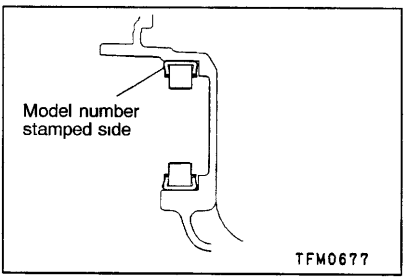
▶A◀ BUSHING INSTALLATION

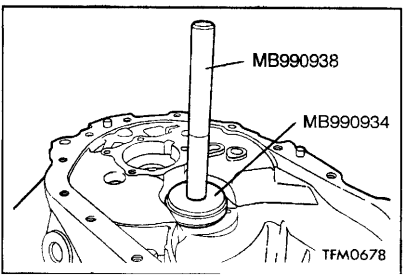
Press fit the bushing up to the illustrated position, while making sure that the split ends of the bushing do not coincide with the air purge groove.

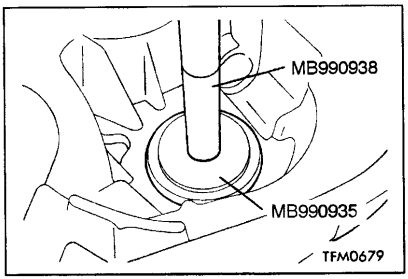


▶B◀ OUTER RACE INSTALLATION

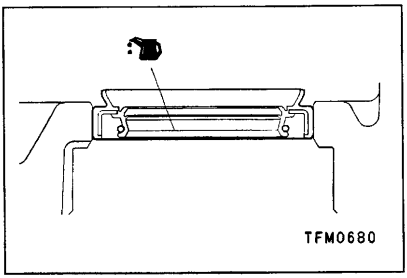
Install the outer race so that the model number stamped side faces the direction shown.







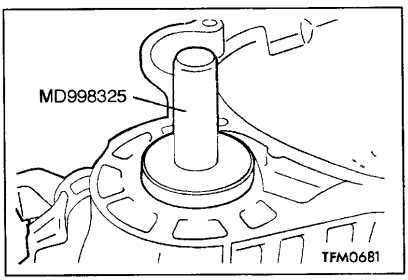
▶C◀ OUTER RACE INSTALLATION

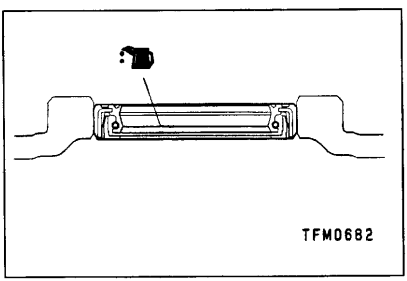


▶D◀ OIL SEAL INSTALLATION

Apply transmission oil to the oil seal lip area.

Specified oil:
Hypoid gear oil SAE 75W-90 or 75W-85W conforming to API classification GL-4

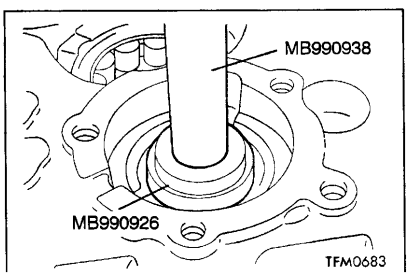




▶E◀ OIL SEAL INSTALLATION

Apply transmission oil to the oil seal lip area.

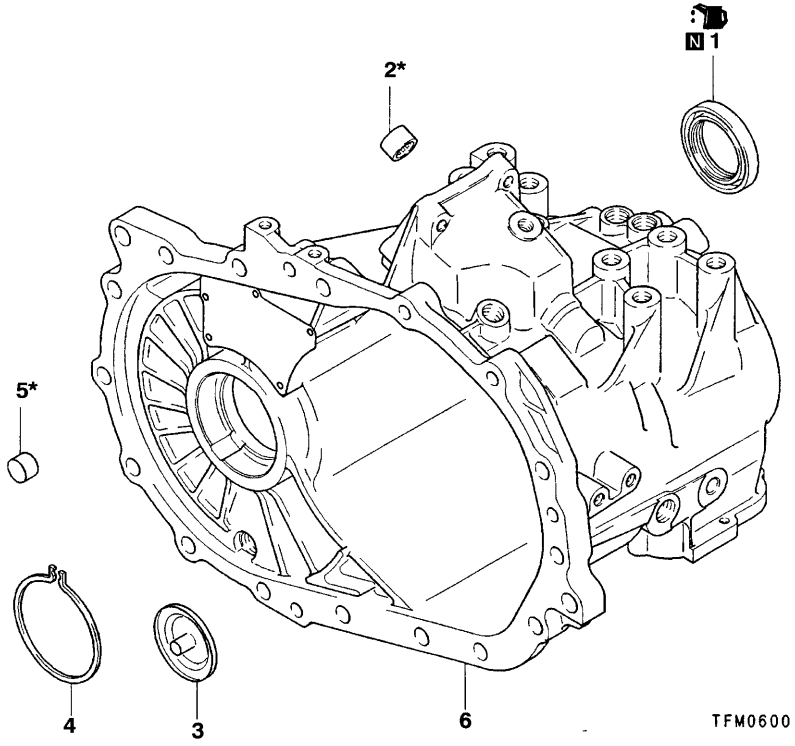
Specified oil:
Hypoid gear oil SAE 75W-90 or 75W-85W conforming to API classification GL-4



TRANSAXLE CASE

22201340016

DISASSEMBLY AND REASSEMBLY

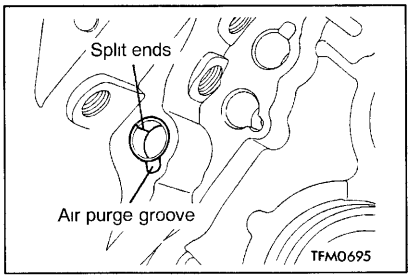


Disassembly steps

- ▶C◀ 1. Oil seal
- ▶B◀ 2. Needle bearing*
- 3. Oil guide
- 4. Snap ring
- ▶A◀ 5. Bushing*
- 6. Transaxle

NOTE

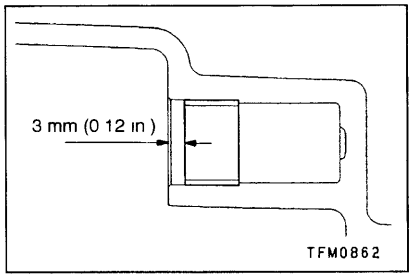
*: Refer to the needle bearing and bushing installation procedures only when replacing the transaxle case.



REASSEMBLY SERVICE POINTS

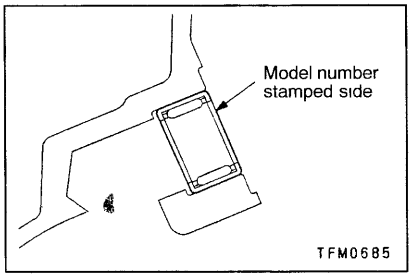
▶A◀ BUSHING INSTALLATION

Press fit the bushing up to the illustrated position, while making sure that the split ends of the bushing do not coincide with the air purge groove.



▶B◀ NEEDLE BEARING INSTALLATION

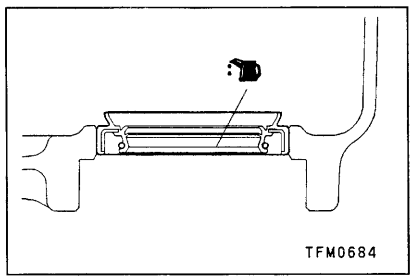
Press fit the needle bearing until it is flush with the case, while making sure that the model number stamped side faces the direction shown.

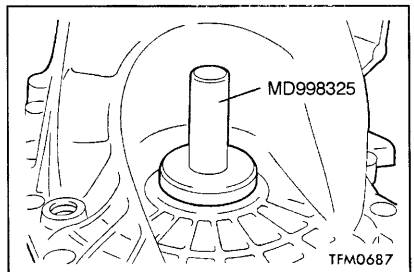


▶C◀ OIL SEAL INSTALLATION

Apply transmission oil to the oil seal lip area.

Specified oil:
Hypoid gear oil SAE 75W-90 or 75W-85W conforming to API classification GL-4



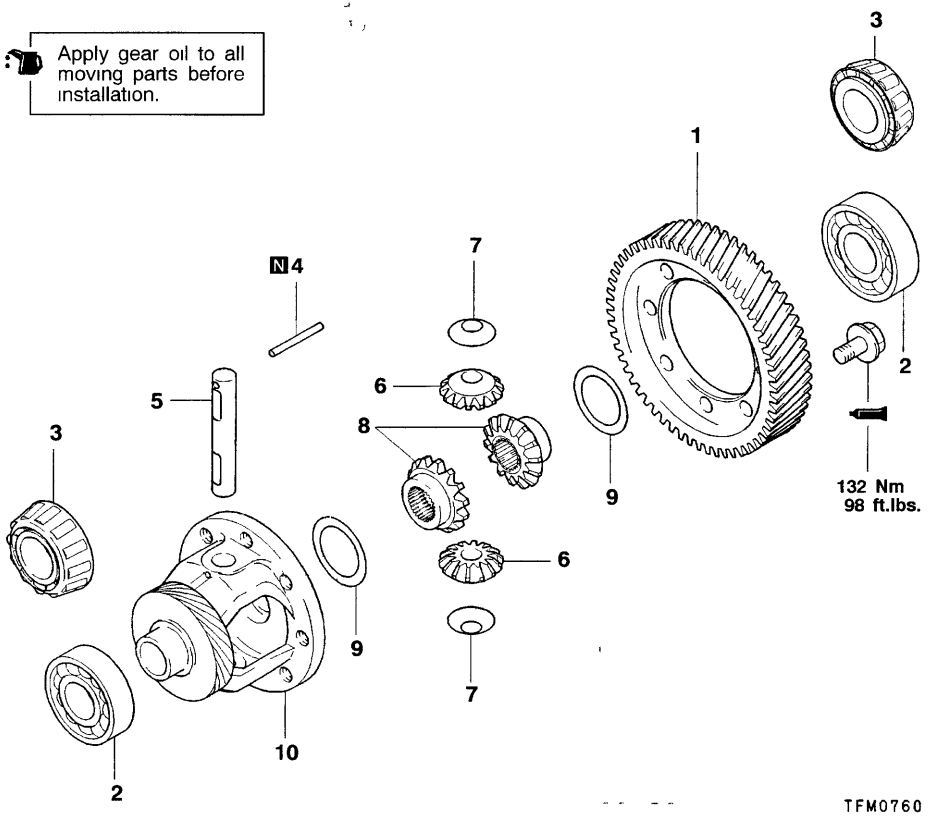


DIFFERENTIAL

22200250082

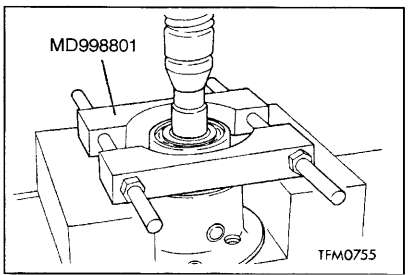
DISASSEMBLY AND REASSEMBLY

Apply gear oil to all moving parts before installation.



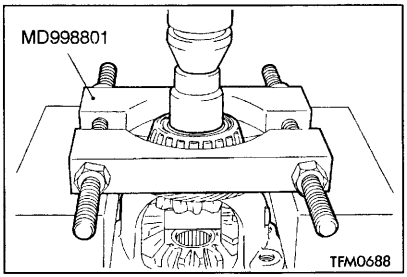
Disassembly steps

	▶E◀	1. Differential drive gear
◀A▶	▶D◀	2. Ball bearing <F5M41>
◀B▶	▶C◀	3 Taper roller bearing <F5M42>
	▶B◀	4. Lock pin
	▶A◀	5. Pinion shaft
	▶A◀	6. Pinion
	▶A◀	7. Washer
	▶A◀	8. Side gear
	▶A◀	9. Spacer
		10. Differential case

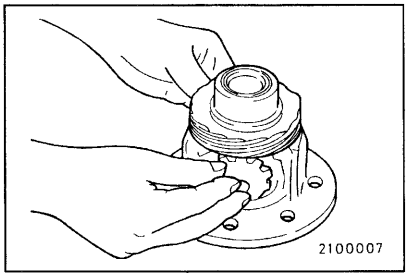


DISASSEMBLY SERVICE POINTS

◀A▶ BALL BEARING REMOVAL



◀B▶ TAPER ROLLER BEARING REMOVAL



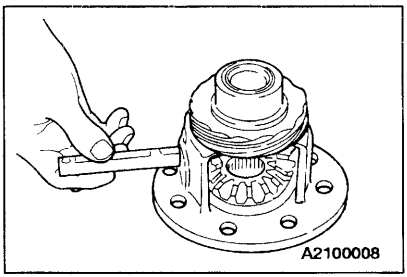
REASSEMBLY SERVICE POINTS

▶A◀ SPACER/SIDE GEAR/WASHER/PINION/PINION SHAFT INSTALLATION

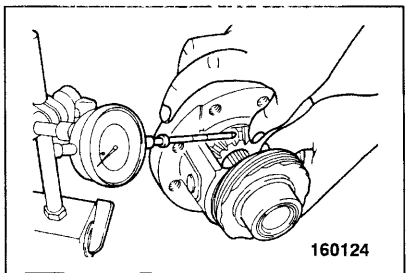
(1) After a spacer has been mounted on the back surface of the side gear, install the side gear in the differential case.

NOTE
When a new side gear is to be installed, mount a medium thickness spacer [0.93 to 1.00 mm (0.0366 to 0.0395 in.)]

(2) Set the washer on the back of each pinion, and put both pinions simultaneously in mesh with the side gears. While rotating them, install them in position.



(3) Insert the pinion shaft.

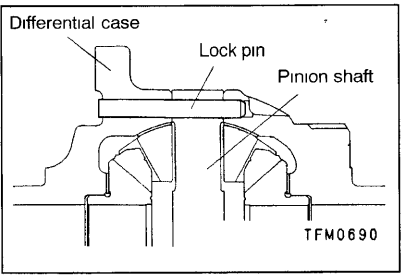


(4) Measure the backlash between the side gear and pinion.

Standard value:
0.025 to 0.150 mm (0.00098 to 0.00591 in.)

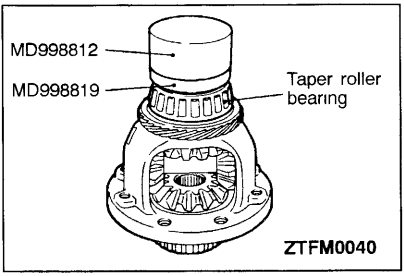
(5) If the backlash is out of specification, select a spacer and re-measure the backlash.

NOTE
Adjust until the backlashes on both sides are equal.

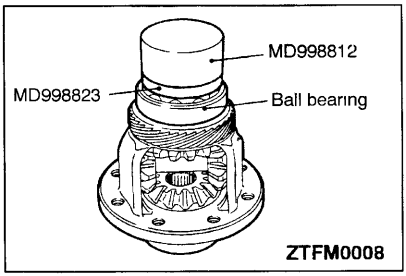


▶B◀ LOCK PIN INSTALLATION

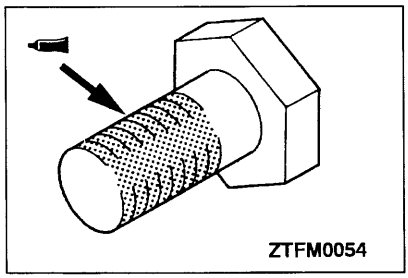
Install the lock pin so that it will be oriented in the direction shown.



▶C◀ TAPER ROLLER BEARING INSTALLATION



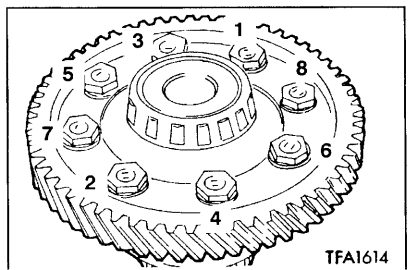
▶D◀ BALL BEARING INSTALLATION



▶E◀ DIFFERENTIAL DRIVE GEAR INSTALLATION

(1) Apply a sealant to the entire threaded portion of the bolt.

Specified sealant:
3M Stud Locking No.4170 or equivalent



(2) Tighten the bolts to the specified torque in the illustrated sequence.

AUTOMATIC TRANSAXLE

CONTENTS

23109000170

AUTOMATIC TRANSAXLE 23A

AUTOMATIC TRANSAXLE OVERHAUL 23B

AUTOMATIC TRANSAXLE

CONTENTS

23109000187

AUTOMATIC TRANSAXLE KEY INTERLOCK & SHIFT LOCK MECHANISMS* 76

GENERAL INFORMATION 3

LUBRICANT 7

ON-VEHICLE SERVICE 50

A/T Control Component Check 56
A/T Control Component Location 54
Essential Service 50
Hydraulic Circuit 64
Hydraulic Pressure Test 59
Key Interlock Mechanism Check 71
Line Pressure Adjustment 70
Selector Lever Operation Check 70
Shift Lock Mechanism Check 71
Torque Converter Stall Test 58

SERVICE SPECIFICATIONS 7

SPECIAL TOOLS 7

TRANSAXLE ASSEMBLY 78

TRANSAXLE CONTROL* 73

TROUBLESHOOTING 9

WARNINGS REGARDING SERVICING OF SUPPLEMENTAL RESTRAINT SYSTEM (SRS) EQUIPPED VEHICLES

WARNING!

(1) Improper service or maintenance of any component of the SRS, or any SRS-related component, can lead to personal injury or death to service personnel (from inadvertent firing of the air bag) or to the driver and passenger (from rendering the SRS inoperative).

(2) Service or maintenance of any SRS component or SRS-related component must be performed only at an authorized MITSUBISHI dealer.

(3) MITSUBISHI dealer personnel must thoroughly review this manual, and especially its GROUP 52B – Supplemental Restraint System (SRS) and GROUP 00 – Maintenance Service before beginning any service or maintenance of any component of the SRS or any SRS-related component.

NOTE

The SRS includes the following components: SRS-ECU, SRS warning light, air bag module, clock spring and interconnecting wiring. Other SRS-related components (that may have to be removed/installed in connection with SRS service or maintenance) are indicated in the table of contents by an asterisk (*).

GENERAL INFORMATION

23100010240

The newly-developed F4A41 and F4A42 automatic transaxle have been used.
These newly-developed transaxles combine the highest-precision electronic and mechanical technology to provide a new era in automatic transaxle performance.
The main features of these new transaxles are described below:
(1) The "INVECS-II" automatic transaxle system seeks to provide the ultimate in easy driving.
(2) Feedback control and learning control are incorporated into the control for all gear shifting clutches to provide an excellent shift feeling that suppresses shifting shocks throughout the vehicle.
(3) The gear shifting clutches use a hydraulic balancing mechanism to enable gear shifting at extra-high engine speed.
(4) The number of shafts has been decreased to two. Increased use has been made of metal plates. The one-way clutch has been removed. These features help to reduce the weight of the A/T assembly.
(5) Increased meshing ratios and improved rigidity of the gear supports and casing result in less noise.

Transaxle model		F4A41-1-M8A3	F4A42-1-M8A5
Torque converter	Type	3-element, 1-stage, 2-phase	
	Torque converter clutch	Provided (3rd to 4th)	
	Stall torque ratio	2.00	
Transaxle ratio		4-speed forward, 1-speed reverse fully automatic	
Gear ratio	1st	2.842	
	2nd	1.529	
	3rd	1.000	
	4th	0.712	
	Reverse	2.480	
Reduction ratio		4.042	
Number of underdrive clutch discs		3	4
Number of overdrive clutch discs		3	4
Number of reverse clutch discs		2	
Number of low-reverse brake discs		4	5
Number of second brake discs		2	3
Manual control type		P-R-N-D-3-2-L (7 positions)	
Shift pattern control		Electronic control (INVECS-II)	
Oil pressure control during shifting		Electronic control (each oil pressure independently controlled)	
Torque converter clutch control		Electronic control	

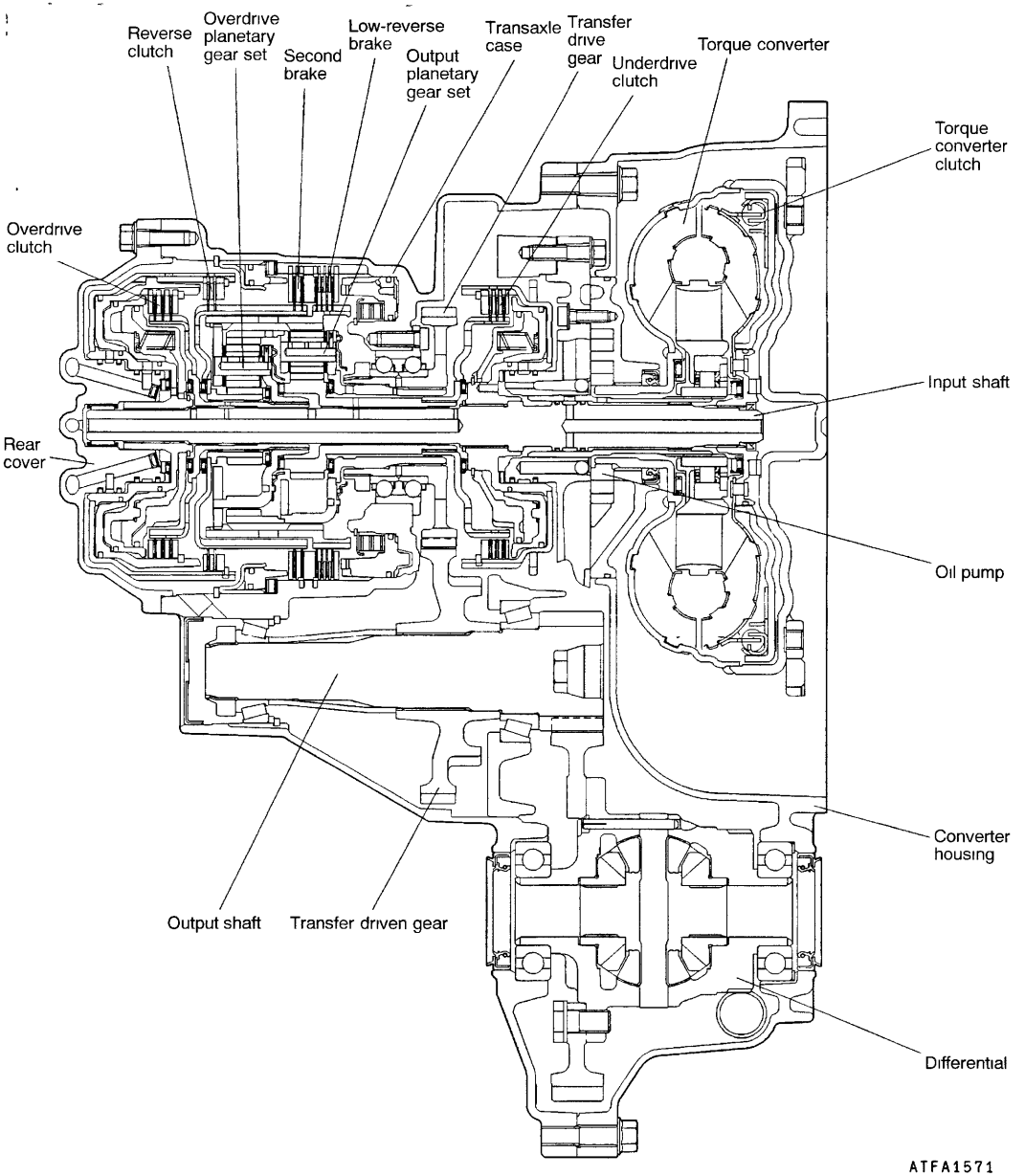
FUNCTION ELEMENT TABLE

× : Function element

Operating element / Selector lever position		Gear ratio	Engine start	Parking mechanism	Underdrive clutch (UD)	Reverse clutch (REV)	Overdrive clutch (OD)	Low-reverse brake (LR)	Second brake (2ND)
P	Parking	-	OK	×	-	-	-	×	-
R	Reverse	2.480	-	-	-	×	-	×	-
N	Neutral	-	OK	-	-	-	-	×	-
D	1st	2.842	-	-	×	-	-	×	-
D	2nd	1.529	-	-	×	-	-	-	×
D	3rd	1.000	-	-	×	-	×	-	-
D	4th	0.712	-	-	-	-	×	-	×
3	1st	2.842	-	-	×	-	-	×	-
3	2nd	1.529	-	-	×	-	-	-	×
3	3rd	1.000	-	-	×	-	×	-	-
2	1st	2.842	-	-	×	-	-	×	-
2	2nd	1.529	-	-	×	-	-	-	×
L	1st	2.842	-	-	×	-	-	×	-

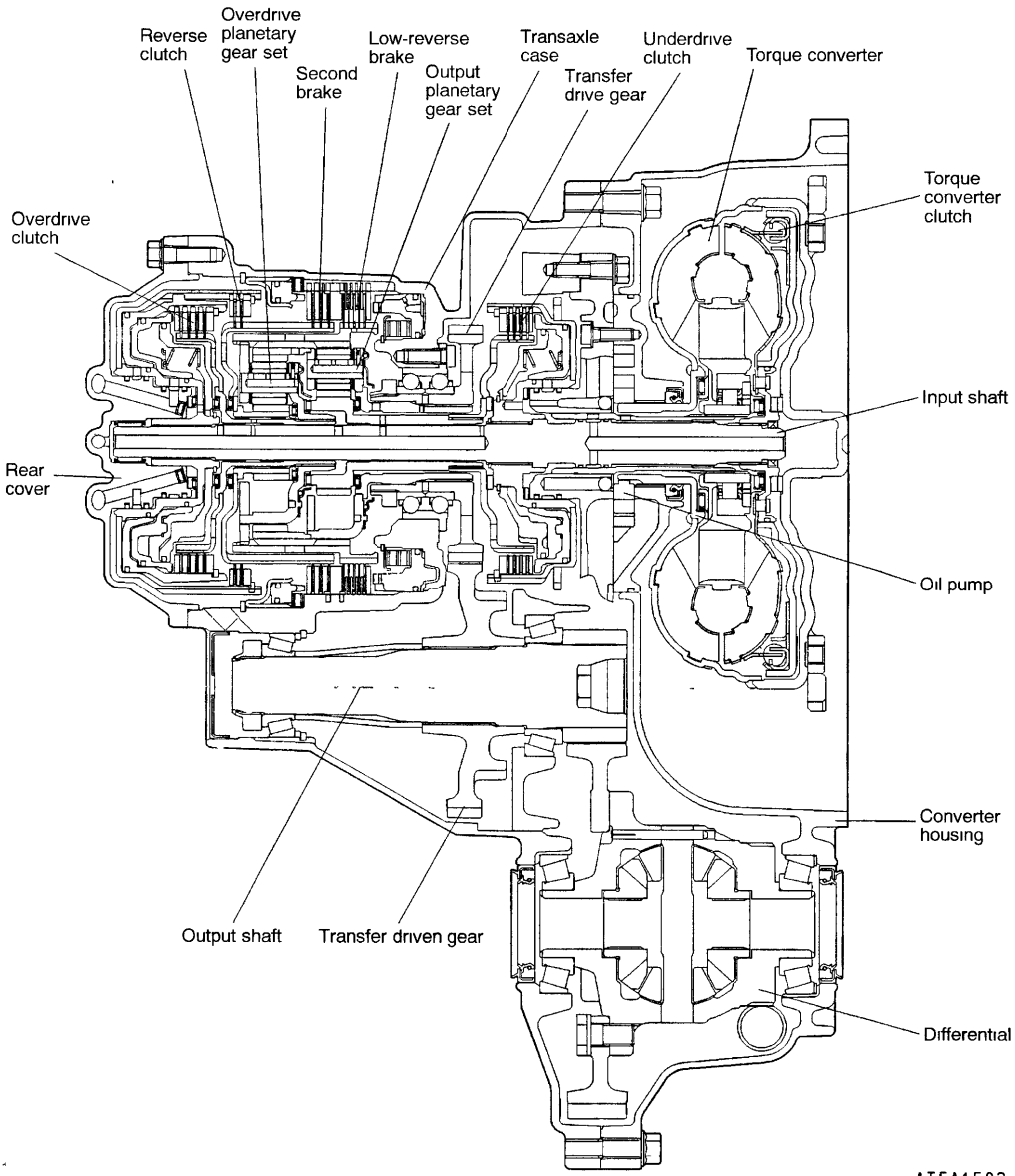
SECTIONAL VIEW

F4A41



SECTIONAL VIEW

F4A42



SERVICE SPECIFICATIONS

23100030093

Items		Standard value
Oil temperature sensor kΩ	at 0°C (32°F)	16.7 - 20.5
	at 100°C (212°F)	0.57 - 0.69
Resistance of torque converter clutch control solenoid coil [at 20°C (68°F)] Ω		2.7 - 3.4
Resistance of Low-Reverse solenoid valve coil [at 20°C (68°F)] Ω		2.7 - 3.4
Resistance of second solenoid valve coil [at 20°C (68°F)] Ω		2.7 - 3.4
Resistance of underdrive solenoid valve coil [at 20°C (68°F)] Ω		2.7 - 3.4
Resistance of overdrive solenoid valve coil [at 20°C (68°F)] Ω		2.7 - 3.4
Stall speed r/min		1,900 - 2,400
Line pressure adjustment value kPa (psi)		1,010 - 1,050 (147 - 152)
Protruding length of stabilizer bar mounting bolt mm (in)		22 (.87)

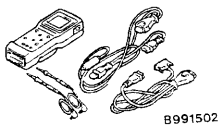
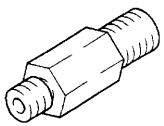
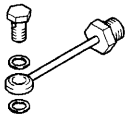
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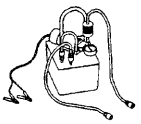
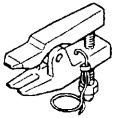
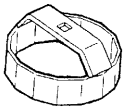
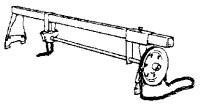
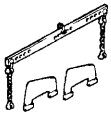
23100040089

Items	Specified lubricant	Quantity dm^3 (qts.)
Transmission fluid	DIAMOND ATF SPII, DIAMOND ATF SPII M or equivalent	7.8 (8.2)

SPECIAL TOOLS

23100060108

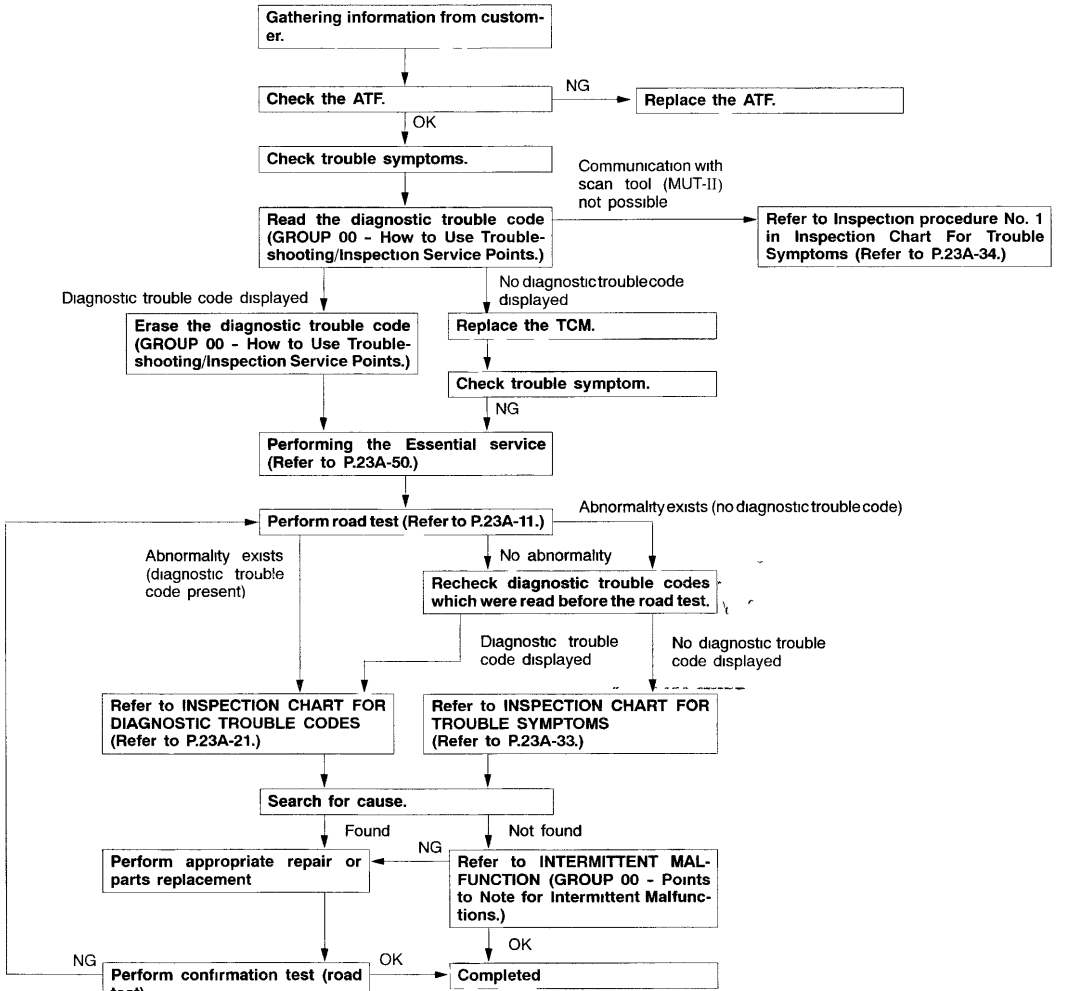
Tool	Tool number and name	Supersession	Application
 B991502	MB991502 Scan tool (MUT-II)	MB991496-OD	Checking for diagnostic trouble codes (DTC)
	MD998330 Oil pressure gauge 2,942 kPa (427 psi)	MD998330-01	Measurement of oil pressure
	MD998332 Adapter	MD998332-01	
	MD998900 Adapter	MD998900-01	

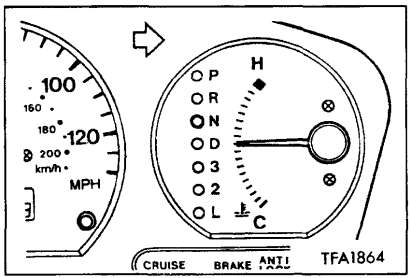
Tool	Tool number and name	Supersession	Application
	MB995062 Flushing tool	-	Flushing of cooler and tubes
 B991113	MB991113 Steering linkage puller	MB991113-01	Removal of the tie rod end and the lower arm
	MB991610 Oil filter wrench	-	Removal and installation of automatic transaxle oil filter
 Z203827	GENERAL SERVICE TOOL MZ203827 Engine lifter	MZ203827-01	Supporting the engine assembly during removal and installation of the transaxle
 B991453	MB991453 Engine hanger assembly	MZ203827-01	Supporting the engine assembly during removal and installation of the transaxle

TROUBLESHOOTING

23100760350

DIAGNOSTIC TROUBLESHOOTING FLOW





DIAGNOSIS FUNCTION

2310U770094

1. N (Neutral) range light

The N range light flashes at a frequency of approximately 1 Hz (once per second) if there is an abnormality in any of the items in the table below which are related to the A/T system. Note that the N range light will flash only when the shift lever position is at the advance range (D, 3, 2 or L). Check for diagnostic trouble codes if the N range light is flashing at a frequency of approximately 1 Hz.

N range light flashing items

Input shaft speed sensor system
Output shaft speed sensor system
Each solenoid valve system
Gear incorrect ratio
A/T control relay system

Caution

- **If the N range light is flashing at a frequency of approximately 2 Hz (two flashes per second), it means that the automatic transmission fluid temperature is too high. Stop the vehicle in a safe place and wait until the N range light switches off.**

2. Method of reading the diagnostic trouble code

Use the Scan tool (MUT-II) or the N range light to take a reading of the diagnostic trouble codes. (Refer to GROUP 00 - How to Use Troubleshooting/Inspection Service Points.)

ROAD TEST

23100780356

Check by the following procedures

Procedure	Condition before test/Operation	Test/Operation	Judgement value	Check item	Diagnostic code No.	Inspection procedure page if there is an abnormality
1	Ignition switch: OFF	Ignition switch (1) ON	Data list No 54 (1) Control Relay Voltage [V]	A/T Control relay	54	A/T Control relay system (23A-32)
2	Ignition switch: ON Engine: Stopped Selector lever position: P	Selector lever position (1) P, (2) R, (3) N, (4) D, (5) 3, (6) 2, (7) L	Data list No 61 (1) P, (2) R, (3)N, (4) D, (5) 3, (6) 2, (7) L	Park/Neutral position switch	27 28	Park/Neutral position switch system (23A-25)
		Accelerator pedal (1) Fully closed (2) Depressed (3) Fully open	Data list No 11 (1) 400 - 1,000 mV (2) Gradually rises from (1) (3) 4,500 - 5,000 mV	TPS	11 12 14	TPS system (23A-22)
		Brake pedal (1) Depressed (2) Released	Data list No. 26 (1) ON (2) OFF	Stop light switch	26	Stop light switch system (23A-25)
3	Ignition switch: ST Engine: Stopped	Starting test with lever P or N range	Starting should be possible	Starting	-	Starting impossible (23A-34)
4	Warming up	Drive for 15 minutes or more so that the automatic fluid temperature becomes 70 - 90°C. (158 - 194 °F)	Data list No 15 Gradually rises to 70 - 90°C	Oil temperature sensor	15 16	Oil temperature sensor system (23A-22)

Procedure	Condition before test/Operation	Test/Operation	Judgement value	Check item	Diagnostic code No	Inspection procedure page if there is an abnormality
5	Engine: Idling Selector lever position. N	Brake pedal (Retest) (1) Depressed (2) Released	Data list No. 26 (1) ON (2) OFF	Stop light switch	26	Stop light switch system (23A-25)
		A/C switch (1) ON (2) OFF	Data list No. 65 (1) ON (2) OFF	Dual pressure switch	-	Dual pressure switch system (23A-42)
5	Engine Idling Selector lever position. N	Accelerator pedal (1) Fully closed (2) Depressed	Data list No 64 (1) ON (2) OFF	Closed throttle position switch	-	Closed throttle position switch system (23A-42)
			Data list No. 21 (1) 600 - 900 rpm (2) Gradually rises from (1)	Crankshaft position sensor	21	Crankshaft position sensor system (23A-22)
			Data list No. 57 (2) Data changes	Communication with ECM	51	Abnormal communication with ECM (23A-32)
5	Engine: Idling Selector lever position: N	Selector lever position (1) N → D (2) N → R	Should be no abnormal shifting shocks Time lag when shifting should be within 2 seconds	Malfunction when starting	-	Engine stalling when shifting (23A-36)
					-	Shocks when changing from N to D and long time lag (23A-37)
					-	Shocks when changing from N to R and long time lag (23A-38)
					-	Shocks when changing from N to D,N to R and long time lag (23A-38)
				Driving impossible	-	Does not move forward (23A-35)
					-	Does not reverse (23A-35)
					-	Does not move (forward or reverse) (23A-36)

Procedure	Condition before test/Operation	Test/Operation	Judgement value	Check item	Diagnostic code No.	Inspection procedure page if there is an abnormality
6	Selector lever position N (on a flat and straight road.)	Selector lever position and vehicle speed (1) Idling in L range (Vehicle stopped) (2) Driving at constant speed of 10 km/h (6.2 mph) in L position (3) Driving at constant speed of 30 km/h (19 mph) in 2 position (4) Accelerate to 50 km/h (31 mph) in 3 position, then release accelerator pedal. (5) Driving at constant speed of 50 km/h (31 mph) in D position (Each condition should be maintained for 10 seconds or more.)	Data list No. 63 (2) 1st, (3) 2nd, (4) 3rd, (5) 4th	Shift condition	-	-
			Data list No. 31 (2) 0 %, (3) 100 %, (4) 100 %, (5) 100 %	Low and reverse solenoid valve	31	Low and reverse solenoid valve system (23A-26)
			Data list No. 32 (2) 0 %, (3) 0 %, (4) 0 %, (5) 100 %	Underdrive solenoid valve	32	Underdrive solenoid valve system (23A-26)
			Data list No. 33 (2)100 %, (3) 0 %, (4) 100 %, (5) 0 %	Second solenoid valve	33	Second solenoid valve system (23A-26)

Procedure	Condition before test/Operation	Test/Operation	Judgement value	Check item	Diagnostic code No.	Inspection procedure page if there is an abnormality
6	Selector lever position N (on a flat and straight road.)	Selector lever position and vehicle speed (1) Idling in L range (Vehicle stopped) (2) Driving at constant speed of 10 km/h (6.2 mph) in L position (3) Driving at constant speed of 30 km/h (19 mph) in 2 position (4) Accelerate to 50 km/h (31 mph) in 3 position, then release accelerator pedal. (5) Driving at constant speed of 50 km/h (31 mph) in D position (Each condition should be maintained for 10 seconds or more.)	Data list No 34 (2) 100 %, (3) 100 %, (4) 0 %, (5) 0 %	Overdrive solenoid valve	34	Overdrive solenoid valve system (23A-26)
			Data list No. 29 (1) 0 km/h (4) 50 km/h	Vehicle speed sensor	-	Vehicle speed sensor system (23A-43)
			Data list No. 22 (4) 1,800 - 2,100 rpm	Input shaft speed sensor	22	Input shaft speed sensor system (23A-23)
			Data list No. 23 (4) 1,800 - 2,100 rpm	Output shaft speed sensor	23	Output shaft speed sensor system (23A-24)
7	Selector lever position. 3 (on a flat and straight road.)	Selector lever position and vehicle speed (1) Accelerate to 50 km/h (31 mph) in 3 position, then release accelerator pedal. (2) Driving at constant speed of 50 km/h (31 mph)	Data list No. 36 (1) 0 % (2) Approx. 70 - 90 %	Torque converter clutch solenoid	36 52 53	Torque converter clutch control solenoid system (23A-26)
			Data list No 52 (1) Approx. 100 - 300 rpm (2) Approx. 0 - 10 rpm			

Procedure	Condition before test/Operation	Test/Operation	Judgement value	Check item	Diagnostic code No.	Inspection procedure page if there is an abnormality
8	Use the scan tool (MUT-II) to stop the IN-VECS-II function. Selector lever position. D (on a flat and straight road)	Monitor data list No. 11, 23, and 63 with the scan tool (MUT-II) (1) Accelerate to 4th gear at a throttle position sensor output of 1.5V (accelerator opening angle of 30 %). (2) Gently decelerate to a standstill. (3) Accelerate to 4th gear at a throttle position sensor output of 2.5 V (accelerator opening angle of 50%) (4) While driving at 60 km/h (37 mph) in 4th gear, shift down to 3 range. (5) While driving at 40 km/h (25 mph) in 3rd gear, shift down to 2 range (6) While driving at 20 km/h (12 mph) in 2nd gear, shift down to L range.	For (1), (2) and (3), the reading should be the same as the specified output shaft speed, and no abnormal shift shocks should occur. For (4), (5) and (6), downshifting should occur immediately after shifting.	Malfunction when shifting	-	Shift shocks and lipping (23A-39)
				Displaced shifting points	-	All points (23A-39)
					-	Some points (23A-40)
				Does not shift	-	No diagnostic trouble code (23A-40)
					22	Input shaft speed sensor system (23A-23)
					23	Output shaft speed sensor system (23A-24)

Procedure	Condition before test/Operation	Test/Operation	Judgement value	Check item	Diagnostic code No.	Inspection procedure page if there is an abnormality
8	Use the scan tool (MUT-II) to stop the IN-VECS-II function. Selector lever position: D (on a flat and straight road)	Monitor data list No. 11, 23, and 63 with the scan tool (MUT-II). (1) Accelerate to 4th gear at a throttle position sensor output of 1.5V (accelerator opening angle of 30 %). (2) Gently decelerate to a standstill (3) Accelerate to 4th gear at a throttle position sensor output of 2.5 V (accelerator opening angle of 50%) (4) While driving at 60 km/h (37 mph) in 4th gear, shift down to 3 range. (5) While driving at 40 km/h (25 mph) in 3rd gear, shift down to 2 range. (6) While driving at 20 km/h (12 mph) in 2nd gear, shift down to L range.	For (1), (2) and (3), the reading should be the same as the specified output shaft speed, and no abnormal shift shocks should occur. For (4), (5) and (6), downshifting should occur immediately after shifting	Does not shift from 1 to 2 or 2 to 1	31	Low and reverse solenoid valve system (23A-26)
					33	Second solenoid valve system (23A-26)
					41	1st gear incorrect ratio (23A-27)
					42	2nd gear incorrect ratio (23A-28)

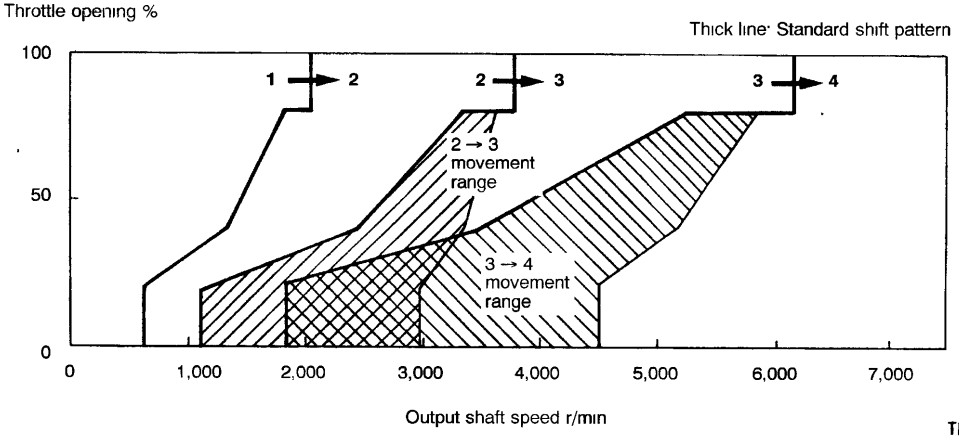
Procedure	Condition before test/Operation	Test/Operation	Judgement value	Check item	Diagnostic code No.	Inspection procedure page if there is an abnormality
8	Use the scan tool (MUT-II) to stop the IN-VECS-II function. Selector lever position: D (on a flat and straight road)	Monitor data list No. 11, 23, and 63 with the scan tool (MUT-II) (1) Accelerate to 4th gear at a throttle position sensor output of 1.5V (accelerator opening angle of 30 %). (2) Gently decelerate to a standstill. (3) Accelerate to 4th gear at a throttle position sensor output of 2.5 V (accelerator opening angle of 50%). (4) While driving at 60 km/h (37 mph) in 4th gear, shift down to 3 range (5) While driving at 40 km/h (25 mph) in 3rd gear, shift down to 2 range. (6) While driving at 20 km/h (12 mph) in 2nd gear, shift down to L range.	For (1), (2) and (3), the reading should be the same as the specified output shaft speed, and no abnormal shift shocks should occur. For (4), (5) and (6), downshifting should occur immediately after shifting	Does not shift from 2 to 3 or 3 to 2	33	Second solenoid valve system (23A-26)
					34	Overdrive solenoid valve system (23A-26)
					42	2nd gear incorrect ratio (23A-28)
					43	3rd gear incorrect ratio (23A-29)

Procedure	Condition before test/Operation	Test/Operation	Judgement value	Check item	Diagnostic code No	Inspection procedure page if there is an abnormality
8	Use the scan tool (MUT-II) to stop the IN-VECS-II function. Selector lever position: D (on a flat and straight road.)	Monitor data list No. 11, 23, and 63 with the scan tool (MUT-II). (1) Accelerate to 4th gear at a throttle position sensor output of 1.5V (accelerator opening angle of 30 %). (2) Gently decelerate to a standstill. (3) Accelerate to 4th gear at a throttle position sensor output of 2.5 V (accelerator opening angle of 50%). (4) While driving at 60 km/h (37 mph) in 4th gear, shift down to 3 range. (5) While driving at 40 km/h (25 mph) in 3rd gear, shift down to 2 range (6) While driving at 20 km/h (12 mph) in 2nd gear, shift down to L range.	For (1), (2) and (3), the reading should be the same as the specified output shaft speed, and no abnormal shift shocks should occur. For (4), (5) and (6), downshifting should occur immediately after shifting	Does not shift from 3 to 4 or 4 to 3	32	Underdrive solenoid valve system (23A-26)
					33	Second solenoid valve system (23A-26)
					43	3rd gear incorrect ratio (23A-29)
					44	4th gear incorrect ratio (23A-29)
9	Selector lever position: N (on a flat and straight road.)	Monitor data list No. 22 and No. 23 with the scan tool (MUT-II). (1) Move selector lever to R range, drive at constant speed of 10 km/h (6.2 mph)	The ratio between data list No. 22 and No. 23 should be the same as the gear ratio when reversing.	Does not shift	22	Input shaft speed sensor system (23A-23)
					23	Output shaft speed sensor system (23A-24)
					46	Reverse gear incorrect ratio (23A-31)

SHIFT PATTERN

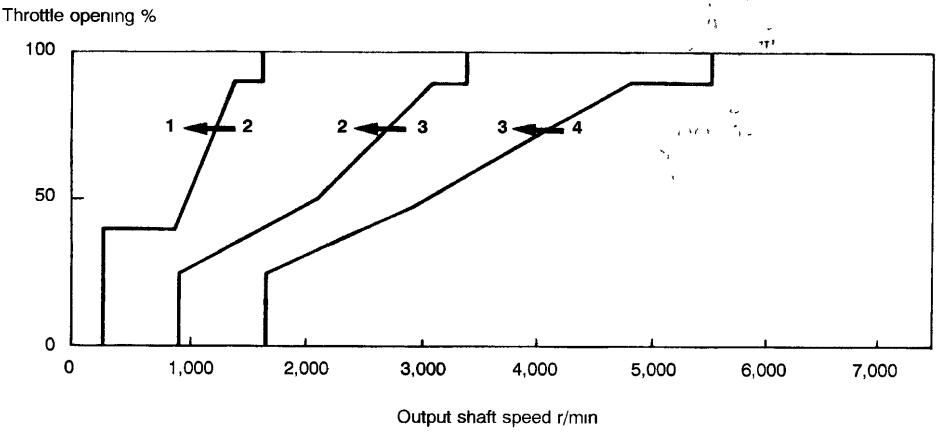
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UPSHIFT PATTERN



TFA2029

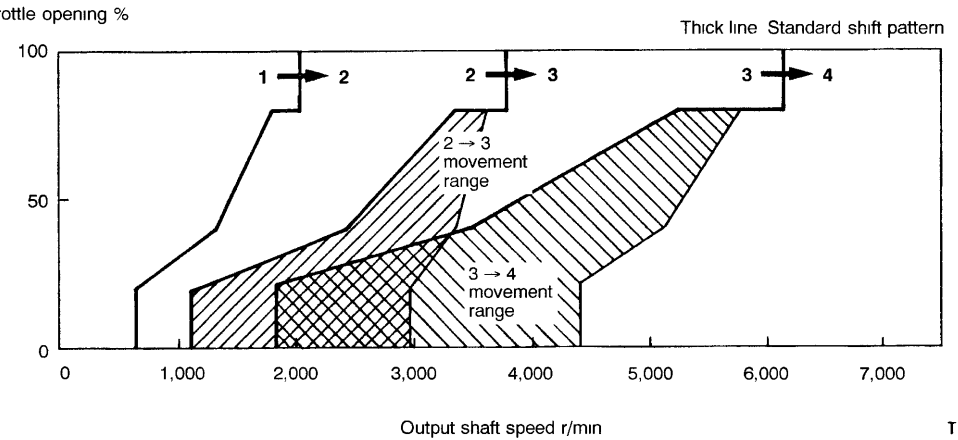
DOWNSHIFT PATTERN



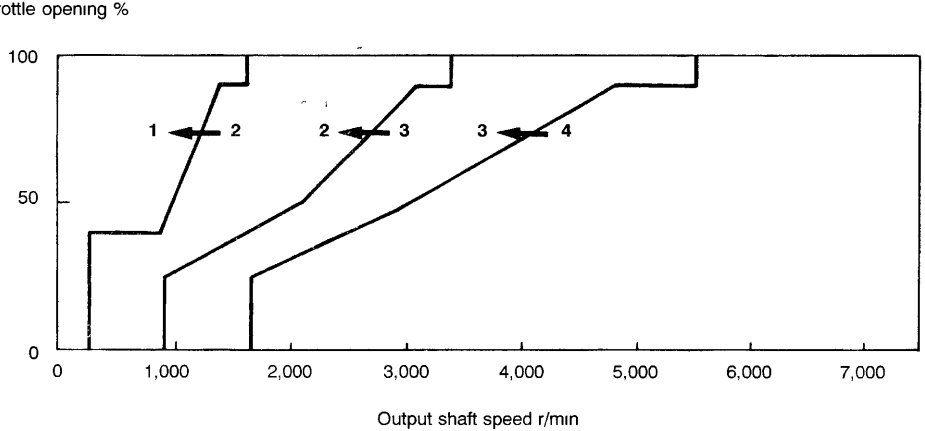
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UPSHIFT PATTERN



DOWNSHIFT PATTERN



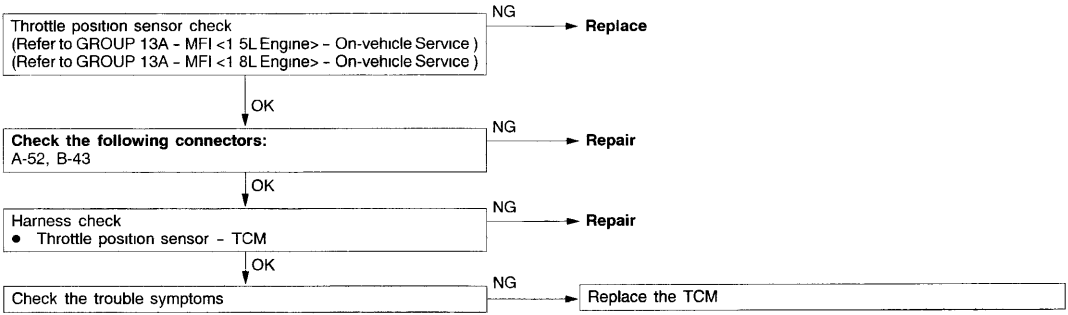
INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODE

23100790328

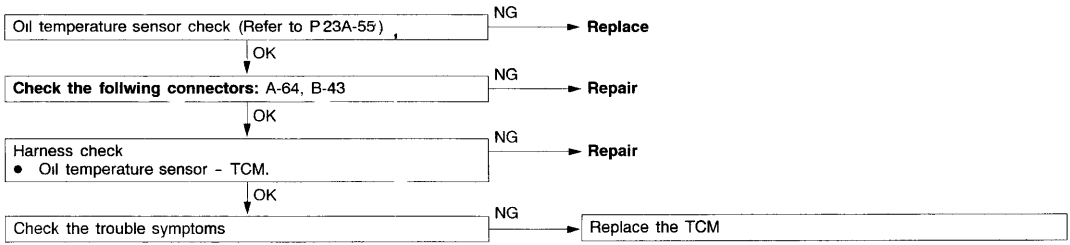
Code	Diagnosis item		Reference page
11	Throttle position sensor system	Short circuit	23A-22
12		Open circuit	23A-22
14		Sensor maladjustment	23A-22
15	Oil temperature sensor system	Open circuit	23A-22
16		Short circuit	23A-22
21	Crankshaft position sensor system	Open circuit	23A-22
22	Input shaft speed sensor system	Short circuit/open circuit	23A-23
23	Output shaft speed sensor system	Short circuit/open circuit	23A-24
26	Stop light switch system	Short circuit/open circuit	23A-25
27	Park/Neutral position switch system	Open circuit	23A-25
28		Short circuit	23A-25
31	Low and reverse solenoid valve system	Short circuit/open circuit	23A-26
32	Underdrive solenoid valve system	Short circuit/open circuit	23A-26
33	Second solenoid valve system	Short circuit/open circuit	23A-26
34	Overdrive solenoid valve system	Short circuit/open circuit	23A-26
36	Torque converter clutch solenoid system	Short circuit/open circuit	23A-26
41	1st gear incorrect ratio		23A-27
42	2nd gear incorrect ratio		23A-28
43	3rd gear incorrect ratio		23A-29
44	4th gear incorrect ratio		23A-30
46	Reverse gear incorrect ratio		23A-31
51	Abnormal communication with ECM		23A-32
52	Torque converter clutch solenoid system	Defective system	23A-26
53		Lock-up stuck on	23A-26
54	A/T Control relay system	Short circuit to ground/open circuit	23A-32
56	N range light system	Short circuit to ground	23A-33
71	Malfunction of TCM		23A-33

INSPECTION PROCEDURES FOR DIAGNOSTIC TROUBLE CODES

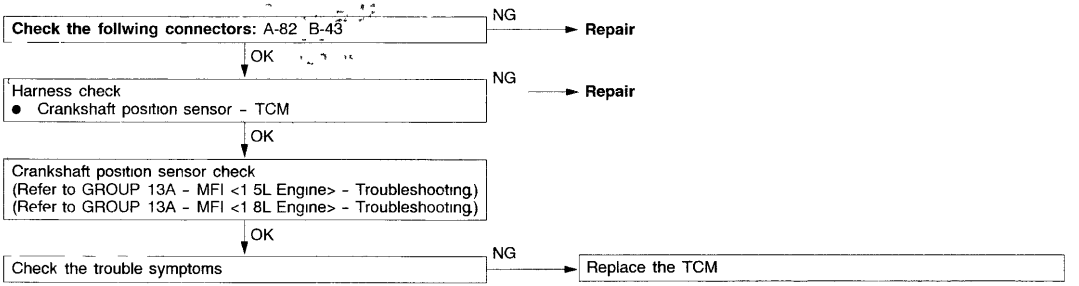
Code No. 11, 12, 14 Throttle position sensor system	Probable cause
If the TPS output voltage is 4 8 V or higher when the engine is idling, the output is judged to be too high and diagnostic trouble code No 11 is output If the TPS output voltage is 0 2 V or lower at times other than when the engine is idling the output is judged to be too low and diagnostic trouble code No 12 is output If the TPS output voltage is 0 2 V or lower or if it is 1 2 V or higher when the engine is idling, the TPS adjustment is judged to be incorrect and diagnostic trouble code No 14 is output	• Malfunction of the throttle position sensor • Malfunction of connector • Malfunction of the TCM



Code No. 15, 16 Oil temperature sensor system	Probable cause
If the oil temperature sensor output voltage is 2 6 V or more even after driving for 10 minutes or more (if the oil temperature does not increase), it is judged that there is an open circuit in the oil temperature sensor and diagnostic trouble code No 15 is output If the oil temperature sensor output detects the voltage which corresponds to 200°C (392°F) or more for more than one second, it is judged that there is an open circuit in oil temperature sensor and diagnostic trouble code No 16 is output	• Malfunction of the oil temperature sensor • Malfunction of connector • Malfunction of the TCM

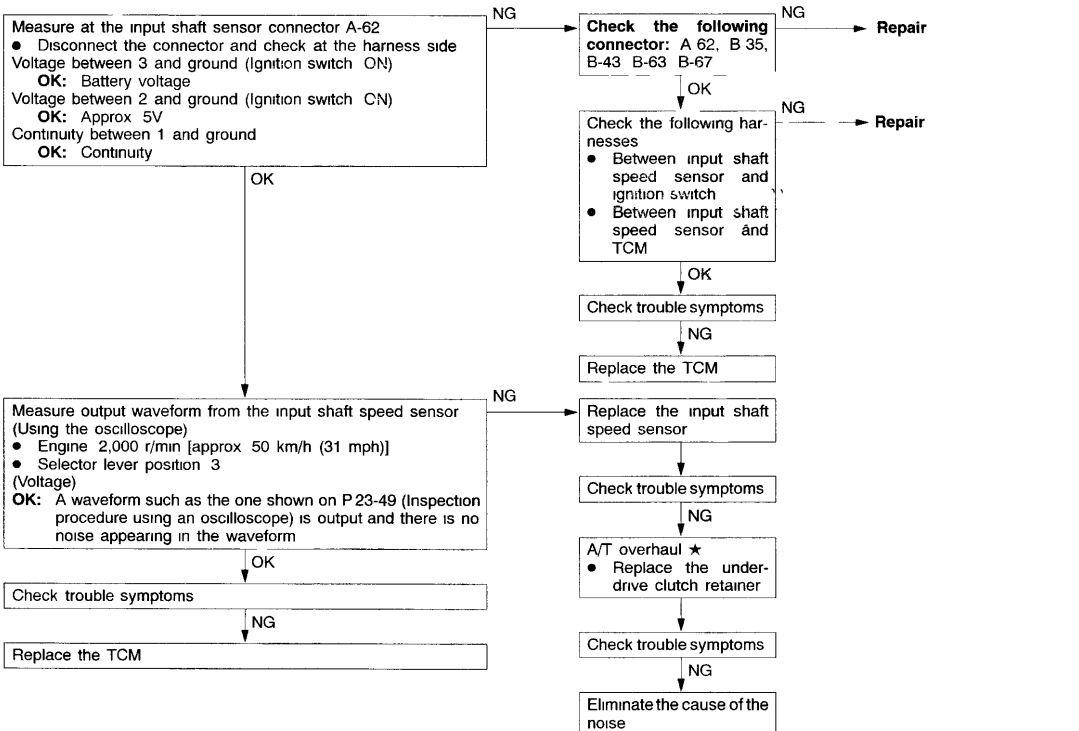


Code No. 21 Crankshaft position sensor system	Probable cause
If no output pulse is detected from the crankshaft position sensor for 5 seconds or more while driving at 25 km/h (16 mph) or more, it is judged that there is an open circuit in the crankshaft position sensor and diagnostic trouble code No 21 is output	• Malfunction of the crankshaft position sensor • Malfunction of connector • Malfunction of the TCM



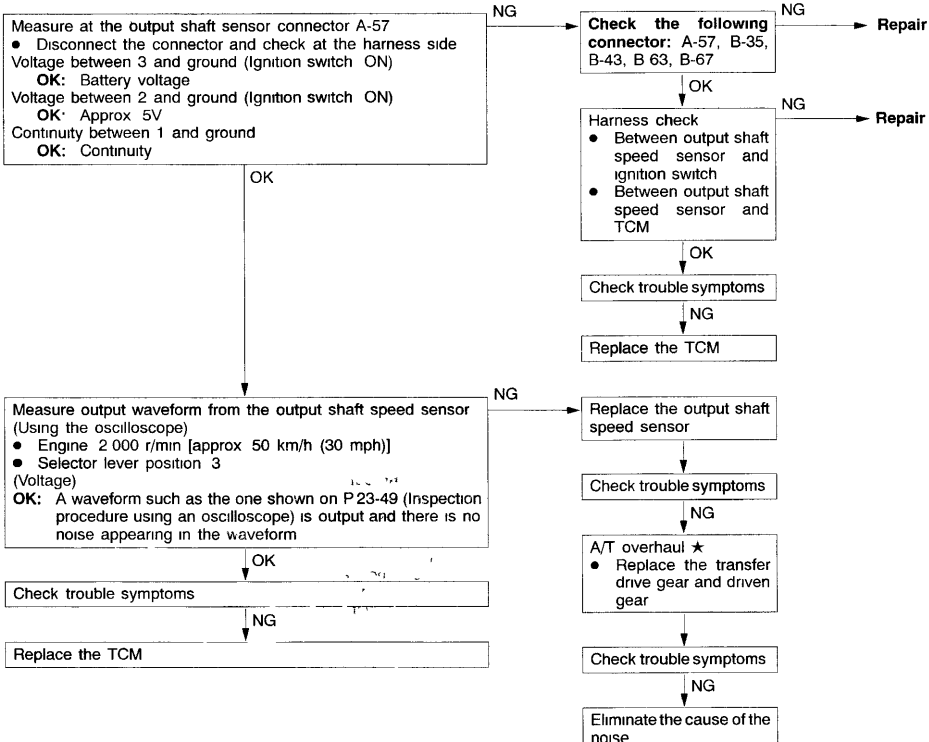
Code No. 22 Input shaft speed sensor system	Probable cause
If no output pulse is detected from the input shaft speed sensor for 1 second or more while driving in 3rd or 4th gear at a speed of 30 km/h (19 mph) or more, it is judged to be an open circuit or short-circuit in the input shaft speed sensor and diagnostic trouble code No 22 is output If diagnostic trouble code No 22 is output four times the transaxle is locked into 3rd gear or 2nd gear as a fail-safe measure, and the N range light flashes at a frequency of 1 Hz	• Malfunction of the input shaft speed sensor • Malfunction of the underdrive clutch retainer • Malfunction of connector • Malfunction of the TCM

★ Refer to GROUP 23B.

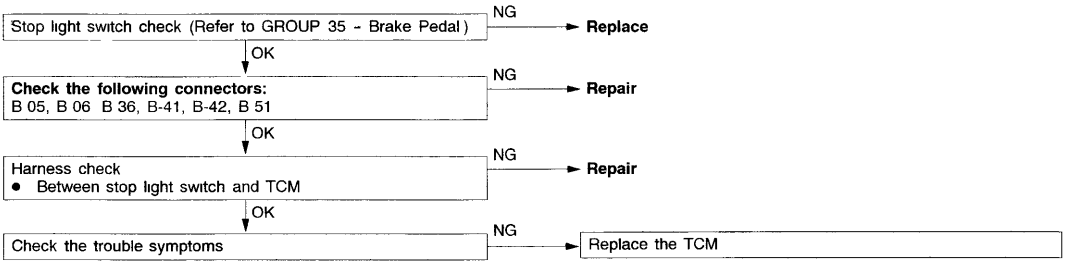


Code No. 23 Output shaft speed sensor system	Probable cause
If the output from the output shaft speed sensor is continuously 50% lower than the vehicle speed for 1 second or more while driving in 3rd or 4th gear at a speed of 30 km/h or more, it is judged to be an open circuit or short-circuit in the output shaft speed sensor and diagnostic trouble code No. 23 is output. If diagnostic trouble code No. 23 is output four times, the transmission is locked into 3rd gear or 2nd gear as a fail-safe measure and the N range light flashes at a frequency of 1 Hz.	• Malfunction of the output shaft speed sensor • Malfunction of the transfer drive gear or driven gear • Malfunction of connector • Malfunction of the TCM

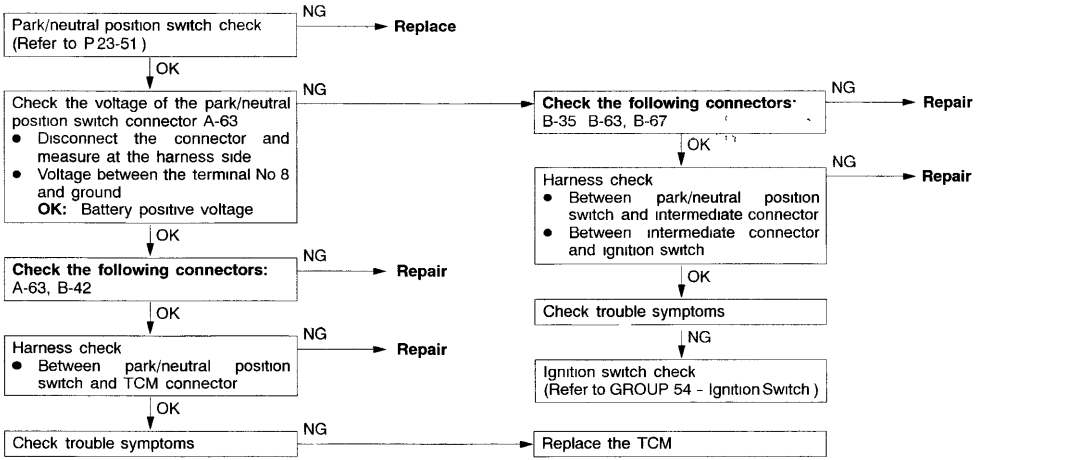
★: Refer to GROUP 23B.



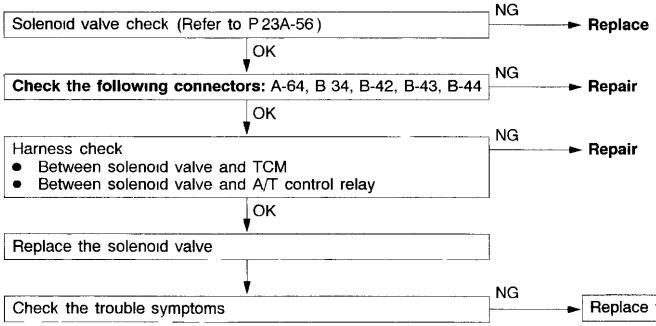
Code No. 26 Stop light switch system	Probable cause
If the stop light switch is on for 5 minutes or more while driving, it is judged that there is a short circuit in the stop light switch and diagnostic trouble code No 26 is output	• Malfunction of the stop light switch • Malfunction of connector • Malfunction of the TCM



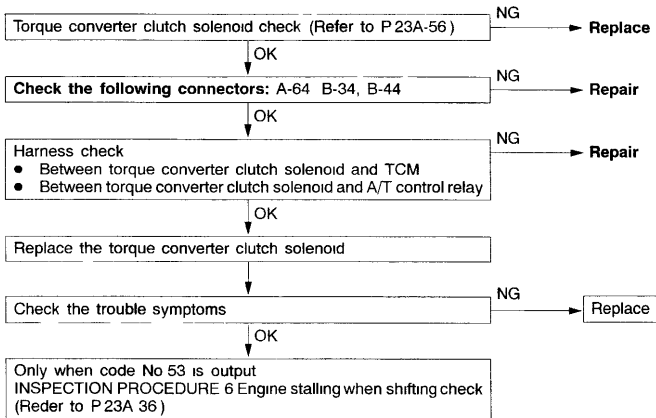
Code No.27, 28 Park/Neutral position switch system	Probable cause
If the TCM detects no park/neutral position switch input signal for a continuous period of 30 seconds it is judged that there is an open circuit in the park/neutral position switch and diagnostic trouble code No 27 is output If the TCM detects more than two kinds of park/neutral position switch input signals for a continuous period of 30 seconds, it is judged that there is an open circuit in the park/neutral position switch and diagnostic trouble code No 28 is output	• Malfunction of the park/neutral position switch • Malfunction of the ignition switch • Malfunction of connector • Malfunction of the TCM



Code No. 31 Low and reverse solenoid valve system Code No. 32 Underdrive solenoid valve system Code No. 33 Second solenoid valve system Code No. 34 Overdrive solenoid valve system	Probable cause
If the resistance value for a solenoid valve is too large or too small, it is judged that there is a short-circuit or an open circuit in the solenoid valve and the respective diagnostic trouble code is output The transaxle is locked into 3rd gear as a fail-safe measure, and the N range light flashes at a frequency of 1 Hz	• Malfunction of solenoid valve • Malfunction of connector • Malfunction of the TCM



Code No. 36, 52, 53 Torque converter clutch solenoid system	Probable cause
If the resistance value for the torque converter clutch solenoid is too large or too small, it is judged that there is a short-circuit or an open circuit in the torque converter clutch solenoid and diagnostic trouble code No 36 is output If the drive duty rate for the torque converter clutch solenoid is 100 % for a continuous period of 4 seconds or more, it is judged that there is an abnormality in the torque converter clutch system and diagnostic trouble code No 52 is output When diagnostic trouble code No 36 is output the transaxle is locked into 3rd gear as a fail-safe measure, and the N range light flashes at a frequency of 1 Hz If the lock-up clutch remains engaged for a continuous period of 10 seconds when the TCM is attempting to disengage the lock-up clutch, it is judged that the torque converter clutch is stuck on and diagnostic trouble code No 53 is output	• Malfunction of the torque converter clutch solenoid • Malfunction of connector • Malfunction of the TCM



Code No. 41 1st gear incorrect ratio	Probable cause
If the output from the output shaft speed sensor multiplied by the 1st gear ratio is not the same as the output from the input shaft speed sensor after shifting to 1st gear has been completed diagnostic trouble code No 41 is output If diagnostic trouble code No 41 is output four times the transaxle is locked into 3rd gear as a fail-safe measure, and the N range light flashes at a frequency of 1 Hz	• Malfunction of the input shaft speed sensor • Malfunction of the output shaft speed sensor • Malfunction of the underdrive clutch retainer • Malfunction of the transfer drive gear or driven gear • Malfunction of the low and reverse brake system • Malfunction of the underdrive clutch system • Noise generated

★: Refer to GROUP 23B.

SCAN TOOL DTC
Is the diagnostic trouble code No 22 output?
- Yes → Code No 22 Input shaft speed sensor system check (Refer to P.23A-23)
- No ↓

SCAN TOOL DTC
Is the diagnostic trouble code No 23 output?
- Yes → Code No 23 Output shaft speed sensor system check (Refer to P.23A-24)
- No ↓

Measure output waveform from the input shaft speed sensor (using an oscilloscope)
- Connect the connector B-43 and measure voltage between 31 and 43 at the TCM
- Engine 2,000 r/min [approx 50 km/h (31 mph)]
- Selector lever position 3

(Voltage)
OK: A waveform such as the one shown on P.23A-49 (Inspection Procedure Using an Oscilloscope) is output (flashing between 0 ←→ 5V) and there is no noise appearing in the waveform

- NG → Replace the input shaft speed sensor
  - ↓ Check the trouble symptoms
    - NG → A/T overhaul ★
      - Replace the underdrive clutch retainer
      - ↓ Check the trouble symptoms
        - NG → Eliminate the cause of the noise
- OK ↓

Measure output waveform from the output shaft speed sensor (using an oscilloscope)
- Connect the connector B-43 and measure voltage between 32 and 43 at the TCM
- Engine 2,000 r/min [approx 50 km/h (31 mph)]
- Selector lever position 3

(Voltage)
OK: A waveform such as the one shown on P.23A-49 (Inspection Procedure Using an Oscilloscope) is output (flashing between 0 ←→ 5V) and there is no noise appearing in the waveform

- NG → Replace the output shaft speed sensor
  - ↓ Check the trouble symptoms
    - NG → A/T overhaul ★
      - Replace the transfer drive gear and driven gear
      - ↓ Check the trouble symptoms
        - NG → Eliminate the cause of the noise
- OK ↓

A/T overhaul ★
- Replace the underdrive clutch (No 42, No 43 or no diagnostic trouble code is output)
- Replace the low and reverse brake (No 46 or no diagnostic trouble code is output)

Code No. 42 2nd gear incorrect ratio	Probable cause
If the output from the output shaft speed sensor multiplied by the 2nd gear ratio is not the same as the output from the input shaft speed sensor after shifting to 2nd gear has been completed, diagnostic trouble code No. 42 is output. If diagnostic trouble code No. 42 is output four times, the transaxle is locked into 3rd gear as a fail-safe measure, and the N range light flashes at a frequency of 1 Hz	• Malfunction of the input shaft speed sensor • Malfunction of the output shaft speed sensor • Malfunction of the underdrive clutch retainer • Malfunction of the transfer drive gear or driven gear • Malfunction of the second brake system • Malfunction of the underdrive clutch system • Noise generated

★: Refer to GROUP 23B

SCAN TOOL DTC
Is the diagnostic trouble code No. 22 output?

Yes → Code No. 22 Input shaft speed sensor system check (Refer to P.23A-23)

No ↓

SCAN TOOL DTC
Is the diagnostic trouble code No. 23 output?

Yes → Code No. 23 Output shaft speed sensor system check (Refer to P.23A-24)

No ↓

Measure output waveform from the input shaft speed sensor (using an oscilloscope)
- Connect the connector B-43 and measure voltage between 31 and 43 at the TCM
- Engine 2,000 r/min [approx. 50 km/h (31 mph)]
- Selector lever position 3

(Voltage)
OK: A waveform such as the one shown on P.23A-49 (Inspection Procedure Using an Oscilloscope) is output (flashing between 0 ←→ 5V) and there is no noise appearing in the waveform

NG → Replace the input shaft speed sensor
→ Check the trouble symptoms
NG → A/T overhaul ★
- Replace the underdrive clutch retainer

→ Check the trouble symptoms
NG → Eliminate the cause of the noise

OK ↓

Measure output waveform from the output shaft speed sensor (using an oscilloscope)
- Connect the connector B-43 and measure voltage between 32 and 43 at the TCM
- Engine 2,000 r/min [approx. 50 km/h (31 mph)]
- Selector lever position 3

(Voltage)
OK: A waveform such as the one shown on P.23A-49 (Inspection Procedure Using an Oscilloscope) is output (flashing between 0 ←→ 5V) and there is no noise appearing in the waveform

NG → Replace the output shaft speed sensor
→ Check the trouble symptoms
NG → A/T overhaul ★
- Replace the transfer drive gear and driven gear

→ Check the trouble symptoms
NG → Eliminate the cause of the noise

OK ↓

A/T overhaul ★
- Replace the underdrive clutch (No. 41, No. 43 or no diagnostic trouble code is output)
- Replace the second brake (No. 44 or no diagnostic trouble code is output)

Code No. 43 3rd gear incorrect ratio	Probable cause
If the output from the output shaft speed sensor multiplied by the 3rd gear ratio is not the same as the output from the input shaft speed sensor after shifting to 3rd gear has been completed diagnostic trouble code No 43 is output If diagnostic trouble code No 43 is output four times, the transaxle is locked into 3rd gear as a fail-safe measure, and the N range light flashes at a frequency of 1 Hz	• Malfunction of the input shaft speed sensor • Malfunction of the output shaft speed sensor • Malfunction of the underdrive clutch retainer • Malfunciton of the transfer drive gear or driven gear • Malfunction of the underdrive clutch system • Malfunction of the overdrive clutch system • Noise generated

★: Refer to GROUP 23B.

SCAN TOOL DTC
Is the diagnostic trouble code No 22 output?
- Yes → Code No 22 Input shaft speed sensor system check (Refer to P 23A-23)
- No ↓

SCAN TOOL DTC
Is the diagnostic trouble code No 23 output?
- Yes → Code No 23 Output shaft speed sensor system check (Refer to P 23A-24)
- No ↓

Measure output waveform from the input shaft speed sensor (using an oscilloscope)
- Connect the connector B-43 and measure voltage between 31 and 43 at the TCM
- Engine 2,000 r/min [approx 50 km/h (31 mph)]
- Selector lever position 3

(Voltage)
OK: A waveform such as the one shown on P 23A-49 (Inspection Procedure Using an Oscilloscope) is output (flashing between 0 ←→ 5V) and there is no noise appearing in the waveform

- NG → Replace the input shaft speed sensor
  - Check the trouble symptoms
    - NG → A/T overhaul ★
      - Replace the underdrive clutch retainer
      - Check the trouble symptoms
        - NG → Eliminate the cause of the noise
- OK ↓

Measure output waveform from the output shaft speed sensor (using an oscilloscope)
- Connect the connector B-43 and measure voltage between 32 and 43 at the TCM
- Engine 2,000 r/min [approx 50 km/h (31 mph)]
- Selector lever position 3

(Voltage)
OK: A waveform such as the one shown on P 23A-49 (Inspection Procedure Using an Oscilloscope) is output (flashing between 0 ←→ 5V) and there is no noise appearing in the waveform

- NG → Replace the output shaft speed sensor
  - Check the trouble symptoms
    - NG → A/T overhaul ★
      - Replace the transfer drive gear and driven gear
      - Check the trouble symptoms
        - NG → Eliminate the cause of the noise
- OK ↓

A/T overhaul ★
- Replace the underdrive clutch (No 41, No 42 or no diagnostic trouble code is output)
- Replace the overdrive clutch (No 44 or no diagnostic trouble code is output)

Code No. 44 4th gear incorrect ratio	Probable cause
If the output from the output shaft speed sensor multiplied by the 4th gear ratio is not the same as the output from the input shaft speed sensor after shifting to 4th gear has been completed, diagnostic trouble code No 44 is output If diagnostic trouble code No 44 is output four times, the transaxle is locked into 3rd gear as a fail-safe measure, and the N range light flashes at a frequency of 1 Hz	• Malfunction of the input shaft speed sensor • Malfunction of the output shaft speed sensor • Malfunction of the underdrive clutch retainer • Malfunction of the transfer drive gear or driven gear • Malfunction of the second brake system • Malfunction of the overdrive clutch system • Noise generated

★: Refer to GROUP 23B.

SCAN TOOL DTC
Is the diagnostic trouble code No 22 output?

Yes → Code No 22 Input shaft speed sensor system check (Refer to P 23A-23)

No ↓

SCAN TOOL DTC
Is the diagnostic trouble code No 23 output?

Yes → Code No 23 Output shaft speed sensor system check (Refer to P 23A-24)

No ↓

Measure output waveform from the input shaft speed sensor (using an oscilloscope)
- Connect the connector B-43 and measure voltage between 31 and 43 at the TCM
- Engine 2,000 r/min [approx 50 km/h (31 mph)]
- Selector lever position 3
(Voltage)
OK: A waveform such as the one shown on P 23A-49 (Inspection Procedure Using an Oscilloscope) is output (flashing between 0 ←→ 5V) and there is no noise appearing in the waveform

NG → Replace the input shaft speed sensor
→ Check the trouble symptoms
NG → A/T overhaul ★
- Replace the underdrive clutch retainer

→ Check the trouble symptoms
NG → Eliminate the cause of the noise

OK ↓

Measure output waveform from the output shaft speed sensor (using an oscilloscope)
- Connect the connector B-43 and measure voltage between 32 and 43 at the TCM
- Engine 2,000 r/min [approx 50 km/h (31 mph)]
- Selector lever position 3
(Voltage)
OK: A waveform such as the one shown on P 23A-49 (Inspection Procedure Using an Oscilloscope) is output (flashing between 0 ←→ 5V) and there is no noise appearing in the waveform

NG → Replace the output shaft speed sensor
→ Check the trouble symptoms
NG → A/T overhaul ★
- Replace the transfer drive gear and driven gear

→ Check the trouble symptoms
NG → Eliminate the cause of the noise

OK ↓

A/T overhaul ★
- Replace the second brake (No 42 or no diagnostic trouble code is output)
- Replace the overdrive clutch (No 43 or no diagnostic trouble code is output)

Code No. 46 Reverse gear incorrect ratio	Probable cause
If the output from the output shaft speed sensor multiplied by the reverse gear ratio is not the same as the output from the input shaft speed sensor after shifting to reverse gear has been completed, diagnostic trouble code No 46 is output If diagnostic trouble code No 46 is output four times, the transaxle is locked into 3rd gear as a fail-safe measure, and the N range light flashes at a frequency of 1 Hz	• Malfunction of the input shaft speed sensor • Malfunction of the output shaft speed sensor • Malfunction of the underdrive clutch retainer • Malfunciton of the transfer drive gear or driven gear • Malfunction of the low and reverse brake system • Malfunction of the reverse clutch system • Noise generated

★: Refer to GROUP 23B.

SCAN TOOL DTC
Is the diagnostic trouble code No 22 output?

Yes → Code No 22 Input shaft speed sensor system check (Refer to P 23A 23)

No ↓

SCAN TOOL DTC
Is the diagnostic trouble code No 23 output?

Yes → Code No 23 Output shaft speed sensor system check (Refer to P 23A-24)

No ↓

Measure output waveform from the input shaft speed sensor (using an oscilloscope)
- Connect the connector B-43 and measure voltage between 31 and 43 at the TCM
- Engine 2 000 r/min [approx 50 km/h (31 mph)]
- Selector lever position 3
(Voltage)
OK: A waveform such as the one shown on P 23A-49 (Inspection Procedure Using an Oscilloscope) is output (flashing between 0 ←→ 5V) and there is no noise appearing in the waveform

NG → Replace the input shaft speed sensor
↓
Check the trouble symptoms
NG ↓
A/T overhaul ★
- Replace the underdrive clutch retainer
↓
Check the trouble symptoms
NG ↓
Eliminate the cause of the noise

OK ↓

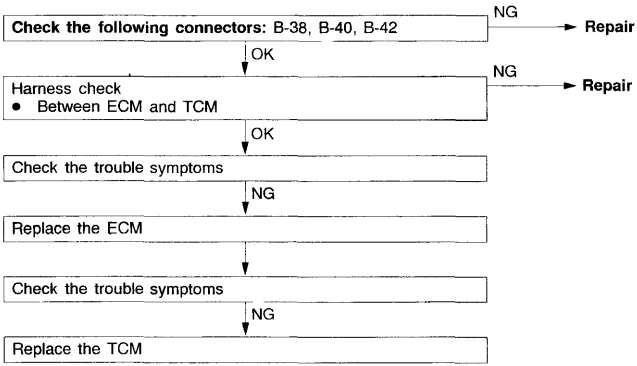
Measure output waveform from the output shaft speed sensor (using an oscilloscope)
- Connect the connector B-43 and measure voltage between 32 and 43 at the TCM
- Engine 2 000 r/min [approx 50 km/h (31 mph)]
- Selector lever position 3
(Voltage)
OK: A waveform such as the one shown on P 23A-49 (Inspection Procedure Using an Oscilloscope) is output (flashing between 0 ←→ 5V) and there is no noise appearing in the waveform

NG → Replace the output shaft speed sensor
↓
Check the trouble symptoms
NG ↓
A/T overhaul ★
- Replace the transfer drive gear and driven gear
↓
Check the trouble symptoms
NG ↓
Eliminate the cause of the noise

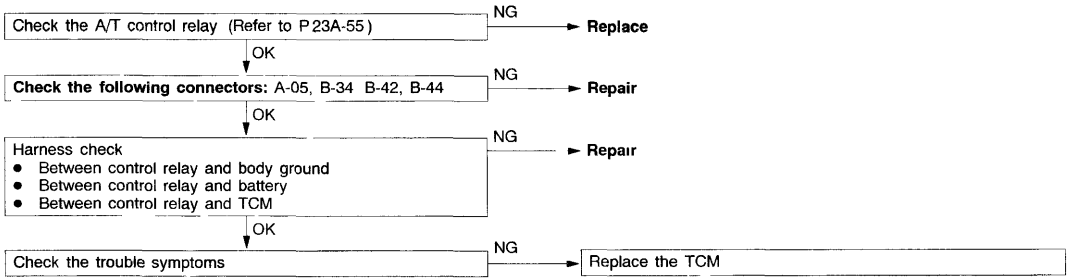
OK ↓

A/T overhaul ★
- Replace the low and reverse brake (No 41 or no diagnostic trouble code is output)
- Replace the reverse clutch (No diagnostic trouble code is output)

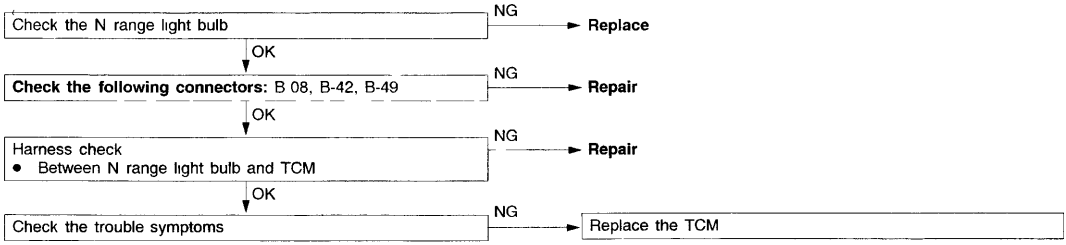
Code No. 51 Abnormal communication with ECM	Probable cause
If normal communication is not possible for a continuous period of 1 second or more when the battery voltage is 10 V or more and the engine speed is 450 r/min or more, diagnostic trouble code No 51 is output Diagnostic trouble code No 51 is also output if the data being received is abnormal for a continuous period of 4 seconds under the same conditions	• Malfunction of connector • Malfunction of the ECM • Malfunction of the TCM



Code No. 54 A/T Control relay system	Probable cause
If the control relay voltage is less than 7 V after the ignition switch has been turned to ON, it is judged that there is an open circuit or a short-circuit in the A/T control relay earth and diagnostic trouble code No 54 is output The transaxle is locked into 3rd gear as a fail-safe measure, and the N range light flashes at a frequency of 1 Hz	• Malfunction of the A/T control relay • Malfunction of connector • Malfunction of the TCM



Code No. 56 N range light system	Probable cause
If the N range signal is off after an N range light illumination instruction (ON instruction) has been given, it is judged that there is a short-circuit in the N range light earth and diagnostic trouble code No. 56 is output	• Malfunction of the N range light bulb • Malfunction of connector • Malfunction of the TCM



Code No. 71 Malfunction of TCM	Probable cause
There is an abnormality in the TCM. The transaxle is locked into 3rd gear as a fail-safe measure	• Malfunction of the TCM

Replace the TCM

INSPECTION CHART FOR TROUBLE SYMPTOMS

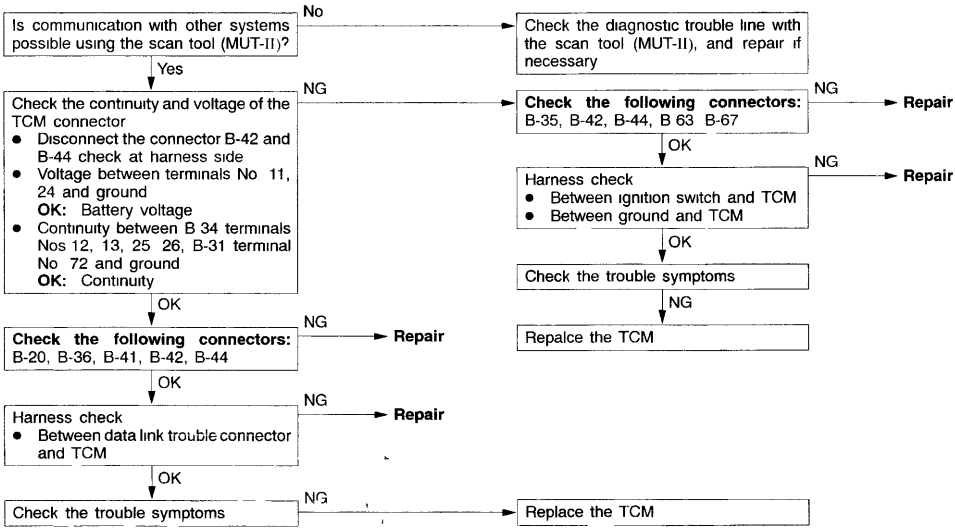
23100800328

Trouble symptom		Inspection procedure No.	Reference page
Communication with the scan tool (MUT-II) is not possible		1	23A-34
Driving impossible	Starting impossible	2	23A-34
	Does not move forward	3	23A-35
	Does not reverse	4	23A-35
	Does not move (forward or reverse)	5	23A-36
Malfunction when starting	Engine stalling when shifting	6	23A-36
	Shocks when changing from N to D and long time lag	7	23A-37
	Shocks when changing from N to R and long time lag	8	23A-38
	Shocks when changing from N to D, N to R and long time lag	9	23A-38
Malfunction when shifting	Shift shocks and lipping	10	23A-39
Displaced shifting points	All points	11	23A-39
	Some points	12	23A-40
Does not shift	No diagnostic trouble codes	13	23A-40
Malfunction while driving	Poor acceleration	14	23A-41
	Vibration	15	23A-41
Closed throttle position switch system		16	23A-42
Dual pressure switch system		17	23A-42
Vehicle speed sensor system		18	23A-43
Cruise control unit signal line system <F4A42>		19	23A-43

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

INSPECTION PROCEDURE 1

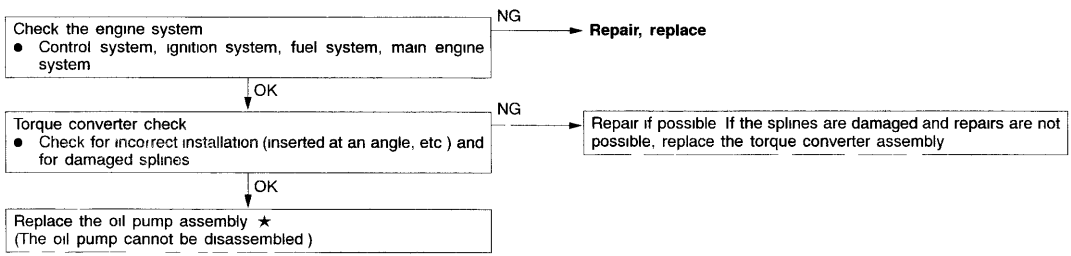
Communication with the scan tool (MUT-II) is not possible	Probable cause
If communication with the scan tool (MUT II) is not possible the cause is probably a defective diagnostic trouble line or the TCM is not functioning	• Malfunction of diagnostic trouble line • Malfunction of connector • Malfunction of the TCM



INSPECTION PROCEDURE 2

Starting impossible	Probable cause
Starting is not possible when the selector lever is in P or N range In such cases, the cause is probably a defective engine system, torque converter or oil pump	• Malfunction of the engine system • Malfunction of the torque converter • Malfunction of the oil pump

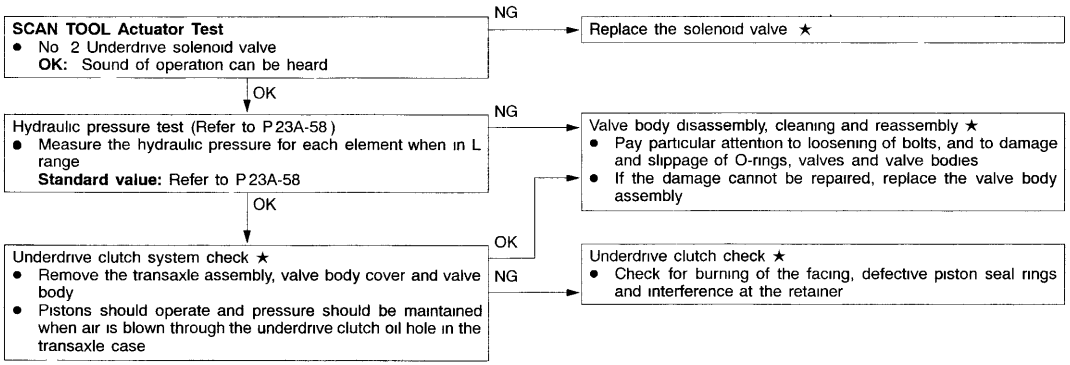
★: Refer to GROUP 23B.



INSPECTION PROCEDURE 3

Does not move (forward)	Probable cause
If the vehicle does not move forward when the selector lever is shifted from N to D 3 2 or L range while the engine is idling, the cause is probably abnormal line pressure or a malfunction of the underdrive clutch or valve body	• Abnormal line pressure • Malfunction of the underdrive solenoid valve • Malfunction of the underdrive clutch • Malfunction of the valve body

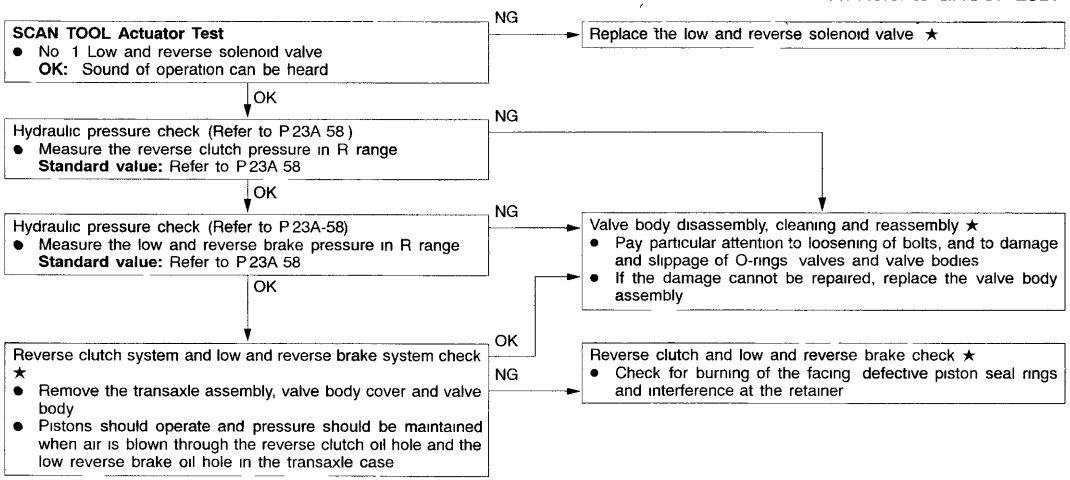
★: Refer to GROUP 23B.



INSPECTION PROCEDURE 4

Does not reverse	Probable cause
If the vehicle does not reverse when the selector lever is shifted from N to R range while the engine is idling, the cause is probably abnormal pressure in the reverse clutch or low and reverse brake or a malfunction of the reverse clutch, low and reverse brake or valve body	• Abnormal reverse clutch pressure • Abnormal low and reverse brake pressure • Malfunction of the low and reverse solenoid valve • Malfunction of the reverse clutch • Malfunction of the low and reverse brake • Malfunction of the valve body

★: Refer to GROUP 23B.



INSPECTION PROCEDURE 5

Does not move (forward or reverse)	Probable cause
If the vehicle does not move forward or reverse when the selector lever is shifted to any position while the engine is idling, the cause is probably abnormal line pressure, or a malfunction of the power train, oil pump or valve body	• Abnormal line pressure • Malfunction of power train • Malfunction of the oil pump • Malfunction of the valve body

★: Refer to GROUP 23B.

Hydraulic pressure check (Refer to P.23A-58)
- Measure the hydraulic pressure for each element when moving forward and back
  Standard value: Refer to P.23A-58

OK → Power train check ★
- Disassemble the transaxle, check the condition of the planetary carrier, output shaft and differential, etc

NG ↓

Replace the oil pump assembly ★
(The oil pump cannot be disassembled)

NG → Valve body disassembly, cleaning and reassembly ★
- Pay particular attention to loosening of bolts, and to damage and slippage of O-rings, valves and valve bodies
- If the damage cannot be repaired, replace the valve body assembly

INSPECTION PROCEDURE 6

Engine stalling when shifting	Probable cause
If the engine stalls when the selector lever is shifted from N to D or R range while the engine is idling, the cause is probably a malfunction of the engine system, torque converter clutch solenoid, valve body or torque converter (torque converter clutch malfunction)	• Malfunction of the engine system • Malfunction of the torque converter clutch solenoid • Malfunction of the valve body • Malfunction of the torque converter (Malfuction of the torque converter clutch)

★: Refer to GROUP 23B.

Engine system check
- Check the control system, ignition system, fuel system and main system

NG → **Repair, replace**

OK ↓

Replace the torque converter clutch solenoid ↓

Valve body disassembly, cleaning and reassembly ★
- Pay particular attention to loosening of bolts, and to damage and slippage of O-rings, valves and valve bodies
- If the damage cannot be repaired, replace the valve body assembly

NG → Repalce the torque converter

INSPECTION PROCEDURE 7

Shocks when changing from N to D and long time lag	Probable cause
If abnormal shocks or a time lag of 2 seconds or more occur when the selector lever is shifted from N to D range while the engine is idling, the cause is probably abnormal underdrive clutch pressure or a malfunction of the underdrive clutch, valve body or closed throttle position switch	• Abnormal underdrive clutch pressure • Malfunction of the underdrive solenoid valve • Malfunction of the underdrive clutch • Malfunction of the valve body • Malfunction of the closed throttle position switch

★: Refer to the GROUP 23B.

SCAN TOOL Actuator Test
- No. 2 Underdrive solenoid valve
  OK: Sound of operation can be heard

NG → Replace the underdrive solenoid valve ★

OK ↓

When does the shock occur?

When starting → Shocks sometimes occur

When shifting ↓

Hydraulic pressure test (Refer to P.23A-58)
- Measure the underdrive clutch pressure when shifting from N to D
  Standard value: Refer to P.23A-58

NG → Valve body disassembly, cleaning and reassembly ★
- Pay particular attention to loosening of bolts, and to damage and slippage of O-rings, valves and valve bodies
- If the damage cannot be repaired, replace the valve body assembly

OK ↓

Underdrive clutch system check ★
- Remove the transaxle assembly, valve body cover and valve body
- Pistons should operate and pressure should be maintained when air is blown through the underdrive clutch oil hole in the transaxle case

NG → Underdrive clutch check ★
- Check for burning of the facing, defective piston seal rings and interference at the retainer

OK → **SCAN TOOL Data list**
- No. 64 Closed throttle position switch
  OK: Turns from on to off when the accelerator pedal is slightly depressed from the fully closed position

No / Yes

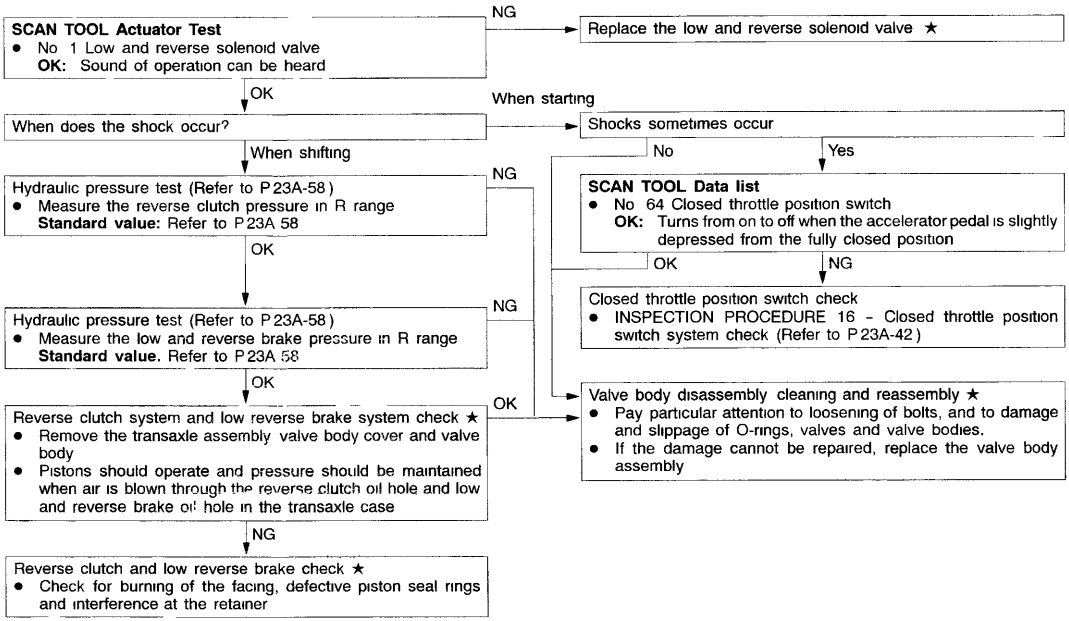
OK → Valve body disassembly, cleaning and reassembly ★ (see above)

NG → Closed throttle position switch check
- INSPECTION PROCEDURE 16 - Closed throttle position switch system check (Refer to P.23A-42)

INSPECTION PROCEDURE 8

Shocks when changing from N to R and long time lag	Probable cause
If abnormal shocks or a time lag of 2 seconds or more occurs when the selector lever is shifted from N to R range while the engine is idling, the cause is probably abnormal reverse clutch pressure or low and reverse brake pressure, or a malfunction of the reverse clutch, low and reverse brake, valve body or closed throttle position switch	• Abnormal reverse clutch pressure • Abnormal low and reverse brake pressure • Malfunction of the low and reverse solenoid valve • Malfunction of the reverse clutch • Malfunction of the low and reverse brake • Malfunction of the valve body • Malfunction of the closed throttle position switch

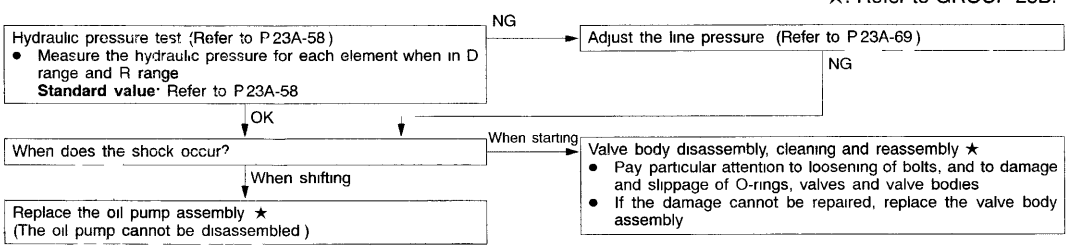
★: Refer to GROUP 23B.



INSPECTION PROCEDURE 9

Shocks when changing from N to D, N to R and long time lag	Probable cause
If abnormal shocks or a time lag of 2 seconds or more occur when the selector lever is shifted from N to D range and from N to R range while the engine is idling, the cause is probably abnormal line pressure or a malfunction of the oil pump or valve body	• Abnormal line pressure • Malfunction of the oil pump • Malfunction of the valve body

★: Refer to GROUP 23B.



INSPECTION PROCEDURE 10

Shift shocks and lipping	Probable cause
If shocks occur when driving due to upshifting or downshifting and the transaxle speed becomes higher than the engine speed, the cause is probably abnormal line pressure or a malfunction of a solenoid valve, oil pump, valve body or of a brake or clutch	• Abnormal line pressure • Malfunction of each solenoid valve • Malfunction of the oil pump • Malfunction of the valve body • Malfunction of each brake or each clutch

★: Refer to GROUP 23B.

SCAN TOOL Actuator Test
- No 1 Low and reverse solenoid valve
- No 2 Underdrive solenoid valve
- No 3 Second solenoid valve
- No 4 Overdrive solenoid valve

OK: Sound of operation can be heard

NG → Replace the solenoid valve

OK ↓

Adjust the line pressure (Refer to P23A-69)

NG → Replace the oil pump assembly ★ (The oil pump cannot be disassembled)

NG ↓

OK ↓

Clutch and brake check ★
- Check for burning of the facing, defective piston seal rings and interference at the retainer

Valve body disassembly, cleaning and reassembly ★
- Pay particular attention to loosening of bolts, and to damage and slippage of O-rings, valves and valve bodies
- If the damage cannot be repaired, replace the valve body assembly

INSPECTION PROCEDURE 11

All points (Displaced shifting points)	Probable cause
If all shift points are displaced while driving, the cause is probably a malfunction of the output shaft speed sensor, TPS or of a solenoid valve	• Malfunction of the output shaft speed sensor • Malfunction of the throttle position sensor • Malfunction of each solenoid valve • Abnormal line pressure • Malfunction of the valve body • Malfunction of the TCM

★: Refer to GROUP 23B

SCAN TOOL Data list
- No 23 Output shaft speed sensor

OK: Increases in proportion to vehicle speed

NG → Code No 23 - Output shaft speed sensor system (Refer to P23A-24)

OK ↓

SCAN TOOL Data list
- No 11 TPS

OK: Increases in proportion to accelerator pedal opening angle

NG → Code No 11, 12, 14 TPS system check (Refer to P23A-22)

OK ↓

SCAN TOOL Data list
- No 31 Low and reverse solenoid valve duty %
- No 32 Underdrive solenoid valve duty %
- No 33 Second solenoid valve duty %
- No 34 Overdrive solenoid valve duty %

OK: Refer to the table below

NG → Replace the solenoid valve ★

NG ↓

Replace the TCM

OK ↓

Adjust the line pressure (Refer to P23A-69)

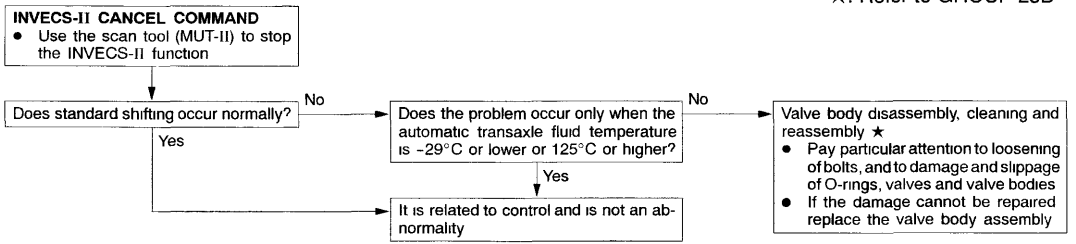
NG → Valve body disassembly, cleaning and reassembly ★
- Pay particular attention to loosening of bolts, and to damage and slippage of O-rings, valves and valve bodies
- If the damage cannot be repaired, replace the valve body assembly

	No. 31	No. 32	No 33	No. 34
Driving at constant speed in 1st gear	0 %	0 %	100 %	100 %
Driving at constant speed in 2nd gear	100 %	0 %	0 %	100 %
Driving at constant speed in 3rd gear	100 %	0 %	100 %	0 %
Driving at constant speed in 4th gear	100 %	100 %	0 %	0 %

INSPECTION PROCEDURE 12

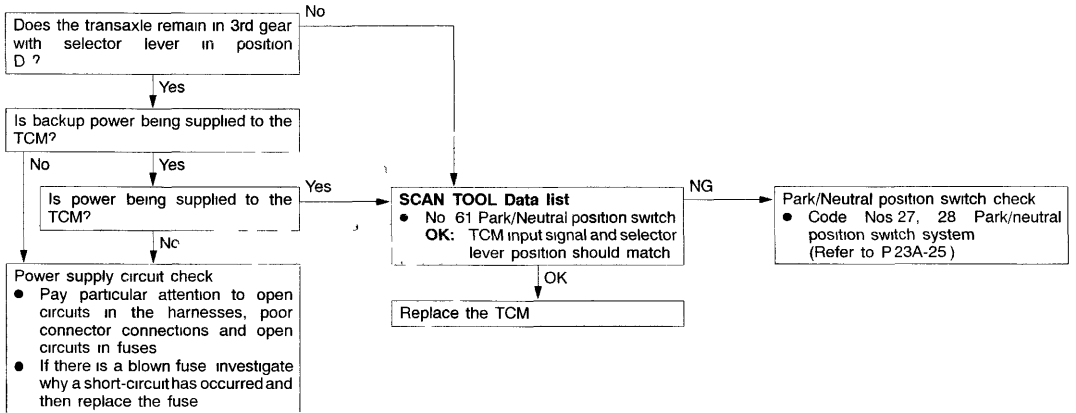
Some points (Displaced shifting points)	Probable cause
If some of the shift points are displaced while driving, the cause is probably a malfunction of the valve body, or it is related to control and is not an abnormality	• Malfunction of the valve body

★: Refer to GROUP 23B



INSPECTION PROCEDURE 13

No diagnostic trouble codes (Does not shift)	Probable cause
If shifting does not occur while driving and no diagnostic trouble codes are output, the cause is probably a malfunction of the Park/Neutral position switch or TCM	• Malfunction of the Park/Neutral position switch • Malfunction of the TCM



INSPECTION PROCEDURE 14

Poor acceleration	Probable cause
If acceleration is poor even if downshifting occurs while driving, the cause is probably a malfunction of the engine system or of a brake or clutch	• Malfunction of the engine system • Malfunction of the brake or clutch

★ Refer to GROUP 23B.

Engine system check
- Check the control system, ignition system, fuel system and main system

NG → **Replace, repair**

OK ↓

Brake or clutch check ★
- Check for burning of the facing, defective piston seal rings and interference at the retainer

INSPECTION PROCEDURE 15

Vibration	Probable cause
If vibration occurs when driving at constant speed or when accelerating in top range, the cause is probably abnormal torque converter clutch pressure or a malfunction of the engine system, torque converter clutch solenoid, torque converter or valve body	• Abnormal torque converter clutch pressure • Malfunction of the engine system • Malfunction of the torque converter clutch solenoid • Malfunction of the torque converter • Malfunction of the valve body

★ Refer to GROUP 23B.

SCAN TOOL Actuator Test
- No. 6 Torque converter clutch solenoid
  OK: Sound of operation can be heard

NG → Replace the torque converter clutch solenoid valve ★

OK ↓

Does the problem occur even when the oil temperature sensor connector is disconnected?

Yes → Engine system check
- Check the control system, ignition system, fuel system and main system

No ↓

Hydraulic pressure test (Refer to P.23A-58)
- Measure the torque converter clutch pressure
  Standard value: Refer to P.23A-58

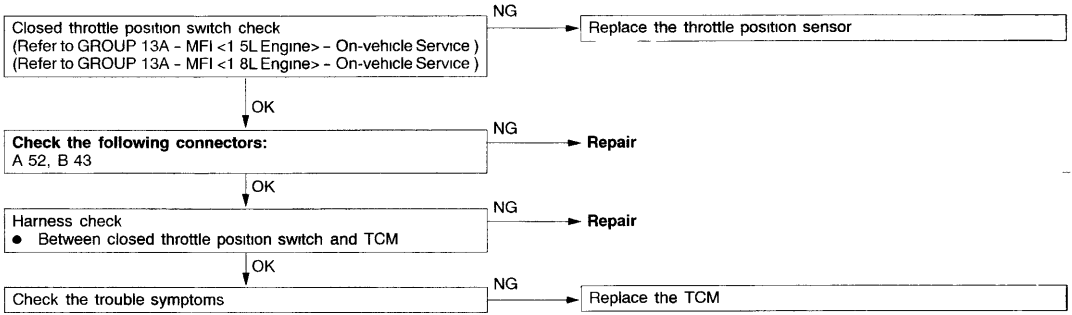
NG → Valve body disassembly, cleaning and reassembly ★
- Pay particular attention to loosening of bolts, and to damage and slippage of O-rings, valves and valve bodies
- If the damage cannot be repaired, replace the valve body assembly

OK ↓

Replace the torque converter assembly

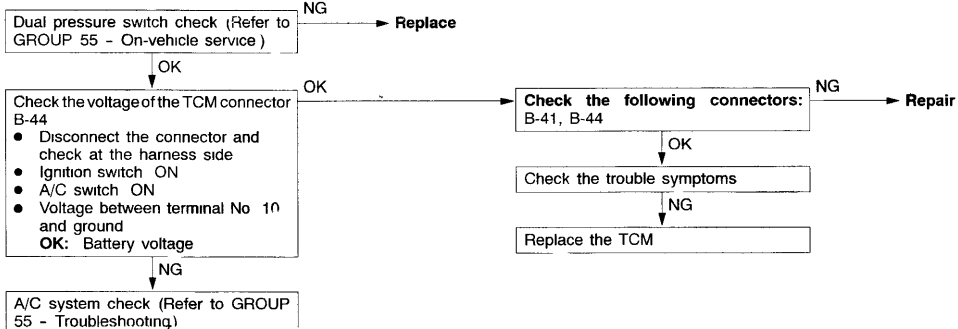
INSPECTION PROCEDURE 16

Closed throttle position switch system	Probable cause
The cause is probably a defective closed throttle position switch circuit or a defective TCM circuit	• Malfunction of the closed throttle position switch • Malfunction of connector • Malfunction of the TCM



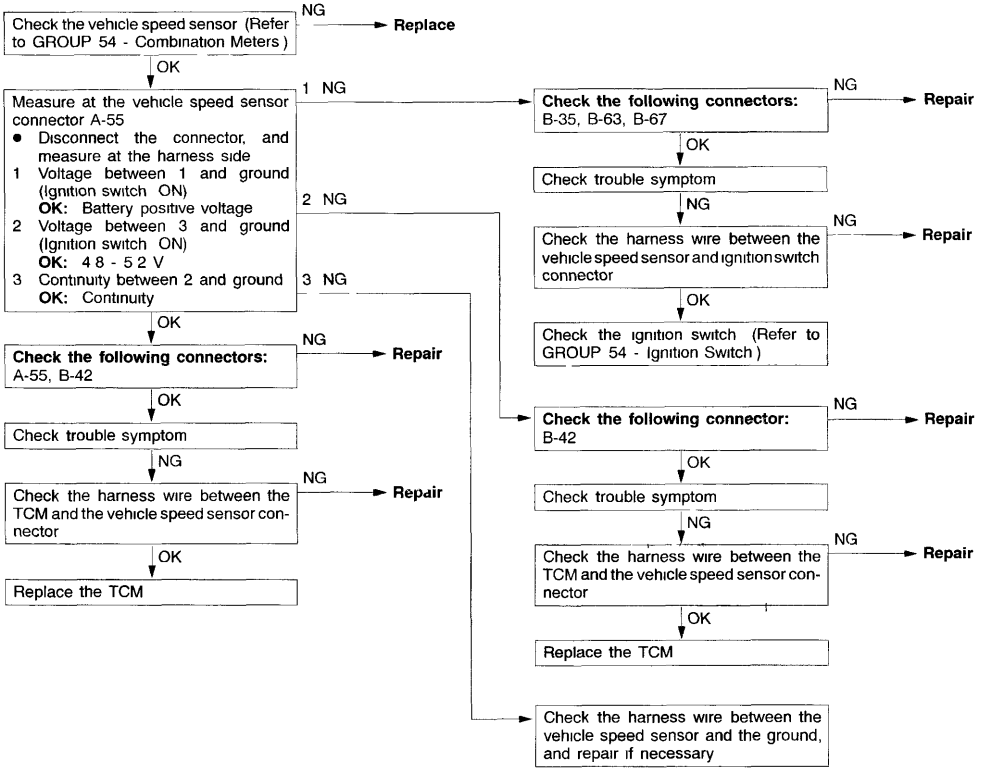
INSPECTION PROCEDURE 17

Dual pressure switch system	Probable cause
The cause is probably a defective dual pressure switch circuit or a defective TCM	• Malfunction of the dual pressure switch • Malfunction of connector • Malfunction of A/C system • Malfunction of the TCM



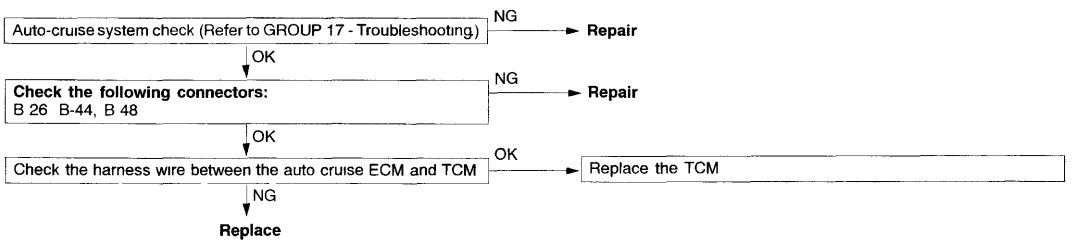
INSPECTION PROCEDURE 18

Vehicle speed sensor system	Probable cause
A malfunction may be present on the speed sensor circuit or the TCM	• Malfunction of the vehicle speed sensor • Malfunction of the connector • Malfunction of the TCM



INSPECTION PROCEDURE 19

Cruise control unit signal line system <F4A42>	Probable cause
A malfunction may be present on the auto-cruise signal line circuit or the TCM	• Malfunction of connector • Malfunction of the TCM • Malfunction of the auto-cruise ECM



SERVICE DATA REFERENCE TABLE

23100810115

Item No.	Check item	Check requirement		Normal value
11	Throttle position sensor	Engine Stopped Selector lever position: P	Accelerator pedal: Fully closed	400 - 1,000 mV
			Accelerator pedal: Depressed	Gradually rises from the above value
			Accelerator pedal: Fully open	4,500 - 5,000 mV
15	Oil temperature sensor	Warming up	Drive for 15 minutes or more so that the automatic transmission fluid temperature becomes 70 - 90 °C. (158 - 194 °F)	Gradually rises to 70 - 90 °C
21	Crankshaft position sensor	Engine: Idling Selector lever position: P	Accelerator pedal: Fully closed	600 - 900 rpm
			Accelerator pedal: Depressed	Gradually rises from the above value
22	Input shaft speed sensor	Selector lever position: 3	Driving at constant speed of 50 km/h (31 mph) in 3rd gear	1,800 - 2,100 rpm
23	Output shaft speed sensor	Selector lever position: 3	Driving at constant speed of 50 km/h (31 mph) in 3rd gear	1,800 - 2,100 rpm
26	Stop light switch	Ignition switch: ON Engine: Stopped	Brake pedal: Depressed	ON
			Brake pedal: Released	OFF
29	Vehicle speed sensor	Selector lever position 3	Idling with 1st gear (Vehicle stopped)	0 km/h
			Driving at constant speed of 50 km/h (31 mph) in 3rd gear	50 km/h
31	Low and reverse solenoid valve duty %	Selector lever position: L, 2, 3, D	Driving at constant speed of 10 km/h (6.2 mph) in 1st gear	No. 31: 0 %, No. 32: 0 %, No. 33: 100 %, No. 34: 100%
32	Underdrive solenoid valve duty %		Driving at constant speed of 30 km/h (19 mph) in 2nd gear	No. 31: 100 %, No. 32: 0 %, No 33: 0 %, No. 34: 100%
33	Second solenoid valve duty %		Driving at constant speed of 50 km/h (31 mph) in 3rd gear	No. 31: 100 %, No. 32: 0 %, No 33 100 %, No. 34: 0%
34	Overdrive solenoid valve duty %		Driving at constant speed of 50 km/h (31 mph) in 4th gear	No. 31: 100 %, No. 32: 100 %, No. 33 0 %, No 34: 0%

Item No	Check item	Check requirement		Normal value
36	Torque converter clutch solenoid duty %	Selector lever position 3	Accelerate to 50 km/h (31 mph) in 3 position, then release accelerator pedal*	0 %
			Driving at constant speed of 50 km/h (31 mph) in 3rd gear	Approx 70 - 90 %
52	Amount of torque converter clutch slippage	Selector lever position: 3	Accelerate to 50 km/h (31 mph) in 3 position, then release accelerator pedal*	Approx. 100 - 300 rpm*
			Driving at constant speed of 50 km/h (31 mph) in 3rd gear	Approx 0 - 10 rpm
54	A/T control relay output voltage		Ignition switch: OFF → ON	0 V → Battery voltage (V)
57	Engine volumetric efficiency	Selector lever position: N	Accelerator pedal fully closed → depressed	Data changes
61	Park/Neutral position switch	Ignition switch: ON Engine: Stopped	Selector lever position: P	P
			Selector lever position: R	R
			Selector lever position: N	N
			Selector lever position: D	D
			Selector lever position. 3	3
			Selector lever position. 2	2
			Selector lever position: L	L
63	Shift position	Selector lever position: L, 2, 3, D	Driving at constant speed of 10 km/h (6.2 mph) in 1st gear	1st
			Driving at constant speed of 30 km/h (19 mph) in 2nd gear	2nd
			Driving at constant speed of 50 km/h (31 mph) in 3rd gear	3rd
			Driving at constant speed of 50 km/h (31 mph) in 4th gear	4th

NOTE
*: The torque converter clutch is released when the accelerator is fully closed (Closed throttle position switch: ON).

Item No.	Check item	Check requirement		Normal value
64	Closed throttle position switch	Engine: Idling Selector lever position: N	Accelerator pedal. Fully closed	ON
			Accelerator pedal: Depressed	OFF
65	Dual pressure switch	Engine: Idling Selector lever position N	A/C switch: ON	ON
			A/C switch: OFF	OFF
66	Auto-cruise ECM signal	While auto-cruise operating	Plain road	OFF
			Sloping road	ON

ACTUATOR TEST JUDGEMENT VALUE

23100820089

Item No.	Check item	Test content	Check requirement	Normal value
1	Low reverse solenoid valve	Drive the solenoid valve specified by the scan tool (MUT-II) at 50 % duty for 5 seconds. No other solenoid valve should be energized.	Ignition switch: ON Selector lever position: P Engine 0 r/min Vehicle speed: 0 km/h (0 mph) (Vehicle stopped) Throttle opening voltage: Less than 1 V Closed throttle position switch. ON While fail-safe function is not in operation	The operation sound should be audible when the solenoid valve is driven.
2	Underdrive solenoid valve			
3	Second solenoid valve			
4	Overdrive solenoid valve			
6	Torque converter clutch solenoid			
12	A/T control relay	Control relay is OFF for 3 seconds.		Data list No. 54 (1) During test: 0 V (2) Normal: Battery voltage [V]

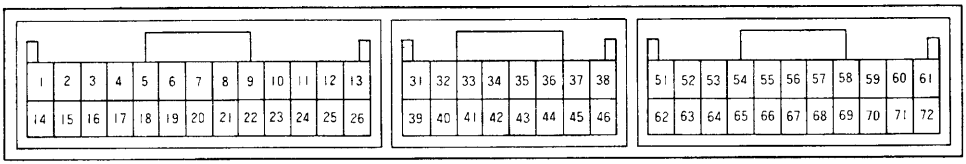
INVECS-II CANCEL COMMAND

23100950078

Item No.	Item	Content	Remarks
14	INVECS-II	Stop the INVECS-II control and change gears according to the standard shift pattern	Use this function when carrying out procedure 8 in the road tests. (Refer to P 23A-15.)

CHECK AT TCM TERMINALS

23100840115



A9FA0133

Terminal No.	Check item	Check requirement	Standard value
1	Underdrive solenoid valve	Selector lever position: L (1st gear)	Battery voltage
		Selector lever position: P	Approx 7 - 9 V
2	Solenoid valve power supply	Ignition switch: OFF	0 V
		Ignition switch: ON	Battery voltage
3	Solenoid valve power supply	Ignition switch: OFF	0 V
		Ignition switch. ON	Battery voltage
8	Cruise control unit (OD-OFF signal) <F4A42>	No OD-OFF request (Auto-cruise operating: Plain road)	Battery voltage
		OD-OFF request (Auto-cruise operating: Sloping road)	0 V
10	Dual pressure switch	A/C switch: OFF	0 V
		A/C switch: ON	Battery voltage
11	Power supply	Ignition switch: OFF	0 V
		Ignition switch: ON	Battery voltage
12	Ground	Always	0 V
13	Ground	Always	0 V
14	Overdrive solenoid valve	Selector lever position: 3 (3rd gear)	Battery voltage
		Selector lever position: P	Approx 7 - 9 V
15	Torque converter control solenoid	Selector lever position: L (1st gear)	Battery voltage
		Selector lever position: 3 (50 km/h in 3rd gear)	Battery voltage
16	Second solenoid valve	Selector lever position: 2 (2nd gear)	Battery voltage
		Selector lever position: P	Approx. 7 - 9 V
23	Diagnosis control	-	-
24	Power supply	Ignition switch: OFF	0 V
		Ignition switch: ON	Battery voltage
25	Ground	Always	0 V

Terminal No	Check item	Check requirement	Standard value
26	Ground	Always	0 V
31	Input shaft speed sensor	Measure between terminal No. 31 and No. 43 by an oscilloscope. Engine: 2,000 r/min Selector lever position: 3 (3rd gear)	Refer to P.23A-49, Oscilloscope inspection procedure
32	Output shaft speed sensor	Measure between terminal No. 32 and No. 43 by an oscilloscope Engine: 2,000 r/min Selector lever position: 3 (3rd gear)	Refer to P.23A-49, Oscilloscope inspection procedure.
33	Crankshaft position sensor	Engine. Idling	2.0 - 2.4 V
36	Closed throttle position switch	Engine· Idling	0 V
		Engine. Other than idling	5 V
38	Back up power suuply	Always	Battery voltage
43	Sensor ground	Always	0 V
44	Oil temperature sensor	ATF temperature· 25 °C	3.8 - 4.0 V
		ATF temperature· 80 °C	2.3 - 2.5 V
45	Thottle position sensor (TPS)	Accelerator pedal: Released (Engine stopped)	0.5 - 1.0 V
		Accelerator pedal: Depressed (Engine stopped)	4.5 - 5.0 V
53	Communication with ECM	Engine. Idling Selector lever position: D	Other than 0 V
54	Communication with ECM	Engine· Idling Selector lever position: D	Other than 0 V
55	PNP switch P	Selector lever position: P	Battery voltage
		Selector lever position: Other than above	0 V
56	PNP switch N	Selector lever position· N	Battery voltage
		Selector lever position. Other than above	0 V
57	PNP switch 3	Selector lever position: 3	Battery voltage
		Selector lever position: Other than above	0 V
58	PNP switch L	Selector lever position. L	Battery voltage
		Selector lever position: Other than above	0 V
59	Stop light switch	Brake pedal Depressed	Battery voltage
		Brake pedal: Released	0 V
62	Low and reverse solenoid valve	Selector lever position. P	Battery voltage
		Selector lever position: 2 (2nd gear)	Approx. 7 - 9 V
63	Diagnosis output	Normal (No diagnosis code output)	0 → 5 V flashing
66	PNP switch R	Selector lever position: R	Battery voltage
		Selector lever position· Other than above	0 V

Terminal No.	Check item	Check requirement	Standard value
67	PNP switch D	Selector lever position: D	Battery voltage
		Selector lever position. Other than above	0 V
68	PNP switch 2	Selector lever position· 2	Battery voltage
		Selector lever position: Other than above	0 V
69	Vehicle speed sensor	When stopped	0 V
		Move forward slowly	0 → 5 V flashing
71	A/T control relay	Ignition switch. OFF	0 V
		Ignition switch ON	Battery voltage
72	Ground	Ignition switch: ON	0 V

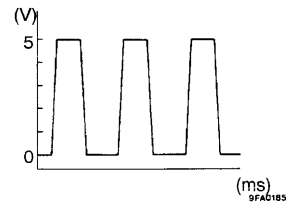
OSCILLOSCOPE INSPECTION PROCEDURE

23100850088

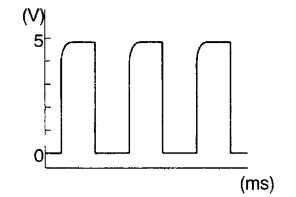
Check item	Check requirement		Normal condition (Waveform sample)
Crankshaft position sensor	Selector lever position: N	Idling (Vehicle stopped)	Waveform A
Input shaft speed sensor	Selector lever position: 3	Driving at constant speed of 50 km/h in 3rd gear (Engine: 1,800 - 2,100 r/min)	Waveform B
Output shaft speed sensor			
Vehicle speed sensor			
Low reverse solenoid valve	Ignition switch· ON Selector lever position· P Engine: 0 r/min Vehicle speed: 0 km/h (Vehicle stopped) Throttle (Accelerator) opening angle: Less than 1 V Closed throttle position switch· ON	Force drive each solenoid valve (Actuator test)	Waveform C
Underdrive solenoid valve			
Second solenoid valve			
Overdrive solenoid valve			
Torque converter clutch control solenoid			

Waveform sample

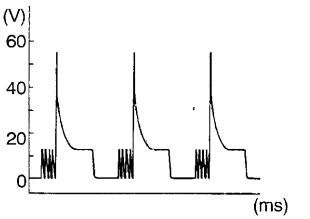
Waveform A



Waveform B



Waveform C



ON-VEHICLE SERVICE 23100090268

ESSENTIAL SERVICE

1. AUTOMATIC TRANSMISSION FLUID CHECK

Refer to GROUP 00 - Maintenance Service.

2. AUTOMATIC TRANSMISSION FLUID REPLACEMENT 23100100299

Refer to GROUP 00 - Maintenance Service.

3. FLUSHING COOLERS AND TUBES 23110480059

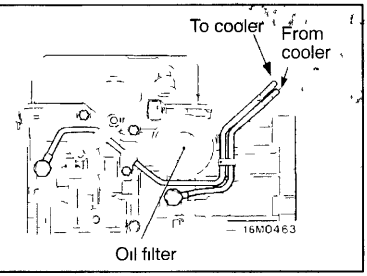
When a transaxle failure has contaminated the fluid, the oil cooler(s) must be flushed. The cooler bypass valve in the transaxle must be replaced also.
The torque converter must also be replaced with an exchange unit. This will ensure that metal particles or sludged oil are not later transferred back into the reconditioned (or replaced) transaxle.
There are two different procedures for flushing coolers and lines. The recommended procedure is to use the special tool MB995062 Flushing tool. The other procedure is to use a hand suction gun and mineral spirits.

WARNING: WEAR PROTECTIVE EYEWEAR THAT MEETS THE REQUIREMENTS OF OSHA AND ANSI Z87.1 - 1968. WEAR STANDARD INDUSTRIAL RUBBER GLOVES. KEEP LIGHTED CIGARETTES, SPARKS, FLAMES, AND OTHER IGNITION SOURCES AWAY FROM THE AREA TO PREVENT THE IGNITION OF COMBUSTIBLE LIQUIDS AND GASES. KEEP A CLASS (B) FIRE EXTINGUISHER IN THE AREA WHERE THE FLUSHER WILL BE USED. KEEP THE AREA WELL VENTILATED. DO NOT LET FLUSHING SOLVENT COME IN CONTACT WITH YOUR EYES OR SKIN: IF EYE CONTAMINATION OCCURS, FLUSH EYES WITH WATER FOR 15 TO 20 SECONDS. REMOVE CONTAMINATED CLOTHING AND WASH AFFECTED SKIN WITH SOAP AND WATER. SEEK MEDICAL ATTENTION.

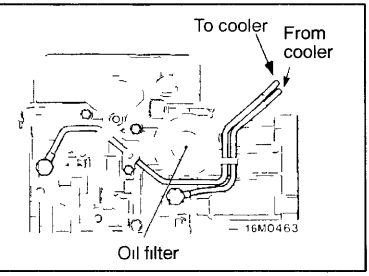
Cooler Flush Using Special Tool MB995062

(1) Remove cover plate filler plug on the special tool MB995062.
Fil reservoir 1/2 to 3/4 full of fresh flushing solution. Flushing solvents are petroleum based solutions generally used to clean automatic transmission components. DO NOT use solvents containing acids, water, gasoline, or any other corrosive liquids.
(2) Reinstall filler plug on the special tool MB995062.
(3) Verify pump power switch is turned OFF.
Connect red alligator clip to positive (+) battery post.
Connect black (-) alligator clip to a good ground.
(4) Disconnect the cooler lines at the transmission.

NOTE
When flushing transmission cooler and lines, ALWAYS reverse flush.



(5) Connect the BLUE pressure line to the OUTLET (From) cooler line.
(6) Connect the CLEAR return line to the INLET (To) cooler line.
(7) Turn pump ON for two to three minutes to flush cooler(s) and lines. Monitor pressure readings and clear return lines. Pressure readings should stabilize below 138 kPa (20 psi) for vehicles equipped with a single cooler and 208 kPa (30 psi) for vehicles equipped with dual coolers. If flow is intermittent or exceeds these pressures, replace cooler.
(8) Turn pump OFF.
(9) Disconnect CLEAR suction line from reservoir at cover plate. Disconnect CLEAR return line at cover plate, and place it in a drain pan.
(10) Turn pump ON for 30 seconds to purge flushing solution from cooler and lines. Turn pump OFF.
(11) Place CLEAR suction line into a one quart container of DIAMOND ATF SPII, DIAMOND ATF SPII M or equivalent automatic transmission fluid.
(12) Turn pump ON until all transmission fluid is removed from the one quart container and lines. This purges any residual cleaning solvent from the transmission cooler and lines. Turn pump OFF.
(13) Disconnect alligator clips from battery. Reconnect flusher lines to cover plate, and remove flushing adapters from cooler lines.



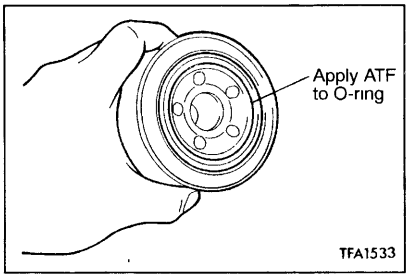
4. OIL COOLER FLOW CHECK

23110490045

After the new or repaired transmission has been installed, fill to the proper level with DIAMOND ATF SPII, DIAMOND ATF SPII M or equivalent automatic transmission fluid. The flow should be checked using the following procedure:
(1) Disconnect the cooler line at the transmission and place a collecting container under the disconnected line.

Caution
With the fluid set at the proper level, fluid collection should not exceed one quart of internal damage to the transmission may occur.

(2) Run the engine at curb idle speed, with the shift selector in neutral.
(3) If fluid flow is intermittent or it takes more than 20 seconds to collect one quart of ATF, replace the cooler.
(4) If flow is found to be within acceptable limits, reconnect the cooler line. Then fill transmission to the proper level, using the approved type of automatic transmission fluid.



5. OIL FILTER REPLACEMENT

23101050098

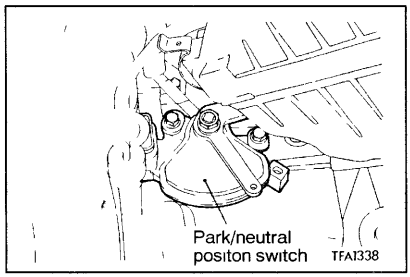
1. Use the special tool (MB991610) to remove the automatic transaxle oil filter.
2. Clean the transaxle case side mounting surface.
3. Apply a small amount of automatic transmission fluid to the O-ring of the new oil filter.
4. Use the special tool (MB991610) to install the automatic transaxle oil filter.

   NOTE
   Tightening torque: 12 Nm (9 ft.lbs.)
5. Check the quantity of the automatic transmission fluid. (Refer to GROUP 00 - Maintenance Service.)

6. THROTTLE POSITION SENSOR ADJUSTMENT

23100190166

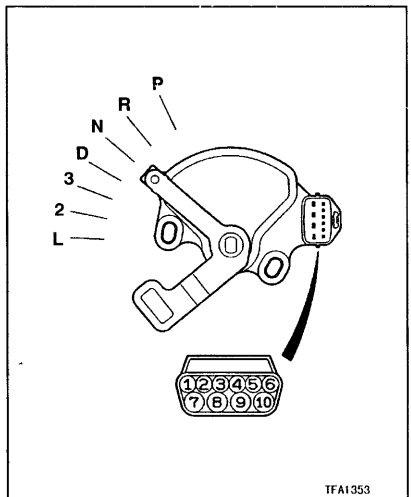
Refer to GROUP 13A - MFI <1.5L Engine> - On-vehicle Service.
Refer to GROUP 13A - MFI <1.8L Engine (Vehicles without auto-cruise control system)> - On-vehicle Service.
Refer to GROUP 13A - MFI <1.8L Engine (Vehicles with auto-cruise control system)> - On-vehicle Service.

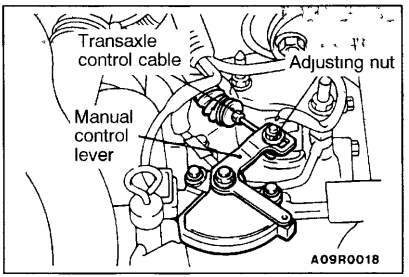


7. PARK/NEUTRAL POSITION SWITCH CONTINUITY CHECK

23100140161

Items	Terminal No.									
	1	2	3	4	5	6	7	8	9	10
P			○					○	○	○
R							○	○		
N				○				○	○	○
D	○							○		
3					○			○		
2		○						○		
L						○		○		

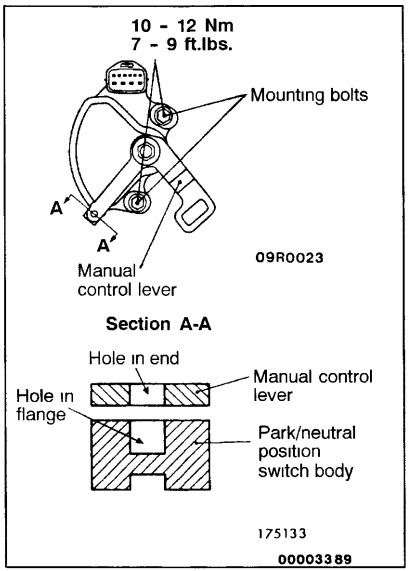




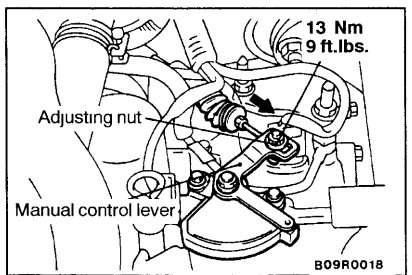
8. PARK/NEUTRAL POSITION SWITCH AND CONTROL CABLE ADJUSTMENT

23100150102

1. Set the selector lever to the "N" position.
2. Loosen the control cable to manual control lever coupling nut to free the cable and lever.
3. Set the manual control lever to the neutral position.



4. Loosen the park/neutral position switch body mounting bolts and turn the park/neutral position switch body so the hole in the end of the manual control lever and the hole (cross section A-A in the figure on the left) in the flange of the park/neutral position switch body flange are aligned.
5. Tighten the park/neutral position switch body mounting bolts to the specified torque. Be careful at this time that the position of the switch body is not changed.

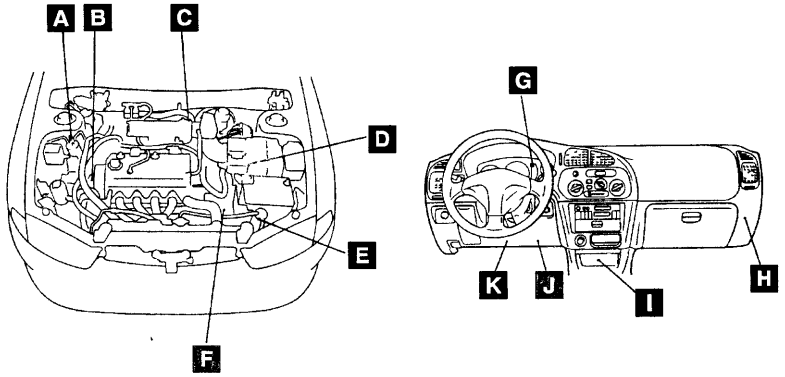


6. Gently pull the transaxle control cable in the direction of the arrow, and then tighten the adjusting nut.
7. Check that the selector lever is in the "N" position.
8. Check that each range on the transaxle side operates and functions correctly for each position of the selector lever.

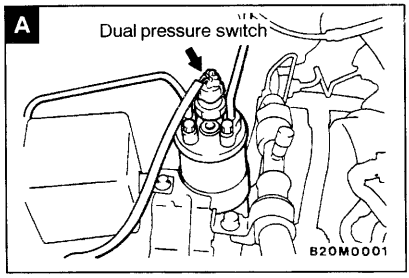
A/T CONTROL COMPONENT LOCATION

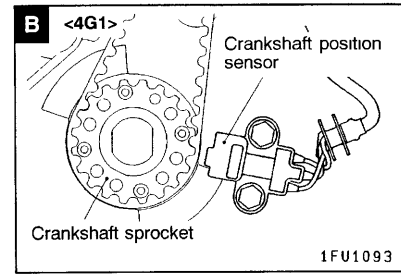
23100860104

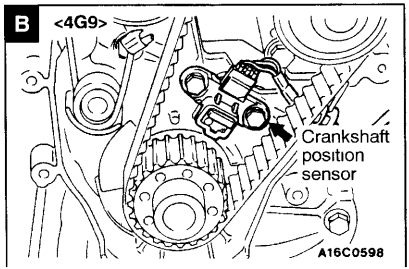
Name	Symbol	Name	Symbol
A/T control relay	I	Output shaft speed sensor	D
Crankshaft position sensor <4G1>	B	Park/Neutral position (PNP) switch	F
Crankshaft position sensor <4G9>	B	Shift indicator light	G
Data link connector	J	Solenoid valve	E
Dual pressure switch	A	Stop light switch	K
Engine control module (ECM)	H	Throttle position sensor <4G1> (built into closed throttle position switch)	C
Input shaft speed sensor	D	Throttle position sensor <4G9> (built into closed throttle position switch)	C
Oil temperature sensor	E	Transaxle control module (TCM)	I
		Vehicle speed sensor	D

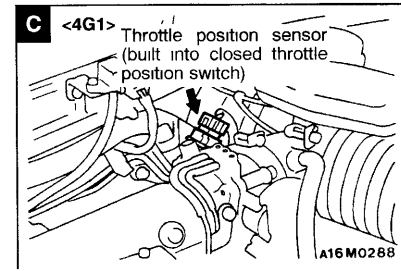


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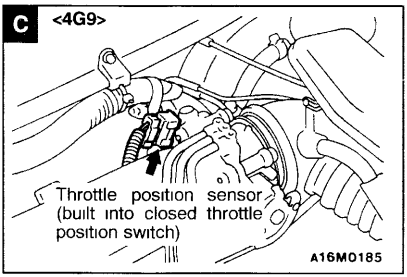




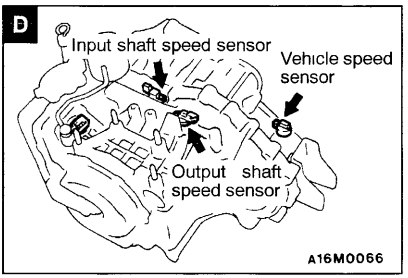




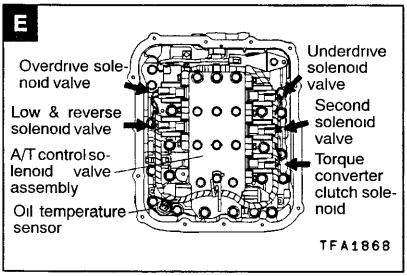
C <4G9>



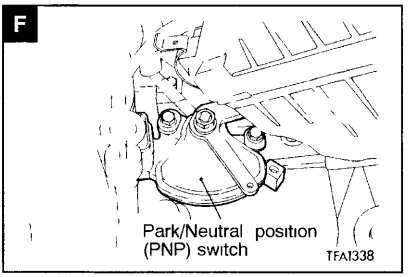
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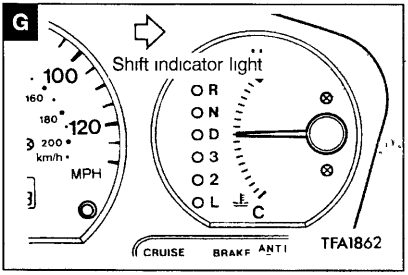
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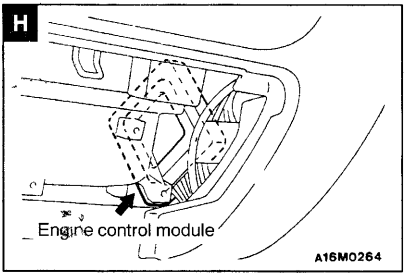
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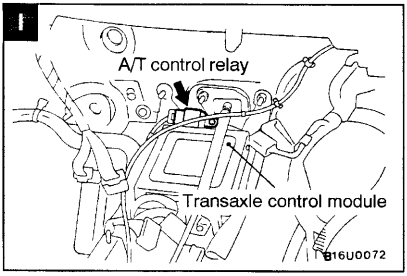
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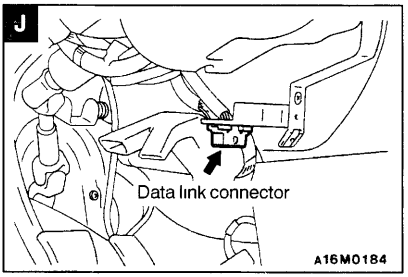
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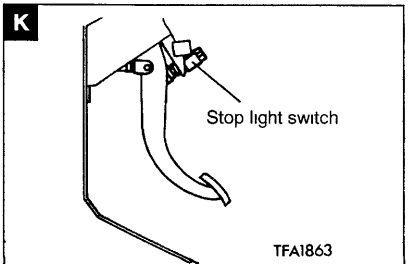
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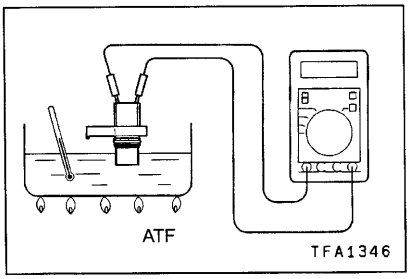
A/T CONTROL COMPONENT CHECK 23100900073

1. CRANKSHAFT POSITION SENSOR CHECK

Refer to GROUP 13A - MFI <1.5L Engine> - Troubleshooting.
Refer to GROUP 13A - MFI <1.8L Engine> - Troubleshooting.

2. THROTTLE POSITION SENSOR CHECK 23100390269

Refer to GROUP 13A - MFI <1.5L Engine> - On-vehicle Service.
Refer to GROUP 13A - MFI <1.8L Engine> - On-vehicle Service.



3. OIL TEMPERATURE SENSOR CHECK 23100450080

1. Remove the oil temperature sensor.
2. Measure the resistance between terminals No.1 and No.2 of the oil temperature sensor connector.

Standard value:

Oil temperature [°C (°F)]	Resistance (kΩ)
0 (32)	16.7 - 20 5
100 (212)	0.57 - 0.69

3. Replace the sensor if not within the standard value.

4. PARK/NEUTRAL POSITION SWITCH CHECK 23100140178

Refer to P.23-51.

5. STOP LIGHT SWITCH CHECK 23100910045

Refer to GROUP 35 - Brake Pedal.

6. VEHICLE SPEED SENSOR CHECK 23100460113

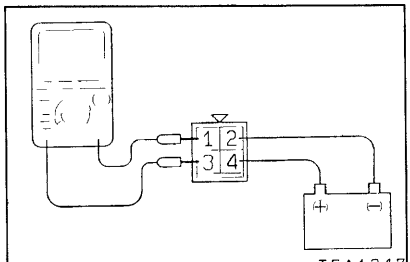
Refer to GROUP 54 - On-vehicle Service.

7. DUAL PRESSURE SWITCH CHECK 23100470093

Refer to GROUP 55 - On-vehicle Service.

8. CLOSED THROTTLE POSITION SWITCH CHECK 23100410187

Refer to GROUP 13A - On-vehicle Service.

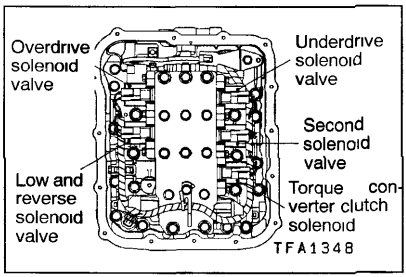


9. A/T CONTROL RELAY CHECK 23100930041

1. Remove the A/T control relay.
2. Use jumper wires to connect the A/T control relay terminal (2) to the battery (-) terminal and terminal (4) to the battery (+) terminal.
3. Check the continuity between the terminal (1) and the terminal (3) of the A/T control relay when the jumper wires are connected to and disconnected from the battery.

Jumper wire	Continuity between terminals No.1 and No.3
Connected	Continuity
Disconnected	No continuity

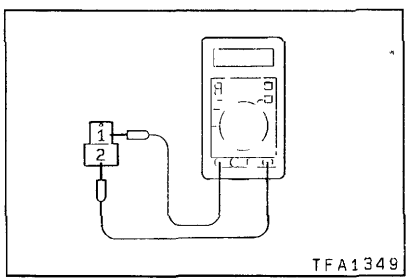
4. If there is a problem, replace the A/T control relay.



10. SOLENOID VALVE CHECK

23100940044

1. Remove the valve body cover.
2. Disconnect the connectors of each solenoid valve.

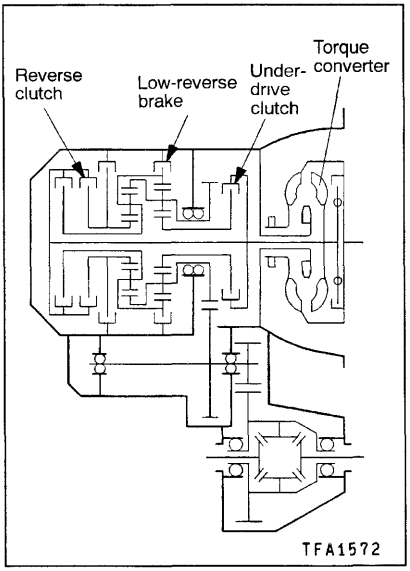


3. Measure the resistance between terminals 1 and 2 of each solenoid valve.

Standard value:

Name	Resistance
Torque converter clutch solenoid	27 - 34 Ω (at 20°C (68°F))
Low and reverse solenoid valve	
Second solenoid valve	
Underdrive solenoid valve	
Overdrive solenoid valve	

4. If the resistance is not within the standard value, replace the solenoid valve.



TORQUE CONVERTER STALL TEST 23100540107

This test measures the maximum engine speed when the selector lever is at the D or R position and the torque converter stalls to test the operation of the torque converter, starter motor and one-way clutch operation and the holding performance of the clutches and brakes in the transaxle.

Caution
Do not let anybody stand in front of or behind the vehicle while this test is being carried out.

1. Check the automatic transmission fluid level and temperature and the engine coolant temperature.
   - Fluid level: At the HOT mark on the oil level gauge
   - Fluid temperature: 80 - 100°C (176 - 212°F)
   - Engine coolant temperature: 80 - 100°C (176 - 212°F)
2. Chock both rear wheels.
3. Pull the parking brake lever on, with the brake pedal fully depressed.
4. Start the engine.
5. Move the selector lever to the D position, fully depress the accelerator pedal and take a reading of the maximum engine speed at this time.

   Caution
   1. **The throttle should not be left fully open for any more than eight seconds.**
   2. **If carrying out the stall test two or more times, move the selector lever to the N position and run the engine at 1,000 r/min to let the automatic transmission fluid cool down before carrying out subsequent tests.**

   Standard value:

   Stall speed: 1,900 - 2,400 r/min
6. Move the selector lever to the R position and carry out the same test again.

   Standard value:

   Stall speed: 1,900 - 2,400 r/min

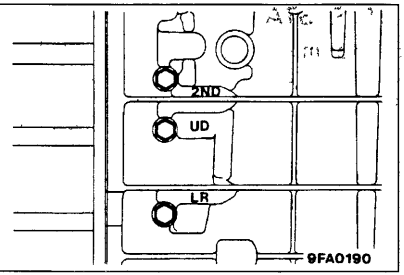
TORQUE CONVERTER STALL TEST JUDGEMENT RESULTS

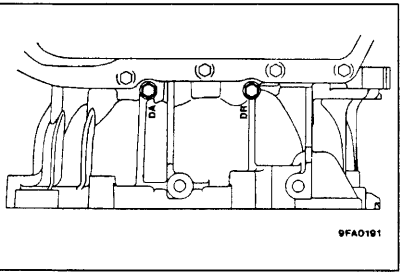
a. Stall speed is too high in both D and R ranges
   - Low line pressure
   - Low & reverse brake slippage

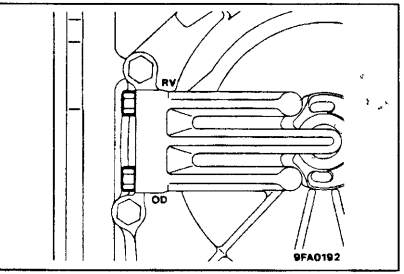
b. Stall speed is too high in D range only
   - Underdrive clutch slippage

c. Stall speed is too high in R range only
   - Reverse clutch slippage

d. Stall speed too low in both D and R ranges
   - Malfunction of torque converter
   - Insufficient engine output







HYDRAULIC PRESSURE TEST

23100550117

1. Warm up the engine until the automatic transmission fluid temperature is 80–100°C.
2. Jack up the vehicle so that the wheels are free to turn.
3. Connect the special tools (2,942 kPa (427 psi) oil pressure gauge [MD998330] and joints [MD998332, MD998900]) to each pressure discharge port.

   NOTE
   2ND: Second brake pressure port
   UD: Underdrive clutch pressure port
   LR: Low and reverse brake pressure port
   DA: Torque converter apply pressure port
   DR: Torque converter release pressure port
   RV: Reverse clutch pressure port
   OD: Overdrive clutch pressure port
4. Measure the hydraulic pressure at each port under the conditions given in the standard hydraulic pressure table, and check that the measured values are within the standard value ranges.
5. If a value is outside the standard range, correct the problem while referring to the hydraulic pressure test diagnosis table.

STANDARD HYDRAULIC PRESSURE TEST

Measurement condition			Standard hydraulic pressure kPa					
Selector lever position	Shift position	Engine speed (r/min)	Underdrive clutch pressure [UD]	Reverse clutch pressure [RV]	Overdrive clutch pressure [OD]	Low and reverse brake pressure [LR]	Second brake pressure [2ND]	Torque converter pressure [DR]
P	-	2,500	-	-	-	310 - 390 (46 - 57)	-	250 - 390 (37 - 57)
R	Reverse	2,500	-	1,270 - 1,770 (185 - 256)	-	1,270 - 1,770 (185 - 256)	-	500 - 700 (73 - 101)
N	-	2,500	-	-	-	310 - 390 (46 - 57)	-	250 - 390 (37 - 57)
D	1st gear	2,500	1,010 - 1,050 (147 - 152)	-	-	1,010 - 1,050 (147 - 152)	-	500 - 700 (73 - 101)
	2nd gear	2,500	1,010 - 1,050 (147 - 152)	-	-	-	1,010 - 1,050 (147 - 152)	500 - 700 (73 - 101)
	3rd gear	2,500	590 - 690 (85 - 100)	-	590 - 690 (85 - 100)	-	-	450 - 650 (65 - 94)
	4th gear	2,500	-	-	590 - 690 (85 - 100)	-	590 - 690 (85 - 100)	450 - 650 (65 - 94)

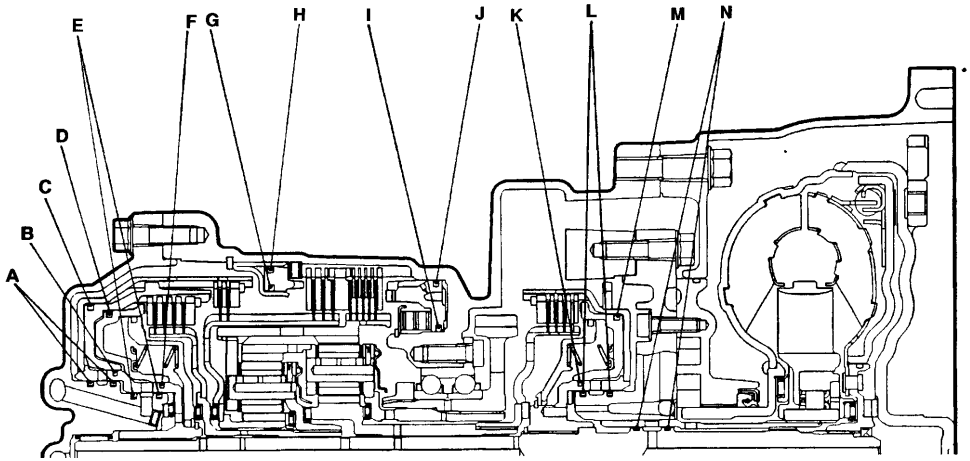
HYDRAULIC PRESSURE TEST DIAGNOSIS TABLE

Trouble symptom	Probable cause
All hydraulic pressures are high.	Incorrect transaxle control cable adjustment
	Malfunction of the regulator valve
All hydraulic pressures are low.	Incorrect transaxle control cable adjustment
	Malfunction of the oil pump
	Clogged internal oil filter
	Clogged oil cooler
	Malfunction of the regulator valve
	Malfunction of the relief valve
	Incorrect valve body installation
Hydraulic pressure is abnormal in "R" range only	Malfunction of the regulator valve
	Clogged orifice
	Incorrect valve body installation
Hydraulic pressure is abnormal in "3" or "4" range only.	Malfunction of the overdrive solenoid valve
	Malfunction of the overdrive pressure control valve
	Malfunction of the regulator valve
	Malfunction of the switch valve
	Clogged orifice
	Incorrect valve body installation

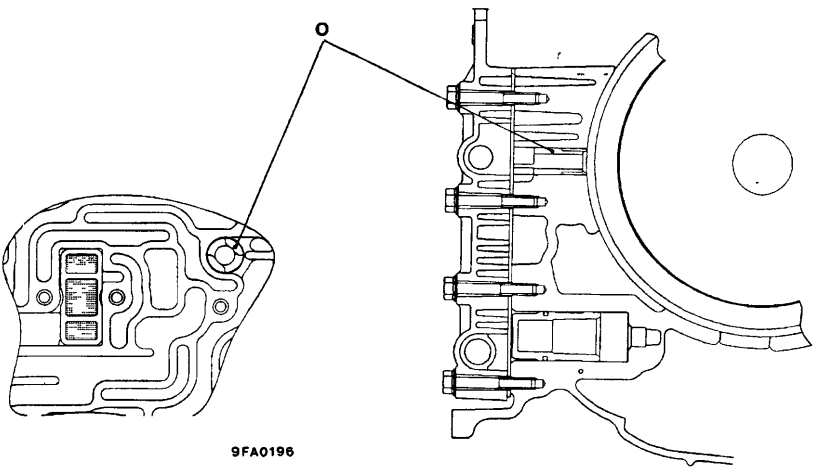
Trouble symptom	Probable cause
Only underdrive hydraulic pressure is abnormal	Malfunction of the oil seal K
	Malfunction of the oil seal L
	Malfunction of the oil seal M
	Malfunction of the underdrive solenoid valve
	Malfunction of the underdrive pressure control valve
	Malfunction of check ball
	Clogged orifice
	Incorrect valve body installation
Only reverse clutch hydraulic pressure is abnormal.	Malfunction of the oil seal A
	Malfunction of the oil seal B
	Malfunction of the oil seal C
	Clogged orifice
	Incorrect valve body installation
Only overdrive hydraulic pressure is abnormal.	Malfunction of the oil seal D
	Malfunction of the oil seal E
	Malfunction of the oil seal F
	Malfunction of the overdrive solenoid valve
	Malfunction of the overdrive pressure control valve
	Malfunction of check ball
	Clogged orifice
	Incorrect valve body installation
Only low and reverse hydraulic pressure is abnormal.	Malfunction of the oil seal I
	Malfunction of the oil seal J
	Malfunction of the low and reverse solenoid valve
	Malfunction of the low and reverse pressure control valve
	Malfunction of the switch valve
	Malfunction of the fail safe valve A
	Malfunction of check ball
	Clogged orifice
	Incorrect valve body installation

Trouble symptom	Probable cause
Only second hydraulic pressure is abnormal	Malfunction of the oil seal G
	Malfunction of the oil seal H
	Malfunction of the oil seal O
	Malfunction of the second solenoid valve
	Malfunction of the second pressure control valve
	Malfunction of the fail safe valve B
	Clogged orifice
	Incorrect valve body installation
Only torque converter pressure is abnormal	Clogged oil cooler
	Malfunction of the oil seal N
	Malfunction of the torque converter clutch solenoid
	Malfunction of the torque converter clutch control valve
	Malfunction of the torque converter pressure control valve
	Clogged orifice
	Incorrect valve body installation
Pressure applied to element which should not receive pressure.	Incorrect transaxle control cable adjustment
	Malfunction of the manual valve
	Malfunction of check ball
	Incorrect valve body installation

OIL SEAL LAYOUT



9FA0281



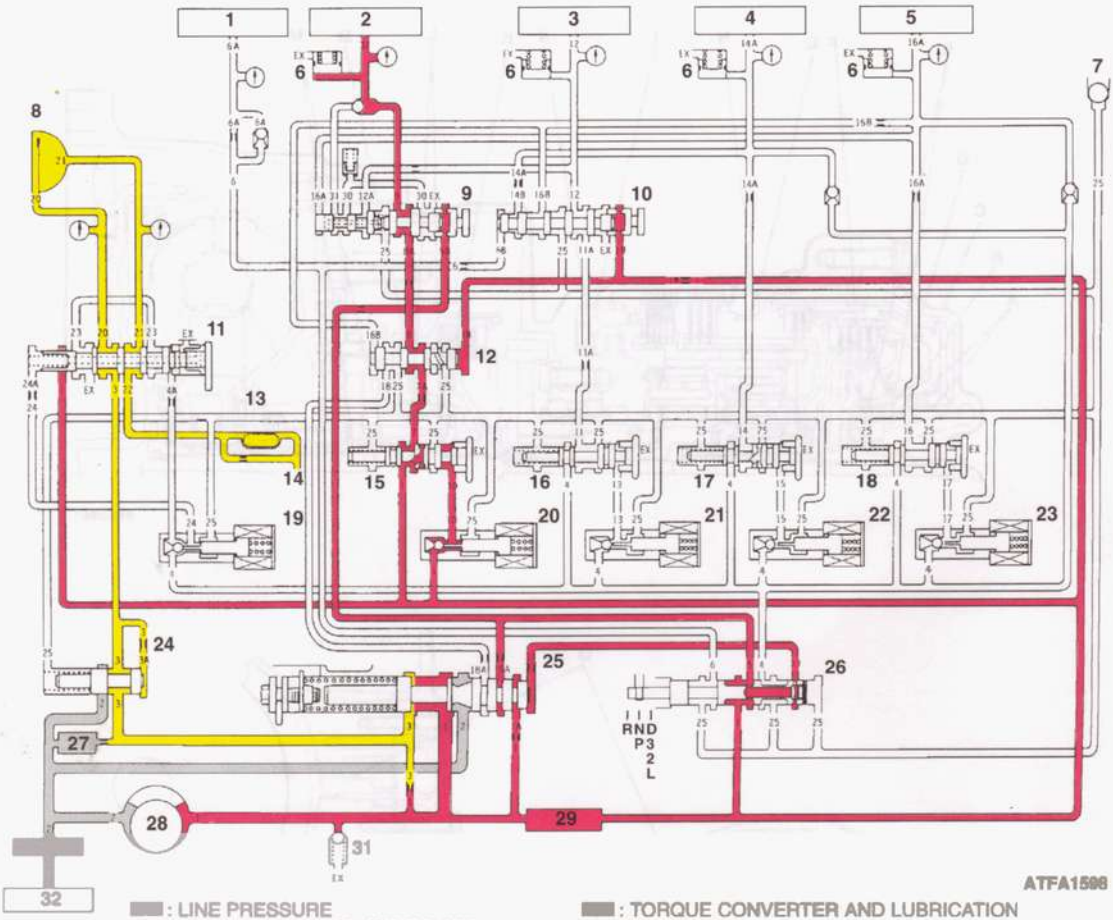
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HYDRAULIC CIRCUIT

23100880094

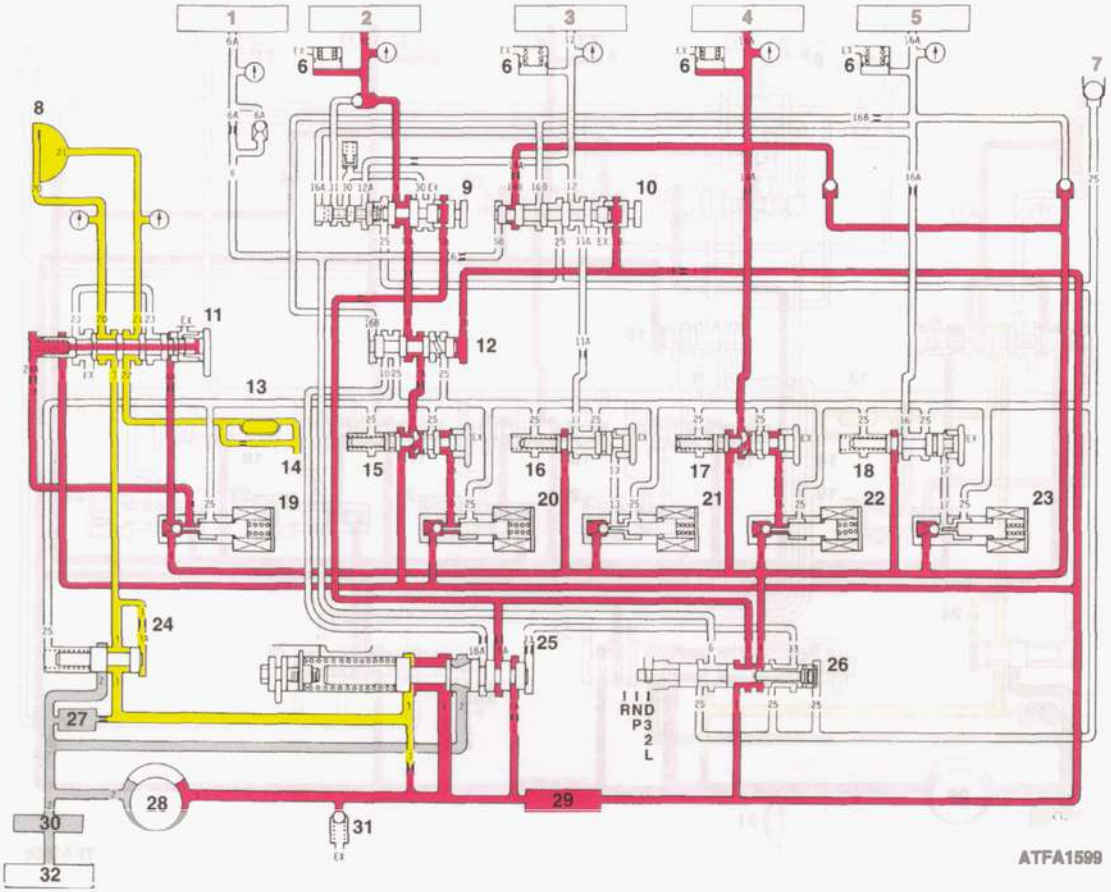
PARKING AND NEUTRAL



: LINE PRESSURE
: OIL PUMP SUCTION PRESSURE
: TORQUE CONVERTER CLUTCH PRESSURE
: TORQUE CONVERTER AND LUBRICATION PRESSURE
: TORQUE CONVERTER CLUTCH SOLENOID VALVE PRESSURE

1. REVERSE CLUTCH
2. LOW-REVERSE BRAKE
3. SECOND BRAKE
4. UNDERDRIVE CLUTCH
5. OVERDRIVE CLUTCH
6. ACCUMULATOR
7. CHECK BALL
8. TORQUE CONVERTER CLUTCH
9. FAIL SAFE VALVE A
10. FAIL SAFE VALVE B
11. TORQUE CONVERTER CLUTCH CONTROL VALVE
12. SWITCH VALVE
13. AUTOMATIC TRANSMISSION FLUID COOLER
14. LUBRICATION
15. LOW-REVERSE PRESSURE CONTROL VALVE
16. SECOND PRESSURE CONTROL VALVE
17. UNDERDRIVE PRESSURE CONTROL VALVE
18. OVERDRIVE PRESSURE CONTROL VALVE
19. TORQUE CONVERTER CLUTCH SOLENOID
20. LOW-REVERSE SOLENOID VALVE
21. SECOND SOLENOID VALVE
22. UNDERDRIVE SOLENOID VALVE
23. OVERDRIVE SOLENOID VALVE
24. TORQUE CONVERTER PRESSURE CONTROL VALVE
25. REGULATOR VALVE
26. MANUAL VALVE
27. OIL FILTER
28. OIL PUMP
29. OIL STRAINER
30. OIL FILTER (BUILT-IN TYPE)
31. RELIEF VALVE
32. OIL PAN

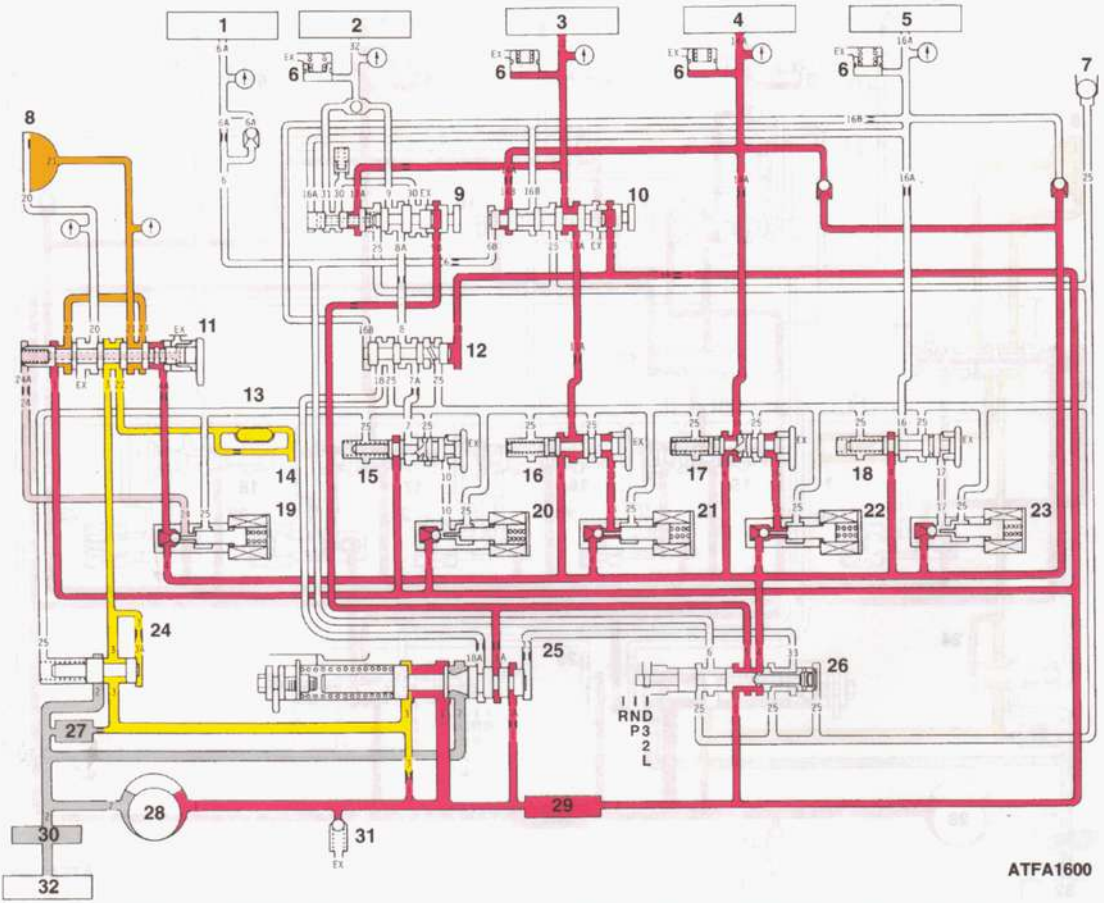
1ST GEAR



: LINE PRESSURE
: OIL PUMP SUCTION PRESSURE
: TORQUE CONVERTER CLUTCH PRESSURE
: TORQUE CONVERTER AND LUBRICATION PRESSURE
: TORQUE CONVERTER CLUTCH SOLENOID VALVE PRESSURE

1. REVERSE CLUTCH
2. LOW-REVERSE BRAKE
3. SECOND BRAKE
4. UNDERDRIVE CLUTCH
5. OVERDRIVE CLUTCH
6. ACCUMULATOR
7. CHECK BALL
8. TORQUE CONVERTER CLUTCH
9. FAIL SAFE VALVE A
10. FAIL SAFE VALVE B
11. TORQUE CONVERTER CLUTCH VALVE
12. SWITCH VALVE
13. AUTOMATIC TRANSMISSION FLUID COOLER
14. LUBRICATION
15. LOW-REVERSE PRESSURE CONTROL VALVE
16. SECOND PRESSURE CONTROL VALVE
17. UNDERDRIVE PRESSURE CONTROL VALVE
18. OVERDRIVE PRESSURE CONTROL VALVE
19. TORQUE CONVERTER CLUTCH SOLENOID
20. LOW-REVERSE SOLENOID VALVE
21. SECOND SOLENOID VALVE
22. UNDERDRIVE SOLENOID VALVE
23. OVERDRIVE SOLENOID VALVE
24. TORQUE CONVERTER PRESSURE CONTROL VALVE
25. REGULATOR VALVE
26. MANUAL VALVE
27. OIL FILTER
28. OIL PUMP
29. OIL STRAINER
30. OIL FILTER (BUILT-IN TYPE)
31. RELIEF VALVE
32. OIL PAN

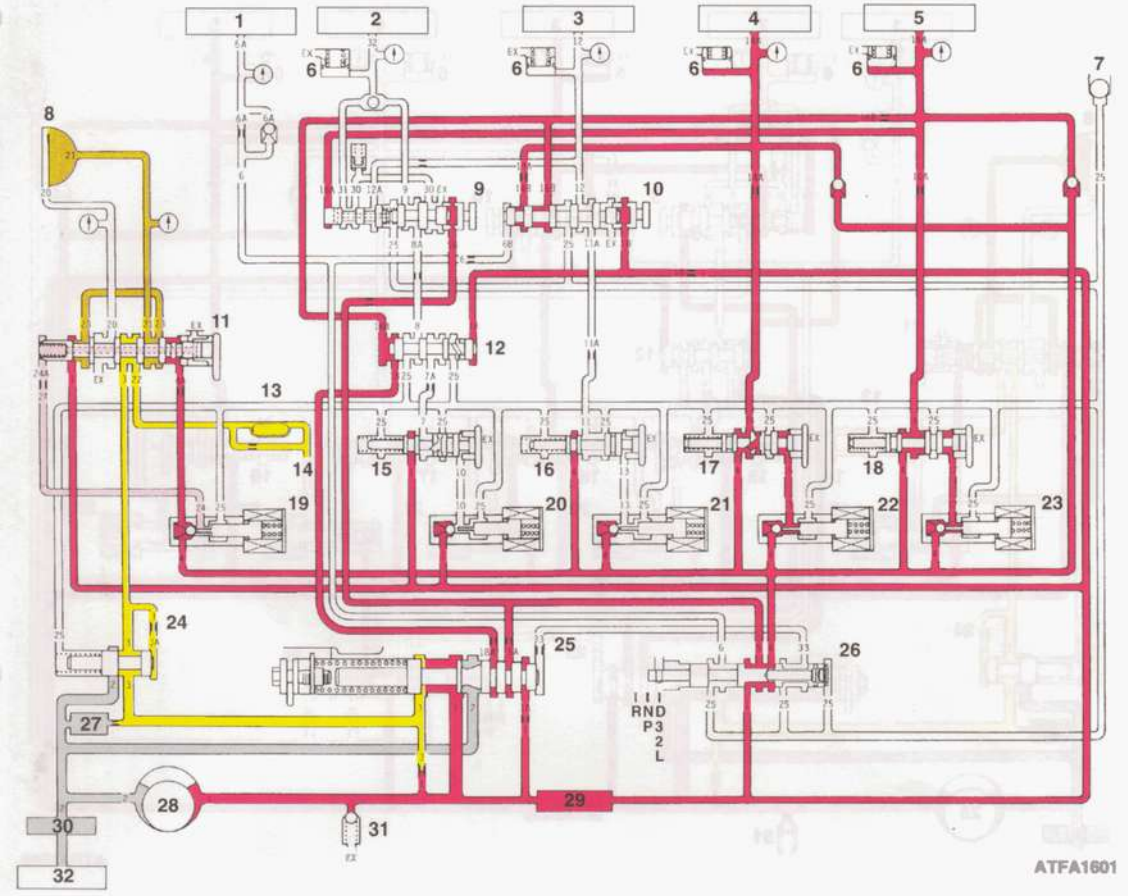
2ND GEAR



: LINE PRESSURE
: OIL PUMP SUCTION PRESSURE
: TORQUE CONVERTER CLUTCH PRESSURE
: TORQUE CONVERTER AND LUBRICATION PRESSURE
: TORQUE CONVERTER CLUTCH SOLENOID VALVE PRESSURE

1. REVERSE CLUTCH
2. LOW-REVERSE BRAKE
3. SECOND BRAKE
4. UNDERDRIVE CLUTCH
5. OVERDRIVE CLUTCH
6. ACCUMULATOR
7. CHECK BALL
8. TORQUE CONVERTER CLUTCH
9. FAIL SAFE VALVE A
10. FAIL SAFE VALVE B
11. TORQUE CONVERTER CLUTCH VALVE
12. SWITCH VALVE
13. AUTOMATIC TRANSMISSION FLUID COOLER
14. LUBRICATION
15. LOW-REVERSE PRESSURE CONTROL VALVE
16. SECOND PRESSURE CONTROL VALVE
17. UNDERDRIVE PRESSURE CONTROL VALVE
18. OVERDRIVE PRESSURE CONTROL VALVE
19. TORQUE CONVERTER CLUTCH SOLENOID
20. LOW-REVERSE SOLENOID VALVE
21. SECOND SOLENOID VALVE
22. UNDERDRIVE SOLENOID VALVE
23. OVERDRIVE SOLENOID VALVE
24. TORQUE CONVERTER PRESSURE CONTROL VALVE
25. REGULATOR VALVE
26. MANUAL VALVE
27. OIL FILTER
28. OIL PUMP
29. OIL STRAINER
30. OIL FILTER (BUILT-IN TYPE)
31. RELIEF VALVE
32. OIL PAN

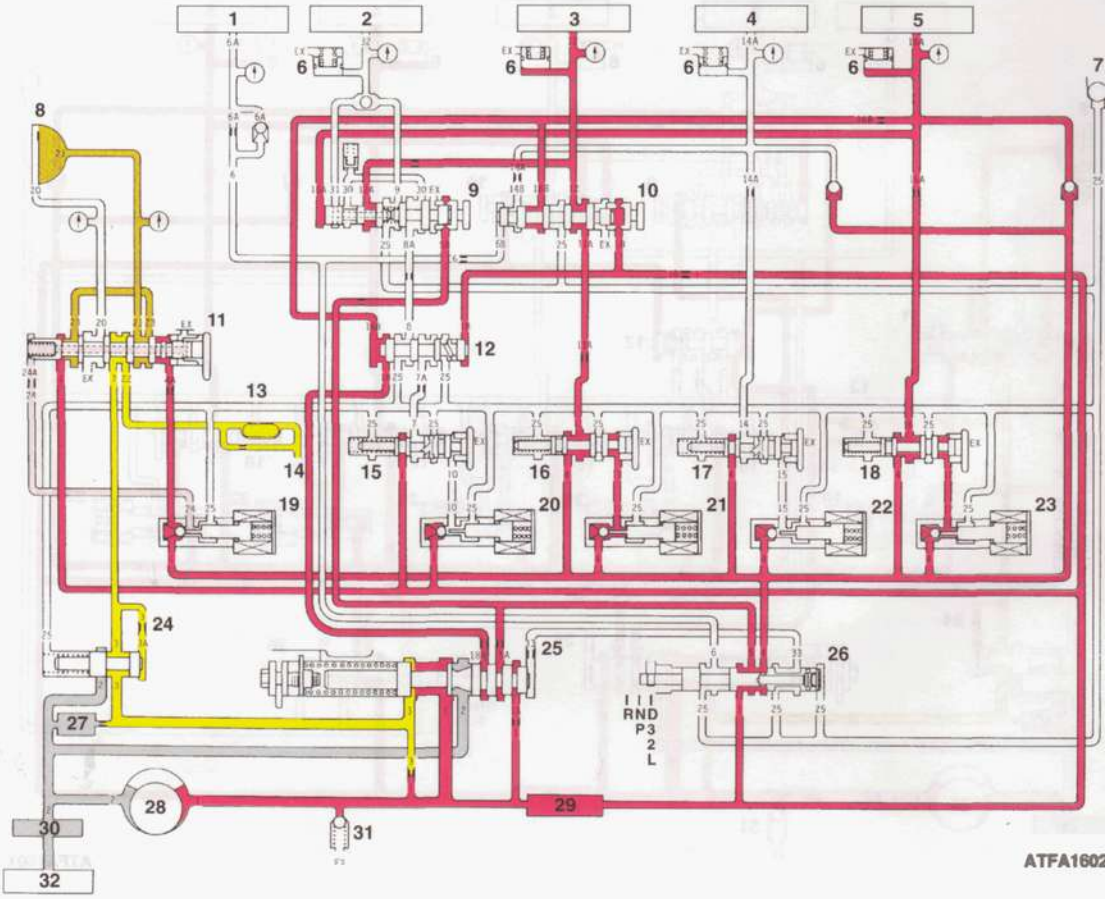
3RD GEAR



: LINE PRESSURE
: OIL PUMP SUCTION PRESSURE
: TORQUE CONVERTER CLUTCH PRESSURE
: TORQUE CONVERTER AND LUBRICATION PRESSURE
: TORQUE CONVERTER CLUTCH SOLENOID VALVE PRESSURE

1. REVERSE CLUTCH
2. LOW-REVERSE BRAKE
3. SECOND BRAKE
4. UNDERDRIVE CLUTCH
5. OVERDRIVE CLUTCH
6. ACCUMULATOR
7. CHECK BALL
8. TORQUE CONVERTER CLUTCH
9. FAIL SAFE VALVE A
10. FAIL SAFE VALVE B
11. TORQUE CONVERTER CLUTCH VALVE
12. SWITCH VALVE
13. AUTOMATIC TRANSMISSION FLUID COOLER
14. LUBRICATION
15. LOW-REVERSE PRESSURE CONTROL VALVE
16. SECOND PRESSURE CONTROL VALVE
17. UNDERDRIVE PRESSURE CONTROL VALVE
18. OVERDRIVE PRESSURE CONTROL VALVE
19. TORQUE CONVERTER CLUTCH SOLENOID
20. LOW-REVERSE SOLENOID VALVE
21. SECOND SOLENOID VALVE
22. UNDERDRIVE SOLENOID VALVE
23. OVERDRIVE SOLENOID VALVE
24. TORQUE CONVERTER PRESSURE CONTROL VALVE
25. REGULATOR VALVE
26. MANUAL VALVE
27. OIL FILTER
28. OIL PUMP
29. OIL STRAINER
30. OIL FILTER (BUILT-IN TYPE)
31. RELIEF VALVE
32. OIL PAN

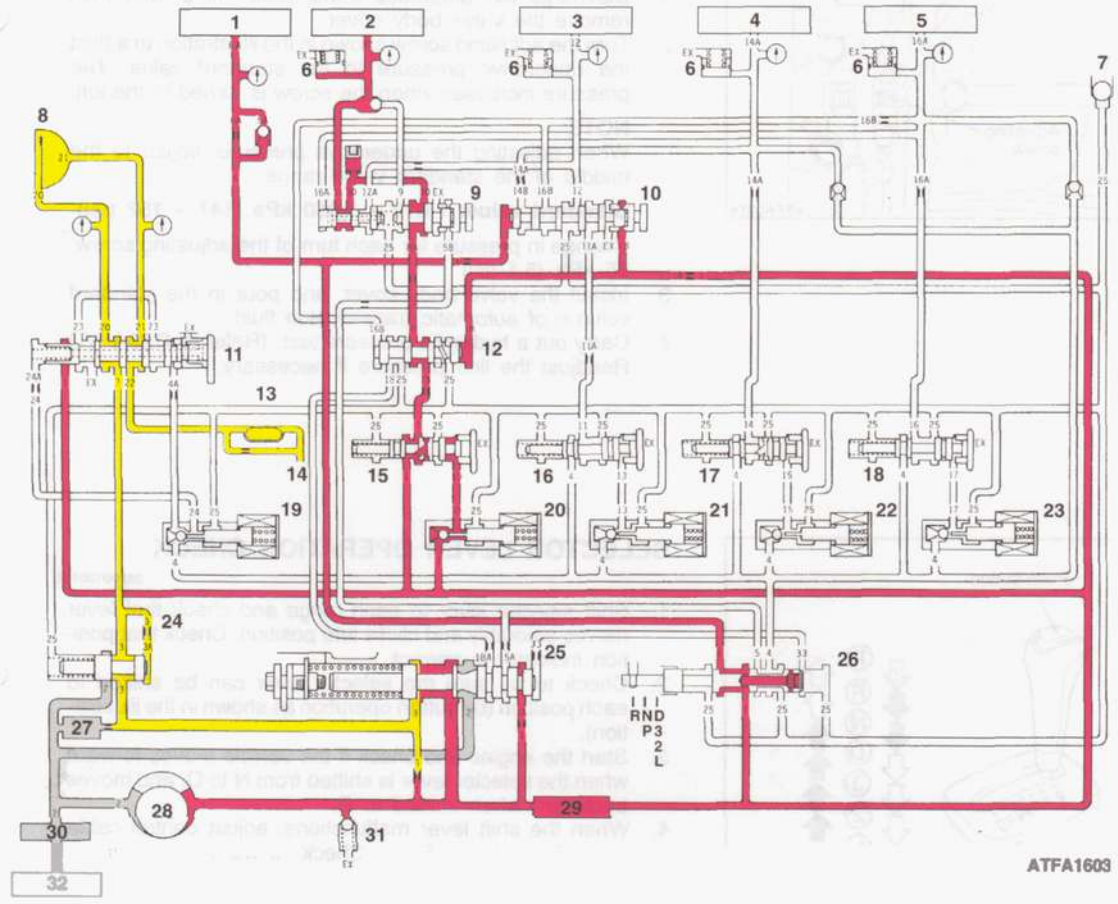
4TH GEAR



: LINE PRESSURE
: OIL PUMP SUCTION PRESSURE
: TORQUE CONVERTER CLUTCH PRESSURE
: TORQUE CONVERTER AND LUBRICATION PRESSURE
: TORQUE CONVERTER CLUTCH SOLENOID VALVE PRESSURE

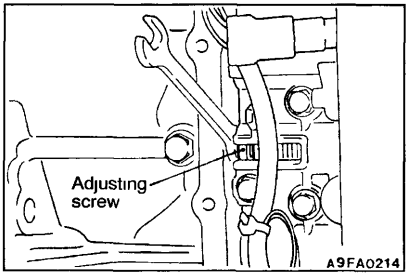
1. REVERSE CLUTCH
2. LOW-REVERSE BRAKE
3. SECOND BRAKE
4. UNDERDRIVE CLUTCH
5. OVERDRIVE CLUTCH
6. ACCUMULATOR
7. CHECK BALL
8. TORQUE CONVERTER CLUTCH
9. FAIL SAFE VALVE A
10. FAIL SAFE VALVE B
11. TORQUE CONVERTER CLUTCH VALVE
12. SWITCH VALVE
13. AUTOMATIC TRANSMISSION FLUID COOLER
14. LUBRICATION
15. LOW-REVERSE PRESSURE CONTROL VALVE
16. SECOND PRESSURE CONTROL VALVE
17. UNDERDRIVE PRESSURE CONTROL VALVE
18. OVERDRIVE PRESSURE CONTROL VALVE
19. TORQUE CONVERTER CLUTCH SOLENOID
20. LOW-REVERSE SOLENOID VALVE
21. SECOND SOLENOID VALVE
22. UNDERDRIVE SOLENOID VALVE
23. OVERDRIVE SOLENOID VALVE
24. TORQUE CONVERTER PRESSURE CONTROL VALVE
25. REGULATOR VALVE
26. MANUAL VALVE
27. OIL FILTER
28. OIL PUMP
29. OIL STRAINER
30. OIL FILTER (BUILT-IN TYPE)
31. RELIEF VALVE
32. OIL PAN

REVERSE



: LINE PRESSURE
: OIL PUMP SUCTION PRESSURE
: TORQUE CONVERTER CLUTCH PRESSURE
: TORQUE CONVERTER AND LUBRICATION PRESSURE
: TORQUE CONVERTER CLUTCH SOLENOID VALVE PRESSURE

1. REVERSE CLUTCH
2. LOW-REVERSE BRAKE
3. SECOND BRAKE
4. UNDERDRIVE CLUTCH
5. OVERDRIVE CLUTCH
6. ACCUMULATOR
7. CHECK BALL
8. TORQUE CONVERTER CLUTCH
9. FAIL SAFE VALVE A
10. FAIL SAFE VALVE B
11. TORQUE CONVERTER CLUTCH VALVE
12. SWITCH VALVE
13. AUTOMATIC TRANSMISSION FLUID COOLER
14. LUBRICATION
15. LOW-REVERSE PRESSURE CONTROL VALVE
16. SECOND PRESSURE CONTROL VALVE
17. UNDERDRIVE PRESSURE CONTROL VALVE
18. OVERDRIVE PRESSURE CONTROL VALVE
19. TORQUE CONVERTER CLUTCH SOLENOID
20. LOW-REVERSE SOLENOID VALVE
21. SECOND SOLENOID VALVE
22. UNDERDRIVE SOLENOID VALVE
23. OVERDRIVE SOLENOID VALVE
24. TORQUE CONVERTER PRESSURE CONTROL VALVE
25. REGULATOR VALVE
26. MANUAL VALVE
27. OIL FILTER
28. OIL PUMP
29. OIL STRAINER
30. OIL FILTER (BUILT-IN TYPE)
31. RELIEF VALVE
32. OIL PAN



LINE PRESSURE ADJUSTMENT

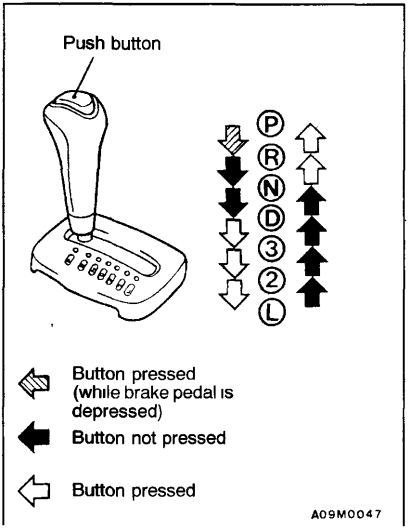
23100170092

1. Discharge the automatic transmission fluid, and then remove the valve body cover.
2. Turn the adjusting screw shown in the illustration to adjust the underdrive pressure to the standard value. The pressure increases when the screw is turned to the left.

   NOTE
   When adjusting the underdrive pressure, adjust to the middle of the standard value range.

   Standard value: 1,010 - 1,050 kPa (147 - 152 psi)

   Change in pressure for each turn of the adjusting screw: 35 kPa (5.1 psi)
3. Install the valve body cover, and pour in the standard volume of automatic transmission fluid.
4. Carry out a hydraulic pressure test. (Refer to P.23A-58.) Readjust the line pressure if necessary.



SELECTOR LEVER OPERATION CHECK

23100130106

1. Shift selector lever to each range and check that lever moves smoothly and clicks into position. Check that position indicator is correct.
2. Check to be sure the selector lever can be shifted to each position (by button operation as shown in the illustration).
3. Start the engine and check if the vehicle moves forward when the selector lever is shifted from N to D, and moves backward when shifted to R.
4. When the shift lever malfunctions, adjust control cable and selector lever sleeve. Check for worn shift lever assembly sliding parts.

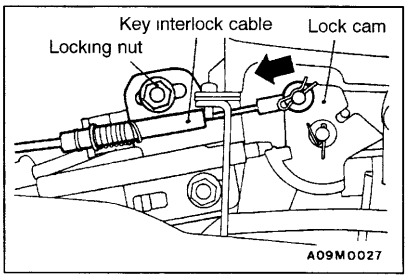
   NOTE
   To move the selector lever from the "P" position to any other position, first turn the ignition key to any position other than "LOCK (OFF)" and depress the brake pedal.

KEY INTERLOCK MECHANISM CHECK

23200090100

1. Carry out the following inspection.

Inspection procedure	Check requirements		Check item (Normal condition)
1	Brake pedal: Depressed	Ignition key position: "LOCK (OFF)" or removed	Pushing the push button of selector lever and shifting from P to other positions are impossible
2		Ignition key position: "ACC"	Pushing the push button of selector lever and shifting from P to other positions are possible.
3	Brake pedal. Not depressed	Selector lever: Other than P	Turning the ignition key to "LOCK" is impossible.
4		Selector lever: P	Turning the ignition key to "LOCK" smoothly is possible.



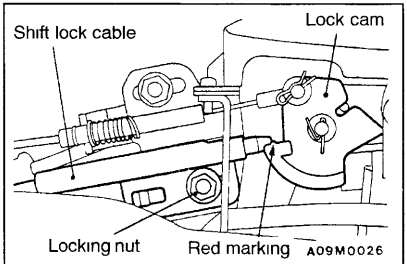
2. When the above operations are defective, adjust the key interlock cable in following procedure.
   (1) Remove the front floor console. (Refer to GROUP 52A.)
   (2) Shift selector lever to "P".
   (3) Turn the ignition key to "LOCK".
   (4) Loosen the locking nut of the key interlock cable.
   (5) Push the cable joint on the lock cam gently toward the arrow, and tighten the locking nut.
   (6) Install the front floor console.

SHIFT LOCK MECHANISM CHECK

23200100100

1. Carry out the following inspections.

Inspection procedure	Check condition		Check item (Normal condition)
1	Brake pedal: Not depressed	Ignition key position: "ACC"	Pushing the selector lever push button and shifting from "P" to other positions are impossible.
2	Brake pedal: Depressed		Pushing the selector lever push button and shifting from "P" to other positions smoothly are possible.
3	Brake pedal: Not depressed		Pushing the selector lever push button and shifting from "R" to "P" smoothly are possible.



2. When the above operations are defective, adjust the shift lock cable as follows:
   (1) Remove the front floor console. (Refer to GROUP 52A.)
   (2) Shift selector lever to "P".
   (3) Loosen the locking nut of shift lock cable.
   (4) Tighten the locking nut so that the end of the shift lock cable comes above the red marking of the lock cam.
   (5) Install the front floor console.

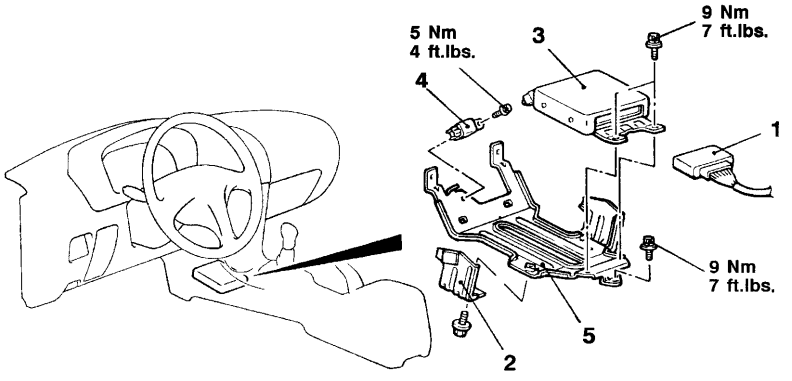
TRANSAXLE CONTROL

23100660322

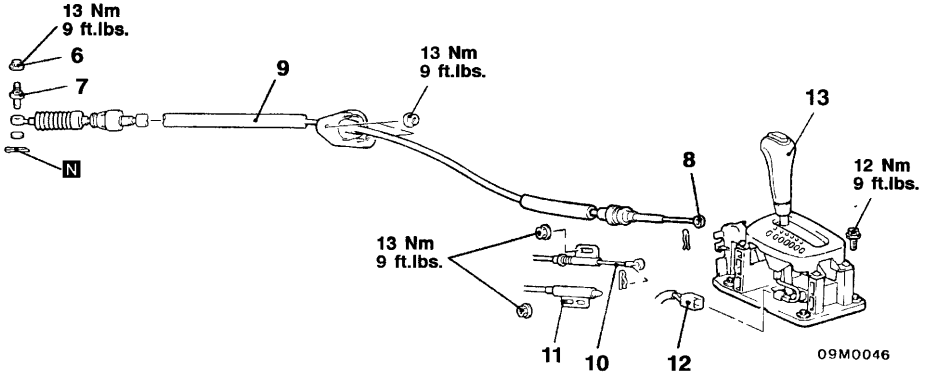
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
(1) Air Cleaner Assembly Removal and Installation
(2) Front Floor Console Removal and Installation (Refer to GROUP 52A)

Caution: SRS
Be careful not to subject the SRS-ECU to any shocks during removal and installation of the transaxle control cable, key interlock cable, shift lock cable and selector lever assembly.



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Transaxle control cable assembly removal steps

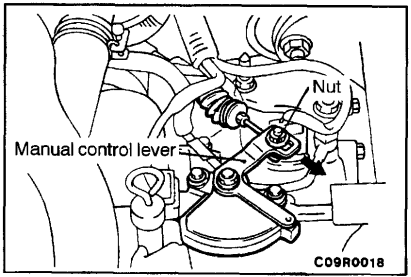
1 Wiring harness connector
2. Arm (L.H.)
3. A/T-ECU
▶A◀ 6. Nut
7 Adjuster
8. Transaxle control cable connection
9. Transaxle control cable assembly

Selector lever assembly removal steps

8. Transaxle control cable connection
10. Key interlock cable connection
11. Shift lock cable connection
12. Wiring harness connector
13 Selector lever assembly

A/T-ECU and carpet bracket removal steps

1. Wiring harness connector
2. Arm (L.H.)
3. A/T-ECU
4 Control relay
● Heater unit (Refer to GROUP 55)
5. Carpet bracket



INSTALLATION SERVICE POINT

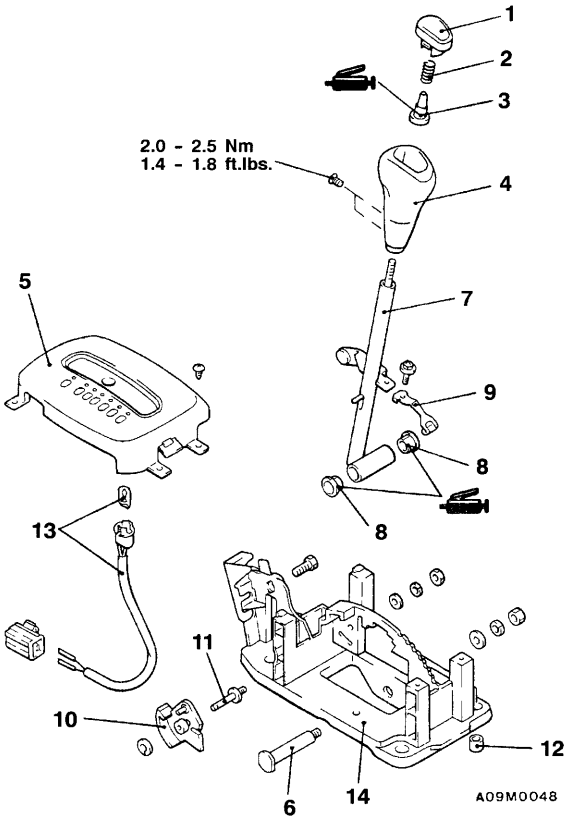
▶A◀ NUT INSTALLATION

1. Put the selector lever in the "N" position.
2. Loosen the adjusting nut, gently pull the transaxle control cable in the direction of the arrow and tighten the nut.

SELECTOR LEVER ASSEMBLY

23100680090

DISASSEMBLY AND REASSEMBLY



Disassembly steps

1. Push button
2. Spring
3. Adjuster
4. Shift knob
5. Indicator panel assembly
6. Bolt
7. Shift lever assembly
8. Bushing
9. Detent spring
10. Lock cam
11. Pin
12. Collar
13. Position indicator light assembly
14. Bracket assembly

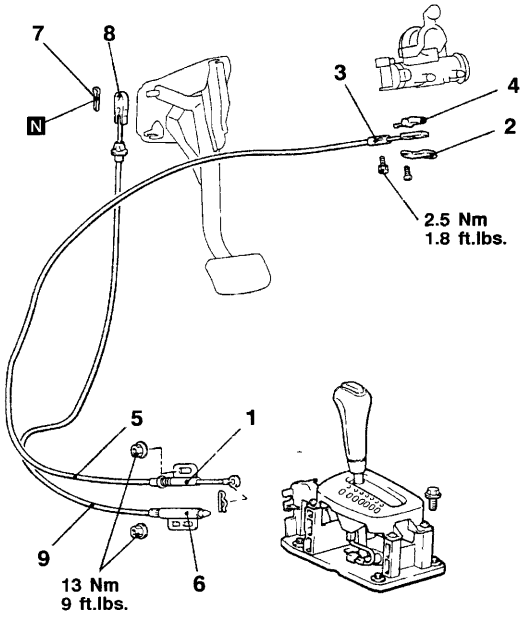
AUTOMATIC TRANSAXLE KEY INTERLOCK & SHIFT LOCK MECHANISMS

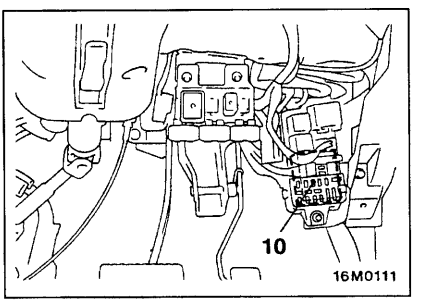
23200120137

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
Front Floor Console Removal and Installation
(Refer to GROUP 52A)

Caution: SRS
Be careful not to subject the SRS-ECU to any shocks during removal and installation of the key interlock cable and shift lock cable.





Key interlock cable removal steps

▶C◀ 1 Key interlock cable connection (selector lever side)
- Lower column cover (Refer to GROUP 37A - Steering Wheel and Shaft)

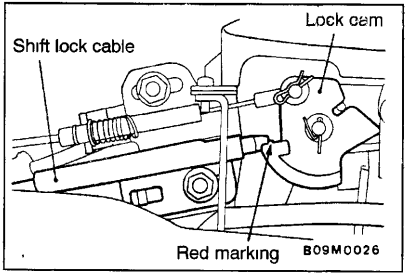
2 Cover
▶B◀ 3. Key interlock cable connection (steering lock cylinder side)
4. Slider
5. Key interlock cable

Shift lock cable removal steps

▶A◀ 6. Shift lock cable connection (selector lever side)
7. Cotter pin
8. Shift lock cable connection (brake pedal side)
9 Shift lock cable

ETACS-ECU or BUZZER-ECU removal

10. ETACS-ECU or buzzer-ECU



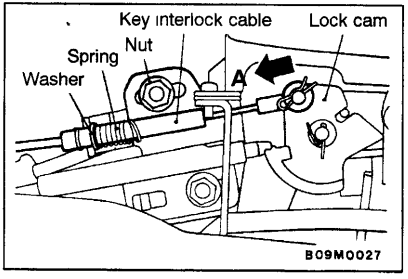
INSTALLATION SERVICE POINTS

▶A◀ SHIFT LOCK CABLE (SELECTOR LEVER SIDE) INSTALLATION

1. Place the selector lever in position "P".
2. Fasten the shift lock cable at the position where the end of the shift lock cable is positioned above the red marking.

▶B◀ KEY INTERLOCK CABLE (STEERING LOCK CYLINDER SIDE) INSTALLATION

Turn the ignition key to the "LOCK" position and install the key interlock cable.



▶C◀ KEY INTERLOCK CABLE (SELECTOR LEVER SIDE) INSTALLATION

1. Install the key interlock cable on the lock cam.
2. Install the spring and washer of the key interlock cable as shown.
3. While lightly pushing the cable coupling portion of the lock cam in the direction A, tighten the nut to fasten the key interlock cable.

INSPECTION

23200130017

Check the cable assembly for function and for damage.

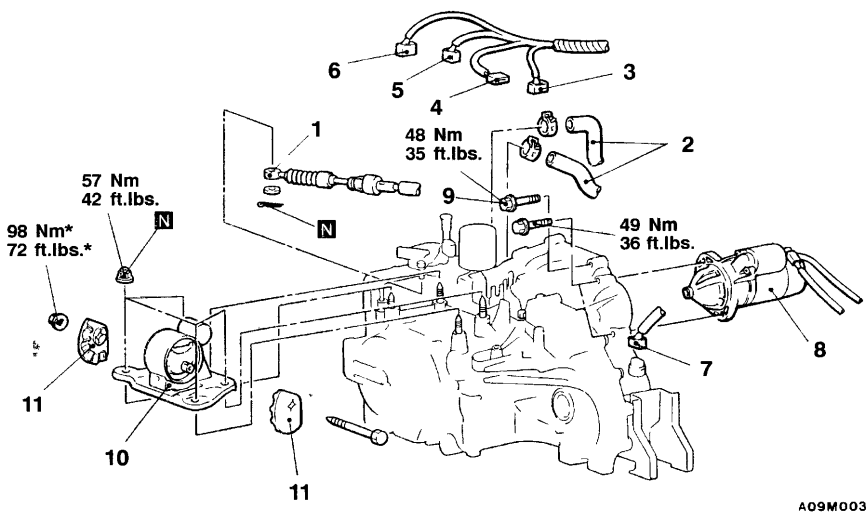
TRANSAXLE ASSEMBLY

23100570342

REMOVAL AND INSTALLATION

Pre-removal Operation
(1) Transaxle Fluid Draining
(Refer to GROUP 00 - Maintenance Service)
(2) Under Cover Removal
(3) Battery and Battery Tray Removal
(4) Air Cleaner Assembly Removal

Post-installation Operation
(1) Air Cleaner Assembly Installation
(2) Battery and Battery Tray Installation
(3) Under Cover Installation
(4) Transaxle Fluid Supplying
(Refer to GROUP 00 - Maintenance Service)
(5) Selector Lever Operation Check
(6) Speedometer Operation Check
(7) Press the dust cover with a finger to check whether the dust cover is cracked or damaged.



Removal steps

1. Transaxle control cable connection
2. Transaxle oil cooler hoses connection
3. Pulse generator "A" connector
4. Pulse generator "B" connector
5. Park/neutral position switch connector
6. A/T control solenoid valve assembly connector
7. Vehicle speed sensor connector

◀A▶ 8. Starter motor

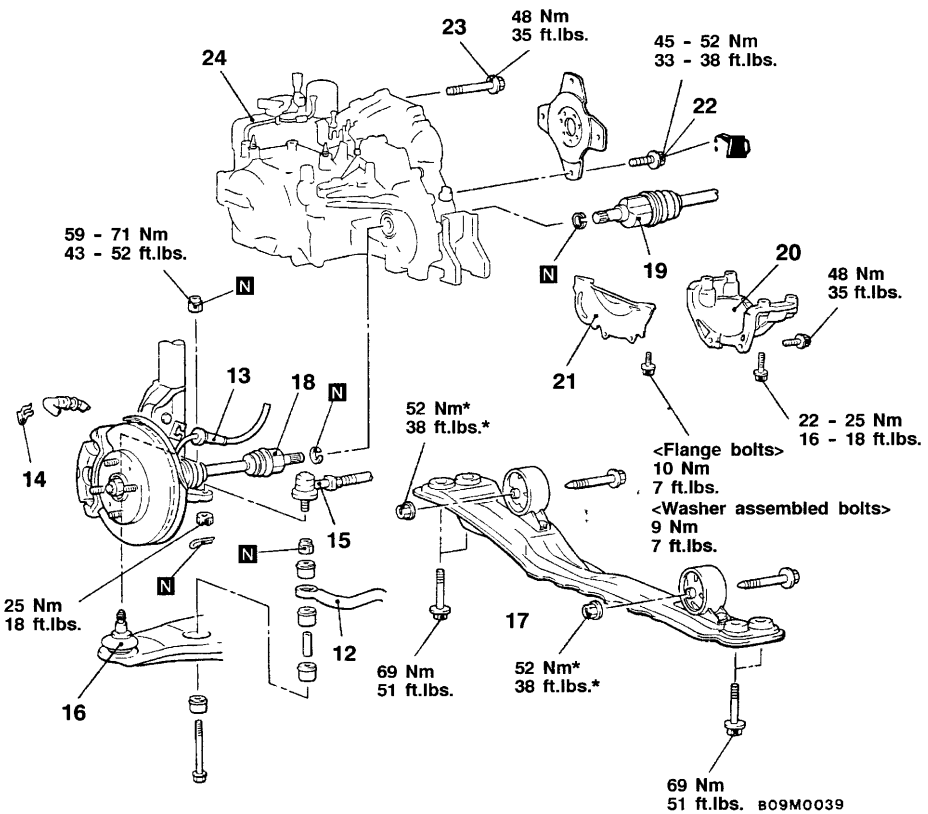
9. Transaxle assembly upper part coupling bolts

◀B▶ 10. Transaxle mount bracket

▶C◀ 11. Transaxle mount stopper

◀C▶ • Engine assembly supporting

Caution
Mounting locations marked by * should be provisionally tightened, and then fully tightened when the body is supporting the full weight of the engine.



Lifting up of the vehicle

- ▶B◀ 12. Stabilizer bar connection
- 13. Speed sensor cable connection <Vehicles with ABS>
- 14. Brake hose clamp
- ◀D▶ 15. Tie rod end connection
- ◀D▶ 16. Lower arm ball joint connection
- 17 Centermember assembly
- ◀E▶ 18. Drive shaft <L.H.> connection
- ◀E▶ 19. Drive shaft <R.H.> connection
- 20. Transaxle stay <Except 1.5L engine>
- 21. Bell housing cover
- ◀F▶ 22. Drive plate bolts
- ◀F▶ 23. Transaxle assembly lower part coupling bolts
- ◀F▶ ▶A◀ 24. Transaxle assembly

Caution

Mounting locations marked by * should be provisionally tightened, and then fully tightened when the body is supporting the full weight of the engine.

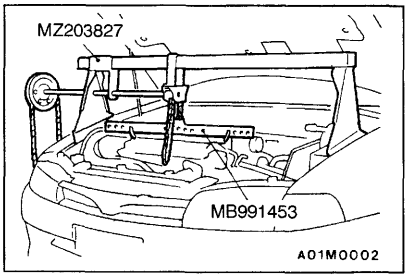
REMOVAL SERVICE POINTS

◀A▶ STARTER MOTOR REMOVAL

Remove the starter motor with the starter motor harness still connected, and secure it inside the engine compartment.

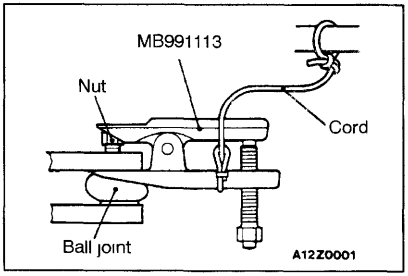
◀B▶ TRANSAXLE MOUNT BRACKET REMOVAL

Jack up the transaxle assembly gently with a garage jack, and then remove the transaxle mounting.



◀C▶ ENGINE ASSEMBLY SUPPORTING

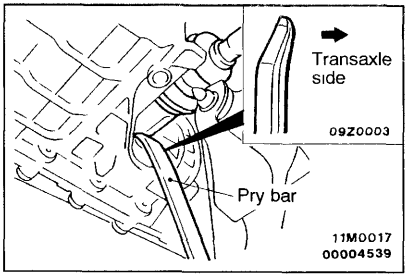
Set the special tool to the vehicle to support the engine assembly.



◀D▶ TIE ROD END/LOWER ARM BALL JOINT DISCONNECTION

Caution

1. **Before using the special tool, loosen the tie-rod end mounting nut. Only loosen the nut; do not remove it from the ball joint.**
2. **Support the special tool with a cord, etc. to prevent it from coming off.**

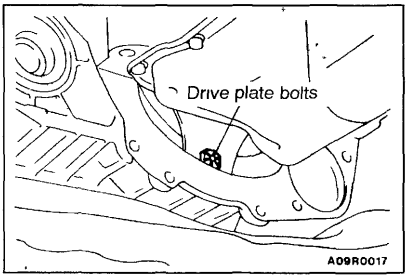


◀E▶ DRIVE SHAFT <L.H.>/DRIVE SHAFT <R.H.> DISCONNECTION

1. Insert a pry bar between the transaxle case and the drive shaft as shown to remove the drive shaft.

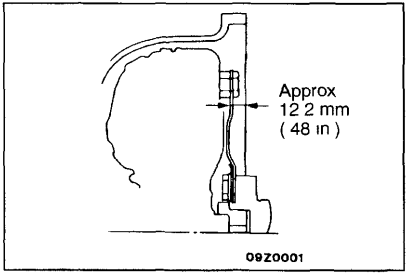
   NOTE
   Do not remove the hub and knuckle from the drive shaft.

   Caution
   Always use a pry bar, or the ball joint will be damaged.
2. Suspend the removed drive shaft with a wire so that there are no sharp bends in any of the joints.
3. Use a shop towel to cover the transaxle case to prevent foreign material from entering it.



◀F▶ DRIVE PLATE BOLTS/TRANSAXLE ASSEMBLY LOWER PART COUPLING BOLTS/TRANSAXLE ASSEMBLY REMOVAL

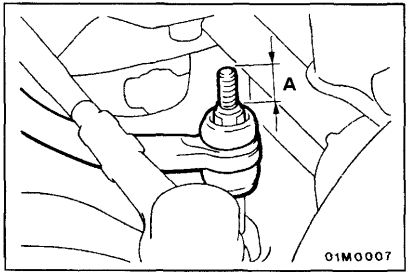
1. Support the transaxle assembly by using a transaxle jack.
2. Remove the drive plate bolts while turning the crank shaft.
3. Press in the torque converter to the transaxle side so that the torque converter does not remain on the engine side.
4. Remove the transaxle assembly lower bolts and lower the transaxle assembly.



INSTALLATION SERVICE POINTS

▶A◀ TRANSAXLE ASSEMBLY INSTALLATION

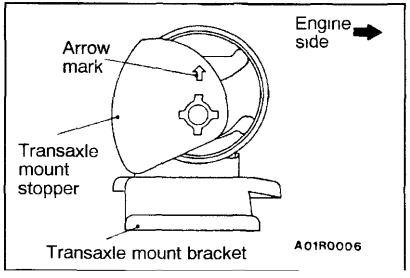
After securely inserting the torque converter into the transaxle side so that the shown dimension is approx. 12.2 mm (.48 in.), install the transaxle assembly to the engine.



▶B◀ STABILIZER BAR INSTALLATION

Tighten the self-locking nut so that the stabilizer mounting bat protrudes 22 mm (.87 in.) as shown.

Standard value (A): 22 mm (.87 in.)



▶C◀ TRANSAXLE MOUNT STOPPER INSTALLATION

Install the transaxle mount stopper so that the arrow mark points as shown in the illustration.

AUTOMATIC TRANSAXLE OVERHAUL

CONTENTS

23309000138

DIFFERENTIAL **66**

DRIVE SHAFT OIL SEAL **74**

GENERAL INFORMATION **2**

LOW-REVERSE BRAKE **60**

OIL PUMP **51**

OUTPUT SHAFT **62**

OVERDRIVE PLANETARY CARRIER **59**

REVERSE AND OVERDRIVE CLUTCH **55**

SECOND BRAKE **61**

SPECIAL TOOLS **12**

SPECIFICATIONS **6**

General Specifications 6

Sealants 11

Service Specifications 6

Snap Ring, Spacer, Thrust Washer, Thrust Race and Pressure Plate For Adjustment 8

Torque Specifications 11

Valve Body Spring Identification Table 7

SPEEDOMETER GEAR **73**

TRANSAXLE **16**

TRANSFER DRIVE GEAR **64**

UNDERDRIVE CLUTCH AND INPUT SHAFT **52**

VALVE BODY **69**

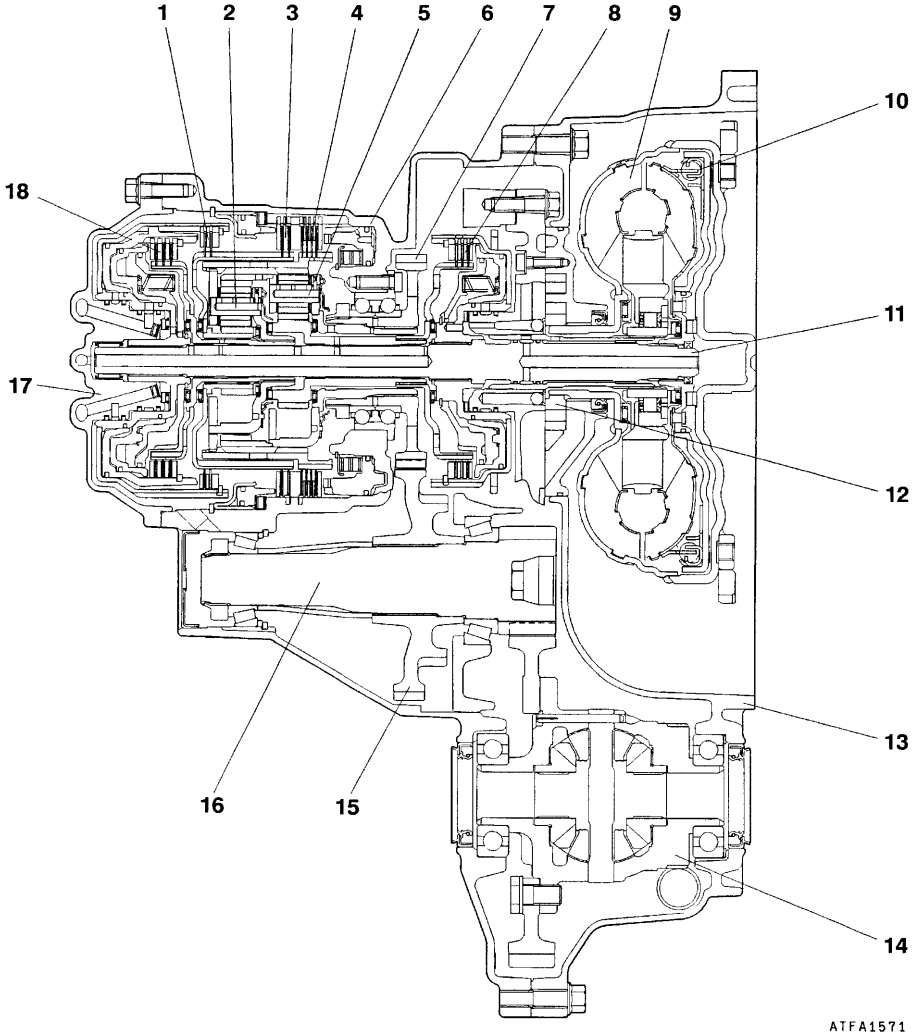
GENERAL INFORMATION

23300010109

(1) The combination of highest-precision electronic and mechanical technology heralds a new era in automatic transaxle performance.
(2) The gear shifting clutches use a hydraulic balancing mechanism to enable gear shifting at extra-high engine speeds.
(3) The number of shafts has been decreased to two, increased use has been made of metal plates and the one-way clutch has been abolished, which all contribute to reduce the weight.
(4) Increased meshing ratios and improved rigidity of the gear supports and casing result in less noise.
(5) In addition, adoption of a newly-developed automatic transmission fluid (ATF) and an external oil filter eliminates the need to periodically replace the fluid.
(6) The number of oil cooler feed tubes is increased to two.

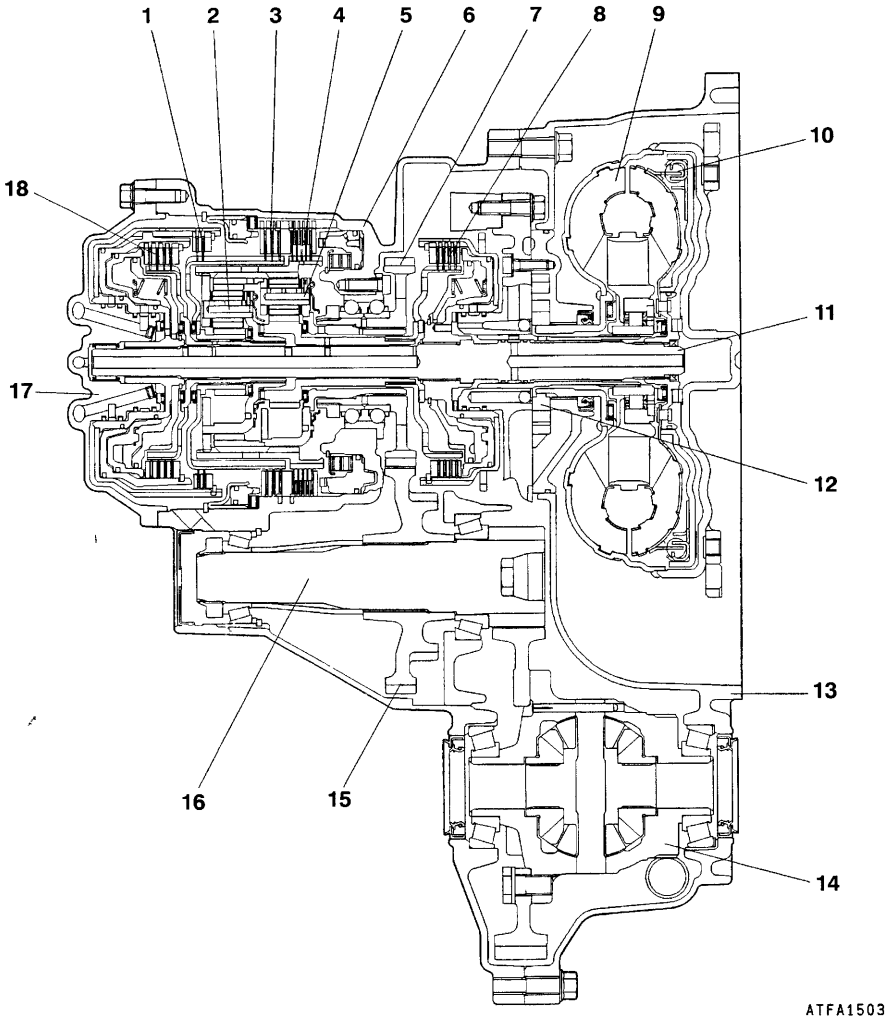
SECTIONAL VIEW

<F4A41>



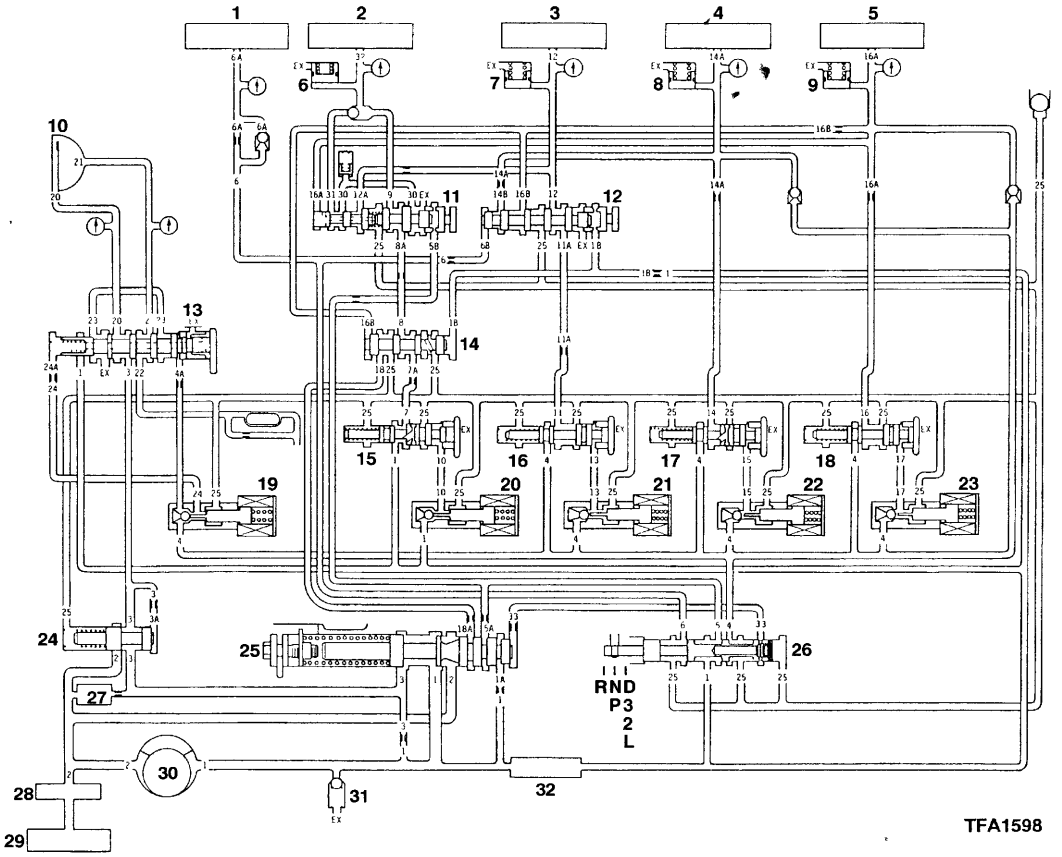
1 Reverse clutch
2. Overdrive planetary carrier
3. Second brake
4 Low-reverse brake
5. Output planetary carrier
6 Transaxle case
7. Transfer drive gear
8 Underdrive clutch
9. Torque converter
10 Torque converter clutch
11 Input shaft
12 Oil pump
13. Converter housing
14. Differential
15. Transfer driven gear
16 Output shaft
17 Rear cover
18 Overdrive clutch

<F4A42>



1. Reverse clutch
2. Overdrive planetary carrier
3. Second brake
4. Low-reverse brake
5. Output planetary carrier
6. Transaxle case
7. Transfer drive gear
8. Underdrive clutch
9. Torque converter
10. Torque converter clutch
11. Input shaft
12. Oil pump
13. Converter housing
14. Differential
15. Transfer driven gear
16. Output shaft
17. Rear cover
18. Overdrive clutch

HYDRAULIC CIRCUIT



1. Reverse clutch
2. Low-reverse brake
3. Second brake
4. Underdrive clutch
5. Overdrive clutch
6. Low-reverse accumulator
7. Second accumulator
8. Underdrive accumulator
9. Overdrive accumulator
10. Torque converter clutch
11. Fail-safe valve A
12. Fail-safe valve B
13. Torque converter clutch control valve
14. Switching valve
15. Low-reverse pressure control valve
16. Second pressure control valve
17. Underdrive pressure control valve
18. Overdrive pressure control valve
19. Torque converter clutch control solenoid valve
20. Low-reverse solenoid valve
21. Second solenoid valve
22. Underdrive solenoid valve
23. Overdrive solenoid valve
24. Torque converter pressure control valve
25. Regulator valve
26. Manual valve
27. Oil filter
28. Oil filter
29. Oil pan
30. Oil pump
31. Relief valve
32. Oil strainer

SPECIFICATIONS

23300020133

GENERAL SPECIFICATIONS

Items		Specifications	
Model		F4A41	F4A42
Type		Electronically controlled 4-speed full-automatic	
Torque converter	Type	3-element with torque converter clutch	
	Engine stall speed	1900 - 2400 r/min	2100 - 2600 r/min
	Stall torque ratio	2.0	2.0
Gear ratio	1st	2.842	2.842
	2nd	1 529	1.529
	3rd	1 000	1.000
	4th	0 712	0.712
	Reverse	2.480	2.480
Final gear ratio		4 042	4.042
Speedometer gear ratio (driven/drive)		31/36	31/36

SERVICE SPECIFICATIONS

23300030129

Items		Standard value
Output shaft preload mm (in.)		0.01 to 0.09 (0 0004 to 0.0035)
Brake reaction plate end play mm (in.)		0 to 0 16 (0 to 0.0063)
Low-reverse brake end play mm (in.)	F4A41	1.05 to 1.51 (0.0413 to 0.0594)
	F4A42	1 35 to 1 81 (0.0531 to 0 0713)
Second brake end play mm (in.)	F4A41	0.49 to 0.95 (0.0193 to 0.0374)
	F4A42	0 79 to 1.25 (0 0311 to 0.0492)
Underdrive sun gear end play mm (in.)		0.25 to 0.45 (0.0098 to 0.0177)
Input shaft end play mm (in.)		0.70 to 1 45 (0.0276 to 0.0571)
Differential case end play mm (in.) <F4A41>		0.045 to 0.165 (0.0018 to 0.0065)
Differential case preload mm (in.) <F4A42>		0 045 to 0 105 (0.0018 to 0.0041)
Underdrive clutch end play mm (in)	F4A41	1.25 to 1.45 (0 0492 to 0.0571)
	F4A42	1.65 to 1 85 (0.0650 to 0.0728)
Reverse and overdrive clutch return spring end play mm (in)		0 to 0.09 (0 to 0.0035)
Overdrive clutch end play mm (in)	F4A41	1.2 to 1 4 (0.0472 to 0.0551)
	F4A42	1.6 to 1.8 (0 0630 to 0.0709)
Reverse clutch end play mm (in)		1.2 to 1 4 (0.0472 to 0.0551)
Backlash between differential side gear and pinion mm (in.)		0.025 to 0.150 (0.00098 to 0 00591)

VALVE BODY SPRING IDENTIFICATION TABLE

23302290044

Spring	Wire diameter mm (in)	Outside diameter mm (in.)	Free length mm (in)	Number of loops
Regulator valve spring	1.8 (0 071)	15 7 (0 618)	86.7 (3 413)	24
Underdrive pressure control valve spring	0.7 (0.028)	7.6 (0.299)	37.7 (1 484)	25
Overdrive pressure control valve spring	0 7 (0 028)	7 6 (0.299)	37.7 (1 484)	25
Low-reverse pressure control valve spring	0.7 (0.028)	7.6 (0.299)	37.7 (1 484)	25
Second pressure control valve spring	0.7 (0 028)	7 6 (0 299)	37.7 (1 484)	25
Torque converter spring	1.6 (0.063)	11.2 (0.441)	34 4 (1.354)	12.5
Torque converter clutch control valve spring	0.7 (0 028)	5 9 (0.232)	28 1 (1.106)	19
Fail-safe valve A spring	0.7 (0 028)	8 9 (0.350)	21.9 (0.862)	9 5
Damping valve spring	1.0 (0 039)	7 7 (0.303)	35.8 (1 409)	17
Line relief valve spring	1 0 (0 039)	7.0 (0.276)	17.3 (0.681)	10
Orifice check ball spring	0.5 (0.020)	4.5 (0 177)	17 2 (0.677)	15

SNAP RING, SPACER, THRUST WASHER, THRUST RACE AND PRESSURE PLATE FOR ADJUSTMENT

23302300044

Thrust washer (For adjustment of input shaft end play)

Thickness mm (in.)	Identification symbol	Part No.	Thickness mm (in.)	Identification symbol	Part No.
1.8 (0.071)	18	MD754509	2 4 (0 094)	24	MD753793
2 0 (0.079)	20	MD754508	2.6 (0.102)	26	MD753794
2.2 (0 087)	22	MD754507	2.8 (0.110)	28	MD753795

Snap ring (For adjustment of underdrive clutch and overdrive clutch end plays)

Thickness mm (in)	Identification symbol	Part No.	Thickness mm (in.)	Identification symbol	Part No.
1 6 (0.063)	None	MD759666	2.4 (0.094)	Brown	MD752129
1.7 (0.067)	Blue	MD759667	2 5 (0 098)	None	MD752130
1.8 (0 071)	Brown	MD759668	2.6(0 102)	Blue	MD752131
1 9 (0 075)	None	MD752124	2.7 (0 106)	Brown	MD752132
2.0 (0.079)	Blue	MD752125	2.8 (0.110)	None	MD752133
2.1 (0.083)	Brown	MD752126	2.9 (0.114)	Blue	MD752134
2.2 (0.087)	None	MD752127	3 0 (0.118)	Brown	MD754680
2.3 (0.091)	Blue	MD752128			

Snap ring (For adjustment of low-reverse brake reaction plate end play)

Thickness mm (in)	Identification symbol	Part No.	Thickness mm (in.)	Identification symbol	Part No.
2.2 (0 087)	Blue	MD754786	2 4 (0.094)	None	MD758240
2.3 (0.091)	Brown	MD754787	2.5 (0.098)	Blue	MD758241

Pressure plate (For adjustment of low-reverse brake and second brake end plays)

Thickness mm (in.)	Identification symbol	Part No.	Thickness mm (in.)	Identification symbol	Part No.
1.6 (0.063)	6	MD759567	2.4 (0.094)	4	MD759417
1 8 (0.071)	1	MD759414	2.6 (0.102)	6	MD759418
2.0 (0 079)	0	MD759415	2.8 (0.110)	8	MD759419
2.2 (0.087)	2	MD759416	3.0 (0.118)	D	MD759420

Snap ring (For adjustment of reverse clutch end play)

Thickness mm (in.)	Identification symbol	Part No.	Thickness mm (in.)	Identification symbol	Part No.
1 9 (0.075)	None	MD752137	2.4 (0.094)	Brown	MD752142
2 0 (0.079)	Blue	MD752138	2 5 (0 098)	None	MD752143
2.1 (0.083)	Brown	MD752139	2.6 (0.102)	Blue	MD752144
2.2 (0 087)	None	MD752140	2.7 (0 106)	Brown	MD752145
2.3 (0.091)	Blue	MD752141	2.8 (0.110)	None	MD752146

Snap ring (For adjustment of reverse clutch and overdrive clutch spring retainers end plays)

Thickness mm (in.)	Identification symbol	Part No.	Thickness mm (in.)	Identification symbol	Part No.
1.48 (0.0583)	Brown	MD755600	1 58 (0.0622)	Blue	MD755602
1.53 (0.0602)	None	MD755601	1.63 (0.0642)	Brown	MD755603

Thrust race (For adjustment of underdrive sun gear end play)

Thickness mm (in.)	Identification symbol	Part No	Thickness mm (in.)	Identification symbol	Part No.
1.6 (0 063)	-	MD707267	2.2 (0.087)	-	MD723065
1.7 (0 067)	-	MD759681	2 3 (0 091)	-	MD754796
1.8 (0.071)	-	MD723064	2.4 (0.094)	-	MD724358
1.9 (0 075)	-	MD754794	2.5 (0.098)	-	MD754797
2.0 (0.079)	-	MD707268	2.6 (0 102)	-	MD754798
2.1 (0 083)	-	MD754795			

Spacer (For adjustment of output shaft preload)

Thickness mm (in.)	Identification symbol	Part No.	Thickness mm (in.)	Identification symbol	Part No.
1.88 (0.0740)	88	MD756579	2.36 (0 0929)	36	MD756591
1 92 (0.0756)	92	MD756580	2 40 (0.0945)	40	MD756592
1 96 (0 0772)	96	MD756581	2.44 (0.0961)	44	MD756593
2.00 (0.0787)	00	MD756582	2.48 (0.0976)	48	MD756594
2.04 (0.0803)	04	MD756583	2.52 (0.0992)	52	MD756595
2 08 (0 0819)	08	MD756584	2.56 (0.1008)	56	MD756596
2.12 (0 0835)	12	MD756585	2 60 (0.1024)	60	MD756597
2.16 (0 0850)	16	MD756586	2.64 (0.1039)	64	MD756598
2 20 (0 0866)	20	MD756587	2 68 (0.1055)	68	MD756599
2.24 (0.0882)	24	MD756588	2.72 (0.1071)	72	MD760685
2.28 (0.0898)	28	MD756589	2.76 (0.1087)	76	MD760686
2 32 (0 0913)	32	MD756590			

Spacer <F4A41> (For adjustment of differential case end play)

Thickness mm (in)	Identification symbol	Part No.	Thickness mm (in.)	Identification symbol	Part No.
1.28 (0.0504)	N	MD710458	1.64 (0.0646)	V	MD710466
1.37 (0 0539)	P	MD710460	1.73 (0.0681)	X	MD710468
1.46 (0.0575)	R	MD710462	1 82 (0.0717)	Z	MD710470
1.55 (0.0610)	T	MD710464			

Spacer <F4A42> (For adjustment of differential case preload)

Thickness mm (in.)	Identification symbol	Part No.	Thickness mm (in.)	Identification symbol	Part No.
0.71 (0.0280)	71	MD754475	1.07 (0.0421)	07	MD720945
0.74 (0.0291)	74	MD727660	1.10 (0.0433)	J	MD710454
0.77 (0.0303)	77	MD754476	1.13 (0.0445)	D	MD700270
0.80 (0.0315)	80	MD727661	1 16 (0.0457)	K	MD710455
0.83 (0.0327)	83	MD720937	1.19 (0.0469)	L	MD710456
0.86 (0.0339)	86	MD720938	1 22 (0 0480)	G	MD700271
0.89 (0.0350)	89	MD720939	1.25 (0.0492)	M	MD710457
0.92 (0.0362)	92	MD720940	1 28 (0.0504)	N	MD710458
0 95 (0.0374)	95	MD720941	1.31 (0 0516)	E	MD706574
0 98 (0.0386)	98	MD720942	1 34 (0.0528)	O	MD710459
1.01 (0.0398)	01	MD720943	1.37 (0.0539)	P	MD710460
1 04 (0.0409)	04	MD720944			

Spacer <F4A41> (For adjustment of backlash between differential side gear and pinion)

Thickness mm (in)	Identification symbol	Part No.	Thickness mm (in.)	Identification symbol	Part No.
0.75 to 0.82 (0 0295 to 0 0323)	-	MD755179	1 01 to 1 08 (0.0398 to 0 0425)	-	MD755175
0 83 to 0.92 (0 0327 to 0.0362)	-	MD755178	1.09 to 1 16 (0.0429 to 0.0457)	-	MD755176
0.93 to 1.00 (0 0366 to 0.0394)	-	MD755177			

Spacer <F4A42> (For adjustment of backlash between differential side gear and pinion)

Thickness mm (in.)	Identification symbol	Part No.	Thickness mm (in.)	Identification symbol	Part No.
0 75 to 0.82 (0 0295 to 0.0323)	-	MD722986	1.01 to 1 08 (0.0398 to 0.0425)	-	MD722982
0.83 to 0.92 (0.0327 to 0.0362)	-	MD722985	1.09 to 1.16 (0.0429 to 0 0457)	-	MD722983
0.93 to 1.00 (0.0366 to 0.0394)	-	MD722984			

TORQUE SPECIFICATIONS

23302310047

Items		Nm	ft lbs.
Transaxle	Roll stopper bracket	69	51
	Wiring harness bracket	23	17
	Control cable bracket	23	17
	Eye bolt	30	22
	Oil cooler feed tube	11	8 0
	Oil filter	12	8 7
	Input shaft speed sensor	11	8.0
	Output shaft speed sensor	11	8.0
	Manual control lever	22	16
	Park/neutral position switch (PNP switch)	11	8 0
	Speedometer gear	4.9	3.6
	Valve body cover	11	8 0
	Valve body mounting bolt	11	8.0
	Fluid temperature sensor	11	8 0
	Manual control shaft detent	5.9	4.3
	Rear cover	23	17
	Torque converter housing	47	35
	Oil pump	23	17
	Transfer drive gear	19	14
	Output shaft lock nut	167	123
	Output shaft bearing retainer	23	17
Components	Transfer drive gear lock nut	191	141
	Differential drive gear	132	98
	Valve body	11	8.0
	Solenoid valve support	5 9	4.3
	Plate	5.9	4.3

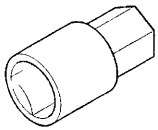
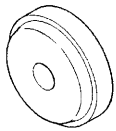
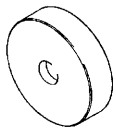
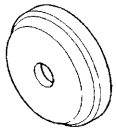
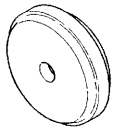
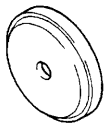
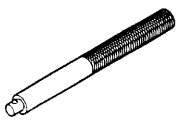
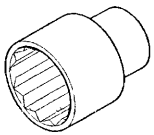
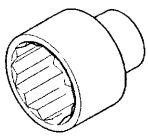
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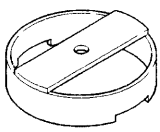
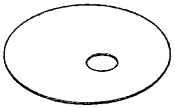
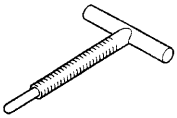
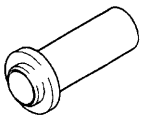
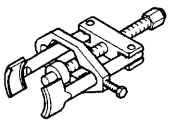
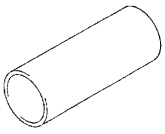
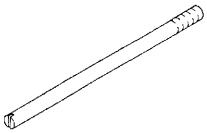
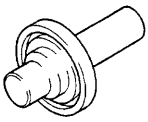
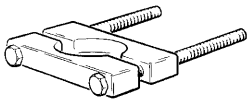
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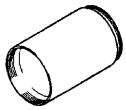
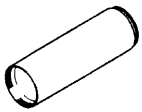
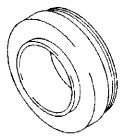
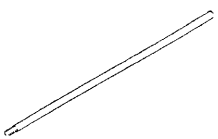
Items	Specified sealant
Rear cover	Mitsubishi genuine sealant Part No MD974421 or equivalent
Torque converter housing	Mitsubishi genuine sealant Part No. MD974421 or equivalent
Valve body cover	Mitsubishi genuine sealant Part No MD974421 or equivalent

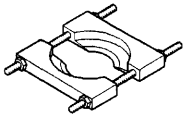
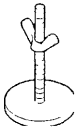
SPECIAL TOOLS

23300060111

Tool	Tool number and name	Supersession	Application
	MB990607 Torque wrench socket	-	Removal and installation of output shaft lock nut
	MB990928 Installer adapter	-	Removal of transfer drive gear bearing
	MB990930 Installer adapter	MB990930-01	Installation of output shaft taper roller bearing outer race
	MB990931 Installer adapter	-	Installation of cap
	MB990935 Installer adapter	-	Installation of differential taper roller bearing outer race <F4A42>
	MB990936 Installer adapter	MB990936-01	Installation of output shaft taper roller bearing outer race
	MB990938 Handle	MB990938-01	• Installation of input shaft rear bearing • Use with installer adapter
	MB991625 Special socket (41)	-	Removal and installation of output shaft lock nut
	MB991626 Socket (60)	-	Removal and installation of transfer drive gear lock nut

Tool	Tool number and name	Supersession	Application
	MB991628 Spring compressor	-	• Removal and installation of low-reverse brake snap ring • Measurement of underdrive clutch and overdrive clutch end plays
	MB991631 Clearance dummy plate	-	Measurement of low-reverse brake and second brake end plays
	MD998333 Oil pump remover	MD998333-01	Removal of oil pump
	MD998334 Oil seal installer	MD998334-01	Installation of oil pump oil seal
	MD998348 Bearing and gear puller	MD998348-01	Removal of transfer drive gear bearing
	MD998350 Bearing installer	MD998350-01	Installation of output shaft rear taper roller bearing
	MD998412 Guide	MD998412	Installation of oil pump and transfer drive gear
	MD998800 Oil seal installer	-	Installation of drive shaft oil seal
	MD998801 Bearing remover	MD998348-01	Removal of each bearing

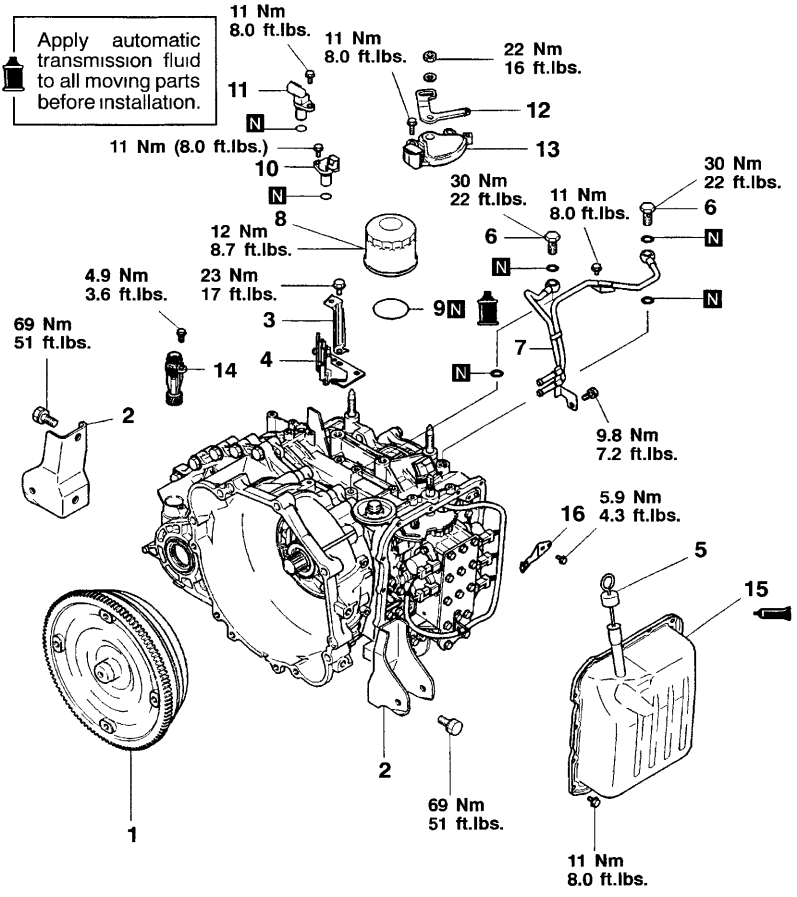
Tool	Tool number and name	Supersession	Application
	MD998812 Installer cap	GENERAL SERVICE TOOL	Use with installer and installer adapter
	MD998813 Installer - 100	GENERAL SERVICE TOOL	Use with installer cap and installer adapter
	MD998814 Installer - 200	MIT304180	Use with installer cap and installer adapter
	MD998819 Installer adapter (40)	MD998819	Installation of differential ball bearing <F4A41>
	MD998820 Installer adapter (42)	MIT215013	Installation of differential taper roller bearing <F4A42>
	MD998823 Installer adapter (48)	-	• Installation of output shaft taper roller bearing • Installation of transfer driven gear
	MD998829 Installer adapter (60)	MD998829-01	Installation of transfer drive gear bearing
	MD998907 Spring compressor	MD998907-01	Removal and installation of underdrive clutch snap ring
	MD998913 Dial gauge extension	MD998913-01	Measurement of low-reverse brake and second brake end plays

Tool	Tool number and name	Supersession	Application
	MD998917 Bearing remover	MD998917-01	Removal of output shaft taper roller bearing
	MD998924 Spring compressor retainer	-	• Removal and installation of low-reverse brake snap ring • Measurement of underdrive clutch and overdrive clutch end plays • Removal and installation of underdrive clutch and overdrive clutch snap ring
	MD999590 Spring compressor	-	Removal and installation of overdrive clutch snap ring

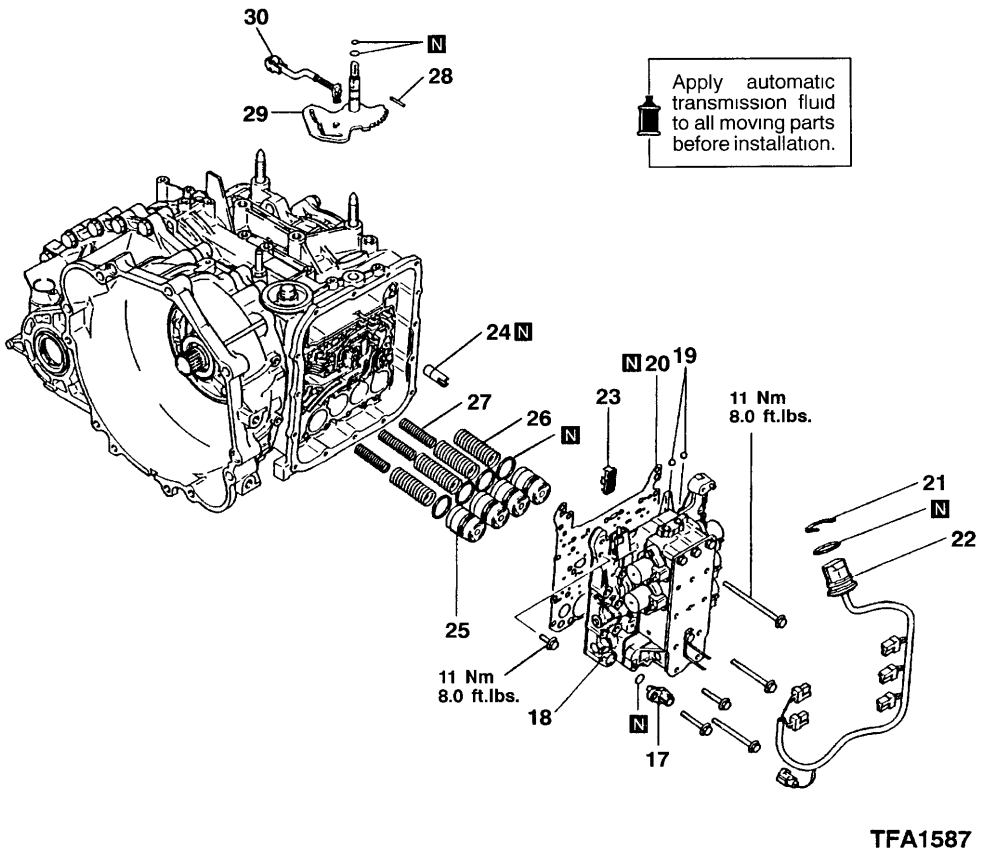
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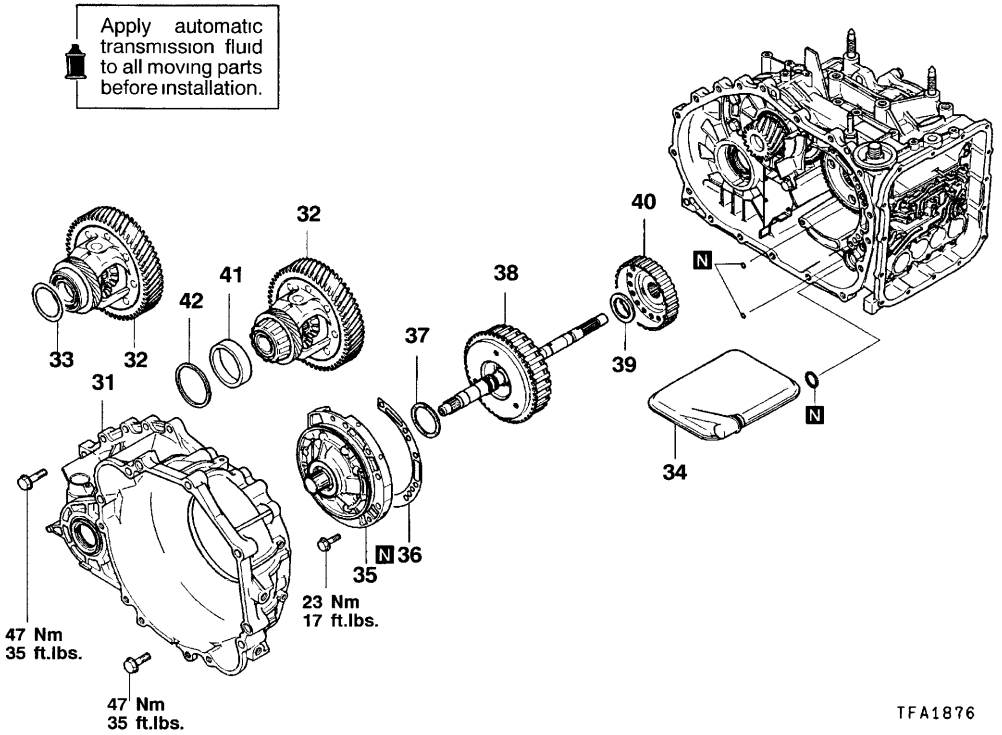
DISASSEMBLY AND REASSEMBLY



1. Torque converter
2. Roll stopper bracket
3. Harness bracket
4. Control cable support bracket
5. Oil level dipstick
6. Eye bolt
7. Oil cooler feed tube
8. Oil filter
9. Oil filter gasket
10. Input shaft speed sensor
11. Output shaft speed sensor
12. Manual control lever
13. Park/neutral position switch
14. Speedometer gear
15. Valve body cover
16. Manual control shaft detent



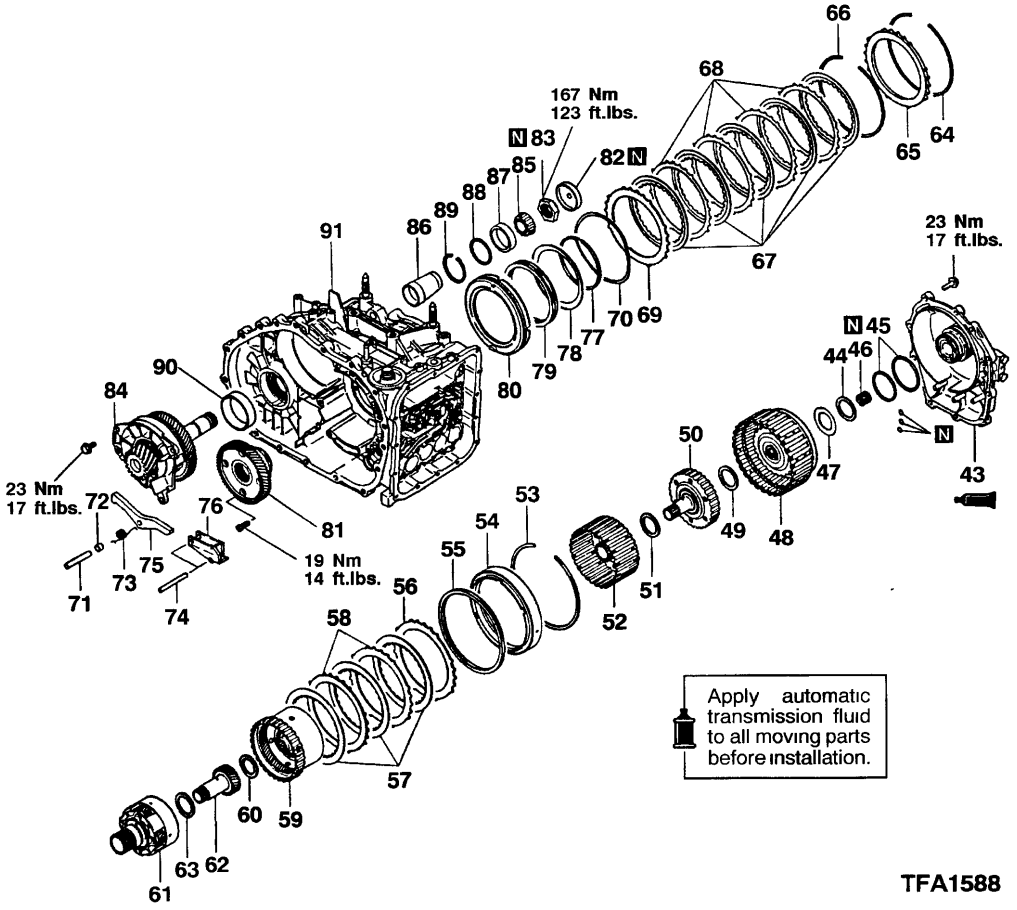
17. Fluid temperature sensor
18. Valve body
19. Steel ball
20. Gasket
21 Snap ring
22. Solenoid valve harness
23. Strainer
24. Second brake retainer oil seal
25 Accumulator piston
26. Accumulator spring
27. Accumulator spring
28. Manual control lever shaft roller
29. Manual control lever shaft
30. Parking pawl rod



31. Torque converter housing
32. Differential
33 Spacer <F4A41>
34. Oil filter
35. Oil pump
36. Gasket
37. Thrust washer #1
38. Underdrive clutch and input shaft
39. Thrust bearing #2
40. Underdrive clutch hub
41. Outer race
42. Spacer

No. of Brake Discs and Plates

Brake	Model	Brake Disc	Brake Plate
Low-reverse brake	F4A41	4	3
	F4A42	5	4
Second brake	F4A41	2	1
	F4A42	3	2



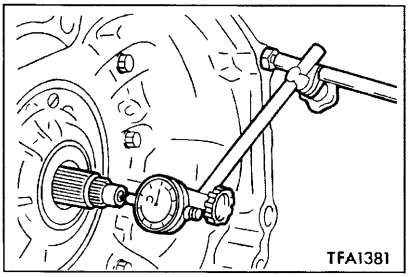
TFA1588

43. Rear cover
44. Thrust race #8
45. Seal ring
46. Input shaft rear bearing
47. Thrust bearing #7
48. Reverse and overdrive clutch
49. Thrust bearing #6
50. Overdrive clutch hub
51. Thrust bearing #5
52. Planetary reverse sun gear
53. Snap ring
54. Second brake piston
55. Return spring
56. Pressure plate
57. Second brake disc
58. Second brake plate
59. Overdrive planetary carrier
60. Thrust bearing #4
61. Output planetary carrier
62. Underdrive sun gear
63. Thrust bearing #3
64. Snap ring
65. Reaction plate
66. Snap ring
67. Low-reverse brake disc
68. Low-reverse brake plate
69. Pressure plate
70. Wave spring
71. Parking pawl shaft
72. Spacer
73. Parking pawl spring
74. Parking roller support shaft
75. Parking pawl
76. Parking roller support
77. Snap ring
78. Spring retainer
79. Return spring
80. Low-reverse brake piston
81. Transfer drive gear
82. Cap
83. Lock nut
84. Output shaft
85. Taper roller bearing
86. Collar
87. Outer race
88 Spacer
89. Snap ring
90. Outer race
91. Transaxle case

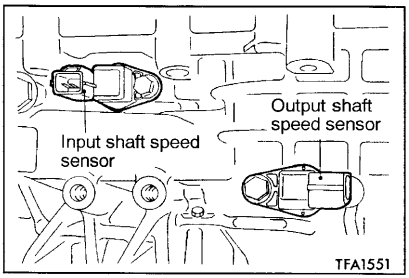
DISASSEMBLY

Caution

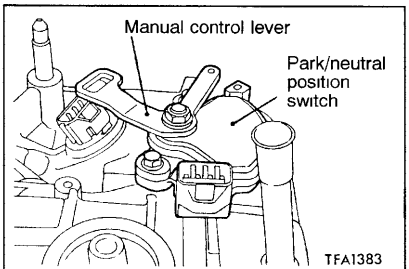
1. **Because the automatic transaxle is manufactured from high-precision parts, sufficient care must be taken not to scratch or damage these parts during disassembly and reassembly.**
2. **The working area should be covered with a rubber mat to keep it clean at all times.**
3. **Do not wear any cloth gloves and do not use any rags during disassembly. Use nylon cloth if you need to use something.**
4. **Parts which have been disassembled should all be cleaned. Metal parts can be cleaned with normal detergent, but they should be dried completely using compressed air.**
5. **Clutch discs, plastic thrust plates and rubber parts should be cleaned with automatic transmission fluid (ATF) so that they do not become dirty.**
6. **If the transmission body has been damaged, disassemble and clean the cooler system also.**



(1) Remove the torque converter.
(2) Remove each bracket.
(3) Remove the oil level gauge.
(4) Remove the eye bolt, gasket and the oil cooler feed tube.
(5) Remove the oil filter and oil filter gasket.

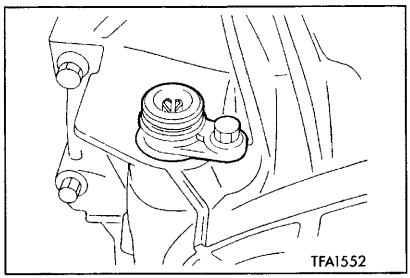


(6) Remove the input shaft speed sensor and output shaft speed sensor.

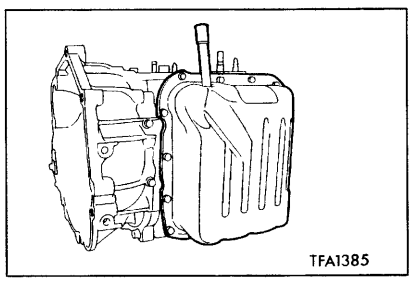


(7) Remove the manual control lever, and then remove the park/neutral position switch.

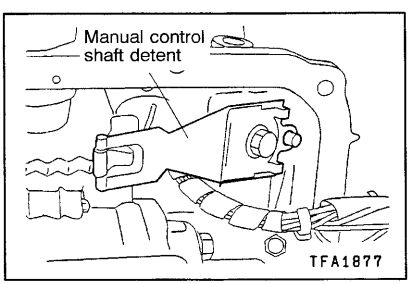
Caution
Make sure that the valve body is installed before removing the manual control lever locking nut.



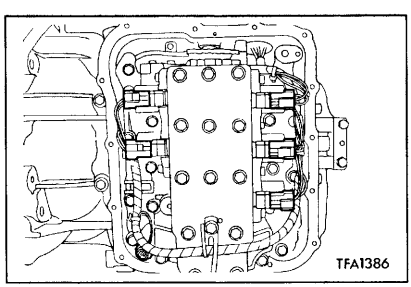
(8) Remove the speedometer gear.



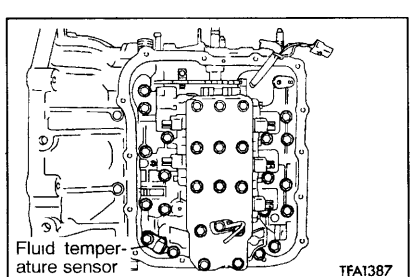
(9) Remove the valve body cover.



(10) Remove the manual control shaft detent.

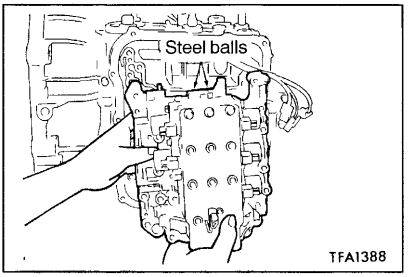


(11) Disconnect the harness connectors of the valve body.



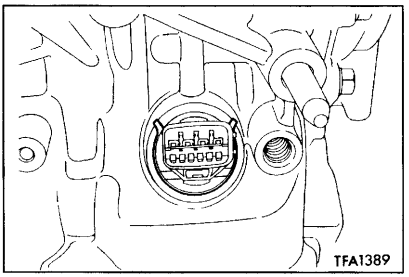
(12) Remove the valve body mounting bolts (28 pieces).
(13) Remove the fluid temperature sensor.

Caution
Make sure that the manual control lever and the park/neutral position switch are removed.

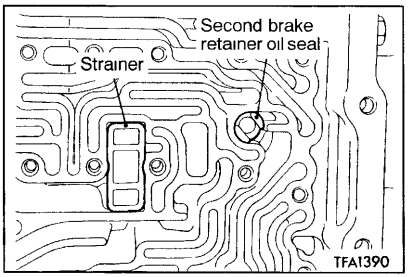


(14) Remove the valve body, gasket and the steel balls (2 pieces).

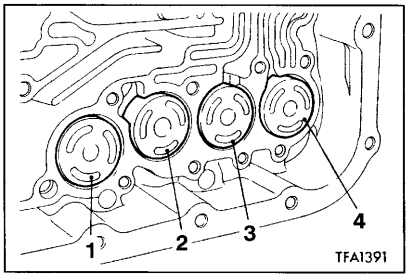
Caution
Do not lose the steel balls (2 pieces).



(15) Remove the snap ring, and then remove the solenoid valve harness.

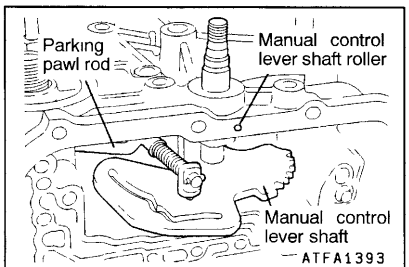


(16) Remove the strainer and the second brake retainer oil seal.

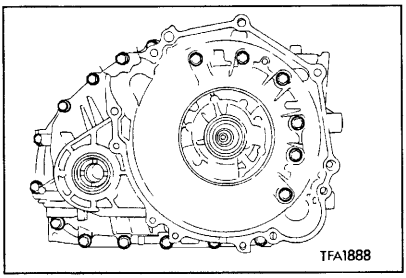


(17) Remove each accumulator piston and spring.

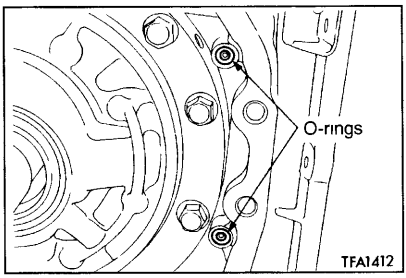
No.	Name
1	For low-reverse brake
2	For underdrive clutch
3	For second brake
4	For overdrive clutch



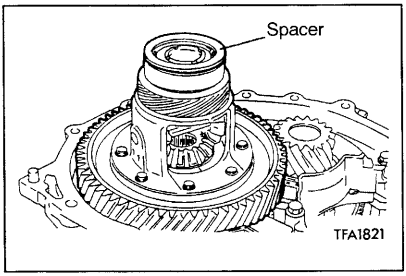
(18) Remove the manual control lever shaft roller.
(19) Remove the manual control lever shaft and the parking pawl rod.



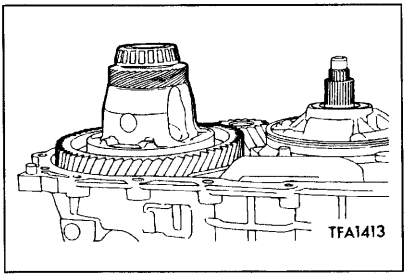
(20) Remove the torque converter housing mounting bolts (18 pieces), and then remove the torque converter housing.



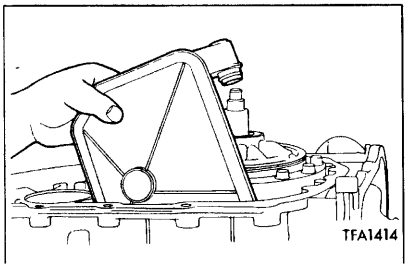
(21) Remove the O-rings (2 pieces).



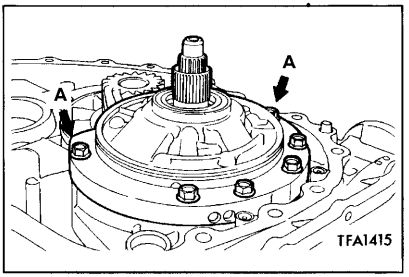
(22) Remove the differential and the spacer. <F4A41>



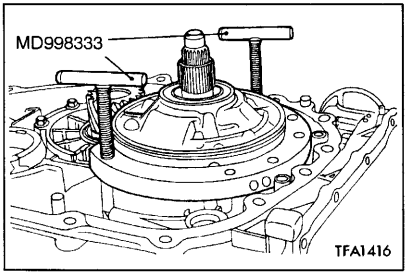
(23) Remove the differential. <F4A42>



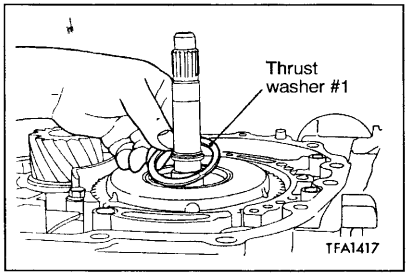
(24) Remove the oil filter.



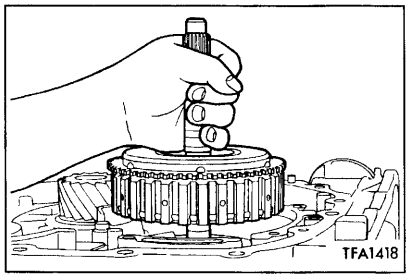
(25) Remove the oil pump mounting bolts (6 pieces).
(26) Install the special tool (MD998333) in the hole A.



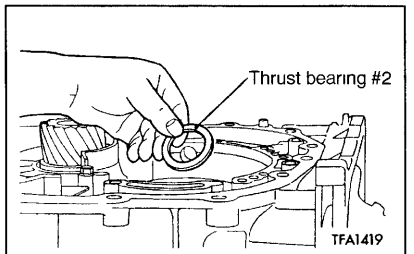
(27) Screw the special tool to remove the oil pump.
(28) Remove the oil pump gasket.



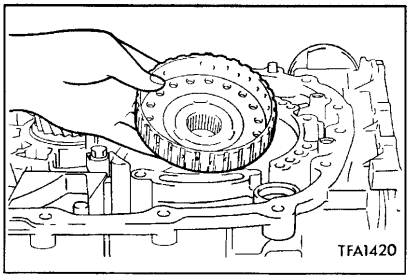
(29) Remove thrust washer #1.



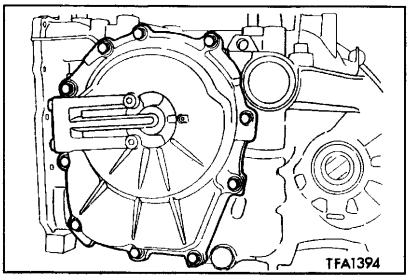
(30) Hold the input shaft, and then remove the underdrive clutch.



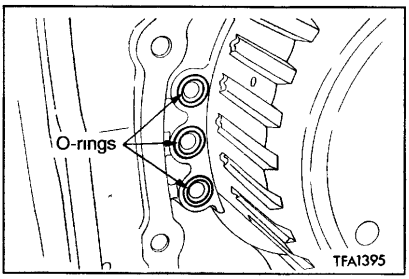
(31) Remove thrust bearing #2.



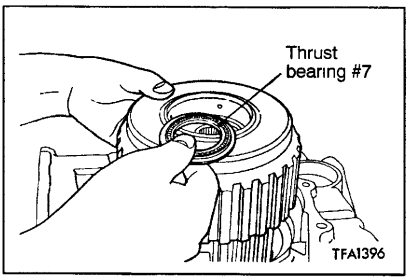
(32) Remove the underdrive clutch hub.



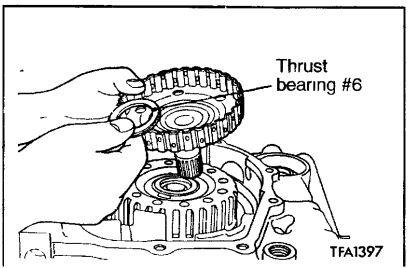
(33) Remove the rear cover.
(34) Remove the thrust race #8.
(35) Remove the seal rings (4 pieces) from rear cover.
(36) Remove the input shaft rear bearing.



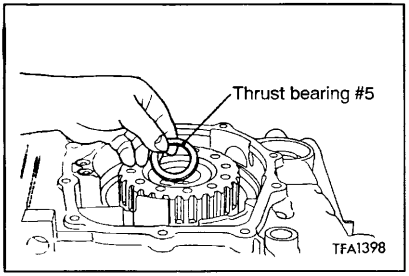
(37) Remove the O-rings (3 pieces).



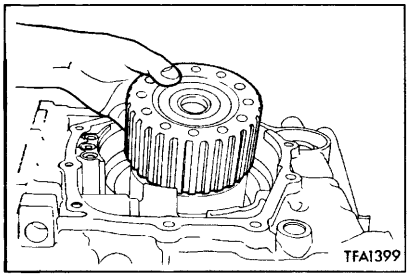
(38) Remove the reverse and overdrive clutch and the thrust bearing #7.



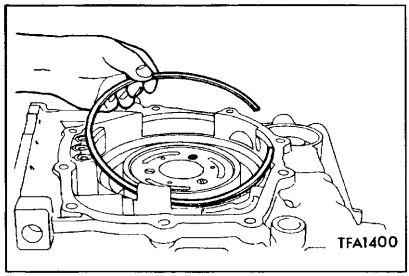
(39) Remove the overdrive clutch hub and the thrust bearing #6.



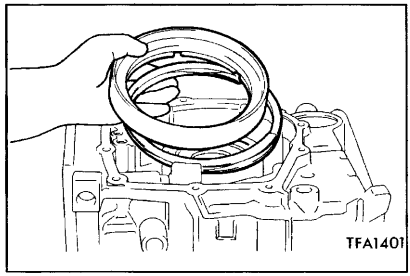
(40) Remove thrust bearing #5.



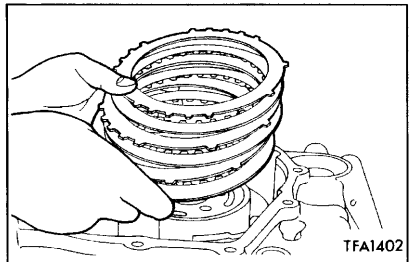
(41) Remove the planetary reverse sun gear.



(42) Remove the snap ring.



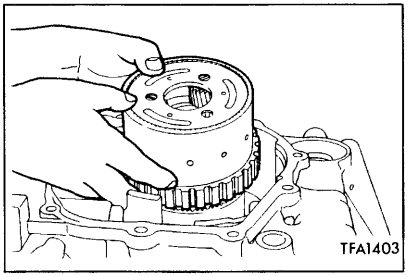
(43) Remove the second brake piston and the return spring.



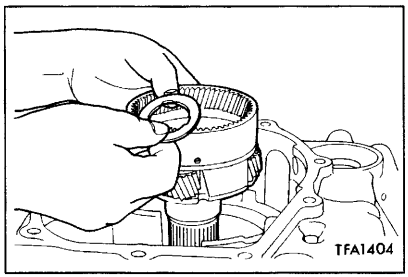
(44) Remove the pressure plate, brake discs and brake plate(s).

Number of brake discs and plates

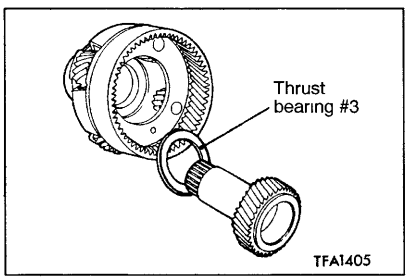
A/T Model	Brake disc	Brake plate	Pressure plate
F4A41	2	1	1
F4A42	3	2	1



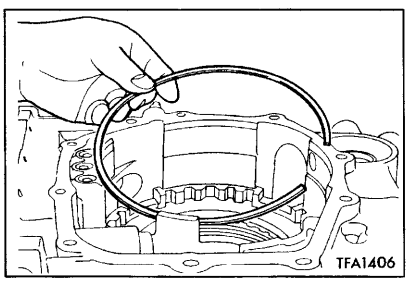
(45) Remove the overdrive planetary carrier.



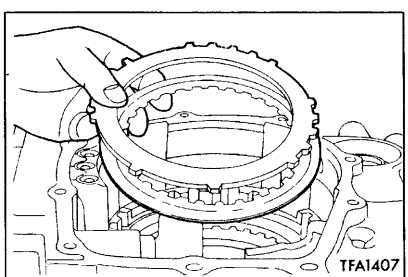
(46) Remove the output planetary carrier and the thrust bearing #4.



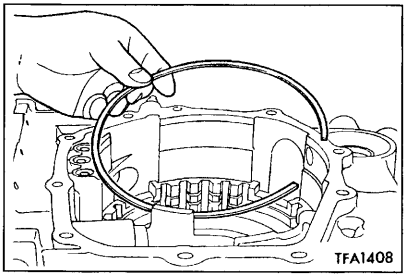
(47) Remove the underdrive sun gear and the thrust bearing #3 from the output planetary carrier.



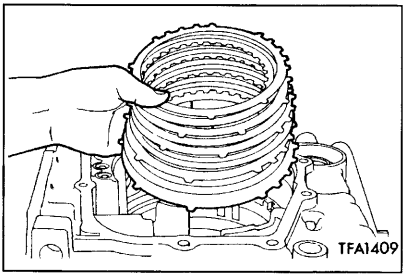
(48) Remove the snap ring.



(49) Remove the reaction plate and the brake disc.



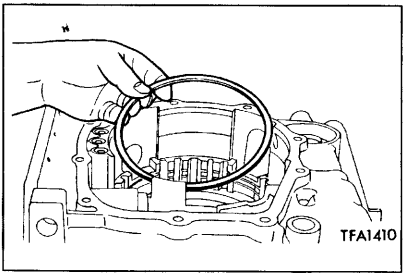
(50) Remove the snap ring.



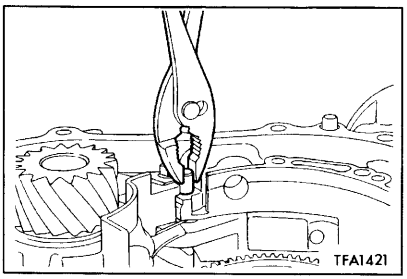
(51) Remove the brake plates, brake discs and pressure plate.

Number of brake discs and plates

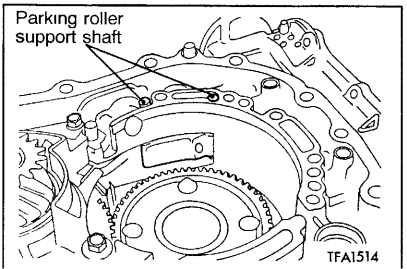
A/T Model	Brake disc	Brake plate	Pressure plate
F4A41	3	3	1
F4A42	4	4	1



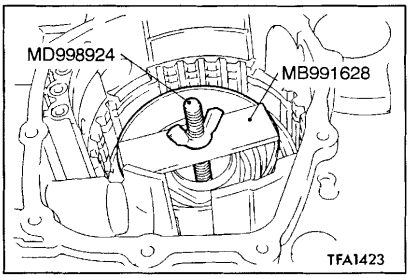
(52) Remove the wave spring.



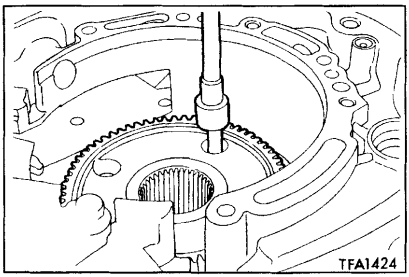
(53) Remove the parking pawl shaft, and then remove the spacer and parking pawl spring.



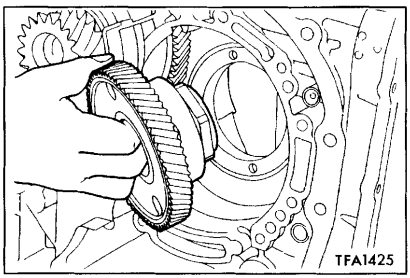
(54) Remove the two parking roller support shafts, and then remove the parking pawl case and parking roller support.



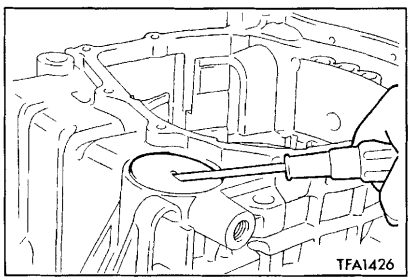
(55) Use the special tool to remove the snap ring.
(56) Remove the spring retainer, return spring and the low-reverse brake piston.



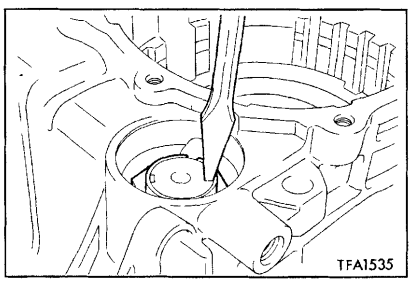
(57) Remove the transfer drive gear mounting bolts (4 pieces).



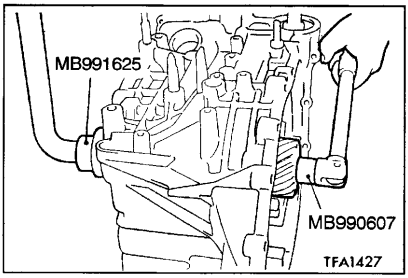
(58) Remove the transfer drive gear.



(59) Remove the cap.

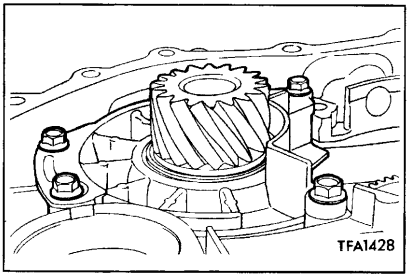


(60) Straighten the locking tab of the output shaft lock nut.

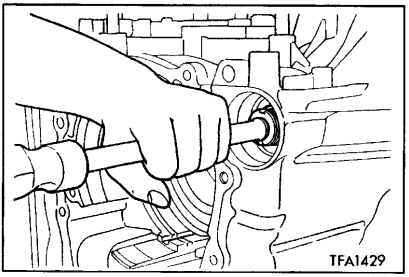


(61) Use the special tool to remove the output shaft lock nut.

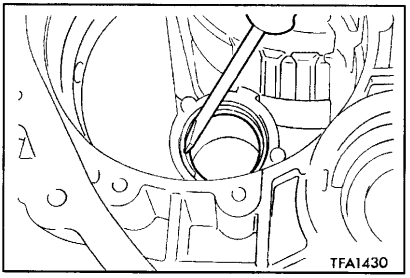
Caution
The lock has left-handed threads.



(62) Remove the output shaft bearing retainer mounting bolts.



(63) Tap on the rear of the output shaft to remove the output shaft, taper roller bearing and the collar.



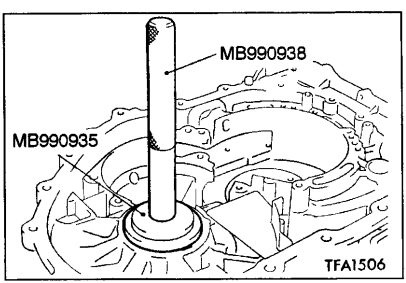
(64) Remove the spacer and the outer race.
(65) Remove the snap ring.

(66) Remove the differential bearing outer race and spacer from the torque converter hosing. <F4A42>
(67) Remove the differential bearing outer race from the transaxle case. <F4A42>

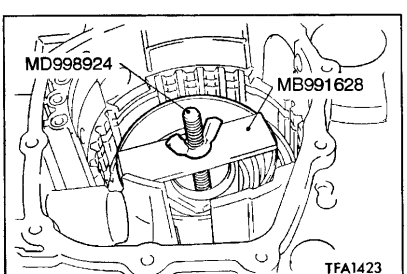
REASSEMBLY

Caution

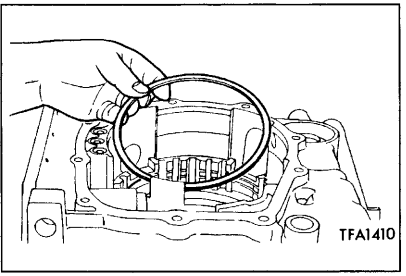
1. **Never reuse the gasket, O-ring, oil seal, etc. Always replace with a new one when reassembling.**
2. **Never use grease other than blue petrolatum jelly and white Vaseline.**
3. **Apply ATF to friction components, rotating parts, and sliding parts before installation. Immerse a new clutch disc or brake disc in ATF for at least two hours before assembling them.**
4. **Never apply sealant or adhesive to gaskets.**
5. **When replacing a bushing, replace the assembly which it belongs to.**
6. **Never use any cloth gloves or any rags during reassembly. Use nylon cloth or paper towels if you need to use something.**
7. **Change the oil in the cooler system.**



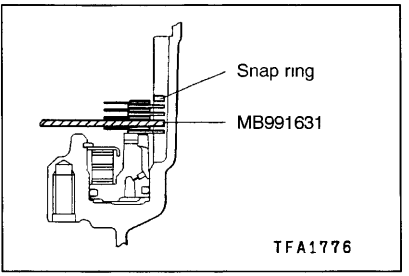
(1) Use the special tools to tap the differential bearing outer race in the transaxle case. <F4A42>



(2) Install the low-reverse brake piston, return spring, and spring retainer.
(3) Use the special tools to install the snap ring.



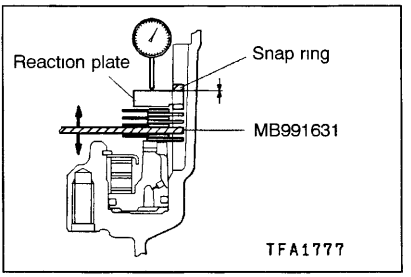
(4) Install the wave spring.



(5) Replace the pressure plate of the low-reverse brake with the special tool, and then install the brake disc, brake plate and snap ring as shown in the figure.

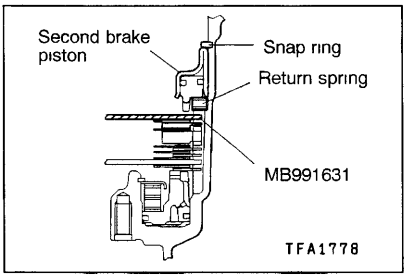
Number of brake discs and plates

A/T Model	Brake disc	Brake plate	Special tool
F4A41	4	3	1
F4A42	5	4	1



(6) Install the reaction plate and the used snap ring.
(7) Move the special tool to measure the end play, and then replace the snap ring installed in step (6) to adjust the end play to standard value.

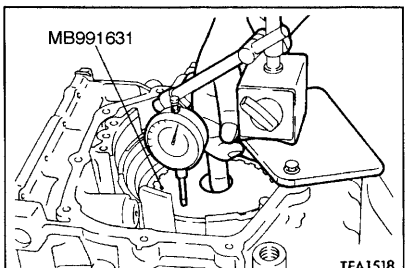
Standard value: 0 - 0.16 mm (0 - 0.0063 in.)



(8) Replace the pressure plate of the second brake with the special tool, and then install the brake disc and brake plate as shown in the figure.
(9) Install the return spring, second brake piston and snap ring.

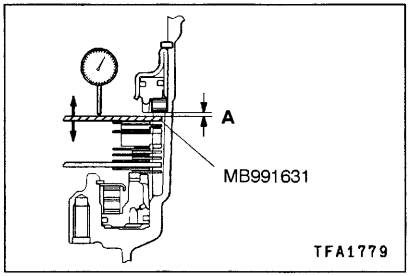
Number of brake discs and plates

A/T Model	Brake disc	Brake plate	Special tool
F4A41	2	1	1
F4A42	3	2	1



(10) Move the special tool (MB991631) to measure the end play.

Standard value:
0.49 - 0.95 mm (0.0193 - 0.0374 in.) <F4A41>
0.79 - 1.25 mm (0.0311 - 0.0492 in.) <F4A42>



Remove the special tool. Use the following formula to determine the proper thickness range for the pressure plate. Install the correct size pressure plate based on your calculations.

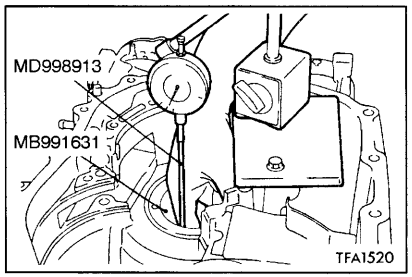
Reference: Pressure Plate Thickness

A=Special tool end play measurement determined earlier in this step.

F4A41
Metric values: [A+(2.0 mm - 0.95 mm)] to [A+(2.0 mm - 0.49 mm)]
English values: [A+(0.079 in. - 0.037 in.)] to [A+(0.079 in. - 0.019 in.)]
(Please use the above format for the end play measurement text in step 14.)

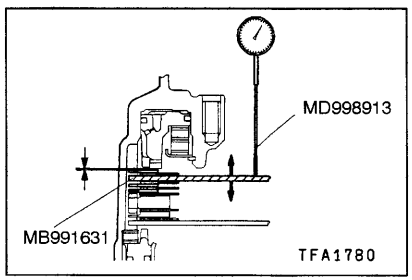
F4A42
Metric values: [A+(2.0 mm - 1.25 mm)] to [A+(2.0 mm - 0.79 mm)]
English values: [A+(0.079 in. - 0.049 in.)] to [A+(0.079 in. - 0.031 in.)]

(11) Turn the transaxle over.



(12) Install the special tool (MD998913) in a dial gauge, and then move the special tool (MB991631) to measure the axial play.

Standard value:
1.05 - 1.51 mm (0.0413 - 0.0594 in.) <F4A41>
1.35 - 1.81 mm (0.0531 - 0.0713 in.) <F4A42>

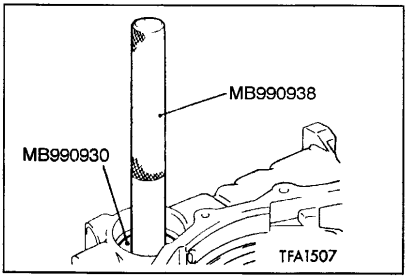


Reference
Select a pressure plate which thickness is within the following value, and replace the special tool mounted at the step (5) with it.

F4A41
[A (moving amount) + thickness of the special tool 2.0 mm (0.079 in.) - 1.51 mm (0.0594 in.)] to [A (moving amount) + thickness of the special tool 2.0 mm (0.079 in.) - 1.05 mm (0.0413 in.)

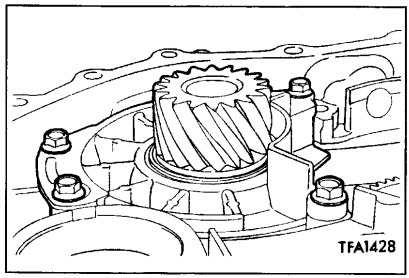
F4A42
[A (moving amount) + thickness of the special tool 2.0 mm (0.079 in.) - 1.81 mm (0.0713 in.)] to [A (moving amount) + thickness of the special tool 2.0 mm (0.079 in.) - 1.35 mm (0.0531 in.)]

(13) Remove the parts installed from steps (4) to (12).

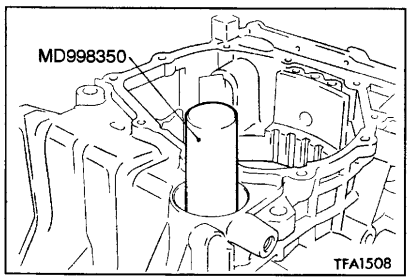


(14) Use the special tools to tap the output shaft bearing outer race in the transaxle case.
(15) Install the snap ring and the thinnest adjustment spacer [1.88 mm (0.0740 in.)].

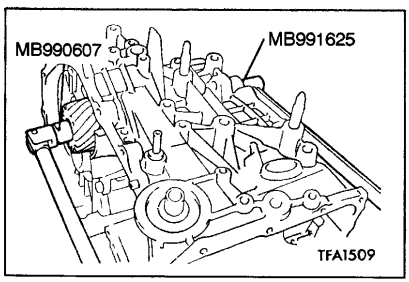
NOTE
The spacer may have to be replaced with one having an adequate thickness after the end play of the output shaft is checked in step (19).



(16) Tighten the mounting bolts of the output shaft bearing retainer to the specified torque.

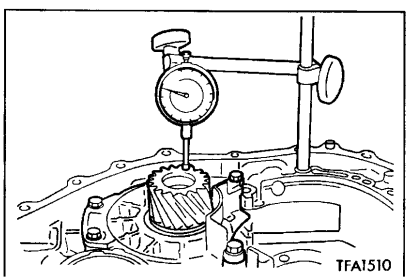


(17) Install the output shaft in the transaxle case, and then use the special tool to install the collar and taper roller bearing in the output shaft.



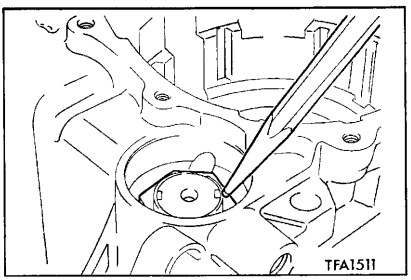
(18) Apply ATF to a new lock nut, and use the special tool to tighten the lock nut to the specified torque. Then turn back one turn, and tighten to the specified torque again.

Caution
The lock nut has left-handed threads.

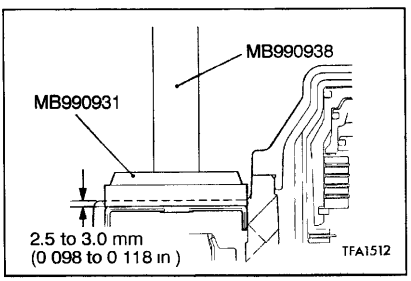


(19) Move the output shaft to measure the shaft end play, and then replace the spacer installed in step (15) with a new one which thickness is within the following value.

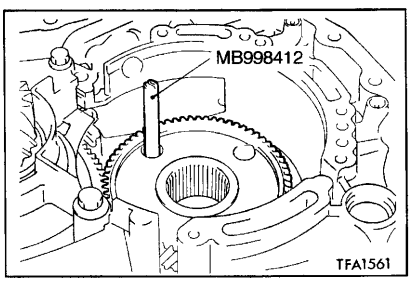
A=Shaft end play mm (in.)
B=Thickness of spacer assembled in step (15) [1.88 mm (0.0740 in.)]
Metric values: [A+B+0.01 mm] to [A+B+0.09 mm]
American values: [A+B+0.0004 in.] to [A+B+0.0035 in.]



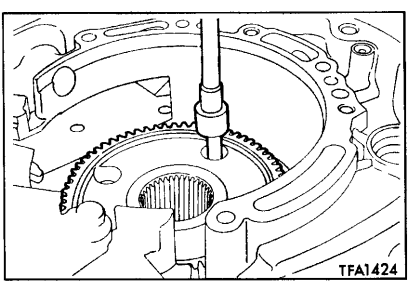
(20) Prevent the lock nut from turning (two parts).



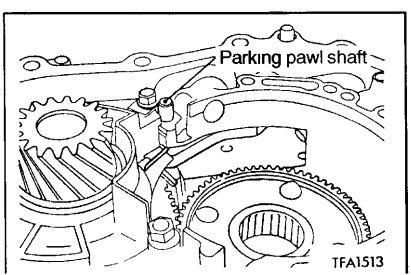
(21) Install the cap as shown in the figure.



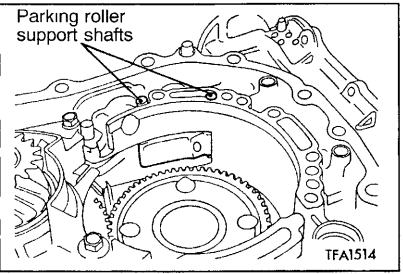
(22) Use the special tool to install the transfer drive gear.



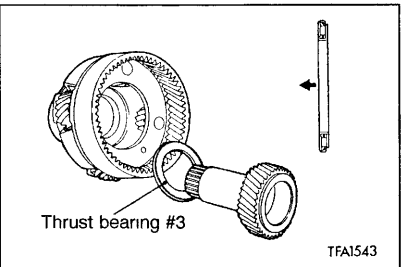
(23) Tighten the four mounting bolts of the transfer drive gear to the specified torque.



(24) Install the parking pawl, spacer, and spring. Then install the parking pawl shaft.

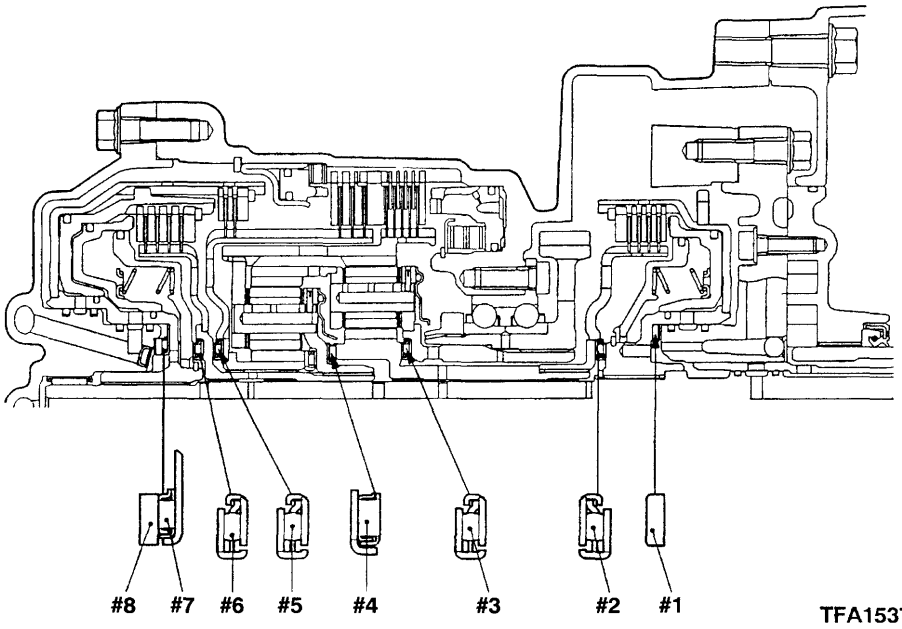


(25) Install the parking roller support, and then the two parking roller support shafts.



(26) Install the underdrive sun gear and thrust bearing #3 to the output planetary carrier.

Caution
Be sure to install the thrust bearing in the correct direction.

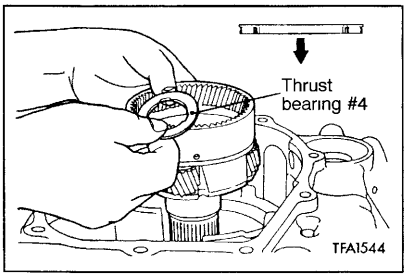


IDENTIFICATION OF THRUST BEARINGS, THRUST RACES, AND THRUST WASHERS

mm (in)

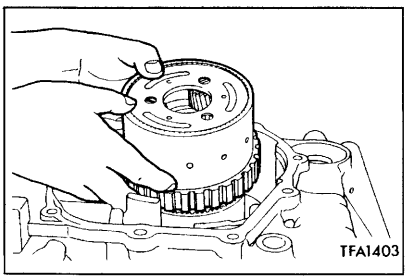
Symbol	O.D.	I.D.	Thickness	Part number
#1	59 (2.32)	47 (1.85)	1.8 (0.071)	MD754509
#1	59 (2.32)	47 (1.85)	2 0 (0 079)	MD754508
#1	59 (2.32)	47 (1.85)	2.2 (0.087)	MD754507
#1	59 (2.32)	47 (1.85)	2 4 (0.094)	MD753793
#1	59 (2.32)	47 (1.85)	2 6 (0.102)	MD753794
#1	59 (2.32)	47 (1.85)	2.8 (0.110)	MD753795
#2	49 (1.93)	36 (1.42)	3 6 (0.142)	MD756846
#3	49 (1.93)	36 (1.42)	3 6 (0.142)	MD756846
#4	45 3 (1 783)	31 (1 22)	3.3 (0.130)	MD757647
#5	49 (1 93)	36 (1.42)	3 6 (0.142)	MD756846
#6	49 (1.93)	36 (1.42)	3.6 (0.142)	MD756846
#7	59 (2 32)	37 (1.46)	2 8 (0.110)	MD754595
#8	48 9 (1 925)	37 (1.46)	1.6 (0.063)	MD707267
#8	48.9 (1 925)	37 (1.46)	1 7 (0.067)	MD759681
#8	48.9 (1.925)	37 (1.46)	1.8 (0.071)	MD723064

Symbol	O.D.	I D.	Thickness	Part number
#8	48 9 (1 925)	37 (1.46)	1.9 (0.075)	MD754794
#8	48 9 (1 925)	37 (1.46)	2.0 (0.079)	MD707268
#8	48.9 (1 925)	37 (1 46)	2 1 (0 083)	MD754795
#8	48.9 (1.925)	37 (1.46)	2.2 (0 087)	MD723065
#8	48.9 (1.925)	37 (1 46)	2.3 (0.091)	MD754796
#8	48.9 (1.925)	37 (1.46)	2.4 (0.094)	MD724358
#8	48.9 (1.925)	37 (1.46)	2.5 (0.098)	MD754797
#8	48.9 (1.925)	37 (1.46)	2.6 (0 102)	MD754798

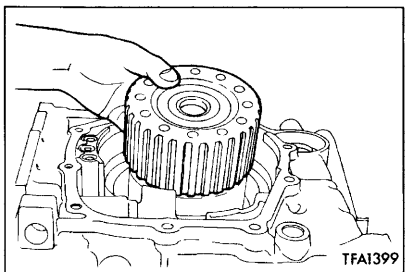


(27) Install the output planetary carrier and thrust bearing #4.

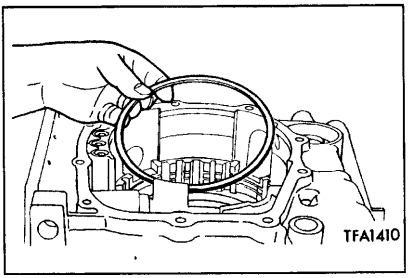
Caution
Be sure to install the thrust bearing in the correct direction.



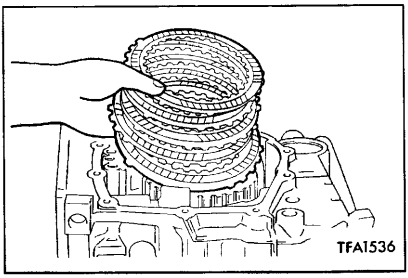
(28) Install the overdrive planetary carrier.



(29) Install the planetary reverse sun gear.



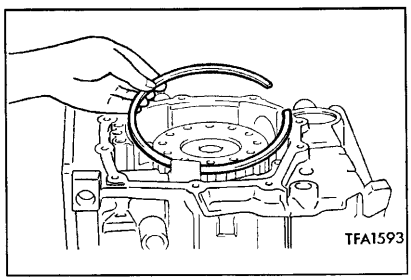
(30) Install the wave spring.



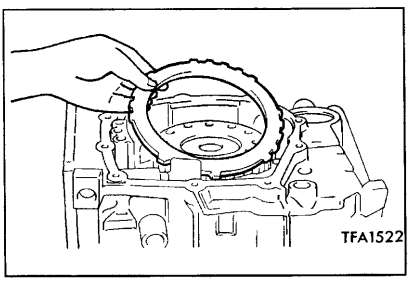
(31) Install the pressure plate, brake disc, and brake plate.

Number of brake discs and plates

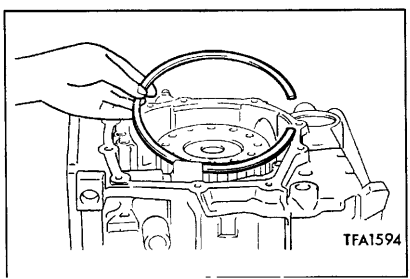
A/T Model	Brake disc	Brake plate	Pressure plate
F4A41	4	3	1
F4A42	5	4	1



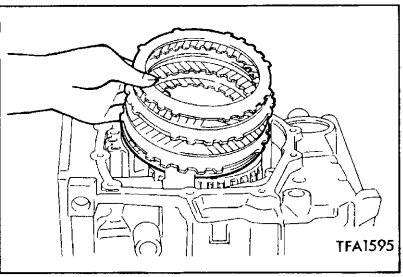
(32) Install the snap ring.



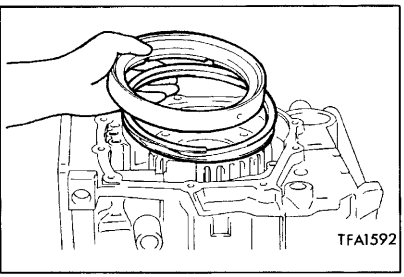
(33) Install the reaction plate.



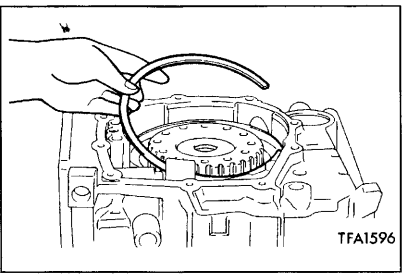
(34) Install the snap ring.



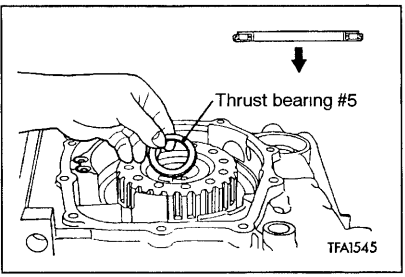
(35) Install the brake disc, brake plate, and pressure plate.



(36) Install the return spring and second brake piston.

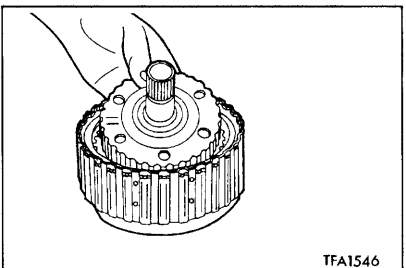


(37) Install the snap ring.



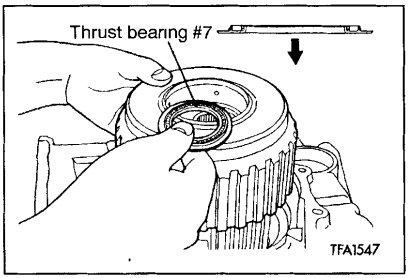
(38) Install thrust bearing #5.

Caution
Be sure to install the thrust bearing in the correct direction.



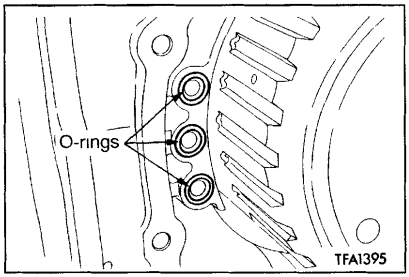
(39) Install the overdrive clutch hub and thrust bearing #6 to the reverse and overdrive clutch.

Caution
Be careful about the installation direction of the thrust bearing.

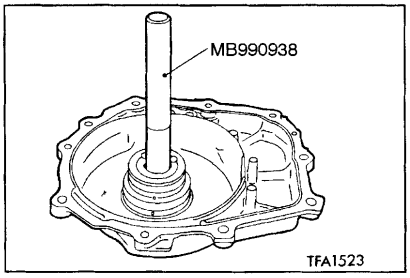


(40) Install the reverse and overdrive clutch, and thrust bearing #7.

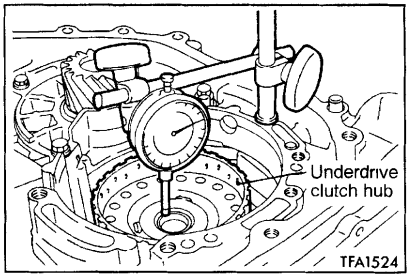
Caution
Be careful about the installation direction of the thrust bearing.



(41) Install the three O-rings.



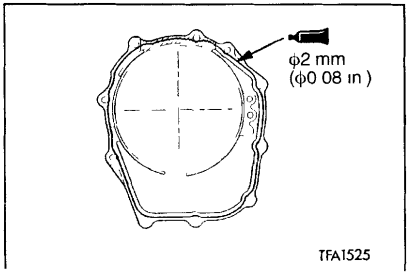
(42) Install the input shaft bearing.
(43) Install the four seal rings.



(44) Install used thrust race #8, and then the rear cover.
(45) Measure end play of the underdrive sun gear. Replace the thrust race installed in step (44) to adjust the play to the standard value. Refer to the chart on P.23B-37 or the appropriate parts number.

Standard value: 0.25 to 0.45 mm (0.0098 to 0.0177 in.)

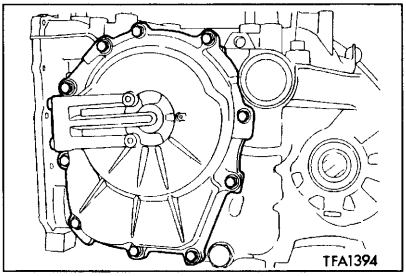
NOTE
Installing the underdrive clutch hub makes it easy to measure the end play of the underdrive sun gear.



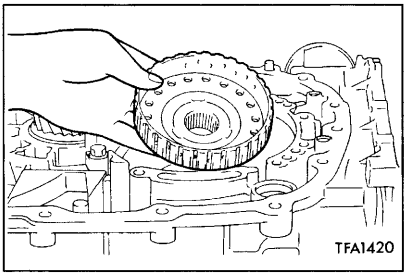
(46) Apply liquid gasket to the mating surface of the rear cover. Be sure to install the transaxle case within 15 minutes after applying liquid gasket.

Liquid gasket:
MITSUBISHI genuine sealant Part No. MD974421 or equivalent

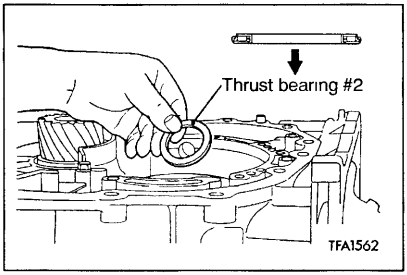
(47) After installation, wait at least one hour. Never run the transaxle or let ATF touch the adhesion surface during that time.



(48) Install the rear cover, and tighten its mounting bolts to the specified torque.

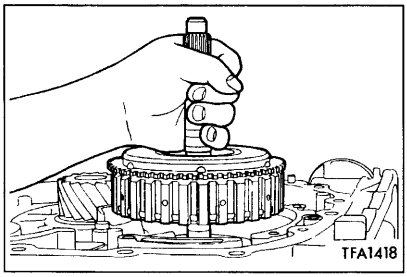


(49) Install the underdrive clutch hub.

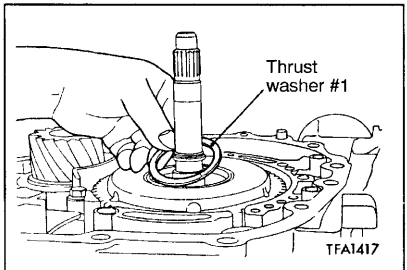


(50) Install thrust bearing #2.

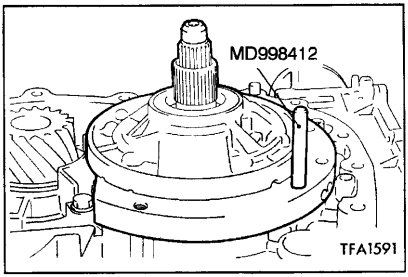
Caution
Be sure to install the thrust bearing in the correct direction.



(51) Hold the input shaft, and install the underdrive clutch.



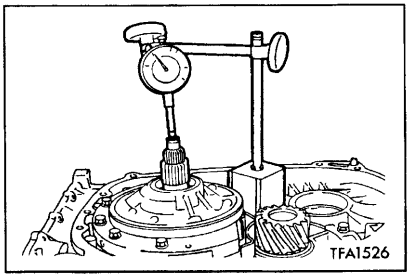
(52) Install the used thrust washer #1.



(53) Use the special tool to install a new oil pump gasket and oil pump.

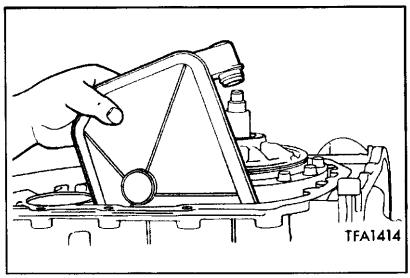
Caution
Never reuse the old gasket.

(54) Tighten the oil pump mounting bolts to the specified torque.

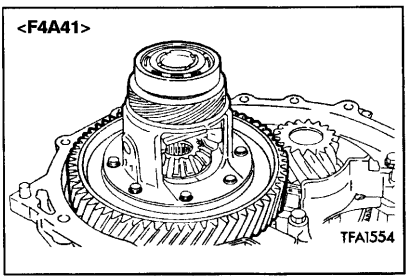


(55) Measure end play of the input shaft. Replace the thrust washer installed in step (52) to adjust the play to the standard value. Refer to the chart on P.23B-37 for the appropriate parts number.

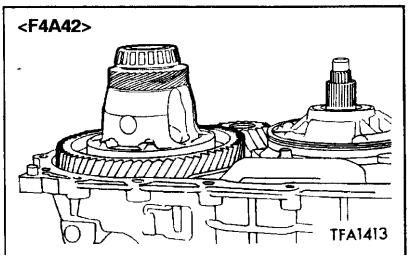
Standard value: 0.70 to 1.45 mm (0.0276 to 0.0571 in.)

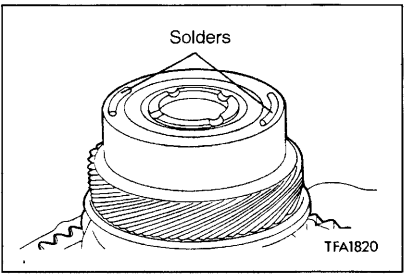


(56) Install the oil filter.

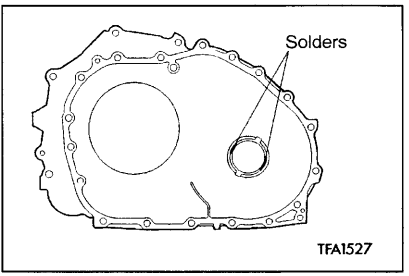


(57) Install the differential.

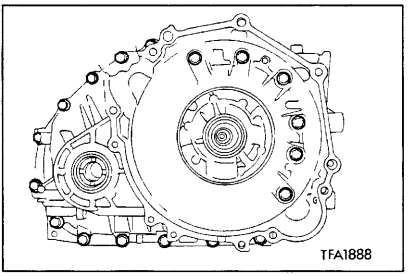




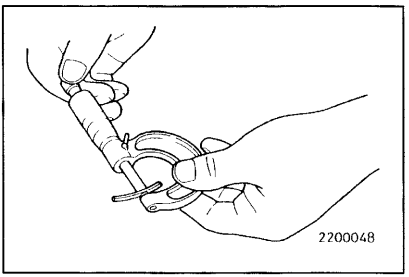
(58) Place a solder (approx. 10 mm (0.39 in.) in length, 3 mm (0.12 in.) in diameter) on the differential as shown in the figure. <F4A41 only>



(59) Place a solder (approx. 10 mm (0.39 in.) in length, 3 mm (0.12 in.) in diameter) on the torque converter housing as shown in the figure. <F4A42 only>



(60) Install the torque converter housing to the transaxle case without applying sealant. Tighten its mounting bolts to the specified torque.
(61) Loosen the bolts, and remove the solder.



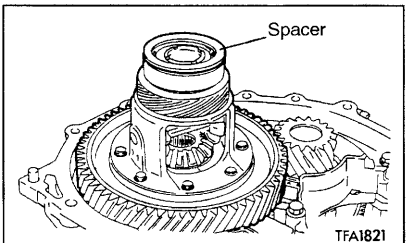
(62) Use a micrometer to measure the thickness of the pressed solder. Select a spacer which thickness is within the following value. Refer to the chart on P.23B-37 for the appropriate parts number.

F4A41

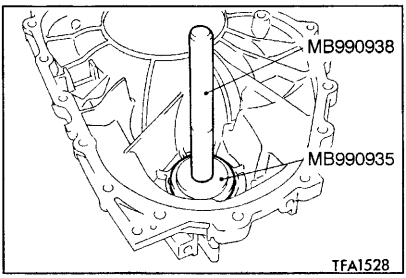
[T - 0.045 mm (0.0018 in.)] to [T - 0.165 mm (0.0065 in.)]

F4A42

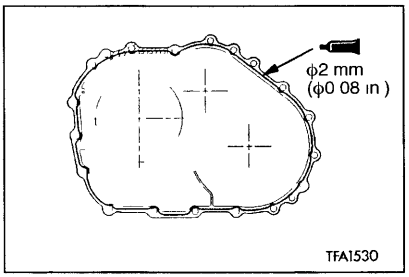
[T + 0.045 mm (0.0018 in.)] to [T + 0.105 mm (0.0041 in.)]



(63) Install the spacer selected in the above step. <F4A41 only>



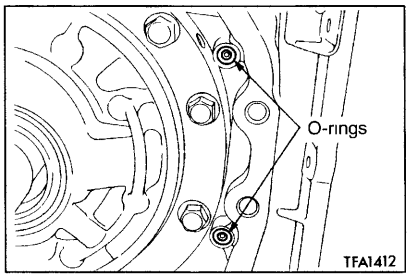
(64) Assemble the spacer selected in step (62) to the torque converter housing. Use the special tool to press in the outer race. <F4A42 only>



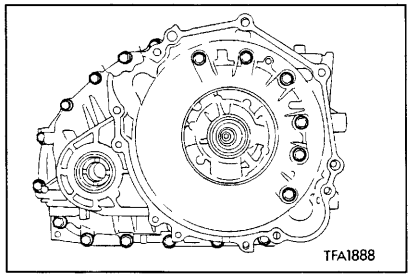
(65) Apply liquid gasket to the mating surface of torque converter.
Be sure to install the transaxle case within 15 minutes after applying liquid gasket.

Liquid gasket:
MITSUBISHI genuine sealant Part No. MD974421 or equivalent

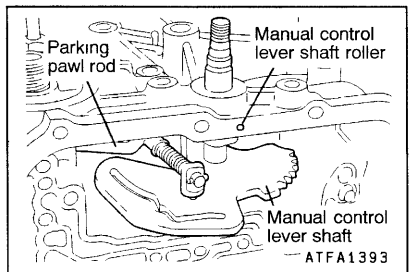
(66) After installation, wait at least one hour. Never run the transaxle or let ATF touch the adhesion surface during that time.



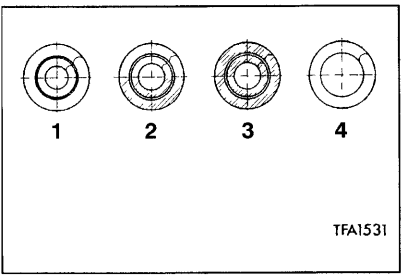
(67) Install the two O-rings.



(68) Install the torque converter, and then tighten its 18 mounting bolts to the specified torque.



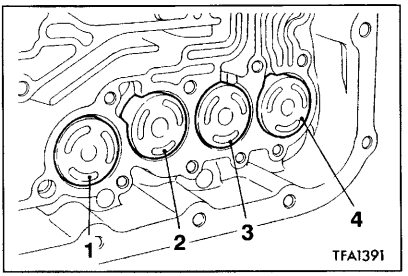
(69) Install the manual control lever shaft and parking pawl rod.
(70) Install the manual control lever shaft roller.

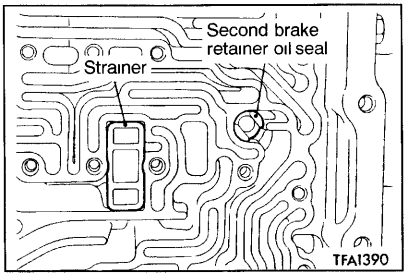


(71) Install the accumulator pistons, new seal rings, and springs.

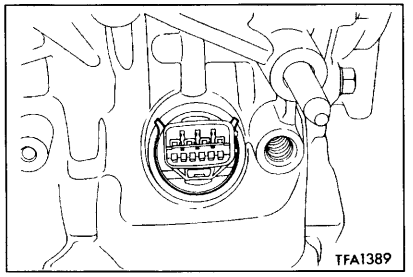
NOTE
The accumulator springs are identified as shown in the figure.

No.	Name
1	For low-reverse brake
2	For underdrive clutch
3	For second brake
4	For overdrive clutch

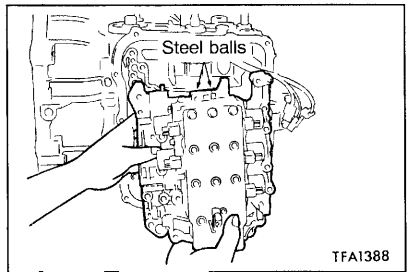




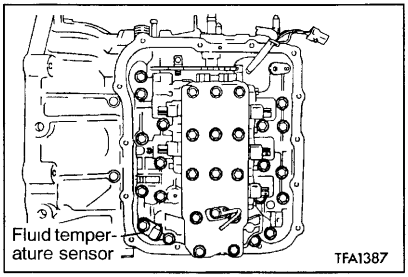
(72) Install the strainer and second brake retainer oil seal.



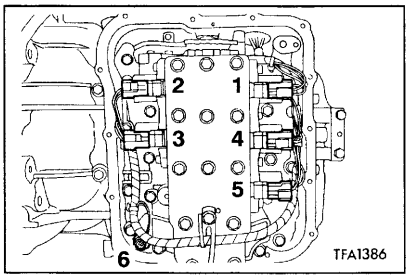
(73) Install the solenoid valve harness, and then secure the snap ring to the connector groove.



(74) Install the valve body, gasket, and two steel balls.

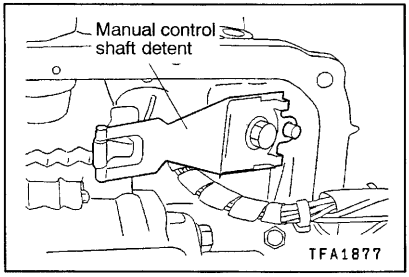


(75) Install the fluid temperature sensor.
(76) Install the 28 valve body mounting bolts.

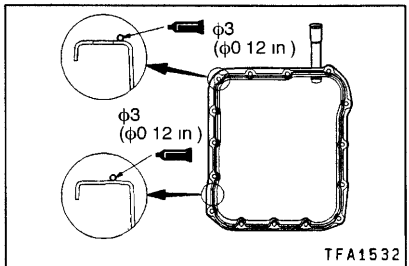


(77) Connect the valve body connectors.

No.	Parts to be connected	Cable colour	Connector housing colour
1	Underdrive solenoid valve	White, red, red	Black
2	Overdrive solenoid valve	Orange, red	Black
3	Low-reverse solenoid valve	Brown, yellow	Milky white
4	Second solenoid valve	Green, red, red	Milky white
5	Damper clutch control solenoid valve	Blue, yellow, yellow	Black
6	Fluid temperature sensor	Black, red	Black



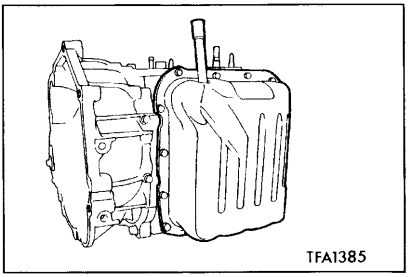
(78) Install the manual control shaft detent.



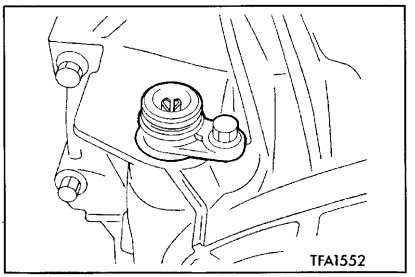
(79) Apply liquid gasket to the mating surface of the valve body cover.
Be sure to install the transaxle case within 15 minutes after applying liquid gasket.

Liquid gasket:
MITSUBISHI genuine sealant Part No. MD974421 or equivalent

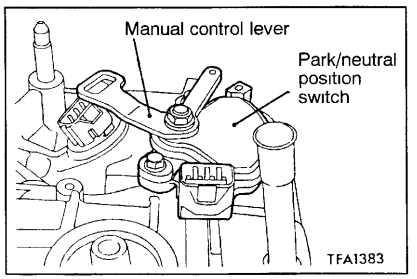
(80) After installation, wait at least one hour. Never run the transaxle or let ATF touch the adhesion surface during that time.



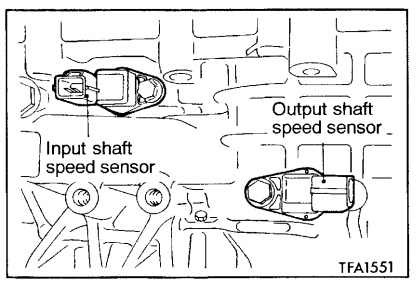
(81) Install the valve body cover, and then tighten its mounting bolts to the specified torque.



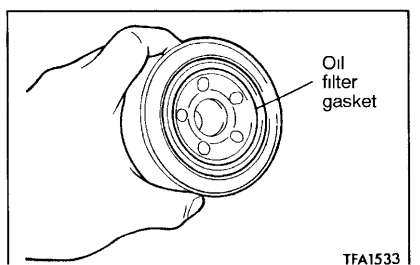
(82) Install the speedometer gear.



(83) Install the park/neutral position switch and manual control lever.



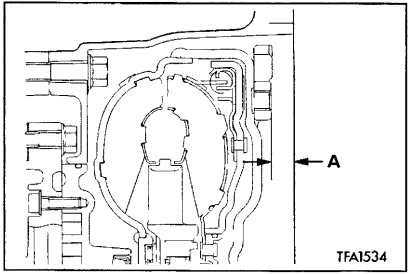
(84) Install the input shaft speed sensor and output shaft speed sensor.



(85) Apply a small amount of ATF to the oil filter gasket. Tighten the filter to the specified torque.

Standard value: 12 Nm (8.7 ft.lbs.)

(86) Install the eye bolt, a new gasket, and the oil cooler feed tube.
(87) Install the oil dipstick.
(88) Install the brackets.



(89) Install the torque converter, and secure it so that the shown dimension (A) meets the reference value.

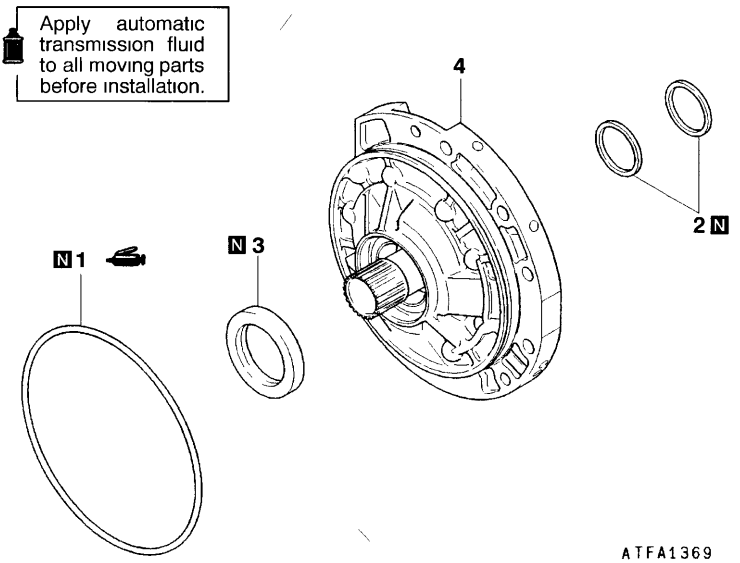
Reference value: approx.12.2 mm (0.480 in.)

Caution
Apply ATF to the oil pump drive hub before installing the torque converter. Be careful not to damage the oil seal lip when installing the torque converter.

OIL PUMP

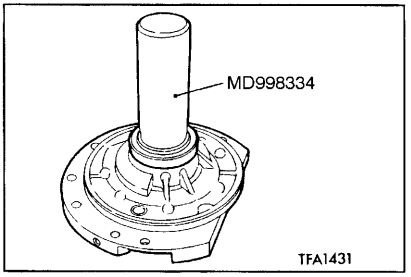
23300130126

DISASSEMBLY AND REASSEMBLY



Disassembly steps

▶B◀ 1 O-ring
2 Seal ring
▶A◀ 3. Oil seal
4. Oil pump assembly



REASSEMBLY SERVICE POINTS

▶A◀ OIL SEAL INSTALLATION

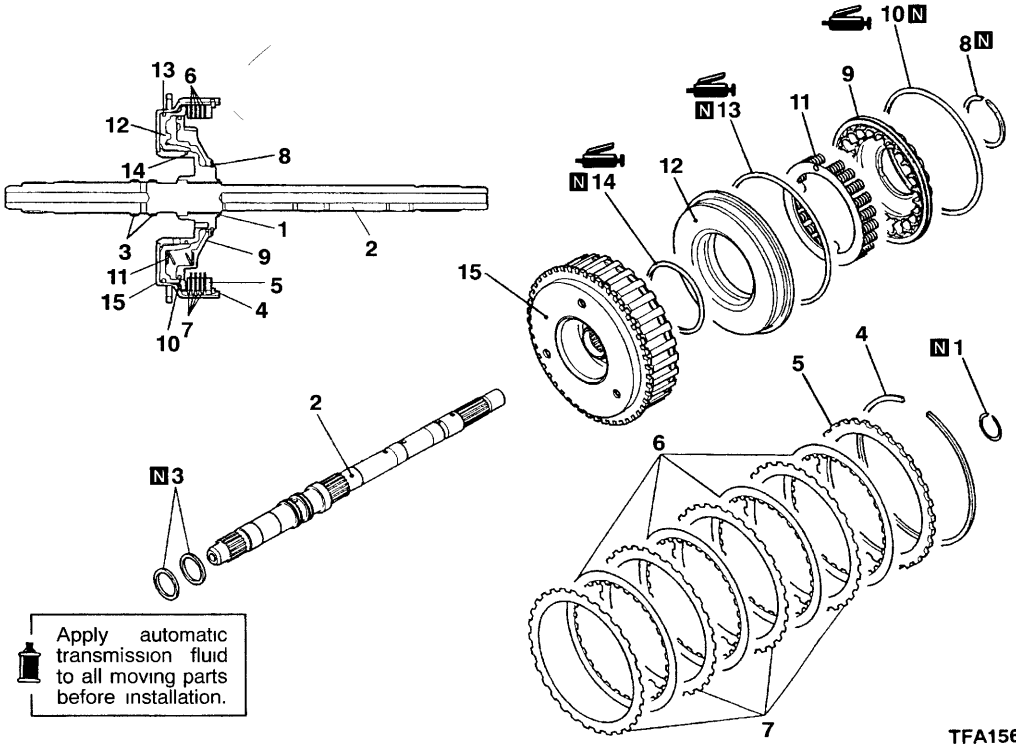
▶B◀ O-RING INSTALLATION

Install a new O-ring to the outer groove of the oil pump, and apply ATF, blue petrolatum jelly or white Vaseline to the outer inside diameter of the O-ring.

UNDERDRIVE CLUTCH AND INPUT SHAFT

23302450015

DISASSEMBLY AND REASSEMBLY



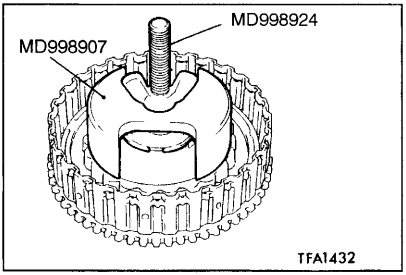
TFA1564

Number of clutch discs and plates

A/T Model	Clutch disc	Clutch plate	Clutch reaction plate
F4A41	3	3	1
F4A42	4	4	1

Disassembly steps

1 Snap ring
2 Input shaft
3. Seal ring
▶D◀ 4 Snap ring
▶C◀ 5 Clutch reaction plate
▶C◀ 6. Clutch disc
▶C◀ 7. Clutch plate
◀A▶ ▶B◀ 8. Snap ring
9 Spring retainer
▶A◀ 10. D-ring
11. Return spring
12. Underdrive clutch piston
▶A◀ 13 D-ring
▶A◀ 14. D-ring
15. Underdrive clutch retainer



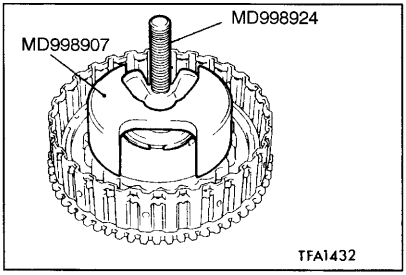
DISASSEMBLY SERVICE POINT

◀A▶ SNAP RING REMOVAL

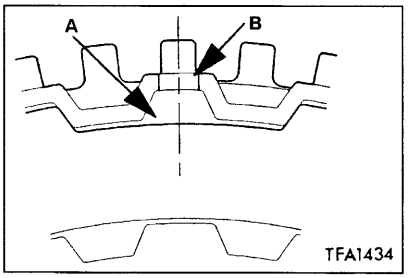
REASSEMBLY SERVICE POINTS

▶A◀ D-RING INSTALLATION

Apply ATF, blue petrolatum jelly or white Vaseline to the D-ring, and install it carefully.



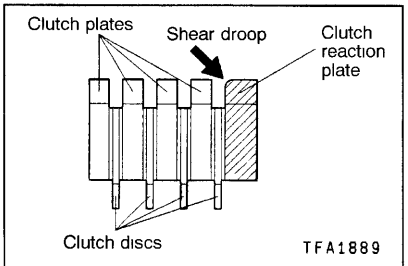
▶B◀ SNAP RING INSTALLATION



▶C◀ CLUTCH PLATE/CLUTCH DISC/CLUTCH REACTION PLATE INSTALLATION

(1) Align the space between the teeth (part A) of the clutch plate, clutch disc and clutch reaction plate to the outer circumference hole (part B) of the underdrive clutch retainer.

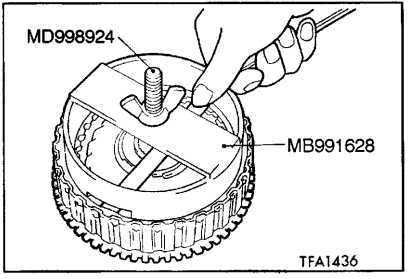
Caution
Immerse the clutch disc in ATF before assembling it.



(2) Install the clutch reaction plate in the shown direction.

Number of clutch discs and plates

A/T Model	Clutch disc	Clutch plate	Clutch reaction plate
F4A41	3	3	1
F4A42	4	4	1



▶D◀ SNAP RING INSTALLATION

Check that the clearance between the snap ring and the clutch reaction plate is within the standard value.

Standard value:

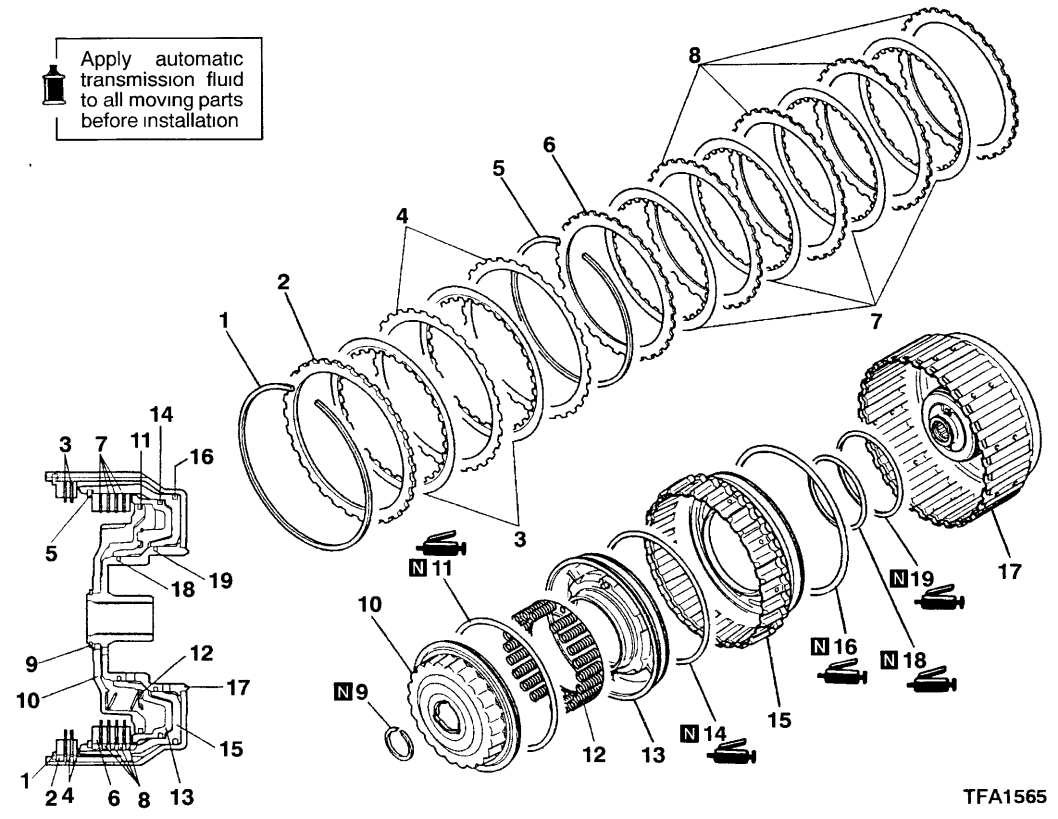
1.25 to 1.45 mm (0.0492 to 0.0571 in.) <F4A41>
1.65 to 1.85 mm (0.0650 to 0.0728 in.) <F4A42>

When measuring the clearance, use the special tool to press the clutch reaction plate evenly. If not within the standard value, select a snap ring to adjust.

REVERSE AND OVERDRIVE CLUTCH

23302480014

DISASSEMBLY AND REASSEMBLY

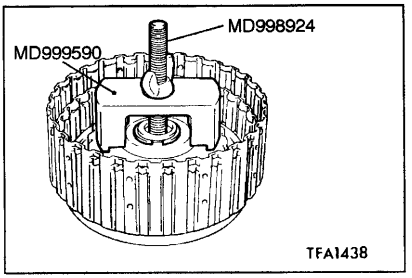


Number of clutch discs and plates (Overdrive)

Model	Clutch disc	Clutch plate	Clutch reaction plate
F4A41	3	3	1
F4A42	4	4	1

Disassembly steps

- ▶G◀ 1. Snap ring
- ▶F◀ 2. Clutch reaction plate
- ▶F◀ 3. Clutch disc
- ▶F◀ 4. Clutch plate
- ▶E◀ 5. Snap ring
- ▶D◀ 6. Clutch reaction plate
- ▶D◀ 7. Clutch disc
- ▶D◀ 8. Clutch plate
- ◀A▶ ▶C◀ 9. Snap ring
- 10. Spring retainer
- ▶A◀ 11. D-ring
- 12. Return spring
- 13. Overdrive clutch piston
- ▶A◀ 14. D-ring
- ▶B◀ 15. Reverse clutch piston
- ▶A◀ 16. D-ring
- 17 Reverse clutch retainer
- ▶A◀ 18. D-ring
- ▶A◀ 19. D-ring



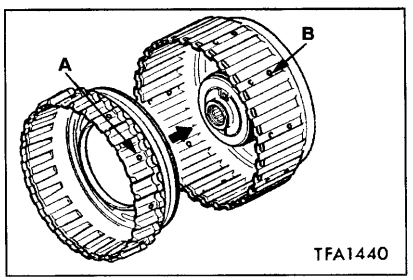
DISASSEMBLY SERVICE POINT

◀A▶ SNAP RING REMOVAL

REASSEMBLY SERVICE POINTS

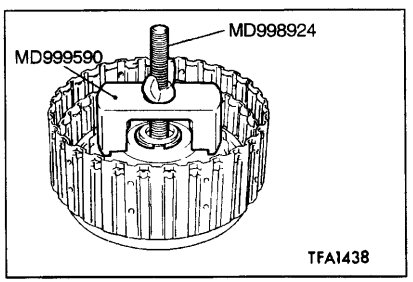
▶A◀ D-RING INSTALLATION

Apply ATF, blue petroleum jelly or white Vaseline to D-ring, and install carefully.



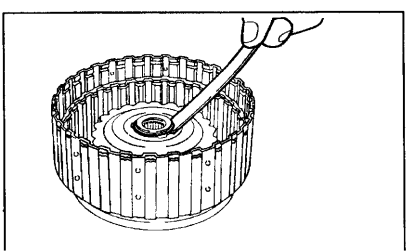
▶B◀ REVERSE CLUTCH PISTON INSTALLATION

Align the outer circumference holes (parts A and B) of the reverse clutch piston and the reverse clutch retainer to assemble them.



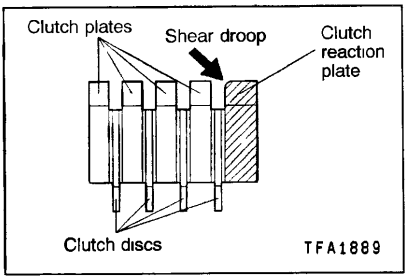
▶C◀ SNAP RING INSTALLATION

(1) Use the special tool to install the snap ring.



(2) Check that the clearance between the snap ring and the return spring retainer is within the standard value. When measuring the clearance, press the return spring retainer by the weight of 49 N (11 lbs.) evenly. If not within the standard value, select a snap ring to adjust.

Standard value: 0.01 to 0.10 mm (0 to 0.0035 in.)



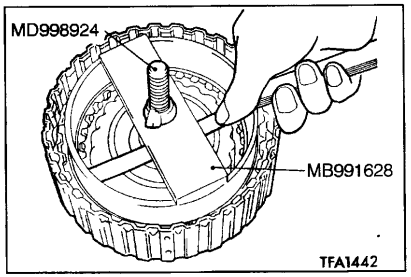
▶D◀ CLUTCH PLATE/CLUTCH DISC/CLUTCH REACTION PLATE INSTALLATION

Install the clutch reaction plate in the shown direction.

Caution
Immerse the clutch disc in ATF before assembling the clutch disc.

Number of clutch discs and plates

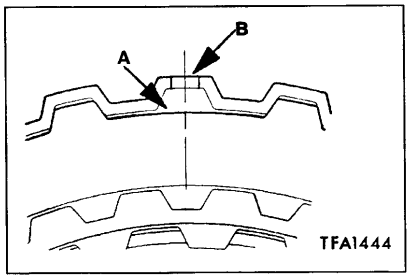
AT Model	Clutch disc	Clutch plate	Clutch reaction plate
F4A41	3	3	1
F4A42	4	4	1



▶E◀ SNAP RING INSTALLATION

Check that the clearance between the snap ring and the clutch reaction plate is within the standard value. When measuring the clearance, use the special tool to press the clutch reaction plate evenly. If not within the standard value, select a snap ring to adjust.

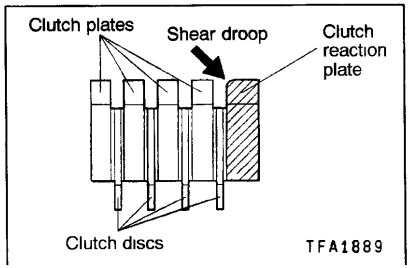
Standard value:
1.2 to 1.4 mm (0.0472 to 0.0551 in.) <F4A41>
1.6 to 1.8 mm (0.0630 to 0.0709 in.) <F4A42>



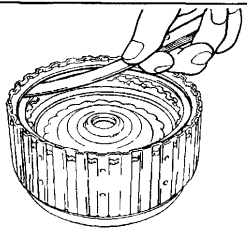
▶F◀ CLUTCH PLATE/CLUTCH DISC/CLUTCH REACTION PLATE INSTALLATION

(1) Align the space between the teeth (part A) of the clutch plate, clutch disc and clutch reaction plate to the outer circumference hole (part B) of the reverse clutch retainer.

Caution
Immerse the clutch disc in ATF.



(2) Install the clutch reaction plate in the shown direction.



TFA1446

▶G◀SNAP RING INSTALLATION

Check that the clearance between the snap ring and the clutch reaction plate is within the standard value. When measuring the clearance, press the clutch reaction plate by the weight of 49 N (11 lbs.) evenly. If not within the standard value, select a snap ring to adjust.

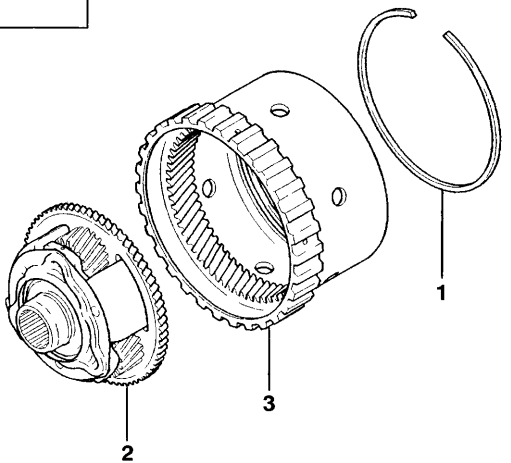
Standard value: 1.2 to 1.4 mm (0.0472 to 0.0551 in.)

OVERDRIVE PLANETARY CARRIER

23302510010

DISASSEMBLY AND REASSEMBLY

Lubricate all internal parts with automatic transmission fluid during reassembly.



TFA1372

Disassembly steps

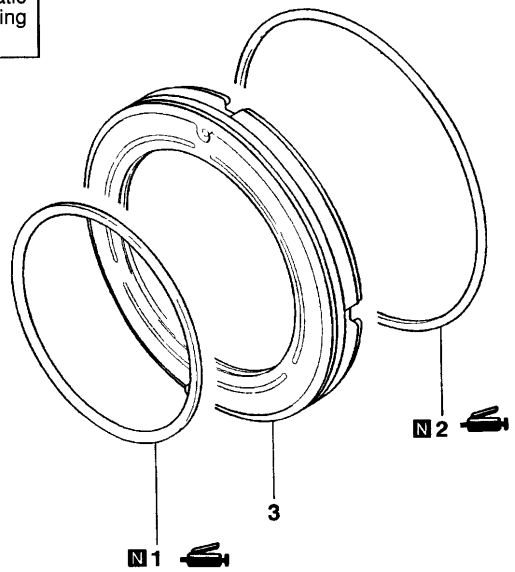
1. Snap ring
2. Overdrive planetary carrier
3. Overdrive annulus gear

LOW-REVERSE BRAKE

23300370078

DISASSEMBLY AND REASSEMBLY

Lubricate all internal parts with automatic transmission fluid during reassembly.



TFA1373

Disassembly steps

▶A◀ 1. D-ring
▶A◀ 2. D-ring
3. Low-reverse brake piston

REASSEMBLY SERVICE POINT

▶A◀ D-RING INSTALLATION

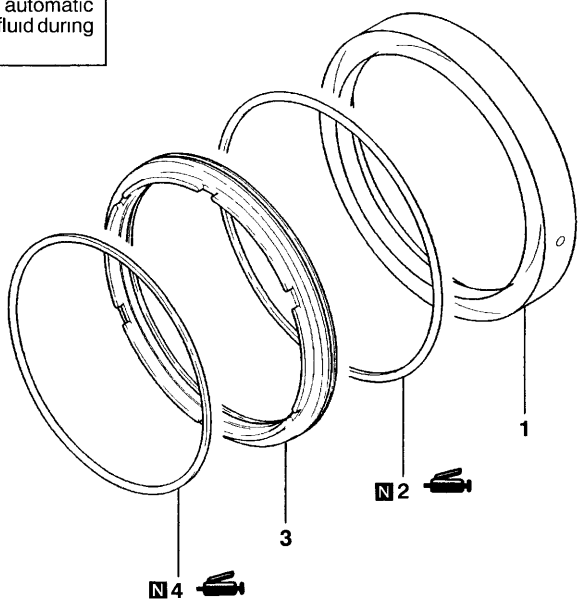
Apply ATF, blue petrolatum jelly or white Vaseline to D-ring, and install carefully.

SECOND BRAKE

23302540019

DISASSEMBLY AND REASSEMBLY

Lubricate all internal parts with automatic transmission fluid during reassembly.



TFA1374

Disassembly steps

▶A◀ 1 Second brake retainer
2 D-ring
3. Second brake piston
▶A◀ 4 D-ring

REASSEMBLY SERVICE POINT

▶A◀ D-RING INSTALLATION

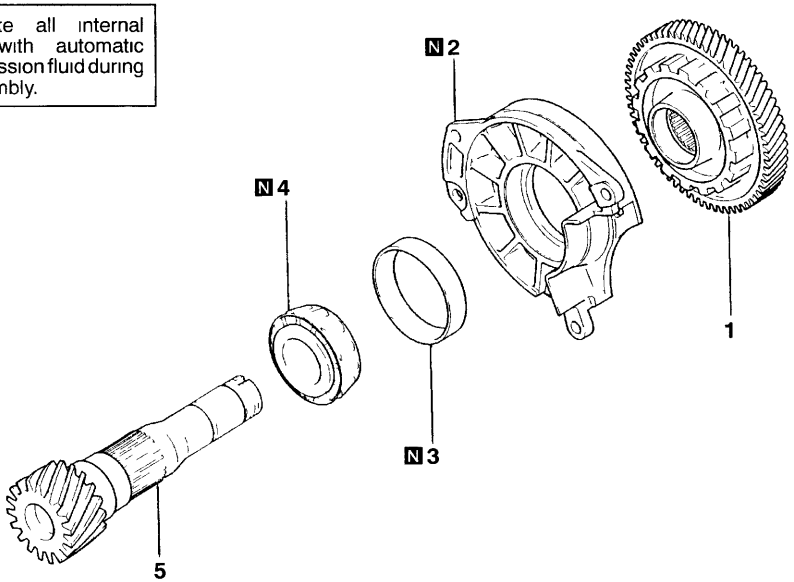
Apply ATF, blue petrolatum jelly or white Vaseline to D-ring, and install carefully.

OUTPUT SHAFT

23302570018

DISASSEMBLY AND REASSEMBLY

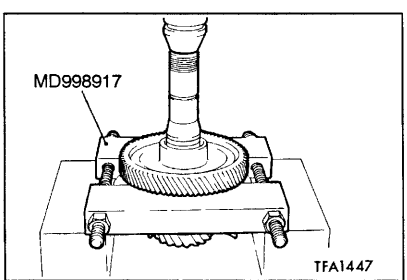
Lubricate all internal parts with automatic transmission fluid during reassembly.



TFA1375

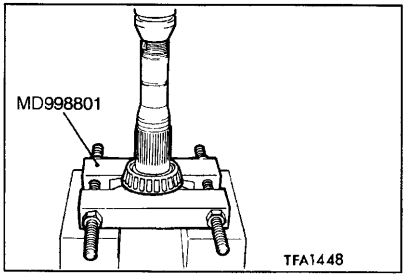
Disassembly steps

◀A▶ ▶C◀ 1. Transfer driven gear
2. Bearing retainer
▶B◀ 3 Outer race
◀B▶ ▶A◀ 4. Taper roller bearing
5 Output shaft



DISASSEMBLY SERVICE POINTS

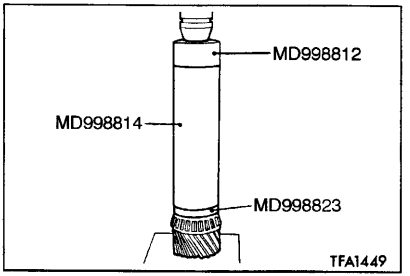
◀A▶ TRANSFER DRIVEN GEAR REMOVAL



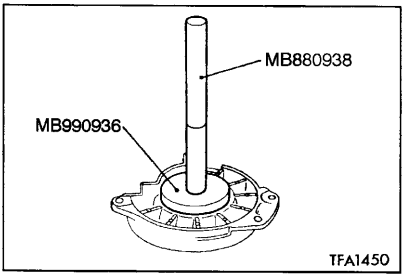
◀B▶ TAPER ROLLER BEARING REMOVAL

REASSEMBLY SERVICE POINTS

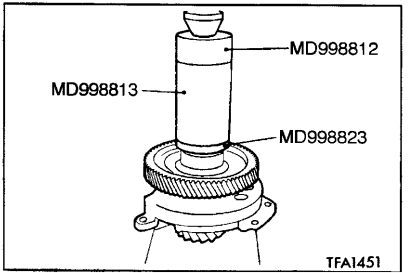
▶A◀ TAPER ROLLER BEARING INSTALLATION



▶B◀ OUTER RACE INSTALLATION



▶C◀ TRANSFER DRIVEN GEAR INSTALLATION

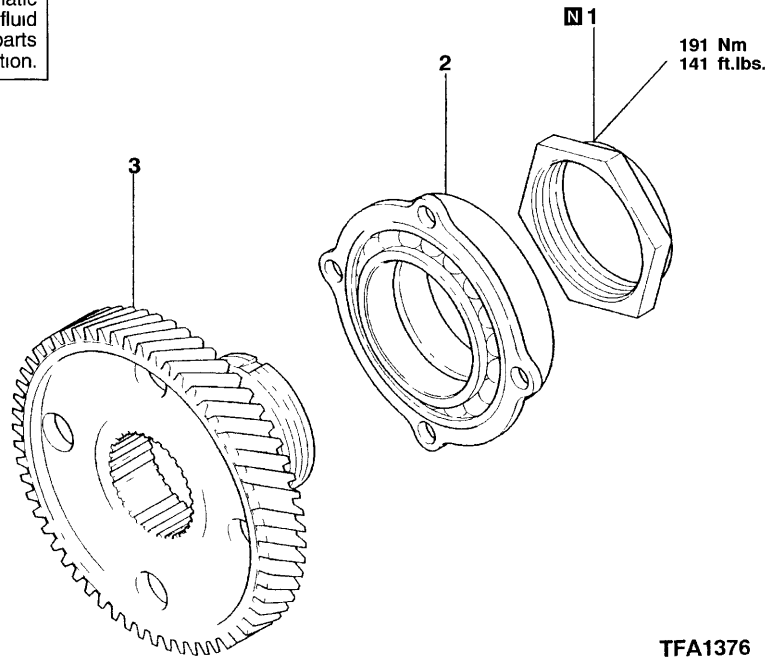


TRANSFER DRIVE GEAR

23302600014

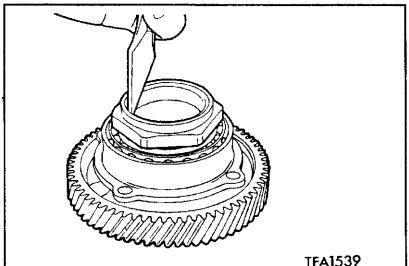
DISASSEMBLY AND REASSEMBLY

Apply automatic transmission fluid to all moving parts before installation.



Disassembly steps

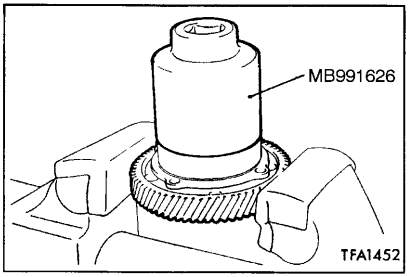
◀A▶ ▶B◀ 1. Lock nut
◀B▶ ▶A◀ 2 Transfer drive gear bearing
3. Transfer drive gear



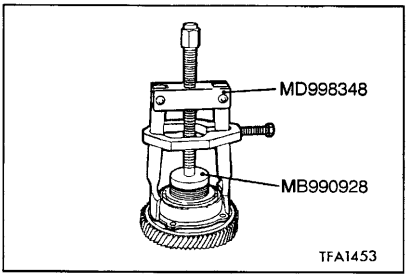
DISASSEMBLY SERVICE POINTS

◀A▶ LOCK NUT REMOVAL

(1) Using a punch, straighten the locking tab of the lock nut.



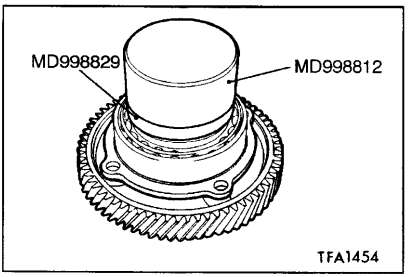
(2) Use the special tool to remove the lock nut.



◀B▶ TRANSFER DRIVE GEAR BEARING REMOVAL

REASSEMBLY SERVICE POINTS

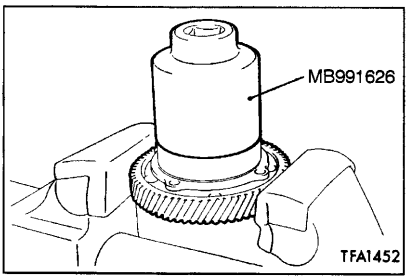
▶A◀ TRANSFER DRIVE GEAR BEARING INSTALLATION



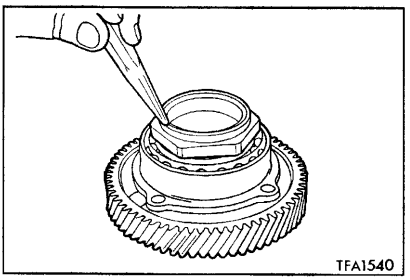
▶B◀ LOCK NUT INSTALLATION

(1) Apply ATF to a new lock nut, and tighten it to the specified torque. Then turn back one turn, and tighten to the specified torque again.

Standard value: 191 Nm (141 ft.lbs.)



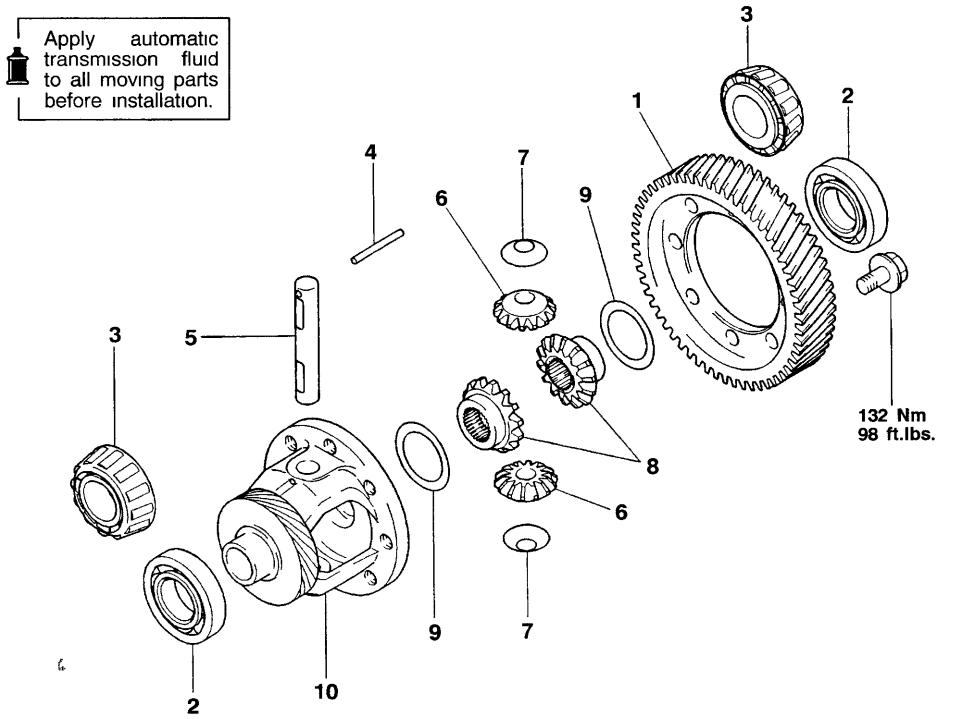
(2) Use a punch to caulk the nut at two points.



DIFFERENTIAL

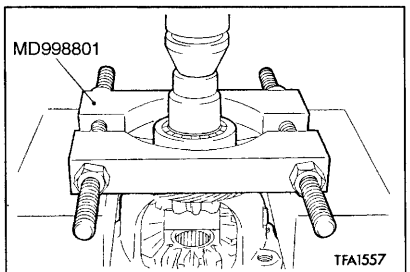
23300310094

DISASSEMBLY AND REASSEMBLY



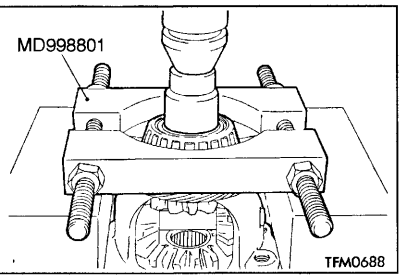
Disassembly steps

- ▶E◀ 1 Differential drive gear
- ◀A▶ ▶D◀ 2. Ball bearings <F4A41>
- ◀B▶ ▶C◀ 3 Taper roller bearings <F4A42>
- ▶B◀ 4 Lock pin
- ▶A◀ 5. Pinion shaft
- ▶A◀ 6. Pinions
- ▶A◀ 7. Washers
- ▶A◀ 8. Side gears
- ▶A◀ 9. Spacers
- 10. Differential case

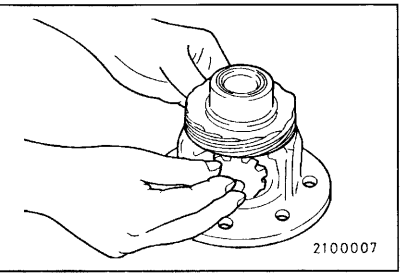


DISASSEMBLY SERVICE POINTS

◀A▶ BALL BEARING REMOVAL



◀B▶ TAPER ROLLER BEARING REMOVAL



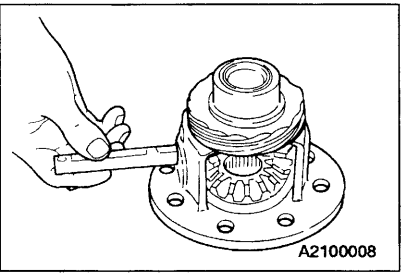
REASSEMBLY SERVICE POINTS

▶A◀ SPACER, SIDE GEAR, WASHER, PINION, PINION SHAFT INSTALLATION

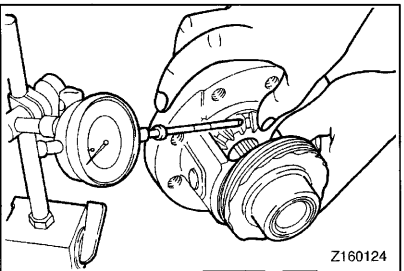
(1) After a spacer has been mounted on the back surface of the side gear, install the side gear in the differential case.

NOTE
When a new side gear is to be installed, mount a medium thickness spacer [0.93 to 1.00 mm (0.0366 to 0.0395 in.)].

(2) Set the washer on the back of each pinion, and put both pinions simultaneously in mesh with the side gears. While rotating them, install them in position.



(3) Insert the pinion shaft.

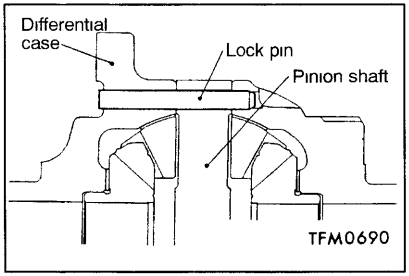


(4) Measure the backlash between the side gears and pinions.

Standard value:
0.025 to 0.150 mm (0.00098 to 0.00591 in.)

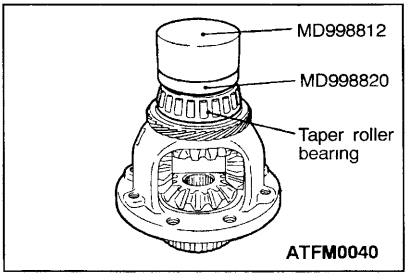
(5) If the backlash is out of specification, select a spacer and re-measure the backlash.

NOTE
Adjust until the backlashes on both sides are equal.

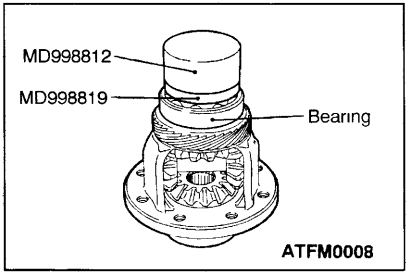


▶B◀ LOCK PIN INSTALLATION

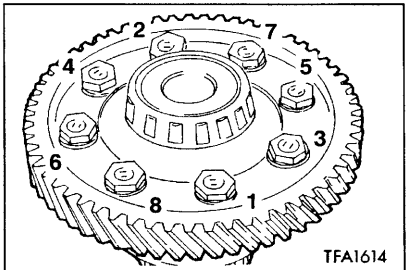
(1) Install the lock pin so that it will be oriented in the direction.



▶C◀ TAPER ROLLER BEARING INSTALLATION



▶D◀ BALL BEARING INSTALLATION



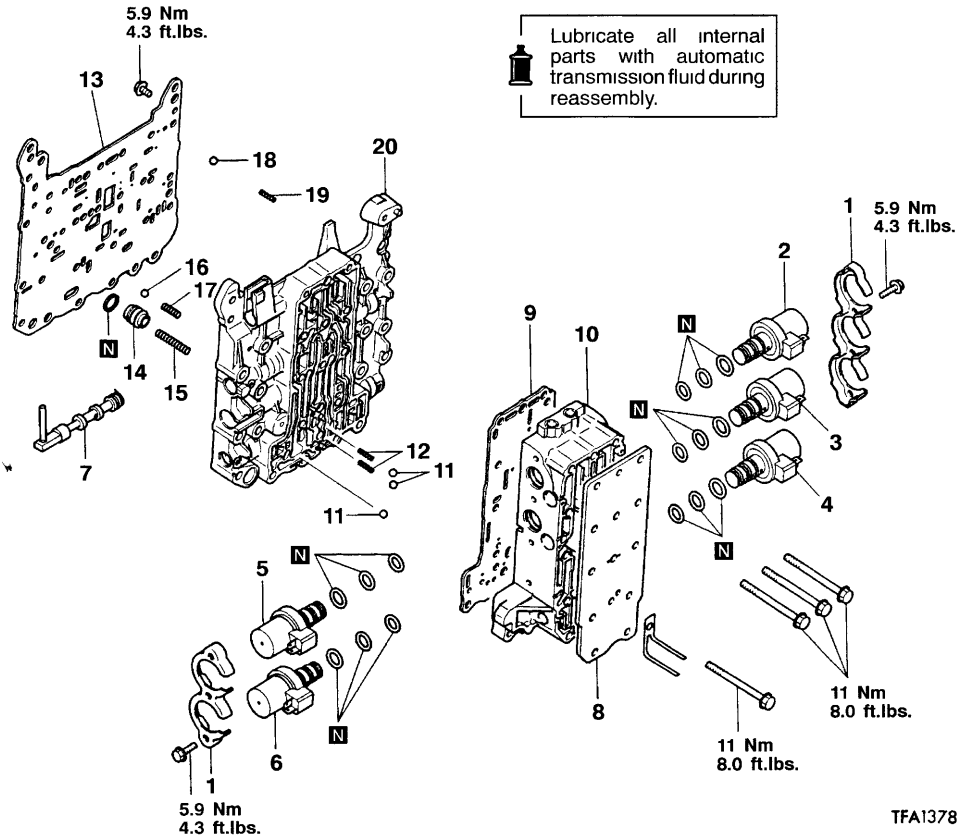
▶E◀ DIFFERENTIAL DRIVE GEAR INSTALLATION

Apply ATF to the bolt, tighten the bolts to the specified torque in the shown sequence.

VALVE BODY

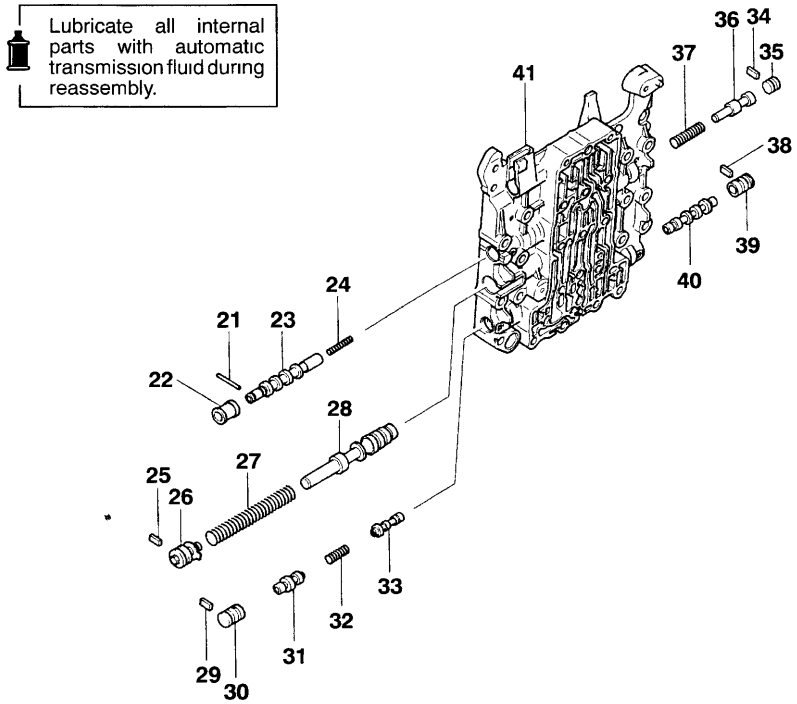
23300550076

DISASSEMBLY AND REASSEMBLY



Disassembly steps

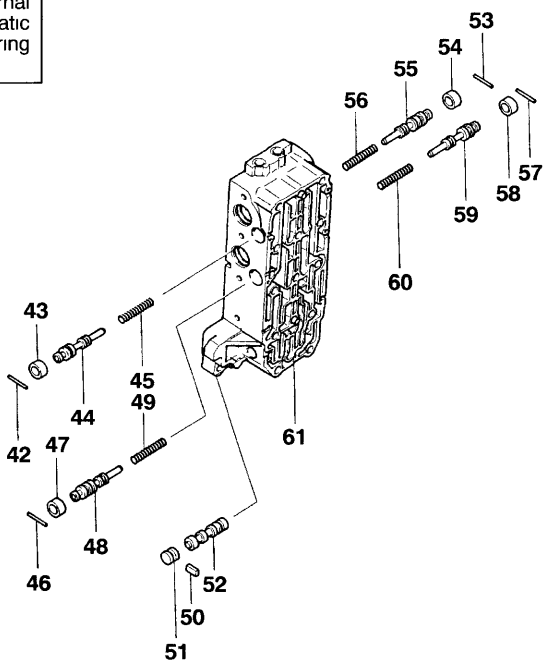
1. Solenoid valve support
2. Underdrive solenoid valve
3. Second solenoid valve
4. Torque converter clutch control solenoid valve
5. Overdrive solenoid valve
6. Low-reverse solenoid valve
7. Manual valve
8. Cover
9. Plate
10. Outside valve body assembly
11. Steel ball (orifice check ball)
12. Spring
13. Plate
14. Damping valve
15. Damping valve spring
16. Steel ball (line relief)
17. Spring
18. Steel ball (orifice check ball)
19. Spring
20. Inside valve body assembly



TFA1589

21. Roller
22. Torque converter clutch control valve sleeve
23. Torque converter clutch control valve
24. Torque converter clutch control valve spring
25. Plate
26. Screw
27. Regulator valve spring
28 Regulator valve
29. Plate
30 Fail-safe valve A sleeve
31. Fail-safe valve A2
32. Fail-safe valve A spring
33. Fail-safe valve A1
34 Plate
35. Plug
36. Torque converter valve
37. Torque converter valve spring
38. Plate
39. Fail-safe valve B sleeve
40. Fail-safe valve B
41 Inside valve body

Lubricate all internal parts with automatic transmission fluid during reassembly.



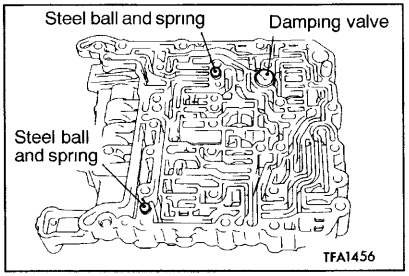
TFA1590

42. Roller
43. Overdrive pressure control valve sleeve
44. Overdrive pressure control valve
45. Overdrive pressure control valve spring
46 Roller
47. Low-reverse pressure control valve sleeve
48 Low-reverse pressure control valve
49. Low-reverse pressure control valve spring
50. Plate
51. Plug
52. Switching valve
53. Roller
54. Underdrive pressure control valve sleeve
55. Underdrive pressure control valve
56. Underdrive pressure control valve spring
57. Roller
58. Second pressure control valve sleeve
59 Second pressure control valve
60. Second pressure control valve spring
61. Outside valve body

DISASSEMBLY SERVICE POINT

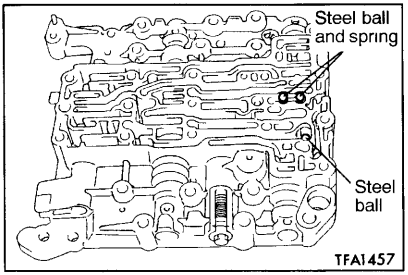
◀A▶ SOLENOID VALVES REMOVAL

NOTE
Store each solenoid valve seperately, according to its location, to avoid incorrect reassembly.

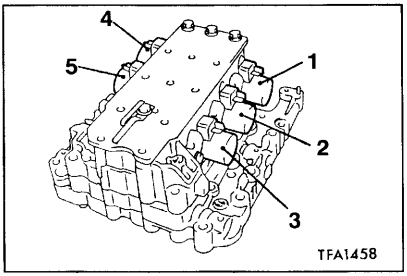


REASSEMBLY SERVICE POINTS

▶A◀ SPRING/STEEL BALL/DAMPING VALVE/DAMPING VALVE SPRING INSTALLATION



▶B◀ SPRING/STEEL BALL INSTALLATION



▶C◀ SOLENOID VALVES INSTALLATION

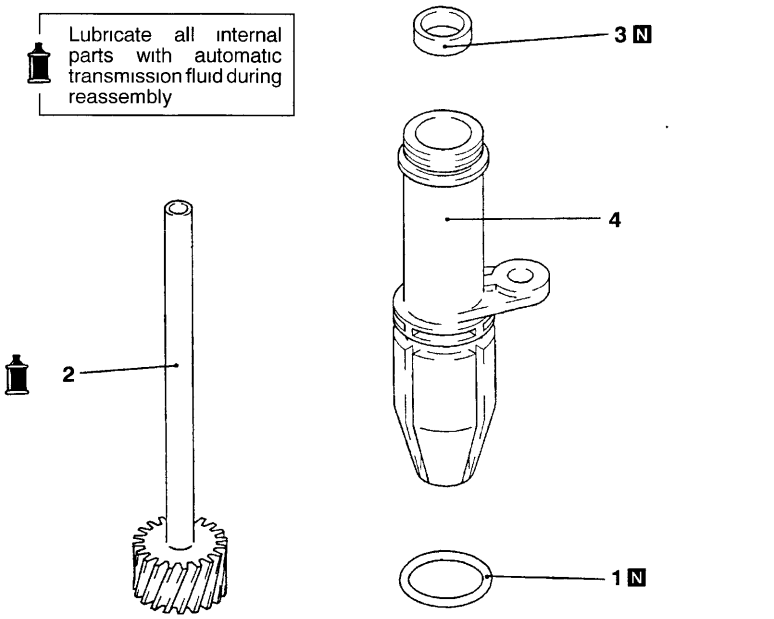
(1) Apply ATF, blue petroleum jelly or white Vaseline to O-ring, and install carefully.
(2) Install the solenoid valves by referring to the marks during disassembly.

No.	Name
1	Underdrive solenoid valve
2	Second solenoid valve
3	Torque converter clutch control solenoid valve
4	Overdrive solenoid valve
5	Low-reverse solenoid valve

SPEEDOMETER GEAR

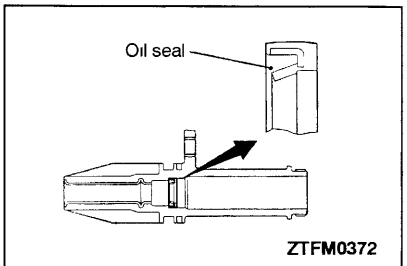
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DISASSEMBLY AND REASSEMBLY



Disassembly steps

1. O-ring
2. Speedometer driven gear
▶A◀ 3. Oil seal
4. Sleeve



REASSEMBLY SERVICE POINT

▶A◀ OIL SEAL INSTALLATION

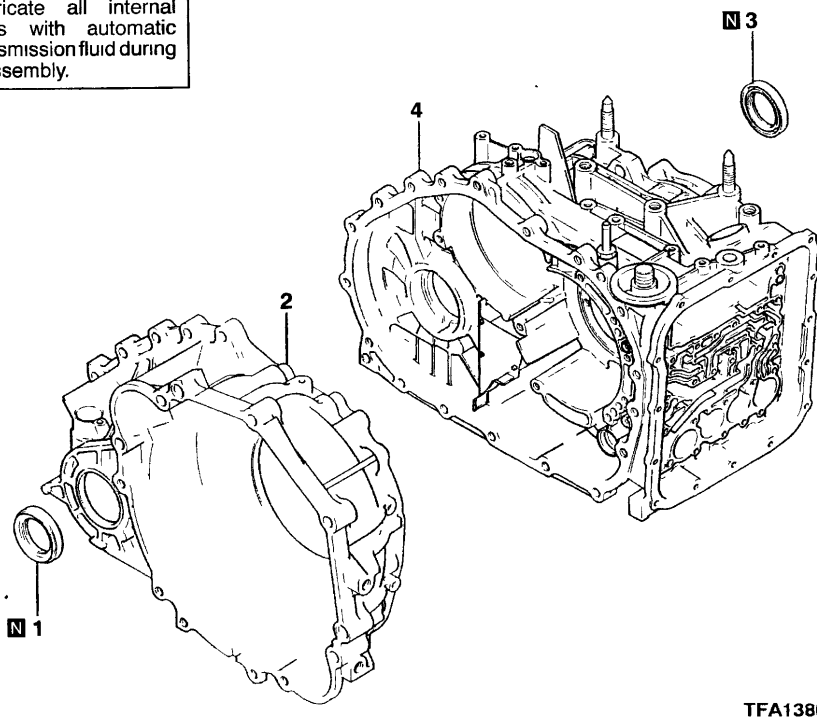
Insert the oil seal in the position and direction shown in the figure.

DRIVE SHAFT OIL SEAL

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DISASSEMBLY AND REASSEMBLY

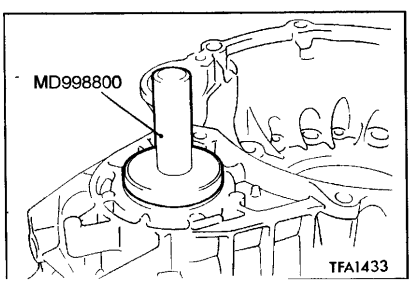
Lubricate all internal parts with automatic transmission fluid during reassembly.



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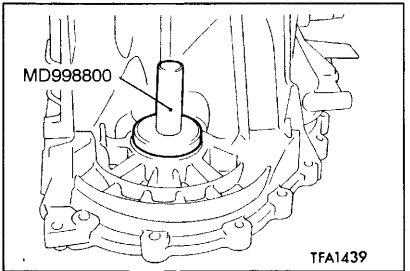
Disassembly steps

▶A◀ 1. Oil seal
2. Torque converter housing
▶B◀ 3 Oil seal
4. Transaxle case



REASSEMBLY SERVICE POINT

▶A◀ OIL SEAL INSTALLATION



▶B◀ OIL SEAL INSTALLATION

A

A/C SWITCH 55-16-II
A/T CONTROL COMPONENT
Check . . . 23A-56-I
Location . . 23A-54-I
ABS
ECU . . 35B-41-II
MOTOR, Operation Check 35B-30-II
MOTOR RELAY, Continuity Check 35B 30-II
VALVE RELAY, Continuity Check 35B-30-II
ACCELERATOR
CABLE 17-5-I
CABLE, Check and Adjustment . . 17-4-I
PEDAL 17-5-I
ADJUSTER, Lash, Check 11A-16, 11C-13
AERO PARTS 51-13-II
AIR CLEANER ELEMENT, Maintenance 00 32-I
AIR CONDITIONING SWITCH, Check 17-40-I
AIR BAG MODULE 52B-27-II
Deployed Disposal Procedures 52B 39-II
Disposal Procedures . . 52B-34-II
Undeployed, Disposal . 52B-34-II
AIR FILTER 17-48-I
ANTENNA 54-67-II
AUTO-CRUISE CONTROL 17-27-I
COMPONENT, Check . . . 17-25 I
SYSTEM, Operation Check . . 17-23-I
AUTOMATIC TRANSAXLE
Maintenance 00-41-I
KEY INTERLOCK & SHIFT LOCK MECHANISMS 23A-76-I
AXLE HUB
Front 26-7-II
Rear 27-5-II

B

BALL JOINT, Tie Rod End, Breakaway Torque Check . . . 37A-7-II
BALL JOINT SEALS, Maintenance 00-46-I
BASIC IDLE SPEED, Adjustment <1 5L Engine> 13A-143-I
<1 8L Engine> . 13B-144-I
BATTERY . . . . . 54-3 II
Charging 54 3-II
Check . 54-3-II, 35B-31-II
Testing Procedure 54-4-II
BLOWER 55-20-II
BODY Valve . . 23B-69-I
BOOSTER, Brake 35B-31-II
Operating Test . . . 35A-9-II
BOOTS, Drive Shaft, Maintenance 00-46-I
BRAKE
Low-reverse 23B 60-I
Rear Drum 35B-33-II
Second . . . . . 23B-61 I
BOOSTER 35B-31-II
Operating Test 35A-9-II
DISC, Front 35A-22-II
Run-out Correction . . 35A-15-II
Run-out Check 35A-15-II
Thickness Check . 35A-14-II
DRUM
Inside Diameter Check
<Vehicles with Rear Drum Brake> 35A-16-II, 35B-27 II
FLUID LEVEL SENSOR, Check 35A 11-II
HOSES, Maintenance 00-46-I
LINING, Thickness Check . 35A-16-II, 35B-26-II
LINING AND BRAKE DRUM, Contact Check 35A 17-II, 35B-27-II
PAD, Disc, Front, Check and Replacement . 35A-12-II
PEDAL 35A-18-II
Check and Adjustment 35A-8-II
ROTOR, Disc, Front, Check . 35A-14-II
BREAKAWAY TORQUE, Tie Rod End Ball Joint, Check 37A 7-II
BUMPER
Front 51-4-II
Rear . 51-7-II

C

CAMSHAFT <1 5L Engine> . . . 11A-23 I, 11B 22-I
<1 8L Engine> . . . 11C 20-I, 11D 24-I
OIL SEALS <1 5L Engine> 11A-23-I
<1 8L Engine> 11C-20-I
POSITION SENSOR, Check 16-38-I
CANISTER Evaporative Emission 17-48-I
CAP, Distributor, Maintenance . . . 00-34-I
CATALYTIC CONVERTER 17-46-I
CENTERMEMBER 32-7-II
CHARGING SYSTEM . 16-2-I
CHARGING 55-9-II
CHECK VALVE, Operation Check 35A-10-II
CIGARETTE LIGHTER . . 54 50-II
CIRCUIT DIAGRAM . . 52B-8-II
CLOCK SPRING . . 52B-27-II
CLOCK 54-51-II
CLOSED THROTTLE POSITION SWITCH
Adjustment <1 5L Engine> . . . . . 13A-141 I
<1 8L Engine> . 13B-142 I
Check <1 5L Engine> 13A-153-I
<1 8L Engine> 13A-149-I
CLUTCH HOUSING 22B 54-I
CLUTCH . . 21B-3-I
Overdrive . . . 23B-55-I
Reverse . . 23B-55-I
Underdrive 23B-52-I
CONTROL . . 21A-9-I
PEDAL . . . . . 21A 8 I
Check and Adjustment . . . 21A-5-I
RELEASE CYLINDER . . . 21B-7-I
COIL, Ignition, Check <1 5L Engine> . . . 16-35-I
<1 8L Engine> . . . 16-36-I
COMBINATION METERS 54-21-II
COMPONENT LOCATION . . . 52B 10-II
COMPRESSION PRESSURE, Check
<1 5L Engine> . . 11A-14-I
<1 8L Engine> . 11C-11-I
COMPRESSOR 55-24-II
DRIVE BELT, Adjustment . . 55-8-II
NOISE, Check . . 55-14-II
CONDENSER 55-31-II
FAN MOTOR 55-31-II
CONFIGURATION DIAGRAMS . 52B-7-II
CONNECTING ROD <1 5L Engine> 11B-38 I
<1 8L Engine> 11D-42-I
CONSOLE, Floor . . . . . 52A-11 II
CONSTRUCTION DIAGRAM 52B-3-II
CONTROL HOUSING 22B-51-I
CONTROL LINK 34-6-II
CONTROL SYSTEM
Evaporative Emission . 17-37-I
Purge, Check 17-38-I
CONTROL UNIT, SRS AIR BAG (SRS ECU) 52B-26-II
COOLANT, Engine
Concentration Test 14-5-I
Replacement 14-5-I
Maintenance . . . . . 00-44 I
Leak Check 14-5-I
CRANKCASE VENTILATION SYSTEM, Check . . 17-36-I

CRANKSHAFT <1 5L Engine> ... 11B-46-I
<1 8L Engine> 11D-50-I
OIL SEAL <1 5L Engine> 11A-26-I
<1 8L Engine> 11C-24-I
POSITION SENSOR 16-50-I
Check 16-38-I
PULLEY <1 5L Engine> 11A-22-I
<1 8L Engine> 11C-19-I
CROSSMEMBER 32-8 II
CURB IDLE SPEED, Check <1 5L Engine> 11A-12-I
<1 8L Engine> 11C-9-I
CYLINDER BLOCK <1 5L Engine> 11B-46-I
<1 8L Engine> 11D 50-I
CYLINDER HEAD <1 5L Engine> 11B-27-I
<1 8L Engine> 11D-30-I
GASKET <1 5L Engine> 11A-28-I
<1 8L Engine> 11C-27-I
CYLINDER VALVES <1 5L Engine> 11B-27-I
<1 8L Engine> 11D-30-I

D

DEFOGGER Rear Window 54-68-II
DIFFERENTIAL 23B-66-I
DIFFERENTIAL 22B 59-I
DISC BRAKE
Front 35A-22-II
Front, Thickness Check 35A-14-II
Front, Run-out Correction 35A 15-II
PADS, Maintenance 00-45-I
DISTRIBUTOR
<1 5L Engine> 16-49-I
CAP, Maintenance 00-34-I
ROTOR Maintenance 00-34 I
DOOR OPENING WEATHERSTRIP 42-41-II
DOOR 42 30-II
GLASS 42-34-II
HANDLE 42-37-II
LATCH 42 37-II
MIRROR 51-20 II
REGULATOR 42-34-II
TRIM 42-32-II
DRIVE BELT
Maintenance 00-35-I
TENSION
Adjustment <1 5L Engine> 11A-8-I
<1 8L Engine> 11C-6-I
Check <1 5L Engine> 11A-8-I
<1 8L Engine> 11C-6-I
Compressor, Adjustment 55-8-II
Power Steering, Check 37A-8-II
OIL SEAL 23B-74-I
DRIVE GEAR, Transfer 23B-64-I
DRIVE SHAFT 26-12 II
BOOTS, Maintenance 00-46-I
DRUM AND LINING, Brake, Contact Check
<Basic Brakes> 35A-17-II
<ABS> 35B-27-II
DRUM BRAKE, Rear <Basic Brakes> 35A 29-II
<ABS> 35B-33-II
DUAL PRESSURE SWITCH, Check 55-8-II

E

EGR
PORT VACUUM, Check 17-44-I
SOLENOID, Check 17-44-I
<1 5L Engine> 13A-157-I
<1 8L Engine> 13A-152-I
SYSTEM Check 17-42-I
VALVE Check 17-43-I
ELEMENT, Air Cleaner, Maintenance 00-32-I
ENGINE <1 5L Engine> 11A-18-I
<1 8L Engine> 11C-15 I
COOLANT
Concentration Test 14 5-I
Leak Check 14-5-I
Maintenance 00 44-I
Replacement 14-5-I
COOLANT TEMPERATURE GAUGE SIMPLE, Check 54-19-II
COOLANT TEMPERATURE GAUGE UNIT, Check 54-20-II
COOLANT TEMPERATURE SENSOR 17-40-I
Check <1 5L Engine> 13A-152 I
<1 8L Engine> 13B-148-I
MOUNTING 32 4-II
OIL
Inspection 12 3 I
Maintenance 00-39-I
Replacement 12-3-I
OIL FILTER Maintenance 00-40-I
ROLL STOPPER 32-7-II
EVAPORATIVE EMISSION
CANISTER 17-48-I
CONTROL SYSTEM 17-37-I
Maintenance 00-33 I
PURGE SOLENOID, Check 17-39-I
<1 5L Engine> 13A-157-I
<1 8L Engine> 13B-152-I
VENTILATION SOLENOID 17 48 I
EVAPORATOR 55-22-II
EXHAUST
GAS RECIRCULATION (EGR) SYSTEM 17-41-I
MANIFOLD 15 6-I
<1 5L Engine> 11B-21 I
<1 8L Engine> 11D-19-I
PIPE 15-8-I
SYSTEM, Maintenance 00-51-I

F

FAN MOTOR, Condenser 55-31-II
FENDER 42-8-II
FILLER DOOR, Fuel 42-9-II
FILTER, Engine Oil Maintenance 00-40-I
FIXED SAS, Adjustment <1 5L Engine> 13A-143-I
<1 8L Engine> 13B-143-I
FLOOR CONSOLE 52A-11-II
FOG LIGHT 54-39 II
Aiming 54-36-II
LIGHT BULB, Replacement 54-38-II
FRONT AXLE HUB 26-7-II
FRONT BUMPER 51-4-II
FRONT DISC BRAKE 35A-22-II
Thickness Check 35A-14-II
PAD, Check and Replacement 35A-12-II
ROTOR, Check 35A-14-II
RUN-OUT Check 35A-15-II
RUN-OUT Correction 35A 15-II
FRONT SEAT 52A-20-II
FRONT SEAT BELT 52A-25-II
FRONT TURN-SIGNAL LIGHT 54-33-II
FRONT WHEEL ALIGNMENT, Check and Adjustment 33A-4-II
FUEL
FILLER DOOR 42-9-II
GAUGE SIMPLE, Check 54-18-II
GAUGE UNIT, Check 54-18-II
HOSES 00-32-I
PRESSURE TEST <1.5L Engine> 13A-144-I

<1 8L Engine> . ... 13B-144 I
PUMP CONNECTOR, Disconnection <1 5L Engine> 13A-147-I
<1 8L Engine> 13B-144-I
PUMP, Operation Check <1 5L Engine> . 13A 147-I
<1 8L Engine> 13B-144-I
PUMP RELAY Continuity Check <1 5L Engine> 13A-152-I
<1 8L Engine> 13B-148-I
SYSTEM, Maintenance 00-32-I
TANK 13C-3-I
FUEL AND EMISSION CONTROL SYSTEM
<1 5L Engine> 11B-17-I
<1 8L Engine> . 11D-17-I

G

GARNISHES 51-10-II
GEAR BOX Manual Steering . 37A-15-II
GENERATOR .. 16 13-I
<1 5L Engine> . . 11B-10-I
<1 8L Engine> 11D 10-I
OUTPUT LINE VOLTAGE DROP, Test . 16-6-I
GLASS
Door .. . 42-34-II
Window . . .. 42 11 II
GUARD, Stone 51-12-II

H

HANDLE, Door 42-37-II
HAZARD WARNING LIGHT SWITCH 54-48-II
HEADLIGHT . . 54-33-II
Aiming with Gauges 54-28-II
Aiming with Screen 54-30-II
BULB, Replacement . .. . 54 32 II
HEADLINING 52A 17 II
HEATED OXYGEN SENSOR, Check <1 5L Engine> 13A-154-I
<1 8L Engine> 13B-150-I
HEATER
CONTROL 55-16-II
CORE . 55-19 II
UNIT . 55-19-II
HIGH MOUNTED STOP LIGHT 54-44-II
HOOD . . 42-3-II
HORN 54-49-II
HOUSING
Control 22B-51-I
Clutch 22B-54-I
HUB BOLT, Replacement <Front Axle> 26-5-II
<Rear Axle> 27-4-II
HUB END PLAY Check . . 26-5-II
HYDRAULIC CIRCUIT 23A-64-I
HYDRAULIC PRESSURE, Test . . 23A-59-I
HYDRAULIC UNIT . .. 35B-37-II
Check 35B-28-II

I

IDLE AIR CONTROL MOTOR (Stepper Motor), Check
<1 5L Engine> 13A-156-I
<1 8L Engine> 13B 152-I
IDLE MIXTURE, Check <1 5L Engine> 11A-13-I
<1 8L Engine> 11C-10-I
IDLE SPEED, Curb, Check <1 5L Engine> 11A 12-I
<1 8L Engine> .. 11C-9-I
IDLE-UP OPERATION, Check 55-15-II
IGNITION
CABLES, Maintenance 00-33-I
COIL, Check <1 5L Engine> 16-35-I
<1 8L Engine> 16-36-I
FAILURE SENSOR, Check <1 8L Engine> 16-37-I
POWER TRANSISTOR CONTINUITY, Check
<1 5L Engine> .. 16-36-I
PRIMARY VOLTAGE WAVEFORM, Check 16-43-I
SECONDARY VOLTAGE WAVEFORM, Check 16-38-I
SWITCH . . 54-10-II
SYSTEM <1 5L Engine> . 11B 10-I 16 47-I
<1 8L Engine> 11D 10-I, 16-48-I
TIMING, Check <1 5L Engine> 11A-12-I
<1 8L Engine> . . 11C-9-I
INJECTOR <1 5L Engine> . 13A-158-I
<1 8L Engine> 13B-153-I
Check <1 5L Engine> 13A-155-I
<1 8L Engine> 13B-152-I
INPUT SHAFT <A/T> 23B 52-I
<M/T> 22B-26-I
INSIDE REAR VIEW MIRROR 52A-19-II
INSTRUMENT PANEL 52A-8-II
INTAKE
AIR TEMPERATURE SENSOR . . 17-40-I
Check <1 5L Engine> 13A-152 I
<1 8L Engine> 13B-148-I
MANIFOLD . 15 3-I
<1 5L Engine> 11B-21-I
<1 8L Engine> ... 11D 19 I
Vacuum Check 15-2-I
INTERIOR LIGHT . . . 54-46-II
INTERLOCK SWITCH
Check and Adjustment 21A-7-I
Operating Check . 21A-6-I

K

KEY INTERLOCK MECHANISM, Check . 23A-71-I

L

LASH ADJUSTER Check . 11A 16-I, 11C-13-I
LATCH Door 42-37-II
LID, Trunk 42-5-II
LIGHT
Fog 54-39-II
Front Turn signal . 54 33-II
High Mounted Stop . . 54-44-II
Interior . 54-46-II
Rear Combination 54-43-II
LINE PRESSURE, Adjustment 23A 70-I
LINING AND DRUM, Brake, Contact Check
<Basic Brakes> 35A-17-II
<ABS> 35B-27-II
LOW-REVERSE BRAKE 23B-60-I
LOWER ARM
<Front Suspension> 33A-9-II
<Rear Suspension> 34-6-II
LUMINOUS INTENSITY, Measurement 54-32-II

M

MAGNETIC CLUTCH, Test 55-7-II
MAIN MUFFLER . ... 15 8 I
MAINTENANCE, SRS 52B 22-II
MANUAL TRANSAXLE, Maintenance 00-41-I
MANUAL STEERING GEAR BOX 37A-15-II
MARKS . 51-19-II
MASTER CYLINDER <Basic Brakes> 35A-19-II
<ABS> . 35B 31-II
METERS, Combination .. . 54 21 II
MIRROR

Door . . . 51-20-II
Rear View, Inside 52A-19-II
MOLDINGS 51-11-II
MUFFLER, Main . . . 15-8-I
MULTIPORT FUEL INJECTION RELAY, Continuity Check
<1 5L Engine> 13A-152-I
<1 8L Engine> 13B 148 I

O

OIL FILTER
Engine Maintenance 00-40-I
Replacement . 12 4-I
OIL LEVEL, Transmission, Check . . 22A-7-I
OIL PAN <1 5L Engine> 11A-25-I, 11B 34-I
<1 8L Engine> 11C-22-I, 11D-37-I
OIL PUMP <1 5L Engine> . . . 11B-34-I
<1 8L Engine> 11D-37-I
<A/T> . 23B-51-I
Power Steering 37A-33-II
Pressure Test 37A 10-II
OUTPUT SHAFT <M/T> . . 22B-36-I
<A/T> 23B-62-I
OUTPUT CURRENT, Test . 16-7-I
OVERDRIVE CLUTCH . . . 23B-55-I
OVERDRIVE PLANETARY CARRIER 23B-59-I

P

PARKING BRAKE
CABLE . 36-6-II
LEVER . . 36-5-II
SWITCH, Check 36 4 II
LEVER, Stroke Check . . . 36-3-II
PISTON <1 5L Engine> . . . 11B-38-I
<1 8L Engine> . . . 11D-42-I
POSITIVE CRANKCASE VENTILATION
SYSTEM . . 17-35-I
VALVE Check . . . 17-36-I
POST-COLLISION DIAGNOSIS . . . 52B-22-II
POWER STEERING
FLUID, Level Check . . 37A-8-II
FLUID, Replacement 37A-8-II
GEAR BOX 37A-22-II
HOSES 37A-38-II
OIL PUMP . . . 37A-33-II
PRESSURE SWITCH, Check . . . 37A-11-II
POWER RELAY, A/C, Check 55-15-II
PRINTED-HEATER LINE, Check . . . 54-68-II
PROPORTIONING VALVE <ABS> . 35B-36-II
<Basic Brakes> 35A-32-II
Function Test 35A-10-II
PURGE CONTROL SYSTEM, Check 17-38-I
PURGE PORT VACUUM, Check 17-39-I

Q

QUARTER WINDOW GLASS <2-door Models> 42-17-II

R

RADIATOR 14-6-I
CAP VALVE, Opening Pressure Check . . . 14-5-I
GRILLE 51-9-II
RADIO 54-65-II
REAR AXLE HUB 27-5-II
REAR BUMPER 51-7-II
REAR COMBINATION LIGHT 54-43-II
REAR DRUM BRAKE <Basic Brakes> 35A-29-II
<ABS> 35B-33-II
LININGS Maintenance . . 00-45 I
WHEEL CYLINDER 35A-31-II
REAR HUB Rotary-Sliding Resistance Check 27-3-II
REAR SEAT 52A-22-II
REAR SEAT BELT . . . 52A 26-II
REAR VIEW MIRROR, Inside . . 52A-19-II
REAR WHEEL ALIGNMENT Check and Adjustment . 34-4 II
REAR WHEEL CYLINDERS, Maintenance 00-45-I
REAR WINDOW DEFOGGER . . 54-68 II
SWITCH 54-69-II
REAR WINDOW GLASS . . . . . 42-19 II
RECEIVER DRIER, Test . . 55-7-II
REFRIGERANT
Leak Repair 55-14-II
LINE . . 55-29-II
REGULATED VOLTAGE, Test 16-9 I
REGULATOR, Door . . 42-34-II
RELAY
ABS Motor, Continuity Check 35B-30-II
ABS Valve Continuity Check 35B-30-II
Fuel Pump, Continuity Check Refer to F
Multiport Fuel Injection, Continuity Check . . . . . Refer to M
Power, Check 55-15-II
Starter, Continuity Check . . . . . 16 21 I
RESISTOR . 55-20-II
REVERSE CLUTCH . . . 23B-55-I
REVERSE IDLER GEAR <F5M42> . . . 22B-48-I
RHEOSTAT 54-47-II
ROCKER ARMS <1 5L Engine> 11B-22-I
<1 8L Engine> . . 11D-24-I
ROLL STOPPER Engine 32-7-II
ROTARY-SLIDING RESISTANCE, Rear Hub, Check . 27-3-II
ROTOR
Disc Brake, Front Check 35A-14-II
Distributor, Maintenance 00-34-I
RUNCHANNEL, Window Glass 42-41-II

S

SCHEMATIC, SRS 52B-6-II
SEAT
Front 52A-20-II
Rear 52A-22-II
SEAT BELT
Front 52A 25-II
Rear 52A-26-II
SECOND BRAKE 23B-61-I
SELECT LEVER . . . 22B-50-I
SELECTOR LEVER, Operation Check 23A-70-I
SENSOR
Brake Fluid Level, Check 35A-11-II
Camshaft Position, Check 16-38-I
Crankshaft Position . . . 16 50 I
Crankshaft Position Check 16-38-I
Engine Coolant Temperature . . . 17-40-I
Engine Coolant Temperature, Check . . Refer to E
Heated Oxygen, Check Refer to H
Ignition Failure Check <1 8L Engine> 16-37-I
Intake Air Temperature . . 17-40-I
Intake Air Temperature Check Refer to I
Throttle Position, Adjustment . . . . . Refer to T
Throttle Position, Check . Refer to T
Volume Air Flow 17-40-I
Wheel Speed, Output Voltage Check 35B-27-II
WHEEL SPEED . . 35B-38-II
SHIFT LOCK MECHANISM, Check . . . 23A-71-I
SHIFT LEVER 22A-10-I
SIGHT GLASS REFRIGERANT, Level Test 55-7-II

SOLENOID
EGR, Check . Refer to E
Evaporative Emission Purge, Check . . Refer to E
VALVE, Check . . . 35B-30-II
SPARK PLUG
Check and Cleaning . 16-37-I
Maintenance 00-33-I
Test 16-35-I
CABLE
Resistance Check 16-37-I
Test . . 16-35-I
SPEAKER . . 54-66-II
SPEEDOMETER
Check . . . 54-17-II
<M/T> 22B-49-I
<A/T> 23B-73-I
SRS
Maintenance . . 00-47 I
AIR BAG CONTROL UNIT (SRS-ECU) . 52B-26-II
MAINTENANCE 52B-22-II
SERVICE PRECAUTIONS . . 52B-10-II
TEST EQUIPMENT . 52B-12-II
STABILIZER BAR . 33A-12-II
STARTER
MOTOR 16-22-I
RELAY, Continuity Check . . 16-21-I
STARTING SYSTEM . . 16-19-I
STATIONARY STEERING EFFORT Check . . 37A-7-II
STEERING
Stationary Effort Check 37A-7-II
ANGLE, Check 37A-6-II
SHAFT 37A-12-II
LINKAGE SEALS, Maintenance . . . 00 46-I
WHEEL 37A-12-II
Angle Check . . 37A-6-II
Free Play Check 37A-6-II
Return to Center Check 37A-7-II
STONE GUARD 51-12-II
STOP LIGHT SWITCH, Check 35A-9-II
STRUT <Front Suspension> 33A-6-II
<Rear Suspension> . . 34-11-II
SUNROOF 42-48 II
SWITCH
A/C 55 16-II
Air Conditioning, Check 17-40-I
Closed Throttle Position, Adjustment . . . Refer to C
Closed Throttle Position, Check . . Refer to C
Defogger, Rear Window 54-68-II
Dual Pressure, Check 55-8-II
Hazard Warning Light . . 54-48-II
Ignition 54-10-II
Parking Brake, Check 36-4-II
Power Steering Pressure, Check 37A-11-II
Stop Light, Check . . . 35A-9-II

T

TACHOMETER, Check . . 54-17-II
TAPE PLAYER 54-65-II
TENSION PULLEY 55-24-II
THERMOSTAT . 14 9-I
THROTTLE POSITION SENSOR
Adjustment <1 5L Engine> 13A-141-I
<1 8L Engine> 13B-142-I
Check <1 5L Engine> 13A-153-I
<1 8L Engine> . . 13B-148-I
THROTTLE BODY
<1 5L Engine> . 13A-160-I
<1 8L Engine> 13B-155-I
THROTTLE BODY (THROTTLE VALVE AREA), Cleaning
<1 5L Engine> 13A-141-I
<1 8L Engine> 13B-142-I
TIE ROD END BALL JOINT Breakaway Torque Check 37A-7-II
TIMING BELT <1 5L Engine> 11A-32-I, 11B 12-I
<1 8L Engine> . 11C-31-I, 11D-12-I
Maintenance . . 00-34-I
TENSION, Adjustment <1 5L Engine> . 11A-15-I
<1 8L Engine> 11C-12-I
TIRE . . . 31-5-II
Wear Check . 31-5-II
INFLATION PRESSURE, Check . . . . . 31 5 II
TORQUE CONVERTER, Stall Test 23A-58-I
TRAILING ARM 34-8-II
TRANSAXLE
Manual, Maintenance 00-41-I
Automatic, Maintenance 00-41-I
<M/T> . 22A-11-I, 22B-11-I
<A/T> . 23A-78-I, 23B-16 I
CASE 22B-57-I
CONTROL <M/T> 22A-8-I
<A/T> . 23A-73-I
MOUNTING 32-5-II
TRANSFER
DRIVE GEAR 23B-64-I
TRANSMISSION OIL
Replacement 22A-7-I
LEVEL, Check . . 22A-7-I
TRIM, Door . 42-32 II
TRIMS 52A-13-II
TRUNK LID . 42-5-II

U

UNDER COVER . . . 42-55-II
UNDERDRIVE CLUTCH . . . 23B-52-I
UPPER LINK 34-6-II

V

VACUUM
EGR Port, Check 17-44-I
Manifold, Check <1 5L Engine> 11A-15-I
<1 8L Engine> 11C-12-I
Purge Port, Check 17-39-I
CIRCUIT DIAGRAM . 17-33-I
CONTROL VALVE, Check 17-43-I
HOSES 17-31-I
Check . 17-35-I
Installation 17-35-I
Routing 17-31-I
VALVE BODY 23B-69-I
VENTILATORS 55-33-II
VOLUME AIR FLOW SENSOR 17-40-I

W

WARNING/CAUTION LABELS . . 52B-4-II
WASHER, Windshield 51-16-II
WATER HOSE <1 5L Engine> . . 11B-19-I, 14-13-I
<1 8L Engine> 11D-21-I, 14-15-I
WATER PIPE <1 5L Engine> 14-13-I
<1 8L Engine> 14-15-I
WATER PUMP <1 5L Engine> 11B-19-I, 14-11-I
<1 8L Engine> 11D-21 I, 14-12-I
WATERPROOF FILM 42-32-II
WAVEFORM
Check using analyzer 16-11 I
Ignition Primary Voltage, Check 16-43-I

Ignition Secondary Voltage, Check 16-38-I
WEATHERSTRIP, Door Opening 42-41-II
WHEEL 31-5-II
Runout Check 31-5-II
ALIGNMENT
Front, Check and Adjustment . . . 33A-4-II
Rear, Check and Adjustment 34-4-II
BEARING, End Play Check . . . . 27-3 II
CYLINDER 35B-35-II
Drum Brake, Rear 35A-31-II
SPEED SENSOR 35B-38-II
Output Voltage Check 35B-27-II
WINDOW GLASS 42-11-II
RUNCHANNEL 42-41-II
WINDSHIELD 42-13-II
WASHER 51-16-II
WIPER 51-16-II
WIPER, Windshield 51-16-II

MITSUBISHI MOTORS

MIRAGE



SERVICE MANUAL

VOLUME 2

Service Manual

MIRAGE

1999
Volume 2

FOREWORD

This Service Manual has been prepared with the latest service information available at the time of publication. It is subdivided into various group categories and each section contains diagnostics, disassembly, repair, and installation procedures along with complete specifications and tightening references. Use of this manual will aid in properly performing any servicing necessary to maintain or restore the high levels of performance and reliability designed into these outstanding vehicles.



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GROUP INDEX

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Front Axle 26
Rear Axle 27
Wheel and Tire 31
Power Plant Mount 32
Front Suspension 33
Rear Suspension 34
Service Brakes 35
Parking Brakes 36
Steering 37
Body 42
Exterior 51
Interior and Supplemental Restraint System (SRS) 52
Chassis Electrical 54
Heater, Air Conditioning and Ventilation 55
Component Locations 70
Configuration Diagrams and Splice Locations 80
Circuit Diagrams 90
Alphabetical Index .....

NOTE:
For information on all service manual groups not listed above, please refer to Volume 1.

FRONT AXLE

CONTENTS

26109000096

AXLE HUB 7

DRIVE SHAFT 12

GENERAL INFORMATION 2

LUBRICANTS 2

ON-VEHICLE SERVICE 6

Hub Bolt Replacement 5

Hub End Play Check 5

SERVICE SPECIFICATIONS 2

SPECIAL TOOLS 3

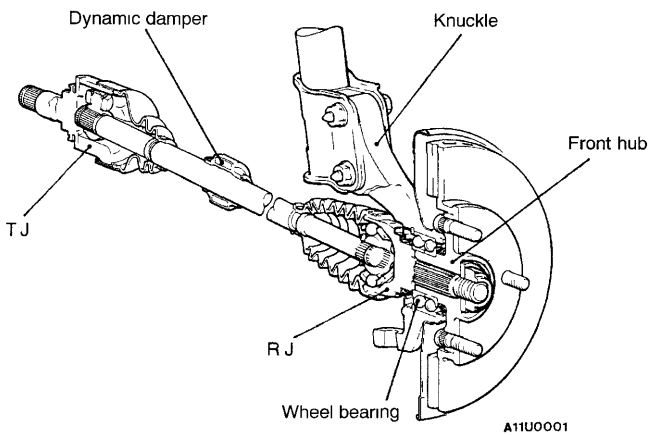
TROUBLESHOOTING 5

GENERAL INFORMATION

26100010104

The wheel bearing and front hub are press-fitted in the axle housing portion of the knuckle to support the drive shaft. In addition, the drive shaft uses R.J. - T.J.-type constant velocity joints to improve power transmission efficiency and to reduce vibration or noise.

CONSTRUCTION DIAGRAM



NOTE
R.J.: Rzeppa Joint
T.J.: Tripod Joint

SERVICE SPECIFICATIONS

26100030124

Items		Standard value	Limit
Hub end play mm (in.)		-	0.05 (.0020)
Wheel bearing breakaway torque Nm (in. lbs.)		-	1 8 (15 62) or less
Setting of T.J. boot length mm (in.)		85±3 (3.35 ± .12)	-
Opening dimension of the special tool (MB991561) mm (in.)	When the R.J. boot band (small) is crimped	1.6 (.063)	-
	When the R.J. boot band (large) is crimped	3.2 (.126)	-
Crimped width of the R.J. boot band mm (in.)		1.0 - 1.5 (.039 - .059)	-
Clearance between the R.J. boot (large diameter side) and the stepped phase of the R.J. housing mm (in.)		0.1 - 1.55 (.004 - .061)	-

LUBRICANTS

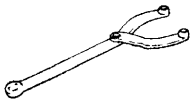
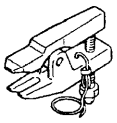
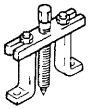
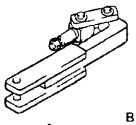
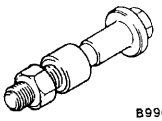
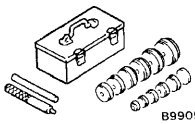
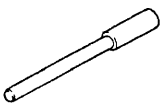
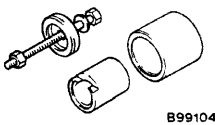
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Items	Quantity g (oz.)	Specified lubricant
T.J. boot grease	125 ± 10 (4.41 ± 0.35)	Repair kit grease
R.J. boot grease	110 ± 10 (3.88 ± 0.35)	Repair kit grease

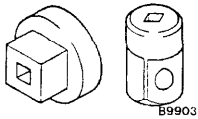
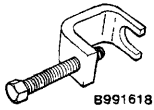
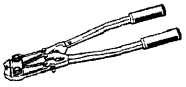
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SPECIAL TOOLS

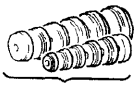
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Tool	Tool number and name	Supersession	Application
	MB990767 End yoke holder	MB990767-01	Hub fixing
 B991113	MB991113 or MB990635 Steering linkage puller	MB991113-01	• Lower arm ball joint and knuckle removal • Knuckle and tie rod end ball joint removal
 B990241	MB990241 Axle shaft puller	MB990241-01 or General service tool	Drive shaft removal
 B991056	MB991056 or MB991355 Knuckle arm bridge	MB991056-01	Hub removal
 B990998	MB990998 Front hub remover and installer	MB990998-01	• Removal of or pressing-in the hub • Provisional holding of the wheel bearing
 B990810	MB990810 Side bearing puller	General service tool	Wheel bearing inner race (outside) removal
 B990925	MB990925 Bearing and oil seal installer set	MB990925-01 or General service tool	Wheel bearing removal MB990932 MB990938
 B990883	MB990938 Rear suspension arbor	MB990883-01	Press-fitting of wheel bearing
 A B991045	MB9901045 A. MB991050 Bushing remover and installer	Tool nut available	Press-fitting of wheel bearing Use together with MB990883

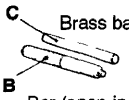
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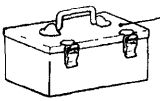
Tool	Tool number and name	Supersession	Application
 B991387	MB991387 Bushing remover and installer	Tool nut available	Press-fitting of the outer oil seal
 B990326	MB990326 Preload socket	General service tool	Wheel bearing breakaway torque measurement
 B991389	MB991389 Bushing remover base	MB991389-01	Press-fitting of the inner oil seal
 B991618	MB991618 Hub bolt remover		Hub bolt removal
	MB991561 Boot band crimping tool		Resin boot band installation

MB990925



A
Installation adapter





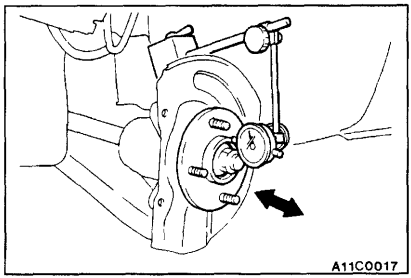
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Type	Tool number	O. D. mm (in.)	Type	Tool number	O.D mm (in.)
A	MB990926	39.0 (1.54)	A	MB990933	63.5 (2.50)
	MB990927	45.0 (1.77)		MB990934	67.5 (2.66)
	MB990928	49.5 (1.95)		MB990935	71.5 (2.81)
	MB990929	51.0 (2.00)		MB990936	75.5 (2.97)
	MB990930	54.0 (2.13)		MB990937	79.0 (3.11)
	MB990931	57.0 (2.24)	B	MB990938	-
	MB990932	61.0 (2.40)	C	MB990939	-

TROUBLESHOOTING

26100070010

Symptom	Probable cause	Remedy
Vehicle pulls to one side	Seizure of drive shaft ball joint	Replace
	Abnormal wear, play or seizure of wheel bearing	Replace
	Malfunction of front suspension or steering	Adjust or replace
Vibration	Bend, damage or abnormal wear of drive shaft	Replace
	Play in drive shaft and hub serration	Replace
	Abnormal wear, play or seizure of wheel bearing	Replace
Shimmy	Improper wheel alignment	Adjust or replace
	Malfunction of front suspension or steering	Adjust or replace
Excessive noise	Broken boot, grease leakage	Replace, repack grease
	Bend, damage or abnormal wear of drive shaft	Replace
	Play of drive shaft and hub serration	Replace
	Abnormal wear, play or seizure of wheel bearing	Replace
	Loose wheel nut	Retighten
	Malfunction of front suspension and steering	Adjust or replace



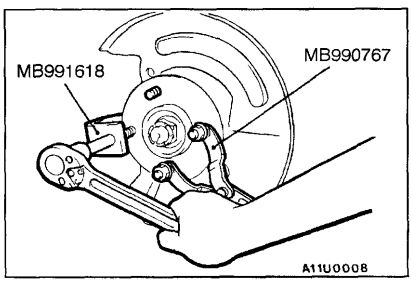
ON-VEHICLE SERVICE

26100090061

HUB END PLAY CHECK

1. Remove the disc brake caliper and suspend it with a wire.
2. Remove the brake disc from the front hub.
3. Attach a dial gauge as shown in the illustration, and then measure the end play while moving the hub in the axial direction.

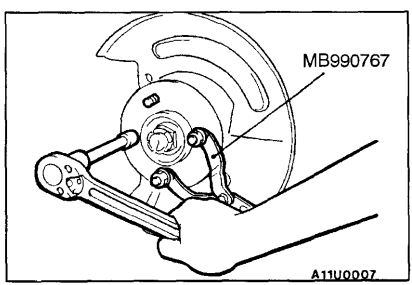
   Limit: 0.05 mm (.0020 in.)
4. If end play exceeds the limit, disassemble and check parts.



HUB BOLT REPLACEMENT

26100100061

1. Remove the caliper assembly and secure it with wire so that it does not fall.
2. Remove the brake disc
3. Use the special tools to remove the hub bolt.



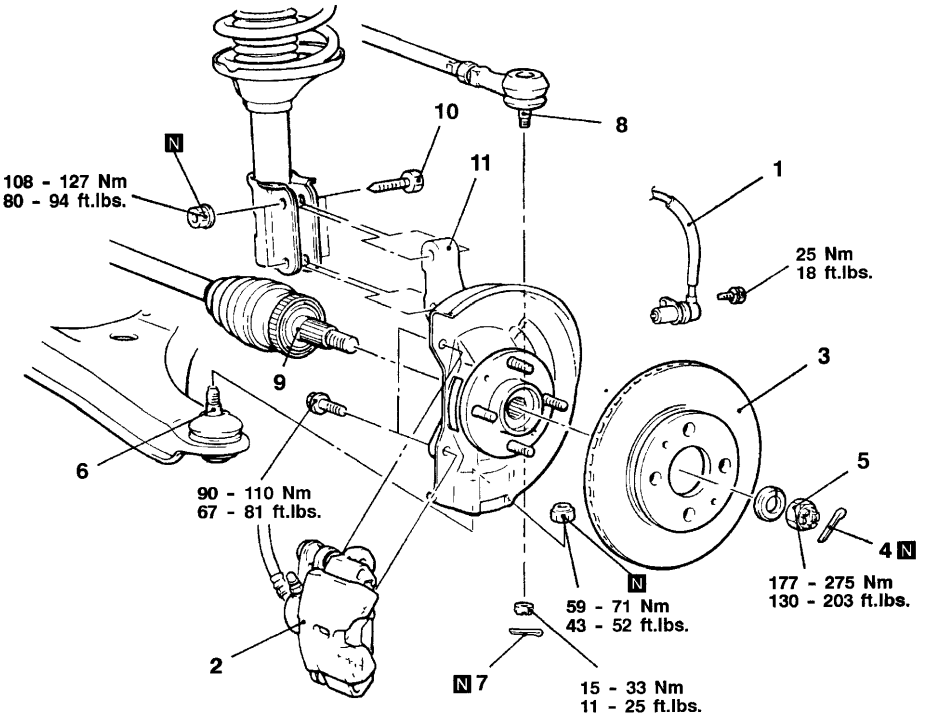
4. Use the wheel nuts to securely install the new hub bolts, while being careful of the serrations of the hub bolts and hub.

AXLE HUB

26100170116

REMOVAL AND INSTALLATION

Post-installation Operation
- Press the lower arm ball joint and tie rod end ball joint dust covers with a finger to check whether the dust covers are cracked or damaged.



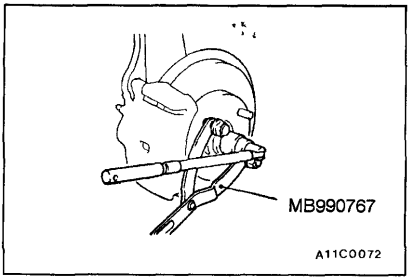
Removal steps

1. Front speed sensor <Vehicles with ABS>
◀A▶ 2. Caliper assembly
3. Brake disc
4. Cotter pin
◀B▶ ▶A◀ 5. Drive shaft nut
- Lower arm and stabilizer bar connection (Refer to GROUP 33A - Stabilizer Bar.)

◀C▶ 6 Lower arm ball joint connection
7. Cotter pin
◀C▶ 8 Tie rod end connection
9. Drive shaft
10. Front strut mounting bolt and nut
11 Hub and knuckle

Caution

1. **For vehicles with ABS, be careful when handling the pole piece at the tip of the speed sensor so as not to damage it by striking against other parts.**
2. **For vehicles with ABS, be careful not to damage the rotors installed to the R.J. outer race during removal and installation of the drive shaft.**

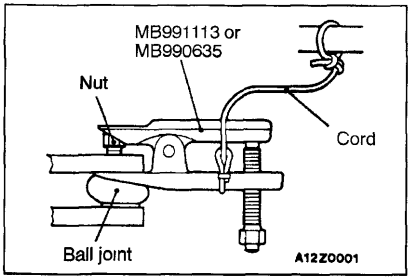


REMOVAL SERVICE POINTS

◀A▶ CALIPER ASSEMBLY REMOVAL

Secure the removed caliper assembly with wire, etc.

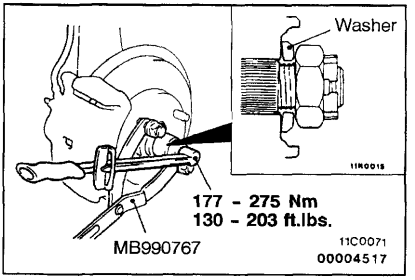
◀B▶ DRIVE SHAFT NUT REMOVAL



◀C▶ LOWER ARM BALL JOINT/TIE ROD END DISCONNECTION

Caution

1. **Using the special tool, loosen the tie rod end mounting nut. Only loosen the nut; do not remove it from the ball joint.**
2. **Support the special tool with a cord, etc. to prevent it from coming off.**



INSTALLATION SERVICE POINT

▶A◀ DRIVE SHAFT NUT INSTALLATION

(1) Be sure to install the drive shaft washer in the specified direction.

(2) Using the special tool, tighten the drive shaft nut.

Caution

Before securely tightening the drive shaft nuts, make sure there is no load on the wheel bearings.

INSPECTION

26100180089

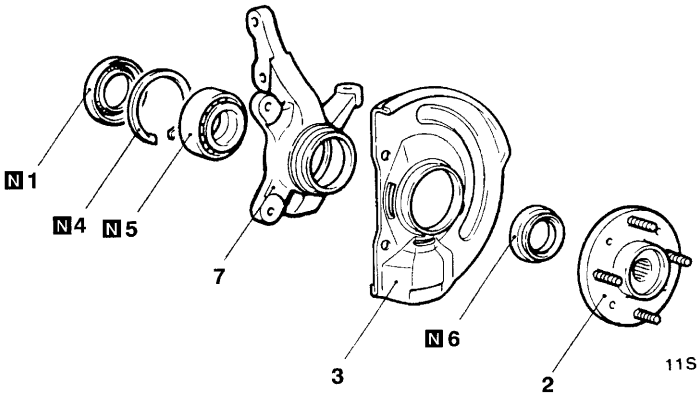
- Check the front hub and brake disc mounting surfaces for galling and contamination.
- Check the hub for cracks and spline for wear.
- Check the oil seal for damage.
- Check the knuckle for cracks.
- Check for defective bearing.

NOTE

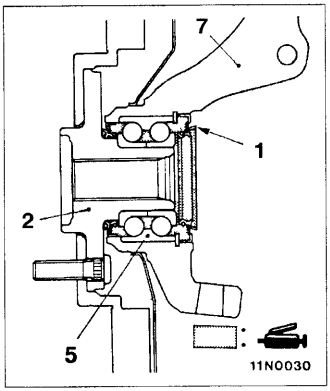
If the meshing of the wheel bearing outer race and the knuckle, or if the wheel bearing inner race and the hub, are loose, replace the bearing or damaged parts.

DISASSEMBLY AND REASSEMBLY

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11S0002



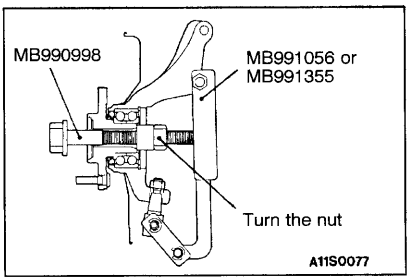
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Disassembly steps

1. Inner oil seal
◀A▶ 2. Hub
3. Dust cover
4. Snap ring
◀B▶ 5. Wheel bearing
6. Outer oil seal
7. Knuckle

Reassembly steps

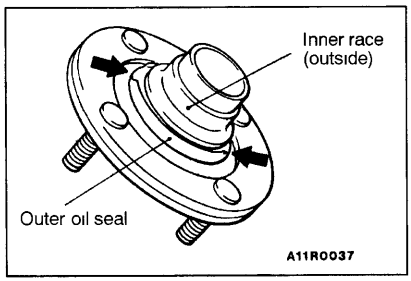
7. Knuckle
▶A◀ 5. Wheel bearing
4 Snap ring
▶B◀ 6 Outer oil seal
3. Dust cover
2. Hub
▶C◀ • Wheel bearing starting torque check
▶C◀ • Hub end play check
▶D◀ 1 Inner oil seal



DISASSEMBLY SERVICE POINTS

◀A▶ HUB REMOVAL

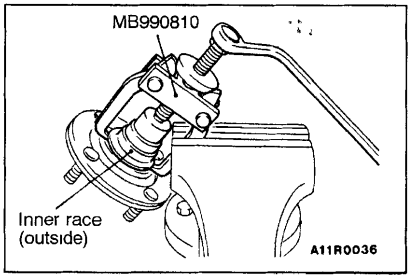
Caution
When removing the hub, always replace the wheel bearing with a new part.



◀B▶ WHEEL BEARING REMOVAL

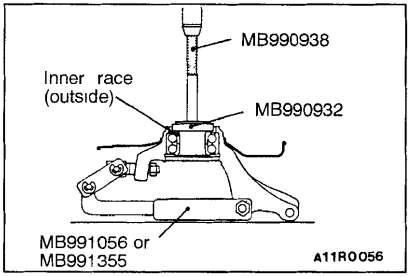
(1) Crush the oil seal in two places so that the tabs of the special tool will be caught on the wheel bearing inner race (outside).

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(2) Remove the wheel bearing inner race (outside) from the front hub by using the special tool.

Caution
When removing the inner race (outside) from the hub, be careful not to let the hub drop.



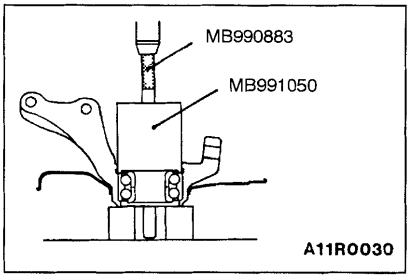
(3) Install the inner race (outside) that was removed from the hub to the wheel bearing, and then use the special tools to remove the wheel bearing.

REASSEMBLY SERVICE POINTS

▶A◀ WHEEL BEARING INSTALLATION

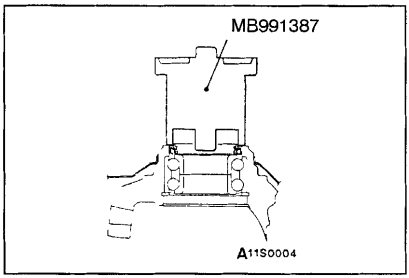
(1) Fill the wheel bearing with multipurpose grease.
(2) Apply a thin coating of multipurpose grease to the knuckle and bearing contact surfaces.
(3) Press-in the bearing by using the special tools.

Caution
Press the outer race when pressing-in the wheel bearing.



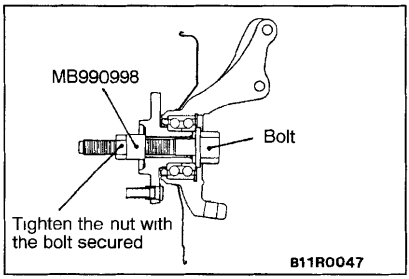
▶B◀ OUTER OIL SEAL INSTALLATION

(1) Drive the oil seal (hub side) into the knuckle by using the special tool until it is flush with the knuckle end surface.
(2) Apply multipurpose grease to the lip of the oil seal and to the surfaces of the oil seal which contact the front hub.

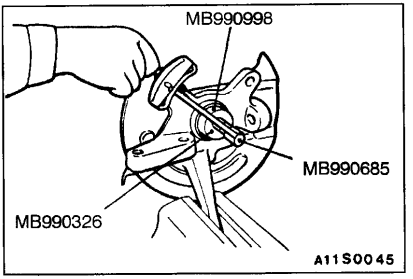


▶C◀ WHEEL BEARING BREAKAWAY TORQUE CHECK/HUB END PLAY CHECK

(1) Use the special tool to mount the hub onto the knuckle.
(2) Tighten the nut of the special tool to 177 - 275 Nm (130 - 203 ft.lbs.).
(3) Rotate the hub in order to seat the bearing.



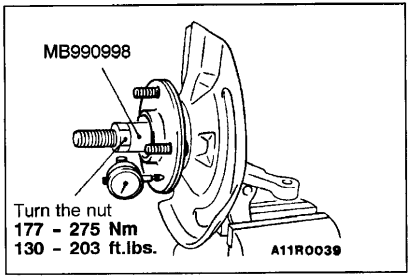
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(4) Measure the wheel bearing breakaway torque (hub breakaway torque) by using the special tools.

Limit: 1.8 Nm (15.62 in. lbs.) or less

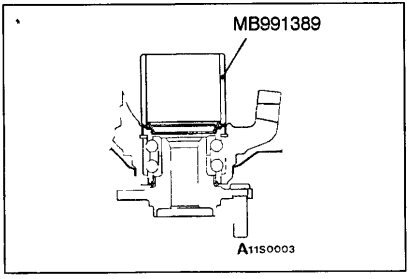
(5) The breakaway torque must be within the limit and, in addition, the bearing must not feel rough when rotated.



(6) Measure to determine whether the end play of the hub is within the specified limit or not.

Limit: 0.05 mm (.002 in.)

(7) If the breakaway torque and hub end play are not within the limit range while the nut is tightened to 177 - 275 Nm (130 - 203 ft.lbs.), the bearing, hub and/or knuckle have probably not been installed correctly. Remove the bearing and re-install.



▶D◀ INNER OIL SEAL INSTALLATION

(1) Apply multipurpose grease to the reverse side of the inner oil seal.
(2) Drive the inner oil seal into the knuckle until it contacts the snap ring.
(3) Apply multipurpose grease to the lip of the inner oil seal.

INSPECTION

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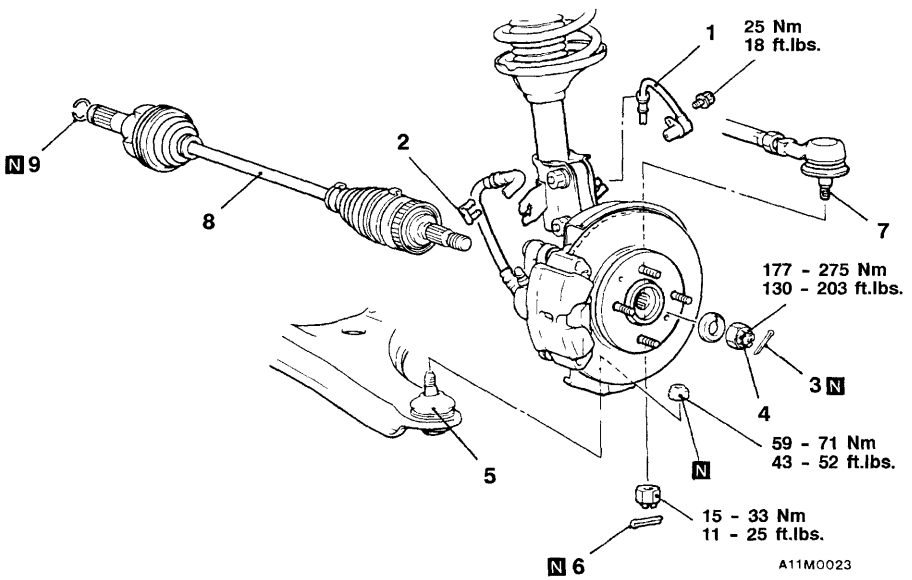
Check the knuckle inner surface for galling and cracks.

DRIVE SHAFT

26100350145

REMOVAL AND INSTALLATION

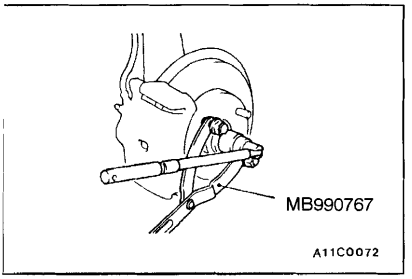
Post-installation Operation
- Press the lower arm ball joint and tie rod end ball joint dust covers with a finger to check whether the dust covers are cracked or damaged



Removal steps

1. Speed sensor cable connection <vehicles with ABS>
2. Brake hose clip
3. Cotter pin
◀A▶ ▶B◀ 4. Drive shaft nut
   - Lower arm and stabilizer bar connection (Refer to GROUP 33A - Stabilizer Bar)
◀B▶ 5. Lower arm ball joint connection
6. Cotter pin
◀B▶ 7. Tie rod end connection
◀C▶ ▶A◀ 8. Drive shaft
9. Circlip

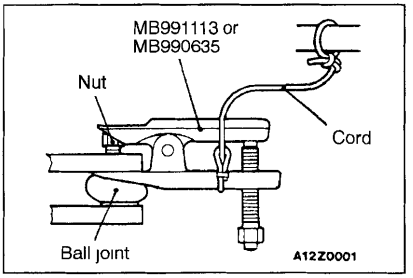
Caution
For vehicles with ABS, be careful when handling the pole piece at the tip of the speed sensor so as not to damage it by striking against other parts.



REMOVAL SERVICE POINTS

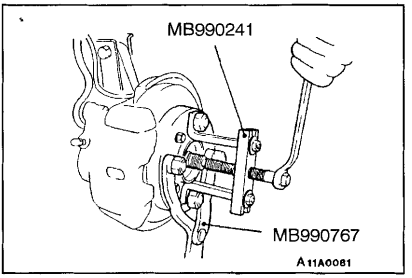
◀A▶ DRIVE SHAFT NUT REMOVAL

Caution
Do not apply the vehicle weight to the wheel bearing while loosening the drive shaft nut.



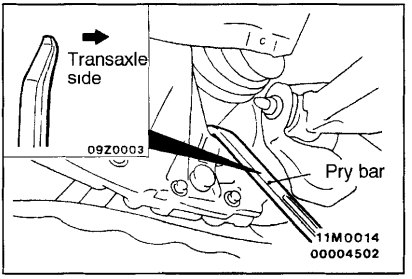
◀B▶ LOWER ARM BALL JOINT/TIE ROD END DISCONNECTION

Caution
1. **Using the special tool, loosen the tie rod end mounting nut. Only loosen the nut; do not remove it from the ball joint.**
2. **Support the special tool with a cord, etc. to prevent it from coming off.**



◀C▶ DRIVE SHAFT REMOVAL

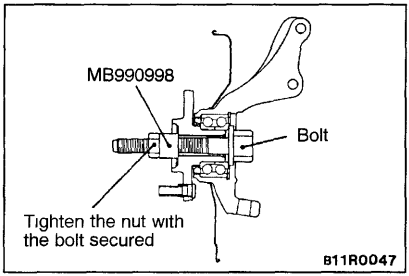
(1) Use the special tools to push out the drive shaft from the hub.



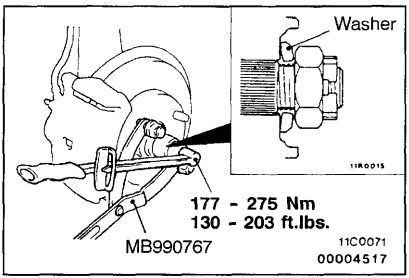
(2) Insert a pry bar between the transaxle case and the drive shaft as shown to remove the drive shaft.

Caution
1. **Do not pull on the drive shaft; doing so will damage the T.J.; be sure to use the pry bar.**
2. **Do not insert the pry bar so deep as to damage the oil seal.**
3. **Be careful not to damage the transaxle oil seal by the spline of the drive shaft.**
4. **Be careful not to damage the ABS rotor attached to the R.J. outer race <Vehicles with ABS>.**

(3) Cover the transaxle case with a shop towel to prevent foreign material from entering it.



Caution
Do not apply the vehicle weight to the wheel bearing while loosening the drive shaft nut. If, however, the vehicle weight must be applied to the bearing (in order to move the vehicle), temporarily secure the wheel bearing by using the special tool.



INSTALLATION SERVICE POINTS

▶A◀ DRIVE SHAFT INSTALLATION

Caution
1. **Be careful not to damage the transaxle oil seal by the spline of the drive shaft.**
2. **Be careful not to damage the ABS rotor attached to the R.J. outer race <Vehicles with ABS>.**

▶B◀ DRIVE SHAFT NUT INSTALLATION

(1) Be sure to install the drive shaft washer as shown.
(2) Using the special tool, tighten the drive shaft nut.

Caution
Before securely tightening the drive shaft nuts, make sure there is no load on the wheel bearings.

(3) If the position of the cotter pin holes does not match, tighten the nut up to 275 Nm (203 ft.lbs.) maximum.
(4) Install the cotter pin in the first matching holes and bend it securely.

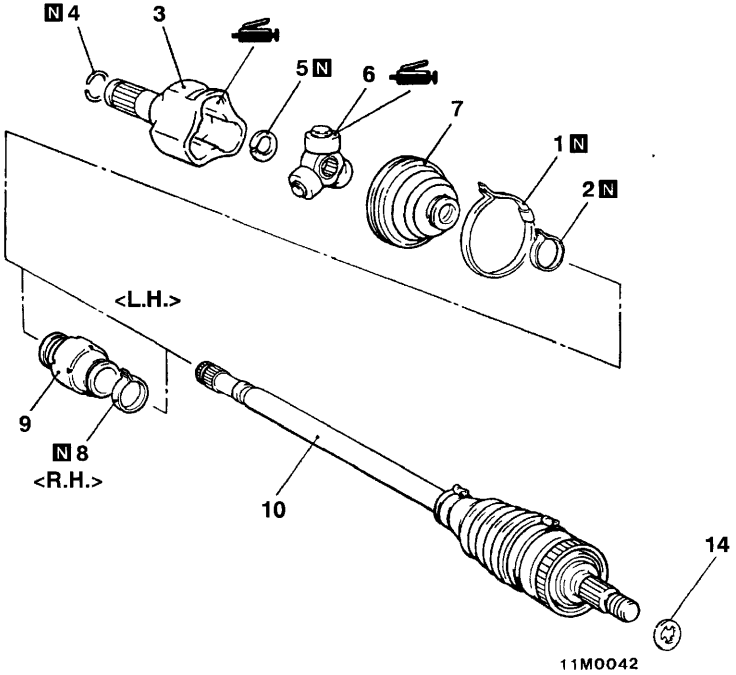
INSPECTION

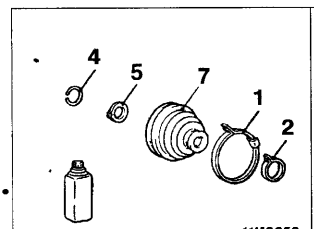
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- Check the drive shaft boot for damage or deterioration.
- Check the ball joints for excessive play or operating condition.
- Check the spline part for wear or damage.

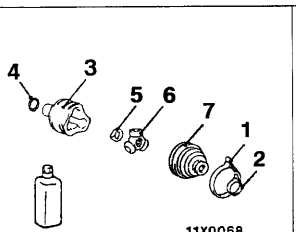
DISASSEMBLY AND REASSEMBLY

26100370301

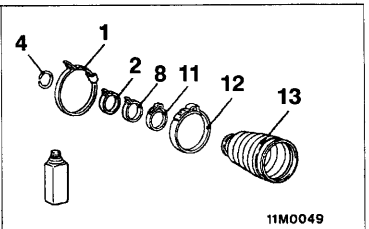




T.J. boot repair kit



T.J. repair kit



R.J. boot repair kit

00008646

Disassembly steps

- ▶C◀ 1. T.J. boot band (large)
- ▶C◀ 2. T.J. boot band (small)
- ◀A▶ ▶B◀ 3. T.J. case
- 4 Circlip
- 5. Snap ring
- ◀A▶ ▶B◀ 6. Spider assembly
- ◀B▶ ▶A◀ 7 T.J boot
- ▶A◀ 8. Damper band
- ▶A◀ 9. Dynamic damper
- 10. R.J. assembly
- 11. R.J. boot band (small)
- 12. R.J. boot band (large)
- 13. R.J. boot
- 14. Front axle shim

Caution

1. **Never disassemble the R.J. assembly except when replacing the R.J. boot.**
2. **On vehicles with ABS, be sure not to damage the rotor attached to the R.J. outer race.**

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DISASSEMBLY SERVICE POINTS

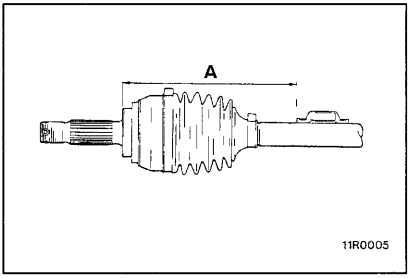
◀A▶ T.J. CASE/SPIDER ASSEMBLY REMOVAL

(1) Wipe off grease from the spider assembly and the inside of the T.J. case.
(2) Always clean the spider assembly when the grease contains water or foreign material.

Caution
1. Do not disassemble the spider assembly.
2. Use care in handling so as not to damage the drive shaft.

◀B▶ T.J. BOOT REMOVAL

(1) Wipe off grease from the shaft spline.
(2) When reusing the T.J. boot, wrap plastic tape around the shaft spline to avoid damaging the boot.

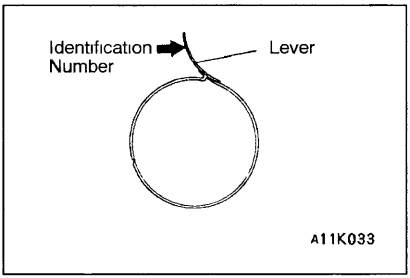


REASSEMBLY SERVICE POINTS

▶A◀ DYNAMIC DAMPER/DAMPER BAND/T.J. BOOT INSTALLATION

(1) Install the dynamic damper in the position shown in the illustration.

Items	A mm (in.)
1.5L (R.H.)	441 ± 3 (17.36 ± .12)
1.8L (R.H.)	381±3 (15.00 ± .12)

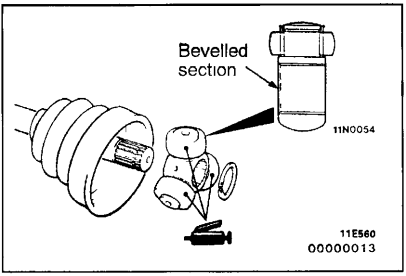


(2) Secure the damper bands.

Caution
1. There should be no grease adhered to the rubber part of the dynamic damper.
2. The damper band and T.J. boot band are identified by the identification number stamped on the lever. Take good care to install the correct one.

Items	Identification number
Damper band	31.3
T.J. boot band	33

(3) Wrap plastic tape around the shaft spline, and then install the T.J. boot band (small) and T.J. boot.

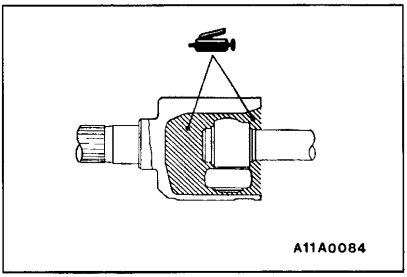


▶B◀ SPIDER ASSEMBLY/T.J. CASE INSTALLATION

(1) Apply the specified grease furnished in the repair kit to the spider assembly between the spider axle and the roller.

Specified grease: Repair kit grease

Caution
1. **The drive shaft joint uses special grease. Do not mix old and new or different types of grease.**
2. **If the spider assembly has been cleaned, take special care to apply the specified grease.**



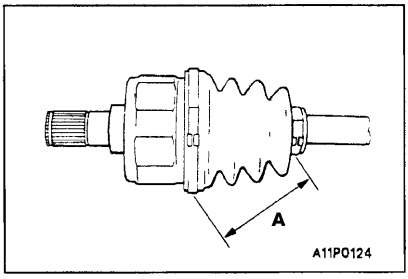
(2) Install the spider assembly to the shaft from the direction of the spline bevelled section.
(3) After applying the specified grease to the T.J. case, insert the drive shaft and apply grease one more time.

Specified grease: Repair kit grease

Amount to use: 125 ± 10 g (4.41 ± 0.35 oz.)

NOTE
The grease in the repair kit should be divided in half for use, respectively, at the joint and inside the boot.

Caution
The drive shaft joint uses special grease. Do not mix old and new or different types of grease.



▶C◀ T.J. BOOT BAND (SMALL)/T.J. BOOT BAND (LARGE) INSTALLATION

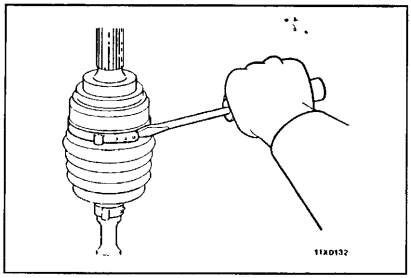
Set the T.J. boot bands at the specified distance in order to adjust the amount of air inside the T.J. boot, and then tighten the T.J. boot bands securely.

Standard value (A): 85 ± 3 mm (3.35 ± .12 in.)

INSPECTION

26100380083

- Check the drive shaft for damage, bending or corrosion.
- Check the drive shaft spline part for wear or damage.
- Check the spider assembly for roller rotation, wear or corrosion.
- Check the groove inside T.J. case for wear or corrosion.
- Check the dynamic damper for damage or cracking.
- Check the boots for deterioration, damage or cracking.



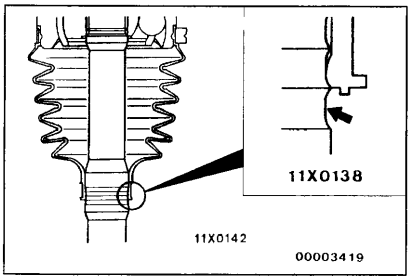
R.J. BOOT (RESIN BOOT) REPLACEMENT

26100520058

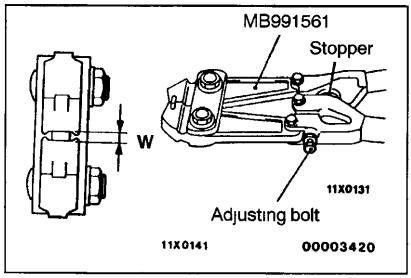
(1) Remove the R.J. boot bands (large and small).

NOTE
The R.J. boot bands cannot be re-used.

(2) Remove the R.J. boot.



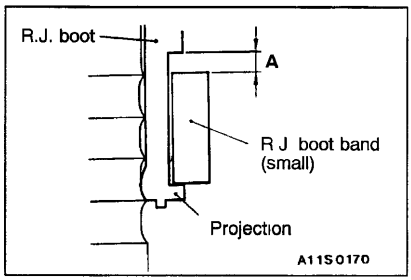
(3) Install the R.J. boot with the part with the smallest diameter in a position such that the shaft groove can be seen.



(4) Turn the adjusting bolt on the special tool so that the size of the opening (W) is at the standard value.

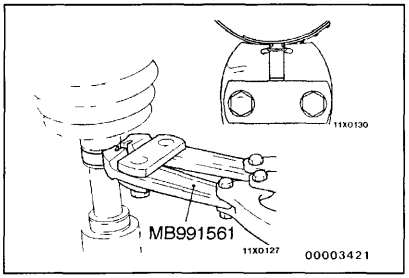
Standard value (W): 1.6 mm (.063 in.)
<If it is larger than 1.6 mm (.063 in.)>
Tighten the adjusting bolt.
<If it is smaller than 1.6 mm (.063 in.)>
Loosen the adjusting bolt.

NOTE
(1) The value of W will change by approximately 0.7 mm (.028 in.) for each turn of the adjusting bolt.
(2) The adjusting bolt should not be turned more than once.



(5) Place the R.J. boot band (small) against the projection at the edge of the boot, and then secure it so that there is a clearance left as shown by (A) in the illustration.

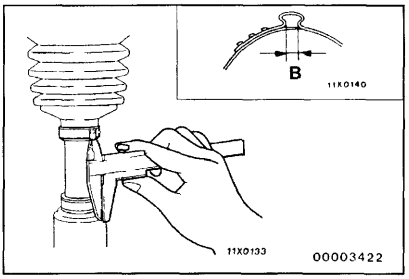
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(6) Use the special tool to crimp the R J. boot band (small).

Caution

1. **Secure the drive shaft in an upright position and clamp the part of the R.J. boot band to be crimped securely in the jaws of the special tool.**
2. **Crimp the R.J. boot band until the special tool touches the stopper.**



(7) Check that the crimping amount (B) of the R.J. boot band is at the standard value.

Standard value (B): 1.0 - 1.5 mm (.039 - .059 in.)

<If the crimping amount is larger than 1.5 mm (.059 in.)>

Readjust the value of (W) in step (4) according to the following formula, and then repeat the operation in step (6).
W = 3.0 mm (.118 in.) - B
Example: If B = 1.6 mm (.063 in.), then W = 1.4 mm (.055 in.).

<If the crimping amount is smaller than 1.0 mm (.039 in.)>

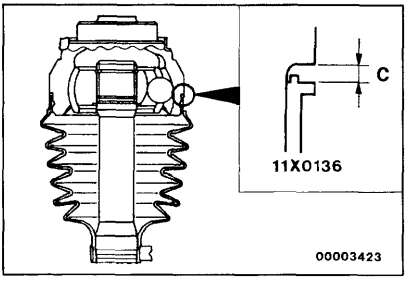
Remove the R.J. boot band, readjust the value of (W) in step (4) according to the following formula, and then repeat the operations in steps (5) and (6) using a new R.J. boot band.
W = 3.0 mm (.118 in.) - B
Example: If B = 0.9 mm (.035 in.), then W = 2.1 mm (.083 in.).

(8) Check that the R.J. boot band is not sticking out past the place where it has been installed.
If the R.J. boot band is sticking out, remove it and then repeat the operations in steps (5) to (7) using a new R.J. boot band.

(9) Fill the inside of the R.J. boot with the specified amount of the specified grease.

Specified grease: Repair kit grease

Amount to use: 110 ± 10 g (3.88 ± 0.35 oz.)

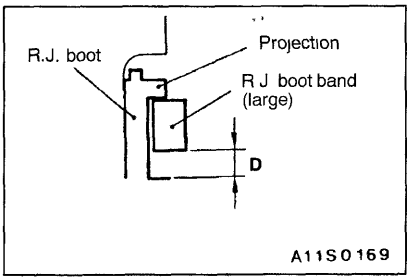


(10) Install the R.J. boot band (large) so that there is the clearance (C) between it and the R.J. housing is at the standard value.

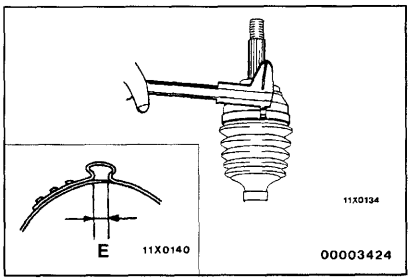
Standard value (C): 0.1 - 1.55 mm (.004 - .061 in.)

(11) Follow the same procedure as in step (4) to adjust the size of the opening (W) on the special tool so that it is at the standard value.

Standard value (W): 3.2 mm (.126 in.)



(12) Place the R.J. boot band (large) against the projection at the edge of the boot, and then secure it so that there is a clearance left as shown by (D) in the illustration.
(13) Use the special tool to crimp the R.J. boot band (large) in the same way as in step (6).



(14) Check that the crimping amount (E) of the R.J. boot band is at the standard value.

Standard value (E): 1.0 - 1.5 mm (.039 - .059 in.)

<If the crimping amount is larger than 1.5 mm>
Readjust the value of (W) in step (11) according to the following formula, and then repeat the operation in step (13).
W = 3.7 mm (.146 in.) - E
Example: If E = 1.6 mm (.063 in.), then W = 2.1 mm (.083 in.).

<If the crimping amount is smaller than 1.0 mm (.039 in.)>
Remove the R.J. boot band, readjust the value of (W) in step (11) according to the following formula, and then repeat the operations in steps (12) and (13) using a new R.J. boot band.
W = 3.7 mm (.146 in.) - E
Example: If E = 0.9 mm (.034 in.), then W = 2.8 mm (.110 in.).

(15) Check that the R.J. boot band is not sticking out past the place where it has been installed.
If the R.J. boot band is sticking out, remove it and then repeat the operations in steps (12) to (14) using a new R.J. boot band.

REAR AXLE

CONTENTS

27109000093

GENERAL INFORMATION 2

ON-VEHICLE SERVICE 3

- Hub Bolt Replacement 4
- Rear Hub Rotary-Sliding Resistance Check 3
- Wheel Bearing End Play Check 3

REAR AXLE HUB 5

SERVICE SPECIFICATIONS 2

SPECIAL TOOLS 2

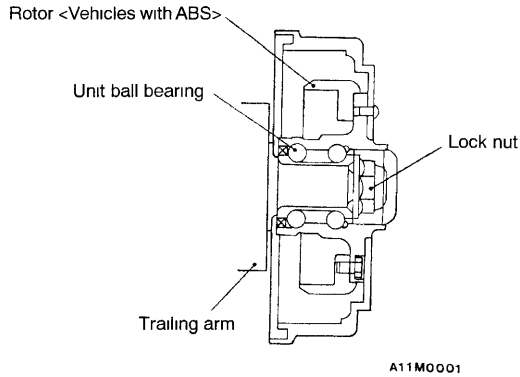
TROUBLESHOOTING 3

GENERAL INFORMATION

27100010101

The wheel bearing adopted is a unit ball bearing (double-row angular contact ball bearing), which uses the inside surface of the rear hub as the bearing outer race to reduce weight and size. This bearing has excellent service efficiency since it is so constructed that appropriate bearing preload is available just by tightening the lock nut to the specified torque.
On vehicles with ABS, the rotor for detecting the wheel speed is installed on the rear hub.

CONSTRUCTION DIAGARM



A11M0001

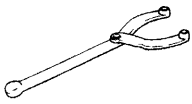
SERVICE SPECIFICATIONS

27100030114

Items	Standard value	Limit
Clearance of the rear speed sensor's pole piece and rotor <Vehicles with ABS> mm (in.)	0.1 - 2.0 (.004 - .079)	-
Wheel bearing end play mm (in.)	-	0.05 (.0020)
Wheel bearing rotary-sliding resistance N (lbs.)	-	19 (4.2) or less

SPECIAL TOOLS

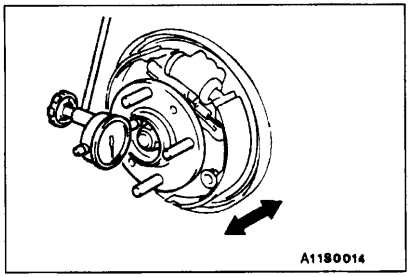
27100060106

Tool	Tool number and name	Supersession	Application
	MB990767 End yoke holder	MB990767-01	Hub fixing
 11H0072	MB991618 Hub bolt remover		Hub bolt removal

TROUBLESHOOTING

27100070017

Symptom	Probable cause	Remedy
Abnormal sound	Loose wheel nuts	Tighten
	Damaged or worn wheel bearings Bent or distorted brake discs	Replace



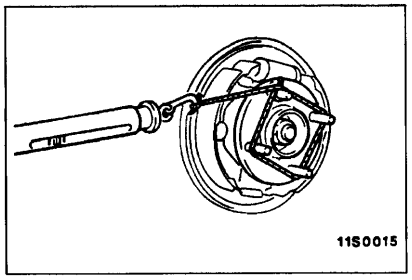
ON-VEHICLE SERVICE

27100090099

WHEEL BEARING END PLAY CHECK

1. Remove the brake drum.
2. Check the bearing's end play.
   Place a dial gauge against the hub surface; then move the hub in the axial direction and check whether or not there is end play.

   Limit: 0.05 mm (.0020 in.)
3. If the end play exceeds the limit, the flange nut should be tightened to the specified torque [172 Nm (127 ft.lbs.)] and check the end play again.
4. Replace the rear hub assembly if an adjustment cannot be made to within the limit.

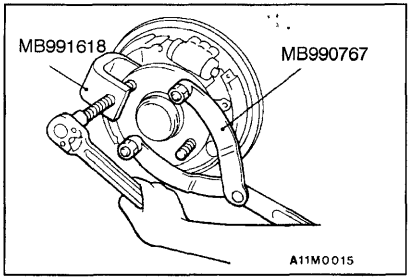


REAR HUB ROTARY-SLIDING RESISTANCE CHECK

27100110092

1. Remove the brake drum.
2. After turning the hub a few times to seat the bearing, wind a rope around the hub bolt and turn the hub by pulling at a 90° angle with a spring scale. Measure to determine whether or not the rotary-sliding resistance of the rear hub is at the limit value.

   Limit: 19 N (4.2 lbs.) or less
3. If the limit value is exceeded, loosen the flange nut and then tighten it to the specified torque [172 Nm (127 ft.lbs.)] and check the rear hub rotary sliding resistance again.
4. Replace the rear hub assembly if an adjustment cannot be made to within the limit.

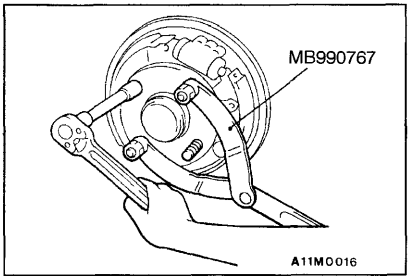


HUB BOLT REPLACEMENT

27100100082

<VEHICLES WITHOUT ABS>

1. Remove the brake drum.
2. Use the special tools to remove the hub bolts.

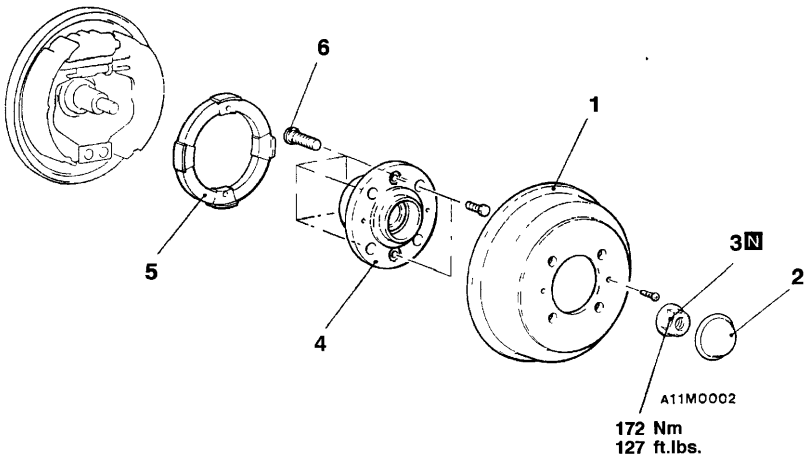


3. Use the wheel nuts to securely install the new hub bolts, while being careful of the hub bolts and hub.

REAR AXLE HUB

27100200133

REMOVAL AND INSTALLATION



Removal steps

1. Brake drum
2. Hub cap
3. Flange nut
▶A◀ 4. Rear hub assembly
5. Rotor <Vehicles with ABS>
6. Hub bolt

Caution

(1) The rear hub unit bearing should not be dismantled.
When removing the rear hub assembly, the wheel bearing inner race may be left at the spindle side.
In this case, always replace the rear hub assembly, otherwise the hub will damage the oil seal, causing oil leaks or excessive play.

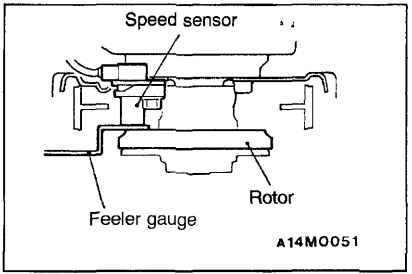
(2) Care must be taken not to scratch or otherwise damage the teeth of the rotor. The rotor must never be dropped. If the teeth of the rotor are chipped, resulting in a deformation of the rotor, it will not be able to accurately detect the wheel rotation speed, and the system will not function normally.

INSTALLATION SERVICE POINT

▶A◀ REAR HUB ASSEMBLY INSTALLATION <VEHICLES WITH ABS>

Caution

Be careful that the pole piece at the end of the speed sensor and the rotor teeth do not become damaged by



Insert a feeler gauge into the space between the speed sensor's pole piece and the rotor's toothed surface, and then tighten the speed sensor bracket at the position where the clearance is the standard value all around.

Standard value: 0.1 - 2.0 mm (.004 - .079 in.)

INSPECTION

27100210075

- Check the oil seal for crack or damage.
- Check the rear hub unit bearing for wear or damage.
- Check the rear rotor for chipped teeth.

WHEEL AND TIRE

CONTENTS

31109000069

GENERAL INFORMATION 2

ON-VEHICLE SERVICE 5

Tire Inflation Pressure Check 5

Tire Wear Check 5

Wheel Runout Check 5

SERVICE SPECIFICATIONS 3

TROUBLESHOOTING 4

WHEEL AND TIRE 5

GENERAL INFORMATION

31100010122

Both steel type and aluminum type wheels have been adopted. The type of wheel used depends on the vehicle model.

A compact spare tire has been adopted as the spare tire in some models.

<2-door models>

Item		CJ2A	CJ2A	CJ5A
		DNSEL, DRSEL	DNMEL, DRSEL	DNDEL, DRDEL
Wheel	Type	Steel type	Steel type, Aluminum type*	Aluminum type
	Size	13 x 5.00B	13 x 5.00B, 13 x 5JJ*	14 x 5 1/2JJ
	Amount of wheel offset mm (in.)	46 (1 8)	46 (1.8)	46 (1.8)
	Pitch circle diameter (P.C.D.) mm (in.)	100 (3.9)	100 (3.9)	100 (3.9)
Tire	Size	P155/80R13 P175/70R13*	P175/70R13	P185/65R14
Spare wheel	Type	Steel type	Steel type	Steel type
	Size	14 x 4.0T	14 x 4.0T	15 x 4 0T
	Amount of wheel offset mm (in.)	46 (1.8)	46 (1.8)	46 (1.8)
	Pitch circle diameter (P C.D.) mm (in.)	100 (3.9)	100 (3 9)	100 (3.9)
Spare tire	Size	T105/70D14 83M	T105/70D14 83M	T125/70D15

NOTE
*. optional parts

<4-door models>

Item		CK2A	CK5A	CK5A
		SNMEL, SRMEL, SRDEL	SNDEL, SRDEL	SRJEL
Wheel	Type	Steel type	Steel type, Aluminum type*	Aluminum type
	Size	13 x 5.00B	13 x 5.00B, 14 x 5 1/2JJ*	14 x 5 1/2JJ
	Amount of wheel offset mm (in.)	46 (1.8)	46 (1.8)	46 (1.8)
	Pitch circle diameter (P.C.D.) mm (in.)	100 (3.9)	100 (3.9)	100 (3.9)
Tire	Size	P175/70R13	P175/70R13 P185/65R14*	P185/65R14
Spare wheel	Type	Steel type	Steel type	Steel type
	Size	14 x 4.0T	14 x 4.0T, 15 x 4.0T*	15 x 4.0T
	Amount of wheel offset mm (in.)	46 (1.8)	46 (1.8)	46 (1.8)
	Pitch circle diameter (P.C.D.) mm (in.)	100 (3.9)	100 (3 9)	100 (3.9)
Spare tire	Size	T105/70D14 83M	T105/70D14 83M T125/70D15*	T125/70D15

NOTE
*: optional parts

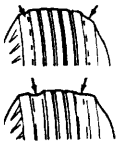
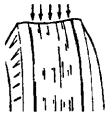
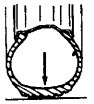
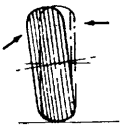
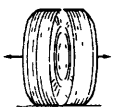
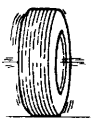
SERVICE SPECIFICATIONS

31100030111

Items		Limit
Tread depth of tire mm (in.)		1.6 (.06)
Wheel runout (Radial runout) mm (in.)	Steel wheel	1.2 (.05) or less
	Aluminum wheel	1.0 (.04) or less
Wheel runout (Lateral runout) mm (in.)	Steel wheel	1.2 (.05) or less
	Aluminum wheel	1.0 (.04) or less

TROUBLESHOOTING

31100070090

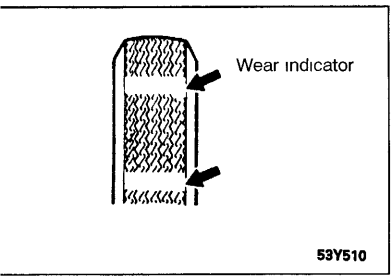
Symptom		Probable cause		Remedy	Reference page
Rapid wear at shoulders	 11X0109	Under-inflation or lack of rotation	 11X0116	Adjust the tire pressure.	Refer to P.31-5
Rapid wear at center	 11X0110	Over-inflation or lack of rotation	 11X0117		
Cracked treads	 11X0111	Under-inflation		Adjust the tire pressure.	Refer to P.31-5
Wear on one side	 11X0112	Excessive camber	 11X0118	Check the camber.	Refer to GROUP 33A - On-vehicle Service.
Feathered edge	 11X0113	Incorrect toe-in	 11X0119	Adjust the toe-in.	
Bald spots	 11X0114	Unbalanced wheel	 11X0120	Adjust the imbalanced wheels.	-
Scalloped wear		Lack of rotation of tires or worn or out-of-alignment suspension		Rotate the tires, check the front suspension alignment.	Refer to GROUP 33A - On-vehicle Service.

ON-VEHICLE SERVICE

31100090096

TIRE INFLATION PRESSURE CHECK

NOTE
For information on tire inflation pressure, refer to the label attached to the center pillar at the driver's side.



TIRE WEAR CHECK

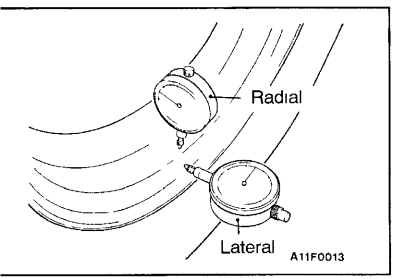
31100100058

Measure the tread depth of tires.

Limit: 1.6 mm (.06 in.)

If the remaining tread depth is less than the limit, replace the tire.

NOTE
When the tread depth of tires is reduced to 1.6 mm (.06in.) or less, wear indicators will appear.



WHEEL RUNOUT CHECK

31100110082

Jack up the vehicle so that the wheels are clear of the floor. While slowly turning the wheel, measure wheel runout with a dial indicator.

Limit:

Radial runout.
Steel wheel; 1.2 mm (.05 in.) or less
Aluminum wheel; 1.0 mm (.04 in.) or less

Lateral runout.
Steel wheel; 1.2 mm (.05 in.) or less
Aluminum wheel; 1.0 mm (.04 in.) or less

If wheel runout exceeds the limit, replace the wheel.

WHEEL AND TIRE

31100130088

INSTALLATION SERVICE POINT

Tighten the wheel nut to the specified torque.

Tightening torque: 88 – 108 Nm (65 - 80 ft.lbs.)

POWER PLANT MOUNT

CONTENTS

32109000011

CROSSMEMBER 8
ENGINE MOUNTING 4
ENGINE ROLL STOPPER, CENTERMEMBER 7
GENERAL INFORMATION 2
SERVICE SPECIFICATIONS 3
SPECIAL TOOLS 3
TRANSAXLE MOUNTING 5
TROUBLESHOOTING 3

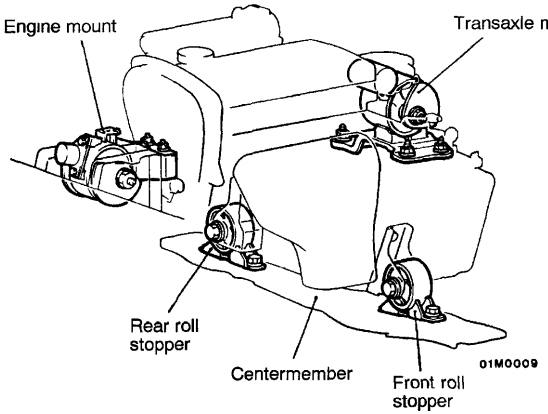
GENERAL INFORMATION

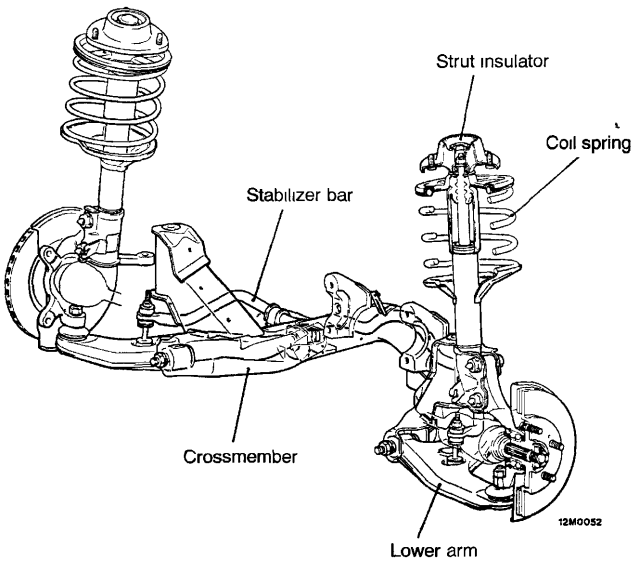
32100010112

The engine-transaxle mount is of an inertial axis supporting type. The inertial axis supporting type mount supports the front upper part of the engine at the front and the rear upper part of the transaxle at the rear. This arrangement effectively suppresses the engine vibration.

The centermember is bolted to the body and crossmember, supporting the front and rear roll stopper bracket.
The crossmember is bolted to the body, supporting the lower arm, steering gear box assembly, stabilizer bar, and centermember.

CONSTRUCTION DIAGRAM





00005015

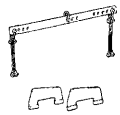
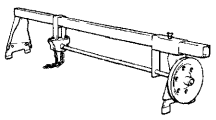
SERVICE SPECIFICATION

32100030071

Item	Standard value
Protruding length of stabilizer bar mounting bolt mm (in.)	22 (.9)

SPECIAL TOOLS

32100060094

Tool	Tool number and name	Supersession	Application
	MB991453 Engine hanger		To support the engine assembly during removal and installation of the centermember
	GENERAL SERVICE TOOL MZ203827 Engine lifter	General service tool	To support the engine assembly during removal and installation of the centermember

TROUBLESHOOTING

32100070011

Symptom	Probable cause	Remedy
Excessive engine wobble or vibration (with engine in normal condition)	Cracked rubber parts of insulator	Replace
	Insufficiently tightened parts	Retighten
Abnormal noise	Insufficiently tightened parts	Retighten

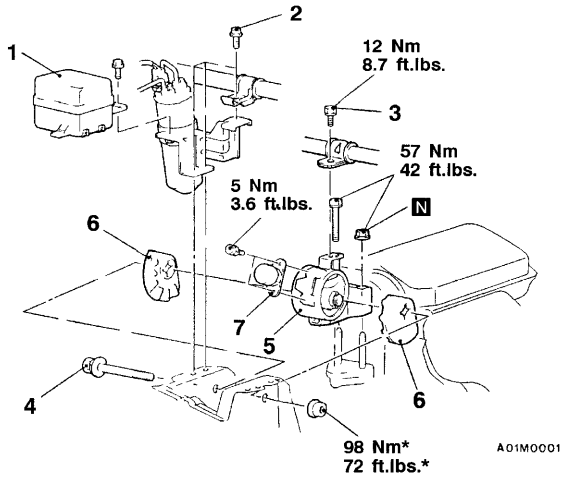
ENGINE MOUNTING

32100110324

REMOVAL AND INSTALLATION

Pre-removal Operation
(1) Jack up the engine and transaxle assembly until there is no weight on the engine mount bracket insulator
(2) Auto-cruise Vacuum Pump and Bracket Assembly removal (Refer to GROUP 17)

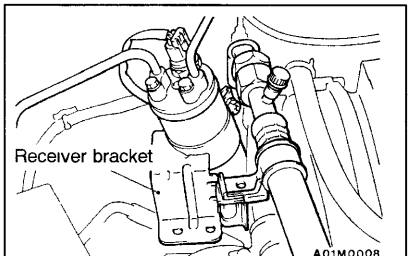
Post-installation Operation
(1) Auto-cruise Vacuum Pump and Bracket Assembly installation (Refer to GROUP 17)



Removal steps

1. Air conditioning relay box
◀A▶ 2. Air conditioning receiver bracket mounting bolts
3. Power steering hose mounting bolt
◀A▶ 4. Engine mount insulator mounting bolt
5. Engine mount bracket
▶A◀ 6. Engine mount stopper
7. Engine mount dynamic damper

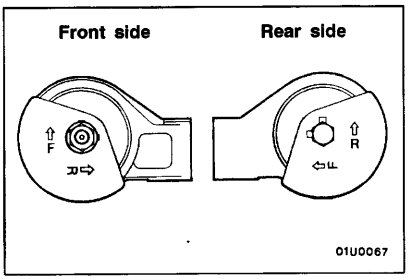
Caution
Mounting locations marked by * should be initially tightened, and then fully tightened when the body is supporting the full weight of the engine.



REMOVAL SERVICE POINT

◀A▶ ENGINE MOUNT INSULATOR MOUNTING BOLT / AIR CONDITIONING RECEIVER BRACKET MOUNTING BOLT REMOVAL

(1) To make it easier to remove the engine mount insulator mounting bolt in vehicles with air-conditioning, remove the air-conditioning receiver bracket and support the receiver so that there are no bends in the pipe.
(2) Remove the engine mount insulator mounting bolt.



INSTALLATION SERVICE POINT

▶A◀ ENGINE MOUNT STOPPER INSTALLATION

(1) At the front, install so that the arrow with the "F" mark is facing upwards.
(2) At the rear, install so that the arrow with the "R" mark is facing upwards.

INSPECTION

32100120051

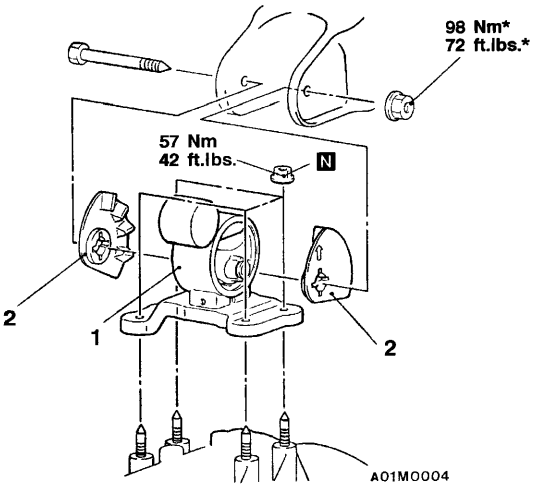
- Check each insulator for cracks or damage.
- Check each bracket for deformation or damage.

TRANSAXLE MOUNTING

32100140101

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Air Cleaner Assembly Installation and Removal
- Battery and Battery Tray Removal and Installation



Removal steps

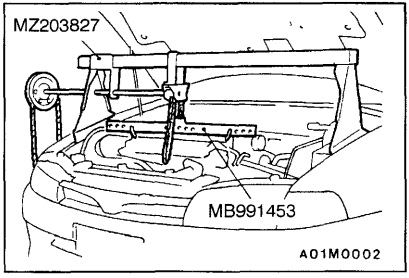
- Centermember mounting bolt (Refer to P.32-7.)

◀A▶ 1. Transaxle mount bracket

▶A◀ 2. Transaxle mount stopper

Caution
Mounting locations marked by * should be provisionally tightened, and then fully tightened when the body is supporting the full weight of the engine.

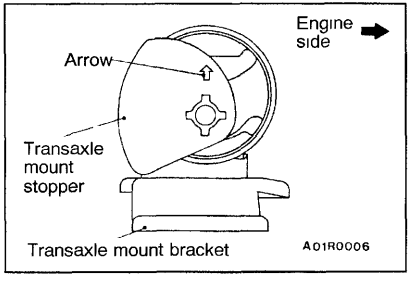
TSB Revision



REMOVAL SERVICE POINT

◀A▶ TRANSAXLE MOUNT BRACKET REMOVAL

(1) Install the special tool to the vehicle body to support the engine and transaxle assembly.
(2) Remove the centermember mounting bolt.
(3) Remove the bolt and nut of the transaxle mount bracket.
(4) After lowering the engine and transaxle assembly, remove the transaxle mount bracket.



INSTALLATION SERVICE POINT

▶A◀ TRANSAXLE MOUNT STOPPER INSTALLATION

Clamp the transaxle mount stopper so that the arrow points in the direction as shown in the diagram.

INSPECTION

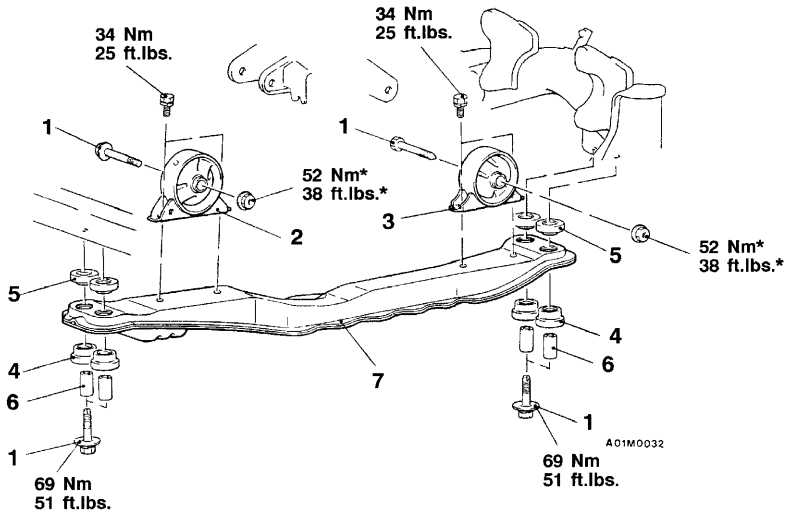
32100150043

- Check each insulator for cracks or damage.
- Check each bracket for deformation or damage.

ENGINE ROLL STOPPER, CENTERMEMBER

32100200090

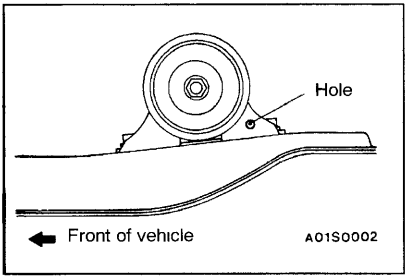
REMOVAL AND INSTALLATION



Removal steps

1. Bolts
▶B◀ 2. Front roll stopper bracket assembly
▶A◀ 3. Rear roll stopper bracket assembly
4. Bushing (lower)
5. Bushing (upper)
6. Collar
7. Centermember

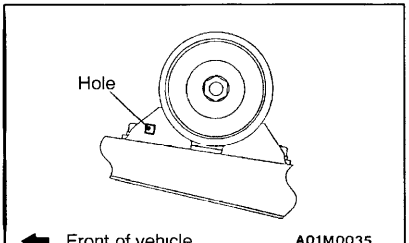
Caution
Mounting locations marked by * should be provisionally tightened, and then fully tightened when the body is supporting the full weight of the engine.



INSTALLATION SERVICE POINTS

▶A◀ REAR ROLL STOPPER BRACKET ASSEMBLY INSTALLATION

Install so that the hole in the rear roll stopper bracket is facing towards the rear of the vehicle.



▶B◀ FRONT ROLL STOPPER BRACKET ASSEMBLY INSTALLATION

Install so that the hole in the front roll stopper bracket is facing towards the front of the vehicle.

INSPECTION

32100210031

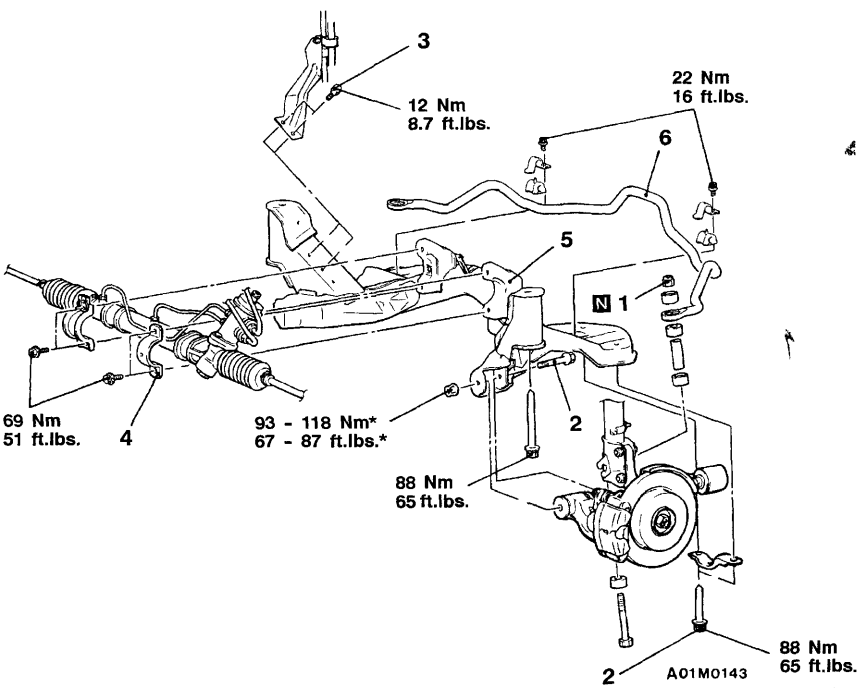
- Check each insulator and bushing for cracks or damage.
- Check each bracket for deformation or damage.

CROSSMEMBER

32100320208

REMOVAL AND INSTALLATION

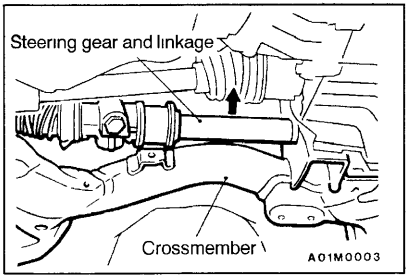
Pre-removal and Post-installation Operation
- Front Exhaust Pipe Removal and Installation (Refer to GROUP 15)
- Centermember Assembly Removal and Installation (Refer to P32-7)



Removal steps

▶B◀ 1. Self-locking nut <Except 2-DOOR MODELS-4G15>
2 Lateral lower arm mounting bolts
3. Oil return pipe clamp mounting bolts
4. Steering gear and linkage clamp
◀A▶ 5. Crossmember assembly
▶A◀ 6. Stabilizer bar <Except 2-DOOR MODELS-4G15>

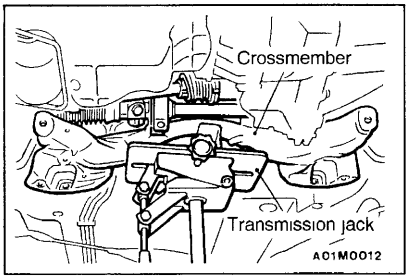
Caution
***: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the ground in the unladen condition.**



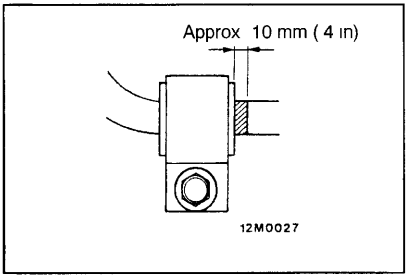
REMOVAL SERVICE POINT

◀A▶ CROSSMEMBER ASSEMBLY REMOVAL

(1) Move the crossmember while supporting the steering gear and linkage in the direction shown by the arrow.



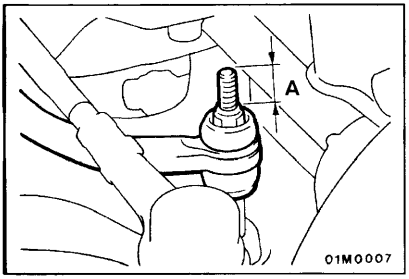
(2) Remove the crossmember while supporting it with a transmission jack.



INSTALLATION SERVICE POINTS

▶A◀ STABILIZER BAR INSTALLATION (Except 2-door models)

Place the identification mark of the stabilizer bar to the left, and install the bushing so that the identification mark protrudes approximately 10 mm (.4 in.) from the edge of the inside of the bushing.



▶B◀ SELF-LOCKING NUT INSTALLATION (Except 2-door models)

Tighten the self-locking nut so that the amount of protrusion of the end of the stabilizer bar mounting bolts is at the standard value.

Standard value (A): 22 mm (.9 in.)

INSPECTION

32100330034

- Check the crossmember for cracks or deformation.

FRONT SUSPENSION

CONTENTS

33209000073

GENERAL INFORMATION 2
LOWER ARM 9
ON-VEHICLE SERVICE 4
Front Wheel Alignment Check and Adjustment 4
SERVICE SPECIFICATIONS 3
SPECIAL TOOLS 3
STABILIZER BAR 12
STRUT ASSEMBLY 6
TROUBLESHOOTING 4

GENERAL INFORMATION

33200010099

The front suspension is a Mcpherson strut with coil spring. The shock absorber is hydraulic double-acting type.

COIL SPRING

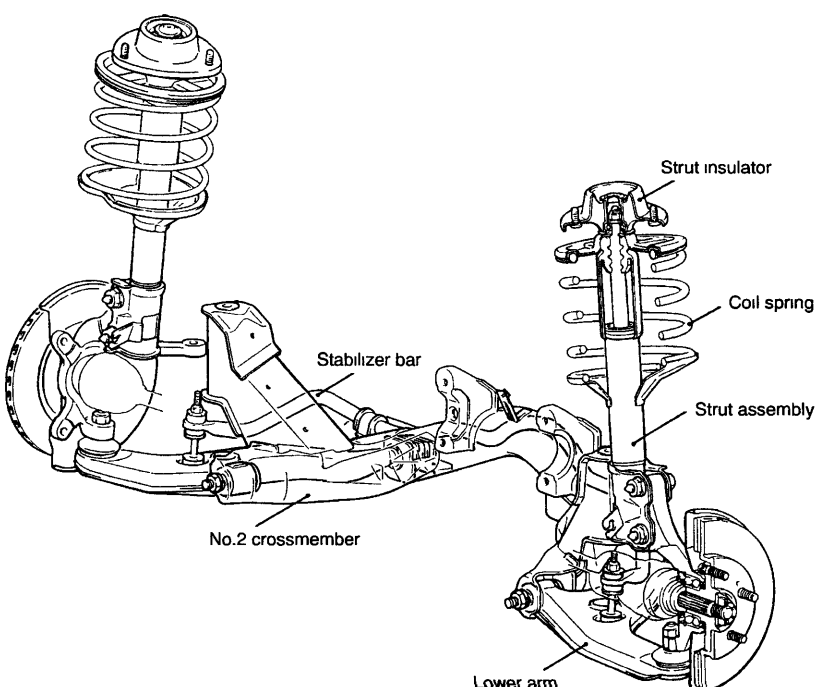
2-door models

Item	1.5L M/T 1.8L M/T	1.5L A/T 1.8L A/T
Wire diameter x free length mm (in.)	12 x 138 x 340 (.47 x 5.43 x 13.39)	12 x 138 x 350 (.47 x 5.43 x 13.78)

4-door models

Item	1.5L 1.8L without ABS	1.8L with ABS
Wire diameter x free length mm (in.)	12 x 138 x 350 (.47 x 5.43 x 13.78)	12 x 138 x 360 (.47 x 5.43 x 14.17)

CONSTRUCTION DIAGRAM



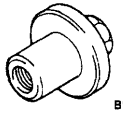
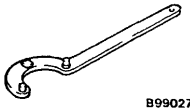
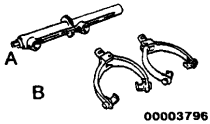
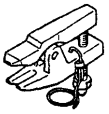
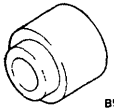
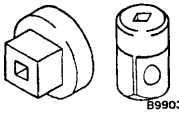
SERVICE SPECIFICATIONS

33200030071

Items		Specifications
Toe-in mm(in.)		0 ± 3 (0 ± .12)
Steering angle	Inner wheel	37°30' ± 2°00'
	Outer wheel	31°40'
Camber		0°00' ± 30' (Left/right deviation within 30')
Caster		2°51' ± 30' (Left/right deviation within 30')
Lower arm ball joint breakaway torque Nm (in.lbs.)		1.0 – 6.4 (9 – 56)
Protruding length of stabilizer bar mounting bolt mm (in.)		22 (.87)

SPECIAL TOOLS

33200060063

Tool	Tool number and name	Supersession	Application
 B991004	MB991004 Wheel alignment gauge attachment	MB991004-01 or General service tool	Wheel alignment measurement
 B990278	MB990278 or MB990775 Special spanner	MB990775-01	Strut assembly disassembly/assembly
 A B 00003796	A: MB991237 Spring compressor body B: MB991238 Arm set	MIT 62220	Front coil spring compression
 B991113	MB991113 Steering linkage puller	MB991113-01	Lower arm ball joint removal
 B990800	MB990800 Ball joint remover and installer	MB990800-01	Dust cover installation
 B990326	MB990326 Preload socket	General service tool	Lower arm ball joint breakaway torque measurement

TROUBLESHOOTING

33200070011

Symptom	Probable cause	Remedy
Steering wheel is heavy, vibrates or pulls to one side	Suspension malfunction Ball joint Coil spring Wheel alignment	Adjust or replace
	Unbalanced or worn tires	Adjust or replace
Excessive vehicle rolling	Broken or deteriorated stabilizer Shock absorber malfunction	Replace
Poor riding	Improper tire inflation pressure	Adjust
	Broken or deteriorated coil spring Shock absorber malfunction	Replace
Inclination of vehicle	Broken or deteriorated coil spring	Replace
Noise	Lack of lubrication	Lubricate
	Looseness and wear of each part	Replace
	Broken coil spring Shock absorber malfunction	Replace

ON-VEHICLE SERVICE

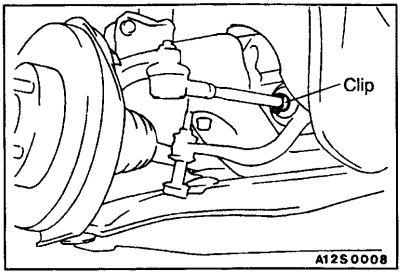
33100090106

FRONT WHEEL ALIGNMENT CHECK AND ADJUSTMENT

Measure wheel alignment with alignment equipment on a level surface.
The front suspension, steering system, and wheels should be serviced to normal condition before measuring of wheel alignment.

TOE-IN

Standard value: 0 ± 3 mm (0 ± .12 in.)



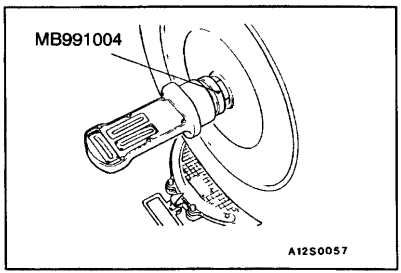
NOTE
1. If the toe-in is not within the standard value, adjust the toe-in by undoing the clips and turning the left and right tie rod turnbuckles by the same amount (in opposite directions).
2. The toe will move out as the left turnbuckle is turned toward the front of the vehicle and the right turnbuckle is turned toward the rear of the vehicle.
   For each one turn of the left and right tie rods, the toe-in will be adjusted by approx. 1°05' (per wheel).

STEERING ANGLE

Standard value:
Inner wheel 37°30' ± 2°00'
Outer wheel 31°40'

CAMBER AND CASTER

Standard value:
Camber 0°00' ± 30' (Left/right deviation within 30')
Caster 2°51' ± 30' (Left/right deviation within 30')



NOTE
1. Camber and caster are preset at the factory and cannot be adjusted.
2. If camber is not within the standard value, check and replace bent or damaged parts.
3. For vehicles with aluminum type wheels, attach the camber/caster/kingpin gauge to the drive shaft by using the special tool. Tighten the special tool to the same torque 177-275 Nm (130-203 ft.lbs.) as the drive shaft nut.

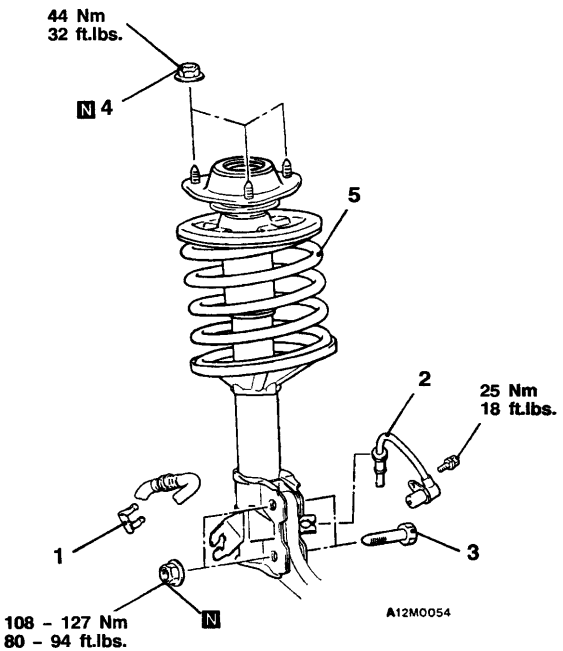
Caution
Never subject the wheel bearings to the vehicle load when the drive shaft nuts are loosened.

STRUT ASSEMBLY

33200110058

REMOVAL AND INSTALLATION

Post-Installation Operation
- Front Wheel Alignment Adjustment (Refer to P.33A-4.)



Removal steps
1. Brake hose clamp
2. Front speed sensor <Vehicles with ABS>
◀A▶ 3. Bolts
4. Self-locking nut
5. Strut assembly

Caution
For vehicles with ABS, be careful when handling the pole piece at the tip of the speed sensor so as not to damage it by striking against other parts.

REMOVAL SERVICE POINT

◀A▶ BOLTS REMOVAL

(1) Suspend the lower arm from the vehicle with wire.
(2) Remove the strut and knuckle connection.

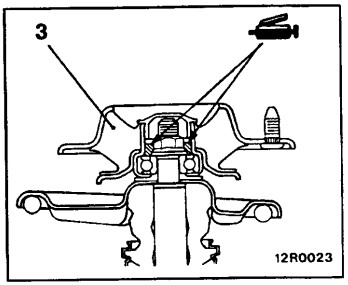
INSPECTION

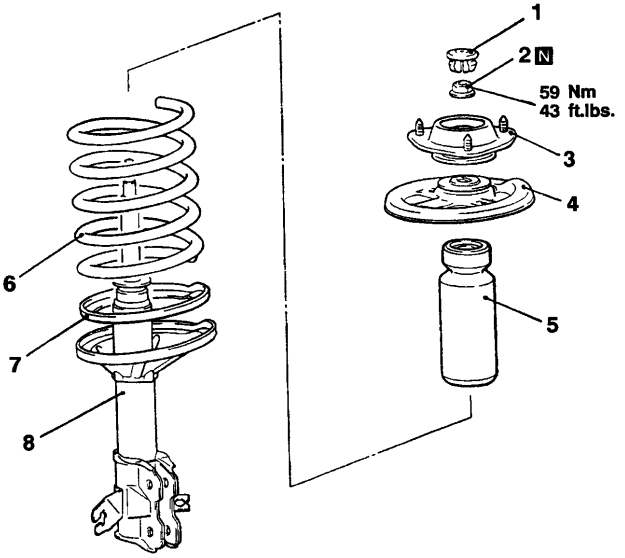
33200120020

- Check for oil leaks from the strut assembly.
- Check the strut assembly for damage or deformation.

DISASSEMBLY AND REASSEMBLY

33200130078

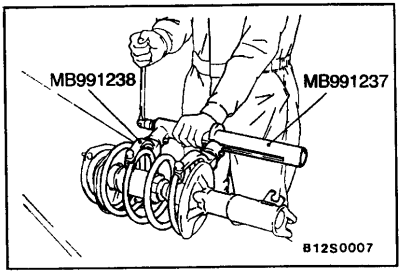


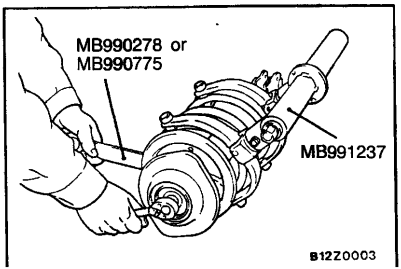


Disassembly steps

1. Dust cover
2. Self-locking nut
3. Strut insulator
4. Spring seat, upper
5. Bump rubber
6. Coil spring
7. Spring pad, lower
8. Strut assembly

◀A▶ ▶A◀ ◀B▶





DISASSEMBLY SERVICE POINTS

◀A▶ SELF-LOCKIING NUT REMOVAL

(1) Use the special tools to compress the coil spring.

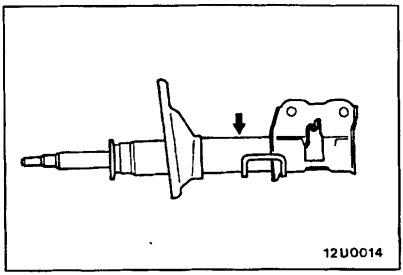
Caution

1. **Install the special tools evenly, and so that the maximum length will be attained within the installation range.**
2. **Do not use an impact wrench to tighten the special tool bolt.**

(2) Use the special tools to remove the self-locking nut.

Caution

Do not use an impact wrench.



◀B▶ STRUT ASSEMBLY REMOVAL

To discard the strut assembly, place the assembly horizontally with its piston rod extended. Then drill a hole of approx. 3 mm (.12 in.) in diameter at the location shown in the illustration and discharge the gas.

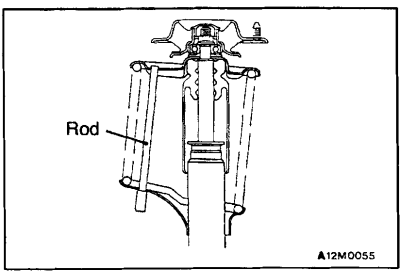
Caution
The gas itself is harmless but it may issue out of the hole together with chips generated by the drill. Therefore, be sure to wear goggles.

REASSEMBLY SERVICE POINT

▶A◀ SELF-LOCKING NUT INSTALLATION

(1) With the coil spring held compressed by the special tools (MB991237 and MB991238), provisionally tighten the self-locking nut.

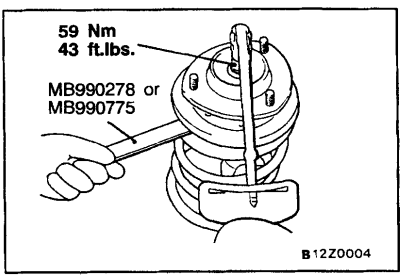
Caution
Do not use an impact wrench to tighten the special tool bolt.



(2) Line up the holes in the strut assembly spring lower seat with the hole in the spring upper seat.

NOTE
The alignment is easily accomplished with a rod.

(3) Correctly align both ends of the coil spring with the grooves in the spring seat, and then loosen the special tools (MB991237 and MB991238).



(4) Using the special tool, tighten the self-locking nut to the specified torque.

Caution
Do not use an impact wrench.

INSPECTION

33200140057

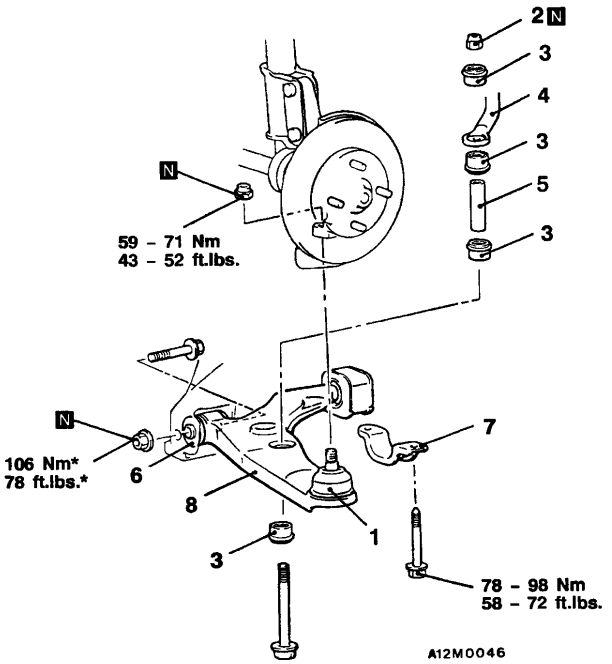
- Check the bearing for wear or rust.
- Check the rubber parts for damage or deterioration.
- Check the spring for deformation, deterioration or damage.
- Check the shock absorber for deformation.

LOWER ARM

33200160053

REMOVAL AND INSTALLATION

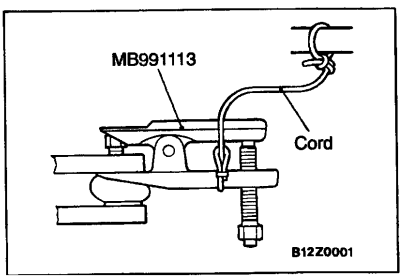
Post-installation Operation
- Press the ball joint dust cover with a finger to check whether the dust cover is cracked or damaged.
- Front Wheel Alignment Adjustment (Refer to P.33A-4.)



Removal steps

◀A▶ ▶A◀
1. Lower arm ball joint connection
2. Self-locking nut
3. Stabilizer rubber
4. Stabilizer bar
5. Collar
6. Lower arm front bushing connection
7. Support bracket
8. Lower arm assembly

Caution
*: **Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the ground in the unladen condition.**

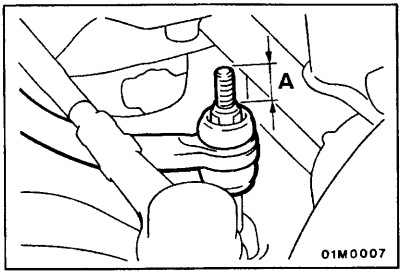


REMOVAL SERVICE POINT

◀A▶ LOWER ARM BALL JOINT DISCONNECTION

Use the special tool to disconnect the lower arm ball joint from the knuckle.

Caution
1. **Using the special tool, loosen the tie rod end mounting nut. Only loosen the nut; do not remove it from the ball joint.**
2. **Support the special tool with a cord, etc. to prevent it from coming off.**



INSTALLATION SERVICE POINT

▶A◀ SELF-LOCKING NUT INSTALLATION

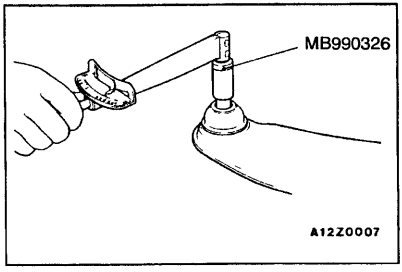
Tighten the self-locking nut so that the amount of protrusion of the end of the stabilizer bar mounting bolt is at the standard value.

Standard value (A): 22 mm (.87 in.)

INSPECTION

33200170070

- Check the bushing for wear and deterioration.
- Check the lower arm for bend or breakage.
- Check the support bracket for deterioration or damage.
- Check the ball joint dust cover for cracks.
- Check all bolts for condition and straightness.



BALL JOINT BREAKAWAY TORQUE CHECK

(1) After shaking the ball joint stud several times, install the nut to the stud and use the special tool to measure the breakaway torque of the ball joint.

Standard value:
1.0 – 6.4 Nm (9 – 56 in.lbs.)

(2) When the measured value exceeds the standard value, replace the ball joint.

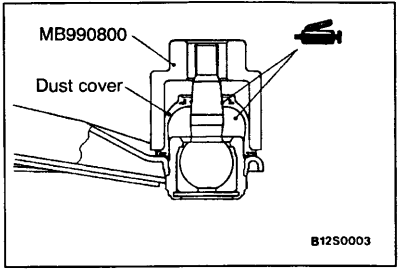
(3) When the measured value is lower than the standard value, check that the ball joint turns smoothly without excessive play. If so, it is possible to use that ball joint.

BALL JOINT DUST COVER CHECK

(1) Press the dust cover with a finger to check whether the dust cover is cracked or damaged.

NOTE
If the dust cover is cracked, the ball joint could be damaged, so if the dust cover is damaged during maintenance work, replace it.

(2) When dust cover is cracked or damaged, replace the lower arm ball boint assembly.

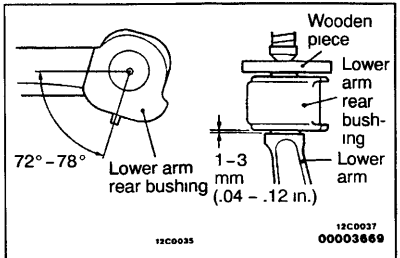


BALL JOINT DUST COVER REPLACEMENT

33200820029

Replace the dust cover only when it has been cracked or damaged by mistake during the maintenance work.

(1) Remove the dust cover.
(2) Apply multipurpose grease to the lip and inside of the dust cover.
(3) Drive in the dust cover with special tool until it is fully seated.
(4) Press the dust cover with a finger to check whether the dust cover is cracked or damaged.



LOWER ARM REAR BUSHING REPLACEMENT

33200810033

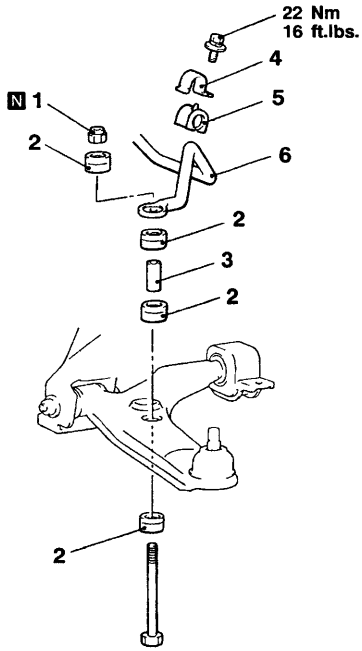
(1) Apply soapy water between the shaft and old bushing, and pry up bushing using a flat-tipped screwdriver.
(2) Apply soapy water to the shaft and new bushing and install new bushing into the shaft at the angle shown in the illustration.
(3) Press in the bushing as illustrated.

STABILIZER BAR

33200190052

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Crossmember Removal and Installation
  (Refer to GROUP 32 - Crossmember.)

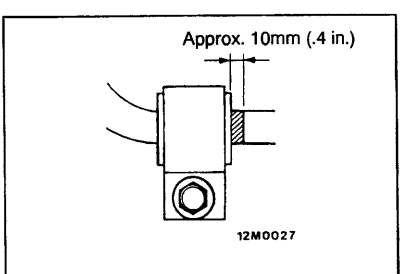


A12M0013

Removal steps

▶B◀ 1. Self-locking nut
2. Stabilizer rubber
3. Collar

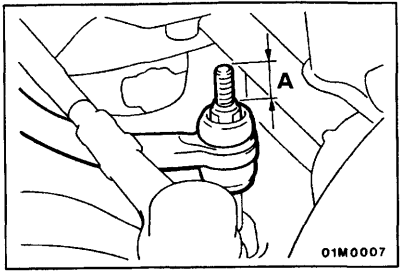
▶A◀ 4. Fixture
▶A◀ 5. Bushing
6. Stabilizer bar



INSTALLATION SERVICE POINT

▶A◀ BUSHING/FIXTURE INSTALLATION

Place the identification mark of the stabilizer bar to the left, and install the bushing so that the identification mark protrudes approximately 10 mm (.4 in.) from the edge of the inside of the bushing.



▶B◀ SELF-LOCKING NUT INSTALLATION

Tighten the self-locking nut so that the amount of protrusion of the end of the stabilizer bar mounting bolt is at the standard value.

Standard value (A): 22 mm (.87 in.)

INSPECTION

33200200021

- Check the bushing for wear and deterioration.
- Check the stabilizer bar for deterioration or damage.

REAR SUSPENSION

CONTENTS

34109000091

CONTROL LINK, UPPER LINK AND LOWER ARM 6

GENERAL INFORMATION 2

ON-VEHICLE SERVICE 4

Rear Wheel Alignment Check and Adjustment 4

SERVICE SPECIFICATIONS 2

STRUT ASSEMBLY 11

SPECIAL TOOLS 3

TRAILING ARM 8

TROUBLESHOOTING 4

GENERAL INFORMATION

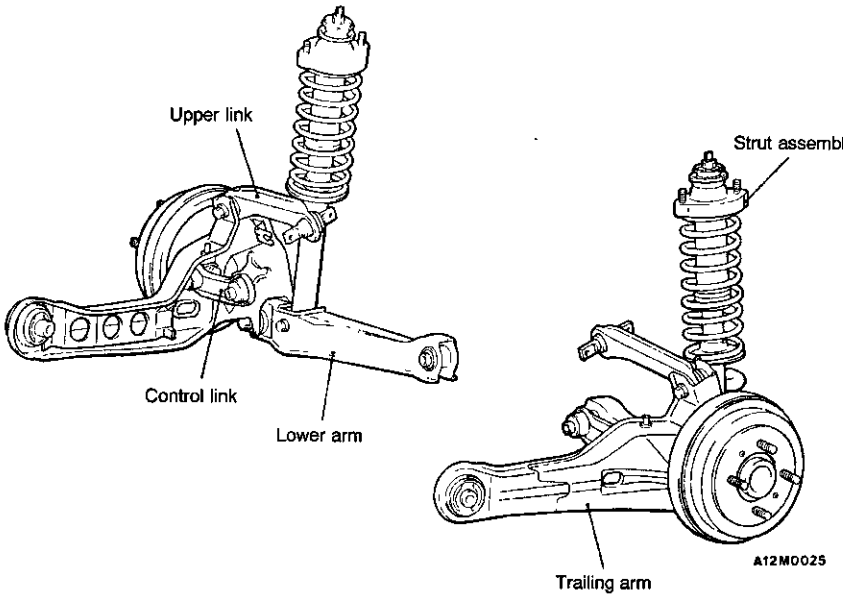
34100010116

The rear suspension is a trailing arm type multi-link suspension. The shock absorber used on the strut assembly is a hydraulic, cylindrical double-acting type.

COIL SPRING

Items	2-DOOR	4-DOOR
Wire dia. x O.D. x free length mm (in.)	9 x 86 x 369 (.35 x 3.39 x 14.5)	9 x 86 x 379 (.35 x 3.39 x 14.9)

CONSTRUCTION DIAGRAM



SERVICE SPECIFICATIONS

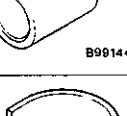
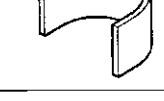
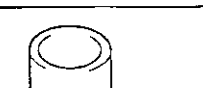
34100030112

Items	Standard value
Toe-in mm (in.)	1 - 5 (.04 - .20)
Thrust angle	0° ± 0.15°
Camber	- 0° 40' ± 30'
Clearance between rear speed sensor pole piece and rotor mm (in.)	0.1 - 2.0 (.004 - .079)

TSB Revision

SPECIAL TOOLS

34100060098

Tool	Tool number and name	Supersession	Application
 B991004	MB991004 Wheel alignment gauge attachment		Measurement of the wheel alignment (Vehicle with aluminum type wheels)
 B991447	MB991447 Bushing remover and installer	Tool not available	Driving out and press-fitting of lower arm bushing
 B991448	MB991448 Bushing remover and installer base		
	MB991449 Bushing remover and installer supporter		
 B991444	MB991444 Bushing remover and installer arbor	Tool not available	Driving out and press-fitting of trailing arm bushing
 B991445	MB991445 Bushing remover and installer base		
 B991446	MB991446 Bushing remover and installer spacer		
 00003795	A: MB991237 Spring compressor body B: MB991239 Arm set	MIT62220	Compression of the rear coil spring

TROUBLESHOOTING

34100070053

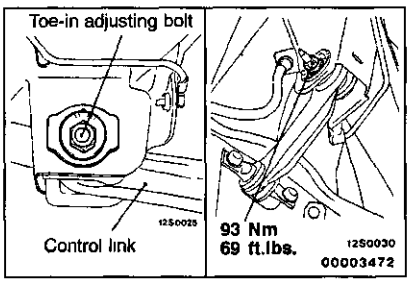
Symptom	Probable cause	Remedy
Squeaks or other abnormal noise	Loose rear suspension installation bolts and nuts	Retighten
	Malfunction of shock absorber	Replace
	Worn bushings	
	Upper links and/or lower arms and/or control links deformed or damaged	
	Trailing arms deformed or damaged	
Poor ride	Excessive tire inflation pressure	Adjust the pressure
	Malfunction of shock absorber	Replace
	Weak or broken springs	
Body tilting	Weak or deteriorated bushings	Replace
	Weak or broken springs	
	Upper links and/or lower arms and/or control links deformed or damaged	
	Trailing arms deformed or damaged	

ON-VEHICLE SERVICE

34101100027

REAR WHEEL ALIGNMENT CHECK AND ADJUSTMENT

Measure the alignment with the vehicle parked on level ground. The rear suspension and wheels should be serviced to the normal condition prior to measurement of wheel alignment.

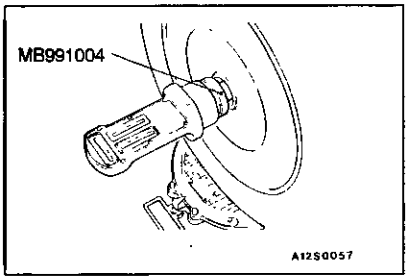


TOE-IN

Standard value: 1 - 5 mm (.04 - .20 in.)

If outside the standard value, adjust by the following procedure.

(1) Be sure to adjust the camber before adjusting the toe-in.
(2) Adjust by turning the toe adjusting bolt (mounting bolt on the inside of the control link).
LH: Turning clockwise → toe-in direction
RH: Turning clockwise → toe-out direction
The scale has gradations of approximately 2.6 mm (.10 in.).

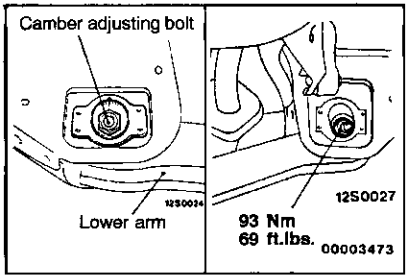


CAMBER

Standard value: - 0°40'±30'
(The difference between the left and right wheels should be 30' or less.)

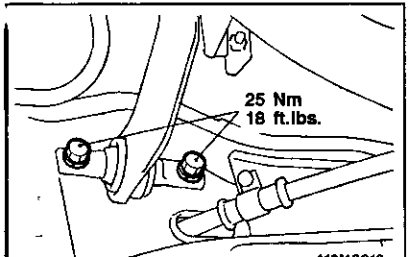
NOTE
For vehicles equipped with aluminum wheels, measure the camber after tightening the special tool (MB991004) to the specified torque 172 Nm (127 ft.lbs.).

Caution
Never subject the wheel bearings to the full vehicle load when the flange nuts are loosened.



If outside the standard value, adjust by the following procedure.
(1) Remove the connection between the control link and the trailing arm.
(2) Adjust by turning the camber adjusting bolt (mounting bolt for the lower arm and rear crossmember).

Left wheel: clockwise + camber
Right wheel: clockwise - camber
The scale has gradations of approximately 14'



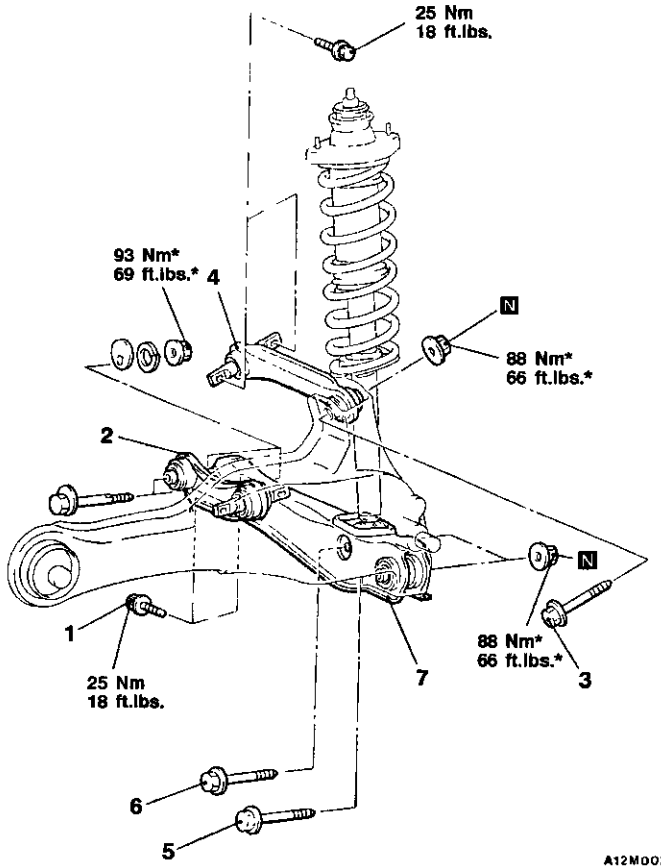
(3) Tighten the control link to the trailing arm at the specified torque.
(4) After adjusting the camber, be sure to adjust the toe-in.

CONTROL LINK, UPPER LINK AND LOWER ARM

34100480047

REMOVAL AND INSTALLATION

Post-installation Operation
- Wheel Alignment Check (Refer to P.34-4.)

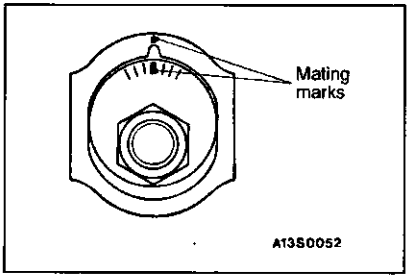


Control link removal steps
1. Control link and trailing arm connection
◀A▶ 2. Control link

Upper link removal steps
◀B▶ 3. Upper link and trailing arm connection
4. Upper link

Lower arm removal steps
1. Control link and trailing arm connection
◀B▶ 5. Lower arm and trailing arm connection
6. Strut assembly and lower arm connection
◀A▶ 7. Lower arm

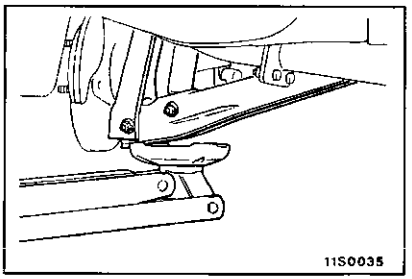
Caution
*** Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the ground in the unladen condition.**



REMOVAL SERVICE POINTS

◀A▶ CONTROL LINK/LOWER ARM REMOVAL

After making a mating mark on the toe-in or camber adjusting bolt, remove the control link and lower arm.

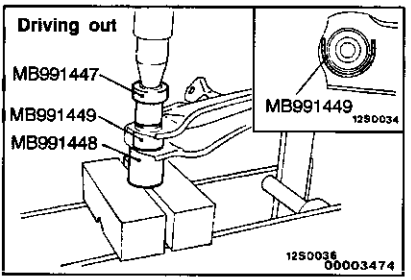


◀B▶ UPPER LINK AND TRAILING ARM / LOWER ARM AND TRAILING ARM DISCONNECTION

Support the lower arm with a jack. Then separate the connection.

INSPECTION 34100490026

- Check the bushing for wear and deterioration.
- Check the control link upper link and lower arm for bends or breakage.
- Check all bolts for condition and straightness.

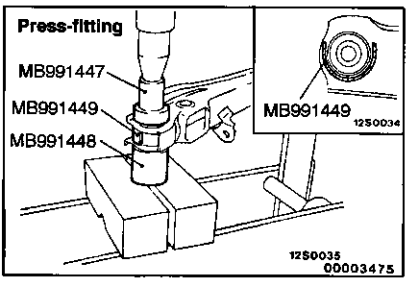


LOWER ARM BUSHING REPLACEMENT 34101110037

Use the special tools to drive out the press-fit the lower arm bushing.

NOTE
If the special tool (MB991449) is hard to install, tap it with a plastic hammer.

Caution
Because the outside diameter of both edges of the bushing are different, be careful not to mistake the direction when driving out and press-fitting.

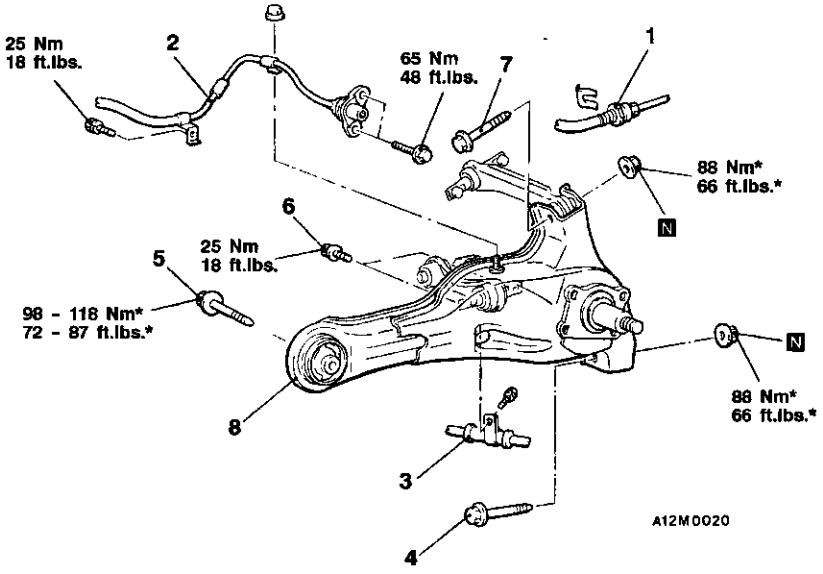


TRAILING ARM

34100420117

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Rear Drum Brake Removal and Installation (Refer to GROUP 35A.)
- Rear Axle Hub Removal and Installation (Refer to GROUP 27.)



Removal steps

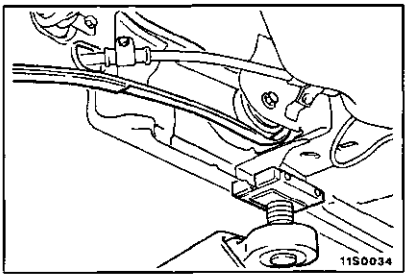
◀A▶ • Lifting point
1. Brake hose

◀B▶ ▶A◀ 2. Rear speed sensor <Vehicles with ABS>
3. Parking brake cable

◀C▶ 4. Lower arm and trailing arm connection
5. Trailing arm and body connection
6. Control link and trailing arm connection
7. Upper link and trailing arm connection
8. Trailing arm

Caution

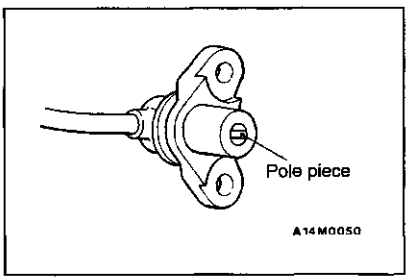
* **Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the ground in the unladen condition.**



REMOVAL SERVICE POINTS

◀A▶ LIFTING POINT

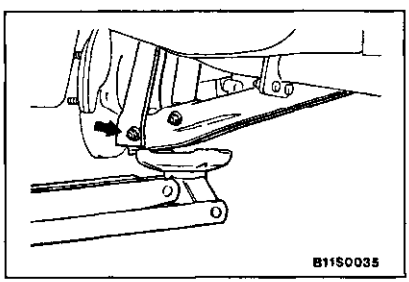
When removing the trailing arm, move the lifting arm slightly towards the front of the vehicle so that it will not be in the way.



◀B▶ REAR SPEED SENSOR REMOVAL

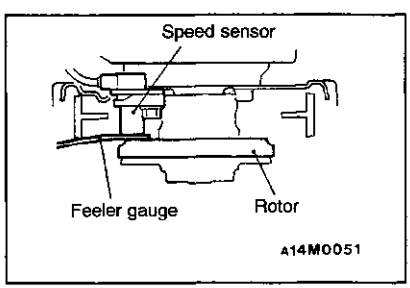
Caution

When removing the speed sensor, be careful that the pole piece at the end does not touch the surface of the rotor teeth or other parts.



◀C▶ LOWER ARM AND TRAILING ARM DISCONNECTION

Support the lower arm with a jack. Then separate the lower arm and trailing arm connection.



INSTALLATION SERVICE POINT

▶A◀ REAR SPEED SENSOR INSTALLATION

Caution

Be careful that the pole piece at the end of the speed sensor and the rotor teeth do not become damaged by striking them against the metal parts.

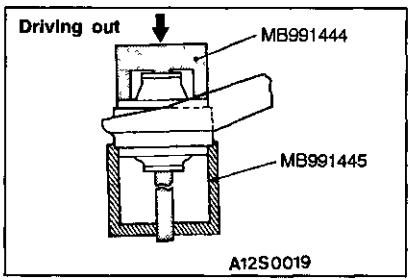
Insert a feeler gauge into the space between the speed sensor's pole piece and the rotor's toothed surface, and then tighten the speed sensor bracket at the position where the clearance is at the standard value all around.

Standard value: 0.1 - 2.0 mm (.004 - .079 in.)

INSPECTION

34100430035

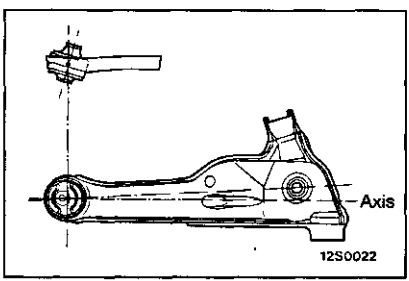
- Check trailing arm for cracks and deformation.
- Check bushing for cracks, deterioration and wear.



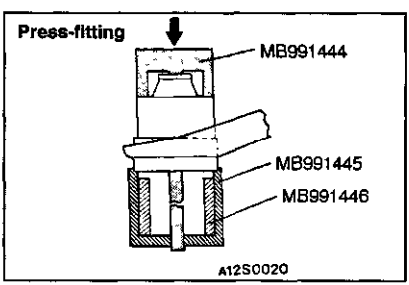
TRAILING ARM BUSHING REPLACEMENT

34101130019

(1) Use the special tools to drive out the trailing arm bushing.



(2) Set the installation direction and installation location of the trailing arm bushing.
   1. Place the long projecting end of the trailing arm bushing inner pipe toward the inside of the vehicle.
   2. Set so that the trailing arm bushing is symmetrical to the axis between the center of the trailing arm bushing and the center of the spindle.



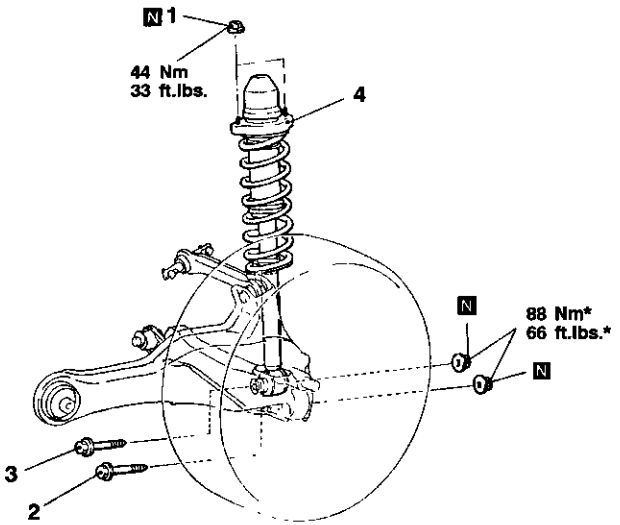
(3) Use the special tools to press-fit the trailing arm bushing.

STRUT ASSEMBLY

34100510104

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Lower arm and trailing arm disconnection (Refer to P.34-8.)

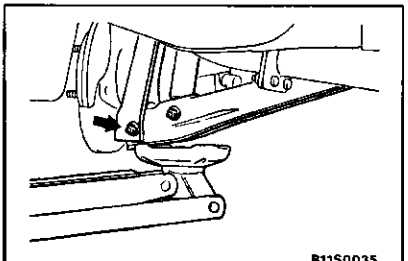


A12S0042

Removal steps

◀A▶ 1. Self-locking flange nut
2. Lower arm and trailing arm connection
3. Strut assembly and lower arm connection
4. Strut assembly

Caution
*** Indicates parts which should be temporarily tightened, and then fully tightened with the vehicles on the ground in the unladen condition.**



B11S0035

REMOVAL SERVICE POINT

◀A▶ LOWER ARM AND TRAILING ARM DISCONNECTION

After supporting the lower arm with a jack, separate the lower arm and trailing arm connection.

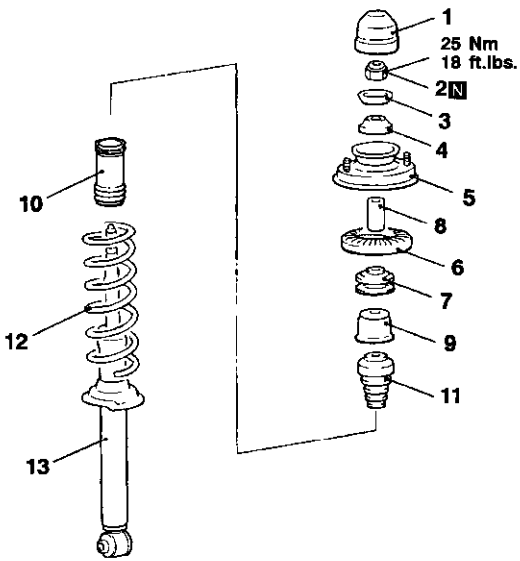
INSPECTION

34100520022

- Check the rubber parts for cracks and wear.
- Check the shock absorber for malfunctions, oil leakage or abnormal noise.

DISASSEMBLY AND REASSEMBLY

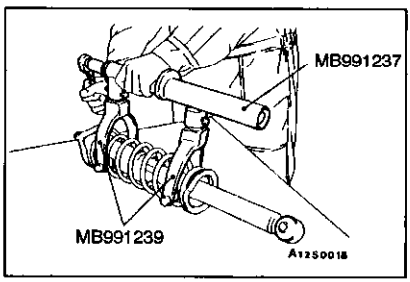
34100530087



A12M0016

Disassembly steps

1. Cap
◀A▶ ▶D◀ 2. Self-locking nut
3. Washer
4. Upper bushing B
▶C◀ 5. Bracket
▶B◀ 6. Spring pad
7. Upper bushing A
8. Collar
9. Cup
10. Dust cover
11. Bump rubber
▶A◀ 12. Coil spring
13. Shock absorber



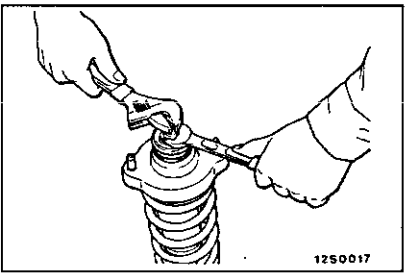
DISASSEMBLY SERVICE POINT

◀A▶ SELF-LOCKING NUT REMOVAL

(1) Use the special tools to compress the coil spring.

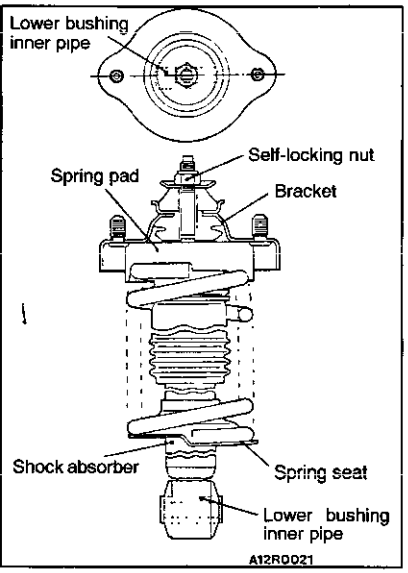
Caution

1. **Install the special tools evenly, and so that the maximum length will be attained within the installation range.**
2. **Do not use an impact wrench to tighten the special tool bolt.**



(2) Holding the piston rod, remove the self-locking nut.

Caution
Do not use an impact wrench.



REASSEMBLY SERVICE POINTS

▶A◀ COIL SPRING INSTALLATION

(1) Use the special tools (MB991237, MB991239) to compress the coil spring, and install it to the shock absorber.

Caution
Do not use an impact wrench to tighten the bolt of the special tool.

(2) Align the end of the coil spring with the stepped section of the spring seat of the shock absorber.

▶B◀ SPRING PAD INSTALLATION

Align the stepped section of the spring pad with the end of the coil spring, and install the spring pad.

▶C◀ BRACKET INSTALLATION

Install the bracket so that the lower bushing inner pipe of the shock absorber and the line between the bracket mounting bolts are straight when looking from above.

▶D◀ SELF-LOCKING NUT INSTALLATION

(1) Provisionally tighten the self-locking nut.
(2) Remove the special tools (MB991237, MB991239), tighten the self-locking nut to the specified torque.

Caution
Do not use an impact wrench.

Specified torque: 25 Nm (18 ft.lbs.)

INSPECTION

34100540035

- Check the rubber parts for damage.
- Check the coil springs for crack, damage or deterioration.

SERVICE BRAKES

CONTENTS

35109000012

BASIC BRAKE SYSTEM 35A

ANTI-LOCK BRAKING SYSTEM (ABS) <FWD> 35B

BASIC BRAKE SYSTEM

CONTENTS

35109000173

BRAKE PEDAL 18

FRONT DISC BRAKE 22

GENERAL INFORMATION 3

LUBRICANTS 4

MASTER CYLINDER AND BRAKE BOOSTER 19

- Master Cylinder 21

ON-VEHICLE SERVICE 8

- Bleeding 11
- Brake Booster Operating Test 9
- Brake Drum Inside Diameter Check 16
- Brake Fluid Level Sensor Check 11
- Brake Lining and Brake Drum Contact Check 17
- Brake Lining Thickness Check 16
- Brake Pedal Check and Adjustment 8
- Check Valve Operation Check 10
- Front Brake Disc Run-out Check 15
- Front Brake Disc Run-out Correction 15
- Front Brake Disc Thickness Check 14
- Front Disc Brake Pad Check and Replacement 12
- Front Disc Brake Rotor Check 14
- Proportioning Valve Function Test 10
- Stop Light Switch Check 9

PROPORTIONING VALVE 32

REAR DRUM BRAKE 29

- Wheel Cylinder 31

SEALANT 5

SERVICE SPECIFICATIONS 4

SPECIAL TOOLS 5

TROUBLESHOOTING 5

GENERAL INFORMATION

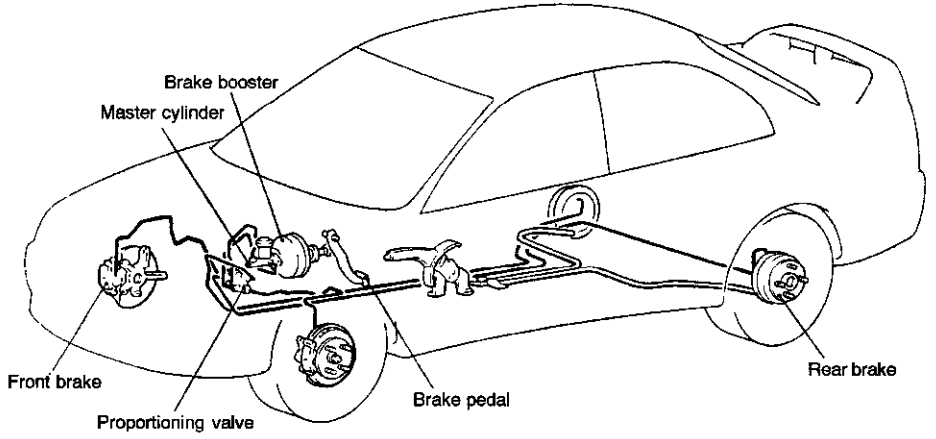
35100010281

The brake system offers high dependability and durability along with improved braking performance and brake sensitivity.

- A tandem type master cylinder is equipped on all models.
- A single type brake booster have been adopted.
- Floating caliper, 1-piston, ventilated disc brakes have been adopted as the front brakes for all models.
- Each rear drum brake is equipped with leading-trailing type brake shoes.

Items			Specification
Master cylinder	I.D. mm (in.)		22.22 (.87)
Brake booster	Effective dia. of power cylinder mm (in.)		230 (9.1)
	Boosting ratio		5.0
Proportioning valve	Decompression ratio		0.25
Front brakes	Disc effective dia. × thickness mm (in.)	Vehicles with 13 inch disc brake	184 × 18 (7.2 × .71)
		Vehicles with 14 inch disc brake	204 × 24 (8.0 × .94)
	Wheel cylinder I.D. mm (in.)		54.0 (2.13)
	Pad thickness mm (in.)		10.0 (.39)
Rear drum brakes	Drum I.D. mm (in.)		203 (8.0)
	Wheel cylinder I.D mm (in.)		19.05 (.750)
	Lining thickness mm (in.)		4.38 (.172)

CONSTRUCTION DIAGRAM



A14M0061

SERVICE SPECIFICATIONS

35100030317

Items			Standard value	Limit
Brake pedal height mm (in.)			163.5 - 166.5 (6.44 - 6.56)	-
Brake pedal free play mm (in.)			3 - 8 (.12 - .31)	-
Brake pedal to floor board clearance mm (in.)			80 (3.15) or more	-
Proportioning valve	Split point MPa (psi)	2-door models	2.45 ± 0.25 (356 ± 36)	-
		4-door models	2.94 ± 0.25 (427 ± 36)	-
	Output fluid pressure [Input fluid pressure] MPa (psi)	2-door models	4.30 ± 0.39 (623 ± 57) [9.81 (1422)]	-
		4-door models	4.66 ± 0.39 (676 ± 57) [9.81 (1422)]	-
	Left/right proportioning valve output pressure difference MPa (psi)		-	0.39 (56.9)
Front disc brake Rear drum brake	Pad thickness mm (in.)		10.0 (.39)	2.0 (.08)
	Disc thickness mm (in.)	Vehicles with 13 inch disc brake	18.0 (.71)	16.4 (.65)
		Vehicles with 14 inch disc brake	24.0 (.94)	22.4 (.88)
	Disc runout mm (in.)		-	0.06 (.0024)
	Drag force (tangential force of wheel mounting bolts) N (lbs.)	Vehicles with 13 inch disc brake	59 (13) or less	-
		Vehicles with 14 inch disc brake	94 (21) or less	-
	Lining thickness mm (in.)		4.38 (.172)	1.00 (.039)
	Drum inside diameter mm (in.)		203 (8.0)	205 (8.1)
Front hub end play mm (in.)			-	0.05 (.0020)

LUBRICANTS

35100040099

Items	Specified lubricant
Brake fluid	DOT3 or DOT4
Brake piston seal	Repair kit grease (orange)
Slide pin boot and slide pin bush inner surfaces	
Brake piston boot inner surfaces	
Piston boot mounting grooves	
Rear brake shoe and backing plate contact surface	Brake grease SAE J310, NLGI No. 1
Shoe assembly and auto adjuster assembly contact surfaces	
Shoe and lever assembly and auto adjuster assembly contact surfaces	

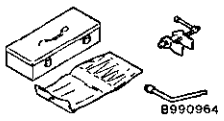
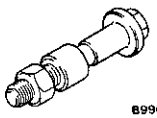
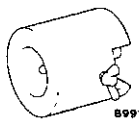
SEALANT

35100050092

Items	Specified sealant	Remarks
Intake manifold thread	3M ATD Part No. 8661 or equivalent	Semi-drying sealant

SPECIAL TOOLS

35100060088

Tool	Tool number and name	Supersession	Application
 B990964	MB990964 MB990520 MB990619 Brake tool set	General service tool	• Pushing-in of the disc brake piston • Installation of drum brake wheel cylinder piston cup
 B990998	MB990998 Front hub remover and installer	MB990998-01	Provisional holding of the wheel bearing
 B991714	MB991714 Push rod adjusting gauge	-	Clearance adjustment between the brake booster push rod and primary piston

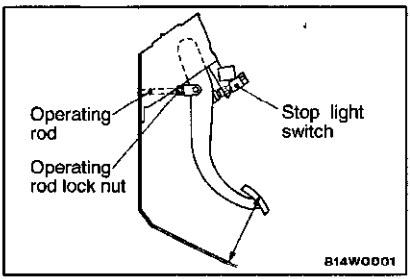
TROUBLESHOOTING

35100070029

Symptom	Probable cause	Remedy
Vehicle pulls to one side when brakes are applied	Grease or oil on pad or lining surface	Replace
	Inadequate contact of pad or lining	Correct
	Auto adjuster malfunction	Adjust
	Drum out of round or uneven wear	Repair or replace as necessary
	Caliper piston sticking	Repair
Insufficient braking power	Low or deteriorated brake fluid	Refill or change
	Air in brake system	Bleed air from system
	Overheated brake rotor due to dragging of pad or lining	Correct
	Inadequate contact of pad or lining	
	Brake booster malfunction	
	Clogged brake line	
	Grease or oil on pad or lining surface	Replace
	Proportioning valve malfunction	
	Auto adjuster malfunction	Adjust

Symptom	Probable cause	Remedy
Increased pedal stroke (Reduced pedal to floorboard clearance)	Air in brake system	Bleed air from system
	Worn lining or pad	Replace
	Broken vacuum hose	
	Faulty master cylinder	
	Brake fluid leaks	Correct
	Auto adjuster malfunction	Adjust
	Excessive push rod to master cylinder clearance	
Brake drag	Incomplete release of parking brake	Correct
	Clogged master cylinder return port	
	Incorrect parking brake adjustment	Adjust
	Incorrect push rod to master cylinder clearance	
	Faulty master cylinder piston return spring	Replace
	Worn brake pedal return spring	
	Broken rear drum brake shoe return spring	
	Caliper piston sticking	Repair
	Lack of lubrication in sliding parts	Lubricate
Scraping or grinding noise when brakes are applied	Worn brake lining or pad	Replace
	Caliper to wheel interference	Correct or replace
	Dust cover to disc interference	
	Bent brake backing plate	
	Cracked drums or brake disc	
Squealing, groaning or chattering noise when brakes are applied	Missing or damaged brake pad anti-squeak shim	Replace
	Brake drums and linings, discs and pads worn or scored	Correct or replace
	Incorrect parts	
	Burred or rusted calipers	Clean or deburr
	Dirty, greased, contaminated or glazed linings	Clean or replace
	Drum brakes-weak, damaged or incorrect shoe hold-down springs, loose or damaged shoe hold-down pins and springs	Correct or replace
	Incorrect brake pedal or booster push rod setting	Adjust

Symptom	Probable cause	Remedy
Squealing noise when brakes are not applied	Bent or warped backing plate causing interference with drum	Replace
	Drum brakes-weak, damaged or incorrect shoe-to-shoe spring	
	Poor return of brake booster, master cylinder or wheel cylinder	
	Loose or excessive brake parts	Retighten
	Improper positioning of pads in caliper	Correct
	Improper installation of support mounting to caliper body	
	Improper machining of drum causing interference with backing plate or shoe	Replace drum
	Disc brakes-rusted, stuck	Lubricate or replace
	Worn, damaged or insufficiently lubricated wheel bearings	
	Incorrect brake pedal or booster push rod setting	Adjust
Groaning clicking or rattling noise when brakes are not applied	Stones or foreign material trapped inside wheel covers or drums	Remove stones, etc.
	Loose wheel nuts	Retighten
	Disc brakes-loose installation bolt	
	Worn, damaged or dry wheel bearings	Lubricate or replace
	Disc brakes-failure of anti-rattle shim	Replace
	Disc brakes-wear on sleeve	
	Incorrect brake pedal or booster push rod setting	Adjust



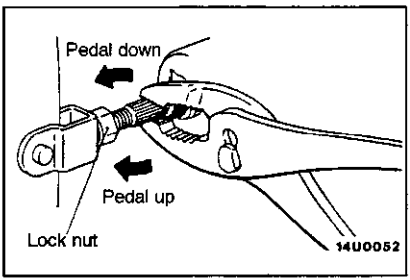
ON-VEHICLE SERVICE

35100090124

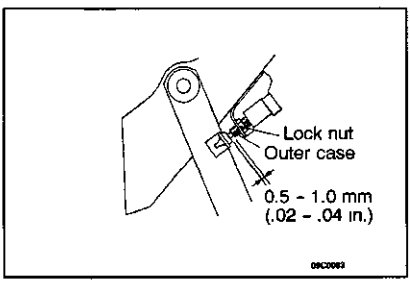
BRAKE PEDAL CHECK AND ADJUSTMENT

1. Turn up the carpet, etc. under the brake pedal.
2. Measure the brake pedal height as illustrated. If the brake pedal height is not within the standard value, follow the procedure below.

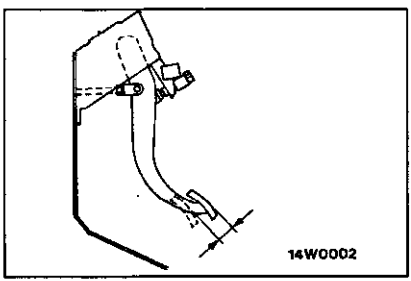
   Standard value: 163.5 - 166.5 mm (6.44 - 6.56 in.)



(1) Disconnect the stop light switch connector.
(2) Adjust the brake pedal height by turning the operating rod with pliers (with the operating rod lock nut loosened), until the correct brake pedal height is obtained.
(3) Secure by tightening the lock nut of the operating rod.



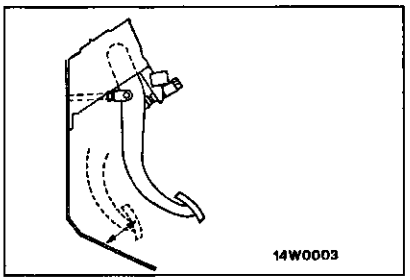
(4) Push the stop light switch in the direction of the pedal stroke until it stops. (The switch will slide if it is pushed firmly.)
(5) Lift up the pedal until the operating rod is fully extended, and then slide the stop light switch back to the required position. Adjust the position of the switch by turning it until the distance shown in the illustration is correct.
(6) Connect the connector of the stop light switch.
(7) Check that the stop light is not illuminated with the brake pedal unpressed.



3. With the engine stopped, depress the brake pedal two or three times. After eliminating the vacuum in the power brake booster, press the pedal down by hand, and confirm that the amount of movement before resistance is met (the free play) is within the standard value range.

   Standard value: 3 – 8 mm (.12 - .31 in.)

   If the free play exceeds the standard value, it is probably due to excessive play between the retaining ring bolt and brake pedal arm.
   Check for excessive clearance and replace faulty parts as required.



4. Start the engine, depress the brake pedal with approximately 490 N (110 lbs.) of force, and measure the clearance between the brake pedal and the floorboard.

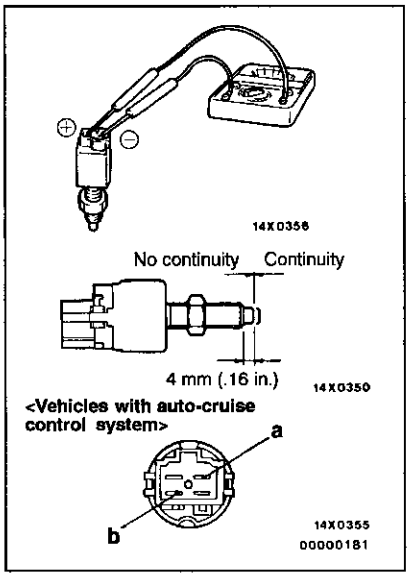
   Standard value: 80 mm (3.15 in.) or more

   If the clearance is outside the standard value, check for air trapped in the brake line, clearance between the lining and the drum and dragging in the parking brake. Adjust and replace defective parts as required.

5. Turn back the carpet to its original position.

STOP LIGHT SWITCH CHECK 35100890014

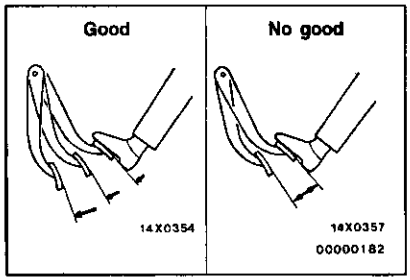
Connect an ohmmeter to the stop light switch, and check whether or not there is continuity when the plunger of the stop light switch is pushed in and when it is released.
The stop light switch is in good condition if there is no continuity when the plunger is pushed in to a depth of within 4 mm (.16 in.) from the outer case edge surface, and if there is continuity when it is released.
For vehicles with auto-cruise control system, the check for continuity should be made at connectors "a" and "b" of the stop light switch.



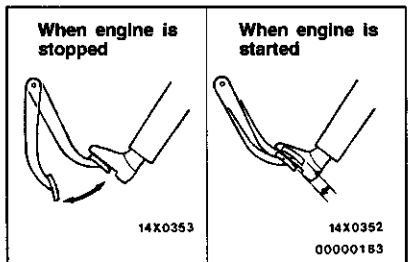
BRAKE BOOSTER OPERATING TEST 35100100049

For simple checking of the brake booster operation, carry out the following tests:

1. Run the engine for one or two minutes, and then stop it.
   If the pedal depresses fully the first time but gradually becomes higher when depressed succeeding times, the booster is operating properly, if the pedal height remains unchanged, the booster is defective.



2. With the engine stopped, step on the brake pedal several times.
   Then step on the brake pedal and start the engine.
   If the pedal moves downward slightly, the booster is in good condition. If there is no change, the booster is defective.

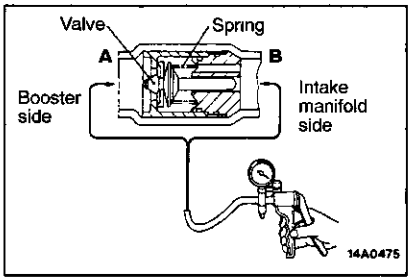


3. With the engine running, step on the brake pedal and then stop the engine.
   Hold the pedal depressed for 30 seconds. If the pedal height does not change, the booster is in good condition, if the pedal rises, the booster is defective.
   If the above three tests are okay, the booster performance can be determined as good.
   If one of the above three tests is not okay at last, the check valve, vacuum hose, or booster will be defective.

CHECK VALVE OPERATION CHECK 35100900106

1. Remove the vacuum hose. (Refer to P.35A-18.)

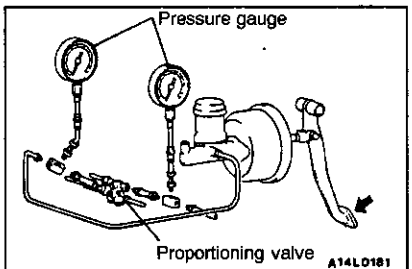
Caution
The check valve should not be removed from the vacuum hose.



2. Check the operation of the check valve by using a vacuum pump.

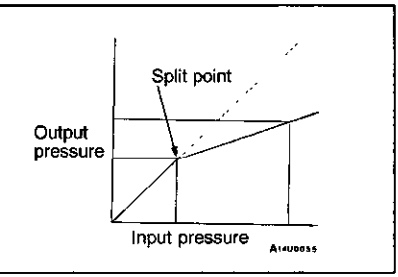
Vacuum pump connection	Accept/reject criteria
Connection at the brake booster side (A)	A negative pressure (vacuum) is created and held.
Connection at the intake manifold side (B)	A negative pressure (vacuum) is not created.

Caution
If the check valve is defective, replace it as an assembly unit together with the vacuum hose.



PROPORTIONING VALVE FUNCTION TEST 35100110097

1. Connect two pressure gauges, one each to the input side and output side of the proportioning valve, as shown.
2. Bleed the air in the brake line and the pressure gauge.
3. While gradually depressing the brake pedal, make the following measurements and check to be sure that the measured values are within the allowable range.



(1) Output pressure begins to drop relative to input pressure (split point).

Standard value:

MPa (psi)

2-door models	4-door models
2.45 ± 0.25 (356 ± 36)	2.94 ± 0.25 (427 ± 36)

(2) Check to be sure that the output fluid pressure is at the standard value when the pedal depression force is increased so that the input fluid pressure is 9.81 MPa (1422 psi).

Standard value:

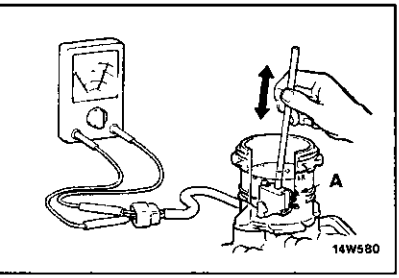
MPa (psi)

2-door models	4-door models
4.30 ± 0.39 (623 ± 57)	4.66 ± 0.39 (676 ± 57)

(3) Output pressure difference between left and right brake lines.

Limit: 0.39 MPa (56.9 psi)

4. If the measured pressures are not within the permissible ranges, replace the proportioning valve.



BRAKE FLUID LEVEL SENSOR CHECK 35100910086

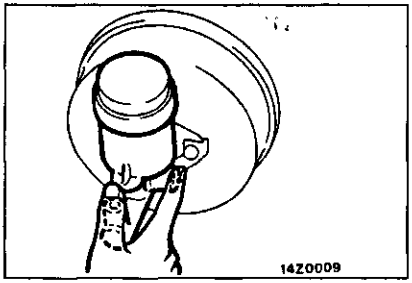
The brake fluid level sensor is in good condition if there is no continuity when the float surface is above "A" and if there is continuity when the float surface is below "A."

BLEEDING 35100140096

Caution

Use the specified brake fluid. Avoid using a mixture of the specified brake fluid and other fluid.

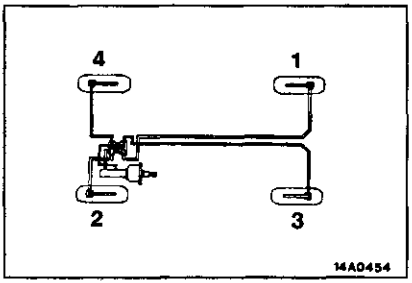
Specified brake fluid: DOT3 or DOT4



MASTER CYLINDER BLEEDING

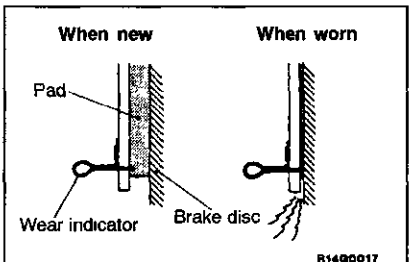
The master cylinder used has no check valve, so if bleeding is carried out by the following procedure, bleeding of air from the brake pipeline will become easier. (When brake fluid is not contained in the master cylinder.)

(1) Fill the reserve tank with brake fluid.
(2) Keep the brake pedal depressed.
(3) Have another person cover the master cylinder outlet with a finger.
(4) With the outlet still closed, release the brake pedal.
(5) Repeat steps (2)-(4) three or four times to fill the inside of the master cylinder with brake fluid.



BRAKE PIPE LINE BLEEDING

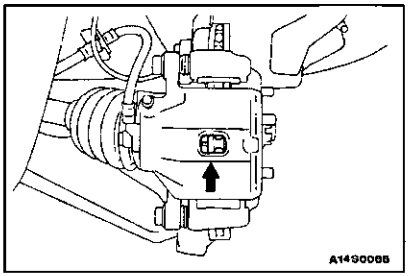
Bleed the air in the sequence shown in the figure.



FRONT DISC BRAKE PAD CHECK AND REPLACEMENT

3510015021

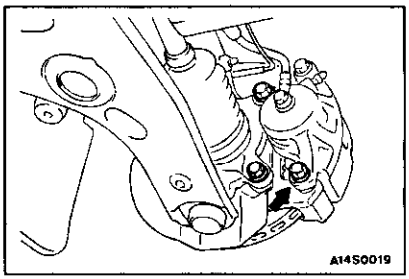
NOTE
The left side inner brake pad has a wear indicator.
The wear indicator contacts the brake disc when the brake pad thickness becomes 2 mm (.08 in.) and emit a squealing sound to warn the driver.



1. Check brake pad thickness through caliper body check port.

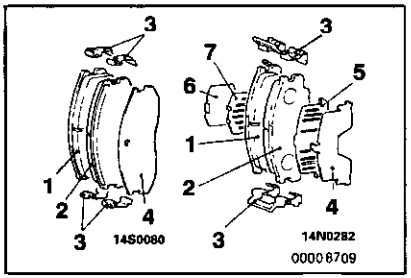
   Standard value: 10 mm (.39 in.)
   Limit: 2.0 mm (.08 in.)

   Caution
   1. **When the limit is exceeded, replace the pads at both sides, and also the brake pads for the wheels on the opposite side at the same time.**
   2. **If there is a significant difference in the thickness of the pads on the left and right sides, check the sliding condition of the piston, lock pin and guide pin.**



2. Remove the slide pin (M14) or guide pin. Lift caliper assembly and retain with wires.

   Caution
   Do not wipe off the special grease that is on the slide pin/guide pin or allow it to contaminate the slide pin/guide pin.



3. Remove the following parts from caliper support.
   1. Pad and wear indicator assembly <L.H.>, and pad assembly <R.H.>
   2. Pad assembly
   3. Pad clip
   4. Outer shim
   5. Outer shim
   6. Inner shim
   7. Inner shim

4. In order to measure the brake drag force after pad installation, measure the rotary-sliding resistance of the hub with the pads removed. (Refer to P.35A-22.)
5. Install the pads and the caliper assembly, and then check the brake drag force. (Refer to P.35A-22.)

FRONT DISC BRAKE ROTOR CHECK

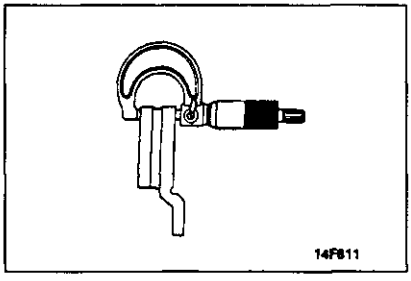
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CAUTION

When servicing disc brakes, it is necessary to exercise caution to keep the disc brakes within the allowable service values in order to maintain normal brake operation.

Before re-finishing or re-processing the brake disc surface, the following conditions should be checked.

Inspection items	Remarks
Scratches, rust, saturated lining materials and wear	• If the vehicle is not driven for a certain period, the sections of the discs that are not in contact with lining will become rusty, causing noise and shuddering. • If grooves resulting from excessive disc wear and scratches are not removed prior to installing a new pad assembly, there will momentarily be inappropriate contact between the disc and the lining (pad).
Run-out or drift	Excessive run-out or drift of the discs will increase the pedal depression resistance due to piston knock-back.
Change in thickness (parallelism)	If the thickness of the disc changes, this will cause pedal pulsation, shuddering and surging.
Inset or warping (flatness)	Overheating and improper handling while servicing will cause inset or warping.



FRONT BRAKE DISC THICKNESS CHECK

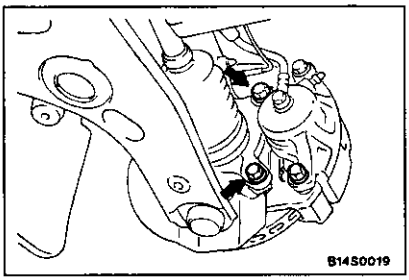
35100160214

1. Using a micrometer, measure disc thickness at eight positions, approximately 45° apart and 10 mm (.39 in.) in from the outer edge of the disc.

   Brake disc thickness
   Standard value:
   18.0 mm (.71 in.) <Vehicles with 13 inch front disc brake>
   24.0 mm (.94 in.) <Vehicles with 14 inch front disc brake>
   Minimum limit:
   16.4 mm (.65 in.) <Vehicles with 13 inch front disc brake>
   22.4 mm (.88 in.) <Vehicles with 14 inch front disc brake>

   Thickness variation (at least 8 positions)
   The difference between any thickness measurements should not be more than 0.015 mm (.0006 in.).

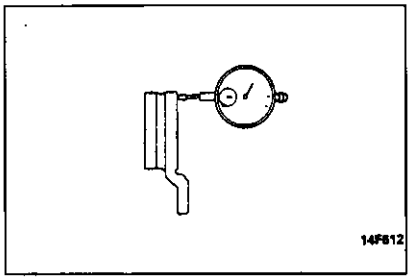
2. If the disc is beyond the limits for thickness, remove it and install a new one. If thickness variation exceeds the specification, replace the brake disc or turn rotor with on the car type brake lathe ("Accuturn-8750" or equivalent).



FRONT BRAKE DISC RUN-OUT CHECK

35100170095

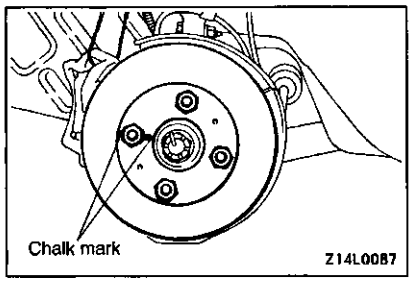
1. Remove the caliper support; then raise the caliper assembly upward and secure with a wire.
2. Inspect the disc surface for grooves, cracks and rust. Clean the disc thoroughly and remove all rust.



3. Place a dial gauge approximately 5 mm (.2 in.) from the outer circumference of the brake disc, and measure the run-out of the disc.

   Limit: 0.06 mm (.0024 in.) or less

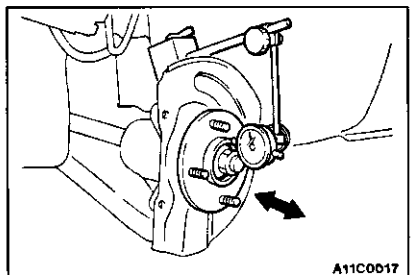
   NOTE
   Tighten the nuts in order to secure the disc to the hub.



FRONT BRAKE DISC RUN-OUT CORRECTION

35100180096

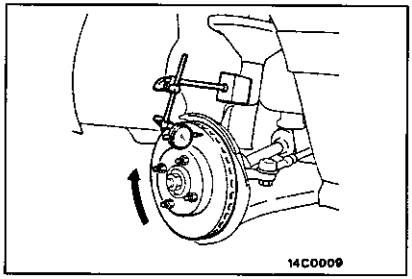
1. If the run-out of the brake disc is equivalent to or exceeds the limit specification, change the phase of the disc and hub, and then measure the run-out again.
   (1) Before removing the brake disc, chalk both sides of the wheel stud on the side at which run-out is greatest.



   (2) Remove the brake disc, and then place a dial gauge as shown in the illustration; then move the hub in the axial direction and measure the play.

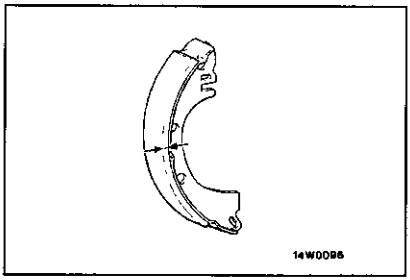
   Limit: 0.05 mm (.0020 in.)

   If the play is equivalent to or exceeds the limit, disassemble the hub knuckle and check each part.



(3) If the play does not exceed the limit specification, install the brake disc at a position 180° away from the chalk mark, and then check the run-out of the brake disc once again.

2. If the run-out cannot be corrected by changing the phase of the brake disc, replace the disc or turn rotor with on the car type brake lathe ("Accuturn-8750" or equivalent).



BRAKE LINING THICKNESS CHECK 35100300111

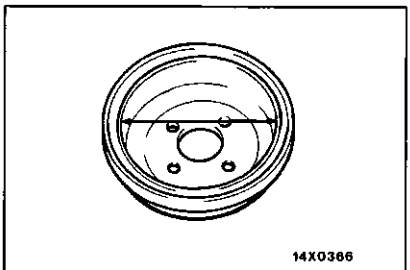
1. Remove the brake drum.
2. Measure the wear of the brake lining at the place worn the most.

   Standard value: 4.38 mm (.172 in.)
   Limit: 1.00 mm (.039 in.)

   Replace the shoe and lining assembly if brake lining thickness is less than the limit or if it is not worn evenly. For information concerning the procedures for installation of the shoe and lining assembly, refer to P.35A-26.

Caution

1. **Whenever the shoe and lining assembly is replaced, replace both RH and LH assemblies as a set to prevent the car from pulling to one side when braking.**
2. **If there is a significant difference in the thickness of the shoe and lining assemblies on the left and right sides, check the sliding condition of the piston.**



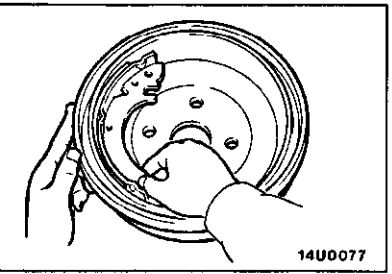
BRAKE DRUM INSIDE DIAMETER CHECK

35100320100

1. Remove the brake drum.
2. Measure the inside diameter of the brake drum at two or more locations.

   Standard value: 203 mm (8.0 in.)
   Limit: 205 mm (8.1 in.)

3. Replace brake drums, shoe and lining assembly when wear exceeds the limit value or is badly imbalanced.



BRAKE LINING AND BRAKE DRUM CONTACT CHECK

35100310114

1. Remove the brake drum.
2. Remove the shoe and lining assembly. (Refer to P.35A-29.)
3. Chalk inner surface of brake drum and rub with shoe and lining assembly.
4. Replace shoe and lining assembly or brake drums if there are any irregular contact area.

NOTE
Clean off chalk after check.

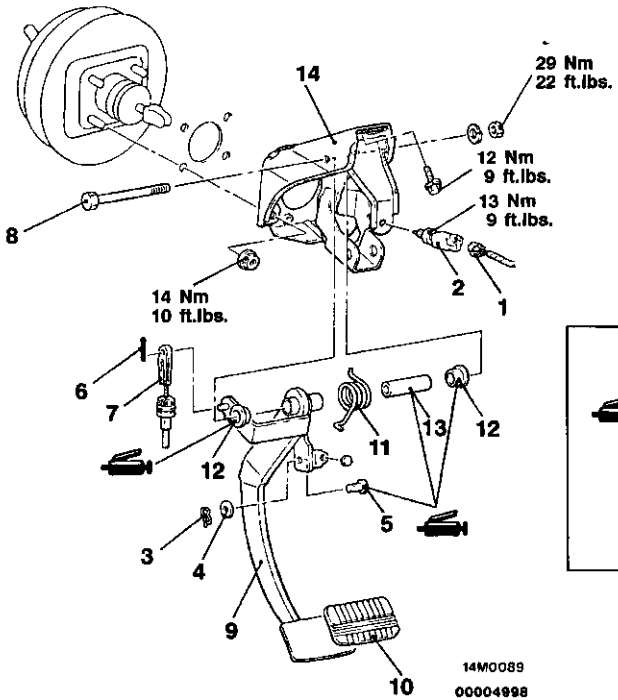
BRAKE PEDAL

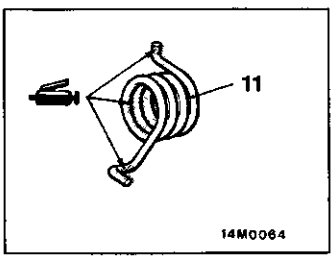
38100340304

REMOVAL AND INSTALLATION

Pre-removal Operation
- Knee Protector Assembly Removal (Refer to GROUP 52A – Instrument Panel.)
- Steering Column Assembly Removal (Refer to GROUP 37A – Steering Wheel and Shaft.)
- Accelerator Pedal Removal (Refer to GROUP 17.)

Post-installation Operation
- Accelerator Pedal Installation (Refer to GROUP 17.)
- Steering Column Assembly Installation (Refer to GROUP 37A – Steering Wheel and Shaft.)
- Knee Protector Assembly Installation (Refer to GROUP 52A – Instrument Panel.)
- Brake Pedal Adjustment (Refer to P.35A-8.)





Removal steps

1. Stop light switch connector
2. Stop light switch
3. Snap pin
4. Washer
5. Clevis pin
6. Cotter pin <A/T>
7. Shift lock cable connection <A/T>
8. Brake pedal shaft bolt
9. Brake pedal
10. Brake pedal pad
11. Brake pedal return spring
12. Bushing
13. Pipe
14. Pedal support member

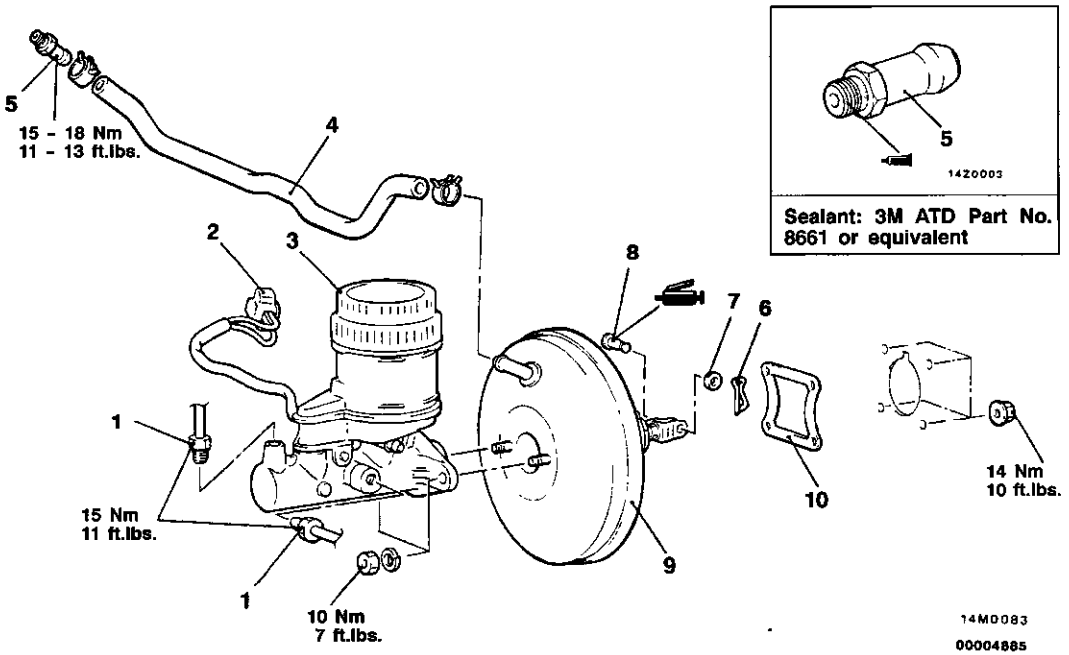
MASTER CYLINDER AND BRAKE BOOSTER

35100370143

REMOVAL AND INSTALLATION

Pre-removal Operation
- Brake Fluid Draining
- Air Intake Hose Removal

Post-installation Operation
- Brake Fluid Supplying
- Brake Line Bleeding (Refer to P.35A-11.)
- Brake Pedal Adjustment (Refer to P.35A-8.)
- Air Intake Hose Installation



Sealant: 3M ATD Part No. 8661 or equivalent

Removal steps

1. Brake pipe connection
2. Brake fluid level sensor connector
3. Master cylinder assembly

▶B◀ • Clearance adjustment between brake booster push rod and primary piston

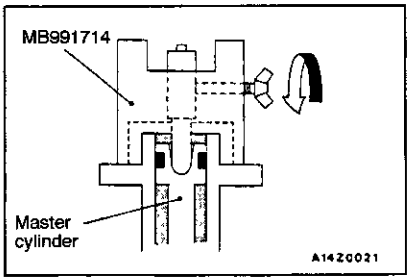
▶A◀ 4. Vacuum hose (With built-in check valve)

5. Fitting
6. Snap pin
7. Washer
8. Clevis pin
9. Brake booster
10. Sealer

INSTALLATION SERVICE POINTS

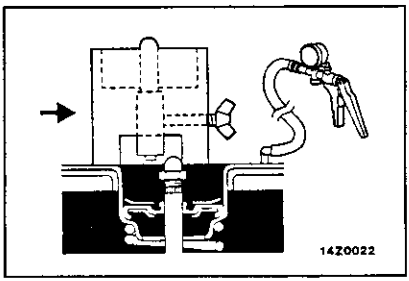
▶A◀ VACUUM HOSE CONNECTION

Insert securely and completely until the vacuum hose at the engine side contacts the edge of the hexagonal part of the fitting, and then secure by using the hose clip.

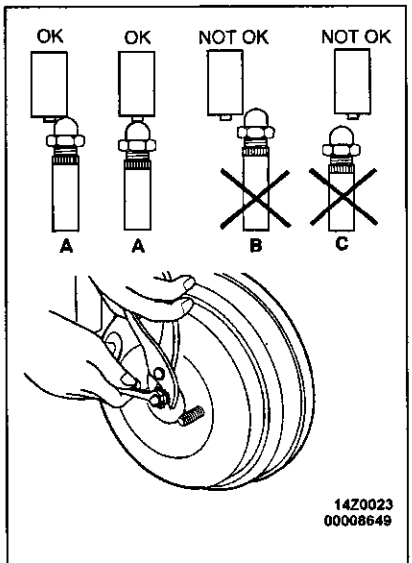


▶B◀ CLEARANCE ADJUSTMENT BETWEEN BRAKE BOOSTER PUSH ROD AND PRIMARY PISTON

1. Set the special tool in the master cylinder.
2. Set the special tool shaft to a position where it lightly contacts the master cylinder piston.
3. Turn the wing bolt to fix the shaft.



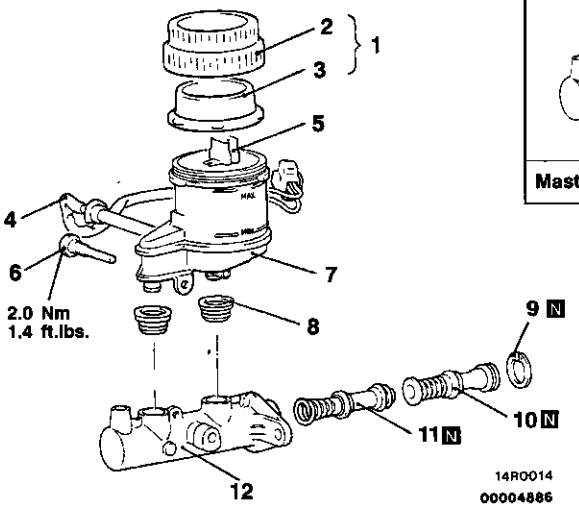
4. Using a hand vacuum pump, apply a vacuum of -66.7 kPa (19.6 in.Hg) to the brake booster.
5. Reverse the special tool to shift it from the center of the brake booster.

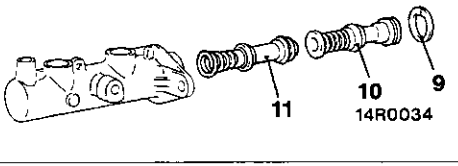


6. Slide the special tool toward the center, and confirm that the protrusion of the shaft contacts the end of the brake booster push rod as shown in drawing A on the left. If the state is as shown in drawings B and C on the left, adjust the push rod length with the following steps to achieve the state shown in A.
   - B: If a section other than the shaft protrusion is contacted, shorten the push rod.
   - C: If there is no contact with the shaft, extend the push rod.

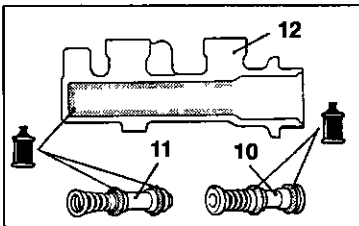
MASTER CYLINDER DISASSEMBLY AND REASSEMBLY

35100420107





Master cylinder kit



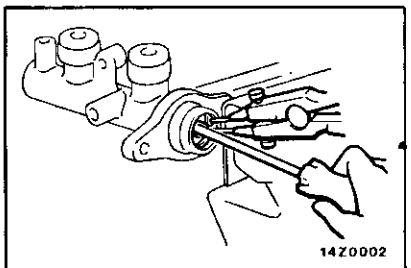
Brake fluid: DOT3 or DOT4

Disassembly steps

1. Reservoir cap assembly
2. Reservoir cap
3. Diaphragm
4. Brake fluid level sensor
5. Float
6. Reservoir stopper bolt

◀A▶

7. Reservoir tank
8. Reservoir seal
9. Piston stopper ring
10. Primary piston assembly
11. Secondary piston assembly
12. Master cylinder body



DISASSEMBLY SERVICE POINT

◀A▶ PISTON STOPPER RING DISASSEMBLY

Remove the piston stopper ring, while depressing the piston.

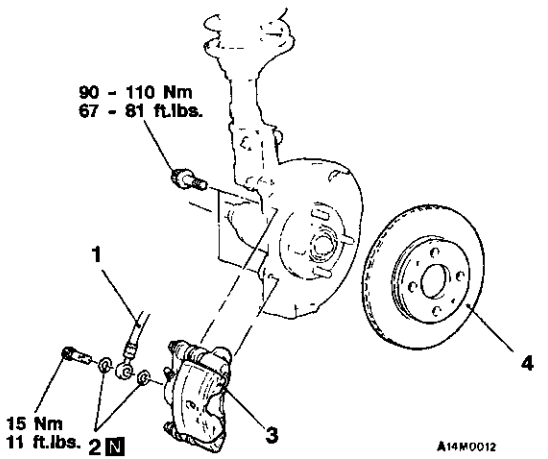
FRONT DISC BRAKE

35100800235

REMOVAL AND INSTALLATION

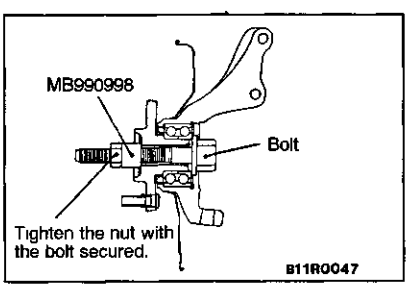
Pre-removal Operation
- Brake Fluid Draining

Post-installation Operation
- Brake Fluid Supplying
- Brake Line Bleeding (Refer to P.35A-11.)



Removal steps

1. Brake hose connection
2. Gasket
▶A◀ 3. Disc brake assembly
4. Brake disc

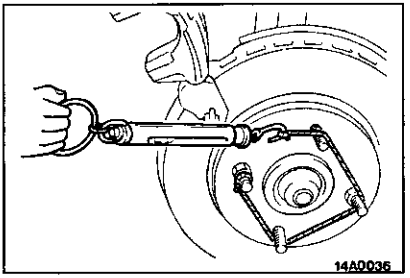


INSTALLATION SERVICE POINT

▶A◀ DISC BRAKE ASSEMBLY INSTALLATION

1. In order to measure the brake drag force after pad installation, measure the rotary-sliding resistance of the hub by the following procedure with the pads removed.
   (1) Remove the drive shaft.
   (Refer to GROUP 26 – Front Axle.)
   (2) Attach the special tool to the front hub assembly as shown in the illustration, and tighten it to the specified torque.

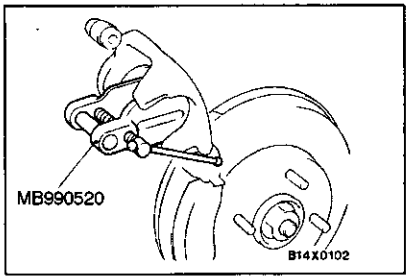
   Tightening torque: 177 - 275 Nm (130 - 203 ft.lbs.)



(3) Use a spring scale to measure the rotary-sliding resistance of the hub in the forward direction.

2. After installing the caliper support to the knuckle, install the pad clips and the pads to the caliper support.

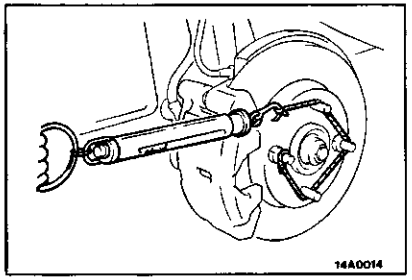
Caution
Do not let any oil, grease or other contamination get onto the friction surfaces of the pads and brake discs.



3. Clean piston and insert into cylinder with special tool.
4. Be careful that the piston boot does not become caught when lowering the caliper assembly, and tighten the slide pin (M14) to the specified torque.

Tightening torque: 83 - 93 Nm (61 - 69 ft.lbs.)

5. Start the engine and then depress the brake pedal 2-3 times.
6. Stop engine.
7. Turn brake disc forward 10 times.



8. Use a spring scale to measure the rotation sliding resistance of the hub in the forward direction.
9. Calculate the drag force of the disc brake (difference between of values measured in item 8 and item 1.)

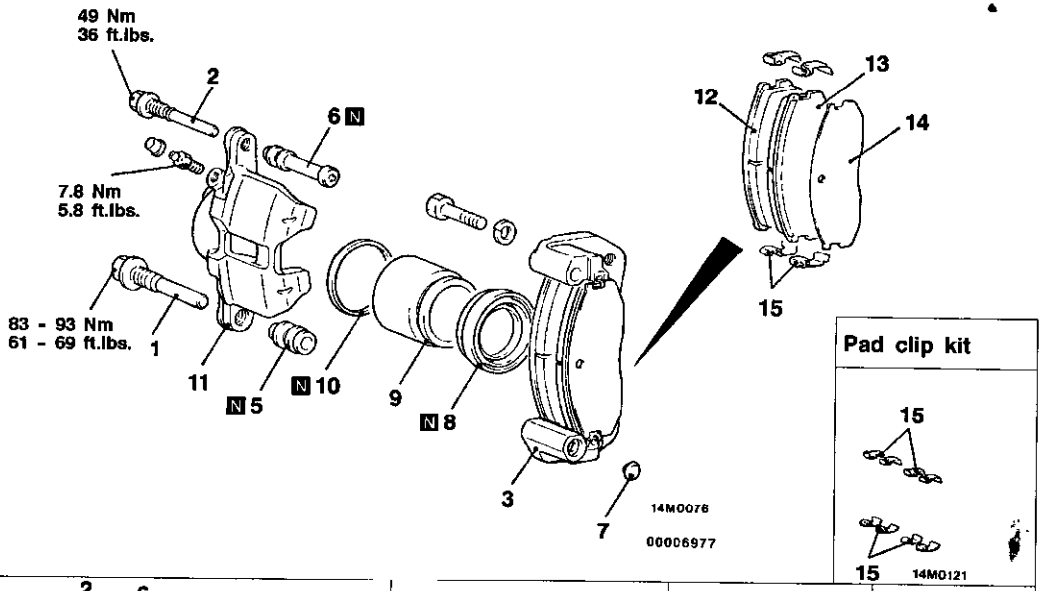
Standard value:
59 N (13 lbs.) or less <Vehicles with 13 inch front disc brake>
94 N (21 lbs.) or less <Vehicles with 14 inch front disc brake>

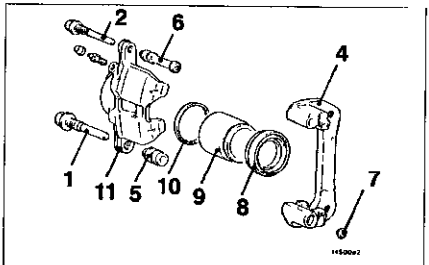
10. If the drag force of the disc brake exceeds the standard value, disassemble piston and clean piston. Check for corrosion or worn piston seal, and check the sliding condition of the slide pins.

DISASSEMBLY AND REASSEMBLY

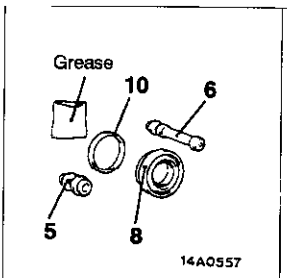
35100620286

<13 inch front disc brake>

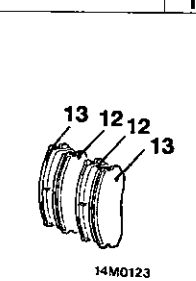




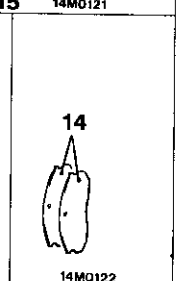
Brake caliper kit



Seal and boots repair kit



Pad set



Shim kit

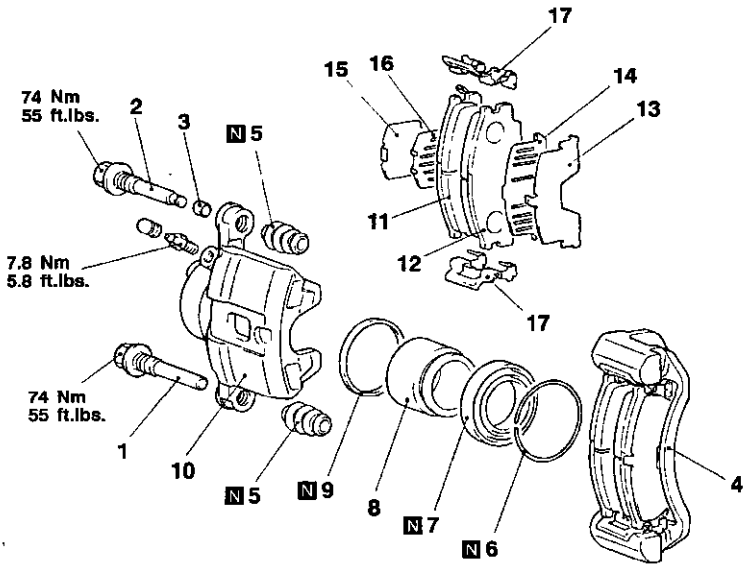
Caliper assembly disassembly steps

1. Slide pin (M14)
2. Slide pin (M10)
3. Torque member, pad, pad clip, shim assembly
4. Torque member
5. Boot
6. Bush
7. Plug
8. Piston boot ◀A▶
9. Piston ◀A▶
10. Piston seal ◀B▶
11. Caliper body

Pad assembly disassembly steps

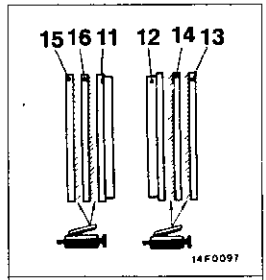
1. Slide pin (M14)
2. Slide pin (M10)
3. Torque member, pad, pad liner, shim assembly
12. Pad and wear indicator assembly <L.H.> or pad assembly <R.H.>
13. Pad assembly
14. Outer shim (coated with rubber)
15. Pad clip

<14 inch front disc brake>

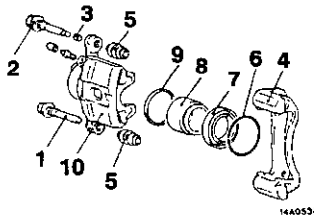


14N0282

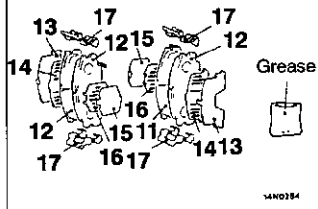
00008714



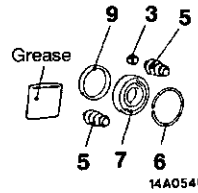
Grease:
Repair kit grease



Brake caliper kit



Pad kit



Seal and boots repair kit

Caliper assembly disassembly steps

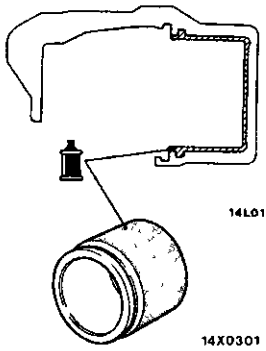
- ▶A◀ 1. Guide pin
- ▶A◀ 2. Lock pin
- 3. Bush
- 4. Caliper support, pad, pad clip, shim assembly
- 5. Boot
- 6. Boot ring
- ◀A▶ 7. Piston boot
- ◀A▶ 8. Piston
- ◀B▶ 9. Piston seal
- 10. Caliper body

Pad assembly disassembly steps

- ▶A◀ 1. Guide pin
- ▶A◀ 2. Lock pin
- 3. Bush
- 4. Caliper support, pad, pad clip, shim assembly
- 11. Pad and wear indicator assembly <L.H.> or pad assembly <R.H.>
- 12. Pad assembly
- 13. Outer shim
- 14. Outer shim
- 15. Inner shim
- 16. Inner shim
- 17. Pad clip

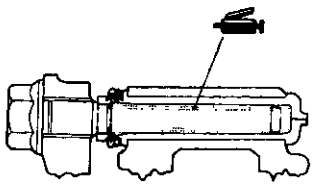
LUBRICATION POINTS

<13 inch front disc brake>

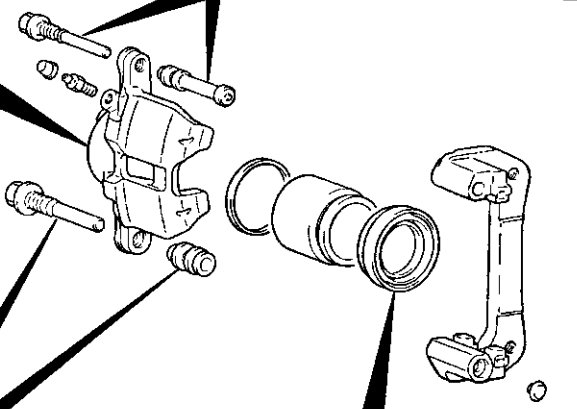


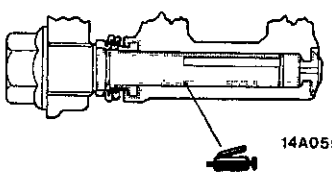
Caution
The piston seal inside the seal and boot kit is coated with special grease, so do not wipe this grease off.

Brake fluid: DOT3 or DOT4

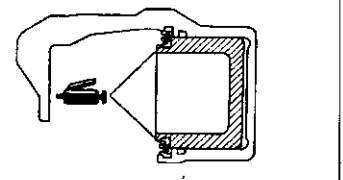


Grease: Repair kit grease (orange)



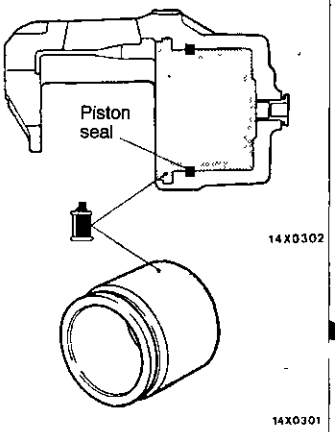


Grease: Repair kit grease (orange)



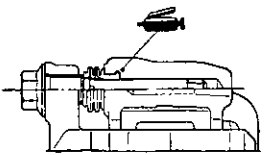
Grease: Repair kit grease (orange)

<14 inch front disc brake>

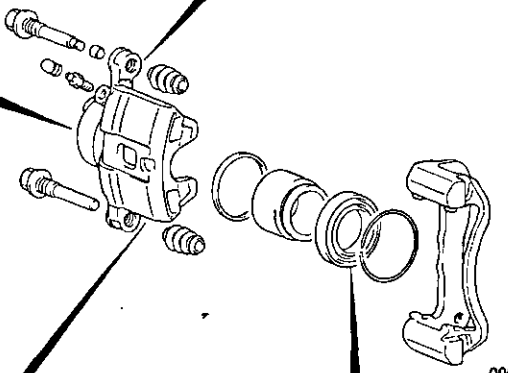


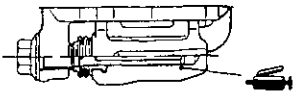
Caution
The piston seal inside the seal and boot kit is coated with special grease, so do not wipe this grease off.

Brake fluid: DOT3 or DOT4

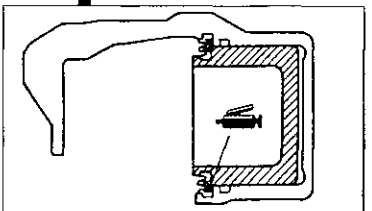


Grease: Repair kit grease





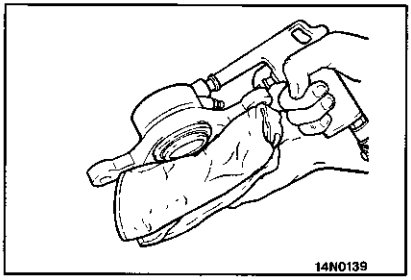
Grease: Repair kit grease



Grease: Repair kit grease

DISASSEMBLY SERVICE POINTS

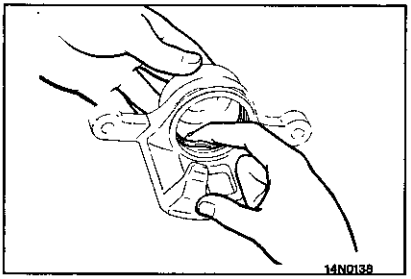
When disassembling the front disc brakes, disassemble both sides (left and right) as a set.



◀A▶ PISTON BOOT/PISTON REMOVAL

Protect caliper body with cloth. Blow compressed air through brake hose to remove piston boot and piston.

Caution
Blow compressed air gently and wear eye protection.



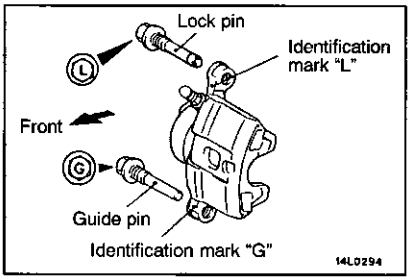
◀B▶ PISTON SEAL REMOVAL

(1) Remove piston seal with finger tip.

Caution
Do not use a flat-tipped screwdriver or other tool to prevent damage to inner cylinder.

(2) Clean piston surface and inner cylinder with trichloroethylene, alcohol or specified brake fluid.

Specified brake fluid: DOT3 or DOT4



REASSEMBLY SERVICE POINT

▶A◀ LOCK PIN/GUIDE PIN INSTALLATION

Install the lock pin and guide pin so that the pin head marks correspond to the identification marks on the caliper body.

INSPECTION

35100630081

- Check cylinder for wear, damage or rust.
- Check piston surface for wear, damage or rust.
- Check caliper body or sleeve for wear.
- Check pad for damage or adhesion of grease, check backing metal for damage.

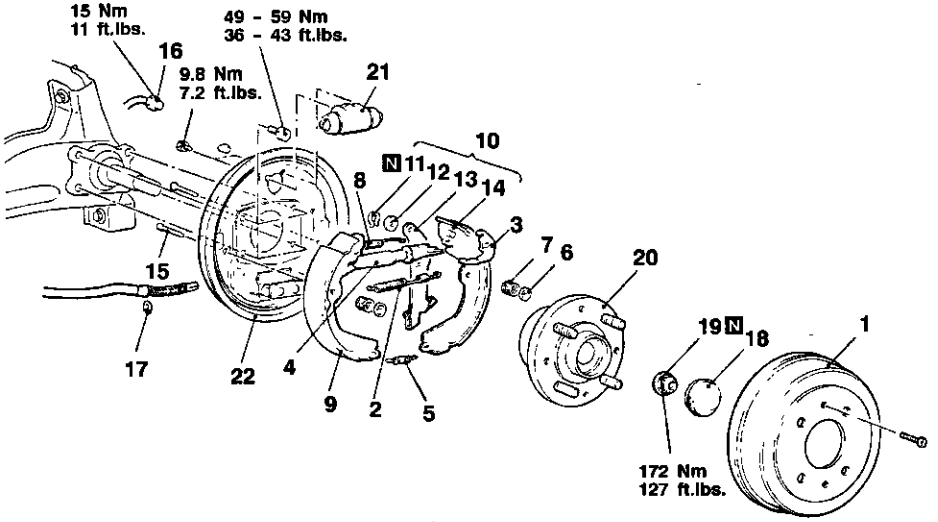
REAR DRUM BRAKE

35100750084

REMOVAL AND INSTALLATION

Pre-removal Operation
- Loosening the Parking Brake Cable Adjusting Nut.
- Brake Fluid Draining

Post-installation Operation
- Brake Line Bleeding (Refer to P.35A-11.)
- Parking Brake Lever Stroke Adjustment (Refer to GROUP 36 – On-vehicle Service.)



A14M0054

Rear drum brake removal steps

1. Brake drum
2. Shoe-to-lever spring
3. Adjuster lever
4. Auto adjuster assembly
5. Retainer spring
6. Shoe hold-down cup
7. Shoe hold-down spring
8. Shoe-to-shoe spring
9. Shoe and lining assembly
10. Shoe, lining and lever assembly

◀A▶ ▶B◀ 11. Retainer
▶A◀ 12. Wave washer

13. Parking lever
14. Shoe and lining assembly
15. Shoe hold-down pin
16. Brake pipe connection
17. Snap ring
18. Hub cap
19. Flange nut
20. Rear hub assembly
21. Wheel cylinder
22. Backing plate

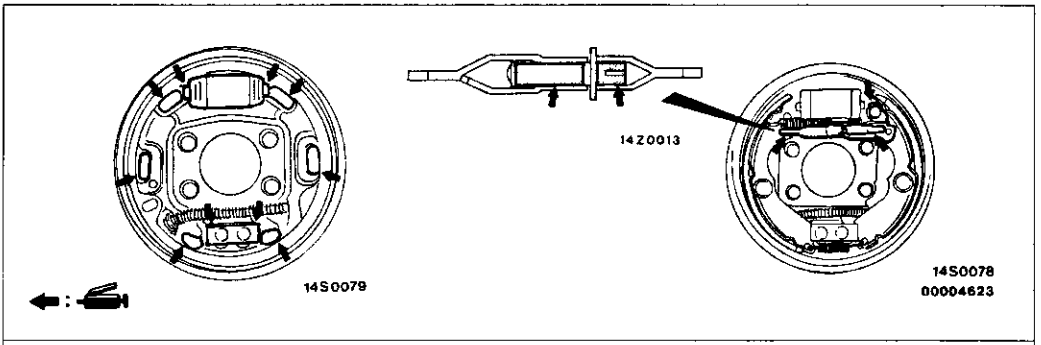
Wheel cylinder removal steps

1. Brake drum
2. Shoe-to-lever spring
8. Shoe-to-shoe spring
16. Brake pipe connection
21. Wheel cylinder

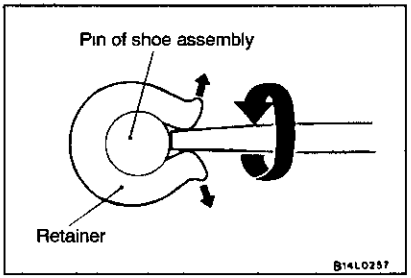
Caution
When removing the rear hub assembly, the wheel bearing inner race may be left at the spindle side. In this case, always replace the rear hub assembly, otherwise the hub will damage the oil seal, causing oil leaks or excessive play.

TSB Revision

LUBRICATION POINTS



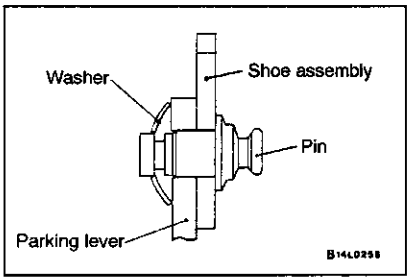
Specified grease: Brake grease SAE J310, NLGI No.1



REMOVAL SERVICE POINT

◀A▶ RETAINER REMOVAL

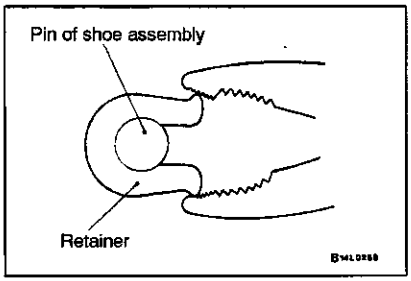
Use a flat-tipped screwdriver or the like to open up the retainer joint, and remove retainer.



INSTALLATION SERVICE POINTS

▶A◀ WAVE WASHER INSTALLATION

Install the washer in the direction shown in the illustration.



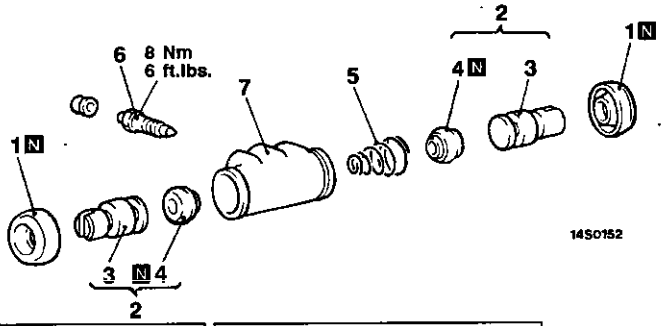
▶B◀ RETAINER INSTALLATION

Use pliers or the like to install the retainer or the pin positively.

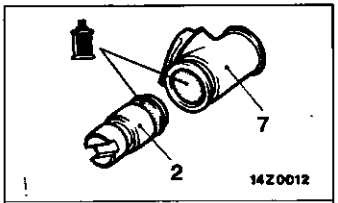
TSB Revision

WHEEL CYLINDER DISASSEMBLY AND REASSEMBLY

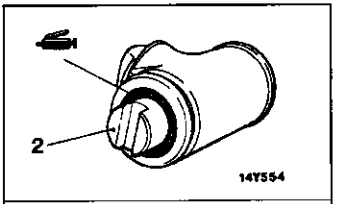
35100770073



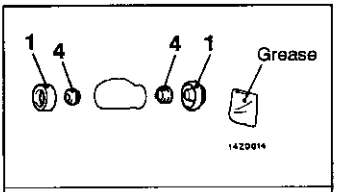
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Brake fluid: DOT3 or DOT4



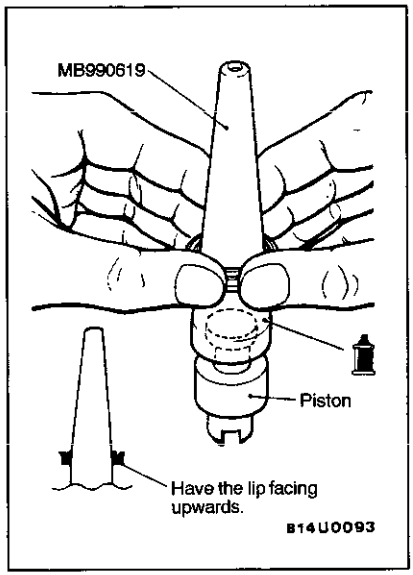
Grease: Repair kit grease



Wheel cylinder repair kit

Disassembly steps

1. Boots
2. Piston assembly
3. ▶A◀ Pistons
4. ▶A◀ Piston cups
5. Spring
6. Bleeder
7. Wheel cylinder body



REASSEMBLY SERVICE POINT

▶A◀ PISTON CUP/PISTON REASSEMBLY

(1) Use alcohol or specified brake fluid to clean the wheel cylinder and the piston.

(2) Apply the specified brake fluid to the piston cups and the special tool.

Specified brake fluid: DOT3 or DOT4

(3) Set the piston cup on the special tool with the lip of the cup facing up, fit the cup onto the special tool, and then slide it down the outside of the tool into the piston groove.

Caution
In order to keep the piston cup from becoming twisted or slanted, slide the piston cup down the tool slowly and carefully, without stopping.

TSB Revision

INSPECTION

35100780038

Check the piston and wheel cylinder walls for rust or damage, and if there is any abnormality, replace the entire wheel cylinder assembly.

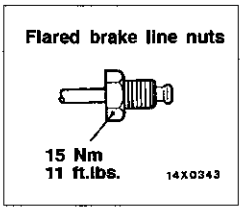
PROPORTIONING VALVE

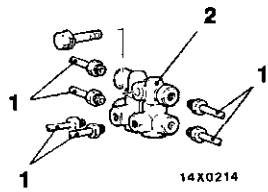
35100670109

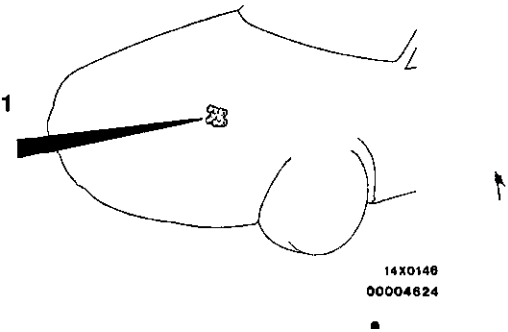
REMOVAL AND INSTALLATION

Pre-removal Operation
- Brake Fluid Draining
- Air Intake Hose Removal

Post-installation Operation
- Brake Fluid Supplying
- Brake Line Bleeding (Refer to P.35A-11.)
- Air Intake Hose Installation

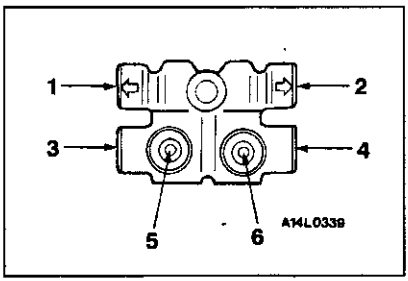






Removal steps

▶A◀ 1. Brake pipe
2. Proportioning valve
3. Bracket



INSTALLATION SERVICE POINT

▶A◀ BRAKE PIPE CONNECTION

Connect the pipes to the hydraulic unit as shown in the illustration.
1. Proportioning valve – Rear brake (L.H.)
2. Proportioning valve – Rear brake (R.H.)
3. Proportioning valve – Front brake (R.H.)
4. Proportioning valve – Front brake (L.H.)
5. Proportioning valve – Master cylinder (secondary)
6. Proportioning valve – Master cylinder (primary)

TSB Revision

ANTI-LOCK BRAKING SYSTEM (ABS) <FWD>

CONTENTS

35209000114

ABS-ECU* 41

BRAKE PEDAL ..... Refer to GROUP 35A

FRONT DISC BRAKE ..... Refer to GROUP 35A

GENERAL INFORMATION 3

HYDRAULIC UNIT 37

LUBRICANTS 5

MASTER CYLINDER AND BRAKE BOOSTER 31

Master Cylinder 31

ON-VEHICLE SERVICE 26

Bleeding 26

Brake Booster Operating Test ..... Refer to GROUP 35A

Brake Drum Inside Diameter Check 27

Brake Fluid Level Sensor Check ..... Refer to GROUP 35A

Brake Lining and Brake Drum Contact Check 27

Brake Lining Thickness Check 26

Brake Pedal Check and Adjustment ..... Refer to GROUP 35A

CONTINUED ON NEXT PAGE

WARNINGS REGARDING SERVICING OF SUPPLEMENTAL RESTRAINT SYSTEM (SRS) EQUIPPED VEHICLES

WARNING!

(1) Improper service or maintenance of any component of the SRS, or any SRS-related component, can lead to personal injury or death to service personnel (from inadvertent firing of the air bag) or to the driver and passenger (from rendering the SRS inoperative).

(2) Service or maintenance of any SRS component or SRS-related component must be performed only at an authorized MITSUBISHI dealer.

(3) MITSUBISHI dealer personnel must throughly review this manual, and especially its GROUP 52B - Supplemental Restraint System (SRS) and GROUP 00 - Maintenance Service before beginning any service or maintenance of any component of the SRS or any SRS-related component.

NOTE

The SRS includes the following components: SRS-ECU, SRS warning light, air bag module, clock spring and interconnecting wiring. Other SRS-related components (that may have to be removed/installed in connection with SRS service or maintenance) are indicated in the table of contents by an asterisk (*).

Check Valve Operation Check ..... Refer to GROUP 35A
Discharged Battery 31
Front Brake Disc Run-out Check ..... Refer to GROUP 35A
Front Brake Disc Run-out Correction ..... Refer to GROUP 35A
Front Brake Disc Thickness Check ..... Refer to GROUP 35A
Front Disc Brake Pad Check and Replacement ..... Refer to GROUP 35A
Front Disc Brake Rotor Check ..... Refer to GROUP 35A
Hydraulic Unit Check 28
Motor Operation Check 30
Motor Relay and Valve Relay Continuity Check 30
Proportioning Valve Function Test ..... Refer to GROUP 35A
Solenoid Valve Check 30
Stop Light Switch Check ..... Refer to GROUP 35A
Wheel Speed Sensor Output Voltage Check 27

PROPORTIONING VALVE 36

REAR DRUM BRAKE 33
Wheel Cylinder 35

SEALANT ..... Refer to GROUP 35A

SERVICE SPECIFICATIONS 4

SPECIAL TOOLS 5

TROUBLESHOOTING 6

WHEEL SPEED SENSOR 38

GENERAL INFORMATION

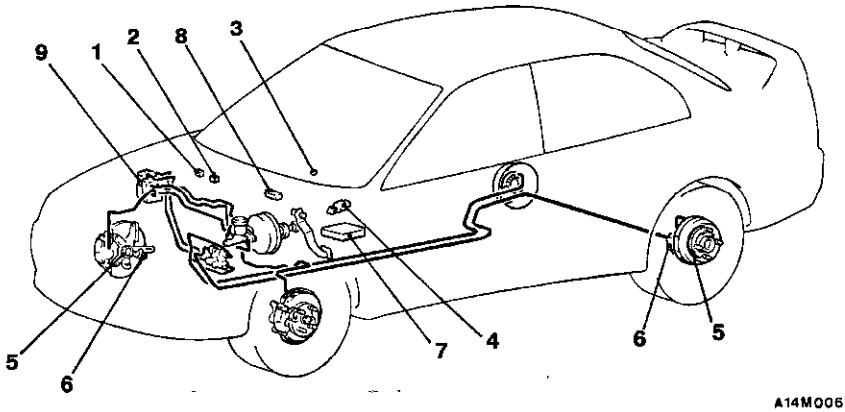
35200010116

The ABS consists of components such as the wheel speed sensors, stop light switch, hydraulic unit assembly, ABS control unit (ABS-ECU) and the ABS warning light. If a problem occurs in the system, the malfunctioning components can be identified and the trouble symptoms will be memorized by the diagnostic function.

In addition, reading of diagnostic trouble codes and data list and actuator testing are possible by using the Scan Tool.

Items		Specifications
Master cylinder	Type	Tandem type (with level sensor)
	I.D. mm (in.)	22.22 (.87)
Brake booster	Type	Vacuum type, single
	Effective dia. of power cylinder mm (in.)	230 (9.1)
	Boosting ratio	5.0
Proportioning valve	Type	Dual type
	Decompression ratio	0.25
Front brakes	Type	Floating caliper, 1-piston, ventilated disc
	Disc effective dia. × thickness mm (in.)	184 × 18 (7.2 × .71)
	Wheel cylinder I.D. mm (in.)	54.0 (2.13)
	Pad thickness mm (in.)	10.0 (.39)
	Clearance adjustment	Automatic
Rear drum brakes	Type	Leading trailing
	Drum I.D. mm (in.)	203 (8.0)
	Wheel cylinder I.D. mm (in.)	17.46 (.687)
	Lining thickness mm (in.)	4.38 (.172)
	Clearance adjustment	Automatic
Brake fluid		DOT-3 or DOT-4
ABS type		4-sensor, 4-channel method
Speed sensor		Magnet coil type on 4-wheels
Front rotor teeth		43
Rear rotor teeth		43

CONSTRUCTION DIAGRAM



A14M0060

1. ABS valve relay
2. ABS motor relay
3. ABS warning light
4. Stop light switch
5. Rotor
6. Wheel speed sensor
7. ABS-ECU
8. Data link connector
9. Hydraulic unit

SERVICE SPECIFICATIONS

35200030129

Items		Standard value	Limit
Rear drum brake	Lining thickness mm (in.)	4.38 (.172)	1.0 (.039)
	Drum inside diameter mm (in.)	203 (8.0)	205 (8.1)
Resistance between solenoid valve terminals Ω	IN	8.04 - 9.04	-
	OUT	4.04 - 4.54	-
Wheel speed sensor's internal resistance kΩ		1.4 - 1.8	-
Wheel speed sensor insulation resistance kΩ		100 or more	-
Clearance between the rear speed sensor mounting surface and the rotor mm (in.)		0.1 - 2.0 (.004 - .079)	-

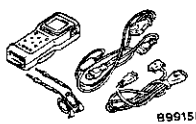
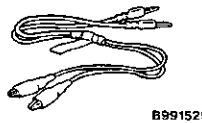
LUBRICANTS

35200050040

Items	Specified lubricant
Brake fluid	DOT-3 or DOT-4
Wheel cylinder body inner surfaces	Repair kit grease
Rear brake shoe and backing plate contact surfaces	Brake grease SAE J310, NLGI No. 1
Shoe assembly and auto adjuster assembly contact surfaces	
Shoe and lever assembly and auto adjuster assembly contact surfaces	

SPECIAL TOOLS

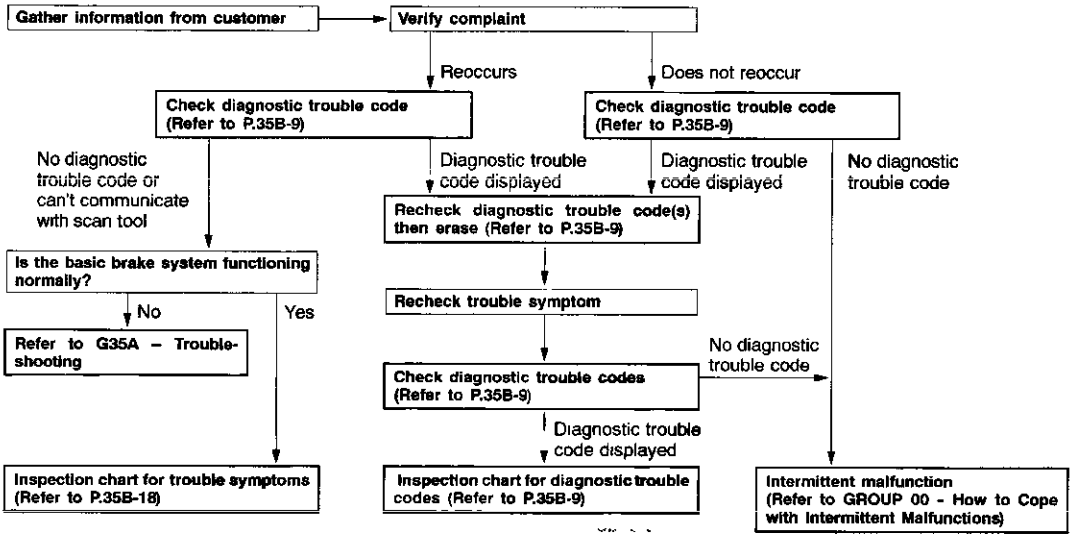
35200060128

Tool	Tool number and name	Supersession	Application
 B991502	MB991502 Scan Tool (MUT-II) sub assembly	MB991496-OD	For checking of ABS [diagnostic trouble code display when using the Scan Tool (MUT-II)]
 B991529	MB991529 Diagnostic trouble code check harness	Tool not necessary if Scan Tool (MUT-II) is available.	For checking of ABS (Diagnostic trouble code display when using the ABS warning light)
	MB991008 Piston cup installer		Installation of drum brake wheel cylinder piston cup
A  B991219	MB991223 Inspection harness set A: MB991219 Connector pin contact pressure inspection harness	MB991219	For checking of wheel speed sensor output voltage

TROUBLESHOOTING

35201110136

DIAGNOSTIC TROUBLESHOOTING FLOW

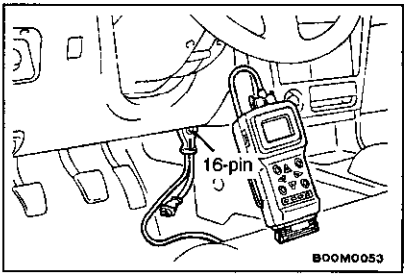


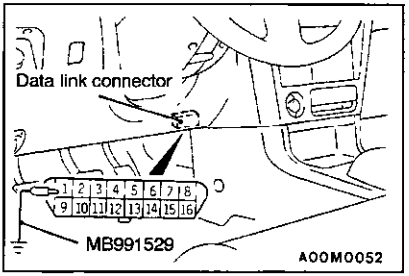
NOTES WITH REGARD TO DIAGNOSIS

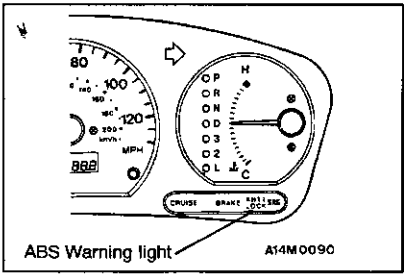
The condition listed in the following table are considered normal.

Condition	Explanation of condition
System check sound	When starting the engine, a thudding sound can sometimes be heard coming from inside the engine compartment, but this is because the system operation check is being performed. This is considered normal.
ABS operation sound	1. Sound of the motor inside the ABS hydraulic unit operation. (whine) 2. Sound is generated along with vibration of the brake pedal. (scraping) 3. When ABS operates, sound is generated from the vehicle chassis due to repeated brake application and release. (Thump: suspension; squeak: tires)
ABS operation (Long braking distance)	For road surfaces such as snow-covered roads and gravel roads, the braking distance for vehicles with ABS can sometimes be longer than that for other vehicles. Accordingly, advise the customer to drive safely on such roads by lowering the vehicle speed.

Diagnosis detection condition depends on the diagnostic trouble code.
When checking to see if the trouble symptom reoccurs after the diagnostic trouble code has been erased, check the "Detection conditions" column in the inpsection chart for diagnostic trouble codes (refer to P.35B-8) and the description in the "Comments" column of the inspection procedure chart for diagnostic trouble codes in order to carry out testing under driving conditions which satisfy each of the given conditions.







DIAGNOSTIC FUNCTION

35201120337

DIAGNOSTIC TROUBLE CODES CHECK

With the Scan Tool

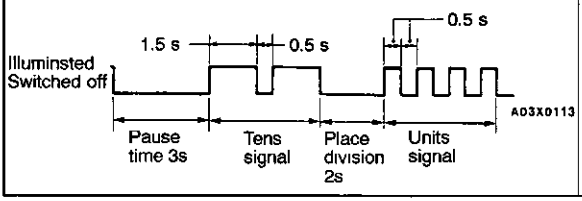
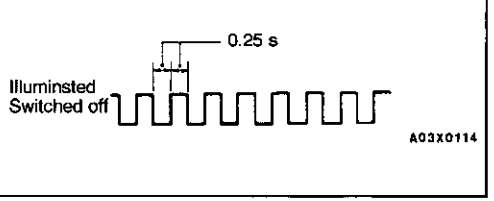
Connect the scan tool to the data link connector then check diagnostic trouble codes.

Caution
Turn the ignition switch off before connecting or disconnecting the scan tool.

With the ABS Warning Light

1. Use the special tool to ground No. 1 terminal of the data link connector.
2. To check ABS system, remove the valve relay.

   NOTE
   That is because the valve relay is off and the warning light remains illuminated if the ABS system is defective.
3. Turn off the ignition switch.
4. Read out a diagnostic trouble code by observing how the warning light flashes.

When the diagnostic trouble code No.24 is output	When no diagnostic trouble code is output*
	

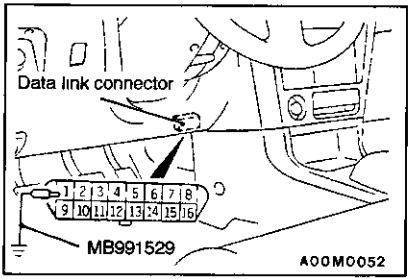
NOTE
*: Even if the ABS system is normal, removing the valve relay causes the diagnostic trouble code No. 51 to be output

ERASING DIAGNOSTIC TROUBLE CODES

With the Scan Tool

Connect the scan tool to the data link connector (16-pin), then erase the diagnostic trouble codes.

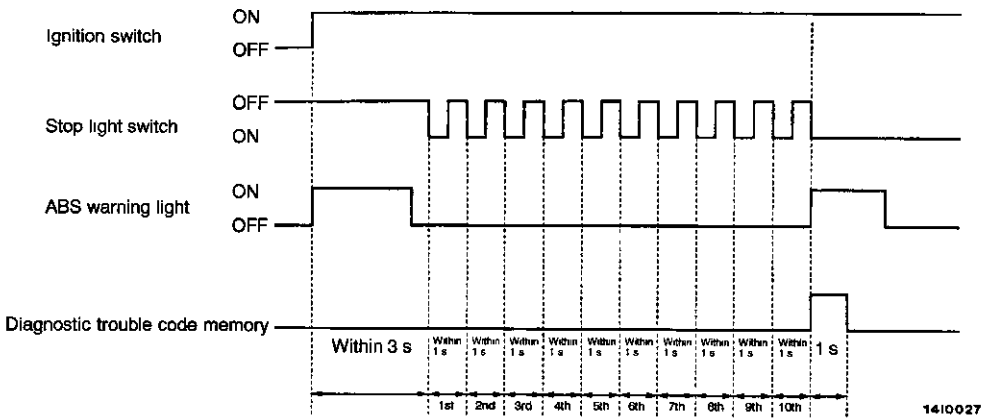
Caution
Turn off the ignition switch before connecting or disconnecting the scan tool.



Without the Scan Tool

1. Use the special tool to ground No.1 terminal of the data link connector.
2. Keep the vehicle from moving.
3. Turn the stop light switch "ON" (by depressing the brake pedal).
4. Keeping the conditions made in steps 1 to 3, turn the ignition switch "ON". Within 3 seconds after this, turn the stop light switch "OFF" (by releasing the brake pedal). Then, turn the stop light switch "ON" and "OFF" ten times successively.

   NOTE
   If the ABS-ECU functions have stopped due to the fail-sale function, the diagnostic code cannot be erased.



INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES

35201130149

Inspect according to the inspection chart that is appropriate for the diagnostic trouble code.

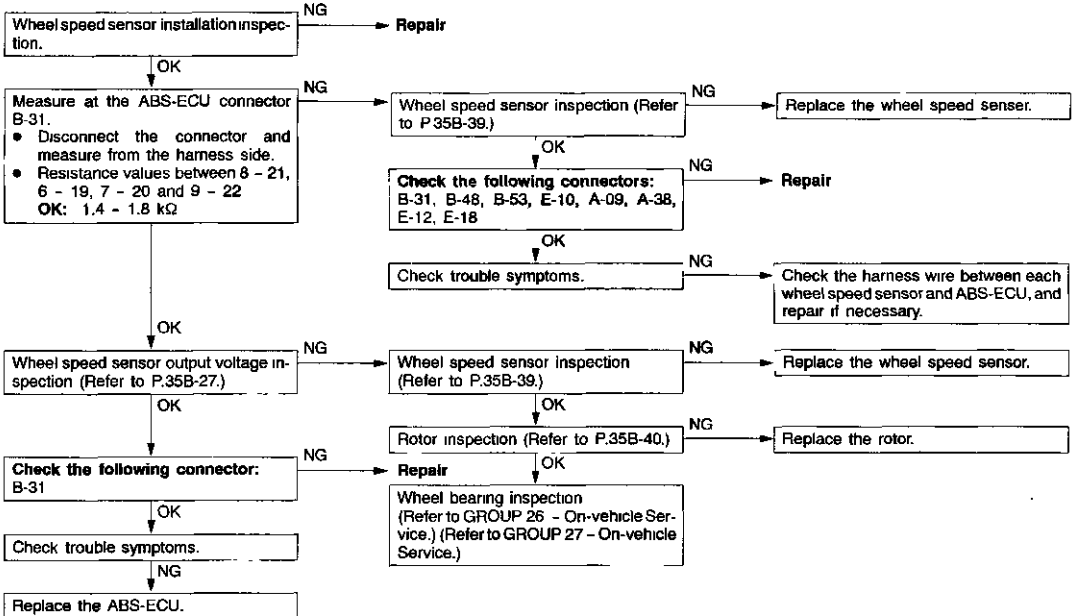
Diagnostic trouble code no.	Inspection item	Diagnostic content	Detection conditions	Reference page
11	Front right wheel speed sensor	Open circuit or short circuit	A, B	35B10
12	Front left wheel speed sensor			
13	Rear right wheel speed sensor			
14	Rear left wheel speed sensor			
15	Wheel speed sensor	Abnormal output signal	B	35B-11
16	Power supply system		A, B	35B-12
21	Front right wheel speed sensor		B	35B-10
22	Front left wheel speed sensor			
23	Rear right wheel speed sensor			
24	Rear left wheel speed sensor			
33	Stop light switch system		A, B	35B-13
41	Front right solenoid valve (inside)		A, B	35B-14
42	Front left solenoid valve (inside)			
43	Rear right solenoid valve (inside)			
44	Rear left solenoid valve (inside)			
51	Valve relay		A, B	35B-15
53	Motor relay, motor		B	35B-16
63	ABS-ECU		A, B	35B-41 (Replace the ABS-ECU)

Detection conditions

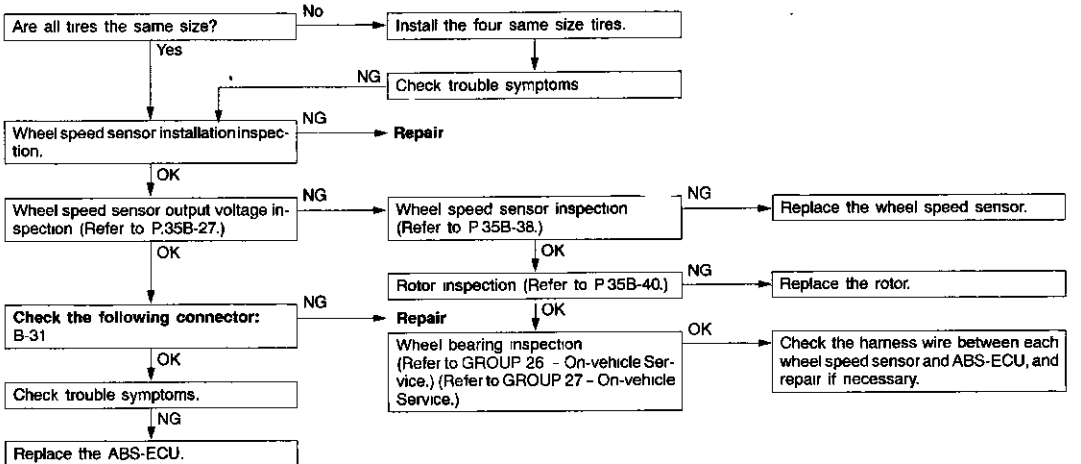
A: During system check immediately after starting
B: When driving

INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES

Code Nos. 11, 12, 13, 14 Wheel speed sensor open circuit or short circuit **Code Nos.21, 22, 23, 24 Wheel speed sensor**	**Probable cause**
Code Nos.11, 12, 13, 14 are output when the ABS-ECU detects an open circuit or short circuit in at least one of the four wheel-speed sensors.	• Malfunction of wheel speed sensor • Malfunction of wiring harness or connector • Malfunction of ABS-ECU
Code Nos.21, 22, 23, 24 are output under the following cases: • When an open circuit cannot be found, but more than one wheel-speed sensor does not output any signal during driving at 8 km/h (5 mph) or higher. • When a chipped or plugged-up rotor tooth, etc. is detected during driving at 40 km/h (25 mph) or more	• Malfunction of wheel-speed sensor • Malfunction of rotor • Malfunction of wheel bearing • Malfunction of wiring harness or connector • Malfunction of ABS-ECU

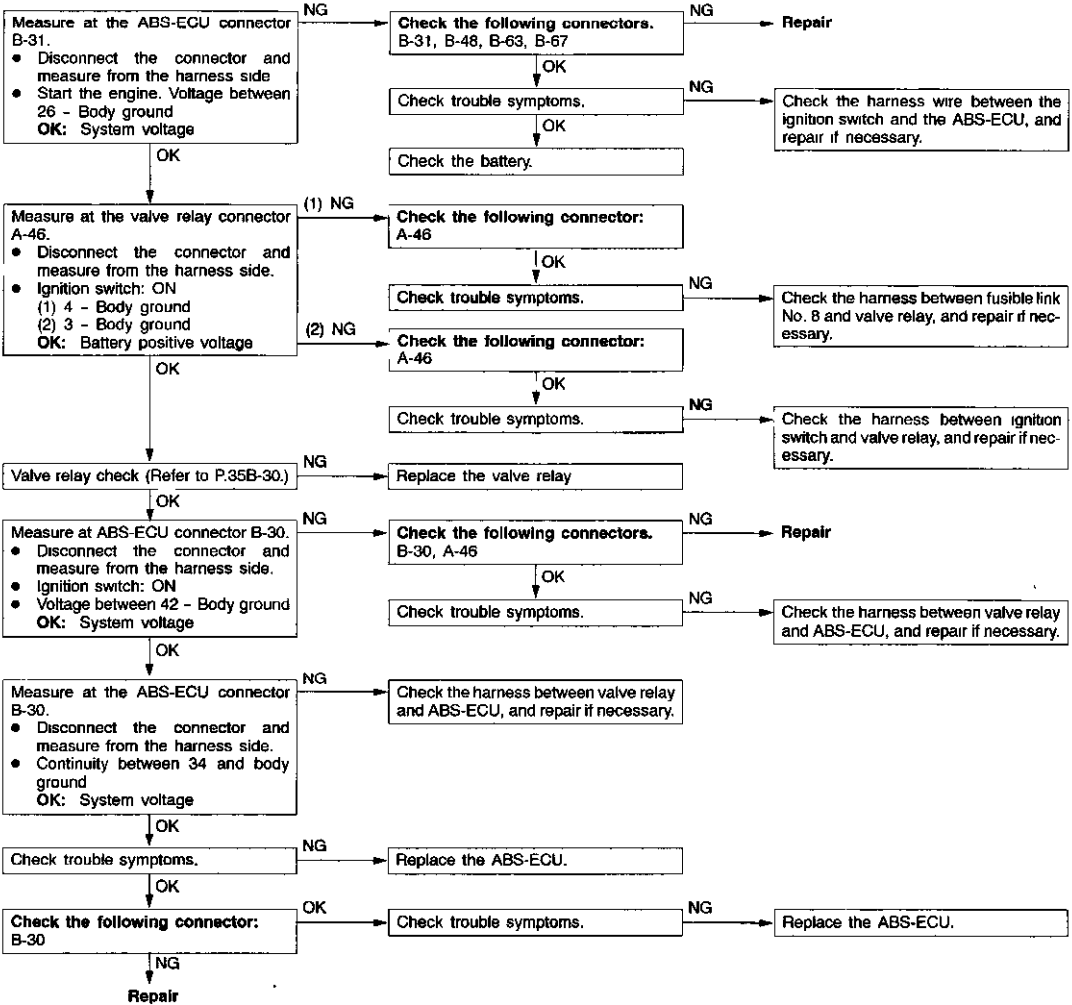


Code No. 15 Wheel speed sensor (Abnormal output signal)	Probable cause
A wheel speed sensor outputs an abnormal signal (other than an open or short-circuit).	• Improper installation of wheel speed sensor • Malfunction of wheel speed sensor • Malfunction of rotor • Malfunction of wheel bearing • Malfunction of wiring harness or connector • Malfunction of ABS-ECU

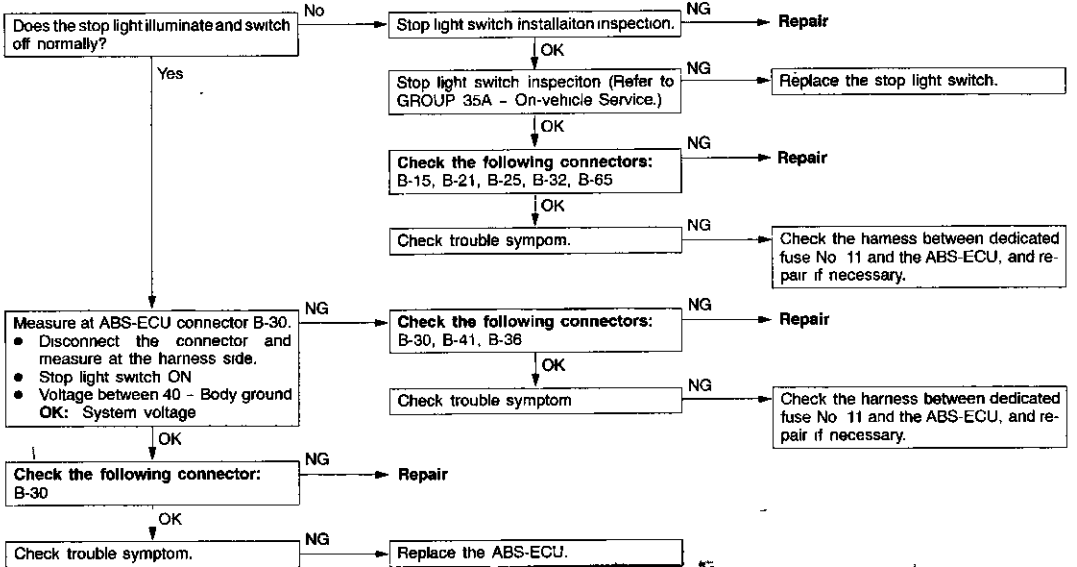


Code No. 16 Power supply system	Probable cause
The voltage of the ABS-ECU power supply or the voltage of the valve relay power supply drops lower or rises higher than the specified value. If the voltage returns to the specified value, this code is no longer output.	• Malfunction of wiring harness or connector. • Malfunction of ABS-ECU

Caution
If battery voltage drops or rises during inspection, this code will be output as well. If the voltage returns to standard value, this code is no longer output.
Before carrying out the following inspection, check the battery level, and refill it if necessary.



Code No. 33 Stop light switch system	Probable cause
This code is output when the stop light switch is not be turned off (when the stop light switch stays on for 15 minutes or more although the ABS is not operating).	• Malfunction of stop light switch • Malfunction of harness or connector • Malfunction of ABS-ECU



Code Nos.41, 42, 43, 44 Solenoid valve	Probable cause
The ABS-ECU always monitors the solenoid valve drive circuit. It determines that there is an open or short-circuit in the solenoid coil or in a harness. • When no current flows in the solenoid even though the ABS-ECU turns on it, and vice versa.	• Malfunction of wiring harness • Malfunction of hydraulic unit • Malfunction of ABS-ECU

Solenoid valve check (Refer to P.35B-30.)
NG → Replace the hydraulic unit.
OK ↓

Measure at hydraulic unit connector A-40 and ABS-ECU connectors B-31 and B-30.
- Disconnect the connector and measure at the harness side.
- Continuity between the following terminals

OK: Continuity

HU side	1	5	4	8
ABS-ECU side	38	46	16	14
HU side	3	7	2	6
ABS-ECU side	1	15	45	37

NG → **Check the following connectors:** A-40, B-31, B-30
NG → **Repair**
OK ↓ Check trouble symptoms
NG → Check the harness between the hydraulic unit and ABS-ECU, and repair if necessary.
OK ↓

Measure at hydraulic unit connector A-39 and valve relay connector A-46.
- Disconnect the connector and measure at the harness side.
- Continuity between 11 at the hydraulic unit and 5 at the valve relay connector

OK: Continuity

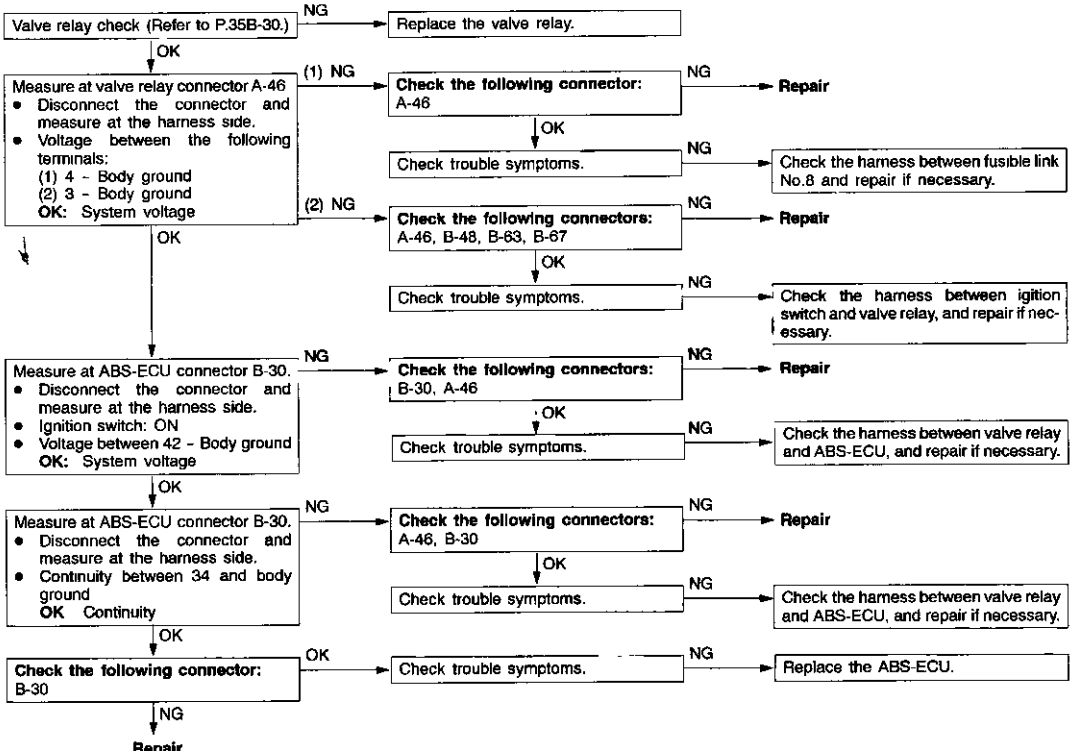
NG → **Check the following connectors:** A-39, A-46
NG → **Repair**
OK ↓ Check trouble symptoms
NG → Check the harness between the hydraulic unit and valve relay, and repair if necessary.
OK ↓

Check the following connectors: B-31, B-30
NG → **Repair**
OK ↓

Check trouble symptoms.
NG → Replace the ABS-ECU.

Code No.51 Valve relay	Probable cause
When the ignition switch is turned to ON, the ABS-ECU switches the valve relay off and on during the initial check. In that way, the ABS-ECU compares the signals sent to the valve relay with the voltage in the valve relay monitor line. That is how to check if the valve relay is operating normally. The ABS-ECU always checks if current flows in the valve relay monitor line, too. It determines that there is an open circuit when no current flows. If no current flows in the valve relay monitor line, this diagnostic trouble code is output.	• Malfunction of valve relay • Malfunction of wiring harness or connector • Malfunction of ABS-ECU • Malfunction of hydraulic unit

NOTE
Whenever reading the diagnostic trouble codes using the ABS warning light (refer to P.35B-7), this diagnostic trouble code will be output. That is not a malfunction but because the valve relay connector is disconnected. After repairing all other malfunctions, connect the valve relay connector again to check the valve relay. Then check that the ABS warning light does not illuminate. If it illuminates, the valve relay may be defective. So carry out the following procedure.

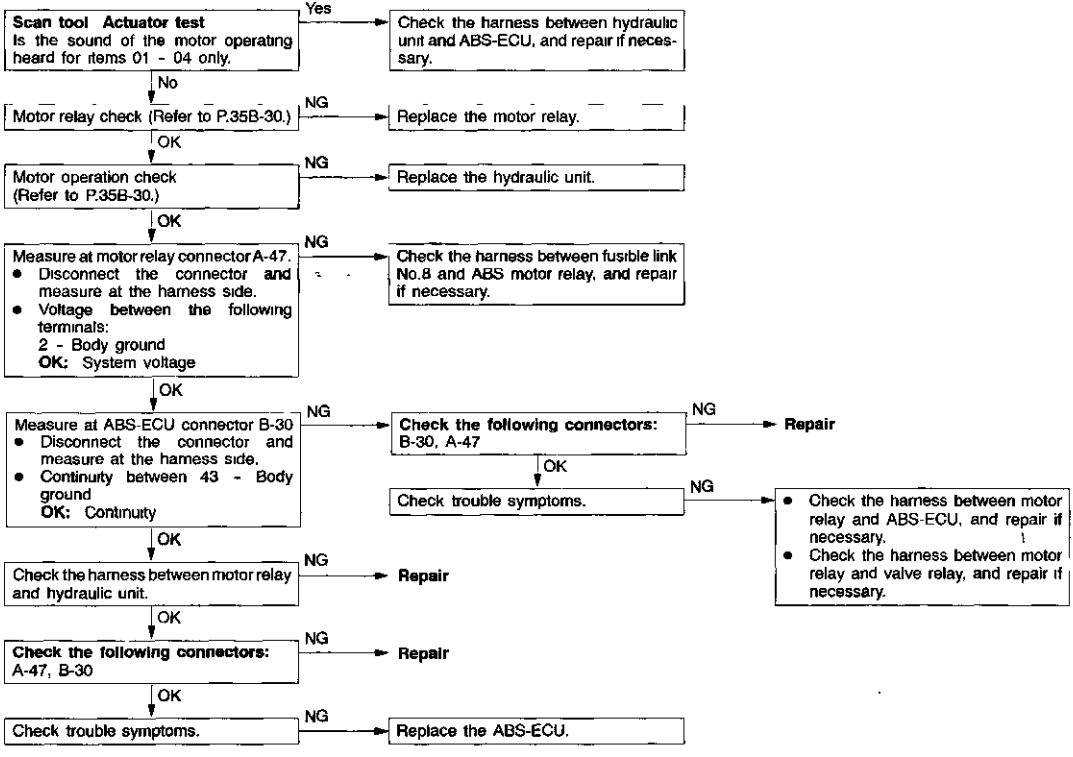


Code No.53 Motor relay, motor	Probable cause
This code is output at the following times: • When the motor relay is on but no signal is input to the motor monitor line (motor is not operating, etc.) • When the motor relay is off but a signal is input to the motor monitor line (motor continues operating, etc.) • When the motor relay does not operate	• Malfunction of motor relay • Malfunction of wiring harness or connector • Malfunction of hydraulic unit • Malfunction of ABS-ECU

<When the motor does not run>

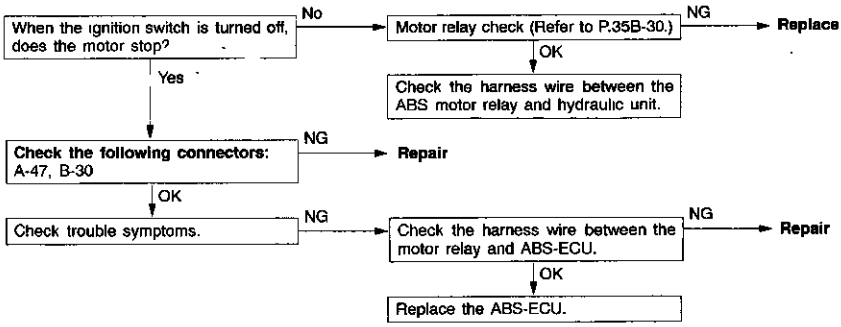
Caution

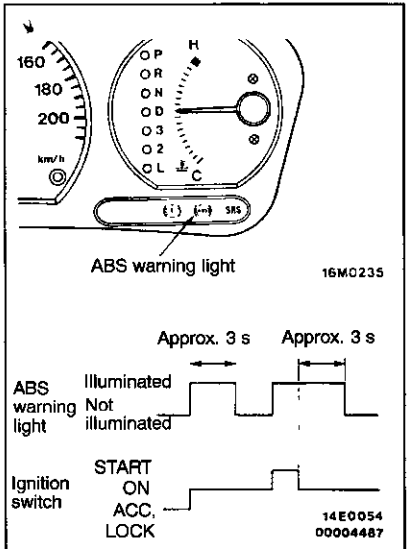
The engine should be started and left to run for a while after testing is completed, because force-driving of the motor by means of the actuator test will drain the battery.



<When the motor keeps running>

Caution
If there is a melted contact in the motor relay, the motor will keep running, even if the ignition switch is turned off. In this case, immediately remove the fusible link No.8, or disconnect the hydraulic unit connector A-39 or motor relay connector A-47. Excessive running of the motor will waste the battery.





ABS WARNING LIGHT INSPECTION 35201200082

Check that the ABS warning light illuminates as follows.

1. When the ignition key is turned to "ON", the ABS warning light illuminates for approximately 3 seconds and then switches off.
2. When the ignition key is turned to "START", the ABS warning light remains illuminated.
3. When the ignition key is released from the "START" position, the ABS warning light illuminates for approximately 3 seconds and then switches off.
4. If the illumination is other than the above, check the diagnostic trouble codes.

INSPECTION CHART FOR TROUBLE SYMPTOMS

35201140135

Get an understanding of the trouble symptoms and check according to the inspection procedure chart.

Trouble symptoms		Inspection procedure No.	Reference page
Communication with scan tool is not possible.	Communication with all systems is not possible.	1	35B-19
	Communication with ABS only is not possible.	2	35B-19
When the ignition key is turned to "ON" (engine stopped), the ABS warning light does not illuminate.		3	35B-20
After the engine starts, the ABS warning light remains illuminated.		4	35B-20
When the ignition key is turned to "START", the ABS warning light does not illuminate.		5	35B-21
After the ignition key is turned to "ON", the ABS warning light blinks twice, and when turned to "START", it illuminates. When returned to "ON", the light flashes once, and then switches off.		6	35B-21
Faulty ABS operation	Unequal braking power on both sides	7	35B-22
	Insufficient braking power		
	ABS operates under normal braking conditions		
	ABS operates before vehicle stops under normal braking conditions		
	Large brake pedal vibration (Caution 2.)	-	-

Caution

1. **If steering movements are made when driving at high speed, or when driving on road surfaces with low frictional resistance, or when passing over bumps, the ABS may operate even though sudden braking is not being applied. Because of this, when getting information from the customer, check if the problem occurred while driving under such conditions as these.**
2. **During ABS operation, the brake pedal may vibrate or may not be able to be depressed. Such phenomena are due to intermittent changes in hydraulic pressure inside the brake line to prevent the wheels from locking and is not an abnormality.**

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

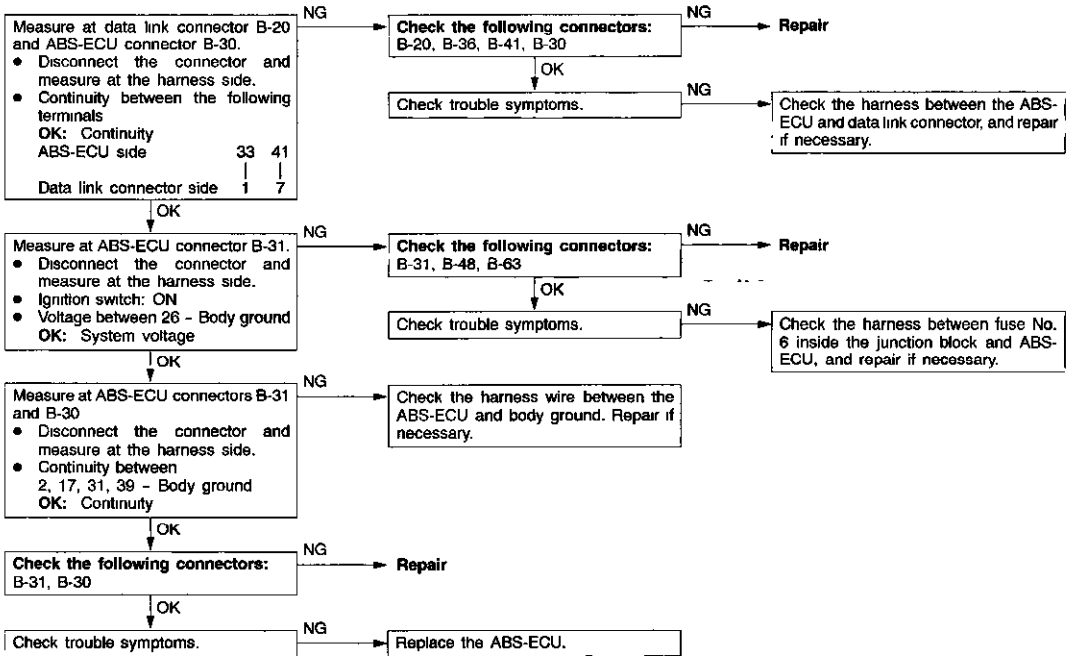
Inspection Procedure 1

Communication with scan tool is not possible. (Communication with all systems is not possible.)	Probable cause
The reason is probably defect in the power supply system (including ground) for the diagnostic line.	• Malfunction of wiring harness or connector

Refer to GROUP 13A - Troubleshooting

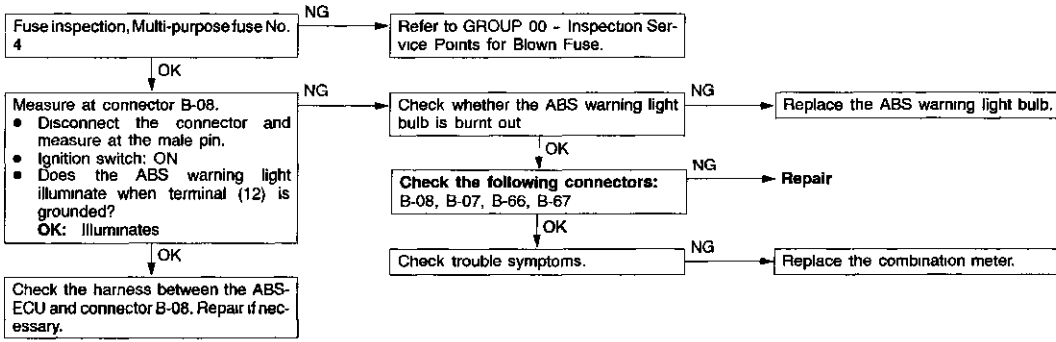
Inspection Procedure 2

Communication with scan tool is not possible. (Communication with ABS only is not possible.)	Probable cause
When communication with the scan tool is not possible, the cause is probably an open circuit in the ABS-ECU power circuit or an open circuit in the diagnostic output circuit.	• Blown fuse • Malfunction of wiring harness or connector • Malfunction of ABS-ECU



Inspection Procedure 3

When ignition key is turned to "ON" (engine stopped), ABS warning light does not illuminate.	Probable cause
The cause may be: an open circuit in the light power supply circuit, a blown light bulb, an open circuit in both the circuit between the ABS warning light and the ABS-ECU.	• Blown fuse • Burnt out ABS warning light bulb • Malfunction of wiring harness or connector

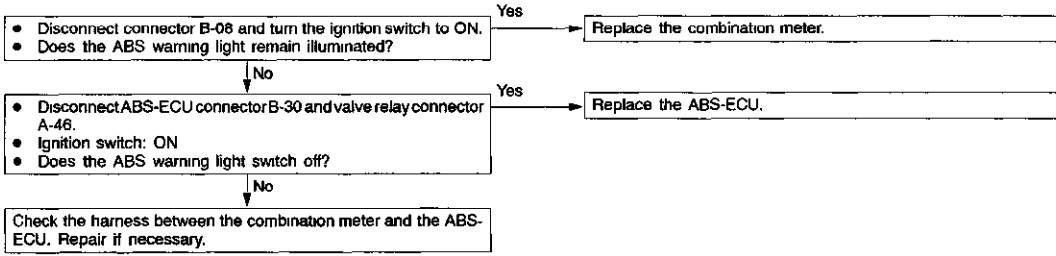


Inspection Procedure 4

Even after the engine is started, the ABS warning light remains illuminated.	Probable cause
The cause is probably a short-circuit in the ABS warning light illumination circuit.	• Malfunction of combination meter • Malfunction of ABS-ECU • Malfunction of wiring harness

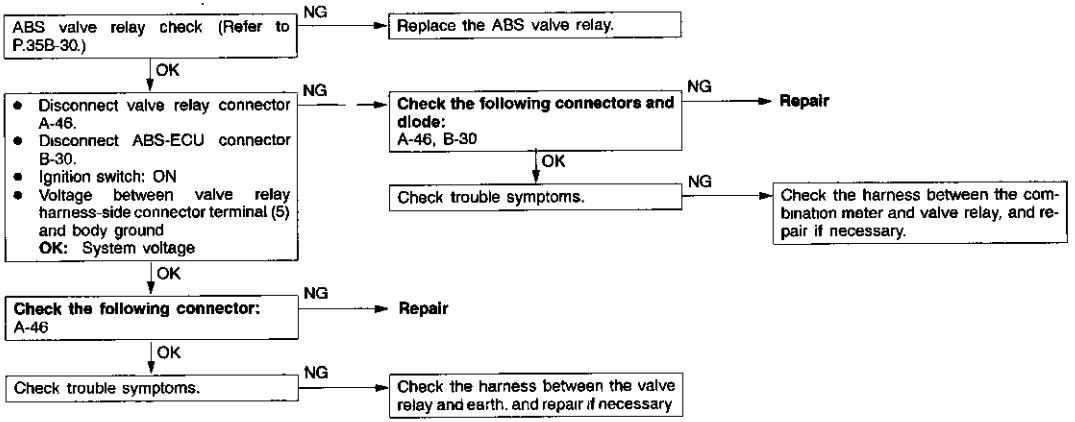
NOTE

This trouble symptom is limited to cases where communication with the scan tool is possible (ABS-ECU power supply is normal) and the diagnostic trouble code is a normal diagnostic trouble code.



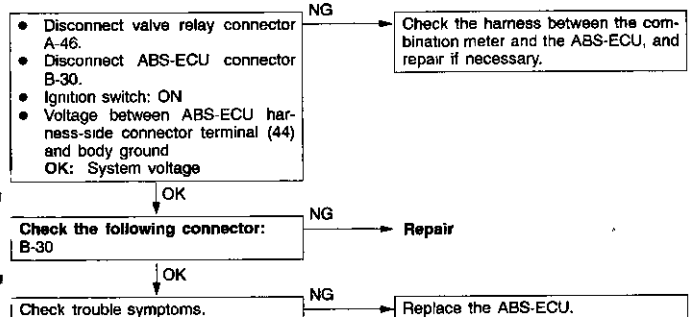
Inspection Procedure 5

When the ignition key is turned to "START", the ABS warning light does not illuminate.	Probable cause
Current does not flow in the ABS-ECU when the ignition switch is turned to "START". Current flows in the ABS warning light even when the ignition switch is turned to "START". Therefore, the valve relay, which current is supplied through the ABS-ECU, turns off when the ignition switch is at "START". However, the warning light circuit of the valve relay must turn on in turn. So the cause must be a defective circuit on valve relay side.	• Malfunction of wiring harness or connector • Malfunction of ABS-ECU



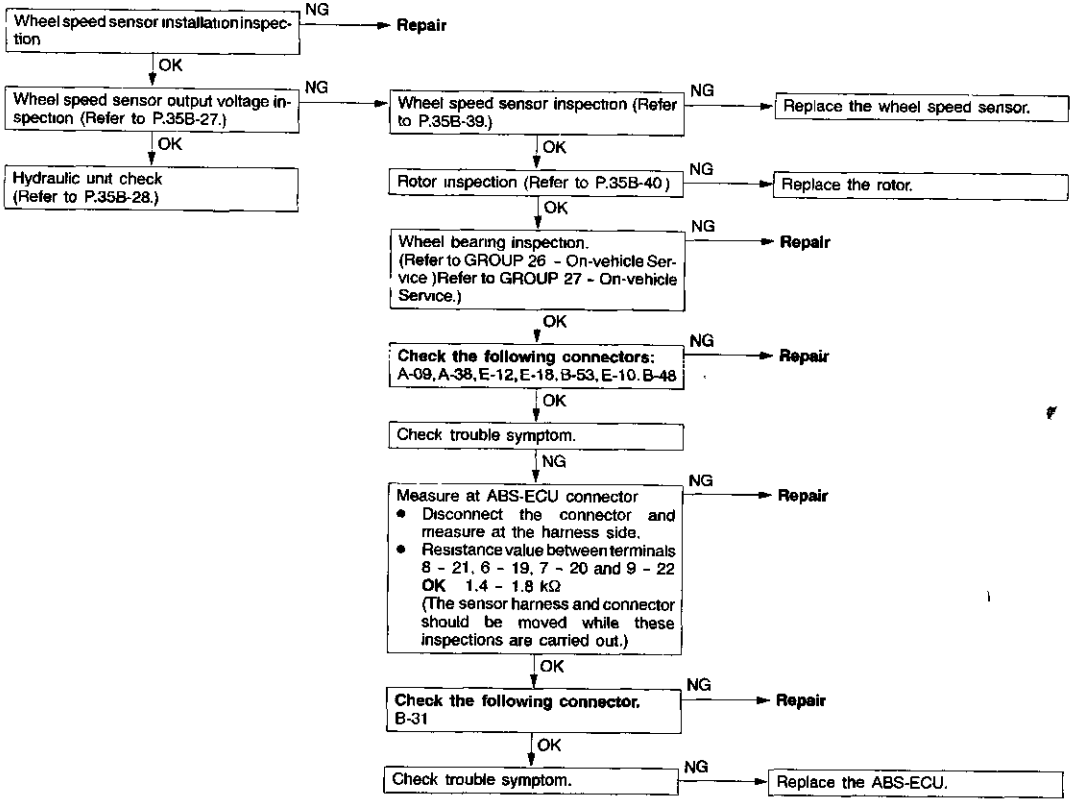
Inspection Procedure 6

After the ignition key is turned to "ON", the ABS warning light blinks twice, and when turned to "START", it illuminates. When returned to "ON", the light flashes once, and then switches off.	Probable cause
The ABS-ECU causes the ABS warning light to illuminate during the initial check (approx. 3 seconds). During the initial check, the valve relay turns from off to on, off and back to on again. If there is an open circuit in the harness between the ABS-ECU and the ABS warning light, the light will illuminate only when the valve relay is OFF during valve relay test, etc.	• Malfunction of wiring harness or connector • Malfunction of ABS-ECU



Inspection Procedure 7

Brake operation is abnormal.	Probable cause
This varies depending on the driving conditions and the road surface conditions, so problem diagnostic trouble is difficult. However, if a normal diagnostic trouble code is displayed, carry out the following inspection.	• Improper installation of wheel speed sensor • Incorrect sensor harness contact • Foreign material adhering to wheel speed sensor • Malfunction of wheel speed sensor • Malfunction of rotor • Malfunction of wheel bearing • Malfunction of hydraulic unit • Malfunction of ABS-ECU



DATA LIST REFERENCE TABLE

35201150084

The following items can be read by the scan tool from the ABS-ECU input data.

1. When the system is normal

Item No.	Check item	Checking requirements	Normal value
11	Front-right wheel speed sensor	Perform a test run	Vehicle speeds displayed on the speedometer and scan tool are identical.
12	Front-left wheel speed sensor		
13	Rear-right wheel speed sensor		
14	Rear-left wheel speed sensor		
16	ABS-ECU power supply voltage	Ignition switch power supply voltage and valve monitor voltage	9–16 V
33	Stop light switch	Depress the brake pedal.	ON
		Release the brake pedal.	OFF

2. When the ABS-ECU shut off ABS operation.

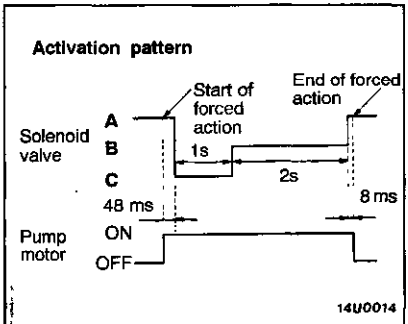
When the diagnostic trouble system stops the ABS-ECU, the scan tool display data will be unreliable.

ACTUATOR TEST REFERENCE TABLE

35201160032

The scan tool activates the following actuators for testing.

NOTE
1. If the ABS-ECU runs down, actuator testing cannot be carried out.
2. Actuator testing is only possible when the vehicle is stationary. If the vehicle speed during actuator testing exceeds 10 km/h (6 mph), forced actuation will be canceled.
3. During the actuator test, the ABS warning light will illuminate and the anti-lock control will be cancelled.



NOTE
A: Hydraulic pressure increase
B: Hydraulic pressure holds
C: Hydraulic pressure decrease

ACTUATOR TEST SPECIFICATIONS

No.	Item	
01	Solenoid valve for front-left wheel	Solenoid valves and pump motors in the hydraulic unit (simple inspection mode)
02	Solenoid valve for front-right wheel	
03	Solenoid valve for rear-left wheel	
04	Solenoid valve for rear-right wheel	

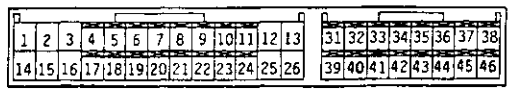
CHECK AT ABS-ECU

35201180113

TERMINAL VOLTAGE CHECK CHART

1. Measure the voltages between terminals (15), (25) and (42) (ground terminals) and each respective terminal.

   NOTE
   Do not measure terminal voltage for approx. 3 seconds after the ignition switch is turned on. The ABS-ECU performs the initial check for that period.
2. The terminal layouts are shown in the illustrations below.



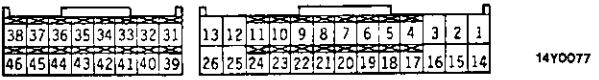
14Y0076

Connector terminal No.	Signal	Checking requirements		Normal condition
1	Output to rear-right solenoid valve (IN)	Ignition switch: ON (When solenoid valve is off)		System voltage
14	Output to front-left solenoid valve (OUT)			
15	Output to rear-right solenoid valve (OUT)			
16	Output to front-left solenoid valve (IN)			
25	Memory power supply	Always		System voltage
26	ABS-ECU power supply	Ignition switch: ON		System voltage
		Ignition switch: START		0 V
33	Input from diagnostic indication selection	Connect the scan tool.		0 V
		Do not connect the scan tool.		Approx. 12 V
34	Valve relay monitor	Ignition switch: ON		System voltage
35	Motor monitor	Ignition switch: ON	Motor is on.	System voltage
			Motor is off.	0.5V or less
37	Output to rear-left solenoid valve (OUT)	Ignition switch: ON (When solenoid valve is off)		System voltage
38	Output to front-right solenoid valve (IN)			
40	Input from stop light switch	Ignition switch: ON	Stop light switch ON	System voltage
			Stop light switch OFF	1 V or less

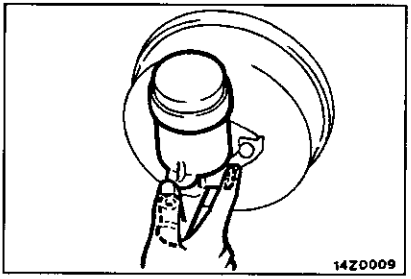
Connector terminal No.	Signal	Checking requirements		Normal condition
41	Scan tool	Connect the scan tool.		Serial communication with scan tool
		Do not connect the scan tool.		1 V or less
42	Output to valve relay	Ignition switch; ON	The relay is on.	2 V or less
			The relay is off. The system runs down.	System voltage
43	Output to motor relay	Ignition switch: ON	Motor is on.	2 V or less
			Motor is off.	System voltage
44	Output to ABS warning light	Ignition switch: ON	The light is switched off.	System voltage
			The light is illuminated.	3 V or less
45	Output to rear-left solenoid valve (IN)	Ignition switch: ON (When solenoid valve is off)		System voltage
46	Output to front-right solenoid valve (OUT)			

RESISTANCE AND CONTINUITY BETWEEN HARNESS-SIDE CONNECTOR TERMINALS

1. Turn the ignition switch off and disconnect the ABS-ECU connectors before checking resistance and continuity.
2. Check them between the terminals indicated in the table below.
3. The terminal layouts are shown in the illustrations below.



Connector terminal No.	Signal	Normal condition
2 - Body ground	ABS-ECU ground	Continuity
6-19	Front-left wheel speed sensor	1.4 - 1.8 kΩ
7-20	Rear-right wheel speed sensor	1.4 - 1.8 kΩ
8-21	Front-right wheel speed sensor	1.4 - 1.8 kΩ
9-22	Rear-left wheel speed sensor	1.4 - 1.8 kΩ
17 - Body ground	ABS-ECU ground	Continuity
31 - Body ground		
39 - Body ground		



ON-VEHICLE SERVICE

35200150092

BLEEDING

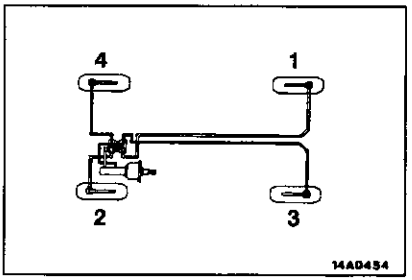
Caution
Use the specified brake fluid. Avoid using a mixture of the specified brake fluid and other fluid.

Specified brake fluid: DOT3 or DOT4

MASTER CYLINDER BLEEDING

The master cylinder used has no check valve, so if bleeding is carried out by the following procedure, bleeding of air from the brake pipeline will become easier. (When brake fluid is not contained in the master cylinder.)

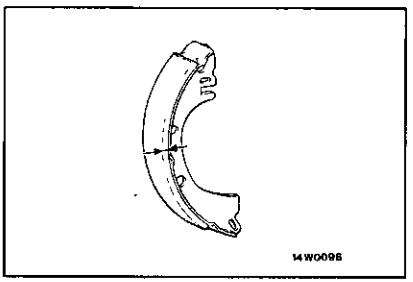
(1) Fill the reserve tank with brake fluid.
(2) Keep the brake pedal depressed.
(3) Have another person cover the master cylinder outlet with a finger.
(4) With the outlet still closed, release the brake pedal.
(5) Repeat steps (2) - (4) three or four times to fill the inside of the master cylinder with brake fluid.



BRAKE PIPE LINE BLEEDING

Start the engine and bleed the air in the sequence shown in the figure.

Caution
Be sure to install a filter to the master cylinder reservoir tank when supplying brake fluid.



BRAKE LINING THICKNESS CHECK

35100300128

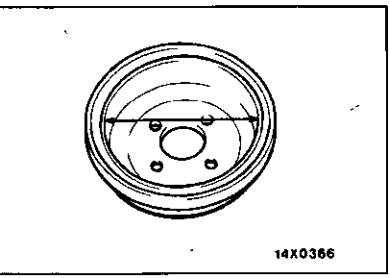
1. Remove the brake drum.
2. Measure the wear of the brake lining at the place worn the most.

   Standard value: 4.38 mm (.172 in.)

   Limit: 1.00 mm (.039 in.)

   Replace the shoe and lining assembly if brake lining thickness is less than the limit if it is not worn evenly. For information concerning the procedures for installation of the shoe and lining assembly, refer to P.35B-32.

   Caution
   1. **Whenever the shoe and lining assembly is replaced, replace both RH and LH assemblies as a set to prevent car from pulling to one side when braking.**
   2. **If there is a significant difference in the thickness of the shoe and lining assemblies on the left and right sides, check the sliding condition of the piston.**



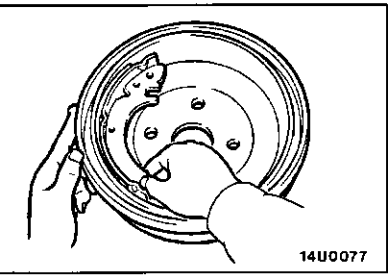
BRAKE DRUM INSIDE DIAMETER CHECK

35100320117

1. Remove the brake drum.
2. Measure the inside diameter of the brake drum at two or more locations.

   Standard value: 203 mm (8.0 in.)

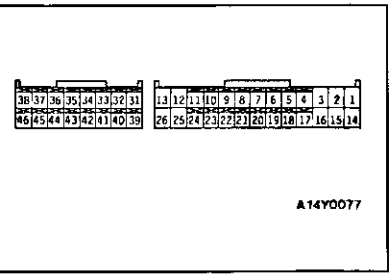
   Limit: 205 mm (8.1 In.)
3. Replace brake drums, shoe and lining assembly when wear exceeds the limit value or is badly imbalanced.



BRAKE LINING AND BRAKE DRUM CONTACT CHECK

35100310121

1. Remove the brake drum.
2. Remove the shoe and lining assembly. (Refer to P.35B-32.)
3. Chalk inner surface of brake drum and rub with shoe and lining assembly.
4. Replace shoe and lining assembly or brake drums if there are any irregular contact area.
   NOTE
   Clean off chalk after check.



WHEEL SPEED SENSOR OUTPUT VOLTAGE CHECK

35200160149

1. Lift up the vehicle and release the parking brake.
2. Disconnect the ABS-ECU connector, and then use the special tool (MB991219) to measure the output voltage at the harness-side connector.
3. Rotate the wheel to be measured at approximately 1/2-1 rotation per second, and check the output voltage using a circuit tester or an oscilloscope.

Wheel speed sensor	Front left	Front right	Rear left	Rear right
Terminal No.	6	8	9	7
	19	21	22	20

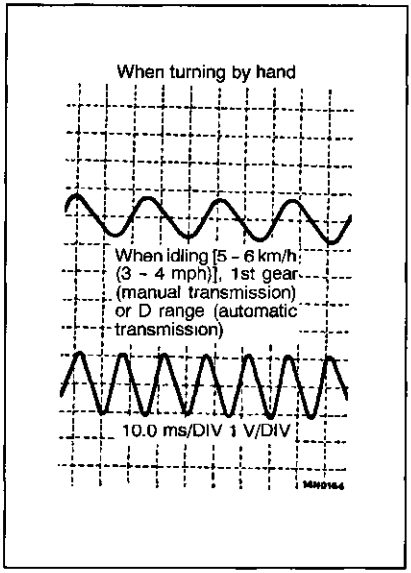
Output voltage

When measuring with a circuit tester:
50 mV or more

When measuring with an oscilloscope:
120 mV p-p or more

4. If the output voltage is lower than the above values, the reason could be as follow:
   - Faulty wheel speed sensor.

   So replace the wheel speed sensor.



Inspecting Waveforms With An Oscilloscope

Use the following method to observe the output voltage waveform from each wheel sensor with an oscilloscope.

- Start the engine, and rotate the front wheels by engaging 1st gear (vehicles with manual transmission) or D range (vehicles with automatic transmission). Turn the rear wheels manually so that they rotate at a constant speed.

NOTE

1. Check the connection of the sensor harness and connector before using the oscilloscope.
2. The waveform measurements can also be taken while the vehicle is actually moving.
3. The output voltage will be small when the wheel speed is low. Similarly, it will be large when the wheel speed is high.

Points In Waveform Measurement

Symptom	Probable causes	Remedy
Too small or zero waveform amplitude	Faulty wheel speed sensor	Replace sensor
Waveform amplitude fluctuates excessively (this is no problem if the minimum amplitude is 100 mV or more)	Axle hub eccentric or with large runout	Replace hub
Noisy or disturbed waveform	Open circuit in sensor	Replace sensor
	Open circuit in harness	Correct harness
	Incorrectly mounted wheel speed sensor	Mount correctly
	Rotor with missing or damaged teeth	Replace rotor

NOTE

The wheel speed sensor cable moves following motion of the front or rear suspension. Therefore, it is likely that it has an open circuit only when driving on rough roads and it functions normally when driving on smooth roads. It is recommended to observe sensor output voltage waveform also under special conditions, such as rough road driving.

HYDRAULIC UNIT (HU) CHECK

35200170159

Caution

Turn the ignition switch off before connecting or disconnecting the scan tool.

1. Jack up the vehicle and support the vehicle with jack stands placed at the specified jack-up points or place the wheels which are checked on the rollers of the braking force tester.

   Caution

   1. The roller of the braking force tester and the tire should be dry during testing.
   2. When testing the front brakes, apply the parking brake. When testing the rear brakes, stop the front wheels by using a wheel chock.

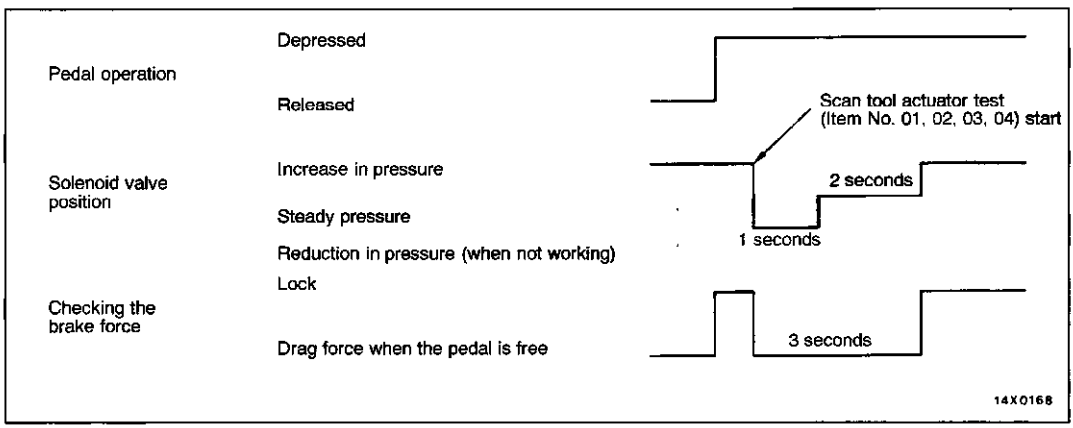
2. Release the parking brake, and feel the drag force (drag torque) on each road wheel. When using the braking force tester, take a reading of the brake drag force.
3. Turn the ignition key to the OFF position and set the scan tool.
4. After checking that the shift lever <M/T> or the selector lever <A/T> is in neutral, start the engine.
5. Use the scan tool to force-drive the actuator.

NOTE
1. During the actuator test, the ABS warning light will illuminate and the anti-lock control will be cancelled.
2. When the ABS has been interrupted by the fail-safe function, the scan tool actuator testing cannot be used.

6. Turn the wheel by hand and check the change in braking force when the brake pedal is depressed. When using the braking force tester, depress the brake pedal until the braking force is at the following values, and check that the braking force decreases when the actuator is force-driven.

Front wheel	785-981 N (176 - 220 lbs.)
Rear wheel	294-490 N (66 - 110 lbs.)

The result should be as shown in the following diagram.

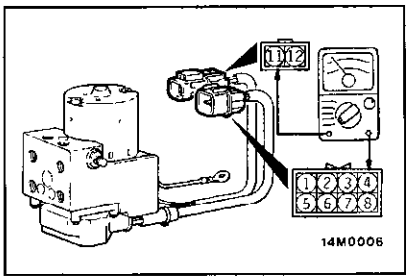


7. If the result of inspection is abnormal, correct according to the Diagnostic Table below.

Diagnostic Table

No.	Operation	Judgement - Normal	Judgement - Abnormal	Probable cause	Remedy
01	(1) Depress brake pedal to lock wheel. (2) Using the scan tool, select the wheel to be checked and force the actuator to operate. (3) Turn the selected wheel manually to check the change of brake force.	Brake force released for 3 seconds after locking.	Wheel does not lock when brake pedal is depressed.	Clogged brake line other than HU	Check and clean brake line
02				Clogged hydraulic circuit in HU	Replace HU assembly
03			Brake force is not released	Incorrect HU brake tube connection	Connect correctly
04				HU solenoid valve not functioning correctly	Replace HU assembly

8. After inspection, disconnect the scan tool immediately after turning the ignition switch to OFF.



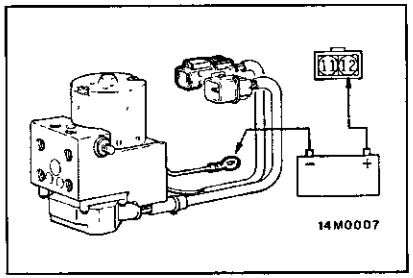
SOLENOID VALVE CHECK

35201070113

Measure the resistance between terminals.

Standard value:

Solenoid valve	Measurement terminals	Resistance between terminals.
Front IN (right side)	1-11	8.04 - 9.04 Ω
Front IN (left side)	4-11	
Rear IN (right side)	3-11	
Rear IN (left side)	2-11	
Front OUT (right side)	5-11	4.04 - 4.54 Ω
Front OUT (left side)	8-11	
Rear OUT (right side)	7-11	
Rear OUT (left side)	6-11	

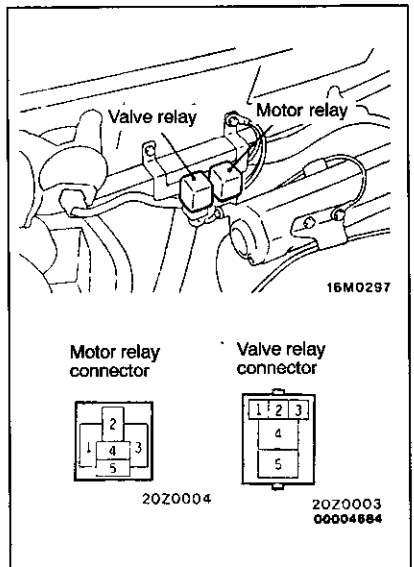


MOTOR OPERATION CHECK

35200160114

Connect the battery and check to be sure that the sound of the hydraulic unit motor operating can be heard.

Caution
The battery power should not be applied for more than 1 second.



MOTOR RELAY AND VALVE RELAY CONTINUITY CHECK

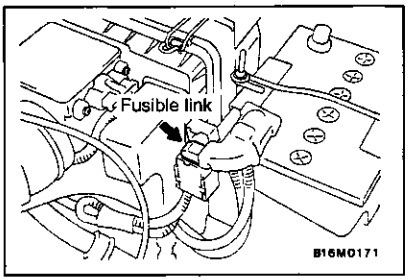
35201090126

Motor relay

Battery voltage	Terminal No.			
	1	2	3	5
Power is not supplied	○		○	
Power is supplied	⊕	○	⊖	○

Valve relay

Battery voltage	Terminal No.				
	1	2	3	4	5
Power is not supplied	○	○	○		○
Power is supplied	⊕		⊖	○	○



DISCHARGED BATTERY

35200350119

The ABS system consumes a large amount of battery current for its self-check function. If the battery is completely discharged and booster cables are used to start the engine, the engine must be allowed to idle for a few minutes to recharge. If the battery does not recharge, the engine may misfire or stall.

To prevent this condition,

- allow the engine to idle for a few minutes before driving the vehicle,
  or
- temporarily disable the ABS system by removing the fusible link for the ABS circuit. The ABS warning light will illuminate when the ABS fusible link is removed. After the battery is recharged, reinstall the ABS fusible link and check that the ABS warning light is not illuminated.

MASTER CYLINDER AND BRAKE BOOSTER

35200400142

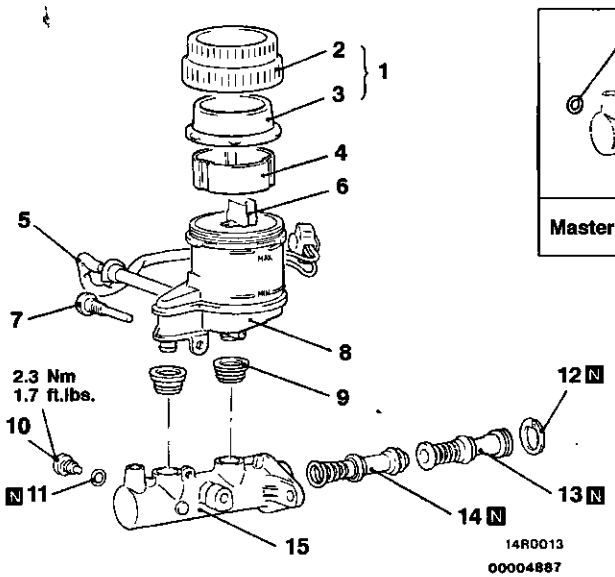
REMOVAL AND INSTALLATION

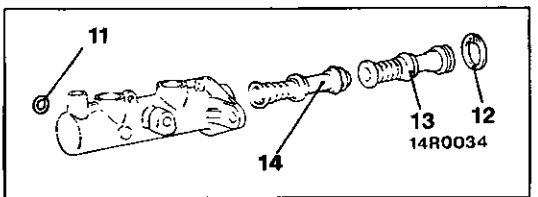
Refer to GROUP 35A - Master Cylinder and Brake Booster

MASTER CYLINDER

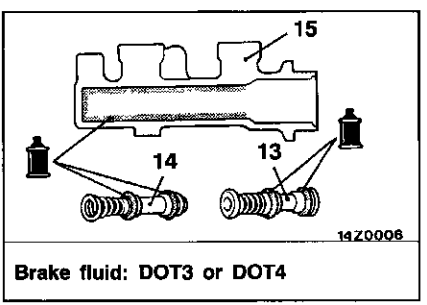
35200450093

DISASSEMBLY AND REASSEMBLY





Master cylinder kit

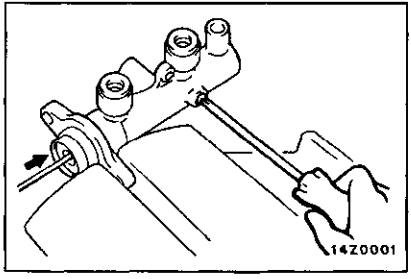


Brake fluid: DOT3 or DOT4

Disassembly steps

1. Reservoir cap assembly
2. Reservoir cap
3. Diaphragm
4. Filter
5. Brake fluid level sensor
6. Float
7. Reservoir stopper bolt
8. Reservoir tank
9. Reservoir seal
10. Piston stopper bolt
11. Gasket
12. Piston stopper ring
13. Primary piston assembly
14. Secondary piston assembly
15. Master cylinder body

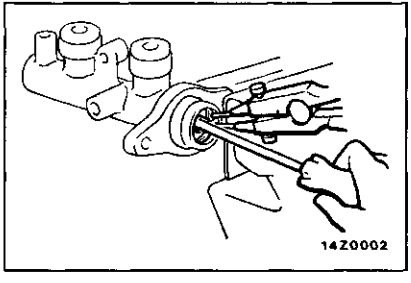
◀A▶
◀B▶



DISASSEMBLY SERVICE POINTS

◀A▶ PISTON STOPPER BOLT DISASSEMBLY

While depressing the piston, remove the piston stopper bolt.



◀B▶ PISTON STOPPER RING DISASSEMBLY

While depressing the piston, remove the piston stopper ring.

INSPECTION

35200460027

- Check the inner surface of master cylinder body for rust or pitting.
- Check the primary and secondary pistons for rust, scoring, wear, damage or wear.
- Check the diaphragm for cracks and wear.

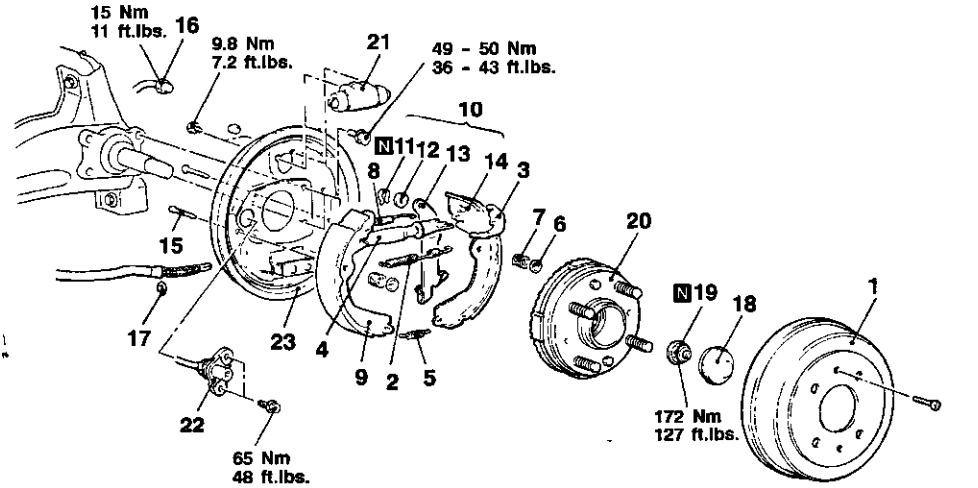
REAR DRUM BRAKE

35200700020

REMOVAL AND INSTALLATION

Pre-removal Operation
- Loosening the Parking Brake Cable Adjusting Nut.
- Brake Fluid Draining

Post-Installation Operation
- Brake Line Bleeding (Refer to P.35B-26.)
- Parking Brake Lever Stroke Adjustment (Refer to GROUP 36 – On-vehicle Service.)



A14M0055

Rear drum brake removal steps

1. Brake drum
2. Shoe-to-lever spring
3. Adjuster lever
4. Auto adjuster assembly
5. Retainer spring
6. Shoe hold-down cup
7. Shoe hold-down spring
8. Shoe-to-shoe spring
9. Shoe and lining assembly
10. Shoe, lining and lever assembly

◀A▶ ▶B◀ 11. Retainer
▶A◀ 12. Wave washer

13. Parking lever
14. Shoe and lining assembly
15. Shoe hold-down pin
16. Brake pipe connection
17. Snap ring
18. Hub cap
19. Flange nut
20. Rear hub and rotor assembly
21. Wheel cylinder
22. Speed sensor
23. Backing plate

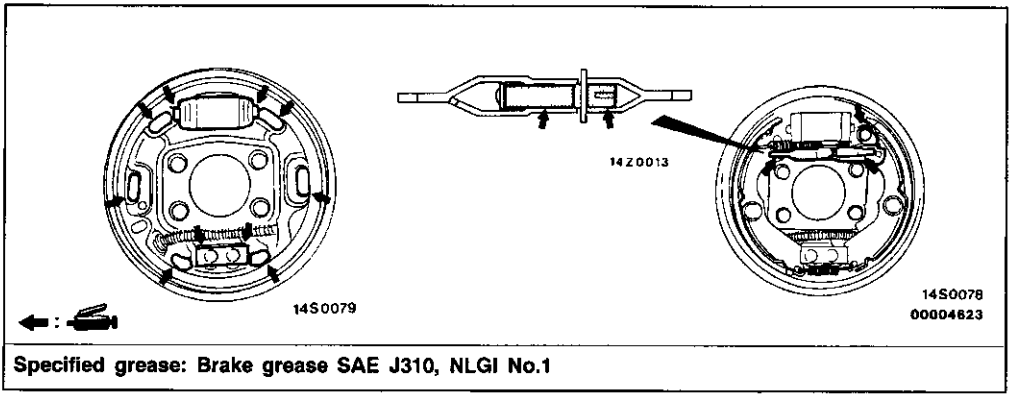
Wheel cylinder removal steps

1. Brake drum
2. Shoe-to-lever spring
8. Shoe-to-shoe spring
16. Brake pipe connection
21. Wheel cylinder

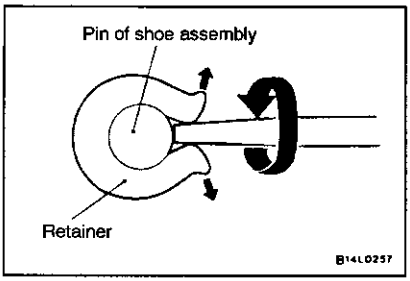
Caution

1. **Be careful when handling the pole piece at the tip of the speed sensor and the toothed edge of the rotor so as not to damage them by striking against other parts.**
2. **When removing the rear hub assembly, the wheel bearing inner race may be left at the spindle side. In this case, always replace the rear hub assembly, otherwise the hub will damage the oil seal, causing oil leaks or excessive play.**

LUBRICATION POINTS



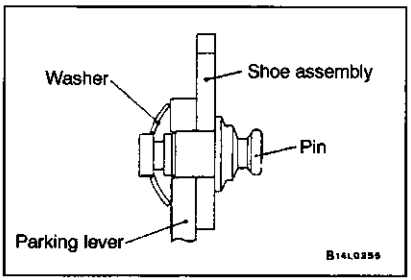
Specified grease: Brake grease SAE J310, NLGI No.1



REMOVAL SERVICE POINT

◀A▶ RETAINER REMOVAL

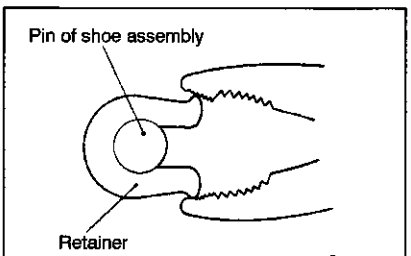
Use a flat-tipped screwdriver or the like to open up the retainer joint, and remove retainer.



INSTALLATION SERVICE POINTS

▶A◀ WAVE WASHER INSTALLATION

Install the washer in the direction shown in the illustration.

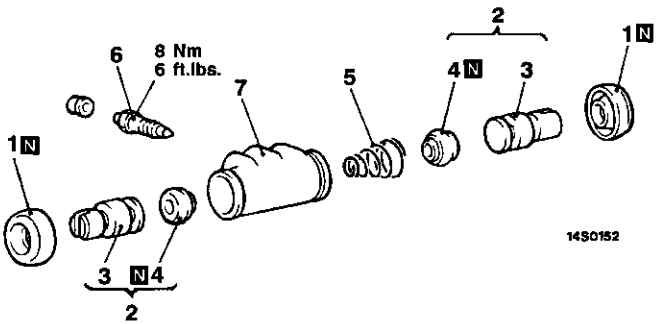


▶B◀ RETAINER INSTALLATION

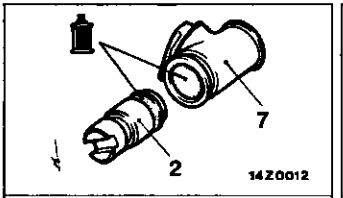
Use pliers or the like to install the retainer or the pin positively.

WHEEL CYLINDER DISASSEMBLY AND REASSEMBLY

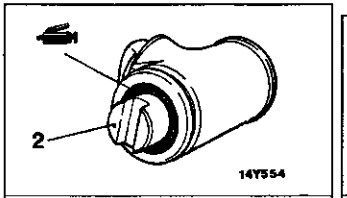
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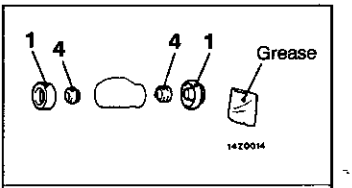
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Brake fluid: DOT3 or DOT4



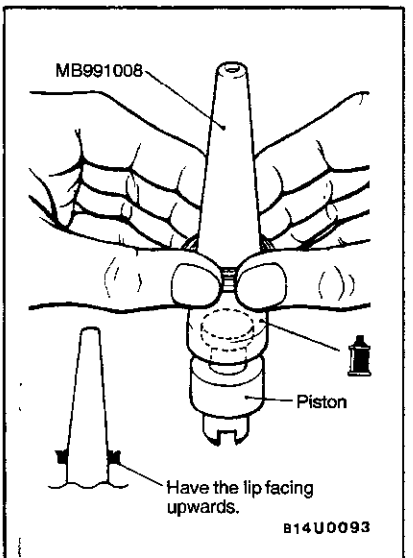
Grease: Repair kit grease



Wheel cylinder repair kit

Disassembly steps

1. Boots
2. Piston assembly
3. ▶A◀ Pistons
4. ▶A◀ Piston cups
5. Spring
6. Bleeder
7. Wheel cylinder body



REASSEMBLY SERVICE POINT

▶A◀ PISTON CUP/PISTON REASSEMBLY

(1) Use alcohol or specified brake fluid to clean the wheel cylinder and the piston.

(2) Apply the specified brake fluid to the piston cups and the special tool.

Specified brake fluid: DOT3 or DOT4

(3) Set the piston cup on the special tool with the lip of the cup facing up, fit the cup onto the special tool, and then slide it down the outside of the tool into the piston groove.

Caution

In order to keep the piston cup from becoming twisted or slanted, slide the piston cup down the tool slowly and carefully, without stopping.

INSPECTION

35100780038

Check the piston and wheel cylinder walls for rust or damage, and if there is any abnormality, replace the entire wheel cylinder assembly.

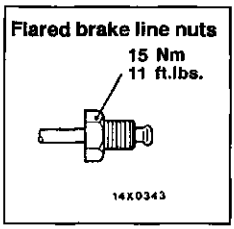
PROPORTIONING VALVE

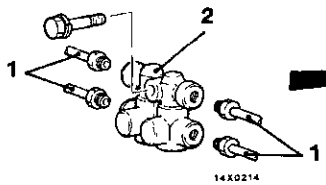
35200570096

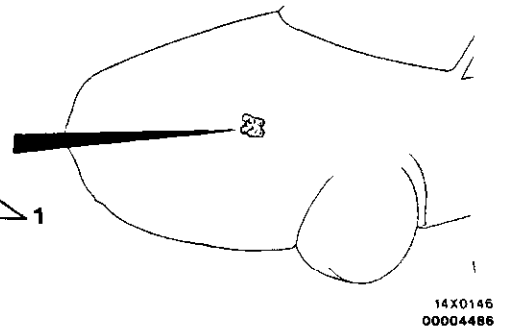
REMOVAL AND INSTALLATION

Pre-removal Operation
- Brake Fluid Draining
- Air Intake Hose Removal

Post-installation Operation
- Brake Fluid Supplying
- Brake Line Bleeding (Refer to P.35B-26.)
- Air Intake Hose Installation

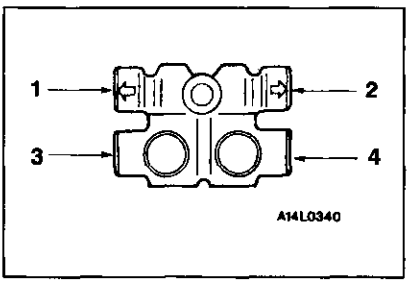






Removal steps

▶A◀ 1. Brake pipe
2. Proportioning valve
3. Bracket



INSTALLATION SERVICE POINT

▶A◀ BRAKE PIPE CONNECTION

Connect the pipes to the hydraulic unit as shown in the illustration.

1. Proportioning valve – Rear brake (L.H.)
2. Proportioning valve – Rear brake (R.H.)
3. Proportioning valve – Hydraulic unit
4. Proportioning valve – Hydraulic unit

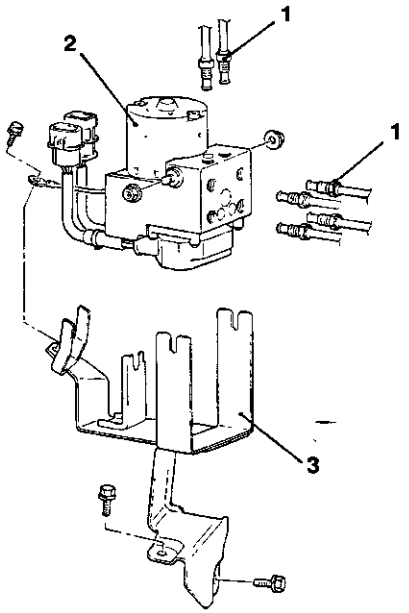
HYDRAULIC UNIT

35200850162

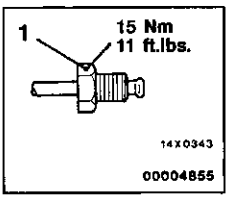
REMOVAL AND INSTALLATION

Pre-removal Operation
- Brake Fluid Draining
- Windshield Wiper Motor Removal (Refer to GROUP 51)

Post-installation Operation
- Windshield Wiper Motor Installation (Refer to GROUP 51)
- Brake Fluid Supplying
- Brake Line Bleeding (Refer to P35B-25.)
- Brake Pedal Adjustment (Refer to GROUP 35A - On-vehicle Service.)



14M0049



Removal steps

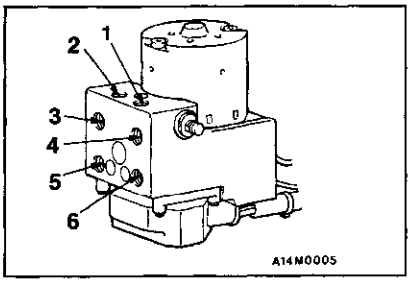
▶A◀ 1. Brake pipe connection
◀A▶ 2. Hydraulic unit assembly
3. Hydraulic unit bracket

REMOVAL SERVICE POINT

◀A▶ HYDRAULIC UNIT ASSEMBLY REMOVAL

Caution

1. **The hydraulic unit assembly is heavy, and so care should be taken when removing it.**
2. **The hydraulic unit assembly is not to be disassembled; its nuts and bolts should absolutely not be loosened.**
3. **The hydraulic unit assembly must not be dropped or otherwise subjected to impact shocks.**
4. **The hydraulic unit assembly must not be turned upside down or laid on its side.**



INSTALLATION SERVICE POINT

▶A◀ BRAKE PIPE CONNECTION

Connect the pipes to the hydraulic unit assembly as shown in the illustration.

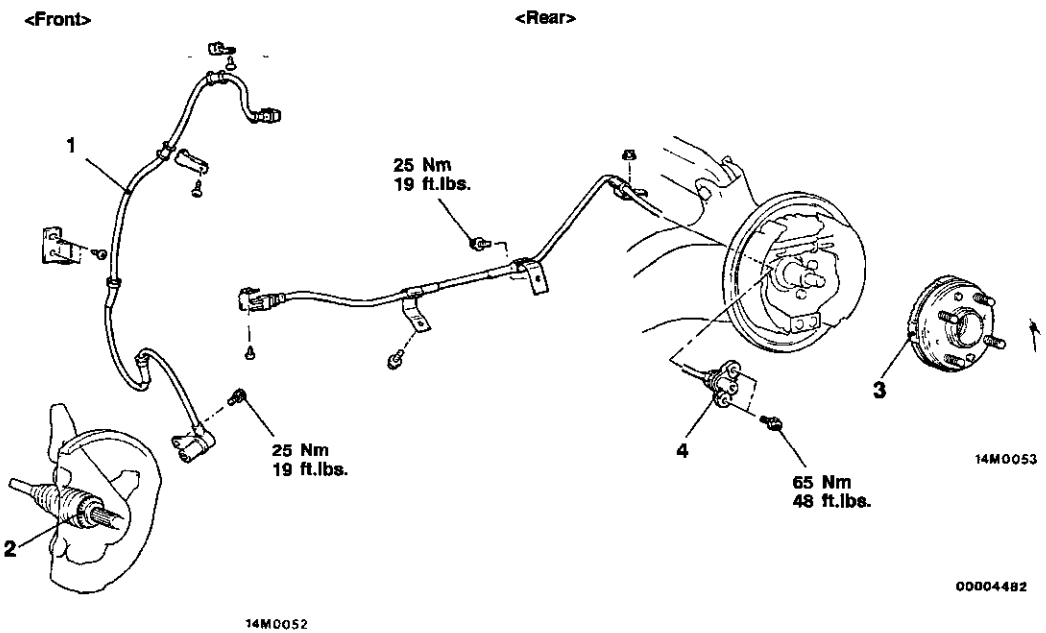
1. To the proportioning valve (RH)
2. To the proportioning valve (LH)
3. From the master cylinder (Primary)
4. From the master cylinder (Secondary)
5. To the front brake (RH)
6. To the front brake (LH)

WHEEL SPEED SENSOR

35200830156

REMOVAL AND INSTALLATION

Post-installation Operation
- Wheel Speed Sensor Output Voltage Check (Refer to P.35B-27.)



Front speed sensor removal steps

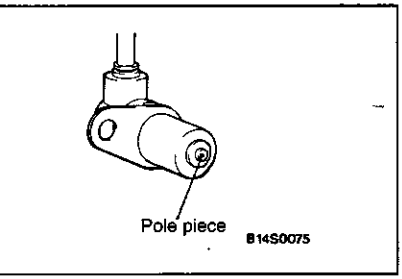
◀A▶ 1. Front speed sensor
2. Front rotor
(Refer to GROUP 26 - Drive shaft.)

NOTE
The front rotor is integrated with the drive shaft and is not disassembled.

Rear speed sensor removal steps

3. Rear rotor
(Refer to GROUP 27 - Rear Axle Hub.)

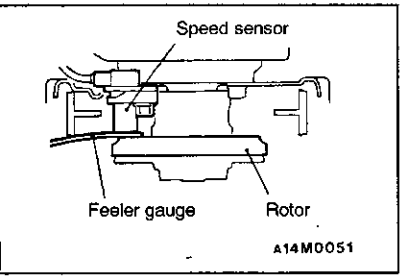
◀A▶ ▶A◀ 4. Rear speed sensor



REMOVAL SERVICE POINT

◀A▶ FRONT SPEED SENSOR/REAR SPEED SENSOR REMOVAL

Caution
Be careful when handling the pole piece at the tip of the speed sensor and the toothed edge of the rotor so as not to damage them by contacting other parts.



INSTALLATION SERVICE POINT

▶A◀ REAR SPEED SENSOR INSTALLATION

Caution
Be careful that the pole piece at the end of the speed sensor and the rotor teeth do not become damaged by striking them against the metal parts.

Insert a feeler gauge into the space between the speed sensor's pole piece and the rotor's toothed surface, and then tighten the speed sensor bracket at the position where the clearance is the standard value all around.

Standard value: 0.1 - 2.0 mm (.004 - .079 in.)

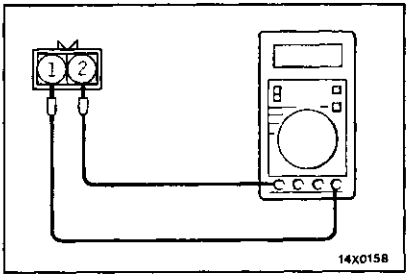
INSPECTION

35200840111

SPEED SENSOR

(1) Check whether any metallic foreign material has adhered to the pole piece at the speed sensor tip. Remove any foreign material.
Also check whether the pole piece is damaged. Replace it with a new one if it is damaged.

NOTE
The pole piece can become magnetized due to the magnet inside the speed sensor, causing foreign material to easily adhere to it. The pole piece may not be able to correctly sense the wheel rotation speed if foreign matter is on it or if it is damaged.



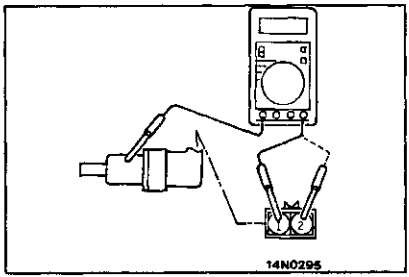
(2) Measure the resistance between the speed sensor terminals.

Standard value: 1.4 - 1.8 kΩ

If the internal resistance of the speed sensor is not within the standard value, replace with a new speed sensor.

(3) Check the speed sensor cable for breakage, damage or disconnection. Replace with a new one if a problem is found.

NOTE
When checking for cable damage, remove the cable clamp part from the body and then gently bend and pull the cable near the clamp to check whether or not temporary disconnection occurs.

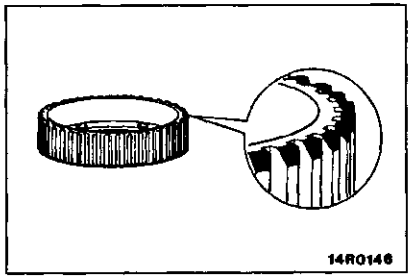


SPEED SENSOR INSULATION INSPECTION

(1) Remove all connections from the speed sensor, and then measure the resistance between terminals (1) and (2) and the body of the speed sensor.

Standard value: 100 kΩ or more

(2) If the speed sensor insulation resistance is outside the standard value range, replace with a new speed sensor.



TOOTHED ROTOR

Check whether rotor teeth are broken or deformed. Replace the rotor if the teeth are damaged or deformed.

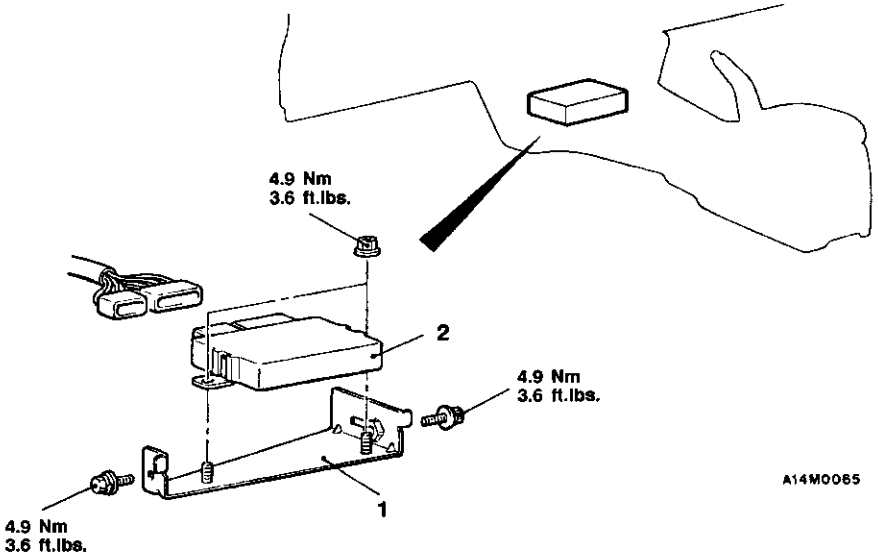
ABS-ECU

35200980134

REMOVAL AND INSTALLATION

CAUTION: SRS
When removing and installing the ABS-ECU from vehicles equipped with SRS, do not let it bump against the SRS-ECU or other components.

Pre-removal and Post-installation Operation
- Floor Console Removal and Installation (Refer to GROUP 52A.)



Removal steps
1. ABS-ECU bracket
2. ABS-ECU

INSPECTION

35200990090

Refer to P.35B-24.

PARKING BRAKES

CONTENTS

36109000118

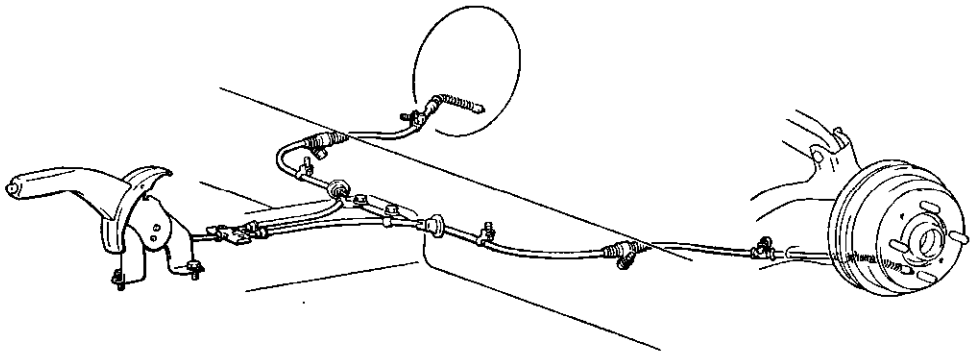
GENERAL INFORMATION 2
LUBRICANTS 2
ON-VEHICLE SERVICE 3
Parking Brake Lever Stroke Check 3
Parking Brake Switch Check 4
PARKING BRAKE LEVER 5
PARKING BRAKE CABLE 6
SERVICE SPECIFICATIONS 2
TROUBLESHOOTING 2

GENERAL INFORMATION

36100010103

The parking brake is of a mechanical rear-wheel brake construction in all vehicles.

CONSTRUCTION DIAGRAM



14M0091

SERVICE SPECIFICATIONS

36100030109

Item	Standard value
Parking brake lever stroke [Operation force: Approx. 196N (44 lbs.)]	5-7 notches

LUBRICANTS

36100040089

Items	Specified Lubricant
Rear brake shoe and backing plate contact surfaces	Brake grease SAE J310, NLGI No.1
Shoe assembly and auto adjuster assembly contact surfaces	
Shoe and lever assembly and auto adjuster assembly contact surfaces	

TROUBLESHOOTING

36100070071

Symptom	Probable cause	Remedy
Brake drag	Incomplete release of parking brake	Correct
	Incorrect parking brake adjustment	Adjust
Insufficient parking brake function	Worn brake lining	Replace
	Grease or oil on lining surface	Replace
	Parking brake cable sticking	Replace
	Stuck wheel cylinder	Replace
	Excessive parking brake lever stroke	Adjust the parking brake lever stroke or check the parking brake cable routing
	Auto adjuster malfunction	Replace

ON-VEHICLE SERVICE

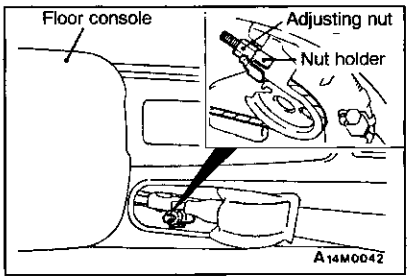
36100090107

PARKING BRAKE LEVER STROKE CHECK

1. Pull the parking brake lever with a force of approx. 196 N (44 lbs.) and count the number of notches.

   Caution
   The 196 N (44 lbs.) force of the parking brake lever must be strictly observed.

   Standard value:
   5-7 notches [Operation force: Approx. 196 N (44 lbs.)]



2. If the parking brake lever stroke is not the standard value, adjust as described below.
   (1) Loosen the adjusting nut to the end of the cable rod, thus freeing the parking brake cable.
   (2) With the engine idling, forcefully depress the brake pedal five or six times and confirm that the pedal stroke stops changing.

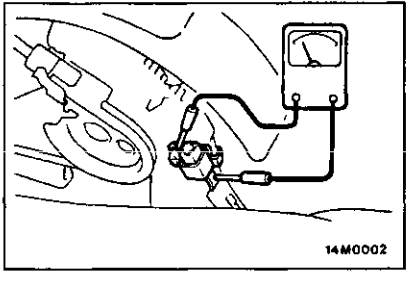
   NOTE
   If the pedal stroke stops changing, the automatic-adjustment mechanism is functioning normally, and the clearance between the shoe and drum is correct.

   (3) Turn the adjusting nut to adjust the parking brake lever stroke to the standard value. After adjusting, check that there is no space between the adjusting nut and the parking brake lever.
   Check that the adjusting nut is also securely held by the nut holder.

   Caution

   If the parking brake lever stroke is below the standard value and the braking is too firm, the rear brakes may drag.

   (4) After adjusting the parking brake lever stroke, jack up the rear of the vehicle. Release the parking brake and turn the rear wheels to check that the rear brakes are not dragging.



PARKING BRAKE SWITCH CHECK

36100330094

1. Remove the floor console. (Refer to GROUP 52A.)
2. Check for continuity between the parking brake switch terminal and the switch mounting bolt.

When parking brake lever is pulled	Continuity
When parking brake lever is released	No continuity

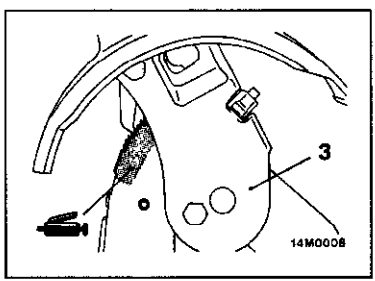
PARKING BRAKE LEVER

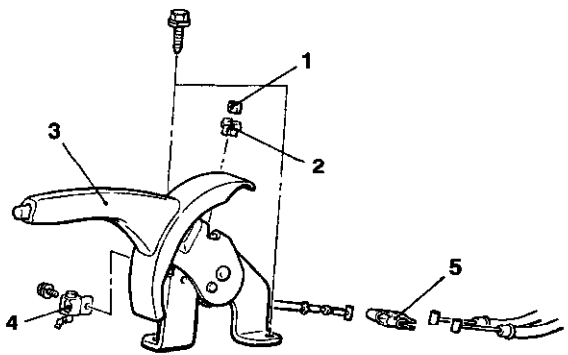
36100130113

REMOVAL AND INSTALLATION

Pre-removal Operation
- Floor Console Removal (Refer to GROUP 52A.)

Post-installation Operation
(1). Parking Brake Lever Stroke Adjustment (Refer to P.36-3.)
(2). Floor Console Installation (Refer to GROUP 52A.)





14M0095
00005281

Removal steps
1. Adjusting nut
2. Nut holder
3. Parking brake lever assembly
4. Parking brake switch
5. Cable equalizer

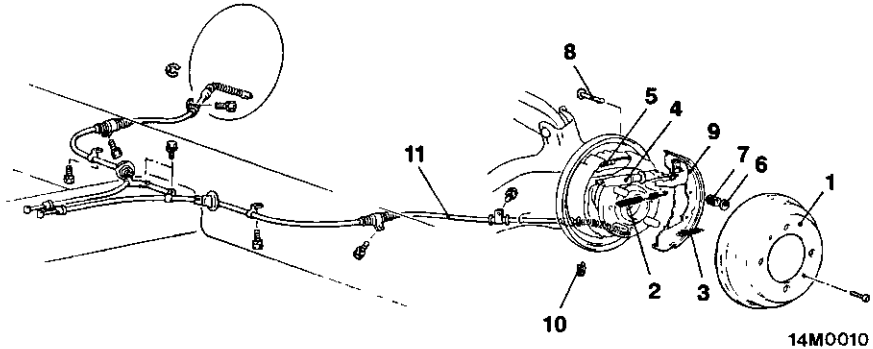
PARKING BRAKE CABLE

36100190159

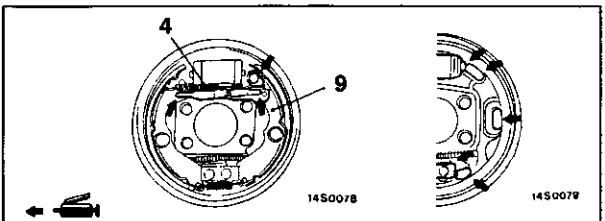
REMOVAL AND INSTALLATION

Pre-removal Operation
(1) Floor Console Removal (Refer to GROUP 52A.)
(2) Rear Seat Removal (Refer to GROUP 52A.)

Post-installation Operation
(1) Parking Brake Lever Stroke Adjustment (Refer to P.36-3.)
(2) Floor Console Installation (Refer to GROUP 52A.)
(3) Rear Seat Installation (Refer to GROUP 52A.)



14M0010
00004481



Brake grease: Brake grease SAE J310, NLGI No. 1

Removal steps

1. Rear brake drum
2. Shoe-to-lever spring
3. Retainer spring
4. Auto adjuster assembly
5. Shoe-to-shoe spring
6. Shoe hold-down cup
7. Shoe hold-down spring
8. Shoe hold-down pin
9. Shoe and lining assembly
10. Clip
11. Parking brake cable

STEERING

CONTENTS

37209000132

GENERAL INFORMATION 2

LUBRICANTS 3

MANUAL STEERING GEAR BOX * 15

ON-VEHICLE SERVICE 6

- Bleeding 9
- Drive Belt Tension Check 8
- Fluid Level Check 8
- Fluid Replacement 8
- Oil Pump Pressure Test 10
- Power Steering Oil Pressure Switch Check 11
- Stationary Steering Effort Check 7
- Steering Angle Check 6
- Steering Wheel Free Play Check 6
- Steering Wheel Return to Center Check 7
- Tie-rod End Ball Joint Breakaway Torque Check 7

POWER STEERING GEAR BOX * 22

POWER STEERING HOSES 38

POWER STEERING OIL PUMP 33

SEALANT 3

SERVICE SPECIFICATIONS 3

SPECIAL TOOLS 4

STEERING WHEEL AND SHAFT * 12

WARNINGS REGARDING SERVICING OF SUPPLEMENTAL RESTRAINT SYSTEM (SRS) EQUIPPED VEHICLES

WARNING!

(1) Improper service or maintenance of any component of the SRS, or any SRS-related component, can lead to personal injury or death to service personnel (from inadvertent firing of the air bag) or to the driver and passenger (from rendering the SRS inoperative).

(2) Service or maintenance of any SRS component or SRS-related component must be performed only at an authorized MITSUBISHI dealer.

(3) MITSUBISHI dealer personnel must thoroughly review this manual, and especially its GROUP 52B - Supplemental Restraint System (SRS) and GROUP 00 - Maintenance Service before beginning any service or maintenance of any component of the SRS or any SRS-related component.

NOTE

The SRS includes the following components: SRS-ECU, SRS warning light, air bag module, clock spring and interconnecting wiring. Other SRS-related components (that may have to be removed/installed in connection with SRS service or maintenance) are indicated in the table of contents by an asterisk (*).

GENERAL INFORMATION

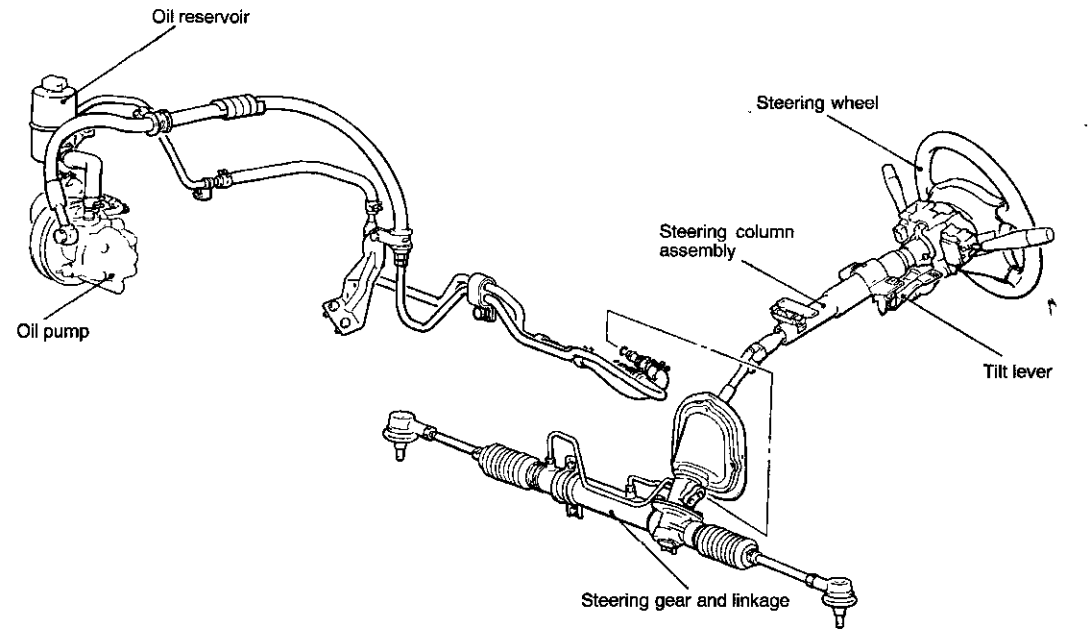
37200010110

The steering wheel is a 4-spoke type. The steering column is equipped with both shock absorbing and tilt steering mechanisms. The manual steering gear is a rack and pinion type with constant gear ratio which features light weight, compact size, good response to steering wheel movement and excellent feeling of steering.

The power steering is an integral rack and pinion type that combines the steering gear and linkage into one light-weight and compact assembly. The steering system uses a vane oil pump with a fluid flow control system, so that steering effort varies with engine speed.

Items		Specifications
Gear box	Steering gear type	Rack and pinion
Oil pump	Oil pump type	Vane type
	Displacement cm^3/rev. (cu.in./rev.)	5.9 (.36)
	Relief set pressure MPa (psi)	9.8 (1,422)

CONSTRUCTION DIAGRAM



A13M0068

SERVICE SPECIFICATIONS

37200030109

Items			Standard value	Limit
Steering wheel free play mm (in.)	Manual steering		-	30 (1.18)
	Power steering (with engine stopped)		10 (.39) or less	-
	Power steering (during hydraulic operation)		-	30 (1.18)
Steering angle	Inner wheel		37°30' ± 2°00'	-
	Outer wheel		31°40'	-
Tie-rod end ball joint breakaway torque Nm (in.lbs.)			0.20 - 0.48 (1.7 - 4.3)	-
Stationary steering effort N (lbs.) [Fluctuation allowance]			29 (6.6) or less [5.9 (1.3) or less]	-
Oil pump pressure MPa (psi)	Oil pump relief pressure		9.8 (1,422)	-
	Pressure under no load conditions		0.2 - 0.5 (28 - 71)	-
	Steering gear retention hydraulic pressure		9.8 (1,422)	-
Oil pressure switch operating pressure MPa (psi)		OFF → ON	1.5 - 2.0 (213 - 285)	-
		ON → OFF	0.7 - 2.0 (100 - 285)	-
Total pinion torque Nm (ft.lbs.)	Manual steering gear box		0.3 - 1.4 (.2 - 1.0)	-
	Power steering gear box		0.6 - 1.4 (.4 - 1.0)	-
Tie-rod joint swing resistance N (lbs.)			7 - 24 (1.5 - 5.3)	-
Tie-rod joint swing torque Nm (ft.lbs.)			1.5 - 4.9 (1.1 - 3.6)	-

LUBRICANTS

37200040102

Items		Specified lubricants	Quantity
Manual steering gear box	Bellows	Silicone grease	As required
Power steering gear box	Bearing, O-ring and oil seal	Automatic transmission fluid "DEXRON II"	As required
	Bushing inside rack stopper		
	Special tool (MB991212)		
	Pinion and valve assembly seal ring part		
	Bellows	Silicone grease	As required
Oil pump	Power steering fluid	Automatic transmission fluid "DEXRON II"	0.9 dm^3 (.95 U.S.qt.)
	Flow control valve	Automatic transmission fluid "DEXRON II"	As required
	Friction surface of rotor, vane cam ring and pump cover		
	Automatic transmission fluid "DEXRON II"		

SEALANT

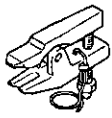
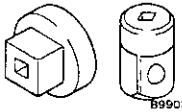
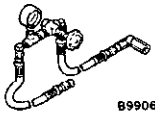
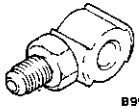
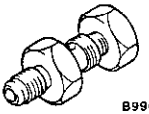
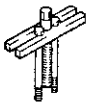
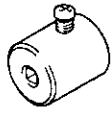
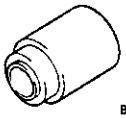
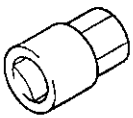
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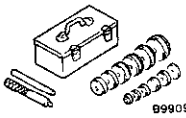
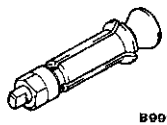
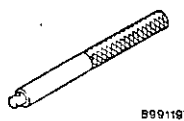
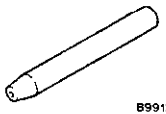
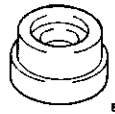
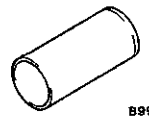
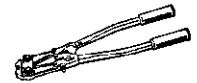
Items	Specified sealant	Remarks
Power steering rack support cover screw	3M ATD Part No.8663 or equivalent	Semi-drying sealant
Dust cover lip for tie-rod end ball joint		

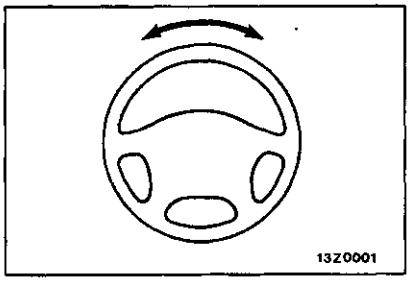
TSB Revision

SPECIAL TOOLS

37200060122

Tool	Tool number and name	Supersession	Application
 B991113	MB991113 or MB990635 Steering linkage puller	MB991113-01, MB990635-01 or general service tool	Tie-rod end disconnection
 B990326	MB990326 Preload socket	General service tool	Tie-rod end ball joint breakaway torque check
 B990662	MB990662 Oil pressure gauge assembly	MB990662-01	Oil pump pressure test
 B990993	MB990993 or MB991217 Power steering oil pressure gauge adapter (pump side)	MB990993-01	
 B990994	MB990994 Power steering oil pressure gauge adapter (hose side)	MB990994-01	
 B990803	MB990803 Steering wheel puller	General service tool	Steering wheel removal
 B991006	MB991006 Preload socket	MB991006-01	Gear box total pinion torque check
 B990776	MB990776 Front axle base	MB990776-01	Dust cover installation
 B991204	MB991204 Torque wrench socket		Rack support adjustment Rack support cover removal

Tool	Tool number and name	Supersession	Application
 B990925	MB990925 Bearing and oil seal installer set	MB990925-01 or General service tool	Oil seal and bearing installation MB990926, MB990927, MB990938, MB990939
 B991120	MB991120 Needle bearing puller	Tool not available	Needle roller bearing removal
 B991197	MB991197 Bar (long type)	General service tool	Back-up washer and oil seal installation
 B991202	MB991202 Oil seal and bearing installer	General service tool	Back-up washer, oil seal and needle roller bearing installation
 B991212	MB991212 Rack installer		Rack installation
 B991203	MB991203 Oil seal and bearing installer	Tool not available	Oil seal and bearing installation
 B991317	MB991317 Seal ring installer	Tool not available	Seal ring installation
	MB991561 Boot band crimping tool		Bellows band installation



ON-VEHICLE SERVICE

37200100091

STEERING WHEEL FREE PLAY CHECK

<Manual steering>

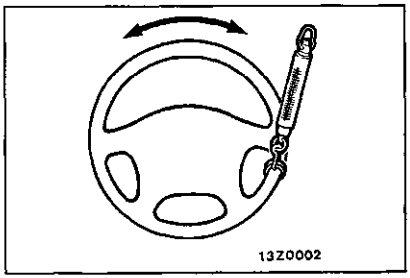
1. Set the front wheels straight ahead.
2. Measure the steering wheel play when the wheels start to move when turning the steering wheel slightly in both directions.

   Limit: 30 mm (1.18 mm)
3. When the play exceeds the limit, check the play in the steering shaft and linkage connections. Correct or replace a defective part.
4. When step (3) is OK, check the following to adjust:
   - Remove the steering gear box, check and adjust the gear box total pinion torque.

<Power steering>

1. With the engine running (during hydraulic operation), set the front wheels straight ahead.
2. Measure the steering wheel play when the wheels start to move when turning the steering wheel slightly in both directions.

   Limit: 30 mm (1.18 in.)
3. When the play exceeds the limit, check the play on the steering shaft and linkage connections. Correct or replace a defective part.



4. If the free play still exceeds the limit value, set the steering wheel straight ahead with the engine stopped. Load 4.9 N (1.1 lbs.) toward the steering wheel circumference and check the play.

   Standard value (steering wheel play with the engine stopped): 10 mm (.39 in.) or less

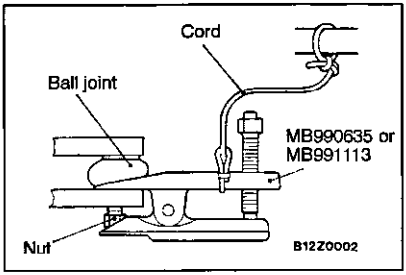
   If the play exceeds the standard value, remove the steering gear box and check the gear box total pinion torque.

STEERING ANGLE CHECK

37200110117

1. Place the front wheels on a turning radius gauge and measure the steering angle.

   Standard value:
   Inner wheel 37°30' ± 2°00'
   Outer wheel 31°40'
2. When the angle is not within the standard value, the toe is probably incorrect. Adjust the toe (Refer to GROUP 33A - On-vehicle Service) and recheck the steering angle.

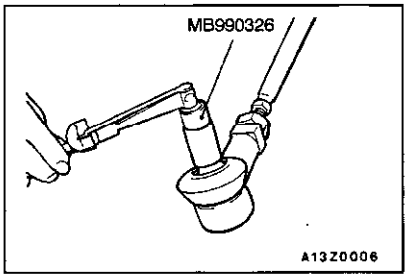


TIE-ROD END BALL JOINT BREAKAWAY TORQUE CHECK

37200150096

1. Disconnect tie-rod and knuckle with special tool.

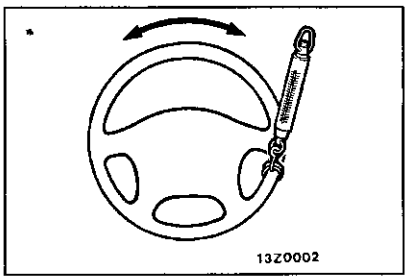
Caution
1. Using the special tool, loosen the tie-rod end mounting nut. Only loosen the nut; do not remove it from the ball joint.
2. Support the special tool with a cord, etc. to prevent it from coming off.



2. Move ball joint stud several times and install nut on the stud. Measure the ball joint breakaway torque with special tools.

Standard value: 0.20 - 0.48 Nm (1.7 - 4.3 in.lbs.)

3. If the measured value exceeds the standard value, replace the tie-rod end.
4. If the measured value is lower than the standard value, check that ball joint turns smoothly without excessive play. If so, it is possible to use that ball joint.



STATIONARY STEERING EFFORT CHECK

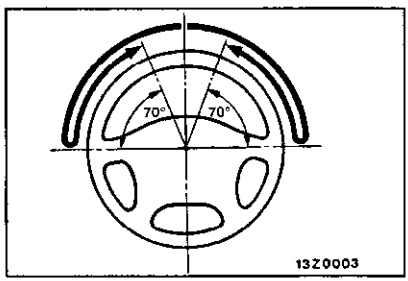
37200170108

1. With the vehicle stopped on a flat, paved surface, turn the steering wheel to the straight ahead position.
2. Start the engine and set it to 1,000±100 r/min.

Caution
After checking the engine r/min must return to the standard idling r/min.

3. Attach a spring scale to the outer circumference of the steering wheel and measure the steering force required to turn the steering wheel from the straight ahead position to the left and right (within a range of 1.5 turns). Also check to be sure that there is no significant fluctuation of the required steering effort.

Standard value:
Steering effort: 29 N (6.6 lbs.) or less
Fluctuation allowance: 5.9 N (1.3 lbs.) or less



STEERING WHEEL RETURN TO CENTER CHECK

37200180101

To make this test, conduct a road test and check as follows.
1. Make both gradual and sudden turns and check the steering "feeling" to be sure that there is not difference in the steering effort required and the wheel return during left and right turns.
2. At a speed of about 35 km/h (22 mph), turn the steering wheel 90° and release the steering wheel after 1 or 2 seconds. If the steering wheel then returns 70° or more, the return can be judged satisfactory.

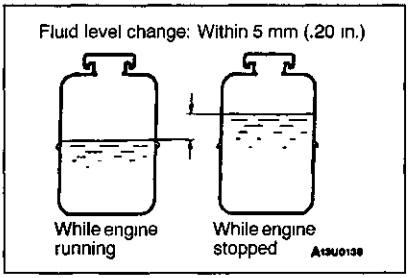
TSB Revision

NOTE
There will be a momentary feeling or "heaviness" when the wheel is turned quickly, but this is not abnormal. (Oil pump discharge amount is especially apt to be insufficient during idling.)

DRIVE BELT TENSION CHECK

37200190180

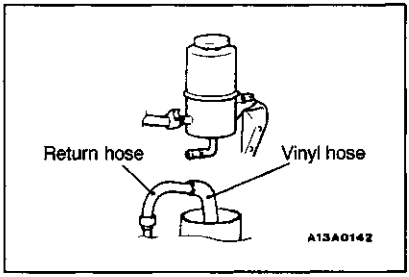
Refer to GROUP 11A - On-vehicle Service.
Refer to GROUP 11C - On-vehicle Service.



FLUID LEVEL CHECK

37200200081

1. Park the vehicle on a flat, level surface, start the engine, and then turn the steering wheel several times to raise the temperature of the fluid to approximately 50-60°C (122 - 140°F).
2. With the engine running, turn the wheel all the way to the left and right several times.
3. Check the fluid in the oil reservoir for foaming or milkiness. Check the difference of the fluid level when the engine is stopped, and while it is running. If the change of the fluid level is 5 mm (.20 in.) or more, air bleeding should be done.



FLUID REPLACEMENT

37200210084

1. Raise the front wheels on a jack, and then support them with jack stands.
2. Disconnect the return hose connection.
3. Connect a vinyl hose to the return hose, and drain the oil into a container.
4. Disconnect the spark plug cable.

Caution
Be careful not to position the high-tension cable near the delivery pipe.

5. While operating the starting motor intermittently, turn the steering wheel all the way to the left and right several times to drain all of the fluid.
6. Connect the return hoses securely, and then secure it with the clip.
7. Fill the oil reservoir with the specified fluid up to the lower position of the filler, and then bleed the air.

Specified fluid:
Automatic transmission fluid "DEXRON II"

BLEEDING

37200220094

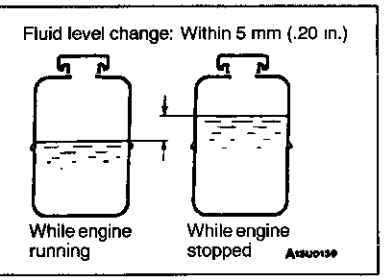
1. Jack up the front wheels and support them by using a jack stands.
2. Manually turn the oil pump pulley a few times.
3. Turn the steering wheel all the way to the left and to the right five or six times.
4. Disconnect the high-tension cable.

   Caution
   Be careful not to position the high-tension cable near the delivery pipe.

5. While operating the starting motor intermittently, turn the steering wheel all the way to the left and right five or six times (for 15 to 20 seconds).

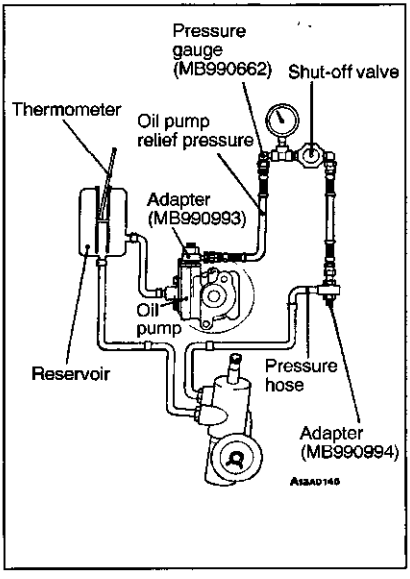
   Caution
   1. **During air bleeding, replenish the fluid supply so that the level never falls below the lower position of the filler.**
   2. **If air bleeding is done while engine is running, the air will be broken up and absorbed into the fluid; be sure to do the bleeding only while cranking.**

6. Connect the high-tension cable.
7. Turn the steering wheel to the left and right until there are no air bubbles in the oil reservoir.
8. Confirm that the fluid is not milky, and that the level is between the high and low dipstick marks.
9. Confirm that there is very little change in the fluid level when the steering wheel is turned to the left and right.



10. Confirm that the change in the fluid level is no more than 5 mm (.20 in.) when the engine is stopped and when it is running.
11. If the change of the fluid level is 5 mm (.20 in.) or more, the air has not been completely bled from the system, and thus must be bled completely.

    Caution
    1. **If the fluid level rises suddenly after the engine is stopped, the air has not been completely bled.**
    2. **If air bleeding is not complete, there will be abnormal noises from the pump and the flow-control valve, and this condition could cause a reduce of the life of the power steering component.**



OIL PUMP PRESSURE TEST

37200230110

1. Disconnect the pressure hose from the oil pump, and then connect the special tools.
2. Bleed the air, and then turn the steering wheel several times while the vehicle is not moving so that the temperature of the fluid rises to approximately 50-60°C (122 - 140°F).
3. Start the engine and idle it at 1,000±100 r/min.
4. Fully close the shut-off valve of the pressure gauge and measure the oil pump relief pressure to confirm that it is within the standard value range.

   Standard value: 9.8 MPa (1,422 psi)

   Caution
   The pressure gauge shut off valve must not remain closed for more than 10 seconds.

5. If it is not within the standard value, replace the oil pump.
6. Check whether or not the hydraulic pressure is the standard value when no-load conditions are created by fully opening the shut-off valve of the pressure gauge.

   Standard value: 0.2 - 0.5 MPa (28 - 71 psi)

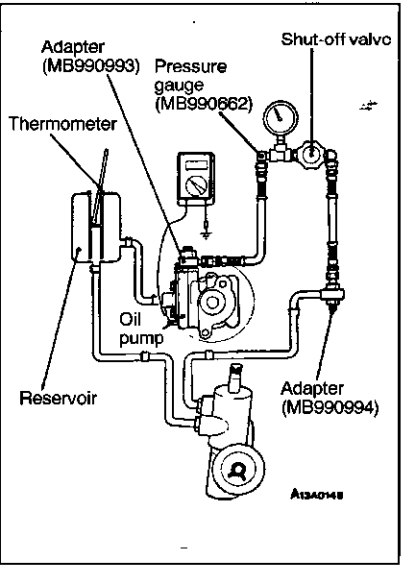
7. If it is not within the standard value, the probable cause is a malfunction of the oil line or steering gear box, so check these parts and repair as necessary.
8. Fully open the shut-off valve of the pressure gauge.
9. Turn the steering wheel all the way to the left or right; then check whether or not the retention hydraulic pressure is at the standard value.

   Standard value: 9.8 MPa (1,422 psi)

10. If not at the standard value, replace the power steering gear box.
    Remeasure fluid pressure.
11. Remove the special tools, and then tighten the pressure hose to the specified torque.

    Tightening torque: 18 Nm (13 ft.lbs.)

12. Bleed the system.



POWER STEERING OIL PRESSURE SWITCH CHECK

37200720099

1. Disconnect the pressure hose from the oil pump, and then connect the special tools.
2. Bleed the air, and then turn the steering wheel several times while the vehicle is not moving so that the temperature of the fluid rises to approximately 50-60°C (122 - 140°F).
3. The engine should be idling.
4. Disconnect the connection of the connector for the oil pressure switch, and place an ohmmeter in position.
5. Gradually close the shut-off valve of the pressure gauge and increase the hydraulic pressure, then check whether or not the hydraulic pressure that activates the switch is the standard value.

   Standard value: 1.5-2.0 MPa (213 - 285 psi)

6. Gradually open the shut-off valve and reduce the hydraulic pressure; then check whether or not the hydraulic pressure that deactivates the switch is the standard value.

   Standard value: 0.7-2.0 MPa (100 - 285 psi)

7. Remove the special tools, and then tighten the pressure hose to the specified torque.

   Tightening torque: 18 Nm (13 ft.lbs.)

8. Bleed the system.

STEERING WHEEL AND SHAFT

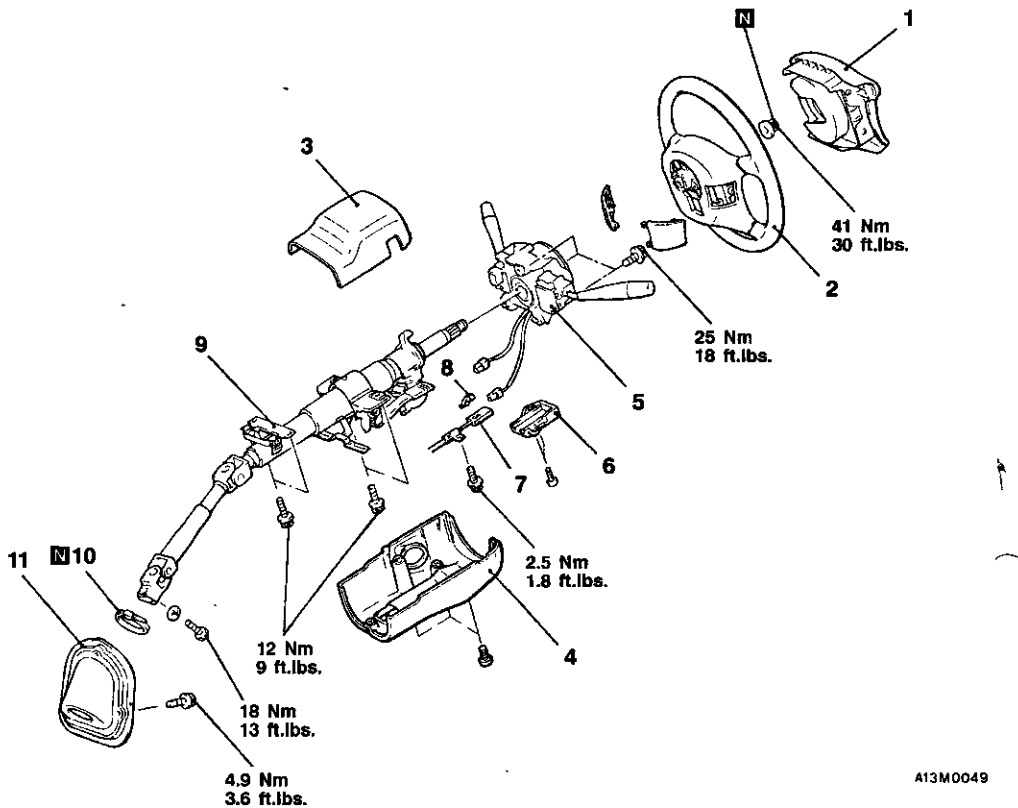
37200260287

REMOVAL AND INSTALLATION

CAUTION: SRS
Before removal of air bag module, refer to: GROUP 52B - Service Precautions, GROUP 52B - Air Bag Modules and Clock Spring

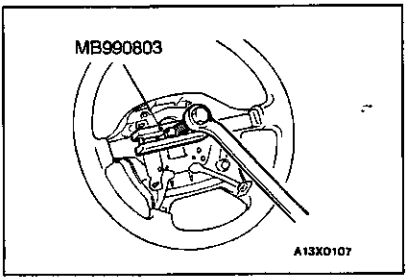
Pre-removal Operation
- Knee Protector Assembly Removal (Refer to GROUP 52A - Instrument Panel.)

Post-installation Operation
(1) Knee Protector Assembly Installation (Refer to GROUP 52A - Instrument Panel.)
(2) Checking Steering Wheel Position with Wheels Straight Ahead



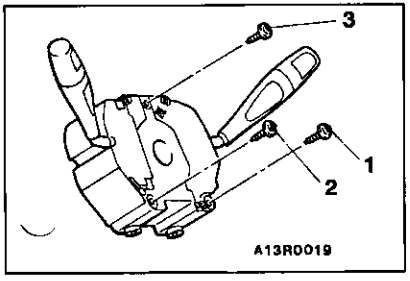
Removal steps

1. Air bag module (Refer to GROUP 52B - Air Bag Module and Clock Spring.)
◀A▶ 2. Steering wheel
3. Upper column cover
4. Lower column cover
▶A◀ 5. Clock spring and column switch (Refer to GROUP 52B - Air Bag Module and Clock Spring.)
6. Key interlock cable cover
7. Key interlock cable
8. Slider
9. Steering shaft assembly
10. Band
11. Steering cover assembly



REMOVAL SERVICE POINT

◀A▶ STEERING WHEEL REMOVAL



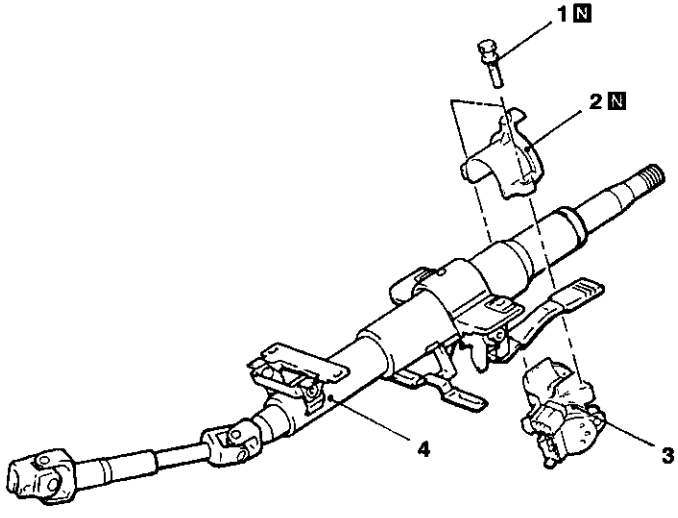
INSTALLATION SERVICE POINT

▶A◀ CLOCK SPRING AND COLUMN SWITCH INSTALLATION

Tighten the screws in the order shown in the illustration.

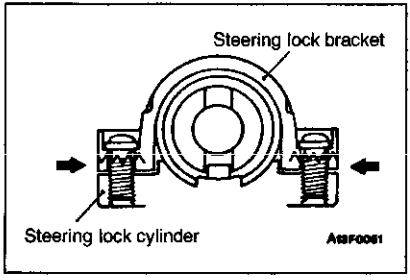
DISASSEMBLY AND REASSEMBLY

37200280106



Disassembly steps

◀A▶ ▶A◀ 1. Special bolt
▶A◀ 2. Steering lock bracket
▶A◀ 3. Steering lock cylinder
4. Steering shaft



DISASSEMBLY SERVICE POINT

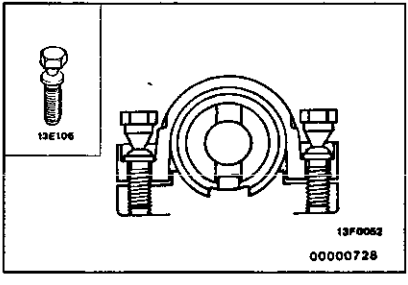
◀A▶ STEERING LOCK BRACKET/STEERING LOCK CYLINDER REMOVAL

If it is necessary to remove the steering lock cylinder, use a hacksaw to cut the special bolts at the steering lock bracket side.

REASSEMBLY SERVICE POINT

▶A◀ STEERING LOCK CYLINDER/STEERING LOCK BRACKET/SPECIAL BOLT INSTALLATION

(1) When installing the steering lock cylinder and steering lock bracket to the column tube, temporarily install the steering lock in alignment with the column boss.



(2) After checking that the lock works properly, tighten the special bolts until the head twists off.

Caution
The steering lock bracket and bolts must be replaced with new ones when the steering lock is installed.

MANUAL STEERING GEAR BOX

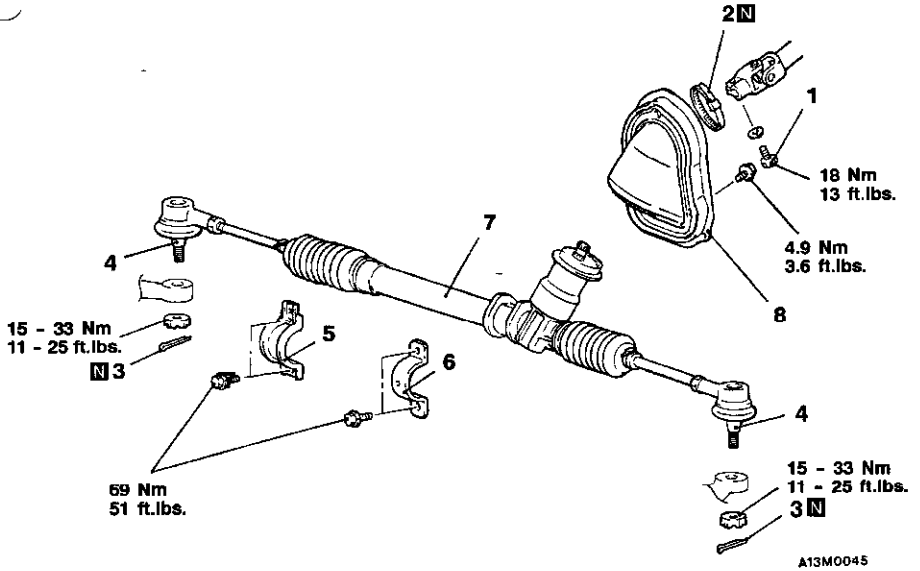
37100220077

REMOVAL AND INSTALLATION

CAUTION: SRS
Before removing the steering box, refer to GROUP 52B - General Information, center the front wheels, and remove the ignition key. Failure to do so may damage the SRS clock spring and render the SRS system inoperative, risking a serious driver's injury.

Pre-removal Operation
- Center Member Removal (Refer to GROUP 32.)
- Front Exhaust Pipe Removal (Refer to GROUP 15.)

Post-installation Operation
- Press the dust cover with a finger to check whether the dust cover is cracked or damaged.
- Front Exhaust Pipe Installation (Refer to GROUP 15.)
- Center Member Installation (Refer to GROUP 32.)
- Checking Steering Wheel Position with Wheels Straight Ahead
- Front Wheel Alignment Adjustment (Refer to GROUP 33A.)



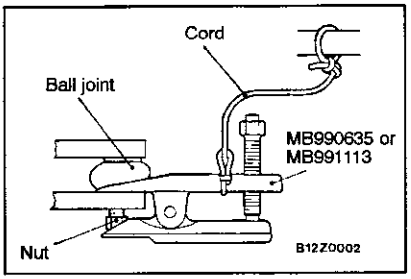
Removal steps

1. Steering shaft assembly and gear box connecting bolt
2. Band
3. Cotter pin
4. Tie-rod end and knuckle connection

◀A▶

◀B▶

5. Cylinder clamp
6. Gear housing clamp
7. Gear box assembly
8. Steering cover assembly



REMOVAL SERVICE POINTS

◀A▶ TIE-ROD END DISCONNECTION

Caution

1. **Using the special tool, loosen the tie-rod end mounting nut. Only loosen the nut; do not remove it from the ball joint.**
2. **Support the special tool with a cord, etc. to prevent it from coming off.**

◀B▶ GEAR BOX ASSEMBLY REMOVAL

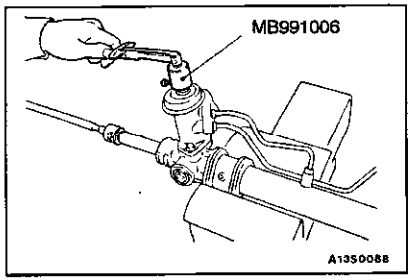
Caution

Be careful not to damage the bellows and the tie-rod end dust cover when removing the gear box assembly.

INSPECTION

37100230032

- Check the rubber parts for cracks and breakage.



GEAR BOX TOTAL PINION TORQUE

Using the special tools, turn the pinion gear at the rate of one rotation in approximately 4 to 6 seconds to check the total pinion torque.

Standard value: 0.3 - 1.4 Nm (.2 - 1.0 ft.lbs.)
[Change in torque: 0.4 Nm (.3 ft.lbs.)]

Caution

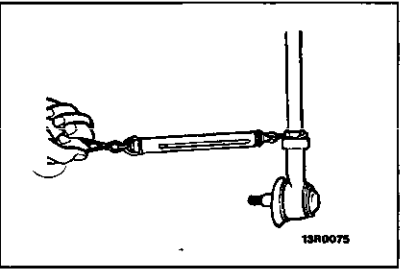
When holding the steering gear box assembly in a vise, secure its mounting positions. If it is secured in any other places, the gear housing may become deformed or damaged.

NOTE

When measuring, remove the bellows from the rack housing. Measure the pinion torque through the whole stroke of the rack.

If the measured value is not within the standard range, first adjust the rack support cover, and then check the total pinion torque again.

If the total pinion torque cannot be adjusted to within the standard range by adjusting the rack support cover, check the rack support cover, rack support spring, rack support and replace any parts if necessary.



CHECK THE TIE-ROD FOR SWING RESISTANCE

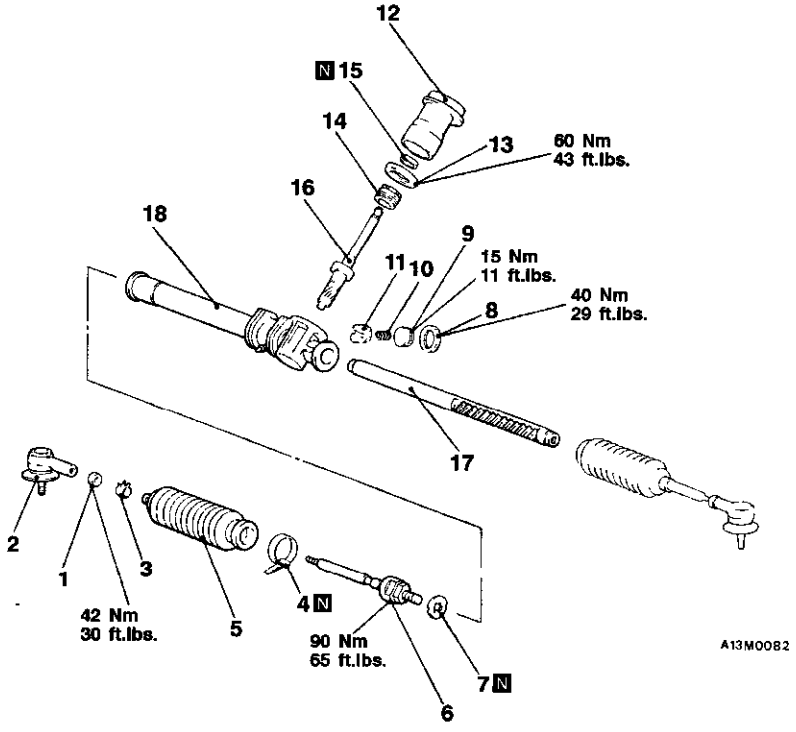
(1) Give 10 hard swings to the tie-rod.
(2) Measure the tie-rod swing resistance with a spring scale.

Standard value:
7 - 24 N (1.5 - 5.3 lbs.)
[1.5 - 4.9 Nm (1.1 - 3.6 ft.lbs.)]

(3) When the measured value exceeds the standard value, replace the tie-rod end.
(4) When the measured value is lower than the standard value, check that ball joint turns smoothly without excessive play. If so, it is possible to use that ball joint.

DISASSEMBLY AND REASSEMBLY

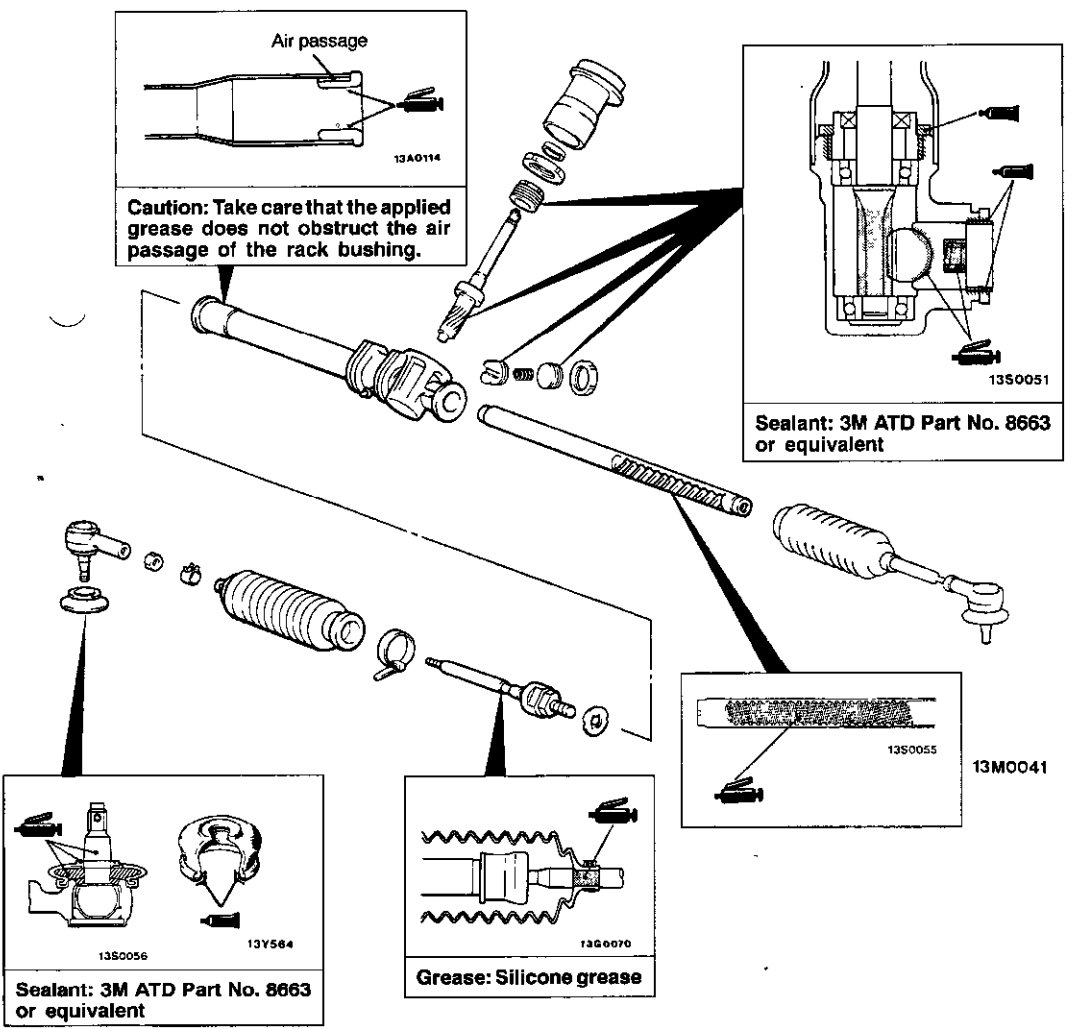
37100240035

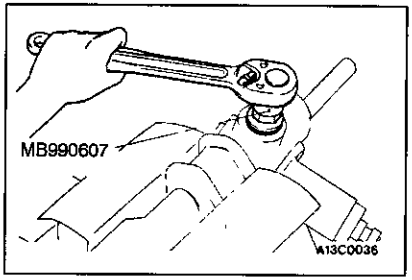


Disassembly steps

- ▶E◀ 1. Tie-rod end lock nut
- ▶E◀ 2. Tie-rod end
- 3. Bellows clip
- 4. Bellows band
- 5. Bellows
- ▶D◀ 6. Tie-rod
- ▶D◀ 7. Tab washer
- ▶C◀ • Total pinion torque adjustment
- 8. Locking nut
- ◀A▶ ▶B◀ 9. Rack support cover
- 10. Rack support spring
- 11. Rack support
- 12. Joint cover
- 13. Locking nut
- 14. Top cover
- ▶A◀ 15. Oil seal
- 16. Pinion
- ◀B▶ 17. Rack
- 18. Gear housing

Lubrication and Sealing Points

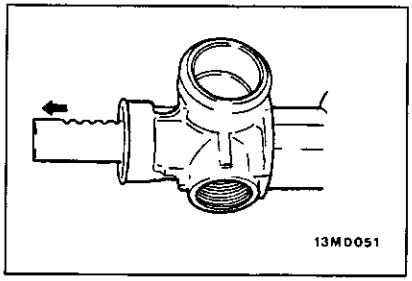




DISASSEMBLY SERVICE POINTS

◀A▶ RACK SUPPORT COVER REMOVAL

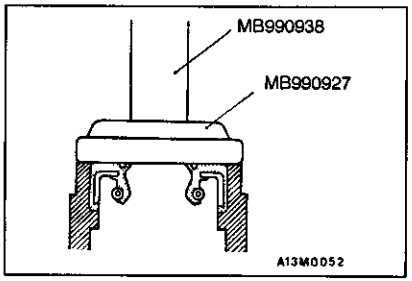
Use the special tool to remove the rack support cover from the gear box.



◀B▶ RACK REMOVAL

Pull out the rack from the gear housing in the direction shown in the illustration.

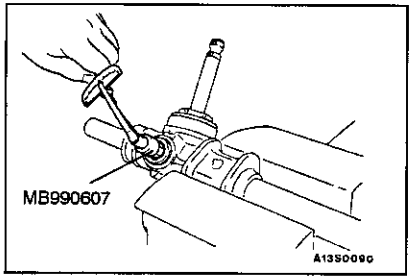
Caution
If the rack is pulled out in the wrong direction, the bushing in the gear box may be damaged by the rack threads.



REASSEMBLY SERVICE POINTS

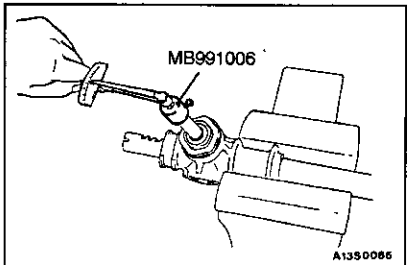
▶A◀ OIL SEAL INSTALLATION

Use the special tool to press the oil seal in the top plug.



▶B◀ RACK SUPPORT COVER INSTALLATION

Position the rack at its center and tighten the rack support cover to 15 Nm (11 ft.lbs.).



▶C◀ TOTAL PINION TORQUE ADJUSTMENT

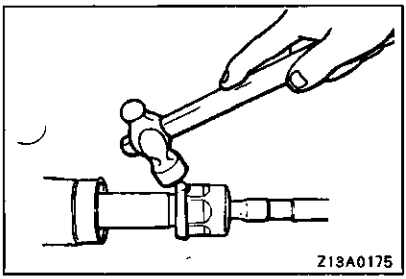
(1) In neutral position, use the special tool to rotate the pinion shaft clockwise one turn per 4 - 6 seconds. Return the rack support cover 30° - 60° and adjust the torque to the standard value.

Standard value: 0.3 - 1.4 mm (3 - 12 in. lbs.)
[Torque variation: 0.4 Nm (3 in. lbs.)]

Caution
1. **When adjusting, set the standard value at its highest value.**
2. **Assure no ratcheting or catching when operating the rack toward the shaft direction.**

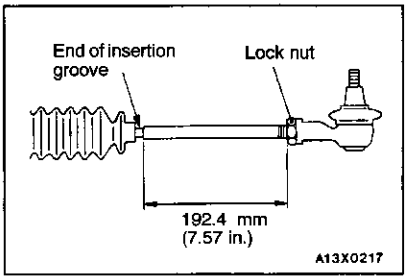
NOTE
When it cannot be adjusted within the specified return angle, check or replace the rack support cover components.

(2) After adjusting, secure the rack support cover with the lock nut.



▶D◀ TAB WASHER/TIE-ROD INSTALLATION

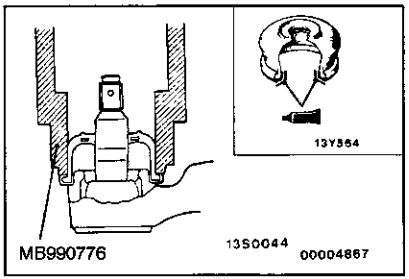
After installing the tie-rod to the rack, fold the tab washer end (two locations) to the tie-rod notch.



▶E◀ TIE-ROD END/TIE-ROD END LOCK NUT INSTALLATION

Screw in the tie-rod end to adjust the dimension shown to the specified. Secure the lock nut.

NOTE
Fully tighten the lock nut after installing the gear box and adjusting the toe-in.



INSPECTION 37100250036

DUST COVER REPLACEMENT

Replace the dust cover only when it has been cracked or damaged by mistake during the maintenance work.
(1) Remove the dust cover.
(2) Pack the dust cover interior with multi-purpose grease.
(3) Apply the specified sealant to the dust cover lip.

Specified sealant:
3M ATD Part No. 8663 or equivalent

(4) Use the special tool to install the dust cover to the tie-rod end ball joint.
(5) Press the dust cover with a finger to check whether the dust cover is cracked or damaged.

- Check the rack support for uneven wear or damage.
- Check the rack support spring for deterioration.
- Check the rack pinion tooth surfaces for wear or damage.
- Check the ball bearings or pinion bushing for noise, uneven rotation, or damage.
- Check the rack bushing for damage.
- Check the dust cover for cracks or damage.

POWER STEERING GEAR BOX

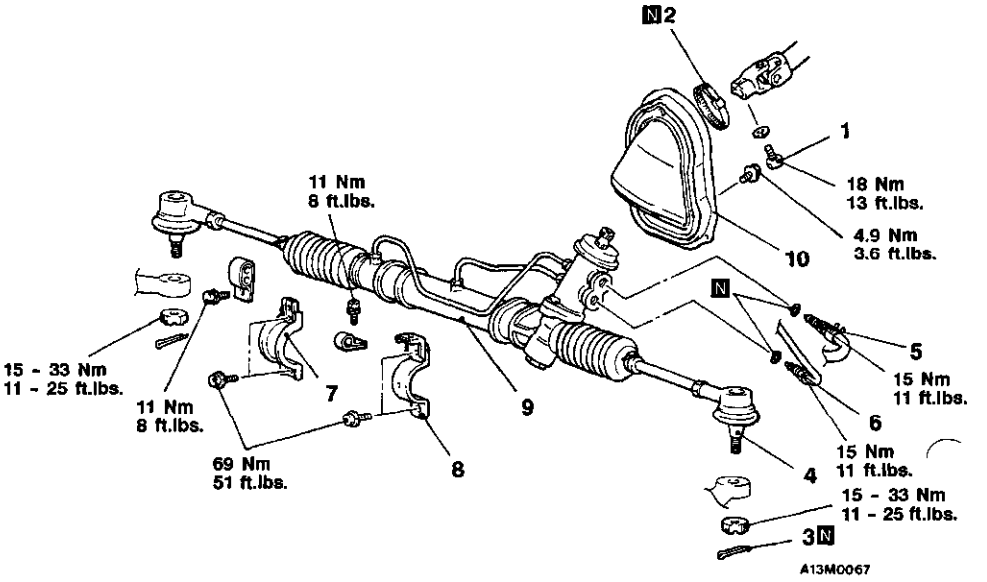
37200390245

REMOVAL AND INSTALLATION

CAUTION: SRS
Before removal of steering gear box, refer to GROUP 52B - General Information, center front wheels and remove ignition key. Failure to do so may damage SRS clock spring and render SRS system inoperative, risking serious driver injury.

Pre-removal Operation
- Power Steering Fluid Draining (Refer to P.37A-8.)
- Center Member Removal (Refer to GROUP 32.)
- Front Exhaust Pipe Removal (Refer to GROUP 15.)

Post-installation Operation
- Press the dust cover with a finger to check whether the dust cover is cracked or damaged.
- Front Exhaust Pipe Installation (Refer to GROUP 15.)
- Center Member Installation (Refer to GROUP 32.)
- Power Steering Fluid Supplying (Refer to P.37A-8.)
- Power Steering Fluid Line Bleeding (Refer to P.37A-9.)
- Checking Steering Wheel Position with Wheels Straight Ahead
- Front Wheel Alignment Adjustment (Refer to GROUP 33A.)



Removal steps

1. Steering shaft assembly and gear box connecting bolt
2. Band
3. Cotter pin
4. Tie-rod end and knuckle connection
5. Return tube connection
6. Pressure tube connection
7. Cylinder clamp
8. Gear housing clamp
9. Gear box assembly
10. Steering cover assembly

◀A▶ ◀B▶

REMOVAL SERVICE POINTS

◀A▶ TIE-ROD END DISCONNECTION

Refer to P.37A-16.

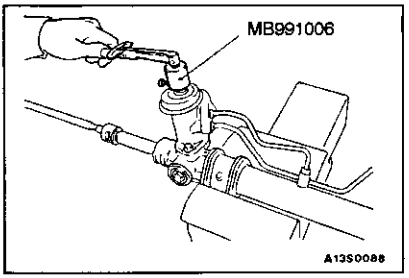
◀B▶ GEAR BOX ASSEMBLY REMOVAL

Refer to P.37A-16.

INSPECTION

37200400085

Refer to P.37A-17.



GEAR BOX TOTAL PINION TORQUE

Using the special tools, rotate the pinion gear at the rate of one rotation in approximately 4 to 6 seconds to check the total pinion torque.

Standard value: 0.6 - 1.4 Nm (.4 - 1.0 ft.lbs.)
[Change in torque: 0.4 Nm (.3 ft.lbs.)]

Caution
When holding the steering gear box assembly in a vice, secure its mounting positions. If it is secured in any other places, the gear housing may become deformed or damaged.

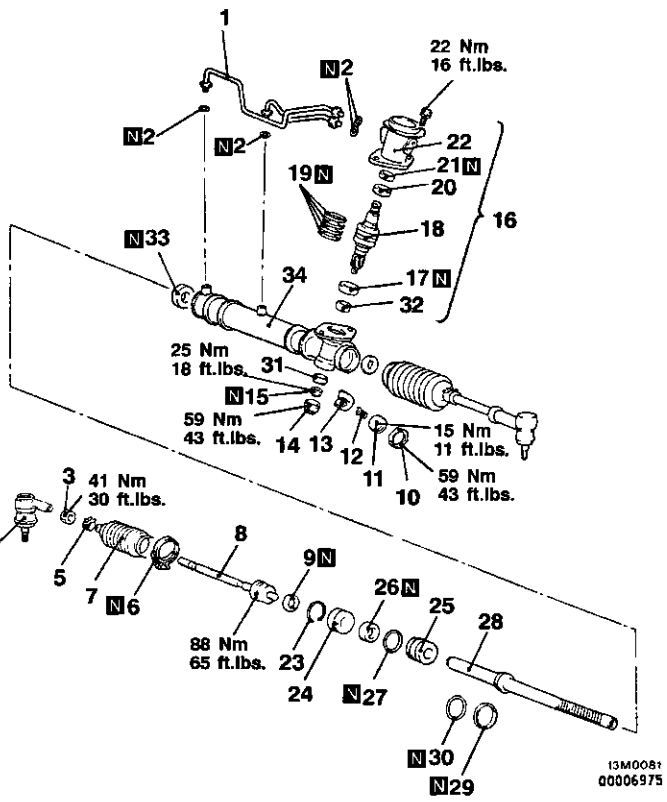
NOTE
When measuring, remove the bellows from the rack housing. Measure the pinion torque through the whole stroke of the rack.
If the measured value is not within the standard range, first adjust the rack support cover, and then check the total pinion torque again.
If the total pinion torque cannot be adjusted to within the standard range by adjusting the rack support cover, check the rack support cover, rack support spring, rack support and replace any parts if necessary.

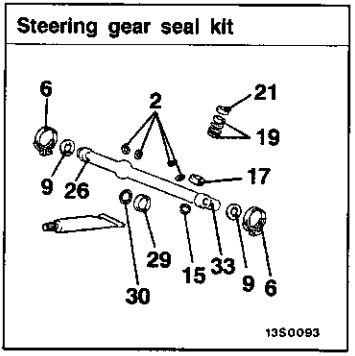
CHECK THE TIE-ROD FOR SWING RESISTANCE

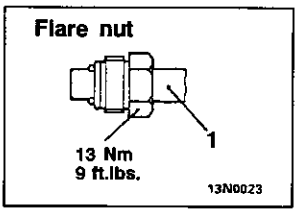
Refer to P.37A-17.

DISASSEMBLY AND REASSEMBLY

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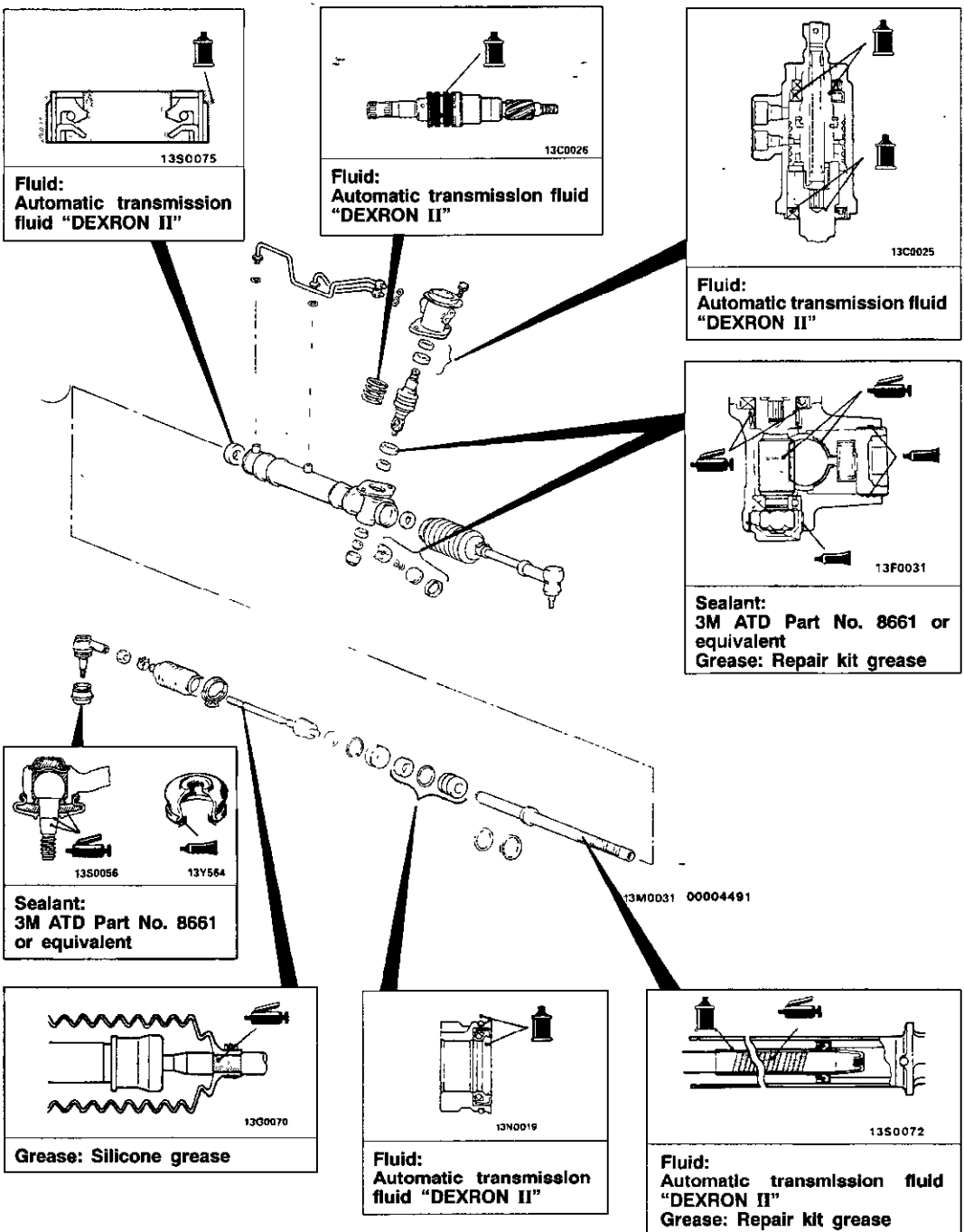


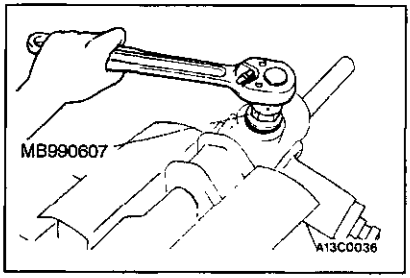


Disassembly steps

1. Feed pipe
2. O-ring
- ▶N◀ 3. Tie-rod end locking nut
- ▶N◀ 4. Tie-rod end
5. Bellows clip
- ▶M◀ 6. Bellows band
7. Bellows
- ▶L◀ 8. Tie-rod
- ▶L◀ 9. Tab washer
- ▶K◀ ● Total pinion torque adjustment
10. Locking nut
- ◀A▶ ▶J◀ 11. Rack support cover
12. Rack support spring
13. Rack support
- ▶I◀ 14. End plug
15. Self-locking nut
16. Valve housing assembly
- ◀B▶ ▶H◀ 17. Oil seal
- ◀B▶ 18. Pinion and valve assembly
- ◀C▶ ▶G◀ 19. Seal ring
- ◀D▶ ▶F◀ 20. Ball bearing
- ◀D▶ ▶F◀ 21. Oil seal
22. Valve housing
- ◀E▶ ▶E◀ 23. Circlip
- ◀F▶ 24. Rack stopper
- ◀F▶ ▶D◀ 25. Rack bushing
- ◀G▶ ▶D◀ 26. Oil seal
27. O-ring
- ◀F▶ ▶C◀ 28. Rack
- ◀C▶ 29. Seal ring
30. O-ring
- ◀H▶ ▶B◀ 31. Ball bearing
- ◀I▶ ▶B◀ 32. Needle roller bearing
- ◀J▶ ▶A◀ 33. Oil seal
34. Rack housing

Lubrication and Sealing Points

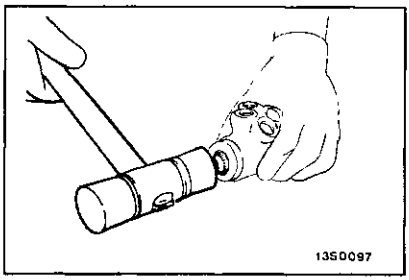




DISASSEMBLY SERVICE POINTS

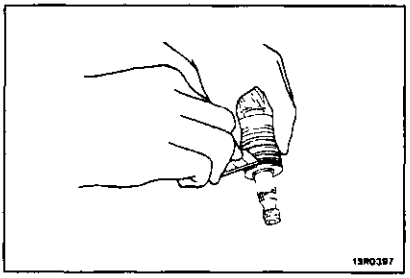
◀A▶ RACK SUPPORT COVER REMOVAL

Use the special tool to remove the rack support cover from the gear box.



◀B▶ OIL SEAL/PINION AND VALVE ASSEMBLY REMOVAL

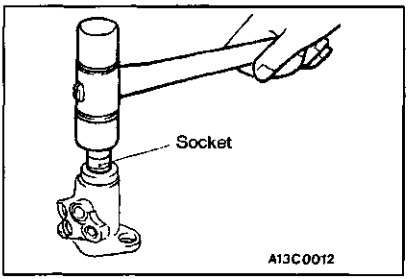
Using a plastic hammer, gently tap the pinion to remove it.



◀C▶ SEAL RING REMOVAL

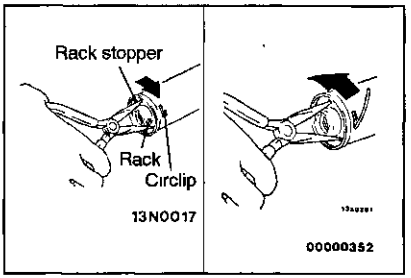
Cut the seal ring and remove it from the pinion and valve assembly and the rack.

Caution
When cutting the seal ring, be careful not to damage the pinion and valve assembly or the rack.



◀D▶ BALL BEARING/OIL SEAL REMOVAL

Use a socket, remove the oil seal and the ball bearing from the valve housing assembly simultaneously.

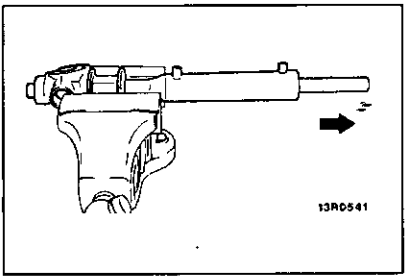


◀E▶ CIRCLIP REMOVAL

(1) Turn the rack stopper clockwise until the end of the circlip comes out of the slot in the rack housing.
(2) Turn the rack stopper counterclockwise to remove the circlip.

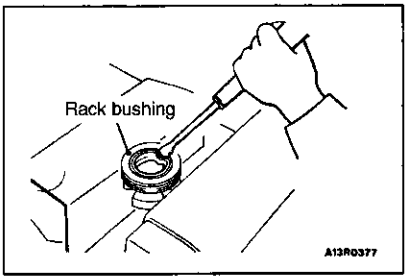
Caution
Note that if the rack stopper is first turned counterclockwise, the circlip will get caught in the slot in the housing and the rack stopper will not turn.

TSB Revision



◀F▶ RACK STOPPER/RACK BUSHING/RACK REMOVAL

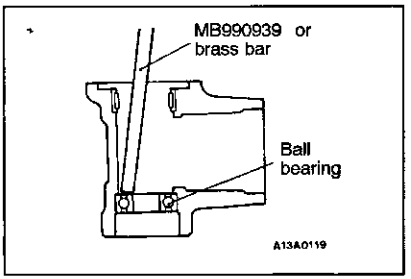
Pull out the rack assembly gently, and remove the rack stopper and rack bushing together.



◀G▶ OIL SEAL REMOVAL

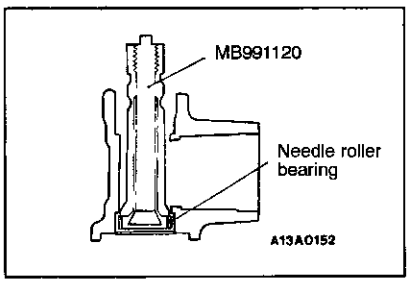
Partially bend the oil seal to remove from the rack bushing.

Caution
Do not damage the oil seal press fitting surface of the rack bushing.



◀H▶ BALL BEARING REMOVAL

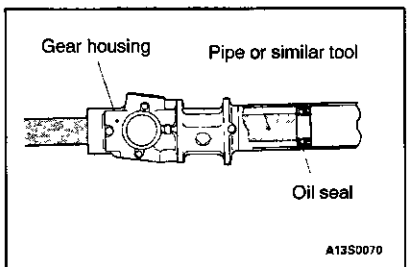
Use a brass bar or the special tool to remove the ball bearing from the gear housing.



◀I▶ NEEDLE ROLLER BEARING REMOVAL

Use the special tool to remove the needle roller bearing from the rack housing.

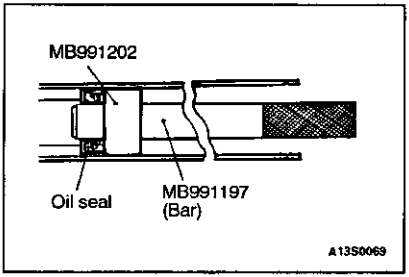
Caution
Do not open the special tool excessively to prevent damaging housing interior.



◀J▶ OIL SEAL REMOVAL

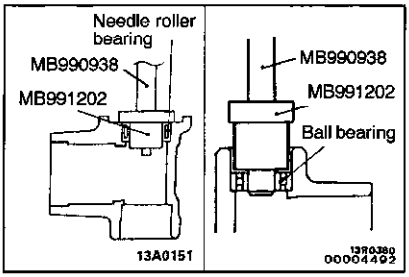
Use a piece of pipe or similar tool to remove the oil seal from the gear housing.

Caution
Be careful not to damage the inner surface of the rack cylinder of the gear housing.

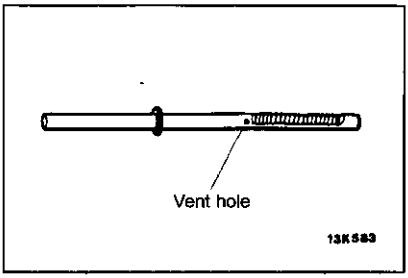


REASSEMBLY SERVICE POINTS

▶A◀ OIL SEAL INSTALLATION



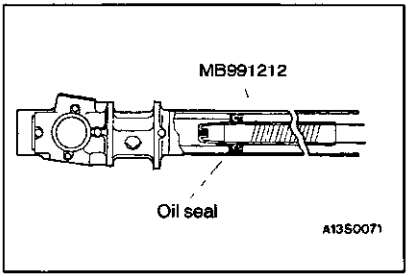
▶B◀ NEEDLE ROLLER BEARING/BALL BEARING INSTALLATION



▶C◀ RACK INSTALLATION

(1) Apply a coating of repair kit grease to the rack tooth face.

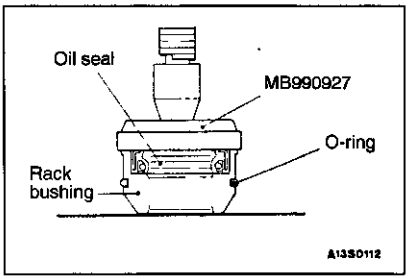
Caution
Do not close the vent hole in the rack with grease.



(2) Cover rack serrations with special tool.
(3) Apply the specified fluid to the special tool.

Specified fluid:
Automatic transmission fluid "DEXRON II"

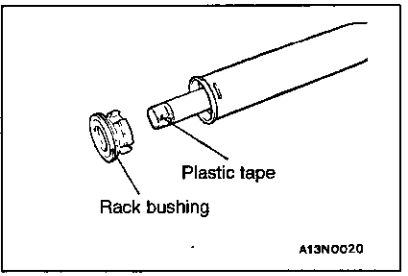
(4) Match the oil seal center with rack to prevent retainer spring from slipping and slowly insert rack from power cylinder side.



▶D◀ OIL SEAL/RACK BUSHING INSTALLATION

(1) Apply the specified fluid to the outer surface of the oil seal. Press-fit the oil seal using the special tool until it is flush with the bushing end face.

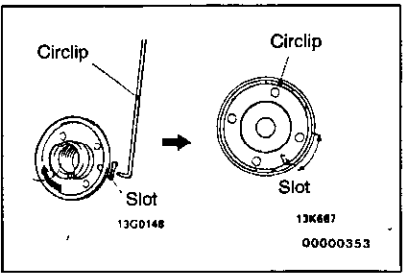
Specified fluid:
Automatic transmission fluid "DEXRON II"



(2) Apply the specified fluid to the oil seal inner surface and the O-ring.

Specified fluid:
Automatic transmission fluid "DEXRON II"

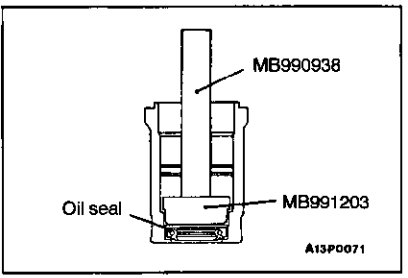
(3) Wrap the rack end with plastic tape, and push the rack bushing onto the rack.



▶E◀ CIRCLIP INSTALLATION

Insert the circlip to the rack stopper hole through the cylinder hole. Turn the rack stopper clockwise and insert the circlip firmly.

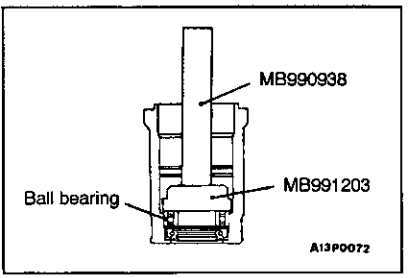
Caution
Insert the circlip to the rack stopper hole while turning the rack stopper clockwise.



▶F◀ OIL SEAL/BALL BEARING INSTALLATION

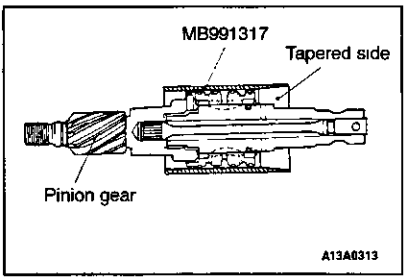
(1) Apply a coating of the specified fluid to the outside of the oil seal. Using the special tools, press the oil seal into the valve housing.

Specified fluid:
Automatic transmission fluid "DEXRON II"



(2) Apply a coating of the specified fluid to the outside of the ball bearing. Using the special tools, press the ball bearing into the valve housing.

Specified fluid:
Automatic transmission fluid "DEXRON II"

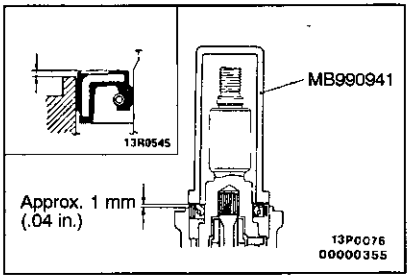


▶G◀ SEAL RING INSTALLATION

(1) Kneed the seal ring to soften it.
(2) Apply the specified fluid to the seal ring, and install to the rack groove.

Specified fluid:
Automatic transmission fluid "DEXRON II"

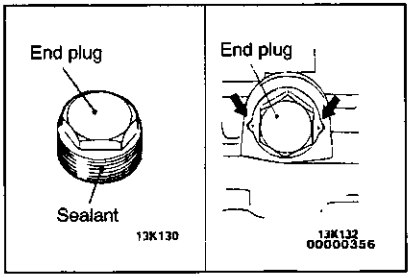
(3) Insert the tapered side of the special tool from the pinion gear side, and compress the seal ring.



▶H◀ OIL SEAL INSTALLATION

Use the special tool to press the oil seal into the valve housing. The upper surface of the oil seal should project outward approx. 1 mm (.04 in.) from the housing edge surface.

Caution
If the oil seal is flush with or lower than the housing edge, it will cause oil leaks and require reassembly.



▶I◀ END PLUG INSTALLATION

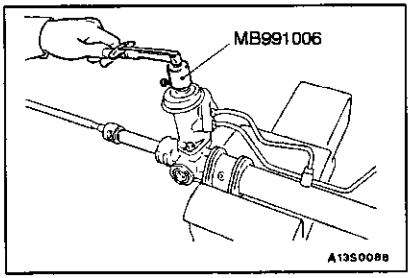
(1) Apply the specified sealant to the threaded part of the end plug.

Specified sealant:
3M ATD Part No.8661 or equivalent

(2) Secure the threaded portion of the end plug at two places by using a punch.

▶J◀ RACK SUPPORT COVER INSTALLATION

Position the rack at its center. Tighten the rack support cover to 15 Nm (11 ft.lbs.).

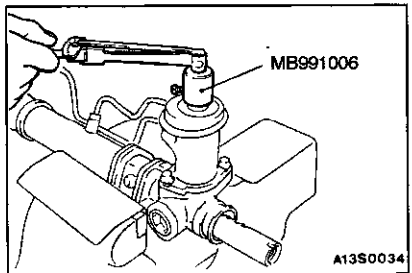


▶K◀ TOTAL PINION TORQUE ADJUSTMENT

(1) In neutral position, rotate the pinion shaft clockwise one turn/4 - 6 seconds with the special tool. Return the rack support cover 30° - 60° and adjust torque to the standard value.

(2) Using the special tools, turn the pinion gear at the rate of one rotation in approximately 4 to 6 seconds to check the total pinion torque.

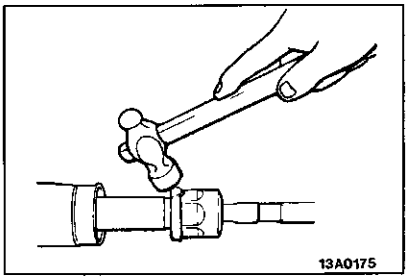
Standard value: 0.6 - 1.4 Nm (.4 - 1.0 ft.lbs.)
[Change in torque: 0.4 Nm (.3 ft.lbs.)]



Caution
1. **When adjusting, set the standard value at its highest value.**
2. **Assure no ratcheting or catching when operating the rack toward the shaft direction.**

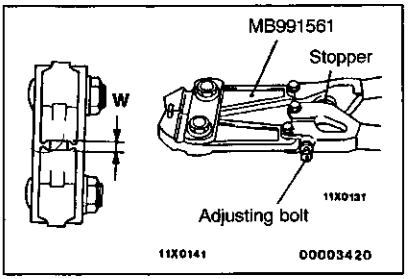
NOTE
When it cannot be adjusted within the specified return angle, check or replace the rack support cover components.

(3) After adjusting, lock the rack support cover with lock nut.



▶L◀ TAB WASHER/TIE-ROD INSTALLATION

After installing the tie-rod to the rack, fold the tab washer end (2 locations) to the tie-rod notch.

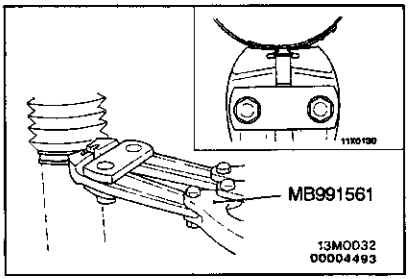


▶M◀BELLOWS BAND INSTALLATION

(1) Turn the adjusting bolt of the special tool to adjust the opening dimension (W) to the standard value.

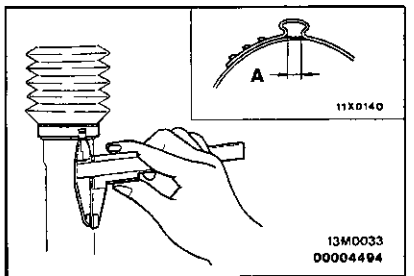
Standard value (W): 2.9 mm (.114 in.)
<When more than 2.9 mm (.114 in.)>
Screw in the adjusting bolt.
<When less than 2.9 mm (.114 in.)>
Loosen the adjusting bolt.

NOTE
(1) The dimension (W) is adjusted by approx. 0.7 mm (.028 in.) per one turn.
(2) Do not turn the adjusting bolt more than one turn.



(2) Use the special tool to crimp the bellows band.

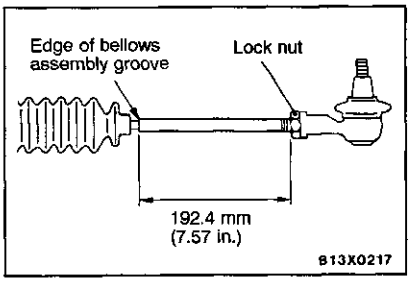
Caution
(1) Hold the rack housing, and use the special tool to crimp the bellows band securely.
(2) Crimp the bellows band until the special tool touches the stopper.



(3) Check that the crimped width (A) is within the standard value.

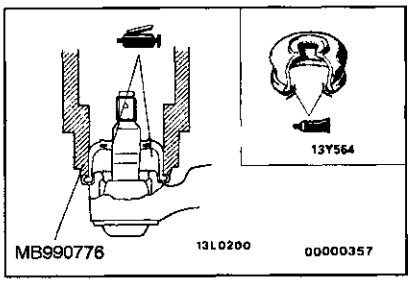
Standard value (A): 2.4 - 2.8 mm (.094 - .110 in.)
<When more than 2.8 mm (.110 in.)>
Readjust the dimension (W) of step (1) to the value calculated by the following equation, and repeat step (2).
W = 5.5 mm (.217 in.) - A [Example: If (A) is 2.9 mm (.114 in.), (W) is 2.6 mm (.102 in.).]

<When less than 2.4 mm (.094 - .110 in.)>
Remove the bellows band, readjust the dimension (W) of step (1) to the value calculated by the following equation, and use a new bellows band to repeat steps (2) to (3).
W = 5.5 mm (.217 in.) - A [Example: If (A) is 2.3 mm (.091 in.), (W) is 3.2 mm (.126 in.).]



▶N◀ TIE-ROD END/TIE-ROD END LOCKING NUT INSTALLATION

Screw in the tie-rod end to have its right and left length as illustrated. Lock with lock nut.



INSPECTION

37200440070

DUST COVER REPLACEMENT

Replace the dust cover only when it has been cracked or damaged by mistake during the maintenance work.
(1) Remove the dust cover.
(2) Pack the dust cover interior with multipurpose grease.
(3) Apply the specified sealant to the dust cover lip.

Specified sealant: 3M ATD Part No.8661 or equivalent

(4) Using the special tool, install the dust cover to the tie-rod end ball joint.
(5) Press the dust cover with a finger to check whether the dust cover is cracked or damaged.

RACK CHECK

- Check the rack tooth surfaces for damage or wear.
- Check the oil seal contact surfaces for uneven wear.
- Check the rack for bends.

PINION AND VALVE ASSEMBLY CHECK

- Check the pinion gear tooth surfaces for damage or wear.
- Check for worn or defective seal ring.

BEARING CHECK

- Check for roughness or abnormal noise during bearing operation.
- Check the bearing for play.
- Check the needle roller bearing for roller slip-off.

OTHER CHECK

- Check the cylinder inner surface of the rack housing for damage.
- Check the boots for damage, cracking or deterioration.
- Check the rack support for uneven wear or dents.
- Check the rack bushing for uneven wear or damage.

POWER STEERING OIL PUMP

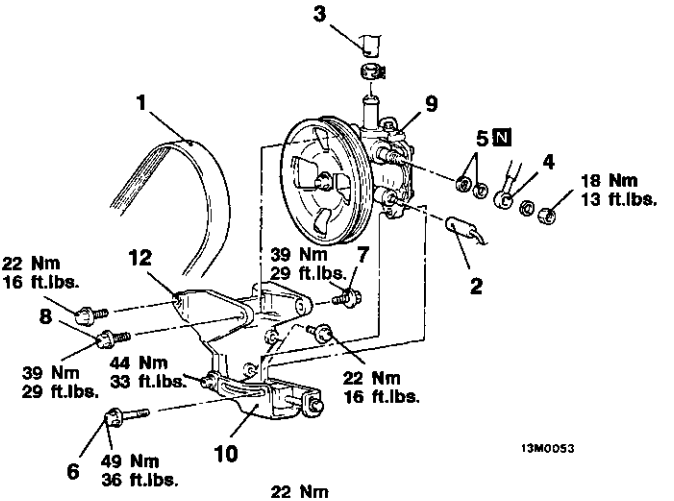
37200520354

REMOVAL AND INSTALLATION

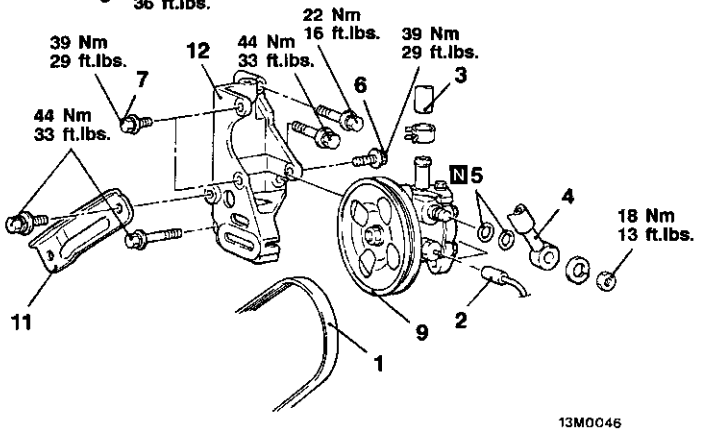
Pre-removal Operation
- Power Steering Fluid Draining (Refer to P.37A-8.)

Post-installation Operation
- Power Steering Fluid Level Check (Refer to P.37A-8.)
- Drive Belt Tension Adjusting (Refer to GROUP 11A - On-vehicle Service, and GROUP 11C - On-vehicle Service.)
- Power Steering Fluid Line Bleeding (Refer to P.37A-9.)
- Oil Pump Pressure Test (Refer to P.37A-10.)

<1.5L Engine>

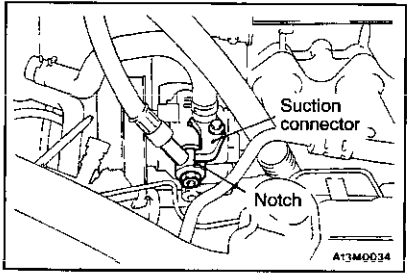


<1.8L Engine>



Removal steps

1. Drive belt
2. Pressure switch connector
3. Suction hose
▶A◀ 4. Pressure hose
5. O-ring
6. Bolt
7. Bolt
8. Bolt
9. Oil pump
10. Oil pump brace
11. Oil pump bracket stay
12. Oil pump bracket



INSTALLATION SERVICE POINT

▶A◀ PRESSURE HOSE INSTALLATION

Connect the pressure hose so that its notched part contacts the suction connector.

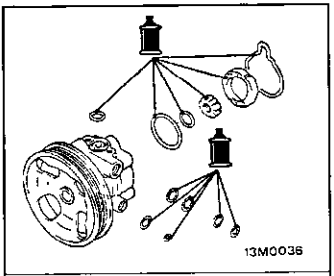
INSPECTION

37200530036

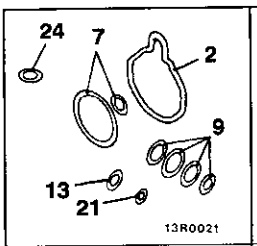
- Check the drive belt for cracks.
- Check the pulley assembly for uneven rotation.

DISASSEMBLY AND REASSEMBLY

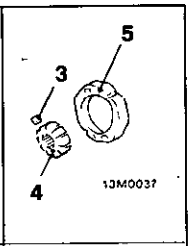
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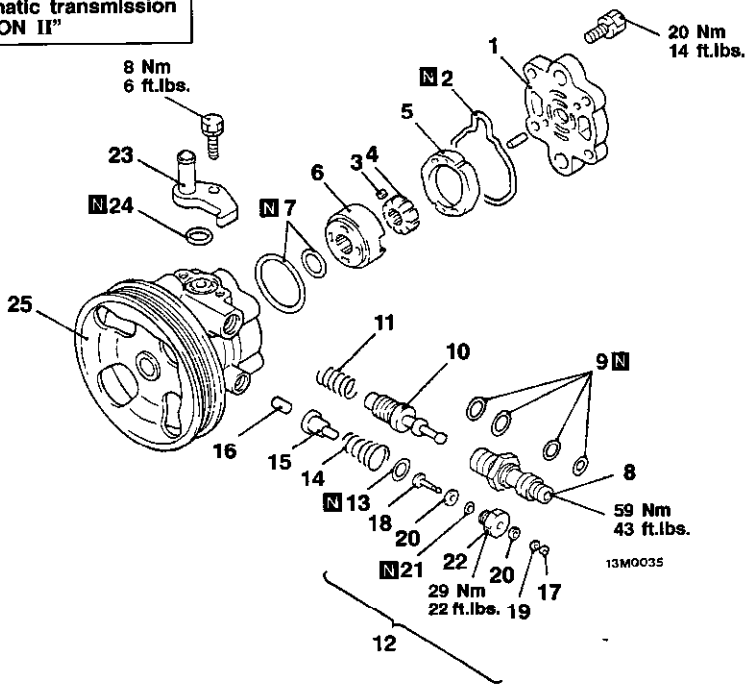
Fluid: Automatic transmission fluid "DEXRON II"



Oil pump seal kit



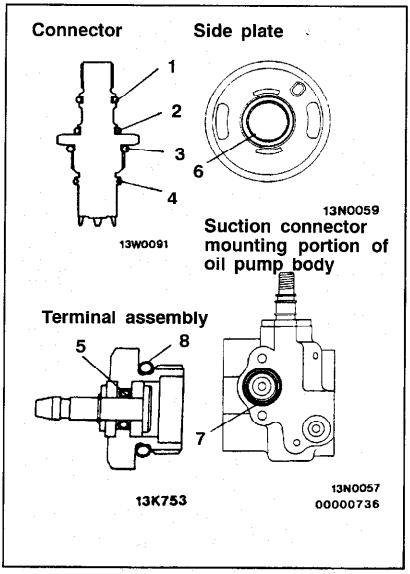
Oil pump cartridge kit



Disassembly steps

1. Pump cover
2. O-ring
▶E◀ 3. Vanes
4. Rotor
▶D◀ 5. Cam ring
▶C◀ 6. Side plate
▶A◀ 7. O-ring
8. Connector
▶A◀ 9. O-ring
10. Flow control valve
11. Flow control spring
12. Terminal assembly
▶A◀ 13. O-ring
▶B◀ 14. Spring
15. Plunger
16. Piston rod
17. Snap ring
18. Terminal
19. Washer
20. Insulator
▶A◀ 21. O-ring
22. Plug
23. Suction connector
▶A◀ 24. O-ring
25. Oil pump body and pulley assembly

Caution
Do not disassemble the flow control valve.

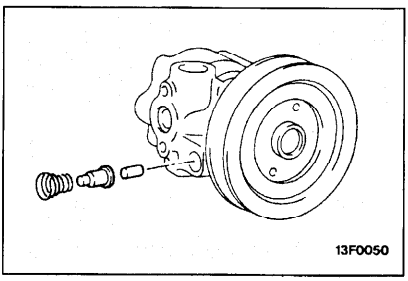


REASSEMBLY SERVICE POINTS

▶A◀ O-RING INSTALLATION

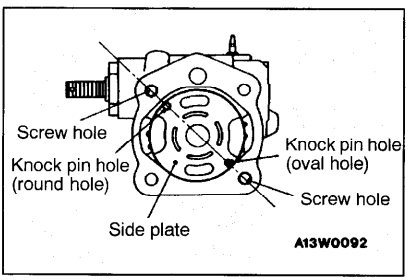
Apply the specified fluid on O-rings before.

No.	I.D. x Width mm (in.)
1	11.0 x 1.9 (.433 x .075)
2	13.0 x 1.9 (.512 x .075)
3	17.8 x 2.4 (.701 x .094)
4	13.5 x 1.5 (.531 x .059)
5	3.8 x 1.9 (.150 x .074)
6	16.8 x 2.4 (.661 x .094)
7	17.8 x 2.4 (.701 x .094)
8	13.0 x 1.9 (.511 x .075)



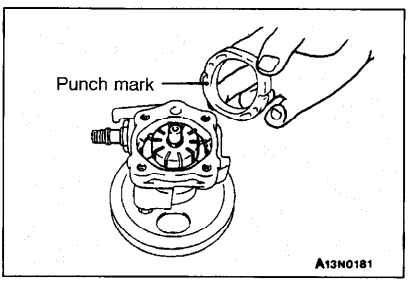
▶B◀ SPRING INSTALLATION

Fit the spring to the oil pump body with the larger diameter end at the terminal assembly side.



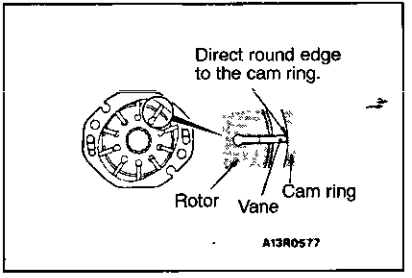
▶C◀ SIDE PLATE INSTALLATION

Install the side plate so that the screw hole in the oil pump body and the knock pin holes in the side plate are all in a straight line.



▶D◀ CAM RING INSTALLATION

Install the cam ring with the punch mark facing the side plate.



▶E◀ VANE INSTALLATION

Install the vanes on the rotor, paying close attention to the installation direction.

INSPECTION

37200550087

- Check the flow control valve for clogging.
- Check the pulley assembly for wear or damage.
- Check the rotor and vanes groove for "stepped" wear.
- Check the contact surface of cam ring and vanes for "stepped" wear.
- Check the vanes for damage.

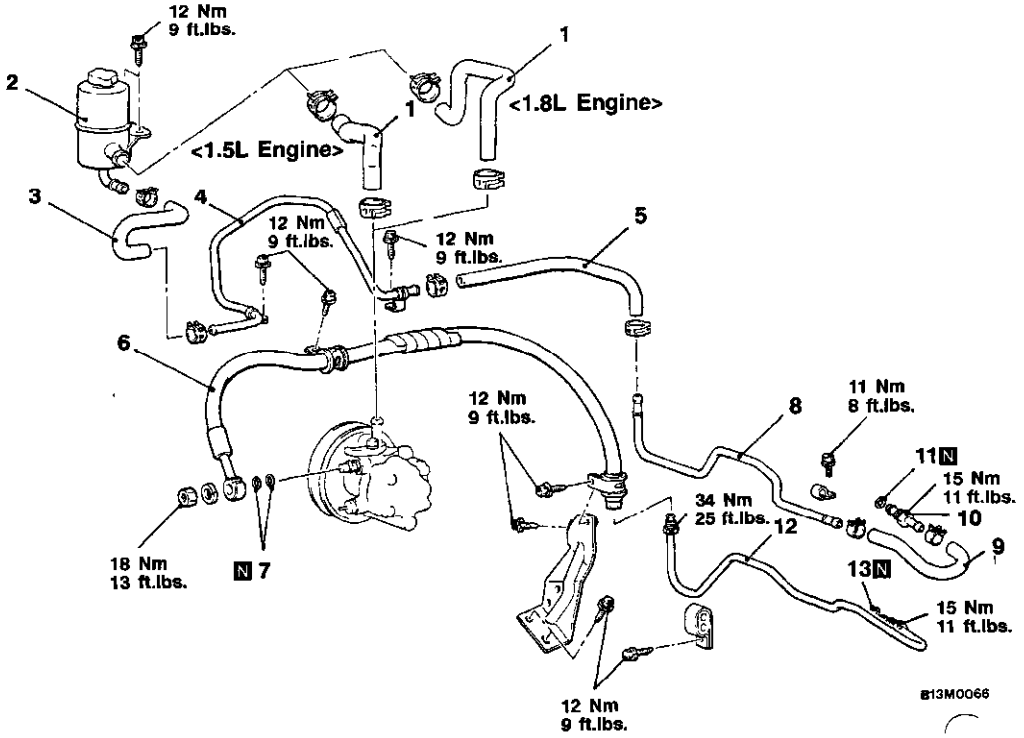
POWER STEERING HOSES

37200570144

REMOVAL AND INSTALLATION

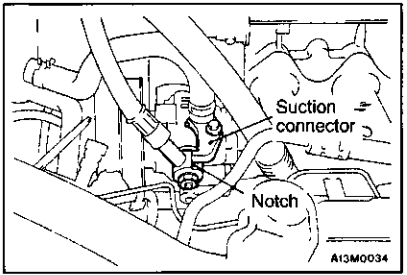
Pre-removal Operation
- Power Steering Fluid Draining (Refer to P.37A-8.)

Post-installation Operation
- Power Steering Fluid Level Check (Refer to P.37A-8.)
- Power Steering Fluid Line Bleeding (Refer to P.37A-9.)



Removal steps

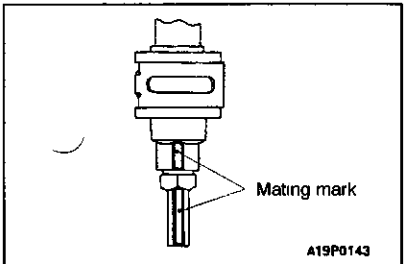
1. Suction hose
2. Oil reservoir
3. Return hose
4. Return tube
5. Return hose
▶A◀ 6. Pressure hose
7. O-ring
8. Return tube
9. O-ring
▶A◀ 10. Pressure tube
11. O-ring



INSTALLATION SERVICE POINT

▶A◀ PRESSURE HOSE/PRESSURE TUBE INSTALLATION

(1) Connect the pressure hose so that its notched part contacts the suction connector.



(2) Align the mating marks on the pressure hose and pressure tube, and install the pressure hose.

BODY

CONTENTS

42109000119

DOOR 21
- DOOR ASSEMBLY 30
- DOOR GLASS AND REGULATOR 34
- DOOR HANDLE AND LATCH 37
- DOOR TRIM AND WATERPROOF FILM 32
- GENERAL INFORMATION 21
- ON-VEHICLE SERVICE 28
- SEALANT 21
- SERVICE SPECIFICATIONS 21
- SPECIAL TOOLS 21
- TROUBLESHOOTING 22
- WINDOW GLASS RUNCHANNEL AND DOOR OPENING WEATHERSTRIP 41

FENDER 8
- FENDER 8
- SEALANT 8

FUEL FILLER DOOR 9

HOOD 2
- HOOD 3
- TROUBLESHOOTING 2

SUNROOF 42
- ON-VEHICLE SERVICE 46
- SEALANT 42
- SERVICE SPECIFICATIONS 42
- SPECIAL TOOLS 42
- SUNROOF 48
- TROUBLESHOOTING 43

TRUNK LID 4
- SPECIAL TOOL 4
- TROUBLESHOOTING 4
- TRUNK LID 5

UNDER COVER 55

WINDOW GLASS 10
- ADHESIVES 10
- QUARTER WINDOW GLASS <2-door models> 17
- REAR WINDOW GLASS 19
- SPECIAL TOOLS 10
- TROUBLESHOOTING 10
- WINDOW GLASS 11
- WINDSHIELD 13

HOOD

42100070010

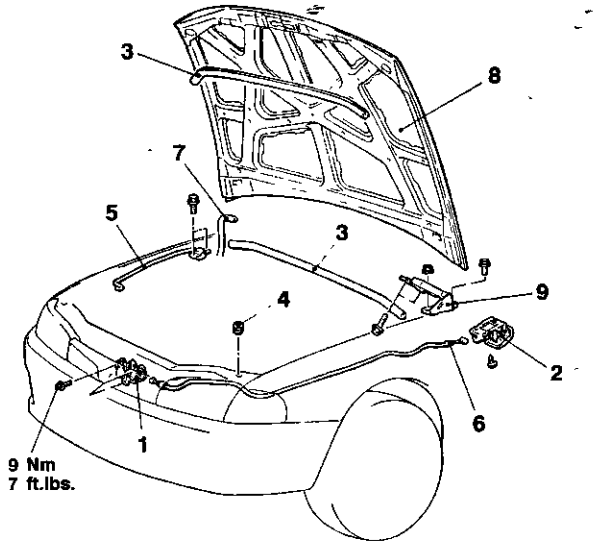
TROUBLESHOOTING

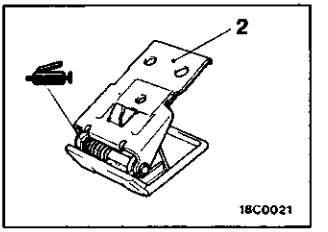
Symptom	Probable cause	Remedy
Improper closure	Striker and latch not properly aligned	Adjust the alignment
Difficult locking and unlocking		
Uneven body clearance	Incorrectly installed hood	Adjust the installation of hood
Uneven height	Incorrect hood bumper height	Adjust the hood bumper height

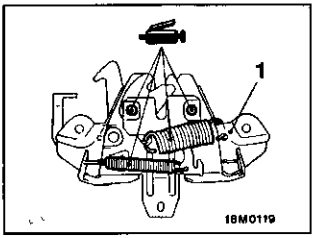
HOOD

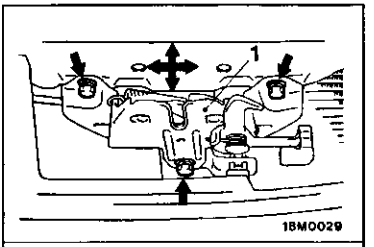
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REMOVAL AND INSTALLATION

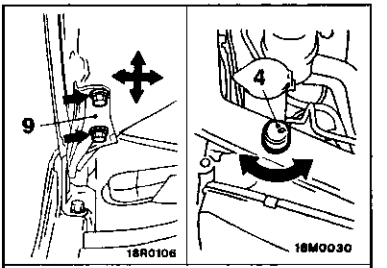








Adjustment of hood step and hood striker linkage



Adjustment of clearance and height around hood

1. Hood latch
2. Hood lock release handle
3. Hood weatherstrip
4. Bumper
5. Hood support rod

Hood lock release cable removal steps

- Splash shield <L.H.> (Refer to P.42-8.)

6. Hood lock release cable

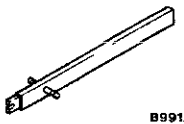
Hood and hood hinge removal steps

7. Washer hose connection
8. Hood
9. Hood hinge

TRUNK LID

42100060079

SPECIAL TOOL

Tool	Tool number and name	Supersession	Application
 B991244	MB991244 Torsion bar remover and installer	MB991244-01	Removal and installation of trunk lid torsion bar

TROUBLESHOOTING

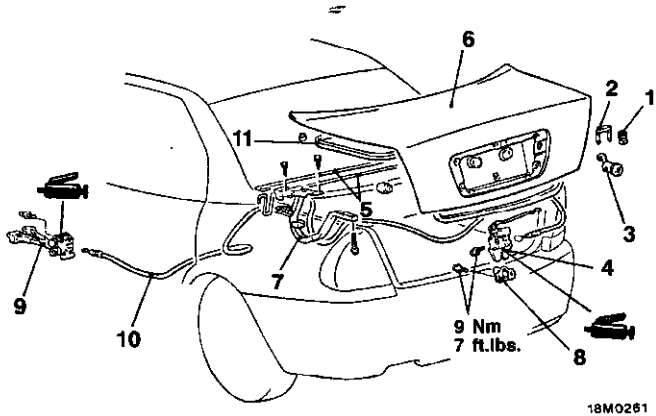
42100070027

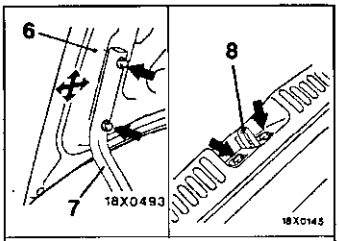
Symptom	Probable cause	Remedy
Improper closure	Striker and latch not properly aligned	Adjust the alignment
Difficult locking and unlocking		
Uneven body clearance	Incorrectly installed trunk lid	Adjust the installation of trunk lid
Uneven height	Incorrect trunk lid bumper height	Adjust the trunk lid bumper height

TRUNK LID

42100220064

REMOVAL AND INSTALLATION





Adjustment of clearance around trunk lid and trunk lid striker linkage

00004813

Trunk lid panel removal steps

- License plate light
- License plate garnish (Refer to GROUP 51.)

▶C◀ 1. Bumper
2. Cylinder lock retainer
3. Trunk lid lock cylinder
4. Trunk lid latch
◀A▶ ▶B◀ 5. Trunk lid torsion bars
6. Trunk lid panel

Trunk lid latch removal

4. Trunk lid latch

Trunk lid hinge removal steps

- Rear shelf trim (Refer to GROUP 52A.)

6. Trunk lid panel assembly
7. Trunk lid hinge

Trunk lid striker removal steps

- Rear end trim cover (Refer to GROUP 52A.)

8. Trunk lid striker

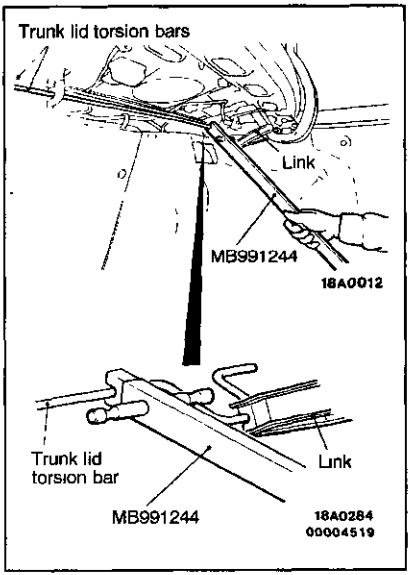
Trunk lid release handle and cable removal steps

- Front seat (L.H.) (Refer to GROUP 52A.)
- Rear seat (Refer to GROUP 52A.)
- Scuff plate (L.H.), quarter trim (L.H.) <2-door models> (Refer to GROUP 52A.)
- Front scuff plate (L.H.), rear scuff plate (L.H.), center pillar trim lower (L.H.) <4-door models> (Refer to GROUP 52A.)
- Trunk side trim (L.H.) (Refer to GROUP 52A.)

4. Trunk lid latch
9. Trunk lid release handle
10. Trunk lid release cable

Trunk lid weatherstrip removal

▶A◀ 11. Trunk lid weatherstrip removal

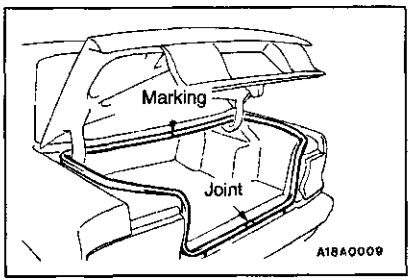


REMOVAL SERVICE POINT

◀A▶ TRUNK LID TORSION BAR REMOVAL

1. Disconnect the body harness and the harness connector of the rear shelf lower panel.
2. Install the special tool as shown in the figure, and then remove the torsion bar from the link while pushing the special tool downwards. Next, repeat the procedure from the other side.

Caution
Be sure to attach the special tool properly, as the body or parts could be damaged when the torsion bar is removed from the special tool.



INSTALLATION SERVICE POINTS

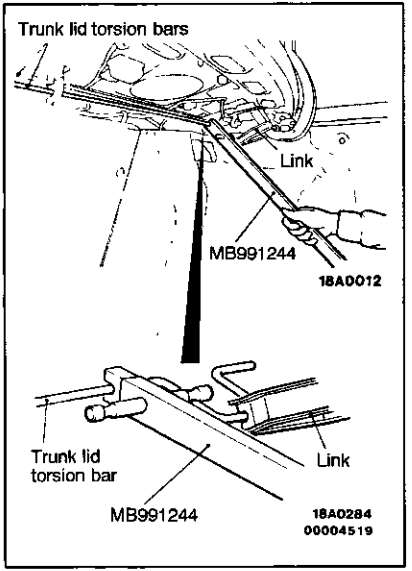
▶A◀ TRUNK LID WEATHERSTRIP INSTALLATION

Install the trunk lid weatherstrip so that the marking and the joint are aligned with the body center line.

▶B◀ TRUNK LID TORSION BAR INSTALLATION

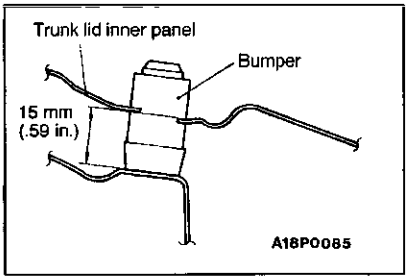
1. Check the color of the identification mark at the middle of the torsion bars to make sure that the correct torsion bars are being used.

Torsion bar	Identification color	
	Vehicles without rear spoiler	Vehicles with rear spoiler
L.H.	–	Green
R.H.	Red	Yellow



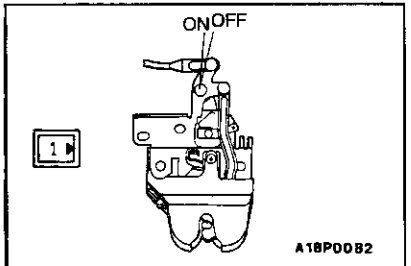
2. Insert the end of the torsion bar through the link side mating hole.
3. Using the special tool attached to the tortion bar as illustrated, twist the bar to connect it to the link. Then hang the bar on the holder.

Caution
Be sure to attach the special tool properly, as the body or parts could be damaged when the torsion bar is removed from the special tool.



▶C◀ BUMPER INSTALLATION

Install the bumper as shown in the figure.



INSPECTION

42100400031

TRUNK LID LATCH SWITCH CONTINUITY CHECK

Switch position	Terminal No.1	Body ground
ON (Latch open)	○	○
OFF (Latch shut)		

FENDER

42100050045

SEALANT

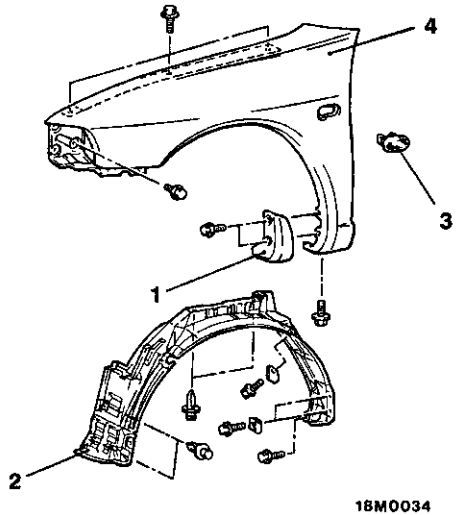
Item	Specified sealant	Remark
Splash shield	3M ATD Part No. 8625 or equivalent	Ribbon sealer

FENDER

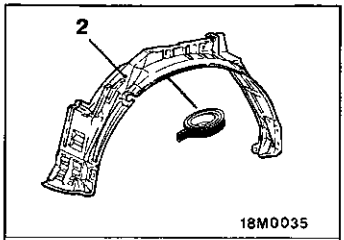
42100190129

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
(1) Front Bumper Removal and Installation (Refer to GROUP 51.)
(2) Front Turn-signal Lamp Removal and Installation (Refer to GROUP 54.)



18M0034



18M0035

Sealant: 3M ATD Part No. 8625 or equivalent

00004814

Removal steps

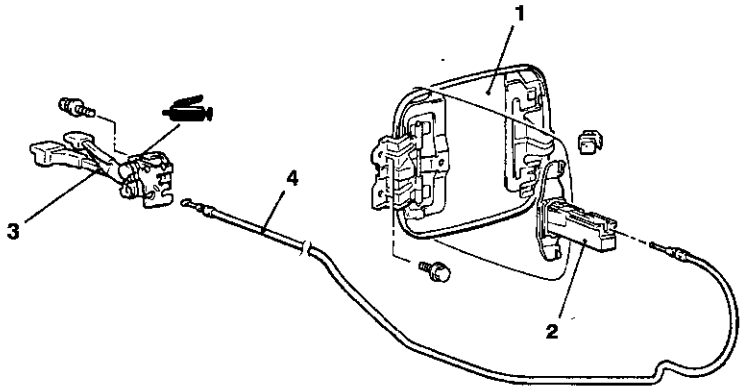
1. Stone guard
2. Splash shield
3. Ornament
4. Fender

FUEL FILLER DOOR

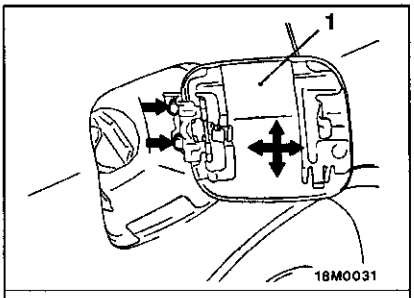
42100250131

REMOVAL AND INSTALLATION

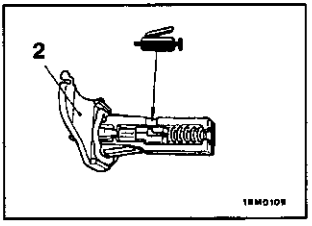
Pre-removal and Post-installation Operation
(1) Front Seat (L.H.) Removal and Installation (Refer to GROUP 52A.)
(2) Rear Seat Removal and Installation (Refer to GROUP 52A.)
(3) Scuff Plate (L.H.) and Quarter Trim Removal and Installation <2-door models> (Refer to GROUP 52A.)
(4) Front Scuff Plate (L.H.), Refer Scuff Plate (L.H.) and Center Pillar Trim Lower (L.H.) Removal and Installation <4-door models> (Refer to GROUP 52A.)
(5) Trunk Side Trim (R.H.) Removal and Installation (Refer to GROUP 52A.) .



18M0260
00005017



Fuel filler door height and clearance adjustment



Removal steps
1. Fuel filler door panel assembly
2. Fuel filler door hook assembly
3. Lid lock release handle
4. Fuel filler door lock release cable

WINDOW GLASS

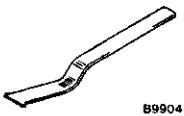
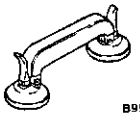
42200050079

ADHESIVES

Items	Specified adhesives
Windshield	3M ATD Part No. 8609 Super Fast Urethane and 3M ATD Part No. 8608 Super Fast Urethane Primer or equivalent
Quarter window glass	
Rear window glass	

SPECIAL TOOLS

42200060072

Tool	Tool number and name	Supersession	Application
 B990449	MB990449 Window molding remover	General service tool	Removal of the window molding
 B990480	MB990480 Glass holder	General service tool	Removal and installation of window glass

TROUBLESHOOTING

42200070044

Symptom	Probable cause	Remedy
Water leak through windshield	Defective seal	Fill sealant
	Defective body flange	Correct
Water leak through quarter window	Defective seal	Fill sealant
	Defective body flange	Correct
Water leak through rear window	Defective seal	Fill sealant
	Defective body flange	Correct

WINDOW GLASS

42200010053

GENERAL

The windshield and window glass are attached by an urethane-base adhesive to the window frame. This adhesive not only provides improved glass holding and sealing, but also permits use of body openings having a greater structural strength.

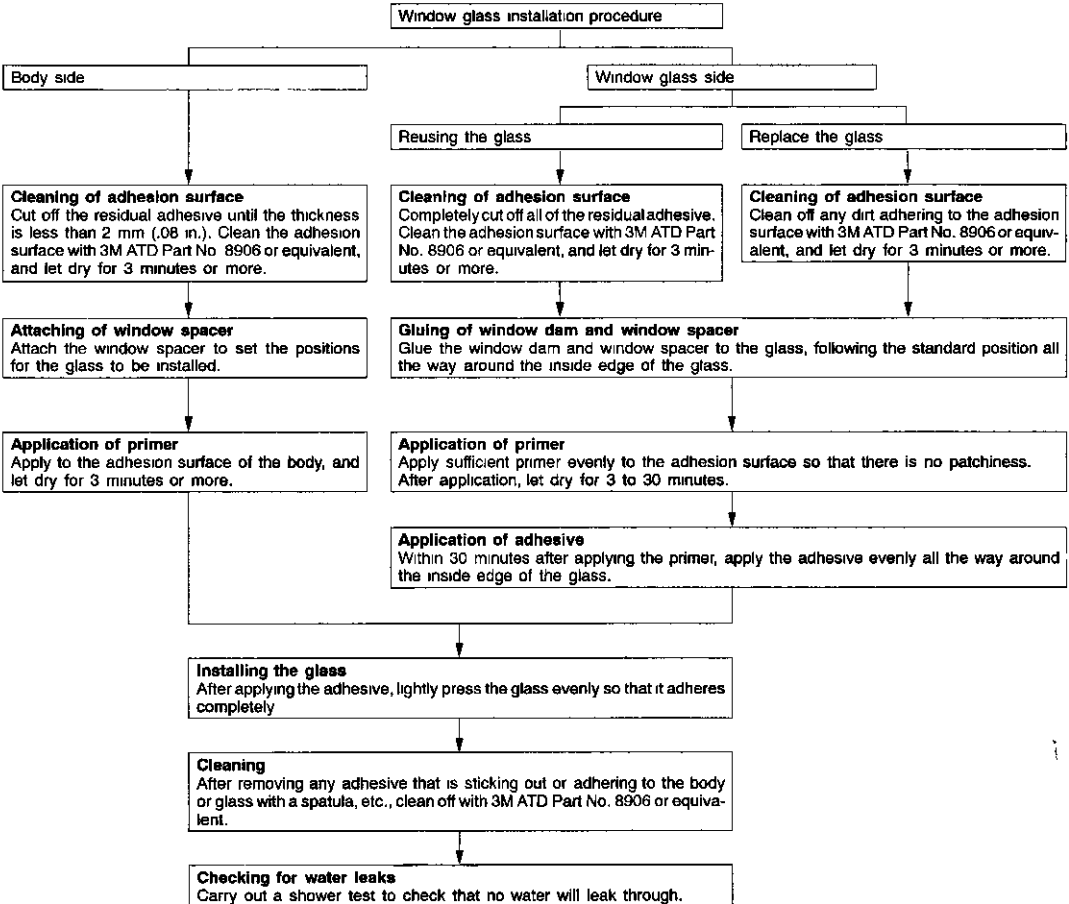
ADHESIVE

Adhesive Kit	Quantity
3M ATD Part No. 8609 SUPER FAST URETHANE	One cartridge
3M ATD Part No. 8608 SUPER FAST URETHANE PRIMER	As required

RESERVE ITEMS

Reserve Items	Applications	Quantity
Wire (dia. length)	For cutting adhesive	Five pieces of wire 0.6 mm × 1 m (.02 in. × 3.3 ft.)
Adhesive gun	For adhesive application	One
Wiping rags	-	As required
Sealer	For prevention of water leaks and gathering after adhesive application	As required
3M ATD Part No. 8906 or equivalent	For cleaning	As required
Glass holder	-	Two
Spacers (Service Part)	-	As required
Window molding (Service Part)	-	One
Dam (Service Part)	-	As required
Tectyl 506T (Valvoline Oil Company)	-	As required

WORKING PROCESS

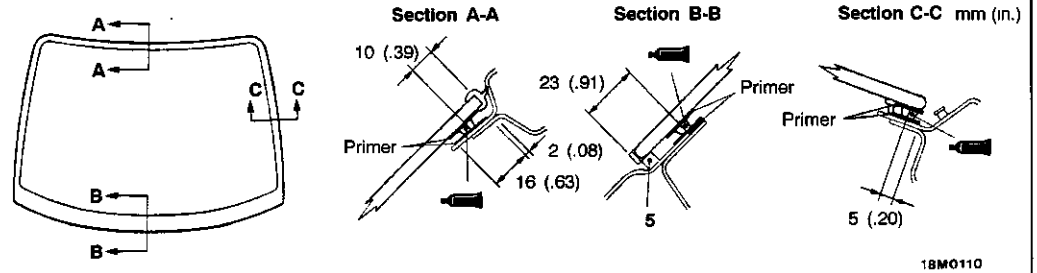


WINDSHIELD

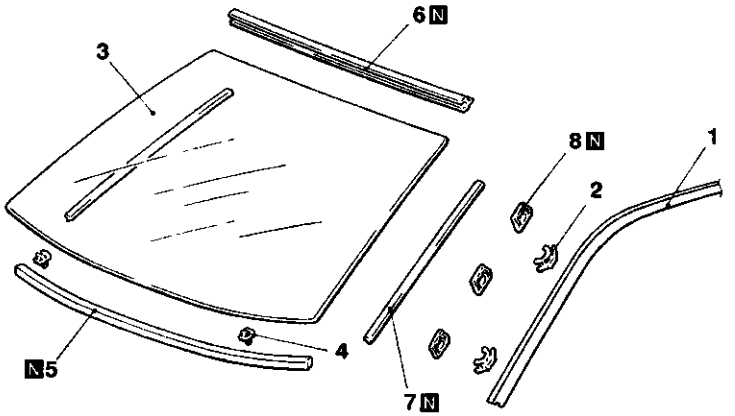
42200100286

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
(1) Front Pillar Trim Removal and Installation (Refer to GROUP 52A.)
(2) Headlining Removal and Installation (Refer to GROUP 52A.)

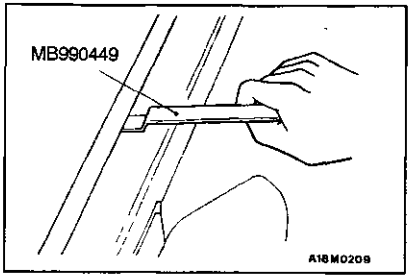


Adhesive: 3M ATD Part No. 8609 Super Fast Urethane and 3M ATD Part No. 8608 Super Fast Urethane Primer or equipment



Removal steps

◀A▶ 1. Roof drip molding
2. Windshield clip
● Front deck garnish (Refer to GROUP 51 - Windshield Wiper and Washer.)
◀B▶ ▶A◀ 3. Windshield
4. Windshield spacer
▶A◀ 5. Window spacer
▶A◀ 6. Windshield upper molding
▶A◀ 7. Window dam
▶A◀ 8. Clip

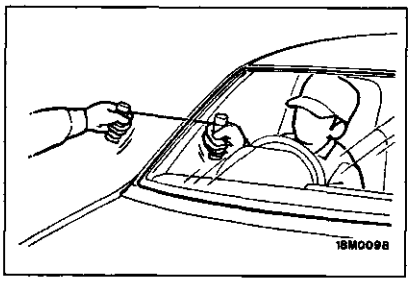


REMOVAL SERVICE POINTS

◀A▶ ROOF DRIP MOLDING REMOVAL

Use the special tool to lever out the molding.

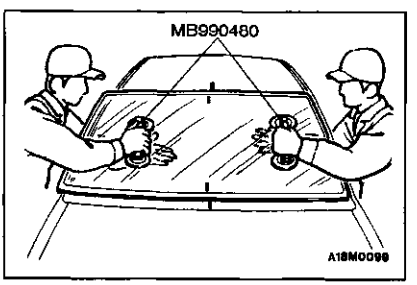
Caution
If the molding has become warped, it should not be reused.



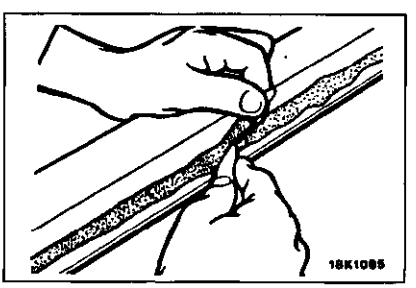
◀B▶ WINDSHIELD REMOVAL

1. In order to protect the body (paint surface), apply cloth tape to all body areas around the installed windshield.
2. Using a sharp-point drill, make a hole in the windshield adhesive.
3. Pass the piano wire from the inside of the vehicle through the hole.
4. Pull the piano wire alternately from the inside and outside along the windshield to cut the adhesive.

   Caution
   Do not let the piano wire touch the edge of the windshield.
5. Make mating marks on the windshield and body.



6. Use the special tool to remove the windshield.



7. Use a knife to cut away the remaining adhesive so that the thickness is within 2 mm (.08 in.) around the entire circumference of the body flange.

TSB Revision

8. Finish the flange surfaces so that they are smooth.

   Caution
   (1) Be careful not to remove more adhesive than is necessary.
   (2) Be careful also not to damage the paintwork on the body surface with the knife. If the paintwork is damaged, repair the damaged area with repair paint or anti-rust agent.

9. When reusing the glass, remove the adhesive still adhering to the glass, and clean with 3M ATD Part No. 8906 or equivalent.
10. Clean the body side in the same way.

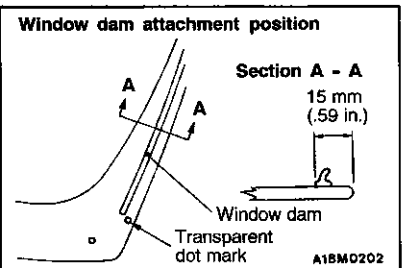
    Caution
    Let the cleaned places stand for 3 minutes or more, and carry out the next procedures after they have dried. Also, do not touch any surface that has been cleaned.

INSTALLATION SERVICE POINTS

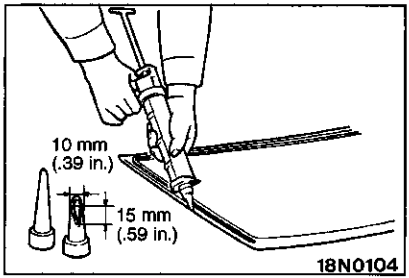
▶A◀ CLIP/WINDOW DAM/WINDOW SPACER/ WINDSHIELD UPPER MOLDING/WINDSHIELD INSTALLATION

1. When replacing the glass, temporarily set the glass against the body, and place a mating mark on the glass and body.
2. Use 3M ATD Part No. 8906 or equivalent to degrease the inside and outside of the windshield and the body flanges.
3. Soak a sponge in the primer, and apply evenly to the glass and the body in the specified places.
4. Apply the primer, and then let it dry for 3 to 30 minutes.

   Caution
   (1) The primer strengthens the adhesive, so be sure to apply it evenly around the entire circumference. However, a too thick application will weaken the adhesive.
   (2) Do not touch the coated surface.

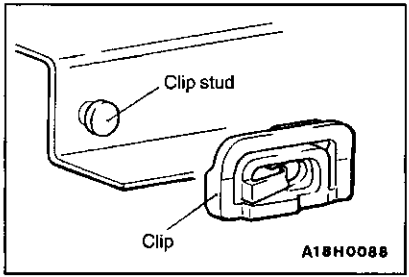


5. Attach the window dam in the specified positions so that there are no bends or lifts on the inside of the windshield.
6. Attach the window spacers so that the clearance at both left and right will be the same during installation.
7. Install the windshield upper molding.



8. Fill a sealant gun with adhesive. Then apply the adhesive evenly around the windshield within 30 minutes after applying the primer.

   NOTE
   Cut the tip of the sealant gun nozzle into a V shape to simplify adhesive application.



9. Place the clips onto the clip studs.

10. Align the mating marks on the glass and the body, and lightly press the windshield evenly so that it adheres completely.
11. Use a spatula or the like to remove any excessive adhesive. Clean the surface with 3M ATD Part No. 8906 or equivalent. Install the roof drip molding before the adhesive hardens.Try not to move the vehicle until the adhesive sets.
12. Wait 30 minutes or more, and then test for water leakage.

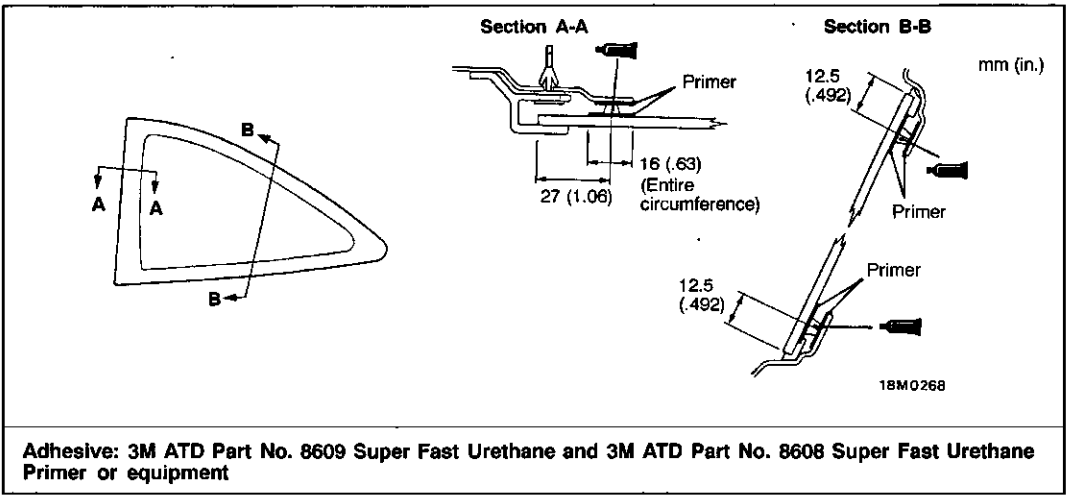
    Caution
    (1) Do not move the vehicle unless absolutely necessary.
    (2) When testing for water leakage, do not pinch the end of the hose to spray the water.

QUARTER WINDOW GLASS <2-door models>

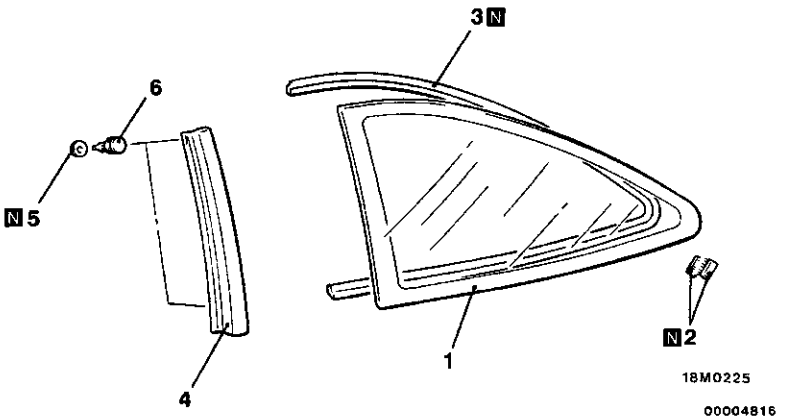
42200250158

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
(1) Quarter Trim, Center Pillar Trim and Rear Pillar Trim Removal and Installation (Refer to GROUP 52A.)
(2) Headlining Removal and Installation (Refer to GROUP 52A.)



Adhesive: 3M ATD Part No. 8609 Super Fast Urethane and 3M ATD Part No. 8608 Super Fast Urethane Primer or equipment



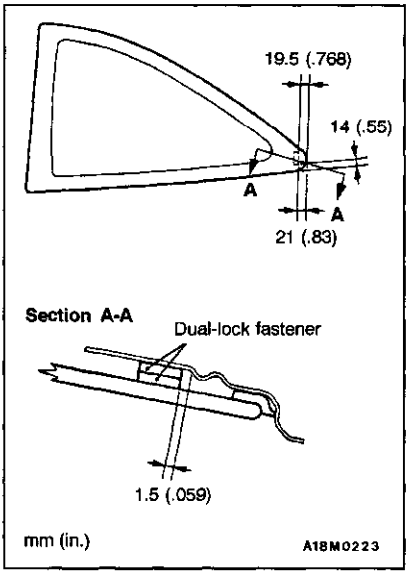
Removal steps

◀A▶ ▶A◀ 1. Quarter window glass
▶A◀ 2. Dual-lock fastener
▶A◀ 3. Window dam
4. Quarter window garnish
5. Packing
6. Clip

REMOVAL SERVICE POINT

◀A▶ QUARTER WINDOW GLASS REMOVAL

Remove the quarter window glass by the same procedure as for the windshield. (Refer to P.42-14.)



INSTALLATION SERVICE POINTS

▶A◀ WINDOW DAM/DUAL-LOCK FASTENER/QUARTER WINDOW GLASS INSTALLATION

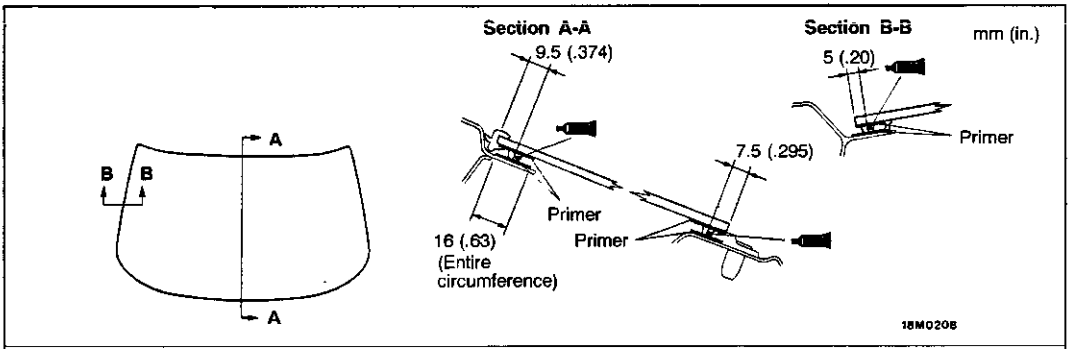
1. Use 3M ATD Part No. 8906 or equivalent to degrease the window dam and dual lock fastener mounting surfaces on both the glass and the body.
2. Attach the window dam.
3. Install the dual lock fastener to the shown position.
4. Apply primer and adhesive. (Refer to P.42-17.)
5. Install the glass in the same way as for the windshield. (Refer to P.42-15.)

REAR WINDOW GLASS

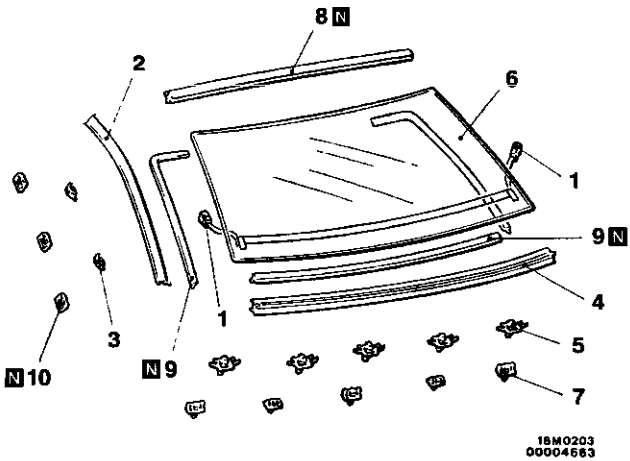
42200160154

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
(1) High Mounted Stop Light Removal and Installation (Refer to GROUP 54.)
(2) Rear Pillar Trim Removal and Installation (Refer to GROUP 52A.)
(3) Headlining Removal and Installation (Refer to GROUP 52A.)

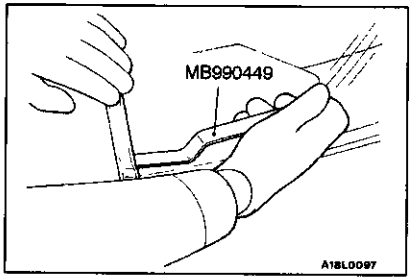


Adhesive: 3M ATD Part No. 8609 Super Fast Urethane and 3M ATD Part No. 8608 Super Fast Urethane Primer or equipment



Removal steps

1. Harness connector
◀A▶ 2. Roof drip molding
3. Windshield clip
◀A▶ 4. Rear window lower molding
5. Rear window molding clip
◀B▶ ▶A◀ 6. Rear window glass
7. Clip
8. Rear window upper molding
▶A◀ 9. Window dam
▶A◀ 10. Clip



REMOVAL SERVICE POINTS

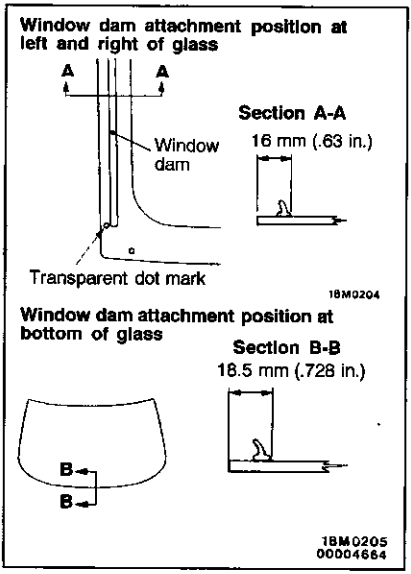
◀A▶ ROOF DRIP MOLDING/ REAR WINDOW LOWER MOLDING REMOVAL

Use the special tool to lever out the molding.

Caution
If the molding has become warped, it should not be reused.

◀B▶ REAR WINDOW GLASS REMOVAL

Remove the rear window glass by the same procedure as for the windshield. (Refer to P.42-14.)

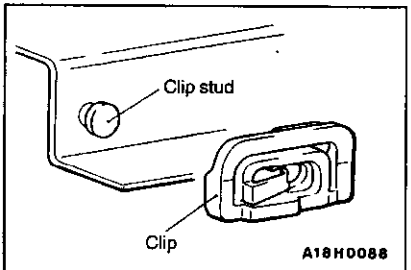


INSTALLATION SERVICE POINT

▶A◀ CLIP/WINDOW DAM/REAR WINDOW GLASS INSTALLATION

1. Use 3M ATD Part No. 8906 or equivalent to degrease the inside and outside edges of the rear window glass and the surface of the body flange.
2. Attach the window dam in the specified positions so that there are no bends or lifts on the inside of the rear window glass.

   NOTE
   Attach the dam at the bottom of the glass so that the clearance at both left and right will be the same during installation.



3. Place the clips onto the clip studs.
4. Apply primer and adhesive. (Refer to P.42-19.)
5. Install the glass in the same way as for the windshield. (Refer to P.42-15.)

DOOR

42300010032

GENERAL INFORMATION

OPERATION

Power windows

- When the power window (main or sub) switch is depressed (UP or DOWN) with the ignition switch in the ON position, current flows through fusible link No. 6 to the power window motor. This energizes the power window motor, causing the door window glass to open or close.
- When the power window lock switch is placed in the LOCK (OFF) position, no switch other than the main switch at the driver's side window can operate the power window motor.
- The power window motor has a circuit breaker that protects the motor from damage caused by excessive current.

SERVICE SPECIFICATIONS

42300030076

Items	Standard value
Door outside handle play mm (in.)	3.6 (.142) or more
Door inside handle play mm (in.)	5.3 (.209) or more

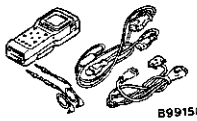
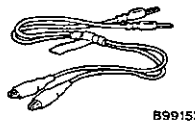
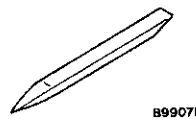
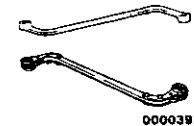
SEALANT

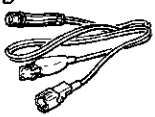
42300050034

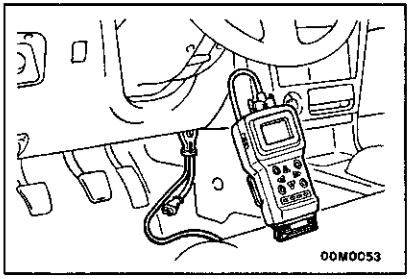
Item	Specified sealant	Remark
Waterproof film	3M ATD Part No. 8625 or equivalent	Ribbon sealer

SPECIAL TOOLS

42300060068

Tool	Tool number and name	Supersession	Application
 B991502	MB991502 Scan Tool (MUT-II)	MB991496-0D	ETACS-ECU input signal checking
 B991529	MB991529 Diagnostic trouble code check harness	Tool not necessary if scan tool <MUT-II> is available	ETACS-ECU input signal checking (when using a voltmeter)
 B990784	MB990784 Ornament remover	General service tool	Removal of switch, trim, etc.
 00003936	MB990900 or MB991164 Door adjusting wrench	MB990900-01	Adjustment of door fit

Tool	Tool number and name	Supersession	Application
A  B  C  D  C991223	MB991223 Harness set A: MB991219 Test harness B: MB991220 LED harness C: MB991221 LED harness adapter D: MB991222 Probe	MB991223	Measurement of terminal voltage A: Connector pin contact pressure inspection B, C: Power circuit inspection D: Commercial tester connection



TROUBLESHOOTING

42700200011

DIAGNOSTIC FUNCTION

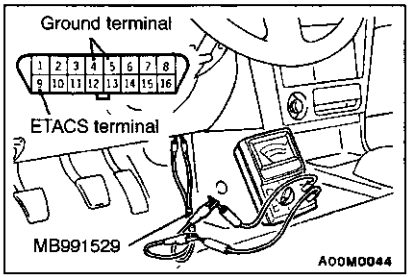
INPUT SIGNAL INSPECTION POINTS <VEHICLES WITH ETACS-ECU>

When Using the Scan Tool

1. Connect the scan tool to the data link connector.

   Caution
   The scan tool should be connected or disconnected after turning the ignition switch to the OFF position.

2. If buzzer of the scan tool sounds once when the each switch is operated (ON/OFF), the ETACS-ECU input signal for that switch circuit system is normal.

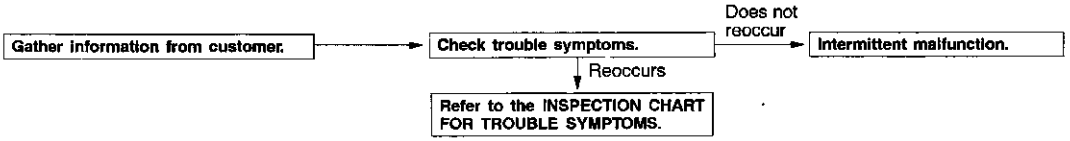


When Using the Voltmeter

1. Use the special tool to connect a voltmeter between the ground terminal and the ETACS terminal of the data link connector.
2. If the voltmeter indicator deflects once when the each switch is operated (ON/OFF), the ETACS-ECU input signal for that switch circuit system is normal.

STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING

42700210014



INSPECTION CHART FOR TROUBLE SYMPTOMS

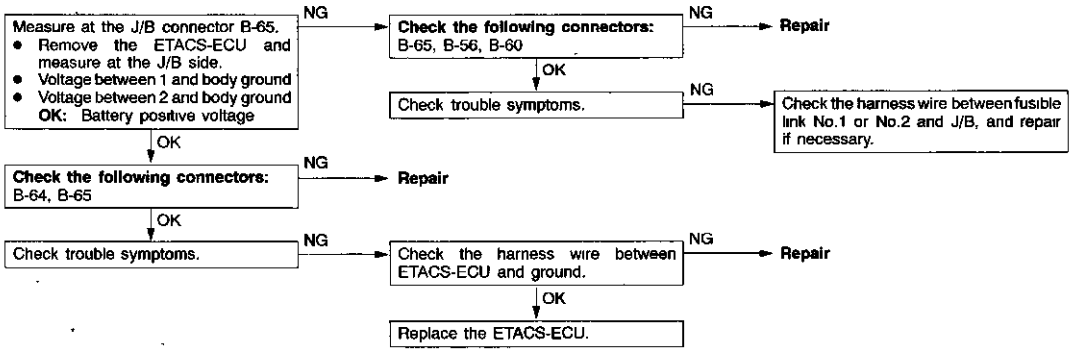
42700180018

Trouble symptom	Inspection procedure	Reference page
None of the door lock functions operate.	1	42-23
The other door(s) does not lock or unlock by the door lock switch or the front passenger's side door lock key cylinder. (However, they can be operated by the driver's inside door lock knob.)	2	42-24
The other door(s) does not lock or unlock by the driver's inside door lock knob or driver's side door lock key cylinder.	3	42-25
Some doors do not lock or unlock.	4	42-25

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

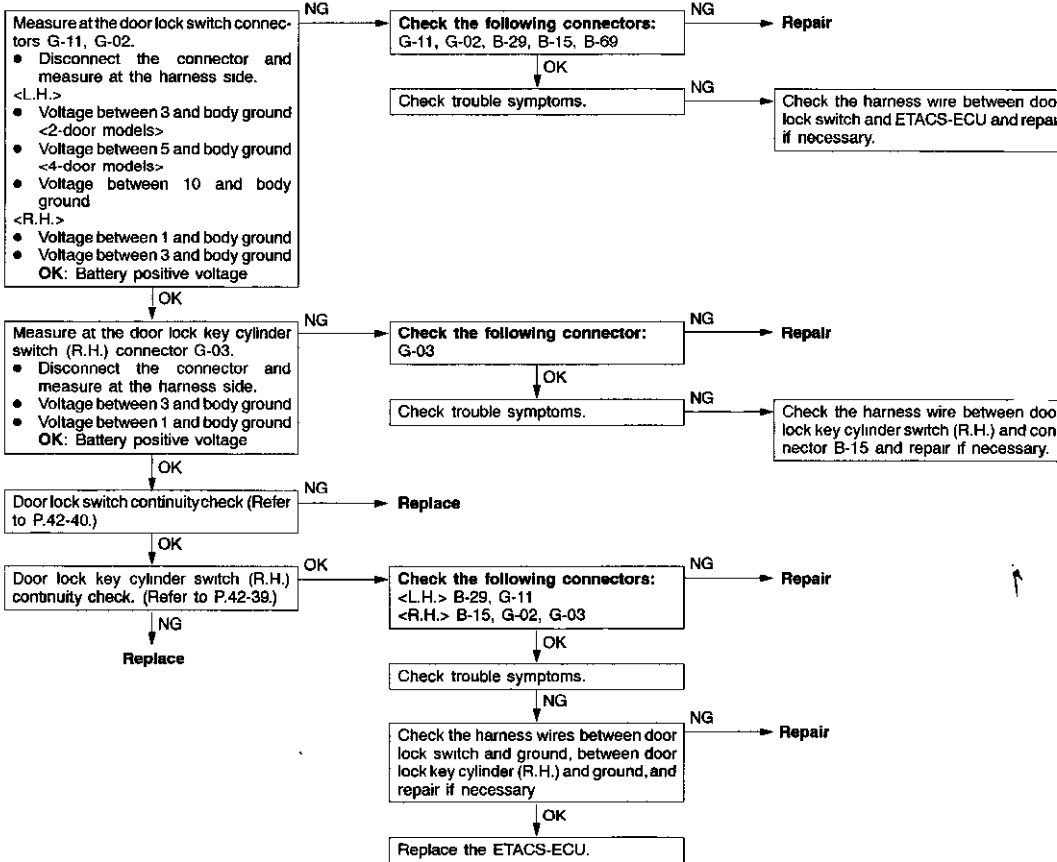
Inspection Procedure 1

None of the door lock functions operate.	**Probable cause**
The cause may be a malfunction of the ETACS-ECU power supply circuit system or of the ground circuit system.	• Malfunction of ETACS-ECU • Malfunction of wiring harness or connector



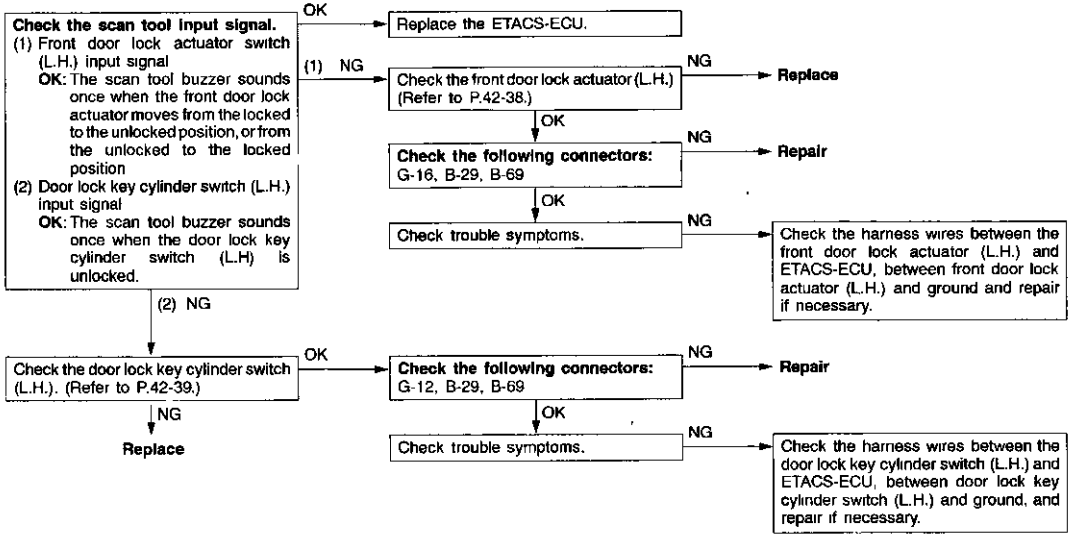
Inspection Procedure 2

The other door(s) does not lock or unlock by the door lock switch or the front passenger's side door lock cylinder. (However, they can be operated by the driver's inside door lock knob.)	Probable cause
The door lock switch, the door lock key cylinder switch (R.H.), the ETACS-ECU, harness or connector may be defective.	• Malfunction of door lock switch • Malfunction of door lock key cylinder switch (R.H.) • Malfunction of ETACS-ECU • Malfunction of wiring harness or connector



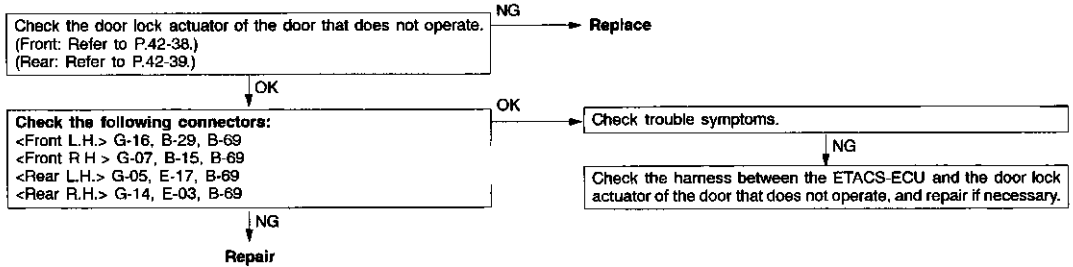
Inspection Procedure 3

The other door(s) does not lock or unlock by the driver's inside door lock knob or driver's side door lock key cylinder.	Probable cause
The front door lock actuator (L.H.), the door lock key cylinder (L.H.), the ETACS-ECU, harness or connector may be defective.	• Malfunction of front door lock actuator (L.H.) • Malfunction of door lock key cylinder switch (L.H.) • Malfunction of ETACS-ECU • Malfunction of wiring harness or connector



Inspection Procedure 4

Some doors do not lock or unlock.	Probable cause
The cause may be a malfunction of the door lock actuator or of a wiring harness or connector	• Malfunction of door lock actuator • Malfunction of wiring harness or connector



TROUBLESHOOTING HINTS

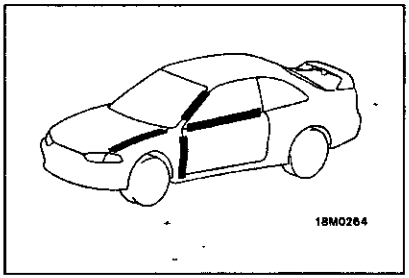
42300070108

Power windows

1. All door windows cannot be operated or closed.
   - Check the fusible link No. 6.
   - Check the multi-purpose fuse No. 6.
   - Check the power window relay.
   - Check the power window main switch.
2. Some door window cannot be opened or closed.
   1) Neither power window main nor sub switch is activated.
      - Check power window main switch.
      - Check defective power window motor.
   2) Either power window main or sub switch is inoperative.
      - Check inoperative power window switch.

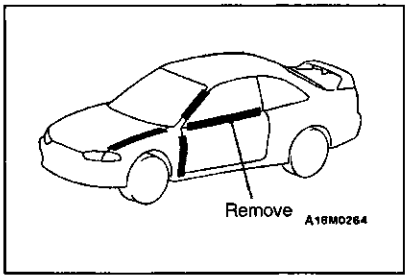
GLASS AND DOORS

Symptom	Probable cause	Remedy
Water leak through door window glass	Incorrect window glass installation	Adjust position
	Gap at upper window glass	Adjust position
Door window malfunction	Incorrect window glass installation	Adjust position
	Damaged or faulty regulator	Correct or replace
Water leak through door edge	Cracked or faulty weatherstrip	Replace
Water leak from door center	Drain hole clogged	Remove foreign objects
	Inadequate waterproof film contact or damage	Correct or replace
Door hard to open	Incorrect latch or striker adjustment	Adjust
Door does not open or close completely	Incorrect door installation	Adjust position
	Defective door check strap	Correct or replace
	Door check strap and hinge require grease	Apply grease
Uneven gap between body	Incorrect door installation	Adjust position
Wind noise around door	Weatherstrip not holding firmly	Adjust fit of door
	Improperly installed weatherstrip or setting of weatherstrip	Repair or replace
	Improperly closed door	Adjust
	Improperly fit door	Adjust
	Improper clearance between door glass and door weatherstrip holder	Adjust
	Deformed door	Repair or replace

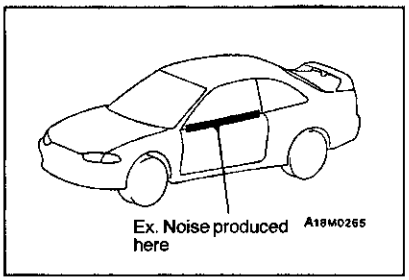


HOW TO LOCATE WIND NOISES

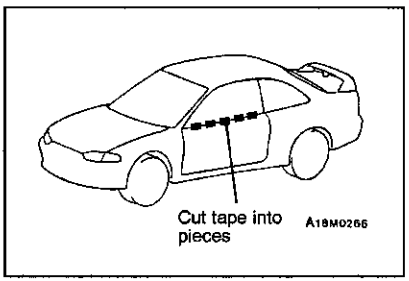
(1) Attach cloth tape to every place, such as panel seams, projections, molding seams, glass and body seams, etc. which might conceivably be the source of wind noise.
(2) Then make a road test to check that the places not covered by tape are not sources of wind noise.



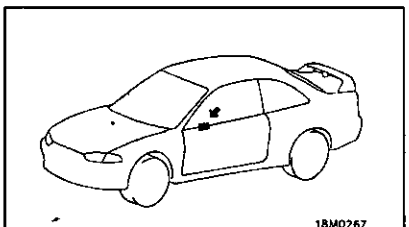
(3) Remove the strips of tape one by one, making a road test after each is removed, until a wind noise source is discovered.



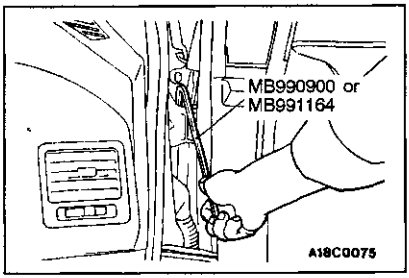
(4) When such a place is found, cover it again and repeat the procedure to check if there are any other noise source.
(5) If no others are found, the last remaining tape is the only source.



(6) Cut the remaining piece of tape into smaller pieces, attach it again as it was before, and then remove the pieces one by one to narrow down the source.



(7) Check that wind noise occurs when the last remaining tape is removed, and that noise does not occur when it is re-attached.
(8) When the source(s) of the wind noise is finally located, attach butyl tape, body sealer or similar material to obstruct this source as much as possible.



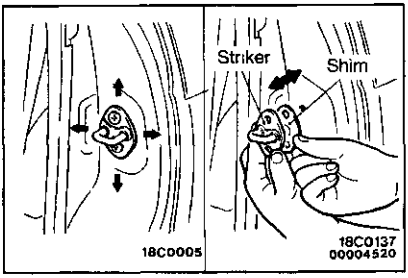
ON-VEHICLE SERVICE

42300090074

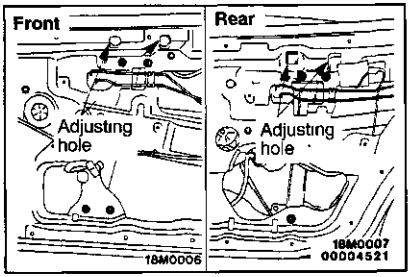
DOOR FIT ADJUSTMENT

1. If the clearance between the door and the vehicle body is uneven, affix protective tape to the fender around the hinge and to the edge of the door. Then use the special tool to loosen the door hinge mounting bolts on the body, and adjust the clearance around the door so that it becomes even.
2. If the door and the body are not flush with each other, use the special tool to loosen the door hinge mounting bolts. Then align the door.

Caution
Do not apply more than 98 Nm (72 ft.lbs.) to the special tool (MB991164).



3. If the door opening and closing is heavy, adjust the meshing of the striker and the door latch (in the longitudinal direction) by adding shims to the striker and by moving the striker up and down or to the left and right.

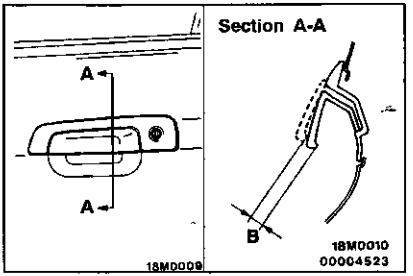


DOOR WINDOW GLASS ADJUSTMENT

42300100128

Check that the door glass moves securely along the door glass runchannel when the window glass is fully raised and fully lowered. If the glass does not move correctly, adjust by the following procedure.

1. Remove the door trim and the waterproof film. (Refer to P.42-32.)
2. Loosen the mounting screw through the adjusting hole with the door window glass fully closed, and lower the door window glass slightly.
3. Close the door window glass fully again, and tighten the door glass mounting screw securely through the adjusting hole.



DOOR OUTSIDE HANDLE PLAY CHECK 42300160089

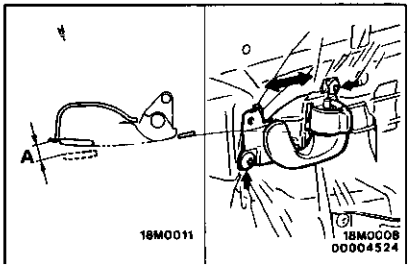
1. Check that the door outside handle play is within the standard value range.

   Standard value (B): 3.6 mm (.142 in.) or more

2. If the door outside handle play is not within the standard value range, check the door outside handle or the door latch assembly. Replace, if necessary.

CIRCUIT BREAKER (INCORPORATED IN THE POWER WINDOW MOTOR) INSPECTION 42900170042

1. Press the power window switch to the UP position to fully close the window glass, and keep pressing the switch for a further 10 seconds.
2. Release the power window switch from the UP position and immediately press it to the DOWN position. The condition of the circuit breaker is good if the power window glass starts to move downward within 60 seconds.



DOOR INSIDE HANDLE PLAY CHECK AND ADJUSTMENT 42300150123

1. Check that the door inside handle play is within the standard value range.

   Standard value (A): 5.3 mm (.209 in.) or more

2. If the door inside handle play is outside the standard value range, remove the door trim. (Refer to P.42-32.)
3. Loosen the inside handle mounting screws, and then move the inside handle back and forth to adjust the play.

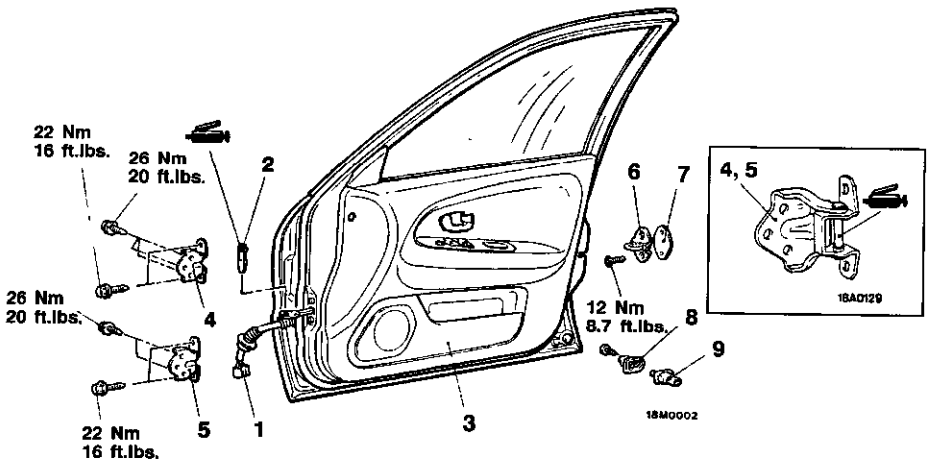
DOOR ASSEMBLY

42300220152

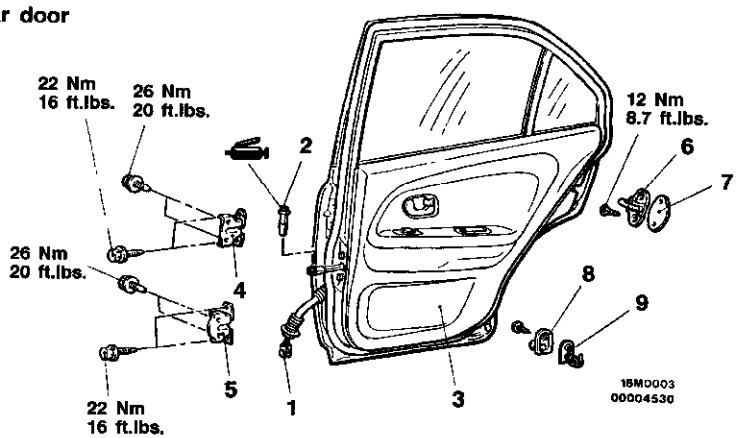
REMOVAL AND INSTALLATION

Post-installation Operation
- Door Fit Adjustment (Refer to P.42-28.)

Front door



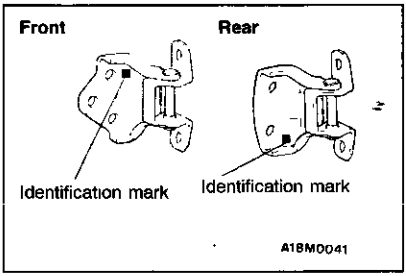
Rear door



Door assembly removal steps
1. Harness connector
2. Spring pin
3. Door assembly
▶A◀ 4. Door upper hinge
▶A◀ 5. Door lower hinge

Striker removal steps
6. Striker
7. Striker shim

Door switch removal steps
8. Door switch cap
9. Door switch

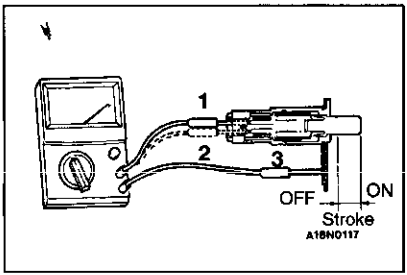


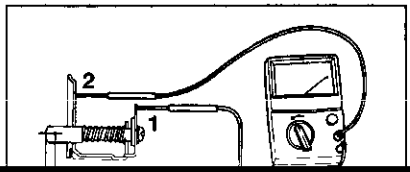
INSTALLATION SERVICE POINT

▶A◀ DOOR LOWER HINGE/DOOR UPPER HINGE INSTALLATION

The door hinges differ according to where they are used, so check the identification marks before installation.

Applicable location		Identification mark
Front left side door	Upper hinge	F1
	Lower hinge	E1
Front right side door	Upper hinge	E1
	Lower hinge	F1
Rear left side door	Upper hinge	A1
	Lower hinge	K1
Rear right side door	Upper hinge	B1
	Lower hinge	L1





INSPECTION

42300600062

DOOR SWITCH CONTINUITY CHECK

Front door switch (L.H.)

Switch position	Terminal No.		
	1	2	3
Open (ON)	○	○	○
Depressed (OFF)			

Front door switch (R.H.) and rear door switch

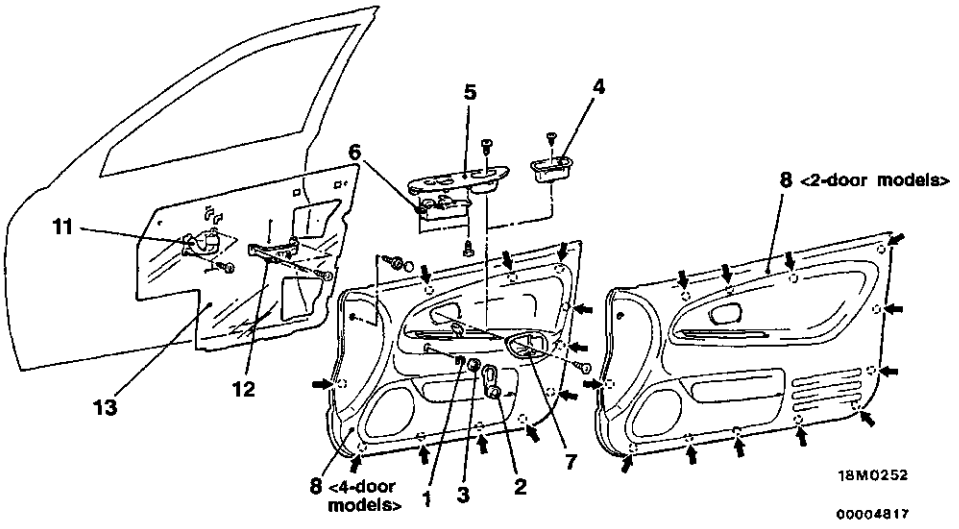
Switch position	Terminal No.	
	1	2
Open (ON)	○	○
Depressed		

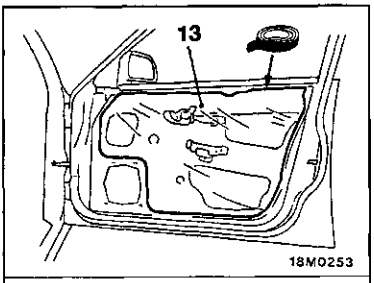
DOOR TRIM AND WATERPROOF FILM

42300430135

REMOVAL AND INSTALLATION

Front door





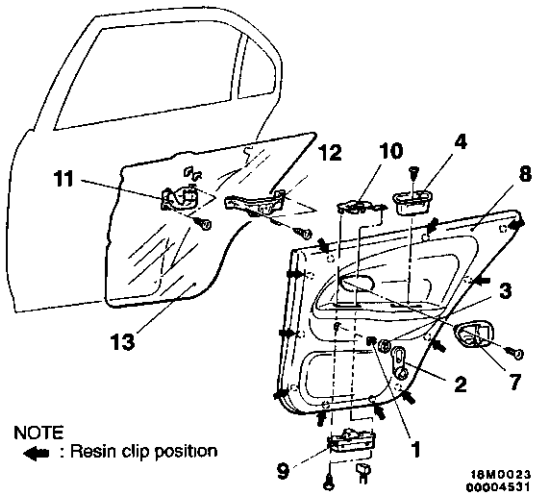
Sealant:
3M ATD Part. No. 8625 or equivalent

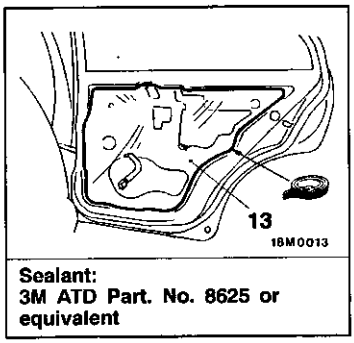
NOTE
◀■ : Resin clip position

Removal steps

◀A▶ ▶A◀ 1. Clip <Vehicles without power windows>
▶A◀ 2. Regulator handle <Vehicles without power windows>
▶A◀ 3. Escutcheon <Vehicles without power windows>
4. Pull handle box <Vehicles without power windows>
5. Power window switch panel <Vehicles with power windows>
6. Power window switch <Vehicles with power windows>
7. Cover
8. Door trim
11. Door inside handle
12. Pull handle bracket
13. Waterproof film

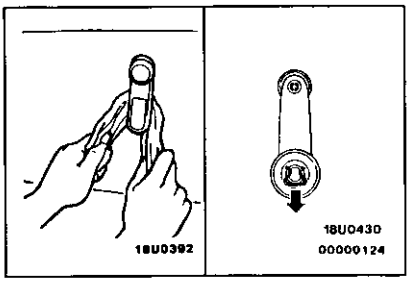
Rear door





Removal steps

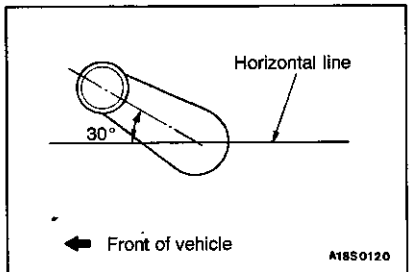
◀A▶ ▶A◀ 1. Clip <Vehicles without power windows>
▶A◀ 2. Regulator handle <Vehicles without power windows>
▶A◀ 3. Escutcheon <Vehicles without power windows>
4. Pull handle box
7. Cover
8. Door trim
9. Power window switch <Vehicles with power windows>
10. Power window switch panel <Vehicles with power windows>
11. Door inside handle
12. Pull handle bracket
13. Waterproof film



REMOVAL SERVICE POINT

◀A▶ CLIP REMOVAL

Remove the clip by using a shop towel, and then remove the regulator handle.



INSTALLATION SERVICE POINT

▶A◀ ESCUTCHEON/REGULATOR HANDLE/CLIP INSTALLATION

1. Install the escutcheon and the clip to the regulator handle.
2. Fully close the front door glass, and install the regulator handle so that it faces as shown in the illustration.

DOOR GLASS AND REGULATOR

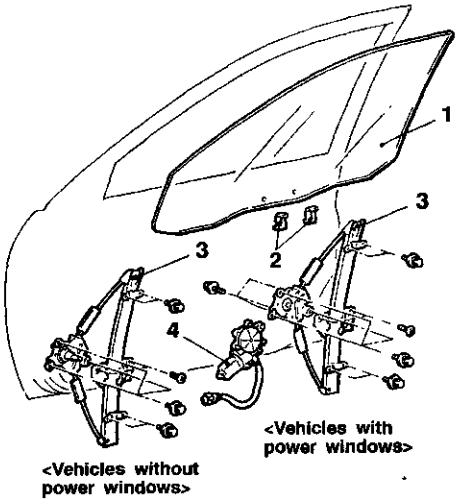
42900130149

REMOVAL AND INSTALLATION

Pre-removal Operation
(1) Door Trim and Waterproof Film Removal (Refer to P.42-32.)
(2) Door Beltline Inner Weatherstrip Removal (Refer to P.42-41.)

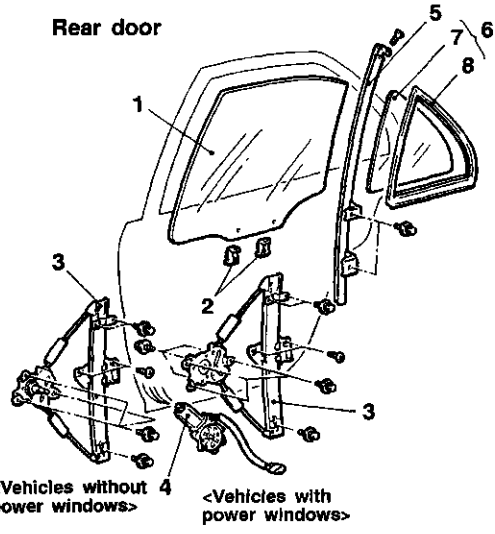
Post-installation Operation
(1) Door Window Glass Adjustment (Refer to P.42-28.)
(2) Door Beltline Inner Weatherstrip Installation (Refer to P.42-41.)
(3) Door Trim and Waterproof Film Installation (Refer to P.42-32.)

Front door



18M0227

Rear door



18M0228
00004721

Front window regulator assembly removal steps
1. Door window glass
2. Door window glass holder
3. Window regulator assembly
4. Power window motor

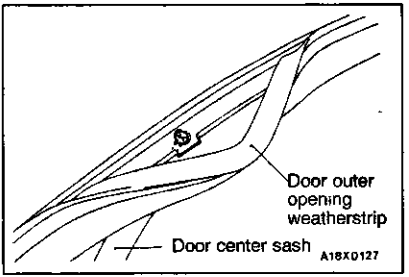
Rear window regulator assembly removal steps
- Window glass runchannel (Refer to P.42-41.)

1. Door window glass
2. Door window glass holder
3. Window regulator assembly
4. Power window motor

◀A▶

Stationary window glass removal steps
- Window glass runchannel (Refer to P.42-41.)

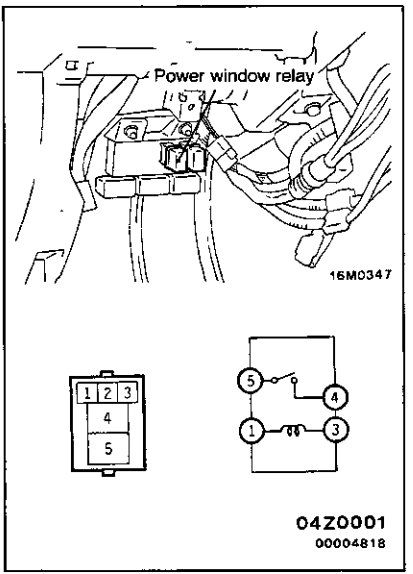
1. Door window glass
5. Door center sash
6. Stationary window glass and weatherstrip assembly
7. Stationary window glass
8. Stationary window weatherstrip



REMOVAL SERVICE POINT

◀A▶ DOOR CENTER SASH REMOVAL

1. Remove the door outer opening weatherstrip from the door center sash only.
2. Remove the door center sash mounting screws, and then remove the door center sash from the door panel.



INSPECTION 42900160052

POWER WINDOW RELAY CONTINUITY CHECK

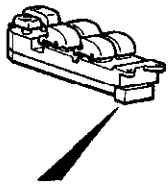
System voltage	Terminal No.			
	1	3	4	5
Not applied	○	○		
Applied	⊕	⊖	○	○

POWER WINDOW MOTOR CHECK 42900160063

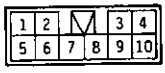
1. Connect a battery directly to the motor terminals and check that the motor runs smoothly.
2. Check that the motor runs in the opposite direction when the battery is connected with the polarity reversed.

POWER WINDOW SWITCH CONTINUITY CHECK

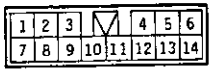
42900160063



2-door models



4-door models

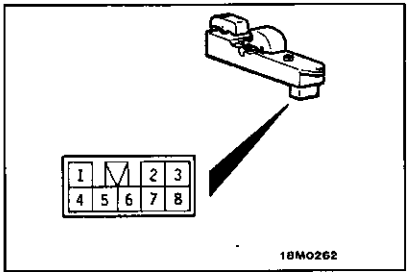


18MC263

Main switch

Terminal No.		Power window switch (normal)			Power window switch (lock)		
		UP	OFF	DOWN	UP	OFF	DOWN
Front (L.H.)	6*1, 13*2	○		○	○		○
	1*1, 8*2	○	○	○	○	○	○
	5*1, 9*2	○	○	○	○	○	○
	9*1, 12*2	○	○	○	○	○	○
Front (R.H.)	6*1, 13*2	○		○	○		○
	7*1, 3*2	○	○	○	○	○	
	8*1, 11*2	○	○	○		○	○
	9*1, 12*2	○	○	○			
Rear (L.H.)*2	13	○		○	○		○
	1	○	○	○	○	○	
	2	○	○	○		○	○
	12	○	○	○			
Rear (R.H.)*2	13	○		○	○		○
	14	○	○	○	○	○	
	6	○	○	○		○	○
	12	○	○	○			

NOTE
*1: 2-door models
*2: 4-door models



Sub switch

Terminal No.		Sub switch		
		UP	OFF	DOWN
Sub switch	4		○	○
	5	○		○
	6	○	○	
	7	○	○	○
	8	○	○	

DOOR HANDLE AND LATCH

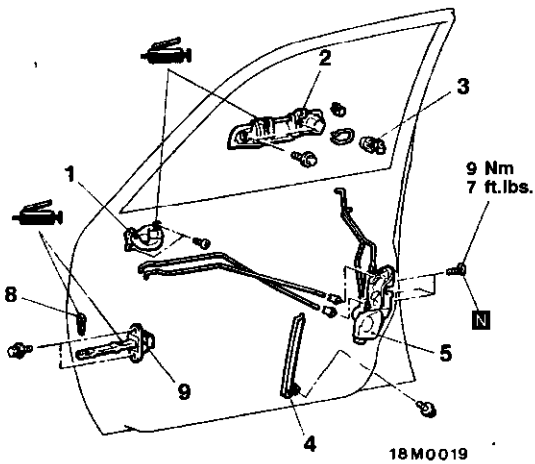
42300460134

REMOVAL AND INSTALLATION

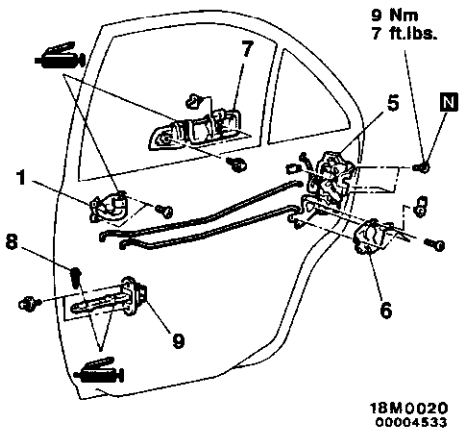
Pre-removal Operation
- Door Trim Removal (Refer to P.42-32.)

Post-installation Operation
(1) Door Inside Handle Play Check (Refer to P.42-29.)
(2) Door Outside Handle Play Check (Refer to P.42-29.)
(3) Door Trim Installation (Refer to P.42-32.)

Front door



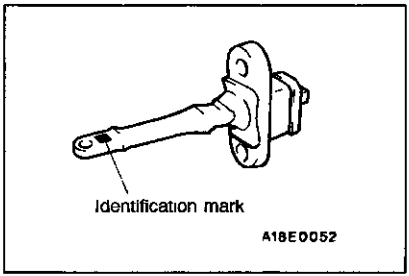
Rear door



Front door handle and door latch assembly removal steps
1. Door inside handle
- Waterproof film (Refer to P.42-32.)
2. Door outside handle
3. Door lock key cylinder
4. Rear lower sash
5. Door latch assembly

Rear door handle and door latch assembly removal steps
1. Door inside handle
- Waterproof film (Refer to P.42-32.)
- Door center sash (Refer to P.42-34.)
5. Door latch assembly
6. Door lock actuator
7. Door outside handle

Door check removal steps
1. Door inside handle
- Waterproof film (Refer to P.42-32.)
8. Spring pin
▶A◀ 9. Door check

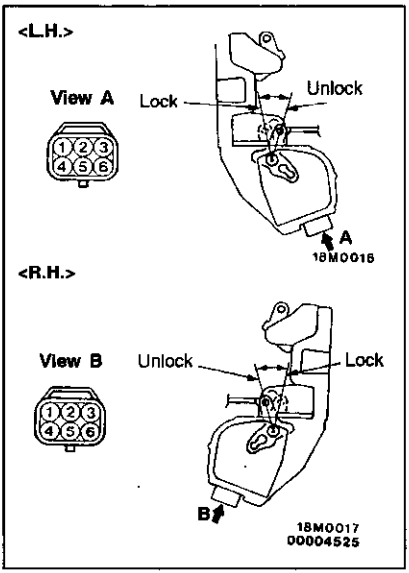


INSTALLATION SERVICE POINT

▶A◀ DOOR CHECK INSTALLATION

Install the door check so that the identification mark faces upward.

Applicable location		Identification mark	
		2-door models	4-door models
L.H.	Front door	YL	XL
	Rear door	–	16L
R.H.	Front door	YR	XR
	Rear door	–	16R



INSPECTION

42300610072

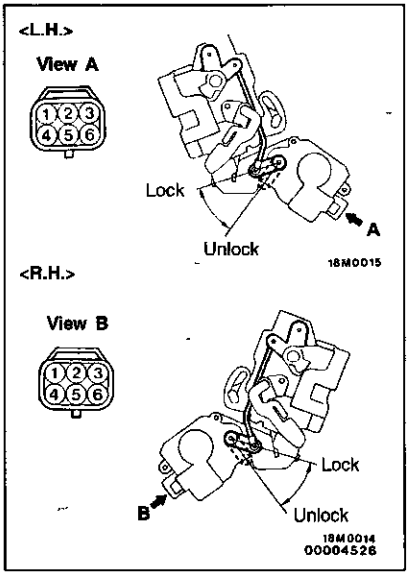
FRONT DOOR LOCK ACTUATOR CHECK

<L.H.>

Rod position	Terminal No.					Rod operation
	1	2	3	4	6	
LOCK				⊕	⊖	LOCK position → UNLOCK position
UNLOCK				⊖	⊕	UNLOCK position → LOCK position
LOCK	○		○			
UNLOCK	○	○				

<R.H.>

Rod position	Terminal No.		Rod operation
	4	6	
LOCK	⊖	⊕	LOCK position → UNLOCK position
UNLOCK	⊕	⊖	UNLOCK position → LOCK position



REAR DOOR LOCK ACTUATOR CHECK

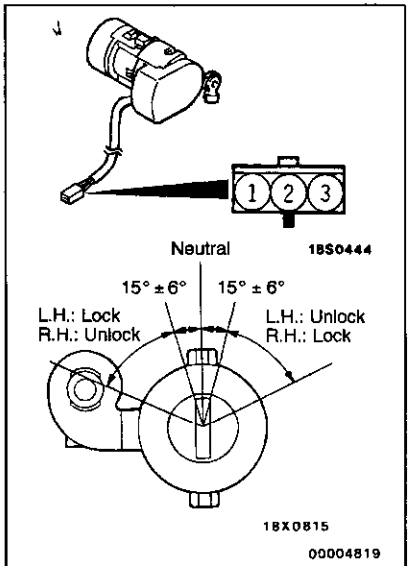
42300620051

<L.H.>

Rod position	Terminal No.		Rod operation
	2	3	
LOCK	⊕	⊖	LOCK position → UNLOCK position
UNLOCK	⊖	⊕	UNLOCK position → LOCK position

<R.H.>

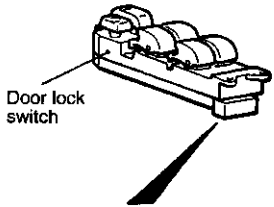
Rod position	Terminal No.		Rod operation
	2	3	
LOCK	⊖	⊕	LOCK position → UNLOCK position
UNLOCK	⊕	⊖	UNLOCK position → LOCK position



DOOR LOCK KEY CYLINDER SWITCH CONTINUITY CHECK

42300630085

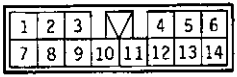
Switch position	Terminal No.					
	L.H.			R.H.		
	1	2	3	1	2	3
LOCK	○	○		○	○	
Neutral (OFF)						
UNLOCK		○	○		○	○



2-door models



4-door models



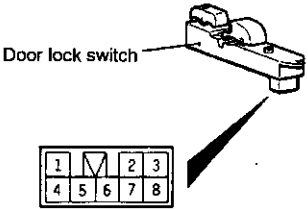
A18M0263

DOOR LOCK SWITCH CONTINUITY CHECK 42700120065

<L.H.>

Switch position	Terminal No.		
	3*1, 5*2	9*1, 12*2	10
LOCK	○	○	
OFF			
UNLOCK		○	○

NOTE
*1: 2-door models
*2: 4-door models



A18M0262

<R.H.>

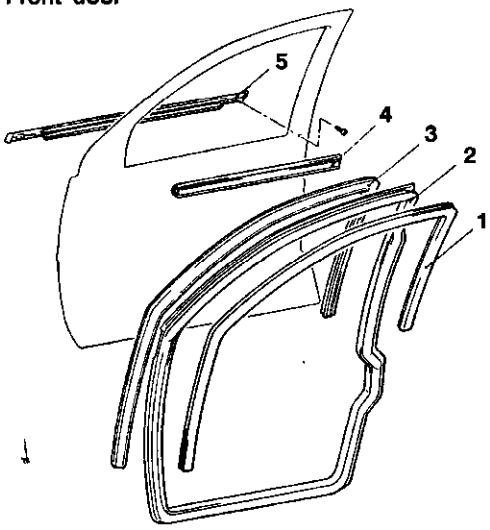
Switch position	Terminal No.		
	1	2	3
LOCK	○	○	
OFF			
UNLOCK		○	○

WINDOW GLASS RUNCHANNEL AND DOOR OPENING WEATHERSTRIP

42300310118

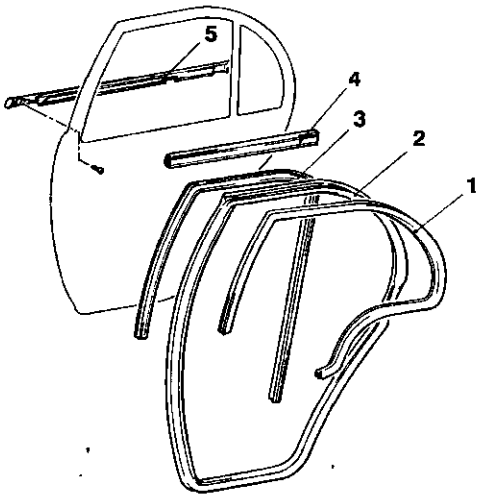
REMOVAL AND INSTALLATION

Front door



18M0032

Rear door



18M0033
00004527

Door inner opening weatherstrip removal steps

- Cowl side trim (Refer to GROUP 52A.)
- Quarter trim <2-door models> (Refer to GROUP 52A.)
- Center pillar lower trim <4-door models> (Refer to GROUP 52A.)

1. Door inner opening weatherstrip

Door outer opening weatherstrip removal

◀A▶ ▶A◀ 2. Door outer opening weatherstrip

Door window glass runchannel removal

3. Door window glass runchannel

Door beltline inner weatherstrip removal steps

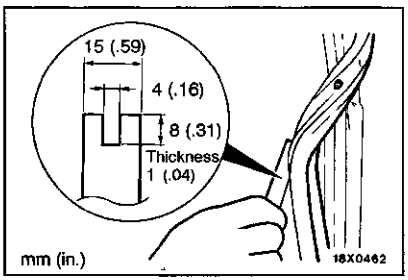
- Door trim (Refer to P.42-32.)

4. Door beltline inner weatherstrip

Door beltline molding removal

- Door mirror (Refer to GROUP 51.)

5. Door beltline molding



REMOVAL SERVICE POINT

◀A▶ DOOR OUTER OPENING WEATHERSTRIP REMOVAL

Make a tool as shown in the illustration to remove the door opening weatherstrip.

TSB Revision

INSTALLATION SERVICE POINT

▶A◀ DOOR OUTER OPENING WEATHERSTRIP INSTALLATION

The clip color identifies the left and right weatherstrips, so be sure to use the colors so as to install correctly.

Applicable location		Identification color	
		2-door models	4-door models
L.H.	Front door	Brown	White
	Rear door	-	Red
R.H.	Front door	Yellow	Pink
	Rear door	-	Dark brown

SUNROOF

42600030044

SERVICE SPECIFICATIONS

Items	Standard value
Roof lid glass operating current A	7 or less [at 20°C (68°F)]
Sunroof motor clutch slippage torque Nm (ft.lbs.)	4.7 - 6.2 (3.5 - 4.6)

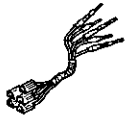
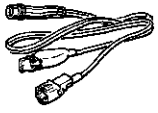
SEALANT

42600050057

Item	Specified sealant
Rail cover assembly	3M ATD Part No.8531 or 3M Part No.8646 or equivalent

SPECIAL TOOLS

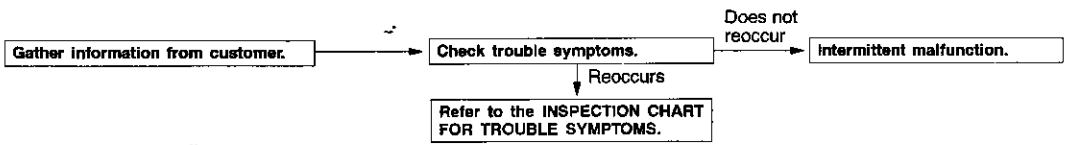
42600060029

Tool	Tool number and name	Supersession	Application
A  B  C  D  C991223	MB991223 Harness set A: MB991219 Test harness B: MB991220 LED harness C: MB991221 LED harness adapter D: MB991222 Probe	MB991223	Measurement of terminal voltage A: Connector pin contact pressure inspection B, C: Power circuit inspection D: Commercial tester connection

TROUBLESHOOTING

42600170029

STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING



INSPECTION CHART FOR TROUBLE SYMPTOMS

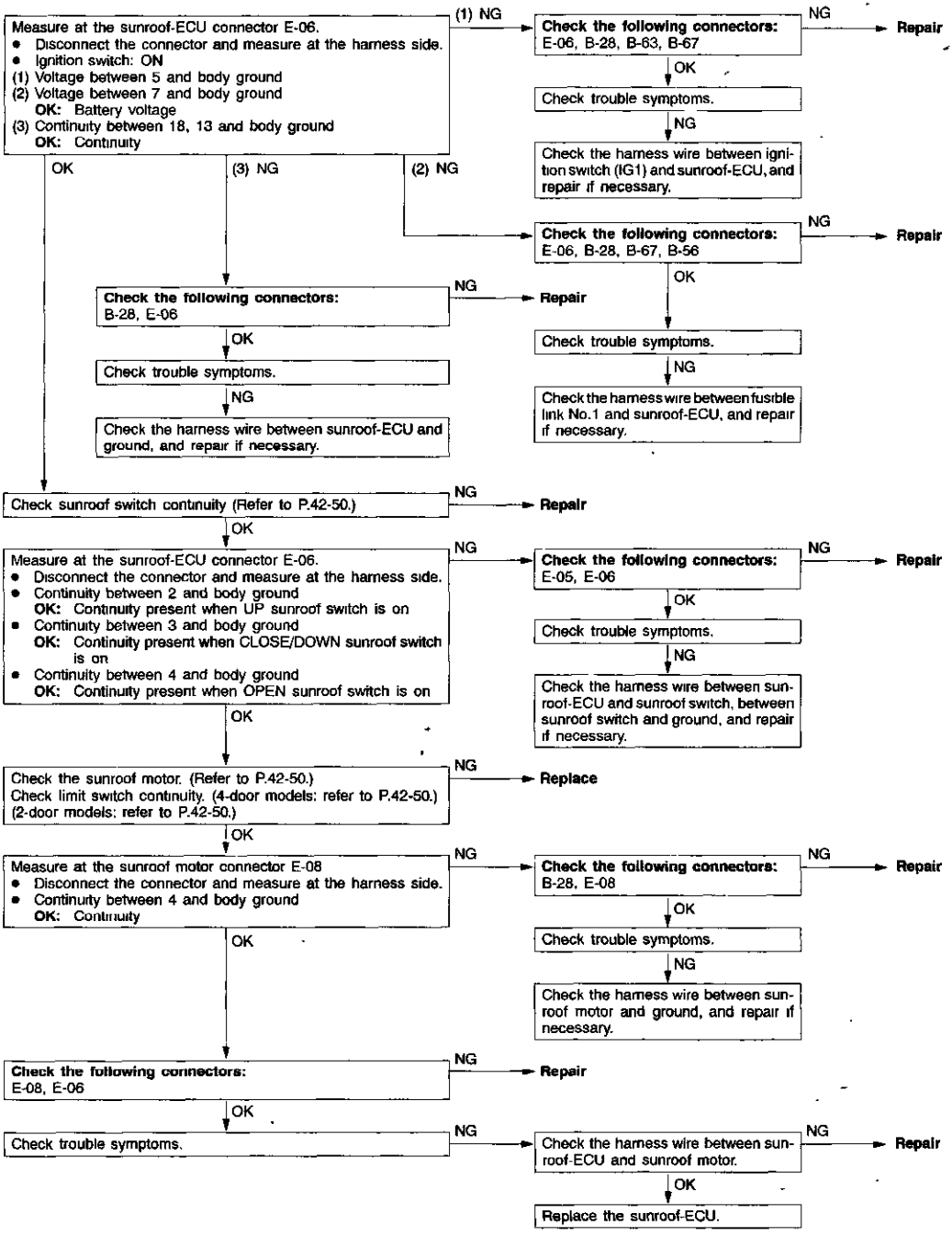
42600200117

Trouble symptom	Inspection procedure	Reference page
The sunroof does not operate when the ignition switch is turned to ON.	1	42-43
The motor does not reverse its direction when a load of 140 N (32 lbs.) or more is applied while the sunroof is closing.	2	42-45
The timer does not operate for 30 seconds after the ignition switch is turned to OFF.	3	42-45
The sunroof operates when the driver's side door is opened within 30 seconds after turning the ignition switch to OFF.	4	42-45

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

Inspection Procedure 1

The sunroof does not operate when the ignition switch is turned to ON.	**Probable cause**
One of the following items may be defective. • Sunroof switch • Sunroof motor • Sunroof-ECU • Power supply circuit • Ground circuit	• Malfunction of sunroof switch • Malfunction of sunroof motor • Malfunction of sunroof-ECU • Malfunction of wiring harness or connector


Measure at the sunroof-ECU connector E-06.
• Disconnect the connector and measure at the harness side.
• Ignition switch: ON
(1) Voltage between 5 and body ground
(2) Voltage between 7 and body ground
OK: Battery voltage
(3) Continuity between 18, 13 and body ground
OK: Continuity
(1) NG
Check the following connectors:
E-06, B-28, B-63, B-67
NG
Repair
OK
Check trouble symptoms.
NG
Check the harness wire between ignition switch (IG1) and sunroof-ECU, and repair if necessary.
OK
(3) NG
(2) NG
Check the following connectors:
E-06, B-28, B-67, B-56
NG
Repair
OK
Check trouble symptoms.
NG
Check the harness wire between fusible link No.1 and sunroof-ECU, and repair if necessary.
Check the following connectors:
B-28, E-06
NG
Repair
OK
Check trouble symptoms.
NG
Check the harness wire between sunroof-ECU and ground, and repair if necessary.
Check sunroof switch continuity (Refer to P.42-50.)
NG
Repair
OK
Measure at the sunroof-ECU connector E-06.
• Disconnect the connector and measure at the harness side.
• Continuity between 2 and body ground
OK: Continuity present when UP sunroof switch is on
• Continuity between 3 and body ground
OK: Continuity present when CLOSE/DOWN sunroof switch is on
• Continuity between 4 and body ground
OK: Continuity present when OPEN sunroof switch is on
NG
Check the following connectors:
E-05, E-06
NG
Repair
OK
Check trouble symptoms.
NG
Check the harness wire between sunroof-ECU and sunroof switch, between sunroof switch and ground, and repair if necessary.
OK
Check the sunroof motor. (Refer to P.42-50.)
Check limit switch continuity. (4-door models: refer to P.42-50.)
(2-door models: refer to P.42-50.)
NG
Replace
OK
Measure at the sunroof motor connector E-08
• Disconnect the connector and measure at the harness side.
• Continuity between 4 and body ground
OK: Continuity
NG
Check the following connectors:
B-28, E-08
NG
Repair
OK
Check trouble symptoms.
NG
Check the harness wire between sunroof motor and ground, and repair if necessary.
OK
Check the following connectors:
E-08, E-06
NG
Repair
OK
Check trouble symptoms.
NG
Check the harness wire between sunroof-ECU and sunroof motor.
NG
Repair
OK
Replace the sunroof-ECU.

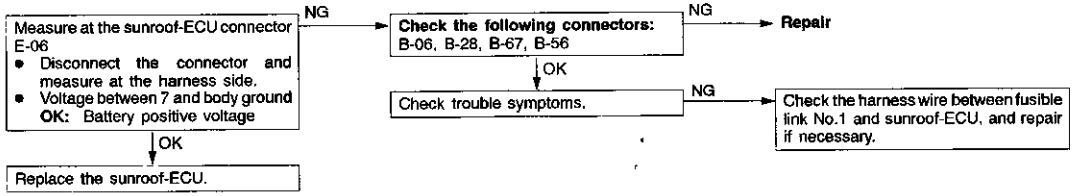
Inspection Procedure 2

The motor does not reverse its direction when a load of 140 N (32 lbs.) or more is applied while the sunroof is closing.	Probable cause
The sunroof-ECU monitors the load conditions from the amount of current flowing to the motor. If more than the constant amount of current is flowing, the direction of motor operation is reversed to prevent jamming If the motor does not reverse direction even when an excessive load is being applied, the cause may be a malfunction of the sunroof-ECU.	• Malfunction of sunroof-ECU

Replace the sunroof-ECU.

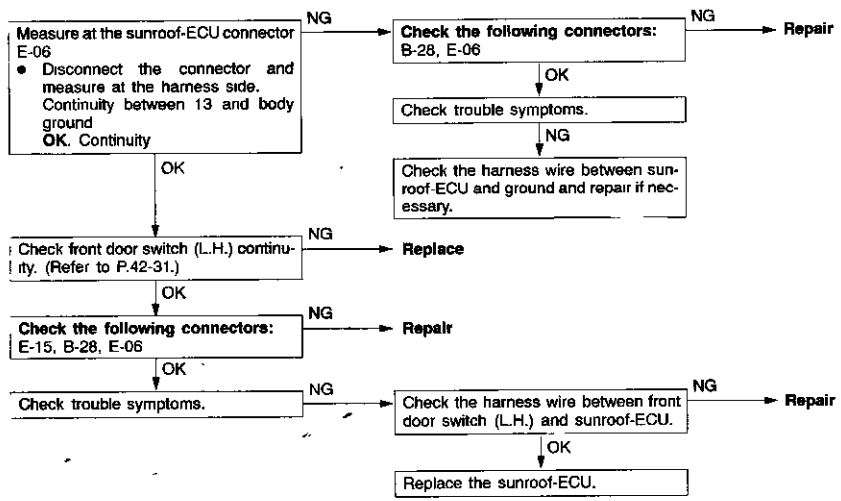
Inspection Procedure 3

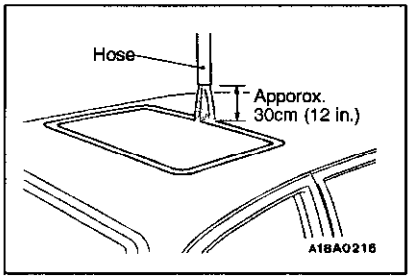
The timer does not operate for 30 seconds after the ignition switch is turned to OFF.	Probable cause
The sunroof-ECU has a timer function which operates for 30 seconds after the ignition switch is turned to OFF. If the timer does not operate, the cause may be a malfunction of the sunroof-ECU or of the wiring harness or connector.	• Malfunction of sunroof-ECU • Malfunction of wiring harness or connector



Inspection Procedure 4

The sunroof operates when the driver's side door is opened within 30 seconds after turning the ignition switch to OFF.	Probable cause
One of the following items may be defective. • Front door switch (L.H.) • Sunroof-ECU • Ground circuit	• Malfunction of the front door switch (L.H.) • Malfunction of sunroof-ECU • Malfunction of wiring harness or connector





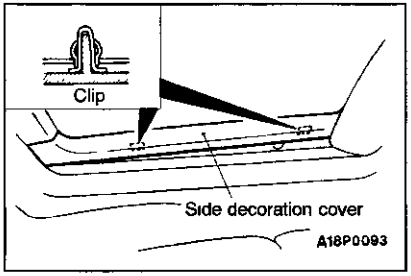
ON-VEHICLE SERVICE

42600090060

WATER TEST

Check if there are any leaks in the sunroof by the following procedure.

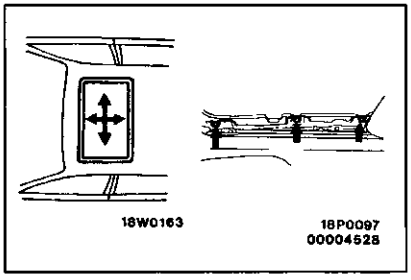
1. Fully close the roof lid glass.
2. Adjust the water pressure so that water comes out of the hose to a height of approximately 50 cm (20 in.) when the hose is held vertically facing upward.
3. Hold the end of the hose approximatery 30 cm (12 in.) above the roof and let the water run onto the weatherstrip for 5 minutes or more.
4. While doing this, check if any water leaks through into the passenger compartment from around the roof lid glass.



SUNROOF FIT ADJUSTMENT

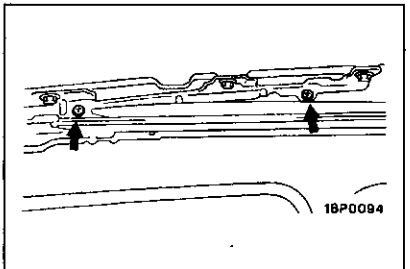
42600100141

1. Fully close the roof lid glass.
2. Fully open the sunshade.
3. <4-door models>
   (1) Remove the side decoration cover.



(2) To adjust the forward, backward and sideways position of the roof lid glass, loosen the six roof lid glass assembly mounting nuts and then adjust the glass forward, backward or sideways.

NOTE
If the adjustment cannot be made by loosening the adjustment nuts, the roof lid glass or the motor have not been fully closed, so they should be adjusted to the fully closed positions.



(3) To adjust the height of the roof lid glass, loosen the four guide (A) assembly mounting screws and then move the roof lid glass assembly along the slot in the guide (A) assembly to adjust the height of the roof lid glass.

4. <2-door models>
   (1) Loosen the roof lid glass assembly mounting screws (four screws), and then slide the roof lid glass assembly along the slot in the drive cable assembly to adjust the height of the roof lid glass.
5. After adjustment, check to be sure that the sunroof operates smoothly.

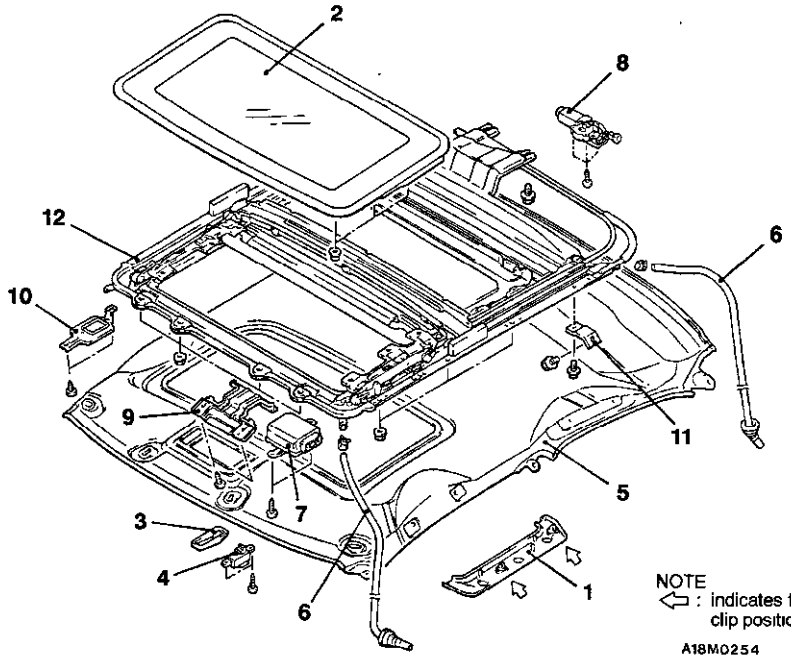
SUNROOF

42600120260

REMOVAL AND INSTALLATION

<4-door models>

Post-installation Operation
<Roof lid glass assembly, Sunroof assembly>
(1) Sunroof Water Test (Refer to P.42-46.)
(2) Sunroof Fit Adjustment (Refer to P.42-46.)



NOTE
⇦ : indicates the sheet metal clip position.

A18M0254

Roof lid glass assembly removal steps

◀A▶ 1. Side decoration cover
2. Roof lid glass assembly

Sunroof switch removal steps

3. Sunroof switch cover
4. Sunroof switch

Drain hose removal steps

● Splash shield (Front drain hose)
5. Headlining
◀B▶ ▶B◀ 6. Drain hose

Sunroof-ECU removal steps

5. Headlining
7. Sunroof-ECU

Sunroof motor removal steps

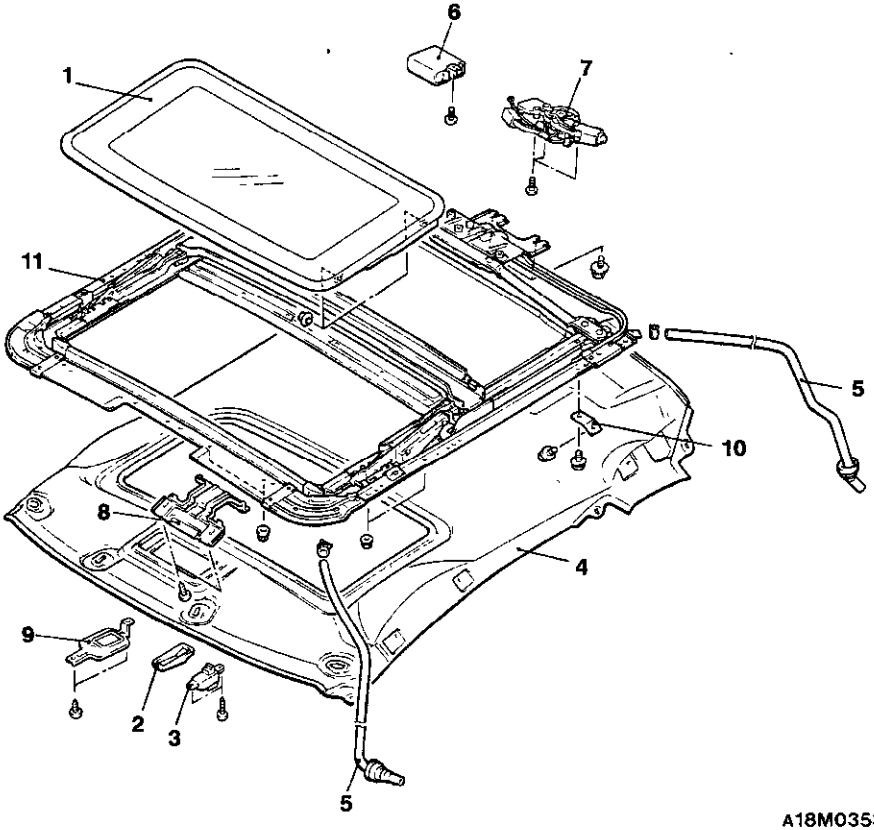
5. Headlining
◀C▶ ▶A◀ 8. Sunroof motor

Sunroof assembly removal steps

5. Headlining
6. Drain hose connection
9. Dome light bracket
10. Sunroof switch bracket
11. Set bracket
12. Sunroof assembly

<2-door models>

Pre-removal Operation
<Roof lid glass assembly, Sunroof assembly>
(1) Sunroof Water Test (Refer to P.42-6.)
(2) Sunroof Fit Adjustment (Refer to P.42-6.)



A18M0353

1. Roof lid glass assembly

Sunroof switch removal steps
2. Sunroof switch cover
3. Sunroof switch

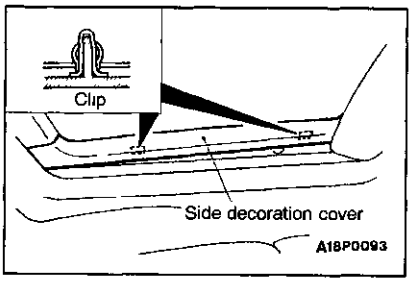
Drain hose removal steps
- Splash shield (Front drain hose)

4. Headlining
◀B▶ ▶B◀ 5. Drain hose

Sunroof-ECU removal steps
4. Headlining
6. Sunroof-ECU

Sunroof motor removal steps
4. Headlining
◀C▶ ▶A◀ 7. Sunroof motor

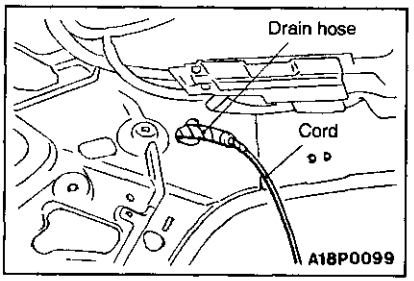
Sunroof assembly removal steps
4. Headlining
5. Drain hose connection
8. Dome light bracket
9. Sunroof switch bracket
10. Set bracket
11. Sunroof assembly



REMOVAL SERVICE POINTS

◀A▶ SIDE DECORATION COVER REMOVAL

Remove the clips, and then remove the side decoration cover.

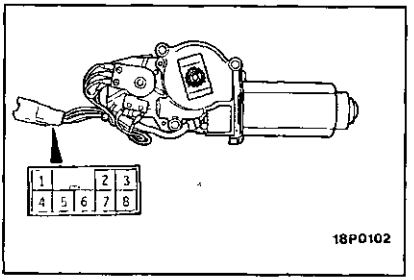


◀B▶ DRAIN HOSE REMOVAL

Tie a cord to the end of the drain hose, and wind tape around the tie until it is smooth. Then pull the drain hose out from the passenger compartment.

◀C▶ SUNROOF MOTOR REMOVAL

Caution
Always close the roof lid glass fully before removing the sunroof motor. If the fully-closed positions of the roof lid glass and the sunroof motor are not the same, the sunroof will not operate properly.



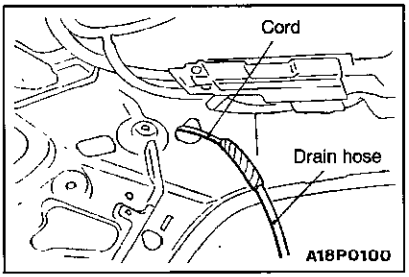
INSTALLATION SERVICE POINTS

▶A◀ SUNROOF MOTOR INSTALLATION

If the fully-closed position of the sunroof motor is incorrect, set the motor to the fully-closed position by the procedure given below before installing the motor.

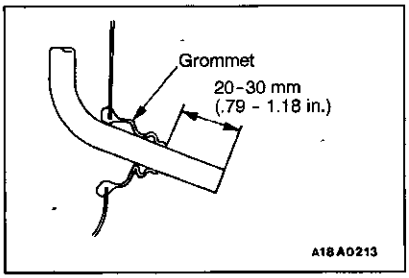
1. Connect an ammeter between terminals (4) and (5)*1, (6)*2 of the motor connector.
2. Connect battery between terminals (1) and (2) operate the motor until the position is reached at which continuity switches from on to off or from off to on, and then install the motor.

NOTE
*1: 2-door models
*2: 4-door models

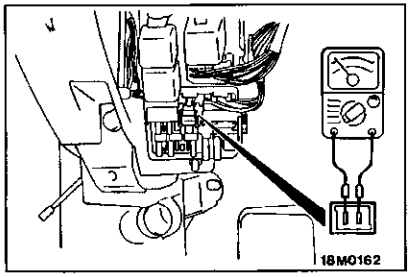


▶B◀ DRAIN HOSE INSTALLATION

1. Tie the cord that was used during removal to the end of the drain hose, and wind tape around it so that there is no unevenness.
2. Pull the cord to pull through the drain hose.



3. Make the protrusion from the drain hose grommet as shown in the illustration.



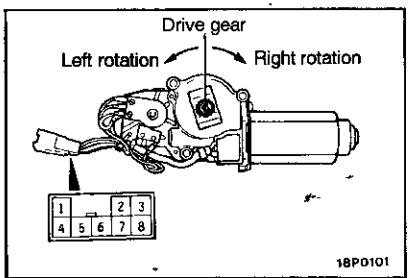
INSPECTION 42600130089

ROOF LID GLASS OPERATION CURRENT CHECK

1. Remove the sunroof fuse and connect an ammeter as shown in the illustration.
2. Press the sunroof switch to the ON position, and then measure the operation current in the intervals between the points when the sunroof starts to operate, when it is fully open, when it is fully closed and when it is fully tilted up.

   Standard value: 7 A or less [at 20°C (60°F)]

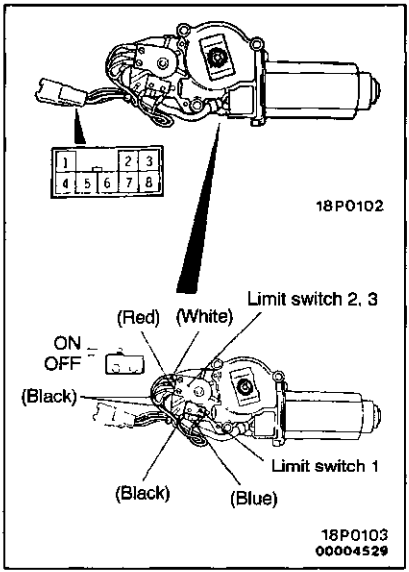
3. If the operation current is outside the standard value, check the following points.
   - Installation condition, warping or jamming of sunroof assembly
   - Sticking of drive cable
   - Tilt of roof lid glass



SUNROOF MOTOR CHECK 42600250051

Check the direction of rotation of the drive gear when the battery is connected to the connector.

Battery connection terminal		Drive gear rotation direction
1	2	
⊖	⊕	Right
⊕	⊖	Left



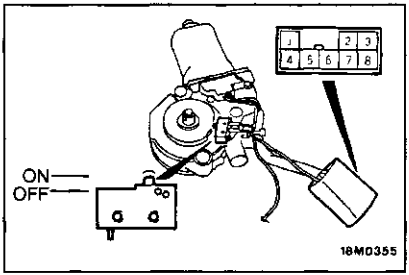
LIMIT SWITCH CONTINUITY CHECK <4-DOOR MODELS>

42600270033

1. Remove the limit switches from the sunroof motor, and then check the operation of the limit switches.

Switch position		Terminal No.			
		4	5	6	7
Limit switch 1	ON	○	○		
	OFF				
Limit switch 2	ON	○		○	
	OFF				
Limit switch 3	ON	○			○
	OFF				

2. Check the identification colors. Then install the limit switches as shown in the illustration.

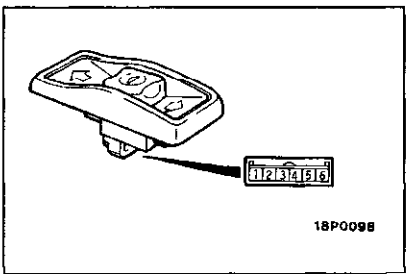


LIMIT SWITCH CONTINUITY CHECK <2-DOOR MODELS>

42600270040

Remove the limit switch from the sunroof motor, and then check the operation of the limit switch.

Switch		Terminal No.	
		4	5
Limit switch	ON	○	○
	OFF		



SUNROOF SWITCH CONTINUITY CHECK

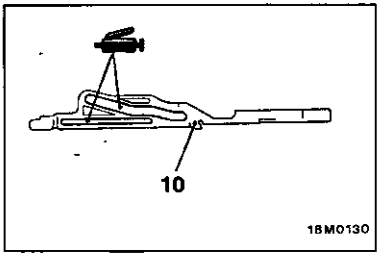
42600160095

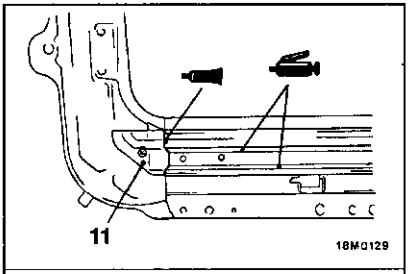
Switch position	Terminal No.			
	3	4	5	6
Slide open		○	○	
Off				
Tilt up	○	○		
Slide close, Tilt down		○		○

DISASSEMBLY AND REASSEMBLY

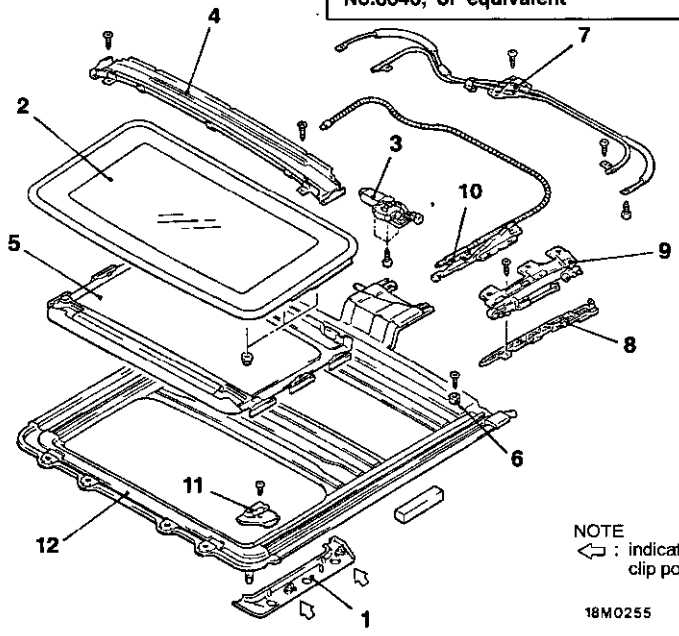
42600140136

<4-door models>





Sealant:
3M ATD Part No.8531 or 3M Part No.8646, or equivalent



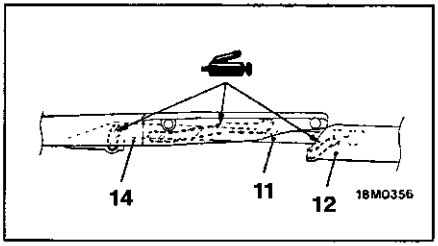
00004820

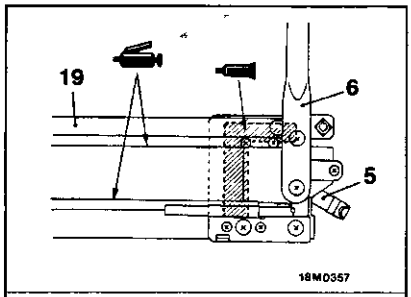
Disassembly steps

1. Side decoration cover (Refer to P.42-47.)
2. Roof lid glass assembly
3. Sunroof motor
4. Drip rail assembly
5. Sunshade assembly
6. Cushion (B) assembly
7. Drive unit assembly
8. Decoration link
9. Guide (A) assembly
10. Slider assembly
11. Rail cover assembly
12. Frame sub assembly

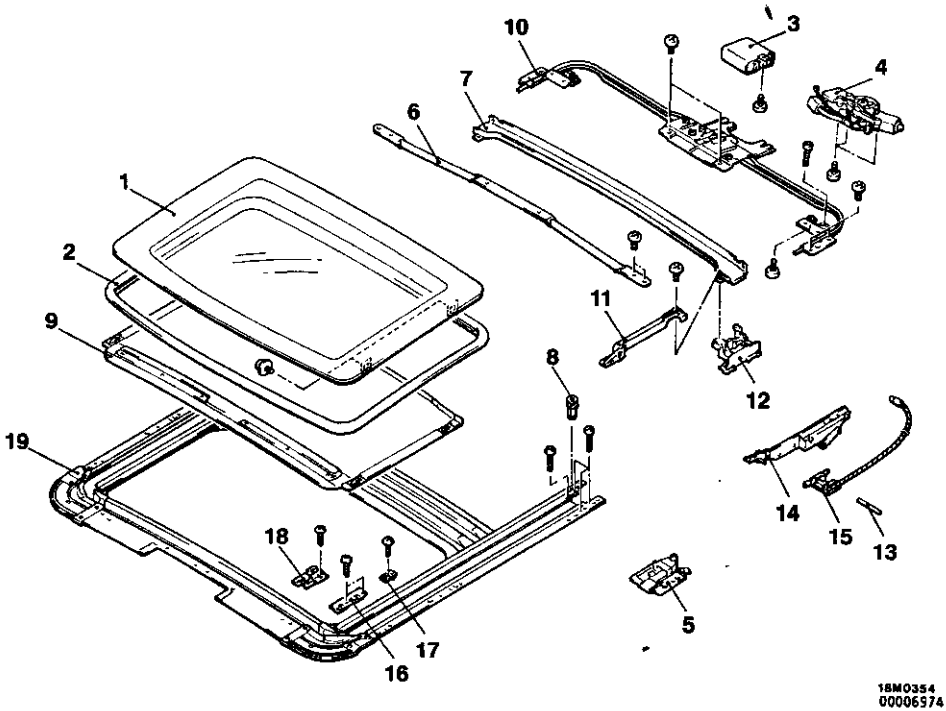
DISASSEMBLY AND REASSEMBLY

<2-door models>





Sealant:
3M ATD Part No.8531 or 3M Part No.8646, or equivalent



Disassembly steps

1. Roof lid glass assembly
2. Weatherstrip
3. Sunroof ECU
4. Sunroof motor
5. Rear drip
6. Frame
7. Drip rail assembly
8. Crip <L.H.>
9. Sunshade assembly
10. Drive unit assembly
11. Drip link
12. Drip shoe assembly
13. Shaft
14. Lifter assembly
15. Cable assembly
16. Set plate
17. Rear set plate
18. Stopper
19. Flame assembly

UNDER COVER

42100050083

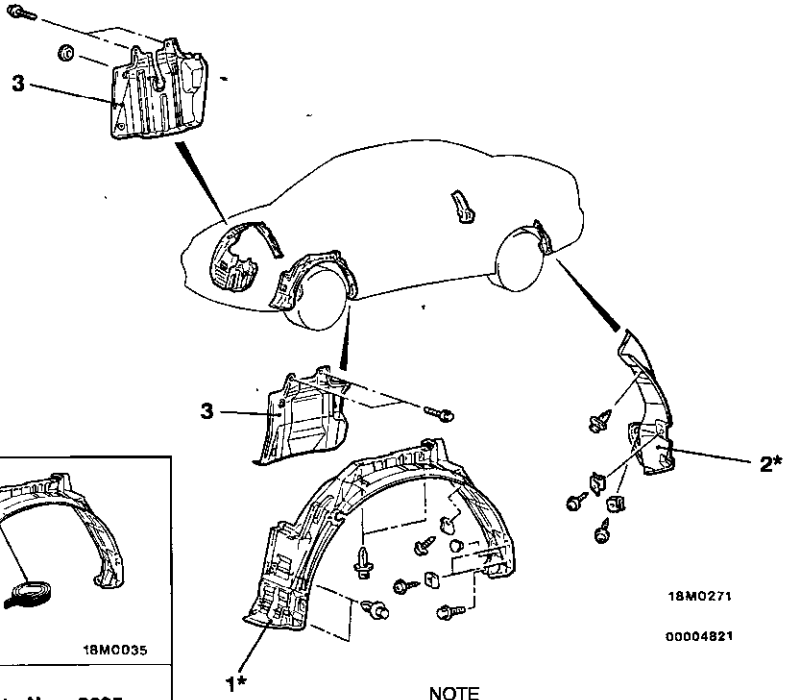
SEALANT

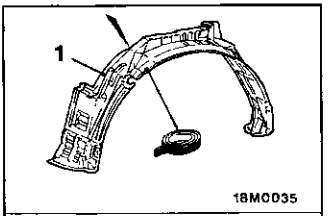
Item	Specified sealant	Remark
Splash shield	3M ATD Part No. 8625 or equivalent	Ribbon sealer

UNDER COVER

42100280055

REMOVAL AND INSTALLATION





Sealant:
3M ATD Part No. 8625 or equivalent

NOTE
The components which are marked with * are also equipped at the right side.

Removal steps

1. Front splash shield*
2. Rear splash shield*
3. Under cover side panel

EXTERIOR

CONTENTS

51109000128

AERO PARTS 13
DOOR MIRROR 20
FRONT BUMPER 4
GARNISHES 10
GENERAL INFORMATION 2
MARKS 19
MOLDINGS 11
RADIATOR GRILLE 9
REAR BUMPER 7
SERVICE SPECIFICATIONS 2
SEALANT AND ADHESIVE 2
SPECIAL TOOLS 2
STONE GUARD 12
TROUBLESHOOTING 3
WINDSHIELD WIPER AND WASHER 16

GENERAL INFORMATION

51100010076

OPERATION

WINDSHIELD WIPER AND WASHER

Low-speed (and high-speed) wiper operation

- When the wiper switch is placed in the "LO" position with the ignition switch in the "ACC" or "ON" position, wipers operate continuously at low speed.
- Placing the wiper switch in the HI position causes the wipers to operate at high speed.

Auto wiper stop operation

- When the wiper switch is placed in the "OFF" position, the cam contacts of wiper motor causes current to flow through the auto wiper stop circuit, allowing the wiper blades to cycle before they reach to the stop positions.

Intermittent wiper operation

- When the wiper switch is placed in the "INT" position with the ignition switch in "ACC" or "ON" position, the intermittent wiper relay is energized causing the intermittent wiper relay contacts to close and open repeatedly.
- When the contacts are closed, the wiper motor is energized.
- When the wiper motor is energized, the relay contacts open; however, the cam contacts keep the wiper motor energized until the wiper blades return to their stop position.

Washer-wiper operation

- When the washer switch is turned "ON," the intermittent wiper relay contacts close causing wipers to cycle one to two times.

Remote controlled mirror

- When the remote-controlled mirror switch is operated while the ignition key is in "ACC" or "ON" position, current flows through multi-purpose fuse No. 7 remote-controlled mirror switch, remote-control mirror, remote-controlled mirror switch, and ground, causing the mirror to move.

SERVICE SPECIFICATIONS

51100030102

Items		Standard value
Windshield wiper blade installation position mm	Driver's side	20 ± 5 (.78 ± .19)
	Passenger's side	20 ± 5 (.78 ± .19)

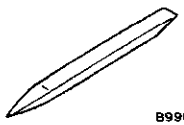
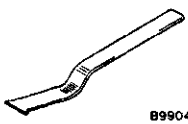
SEALANT AND ADHESIVE

51100050221

Items	Specified sealant and adhesive
Front airdam to front bumper	Adhesive tape: double-sided tape [10 mm width and 1.2 mm thickness]
Side airdam to body panel	Adhesive tape: double-sided tape [5 mm width and 1.2 mm thickness]

SPECIAL TOOLS

51100060088

Tool	Tool number and name	Supersession	Application
 B990784	MB990784 Ornament remover	General service tool	Removal of bumper mounting clips (front and rear) and door mirror control switch
 B990449	MB990449 Window molding remover	General service tool	Removal of roof drip molding, etc.

TROUBLESHOOTING

51100070081

TROUBLESHOOTING HINTS

Windshield wiper and washer

1. Wipers do not operate.
   1) Washer is not operative, either.
      - Check multi-purpose fuse No. 1.
      - Check ground.
2. Low-speed (or high-speed) wiper operation only is inoperative.
   - Check wiper switch.
3. Wipers do not stop.
   - Check wiper motor.
   - Check intermittent wiper relay.
   - Check wiper switch.
4. Intermittent wiper operation is inoperative.
   - Check terminal voltage of steering-column switch (with a built-in intermittent wiper relay) with the intermittent wiper relay energezed. (Refer to Fig.1)
5. The length of pause for intermittent operation cannot be varied.
   - Check variable intermittent wiper control switch.
   - Check intermittent wiper relay.
6. Washer is inoperative.
   1) Wiper is operative on washer-wiper operation.
      - Check washer motor.
   2) Washer-wiper operation is inoperative also.
      - Check washer switch.
7. Washer-wiper operation is inoperative.
   - Check intermittent wiper relay.

Remote controlled mirror

Neither right nor left mirror operates.

1) Also cigarette lighter wiper does not operate.
   - Check multi-purpose fuse No. 7.
2) Windshield wiper operates.
   - Check remote-controlled mirror switch.

Fig.1

Terminal No.	Voltage	Check
8	0V	Intermittent wiper relay or wiper switch
	Battery positive voltage	Intermittent wiper relay
	0 to Battery positive voltage (alternating)	- (Normal)

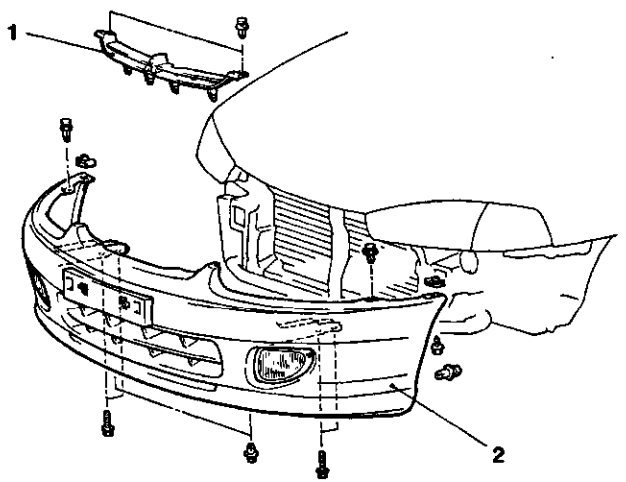
FRONT BUMPER

51100140102

REMOVAL AND INSTALLATION

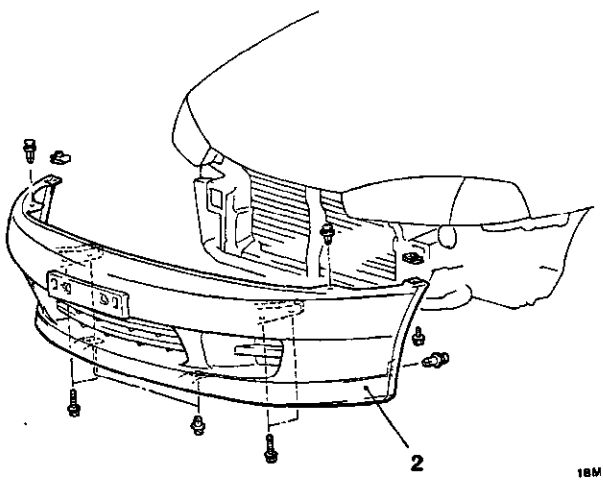
Pre-removal and Post-installation Operation
(1) Splash Shield Removal and Installation (Refer to GROUP 42 - Fender.)
(2) Front Turn-signal Light Removal and Installation (Refer to GROUP 54 - Headlight and Turn Signal Light.)

<2-door models>



18M0238

<4-door models>

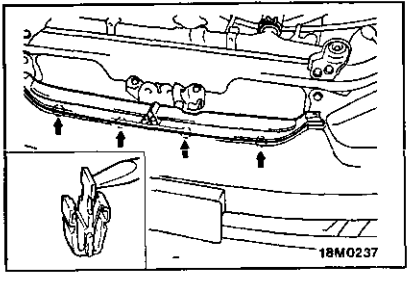


18M0245

00004840

Removal steps

◀A▶ 1. Radiator grille
2. Front bumper assembly



REMOVAL SERVICE POINT

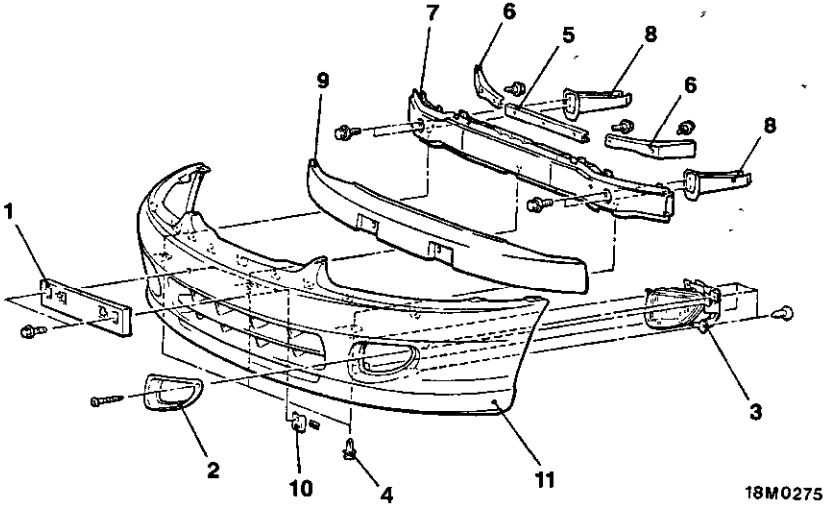
◀A▶ RADIATOR GRILLE REMOVAL <2-door models>

Remove the radiator grille by pushing the tab of the radiator grille clips in the direction of the arrows with a flat-tipped screwdriver, while lightly pulling the radiator grille towards you.

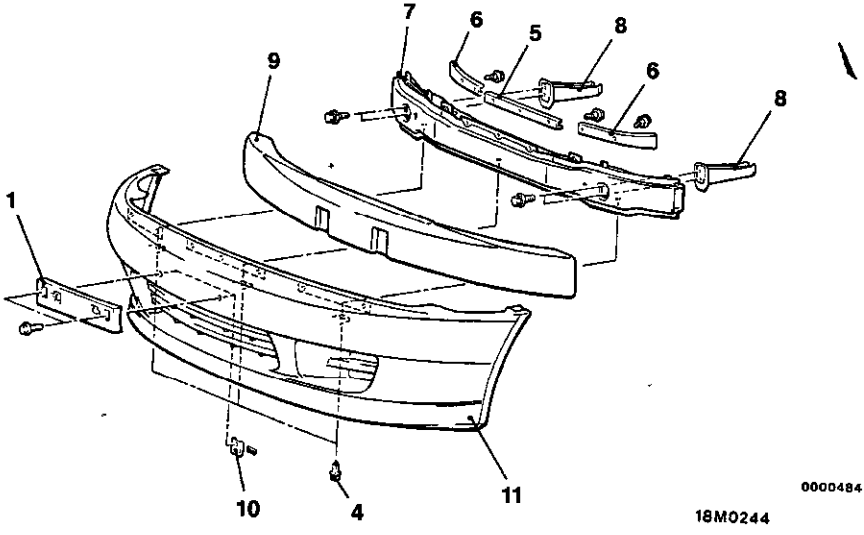
DISASSEMBLY AND REASSEMBLY

51100160115

<2-door models>

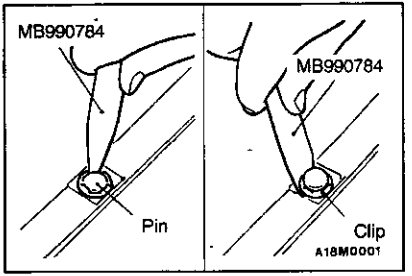


<4-door models>



Disassembly steps

1. License plate garnish
2. Front fog light bezel <2-door models>
3. Front fog light assembly <2-door models>
4. Clip ◀A▶
5. Upper center plate
6. Upper side plate
7. Bumper reinforcement
8. Bumper stay
9. Bumper core
10. License plate support bracket
11. Bumper face

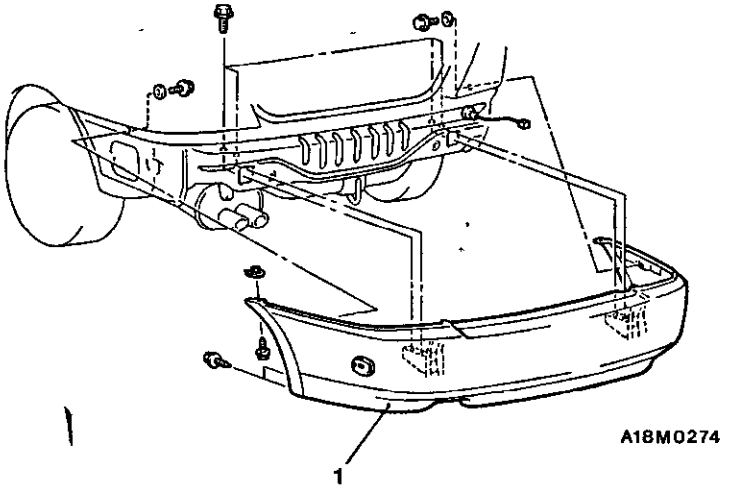


DISASSEMBLY SERVICE POINT

REAR BUMPER

51100190121

REMOVAL AND INSTALLATION

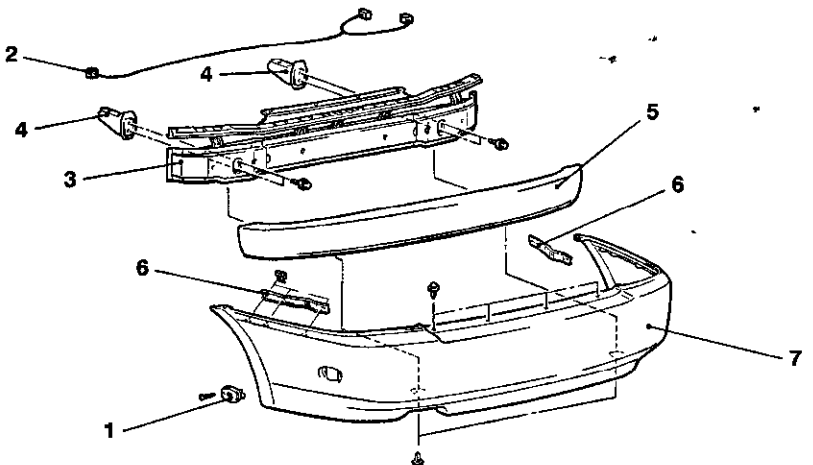


Removal steps

1. Rear bumper assembly

DISASSEMBLY AND REASSEMBLY

51100210117



Disassembly steps

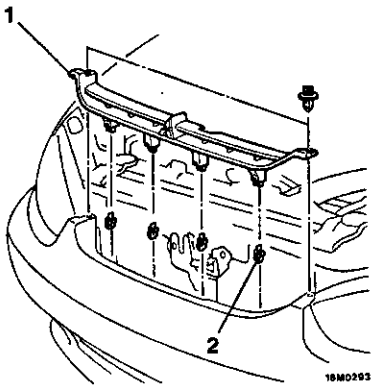
1. Rear side marker
2. Rear bumper harness
3. Bumper reinforcement
4. Bumper stay
5. Bumper core
6. Side bracket
7. Bumper face

RADIATOR GRILLE

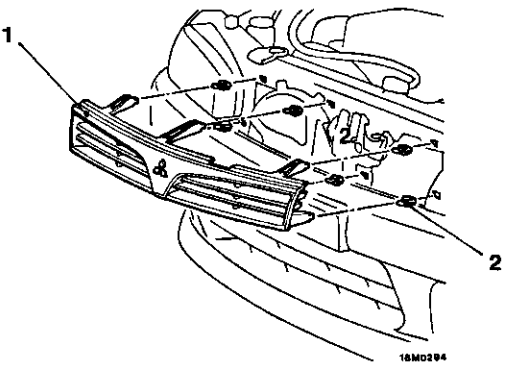
51100380016

REMOVAL AND INSTALLATION

<2-door models>



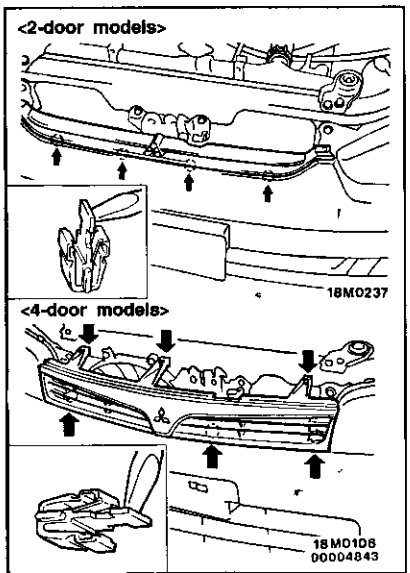
<4-door models>



00004842

Removal steps

◀A▶ 1. Radiator grille
2. Clip



REMOVAL SERVICE POINT

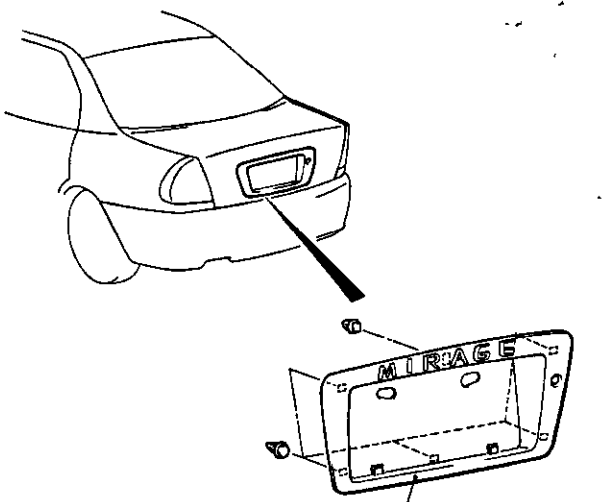
◀A▶ RADIATOR GRILLE REMOVAL

Remove the radiator grille by pushing the tab of the radiator grille clips in the direction of the arrows with a flat-tipped screwdriver, while lightly pulling the radiator grille toward you.

GARNISHES

51100410043

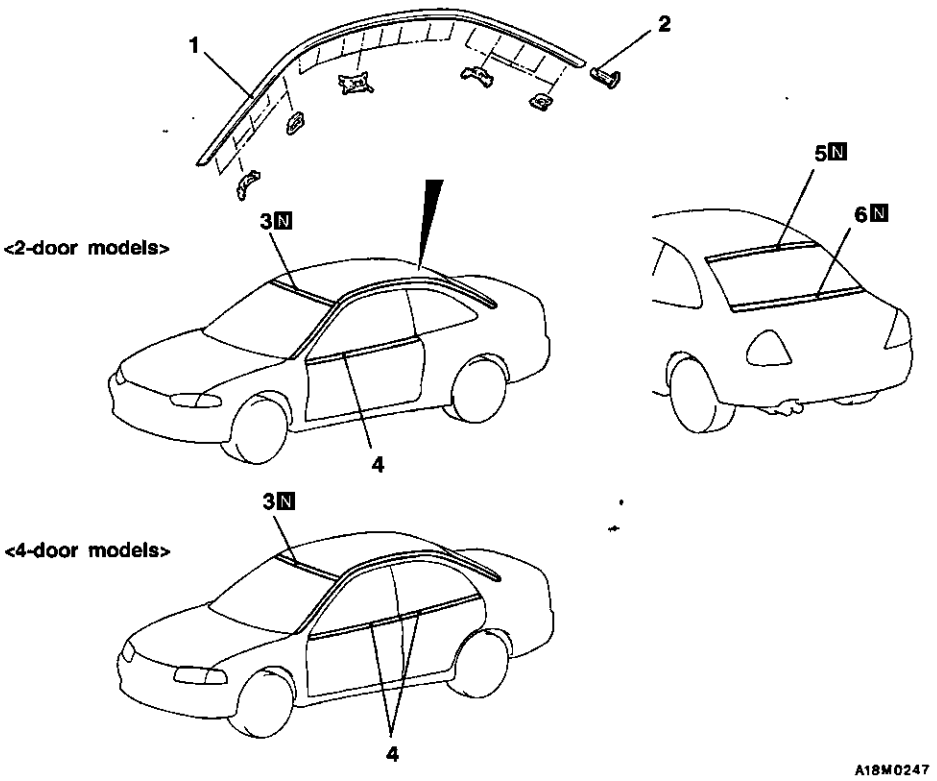
REMOVAL AND INSTALLATION



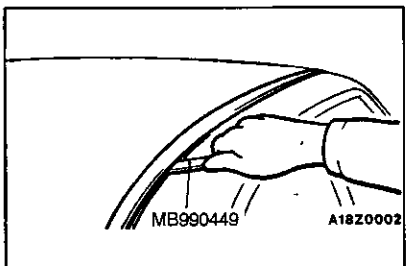
MOLDINGS

51100470188

REMOVAL AND INSTALLATION



◀A▶ ▶A◀
1. Roof drip molding
2. End cap
3. Windshield upper molding (Refer to GROUP 42 - Windshield.)
4. Belt line molding (Refer to GROUP 42 - Window Glass Runchannel and Door Opening Weatherstrip.)
5. Rear window molding upper (Refer to GROUP 42 - Rear Window Glass.)
6. Rear window molding lower (Refer to GROUP 42 - Rear Window Glass.)



REMOVAL SERVICE POINT

◀A▶ ROOF DRIP MOLDING REMOVAL

Use the special tool to lever out the molding.

Caution
If the molding has become warped, it should not be reused.

INSTALLATION SERVICE POINT

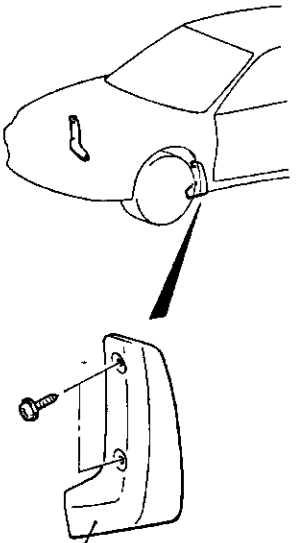
▶A◀ ROOF DRIP MOLDING INSTALLATION

(1) Install the clips to the clip installation bosses on the roof.
(2) Install the roof molding with the clips.

STONE GUARD

5110141001I

REMOVAL AND INSTALLATION

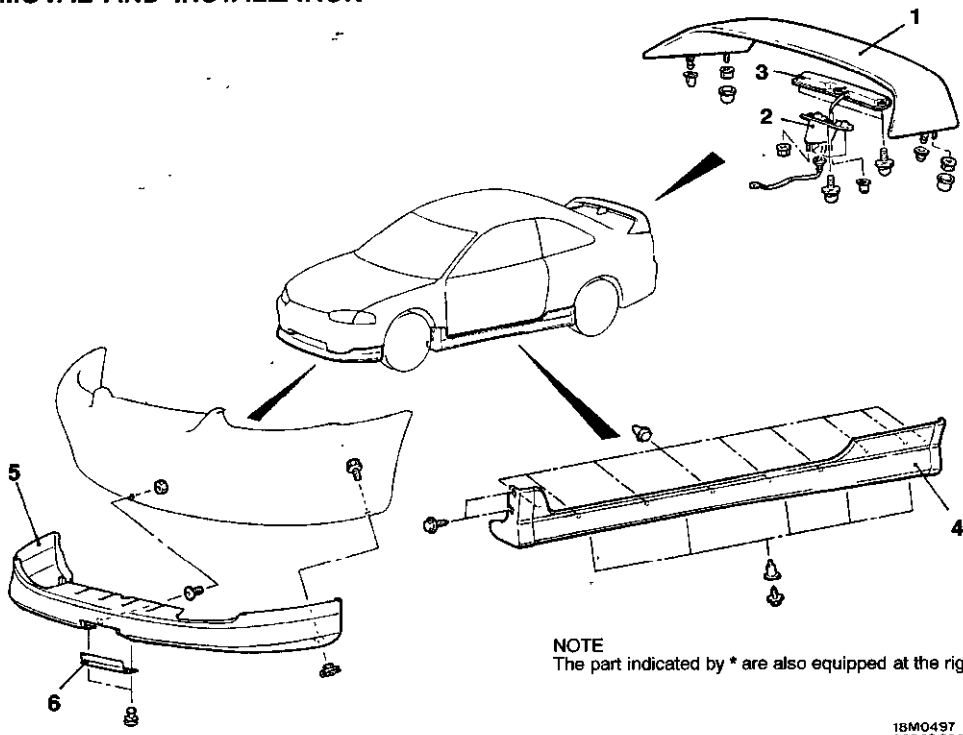


NOTE
The stone guard is also attached on the right side.

AERO PARTS

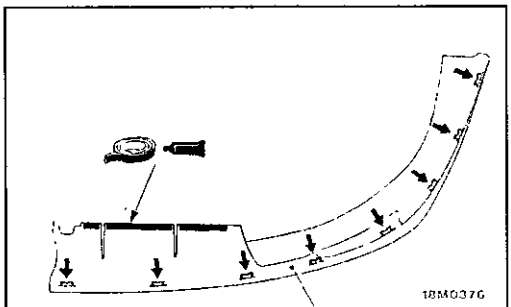
51100500221

REMOVAL AND INSTALLATION



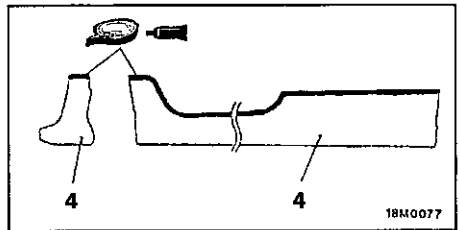
NOTE
The part indicated by * are also equipped at the right side.

18M0497
00008630



⇐: Insert bolt installation position

Adhesive tape: double-sided tape [10 mm width and 1.2 mm thickness]



Adhesive tape: double-sided tape [5 mm width and 1.2 mm thickness]

Rear spoiler removal steps

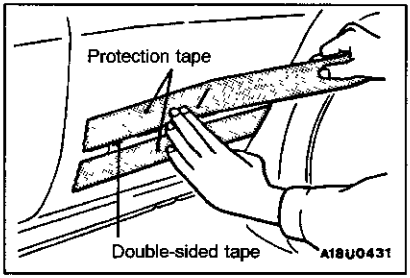
1. Rear spoiler
2. Center stay
3. High-mounted stop light

Side airdam removal <2-door models>

◀A▶ ▶A◀ 4. Side airdam

Front airdam removal steps <2-door models>

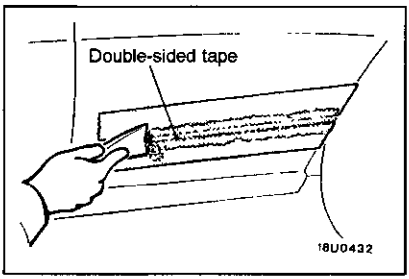
◀A▶ ▶A◀ 5. Front airdam
6. Airdam center cover



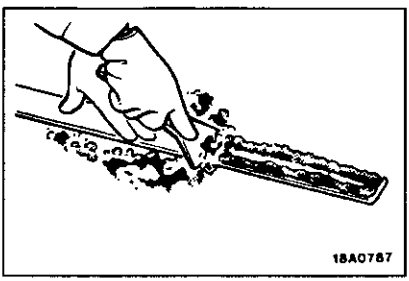
REMOVAL SERVICE POINT

◀A▶ SIDE AIRDAM/FRONT AIRDAM REMOVAL

1. Attach protection tape all the way along the edges of the double-sided tape which is still adhering to the body.



2. Use a resin spatula to scrape off the double-sided tape.
3. Peel off the protection tape.
4. Wipe the body surface and clean it with a rag moistened with isopropyl alcohol.



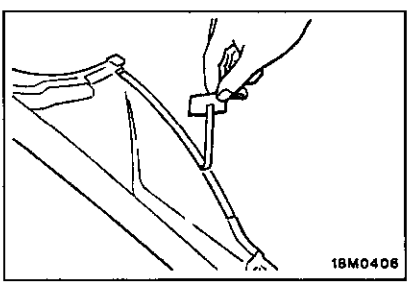
INSTALLATION SERVICE POINT

▶A◀ FRONT AIRDAM/SIDE AIRDAM INSTALLATION

Affixing double-sided tape to the side airdam (when reusing).

1. Scrape off the double-sided tape with a resin spatula or gasket scraper.
2. Wipe the side airdam adhesion surface and clean it with a rag moistened with isopropyl alcohol.
3. Affix specified pressure sensitive double-sided tape to the side airdam.

   Specified adhesive tape:
   Double-sided tape
   Front airdam: 10 mm width and 1.2 mm thickness
   Side airdam: 5 mm width and 1.2 mm thickness



4. Remove strip paper from the pressure sensitive double-sided tape.

   NOTE
   Affix double-sided tape to the end of strip paper for ease of strip paper removal.

5. Install the side airdam.

NOTE
If it is hard to affix the pressure sensitive double-sided tape in winter, heat the application surface of the body and the adhesive surface of the side airdam, before affixing the tape.

Body ..... 40 - 60°C (104 - 140°F)

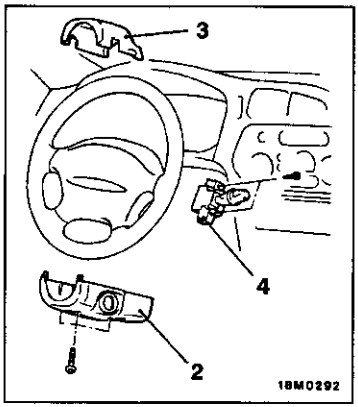
Front airdam/
Side airdam ..... 20 - 30°C (68 - 86°F)

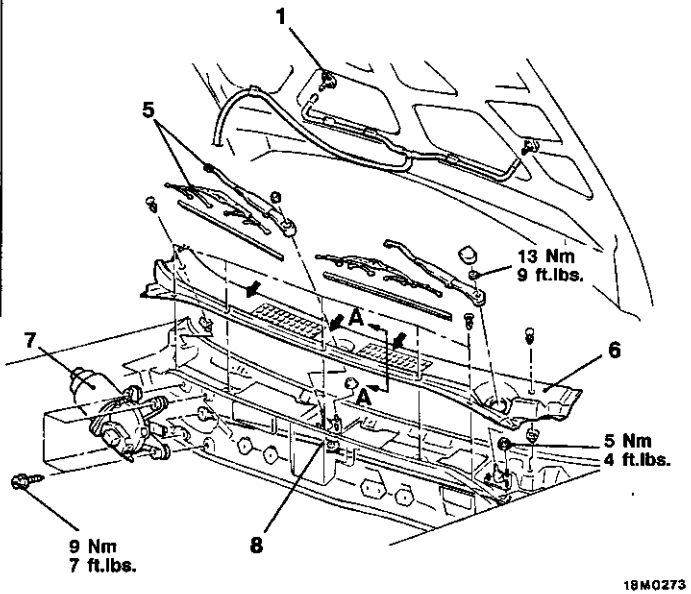
Apply pressure fully to the side airdam.

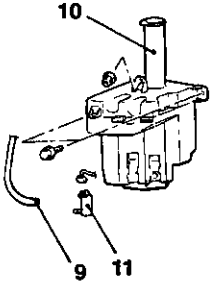
WINDSHIELD WIPER AND WASHER

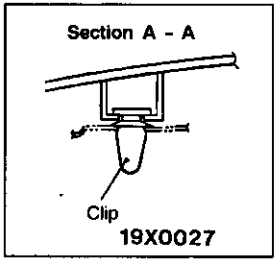
51100760131

REMOVAL AND INSTALLATION









00004844

NOTE
⬅ : Clip position

1. Washer nozzle assembly

Wiper and washer switch removal steps

2. Column cover, lower
3. Column cover, upper
4. Wiper and washer switch

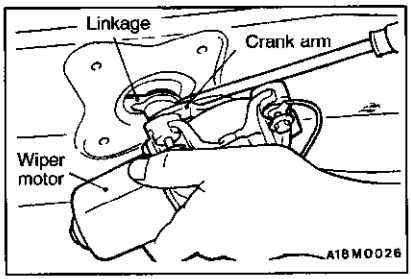
Wiper motor and linkage removal steps

▶A◀ 5. Wiper arm and blade assembly
6. Front deck garnish
◀A▶ 7. Wiper motor
8. Linkage

Washer tank removal steps

- Draining of washer fluid
- Front bumper (Refer to P.51-3.)

9. Washer hose
10. Washer tank
11. Washer motor

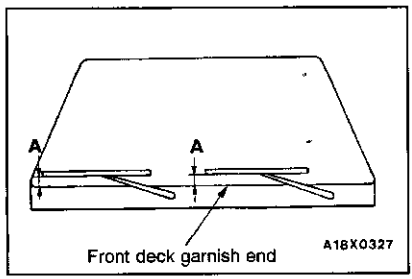


REMOVAL SERVICE POINT

◀A▶ WIPER MOTOR REMOVAL

Loosen the wiper motor assembly mounting bolts, and then remove the wiper motor assembly. Disconnect the linkage and the motor assembly, and then remove the linkage.

Caution
Because the installation angle of the crank arm and the motor has been set, do not remove them unless it is necessary to do so. If they must be removed, remove them only after marking their mounting positions.

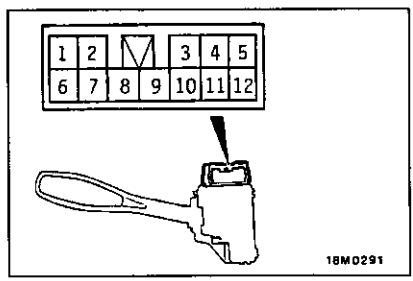


INSTALLATION SERVICE POINT

▶A◀ WIPER ARM AND BLADE ASSEMBLY INSTALLATION

Install the wiper blade in the specified position (standard value) as shown in the illustration.

Standard value (A): 25 ± 5 mm



INSPECTION

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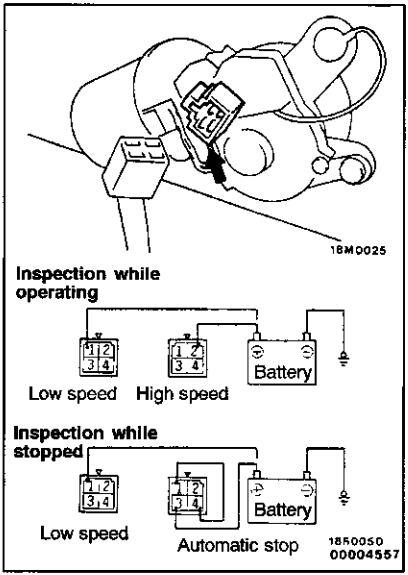
Wiper and Washer Switch

Switch position		Terminal No.				
		6	7	8	9	10
Wiper switch	OFF		○	○		
	INT		○	○		
	1 (LO)			○		○
	2 (HI)				○	○
Washer switch	ON	○				○

Intermittent Wiper Relay (Intermittent Operation Inspection)

1. Connect the column switch connector.
2. Turn the ignition switch to "ACC."
3. Inspect the intermittent operation time when the wiper switch is turned to INT.

Vehicles with variable intermittent control
FAST: Approx. 2 seconds
SLOW: Approx. 15 seconds



WIPER MOTOR CHECK

51101260043

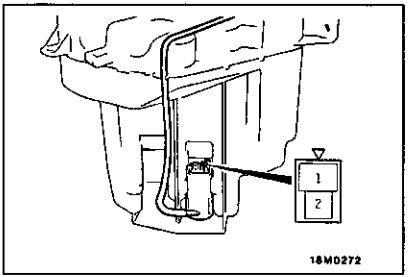
Check the wiper motor after disconnecting the wiring harness connector, and with the wiper motor remaining installed to the body.

Wiper Motor at Low Speed and High Speed Operation

Connect a battery to the wiper motor as shown in the illustration and inspect motor operation at low speed and high speed.

Wiper Motor at Stop Position Operation

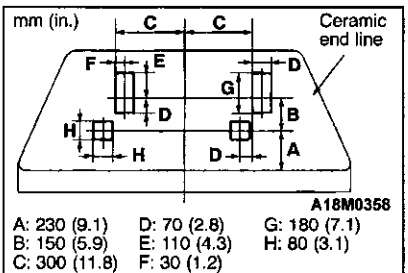
1. Run the wiper motor at low speed, disconnect the battery, and stop the motor.
2. Reconnect the battery as shown in the illustration, and confirm that after the motor starts turning at low speed, and stops at the automatic stop position.



WASHER MOTOR CHECK

51101270053

1. With the washer motor installed to the washer tank, fill the washer tank with water.
2. Check that the water squirts out strongly when battery voltage is applied to terminals (1) and (2).



A: 230 (9.1) D: 70 (2.8) G: 180 (7.1)
B: 150 (5.9) E: 110 (4.3) H: 80 (3.1)
C: 300 (11.8) F: 30 (1.2)

WASHER FLUID EJECTION POINTS CHECK

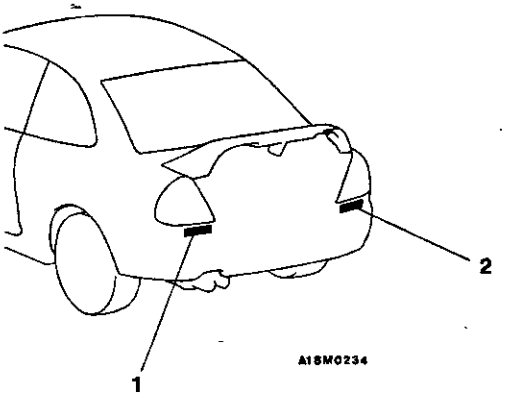
51100830016

Adjust the ejection angle by moving the ball inside the nozzle.

MARKS

51101180059

REMOVAL AND INSTALLATION



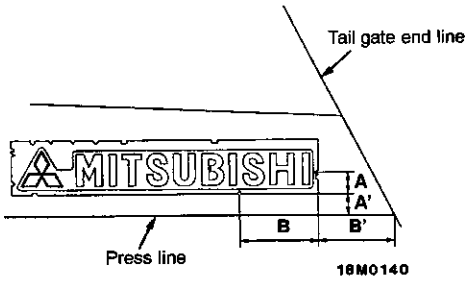
▶A◀ 1. MITSUBISHI mark
▶A◀ 2. GRADE mark

INSTALLATION SERVICE POINT

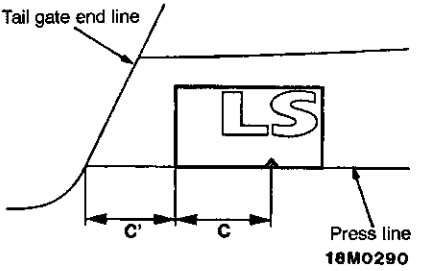
MARK INSTALLATION

Each dimension from the edge to the notch of the mark should be equal to each installation dimension. (i.e. A=A', B=B', C=C')

MITSUBISHI MARK



GRADE MARK <ES, LS, DE>



00004845

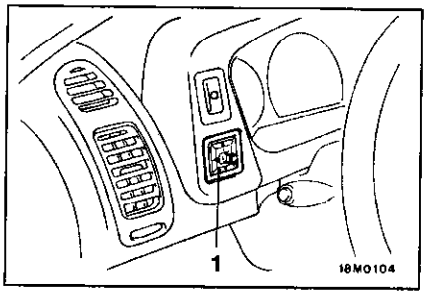
1. Clean the mark installation surfaces on the body with unleaded gasoline.
2. Peel off the backing paper from the reverse side of the marks, and then attach the marks to the vehicle body so that they fit properly into position.

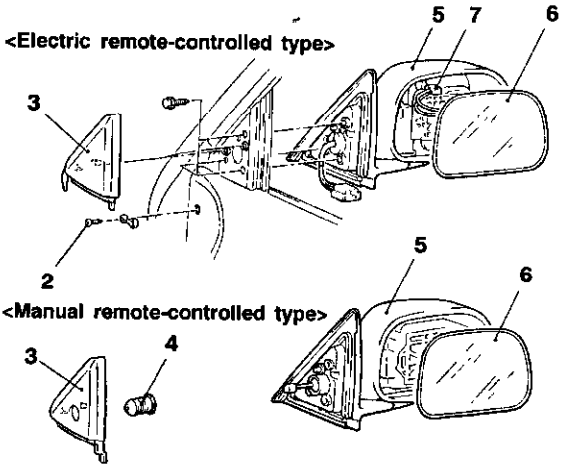
Caution
When attaching the marks, the surrounding temperature should be 20 - 38°C and the air should be completely free from dust.
If the surrounding temperature is lower than 20°C, the marks and the places on the body where the marks are to be attached should be heated to 20 - 38°C.

DOOR MIRROR

51100640053

REMOVAL AND INSTALLATION

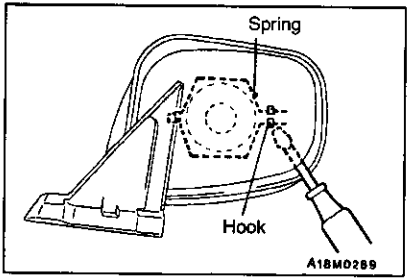




1. Door mirror control switch

Door mirror removal steps

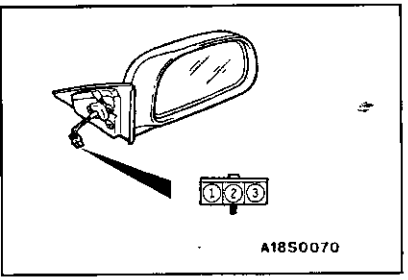
2. Door trim attaching screw
3. Delta cover inner
4. Boot
5. Door mirror
◀A▶ 6. Mirror
7. Harness connector



REMOVAL SERVICE POINT

◀A▶ MIRROR REMOVAL

Let the mirror face up, insert a flat-tipped screwdriver wound with masking tape, and remove the mirror by releasing the spring from the hook.



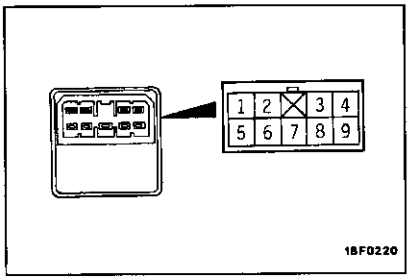
INSPECTION

51100650049

REMOTE CONTROL MIRROR ASSEMBLY CHECK

Check to be sure that the mirror moves as described in the table when each terminal is connected to the battery.

Terminal No.			Direction of operation
1	2	3	
⊖		⊕	UP
⊕		⊖	DOWN
⊕	⊖		RIGHT
⊖	⊕		LEFT



DOOR MIRROR CONTROL SWITCH CONTINUITY CHECK

51101350030

Switch position		Terminal No.						
		2	3	4	6	7	8	9
Left side	UP			○		○	○	
	DOWN			○		○	○	
	LEFT		○	○	○			
	RIGHT		○	○		○		
Right side	UP	○		○		○		
	DOWN	○		○	○			
	LEFT			○		○		○
	RIGHT			○	○			○

INTERIOR AND SUPPLEMENTAL RESTRAINT SYSTEM (SRS)

CONTENTS

52109000187

INTERIOR 52A

SUPPLEMENTAL RESTRAINT SYSTEM (SRS) 52B

INTERIOR

CONTENTS

52109000224

ADHESIVE 3
FLOOR CONSOLE* 11
FRONT SEAT 20
FRONT SEAT BELT 25
GENERAL INFORMATION 3
HEADLINING 17
INSIDE REAR VIEW MIRROR 19
INSTRUMENT PANEL* 8
REAR SEAT 22
REAR SEAT BELT 26
SPECIAL TOOLS 3
TRIMS 13
TROUBLESHOOTING 4

WARNINGS REGARDING SERVICING OF SUPPLEMENTAL RESTRAINT SYSTEM (SRS) EQUIPPED VEHICLES

WARNING!

(1) Improper service or maintenance of any component of the SRS, or any SRS-related component, can lead to personal injury or death to service personnel (from inadvertent firing of the air bag) or to the driver and passenger (from rendering the SRS inoperative).

(2) Service or maintenance of any SRS component or SRS-related component must be performed only at an authorized MITSUBISHI dealer.

(3) MITSUBISHI dealer personnel must thoroughly review this manual, and especially its GROUP 52B - Supplemental Restraint System (SRS) and GROUP 00 - Maintenance Service, before beginning any service or maintenance of any component of the SRS or any SRS-related component.

NOTE

The SRS includes the following components:SRS air bag control unit, SRS warning light, air bag module, clock spring, and interconnecting wiring. Other SRS-related components (that may have to be removed/installed in connection with SRS service or maintenance) are indicated in the table of contents by an asterisk (*).

GENERAL INFORMATION

52300010024

OPERATION

Seat belt warning buzzer

- When the ignition switch is turned ON, the decision circuit operates and the seat belt warning light inside of the combination meter flashes four times for 6 seconds.
- The decision circuit output makes the seat belt warning buzzer sound intermittently for 6 seconds to indicate unfastening of the seat belt.
- When the seat belt is buckled (seat belt buckle switch is turned OFF), the seat belt warning buzzer stops sounding.
  When the ignition switch is turned OFF, both seat belt warning light and buzzer do not operate.

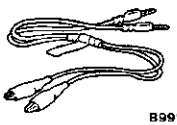
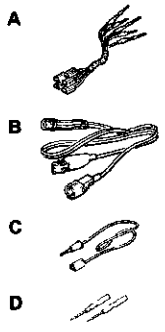
ADHESIVE

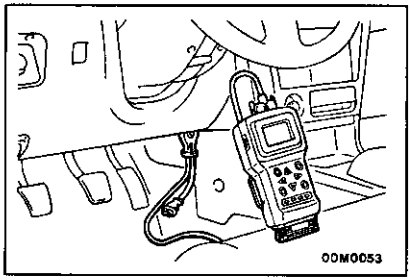
52100050037

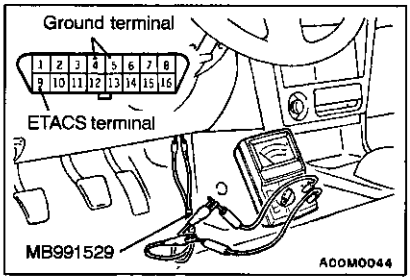
Item	Specified adhesive
Roof pad <Vehicles without sunroof>	3M Part No.EC-1368 or equivalent

SPECIAL TOOLS

52100050139

Tool	Tool number and name	Supersession	Application
 B990784	MB990784 Ornament remover	General service tool	Removal of switch, trim, etc.
 B991502	MB991502 Scan tool (MUT-II)	MB991496-OD	ETACS-ECU input signal checking
 B991529	MB991529 Diagnostic trouble code check harness	Tool not necessary if scan tool <MUT-II> is available	ETACS-ECU input signal checking (when using the voltmeter)
 C991223	MB991223 Harness set A: MB991219 Test harness B: MB991220 LED harness C: MB991221 LED harness adapter D: MB991222 Probe	MB991223	Measurement of terminal voltage A: Connector pin contact pressure inspection B, C: Power circuit inspection D: Commercial tester connection





TROUBLESHOOTING

52300280036

DIAGNOSTIC FUNCTION

INPUT SIGNAL INSPECTION POINTS <VEHICLES WITH ETACS-ECU>

When Using the Scan Tool

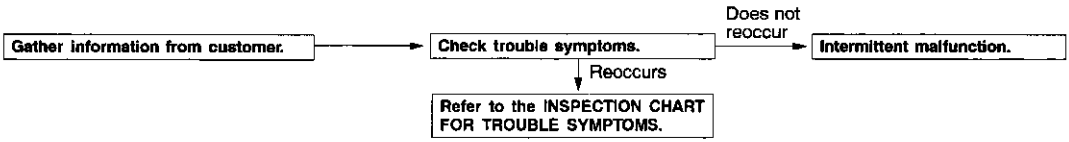
1. Connect the scan tool to the data link connector.
   Caution
   The scan tool should be connected or disconnected after turning the ignition switch to the OFF position.
2. If buzzer of the scan tool sounds once when the front seat belt buckle switch is operated (ON/OFF), the ETACS-ECU input signal for that switch circuit system is normal.

When Using the Voltmeter

1. Use the special tool to connect a voltmeter between the ground terminal and the ETACS terminal of the data link connector.
2. If the voltmeter indicator deflects once when the front seat belt buckle switch is operated (ON/OFF), the ETACS-ECU input signal for that switch circuit system is normal.

STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING

52300270019



INSPECTION CHART FOR TROUBLE SYMPTOM

52300300091

Trouble symptom		Inspection procedure No.	Reference page
Communication with scan tool is not possible. <Vehicles with ETACS-ECU>	Communication with all systems is not possible.	1	52A-5
	No communication with switch signal input.	2	52A-5
When the seat belts are not fastened and the ignition switch is turned to the ON position, the seat belt warning buzzer does not sound and the seat belt warning light does not illuminate nor flash.		3	52A-5
When the seat belts are not fastened and the ignition switch is turned to the ON position, the seat belt warning light illuminates or flashes, but the seat belt warning buzzer does not sound.		4	52A-6
When the seat belts are not fastened and the ignition switch is turned to the ON position, the seat belt warning buzzer sound, but the seat belt warning light does not illuminate nor flash.		5	52A-7
After having the ignition switch turned to the ON position, the seat belt warning buzzer does not stop sounding for six seconds, even though the seat belt is buckled immediately.		Refer to inspection procedure No.4	52A-6

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

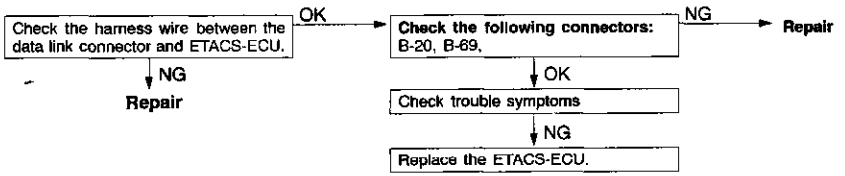
INSPECTION PROCEDURE 1

Communication with scan tool is not possible. (Communication with all systems is not possible.)	Probable cause
The cause is probably in the defective power supply system (including ground) for the diagnostic line.	• Malfunction of wiring harnesses or connectors

Refer to GROUP 13A - Troubleshooting.

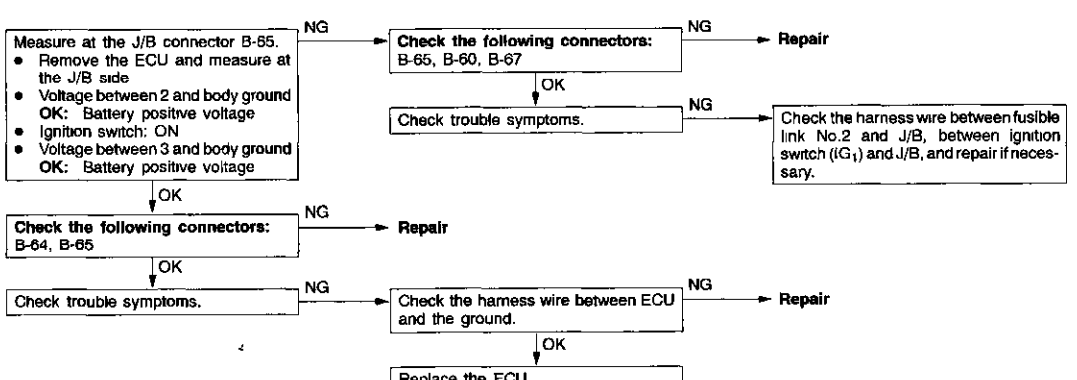
INSPECTION PROCEDURE 2

Communication with scan tool is not possible. (No communication with switch signal input.)	Probable cause
The cause is probably a defective one-shot pulse input circuit system of the diagnostic line.	• Malfunction of ETACS-ECU • Malfunction of wiring harnesses or connectors



INSPECTION PROCEDURE 3

When the seat belts are not fastened and the ignition switch is turned to the ON position, the seat belt warning buzzer does not sound, and the seat belt warning light does not illuminate nor flash.	Probable cause
The cause may be a malfunction of the ECU power supply circuit system or of the ground circuit system.	• Malfunction of ECU • Malfunction of wiring harnesses or connectors



INSPECTION PROCEDURE 4

When the seat belts are not fastened and the ignition switch is turned to the ON position, the seat belt warning light illuminates or flashes, but the seat belt warning buzzer does not sound.	Probable cause
It is possible that there is a malfunction of the seat belt buckle switch circuit	• Malfunction of seat belt buckle switch • Malfunction of ECU • Malfunction of harnesses or connectors

<Vehicles with ETACS-ECU>

Scan tool input signal check
Seat belt buckle switch input check
OK: When the front seat belt buckle switch is turned on, the scan tool buzzer sounds once.
NG → Seat belt buckle switch continuity check (Refer to P.52A-26)
NG → **Replace**
OK ↓
OK → Replace the ETACS-ECU.

Check the following connectors:
B-23, E-19, B-64, B-65
NG → **Repair**
OK ↓

Check trouble symptom.
NG → Check the harness wire between the seat belt buckle switch and J/B, between the seat belt buckle switch and ground, and repair if necessary.

<Vehicles with buzzer-ECU>

Disconnect the seat belt buckle switch connector E-19 and measure at the harness side.
- Voltage between 1 and body ground
  OK: System voltage

NG → **Check the following connectors:**
E-19, B-64, B-65
NG → **Repair**
OK ↓

Check trouble symptom.
NG → Check the harness wire between the seat belt buckle switch and J/B, and repair if necessary

OK ↓

Seat belt buckle switch continuity check (Refer to P.52A-26.)
NG → **Replace**
OK ↓

Disconnect the seat belt buckle switch connector E-19 and measure at the harness side.
- Continuity between 2 and body ground
  OK: Continuity

NG → **Check the following connectors:**
B-23, E-19
NG → **Repair**
OK ↓

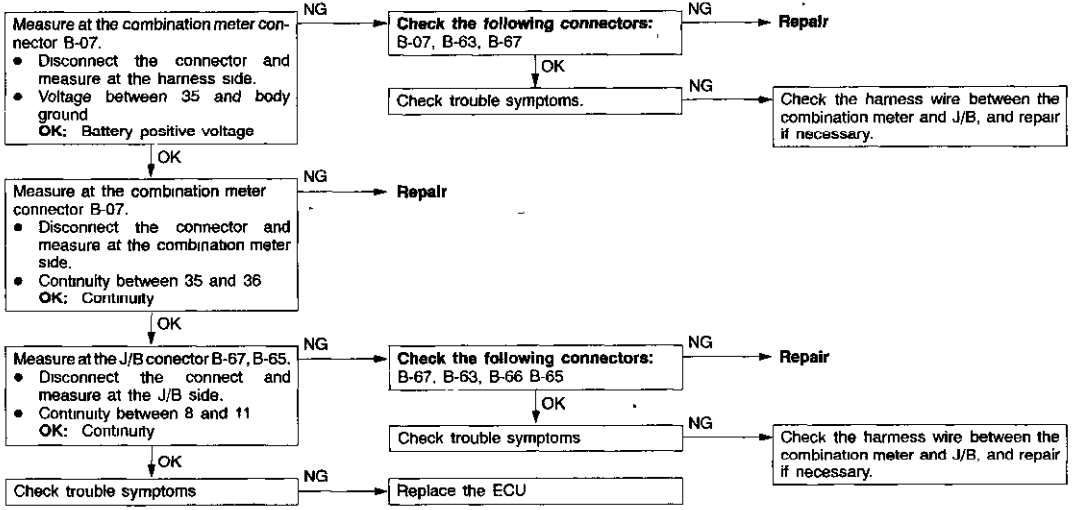
Check trouble symptom.
NG → Check the harness wire between the seat belt buckle switch and ground, and repair if necessary.

OK ↓

Replace the buzzer-ECU.

INSPECTION PROCEDURE 5

When the seat belts are not fastened and the ignition switch is turned to the ON position, the seat belt warning buzzer sounds, but the seat belt warning light does not illuminate nor flash.	Probable cause
It is possible that there is a malfunction of the seat belt warning light circuit or ECU.	• Malfunction of bulb • Malfunction of ECU • Malfunction of harnesses or connectors



INSTRUMENT PANEL

52100170306

REMOVAL AND INSTALLATION

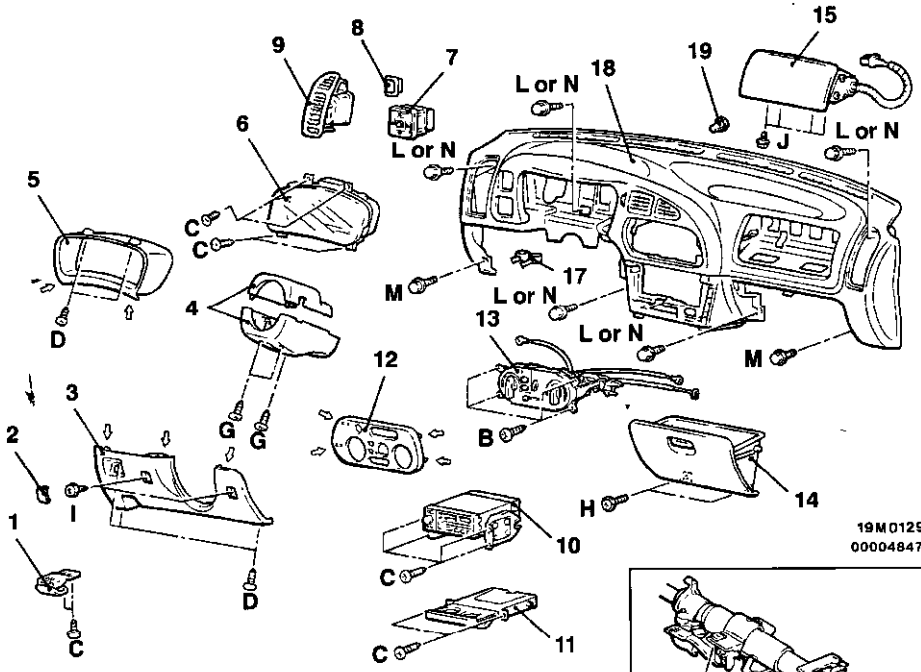
For installation of the instrument panel, the bolts and screws described below are used. They are indicated by symbols in the illustration.

Name	Symbol	Size mm (D x L)	Color	Shape
Tapping screw	A	5×12	-	 A00Z0010
	B	5×14	-	
	C	5×16	-	
	D	5×20	Black	
	E	5×12	-	 B00Z0010
	F	5×16	-	
	G	5×20	-	
Washer-assembled screw	H	5×16	-	 C00Z0010
	I	5×20	-	
Washer-assembled bolt	J	6×16	-	 D00Z0010
	K	6×20	-	
	L	6×16	-	 E00Z0010
	M	6×16	Black	
Self-tapping bolt	N	6×16	-	 F00Z0010

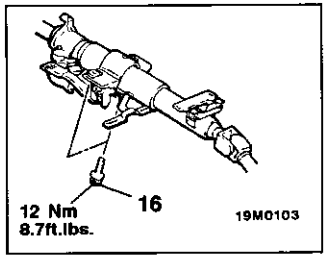
D = Thread diameter
L = Effective thread length

CAUTION: SRS
- **When removing and installing the floor console, do not let it bump against the SRS-ECU.**
- **For the passenger side air bag module removal/installation, always observe the service procedures of GROUP 52B - Air Bag Module and Clock Spring.**

Pre-removal and Post-installation Operation
- Floor Console Assembly Removal and Installation (Refer to P.52A-11.)



NOTE
⇦ : metal clip position

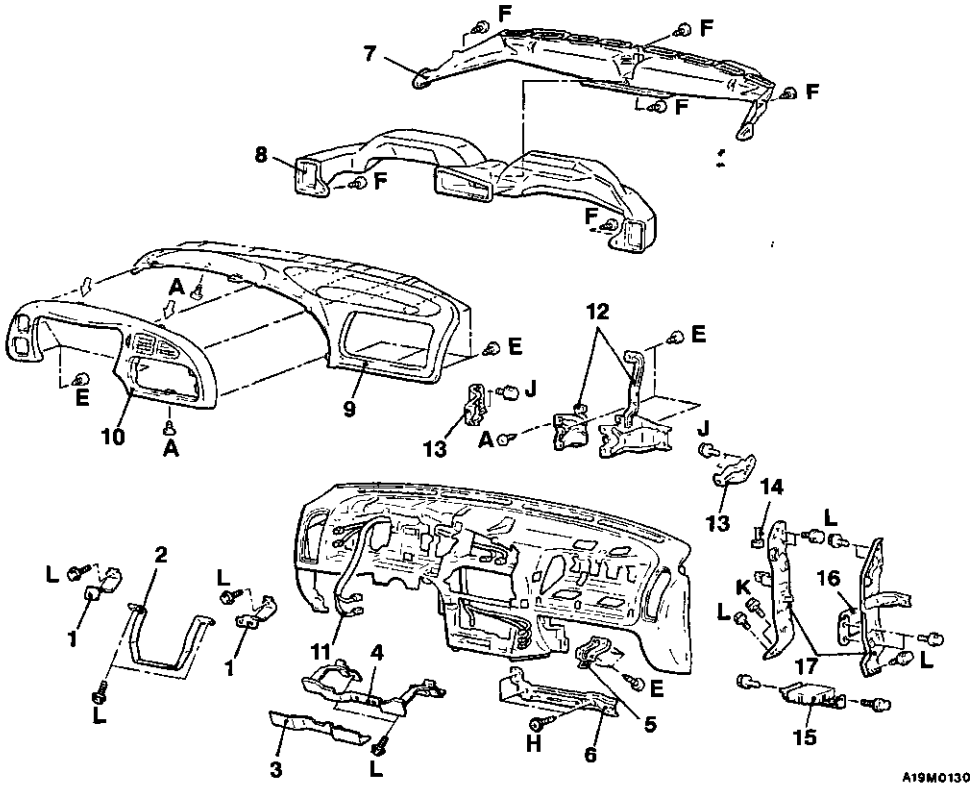


Removal steps
- Rheostat (Refer to GROUP 54.)

1. Hood lock release handle
2. Knee protector plug
3. Knee protector assembly
4. Column cover
5. Meter bezel
6. Combination meter
7. Door mirror control switch or plug
8. Auto-cruise control main switch, fog light switch or plug
9. Side air outlet assembly
10. Radio and tape player
11. Cup holder
12. Heater control panel
13. Heater control assembly (Refer to GROUP 55.)
14. Glove box
15. Front passenger's air bag module assembly
16. Steering column assembly installation bolt
17. Harness connector
18. Instrument panel assembly
19. Grommet

DISASSEMBLY AND REASSEMBLY

52100190135



NOTE
⇦ : metal clip position

Disassembly steps

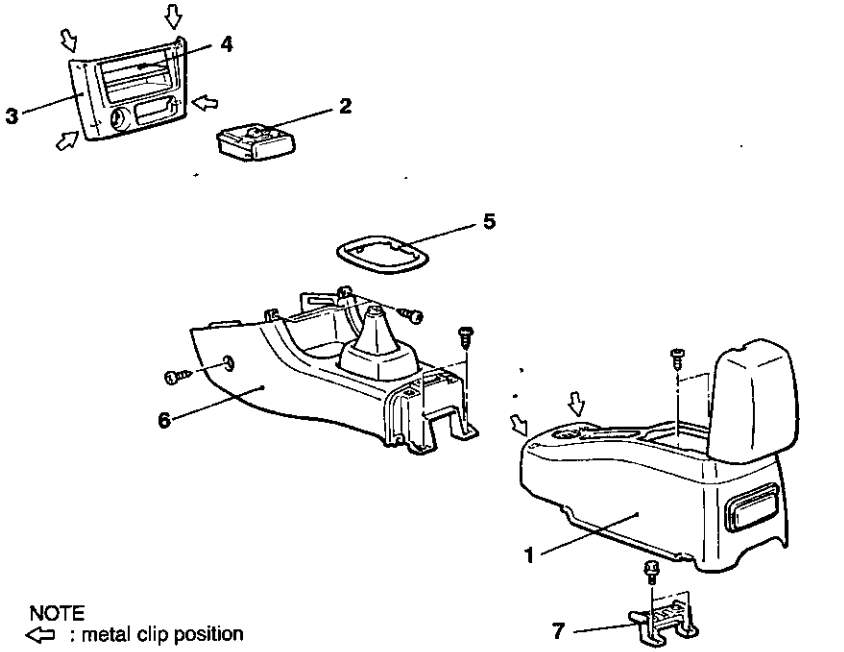
1. Stay
2. Column protector
3. Reinforcement cover
4. Bracket
5. Glove box striker
6. Glove box frame
7. Defroster nozzle assembly
8. Distribution duct
9. Instrument pad
10. Cluster panel
11. Instrument panel wiring harness
12. Instrument panel reinforcement
13. Lower bracket
14. Harness connector
15. ABS-ECU
16. Relay
17. Center reinforcement

FLOOR CONSOLE

52100220117

REMOVAL AND INSTALLATION

CAUTION: SRS
When removing and installing the floor console, do not let it bump against the SRS-ECU.



NOTE
⇦ : metal clip position

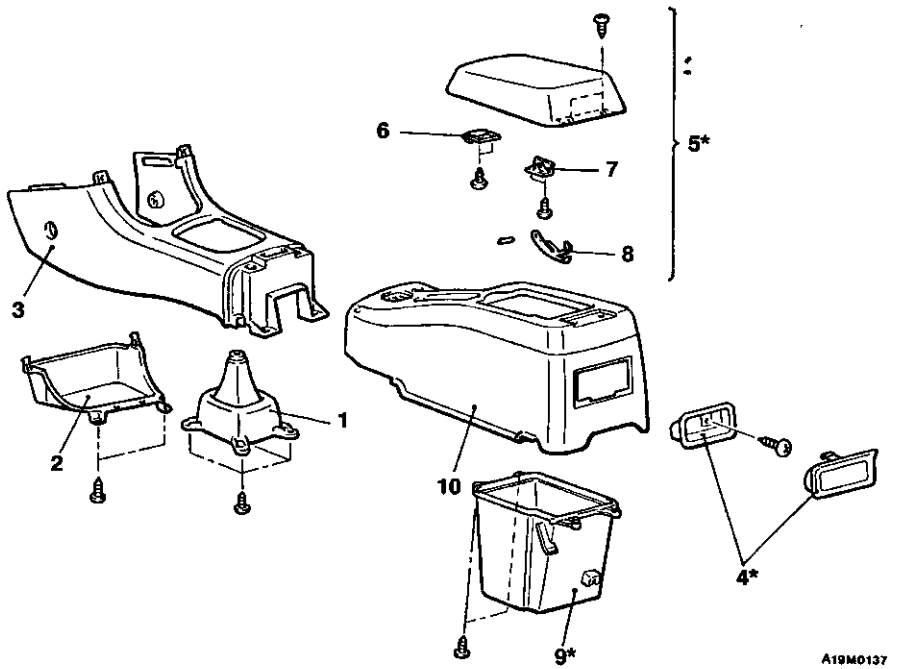
A19M0136

Removal steps

1. Rear floor console assembly
2. Ashtray
3. Audio panel
4. Box
   - Shift lever knob <M/T> (Refer to GROUP 22A - Transaxle Control.)
5. A/T panel
6. Front floor console assembly
7. Rear console bracket

DISASSEMBLY AND REASSEMBLY

52100240083



NOTE
*: Vehicles with console lid

Disassembly steps

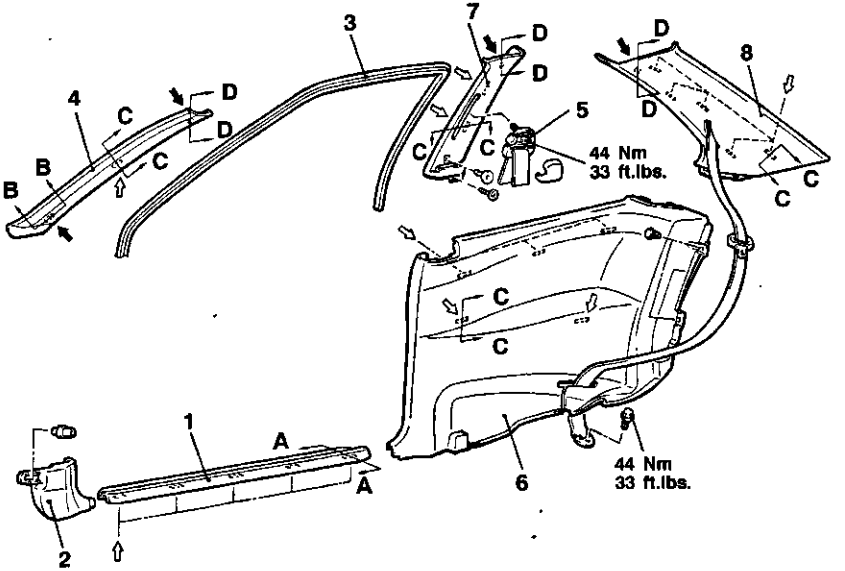
1. Shift lever cover <M/T>
2. Console tray
3. Front floor console
4. Ashtray
5. Console lid assembly
6. Lock lever
7. Cover
8. Stopper
9. Cover box
10. Rear floor console

TRIMS

52100110148

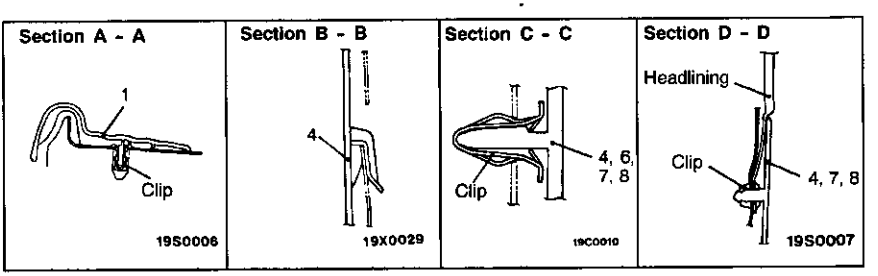
REMOVAL AND INSTALLATION

<2-door models>



19M0134
00004848

NOTE
⇦ : Metal clip position
⬅ : Resin clip position



Cowl side trim removal steps

1. Scuff plate
2. Cowl side trim

Front pillar trim removal steps

3. Door inner opening weatherstrip
4. Front pillar trim

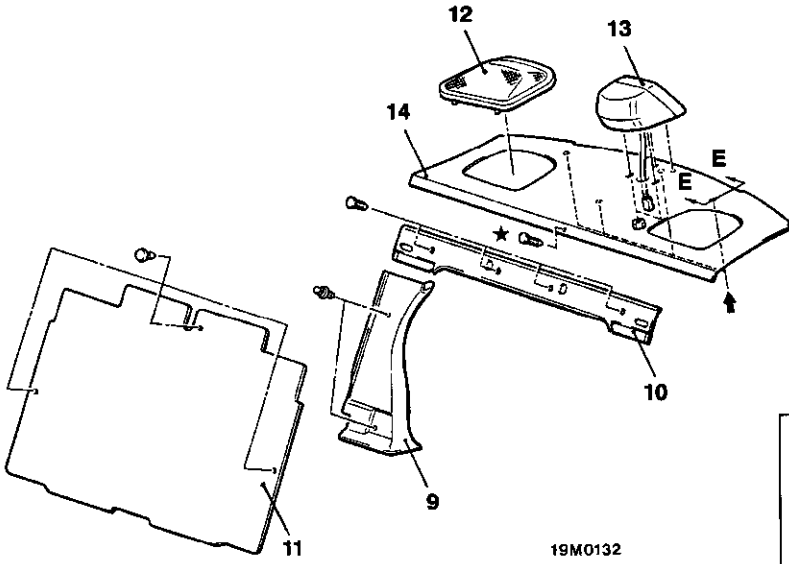
Center pillar trim, rear pillar trim and quarter trim removal steps

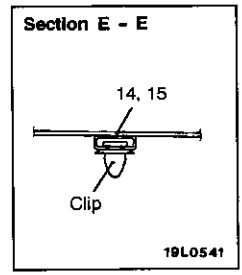
- Rear seat assembly (Refer to P.52A-22.)

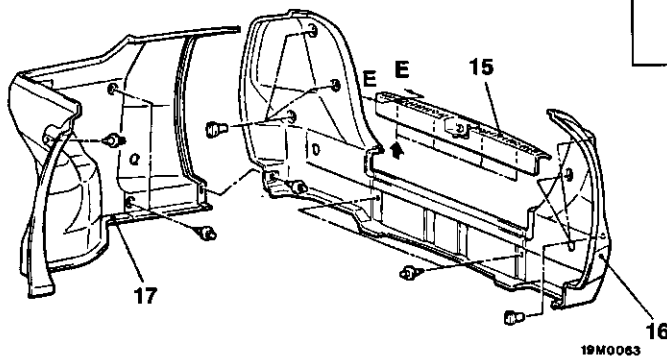
1. Scuff plate
3. Door inner opening weatherstrip
5. Sash guide
6. Quarter trim
7. Center pillar trim

- Rear shelf trim (Refer to P.52A-14.)

8. Rear pillar trim







00004849

NOTE
(1)⬅ : Resin clip position
(2) Clips marked with ★ are used on vehicles with split type rear seat.

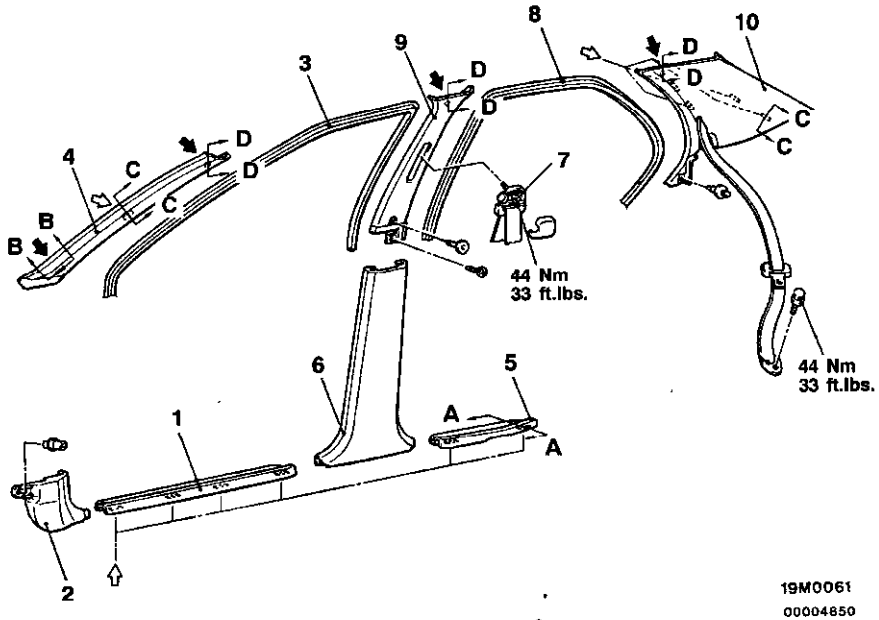
Rear shelf trim removal steps

- Rear seat assembly
  (Refer to P.52A-22.)
9. Rear seat back brace trim
   <Vehicles with split type rear seat>
10. Rear seat back trim
    <Vehicles with split type rear seat>
11. Rear partition board
    <Vehicles with bench type rear seat>
12. Speaker garnish
13. High mounted stop light
14. Rear shelf trim

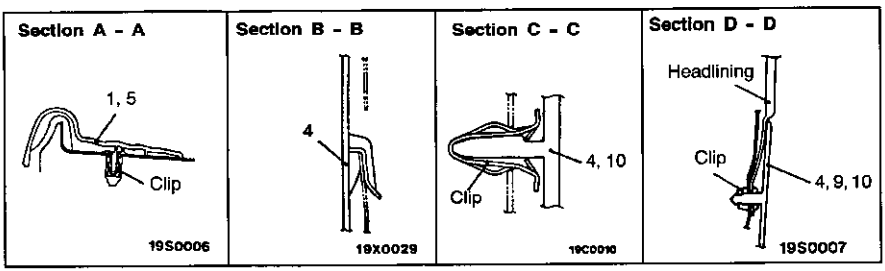
Trunk trim removal steps

15. Rear end trim cover
16. Rear end trim
17. Trunk side trim

<4-door models>



NOTE
⇦ : Metal clip position
⬅ : Resin clip position

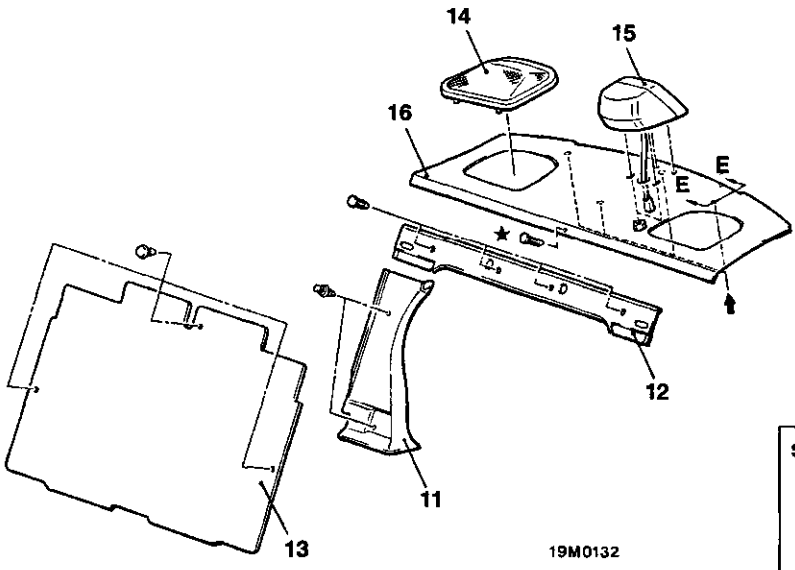


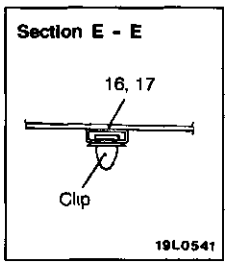
Cowl side trim removal steps
1. Front scuff plate
2. Cowl side trim

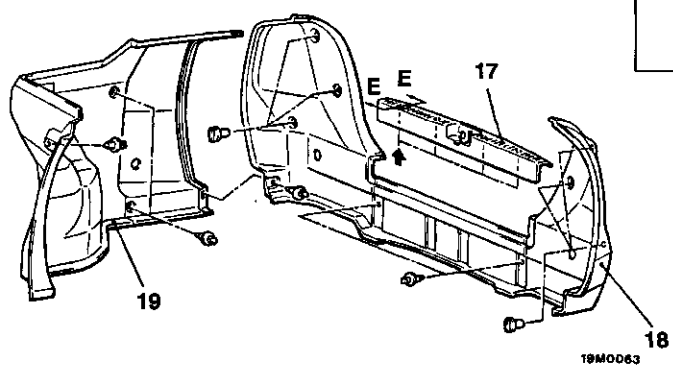
Front pillar trim removal steps
3. Front door inner opening weather-strip
4. Front pillar trim

Center pillar trim lower and center pillar trim upper removal steps
1. Front scuff plate
5. Rear scuff plate
6. Center pillar trim, lower
3. Front door inner opening weather-strip
7. Sash guide
8. Rear door inner opening weather-strip
9. Center pillar trim, upper

Rear pillar trim removal steps
- Rear seat assembly (Refer to P.52A-22.)
8. Rear door inner opening weather-strip
- Rear shelf trim (Refer to P.52A-16.)
10. Rear pillar trim







00004849

NOTE
(1) ⬅ : Resin clip position
(2) Clips marked with ★ are used on vehicles with split type rear seat.

Rear shelf trim removal steps

- Rear seat assembly
  (Refer to P.52A-22.)
11. Rear seat back brace trim
    <Vehicles with split type rear seat>
12. Rear seat back trim
    <Vehicles with split type rear seat>
13. Rear partition board
    <Vehicles with bench type rear seat>
14. Speaker garnish
15. High mounted stop light
16. Rear shelf trim

Trunk trim removal steps

17. Rear end trim cover
18. Rear end trim
19. Trunk side trim

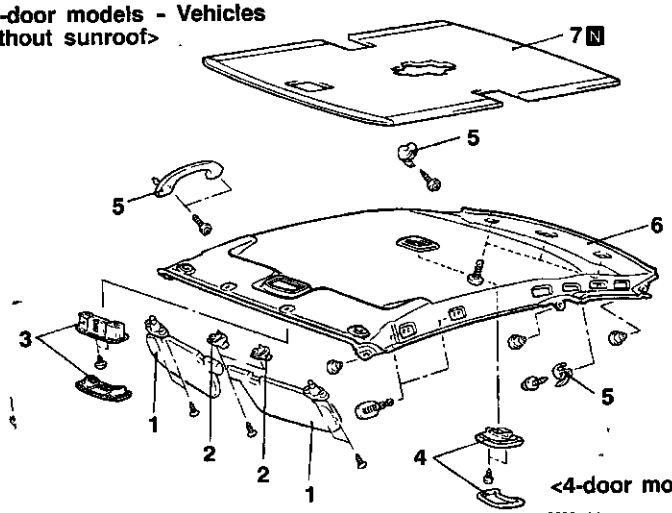
HEADLINING

52100140222

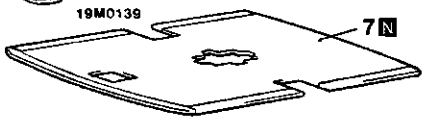
REMOVAL AND INSTALLATION

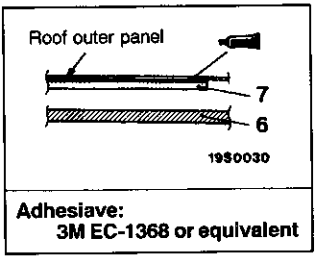
Pre-removal and Post-installation Operation
- Front Pillar Trim, Center Pillar Trim <2-door models>, Center Pillar Trim Upper <4-door models> and Rear Pillar Trim Removal and Installation (Refer to P.52A-13.)

<2-door models - Vehicles without sunroof>

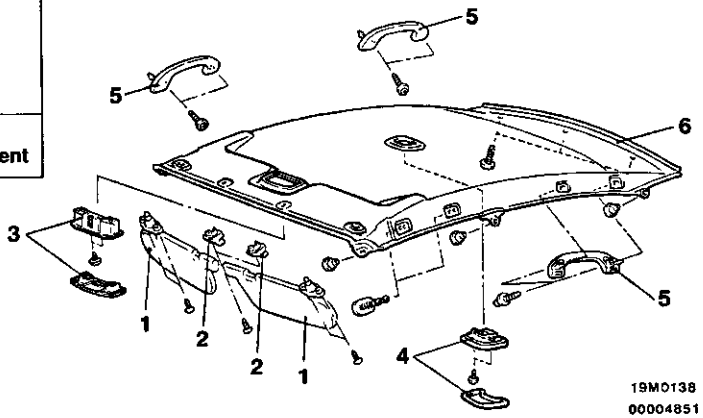


<4-door models - Vehicles without sunroof>





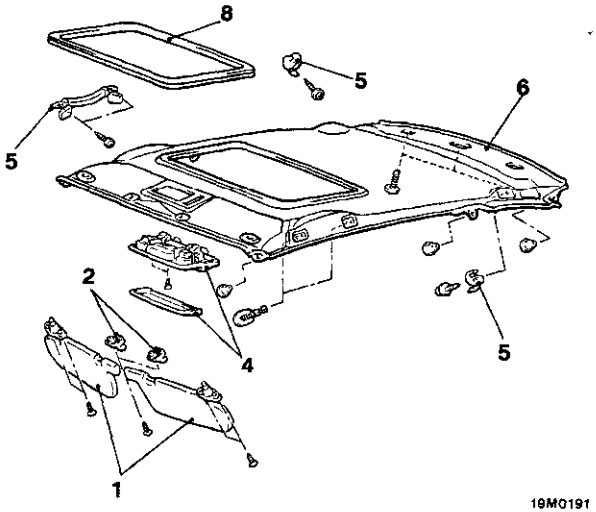
Adhesiave:
3M EC-1368 or equivalent



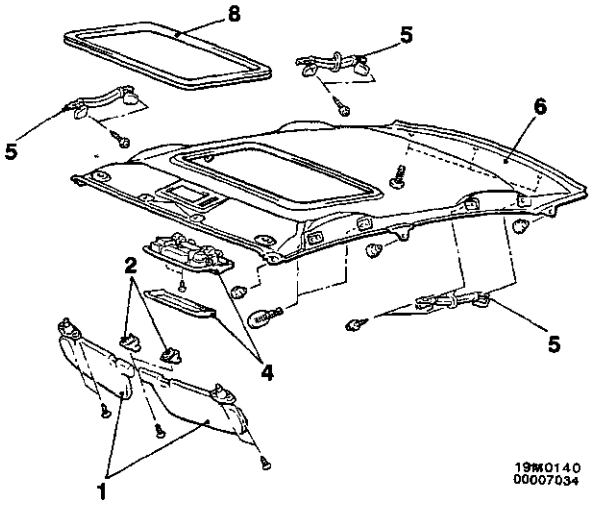
Removal steps

1. Sunvisor assembly
2. Sunvisor holder
3. Map light
   <Vehicles with map light>
4. Dome light
5. Assist grip or coat hanger
6. Headlining
7. Roof pad

<2-door models - Vehicles with sunroof>



<4-door models - Vehicles with sunroof>



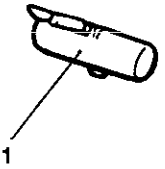
Removal steps

1. Sunvisor assembly
2. Sunvisor holder
4. Dome light assembly
5. Assist grip or coat hanger
6. Headlining
8. Headlining trim

INSIDE REAR VIEW MIRROR

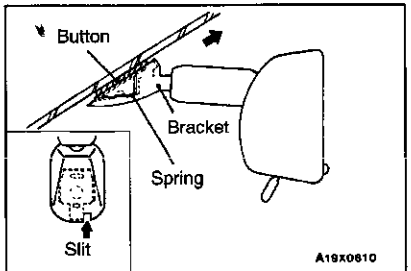
52100270068

REMOVAL AND INSTALLATION



A19X0657

◀A▶ 1. Inside rear view mirror



REMOVAL SERVICE POINT

◀A▶ INSIDE REAR VIEW MIRROR REMOVAL

Insert a narrow flat-tip screwdriver into the slit in the inside rear view mirror bracket, keep the spring pushed in and remove the inside rear view mirror in the direction of the arrow in the illustration.

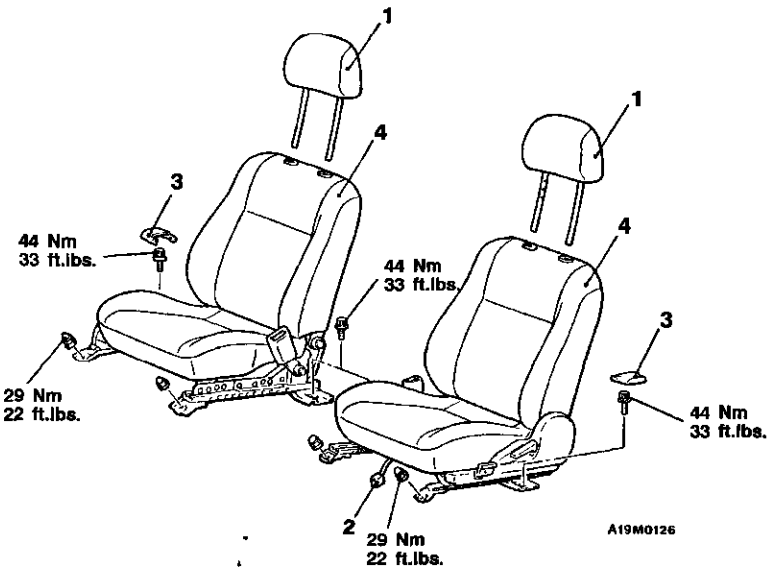
NOTE
While the spring is pushed in, the connection between the spring and the pawl of the button is released.

FRONT SEAT

52200130130

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Rear Floor Console Assembly Removal and Installation (Refer to P.52A-11.)

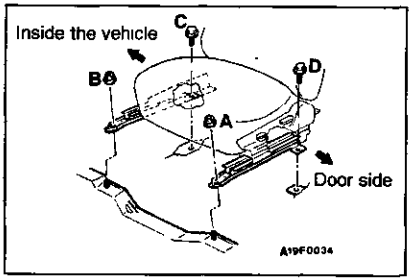


1. Headrestraint
   <Vehicles with low-back seat>

Front seat assembly removal steps

2. Harness connector
3. Seat anchor cover
▶A◀ 4. Front seat assembly

NOTE
Install each seat assembly mounting nut and bolt in every installation location, then tighten to the specified torque.



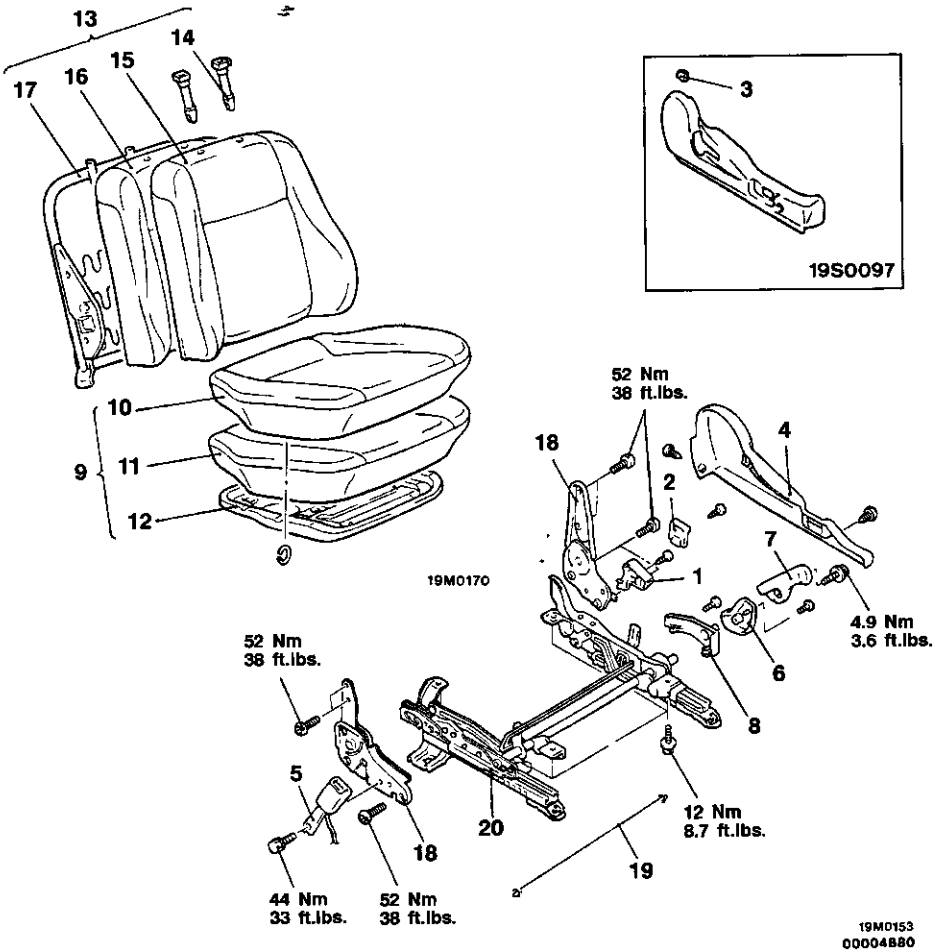
INSTALLATION SERVICE POINT

▶A◀ FRONT SEAT ASSEMBLY INSTALLATION

Tighten the front seat mounting bolts in the order A, B, C, and D.

DISASSEMBLY AND REASSEMBLY

52200150174



Disassembly steps

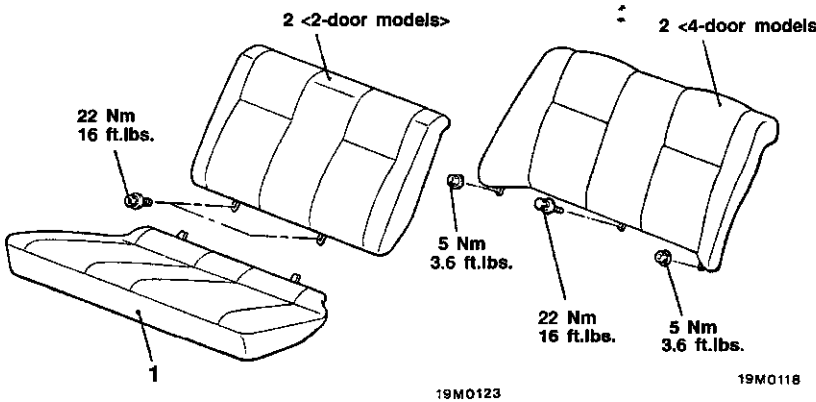
1. Reclining adjusting knob
2. Slide adjusting knob
3. Walk-in knob
   <Vehicles with walk-in system>
4. Front seat shield cover
5. Inner seat belt
6. Front seat height adjuster inner lever <Vehicles with height adjuster>
7. Front seat height adjuster lever <Vehicles with height adjuster>
8. Front seat inner cover
   <Vehicles with height adjuster>
9. Front seat cushion assembly
10. Front seat cushion cover
11. Front seat cushion pad
12. Front seat cushion frame
13. Front seat back assembly
14. Head restraint guide
    <Vehicles with low-back seat>
15. Front seat back cover
16. Front seat back pad
17. Front seat back frame
18. Reclining adjuster
19. Pull wire
20. Seat adjuster

REAR SEAT

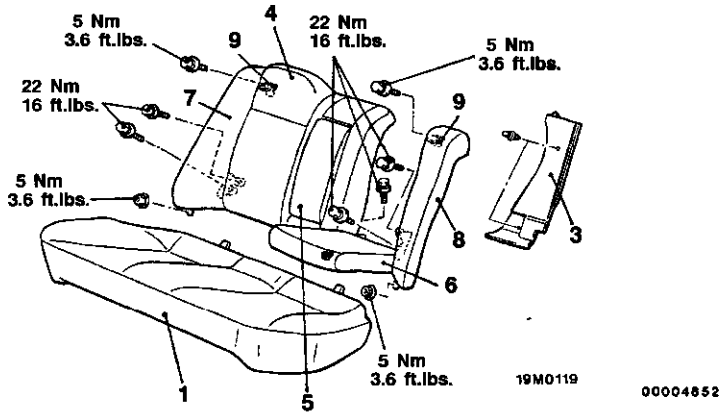
52200180128

REMOVAL AND INSTALLATION

<Bench seat>



<Split seat>

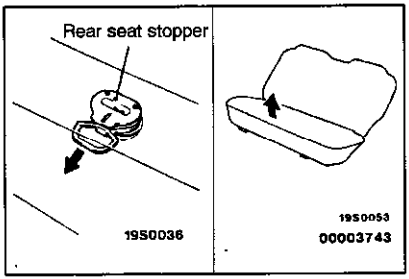


Bench seat removal steps

◀A▶ ▶C◀ 1. Rear seat cushion
▶A◀ 2. Rear seat back

Split seat removal steps

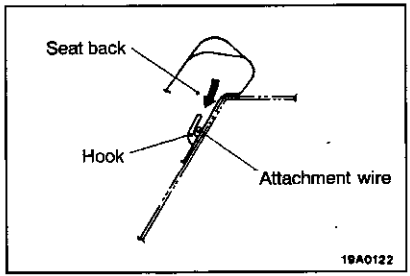
◀A▶ ▶C◀ 1. Rear seat cushion
3. Rear seat back brace trim
▶B◀ 4. Rear seat back (R.H.)
5. Arm rest
▶B◀ 6. Rear seat back (L.H.)
▶A◀ 7. Rear seat back, side (R.H.) <4-door models>
▶A◀ 8. Rear seat back, side (L.H.) <4-door models>
9. Striker



REMOVAL SERVICE POINT

◀A▶ REAR SEAT CUSHION REMOVAL

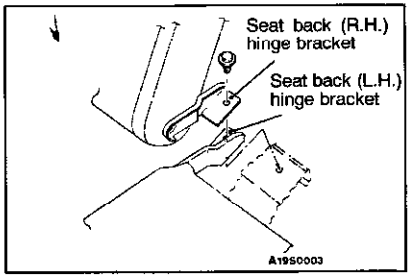
While keeping the rear seat stopper pulled, lift up the seat cushion to remove it.



INSTALLATION SERVICE POINTS

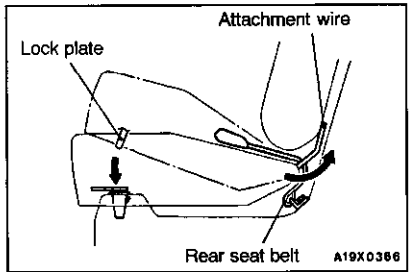
▶A◀ REAR SIDE SEAT BACK (L.H.)/REAR SIDE SEAT BACK (R.H.)/REAR SEAT BACK INSTALLATION

1. Push the seat back.
2. Then down in the direction indicated in the illustration; then securely attach the attachment wire to the body side hook and install the seat back.



▶B◀ REAR SEAT BACK (L.H.)/REAR SEAT BACK (R.H.) INSTALLATION

Place the seat back (L.H.) hinge bracket facing downward and the seat back (R.H.) hinge bracket facing upward, and then install the bolt.



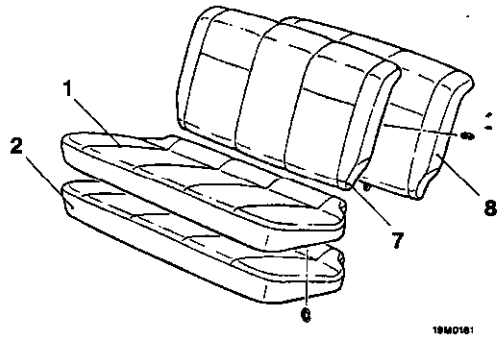
▶C◀ REAR SEAT CUSHION INSTALLATION

1. Pull the rear seat belt on top of the seat cushion.
2. Insert the seat cushion attachment wire securely below the seat back.
3. Insert the seat cushion lock plate securely into the floor holes.

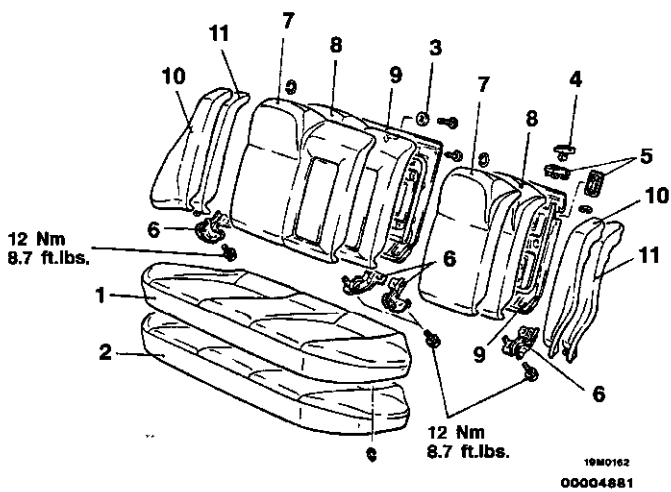
DISASSEMBLY AND REASSEMBLY

52200200015

<Bench seat>



<Split seat>



Bench seat disassembly steps

1. Rear seat cushion cover
2. Rear seat cushion pad
7. Rear seat back cover
8. Rear seat back pad

Split seat disassembly steps

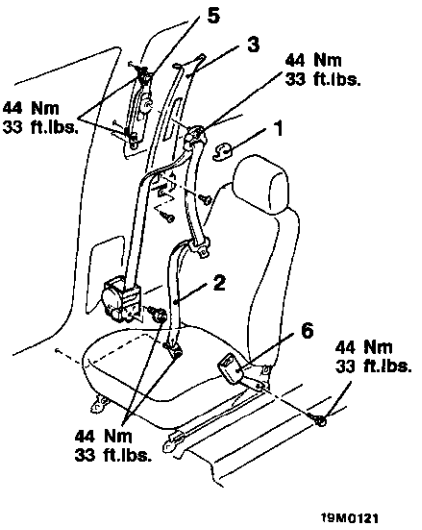
1. Rear seat cushion cover
2. Rear seat cushion pad
3. Rear seat back damper
4. Knob
5. Garnish
6. Rear seat back hinge
7. Rear seat back cover
8. Rear seat back pad
9. Rear seat back frame
10. Rear seat back side cover <4-door models>
11. Rear seat back side pad <4-door models>

FRONT SEAT BELT

52300130287

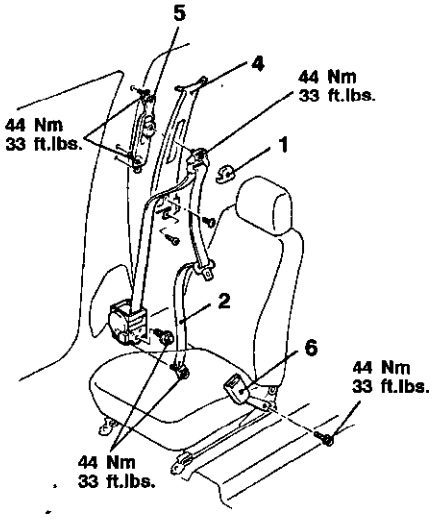
REMOVAL AND INSTLLATION

<2-door models>



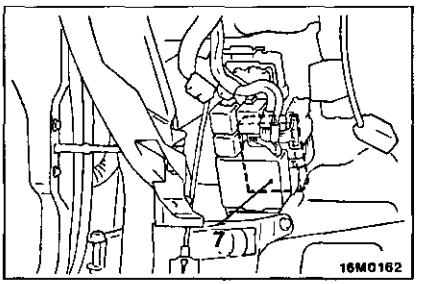
19M0121

<4-door models>



19M0120

00004853



16M0162

Outer seat belt removal steps

- Quarter trim
  <2-door model>
  (Refer to P.52A-13.)
- Center pillar trim, lower
  <4-door model>
  (Refer to P.52A-15.)

1. Sash guide cover
2. Outer seat belt
3. Center pillar trim
   <2-door models>
   (Refer to P.52A-13.)
4. Center pillar trim, upper
   <4-door models>
   (Refer to P.52A-15.)
5. Adjustable seat belt anchor

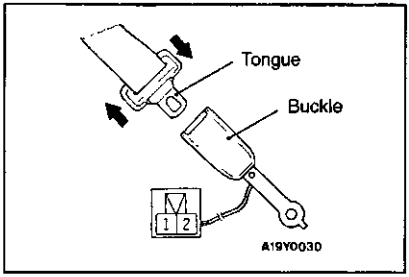
Inner seat belt removal steps

- Front seat (Refer to P.52A-20.)

6. Inner seat belt

Buzzer-ECU or ETACS-ECU (Seat belt warning light timer and buzzer) removal

7 Buzzer-ECU or ETACS-ECU
(Refer to GROUP 54 - ignition Switch.)



INSPECTION

52300140051

SEAT BELT BUCKLE SWITCH CONTINUITY CHECK

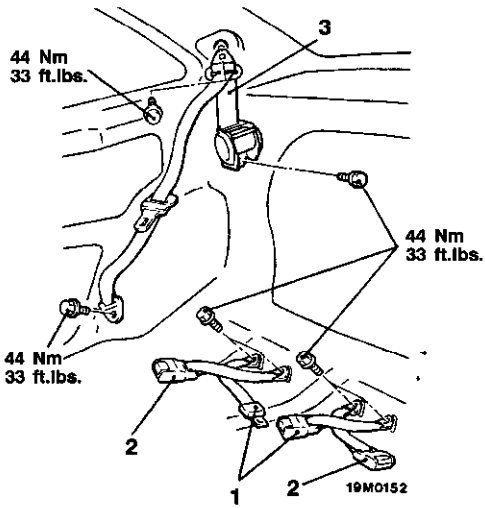
Items	Terminal No.	
	1	2
Fastened seat belt		
Unfastened seat belt	○	○

REAR SEAT BELT

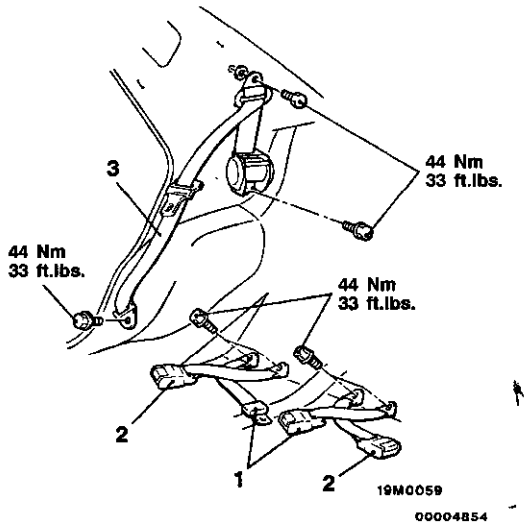
52300160088

REMOVAL AND INSTALLATION

<2-door models>



<4-door models>



Removal steps

- Rear seat
  (Refer to P.52A-22.)
1. Center seat belt
2. Inner seat belt
- Quarter trim <2-door models>
  (Refer to P.52A-13.)
- Rear pillar trim
  (Refer to P.52A-13.)
3. Outer seat belt

SUPPLEMENTAL RESTRAINT SYSTEM (SRS)

CONTENTS

52409000117

AIR BAG MODULES AND CLOCK SPRING 27

AIR BAG MODULE DISPOSAL PROCEDURES 34

- Deployed Air Bag Module Disposal 39
- Undeployed Air Bag Module Disposal 34

GENERAL INFORMATION 2

- Circuit Diagram 8
- Component Location 10
- Configuration Diagrams 7
- Construction Diagram 3
- Introduction 2
- Schematic 6
- Warning/Caution Labels 4

INDIVIDUAL COMPONENT SERVICE 25

POST-COLLISION DIAGNOSIS 22

SPECIAL TOOLS 12

SRS AIR BAG CONTROL UNIT (SRS-ECU) 26

SRS MAINTENANCE 22

SRS SERVICE PRECAUTIONS 10

TEST EQUIPMENT 12

TROUBLESHOOTING 13

CAUTION

- **Carefully read and observe the information in the SRS SERVICE PRECAUTIONS (P.52B-10.) prior to any service.**
- **For information concerning troubleshooting or maintenance, always observe the procedures in the Troubleshooting (P.52B-13.) or the SRS Maintenance (P.52B-22.) sections, respectively.**
- **If any SRS components are removed or replaced in connection with any service procedures, be sure to follow the procedures in the INDIVIDUAL COMPONENT SERVICE section (P.52B-25.) for the components involved.**
- **If you have any questions about the SRS, please contact your local distributor.**

GENERAL INFORMATION

52400010324

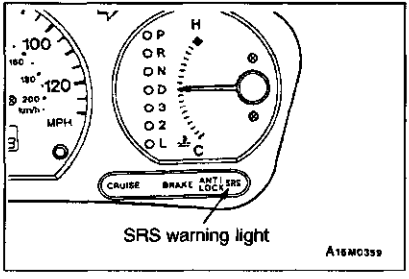
INTRODUCTION

The Supplemental Restraint System (SRS) is designed to supplement the driver's and front passenger's seat belts to help reduce the risk or severity of injury to the driver and front passenger by activating and deploying both air bags in certain frontal collisions.

The SRS consist of two air bag modules, SRS air bag control unit (SRS-ECU), SRS warning light, and clock spring. One air bag is located in the center of the steering wheel and another above the glove box. Each air bag is made up of a folded air bag and an inflator unit. The control unit under the floor console monitors the system and has a safing G sensor and an analog G sensor. The warning light on the instrument panel indicates the operational status of the SRS. The clock spring is installed in the steering column. Only authorized service personnel should do work on or around the SRS components. Those service personnel should read this manual carefully before starting any such work.

Caution

Extreme care must be used when servicing the SRS to avoid injury to the service personnel (by inadvertent deployment of the air bags) or the driver (by rendering the SRS inoperative).



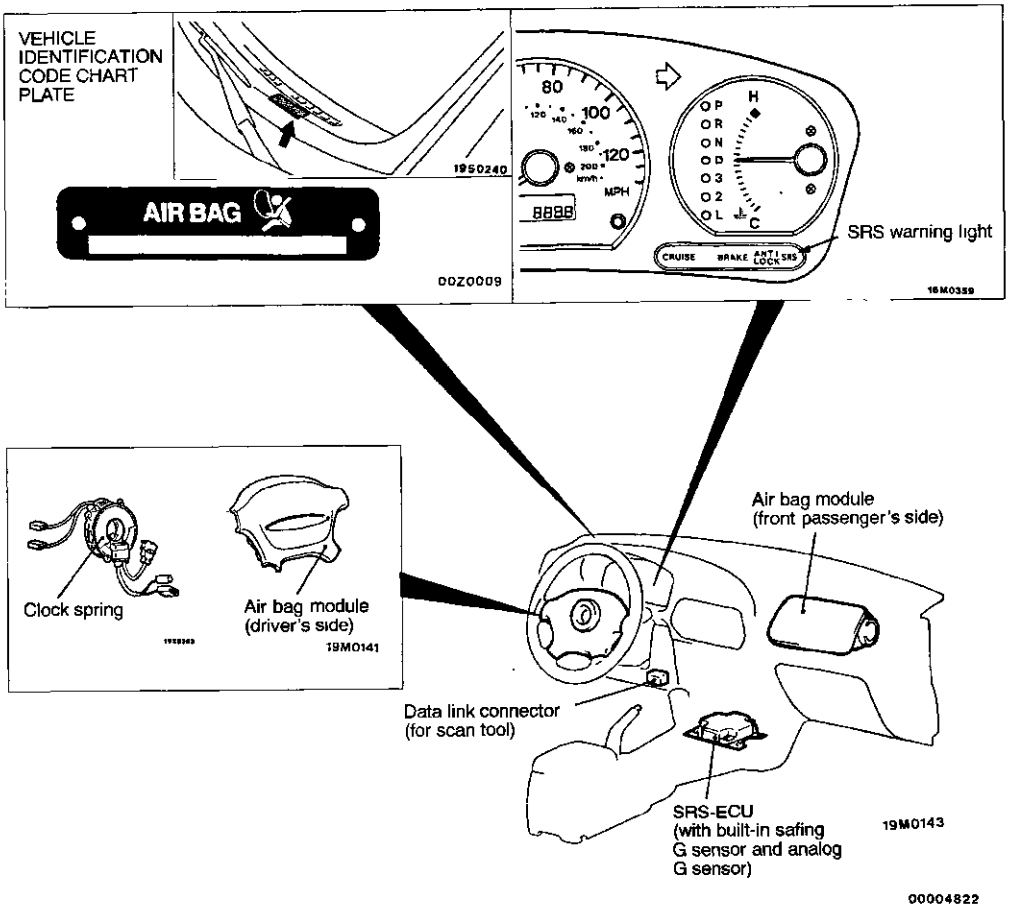
ON-BOARD DIAGNOSTIC/SRS WARNING LIGHT FUNCTION

The diagnosis unit monitors the SRS system and stores data concerning any detected faults in the system. When the ignition key is in "ON" or "START" position, the SRS warning light should illuminate for about 7 seconds and then turn off. That indicates that the SRS system is in operational order. If the SRS warning light does any of the following, immediate inspection by an authorized dealer is needed.

(1) The SRS warning light does not illuminate as described above.
(2) The SRS warning light stays on for more than 7 seconds.
(3) The SRS warning light illuminates while driving.

If a vehicle's SRS warning light is in any of these three conditions when brought in for inspection, the SRS system must be inspected, diagnosed and serviced in accordance with this manual.

CONSTRUCTION DIAGRAM

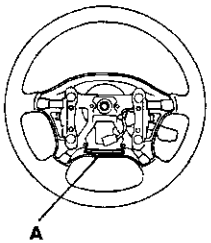


NOTE
This construction diagram shows the general view of the SRS components.
For details, refer to "Schematic" (P.52B-6), "Configuration Diagrams" (P.52B-7) and "Circuit Diagram" (P.52B-8).

WARNING/CAUTION LABELS

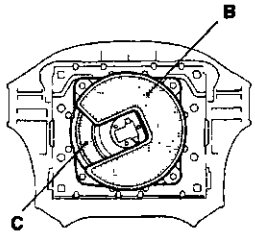
A number of caution labels related to the SRS are found in the vehicle, as shown in the following illustration. Follow label instructions when servicing SRS. The label J is not to be removed except by owner. If the other labels are dirty or damaged, replace them.

Steering wheel



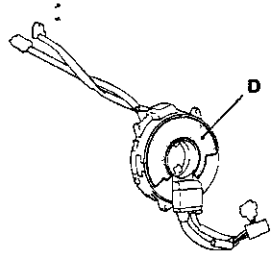
19X0541

Air bag module (driver's side)



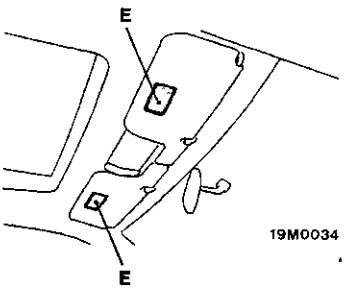
19M0147

Clock spring



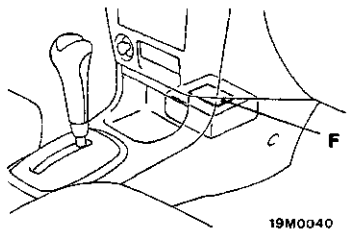
19X0015

Sun visor



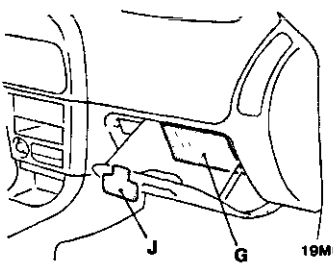
19M0034

SRS-ECU



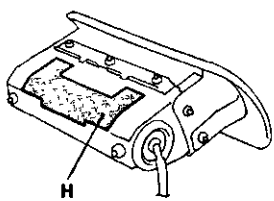
19M0040

Glove box



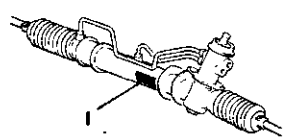
19M0190

Air bag module (front passenger's side)



19M0021

Steering gear box

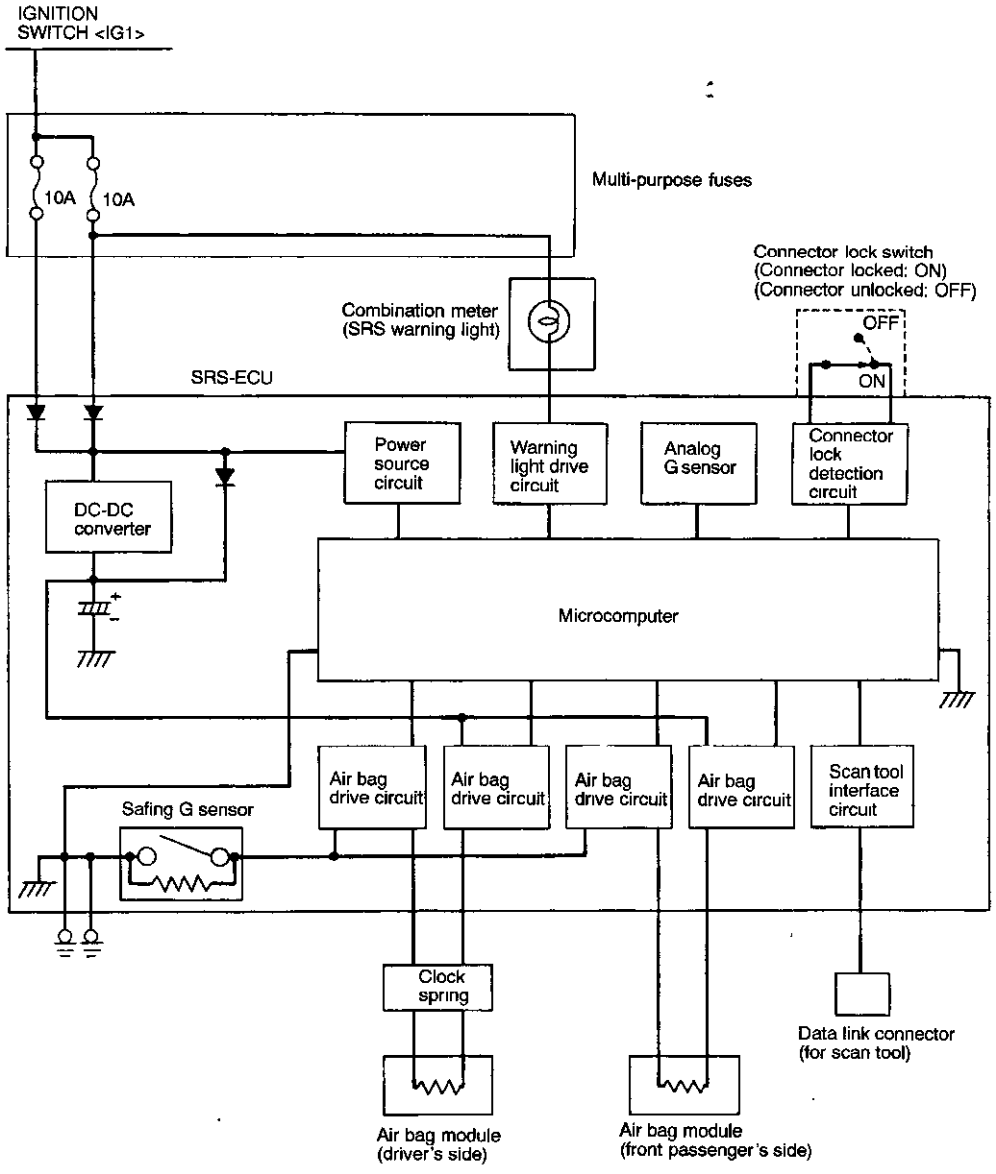


19S0223

00007035

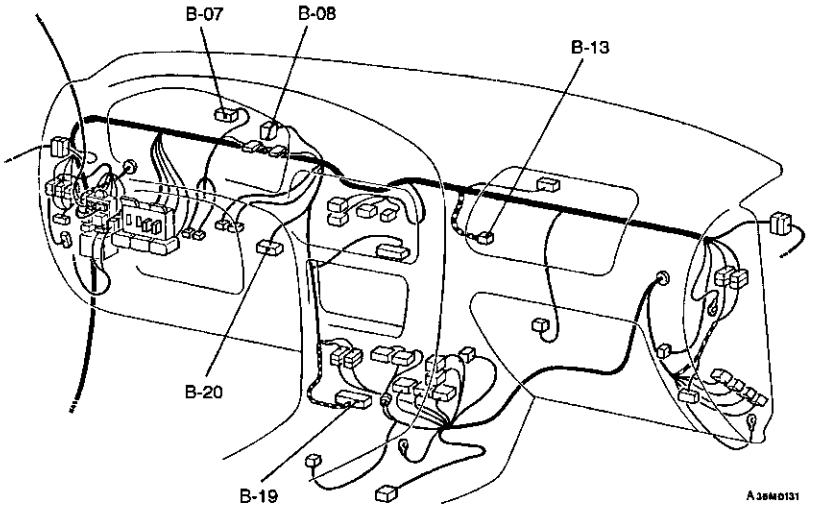
Label contents		Label contents	
A.	CAUTION: SRS Before replacing steering wheel, read service manual, center front wheels, and align SRS clock spring neutral marks. Failure to do so may render SRS system inoperative, risking serious driver injury.	G.	AIR BAG SYSTEM INFORMATION This vehicle has an air bag system which will supplement the seatbelt in certain frontal collisions. The air bag is not a substitute for the seatbelt in any type of collision. The driver and all other occupants should wear seatbelts at all times. WARNING! If the "SRS" warning light does not illuminate for several seconds when the ignition key is turned to "ON" or the engine is started, or if the warning light stays on while driving, take the vehicle to your nearest authorized dealer immediately. Also, if the vehicle's front end is damaged or if the air bag has deployed, take the vehicle for service immediately. The air bag system must be inspected by an authorized dealer ten years after the vehicle manufacture date shown on the certification label located on the left front door-latch post or door frame. Read the "SRS" section of your owner's manual before driving for important information about operation and service of the air bag system. When you are going to discard your gas generator or vehicle, please see your dealer.
B.	WARNING: SRS This air bag module cannot be repaired. Do not disassemble or tamper. Do not perform diagnosis. Do not touch with electrical test equipment or probes. Refer to service manual for further instructions, and for special handling, storage, and disposal procedures. Tampering or mishandling can result in injury.		
C.	DANGER POISONOUS FLAMMABLE MATERIAL To prevent personal injury, do not dismantle, incinerate, or bring into contact with electricity store below 200 °F (93 °C).		
D.	CAUTION: SRS clock spring This is not a repairable part. Do not disassemble or tamper. If defective, replace entire unit per service manual instructions. To re-center: rotate clockwise until tight. Then rotate in opposite direction approximately 3 4/5 turns and align arrows ▶◀.	H.	WARNING: SRS This air bag module cannot be repaired. Do not disassemble or tamper. Do not perform diagnosis. Do not touch with electrical test equipment or probes. Refer to service manual for further instructions, and for special handling, storage, and disposal procedures. Tampering or mishandling can result in injury. DANGER POISON Keep out of the reach of children. Contains sodium azide and potassium nitrate. Contents are poisonous and extremely flammable. Contact with acid, water, or heavy metals may produce harmful and irritating gases or explosive compounds. Do not dismantle, incinerate, bring into contact with electricity, or store at temperatures exceeding 200 °F (93 °C). FIRST AID: If contents are swallowed, induce vomiting. For eye contact flush eye with water for 15 minutes. If gases from acid or water contact are inhaled, fresh air. In every case, get prompt medical attention.
E.	 V0037AA WARNING: DEATH or SERIOUS INJURY can occur • Children 12 and under can be killed by the air bag. • The BACK SEAT is the SAFEST place for children. • NEVER put a rear-facing child seat in the front. • Sit as far back as possible from the air bag. • ALWAYS use SEAT BELTS and CHILD RESTRAINS.	I.	CAUTION: SRS Before removal of steering gear box, read service manual, center front wheels and remove ignition key. Failure to do so may damage SRS clock spring and render SRS system inoperative, risking serious driver injury.
F.	CAUTON: Do not disassemble or drop. If defective refer to service manual.	J.	WARNING: Children Can Be KILLED or INJURED by Passenger Air Bag The back seat is the safest place for children 12 and under. Make sure all children use seat belts or child seats. Not to be removed except by owner.

SCHEMATIC


IGNITION SWITCH <IG1>
10A
10A
Multi-purpose fuses
Connector lock switch
(Connector locked: ON)
(Connector unlocked: OFF)
OFF
ON
Combination meter
(SRS warning light)
SRS-ECU
Power source circuit
Warning light drive circuit
Analog G sensor
Connector lock detection circuit
DC-DC converter
Microcomputer
Air bag drive circuit
Air bag drive circuit
Air bag drive circuit
Air bag drive circuit
Scan tool interface circuit
Safing G sensor
Clock spring
Data link connector (for scan tool)
Air bag module (driver's side)
Air bag module (front passenger's side)

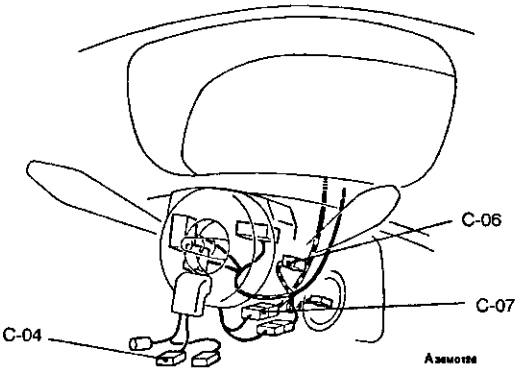
CONFIGURATION DIAGRAMS

Dash panel



B-07 Combination meter (for SRS warning light)
B-08 Combination meter (for SRS warning light)
B-13 Air bag module (front passenger's side)
B-19 SRS-ECU
B-20 Data link connector (for scan tool)

Steering column

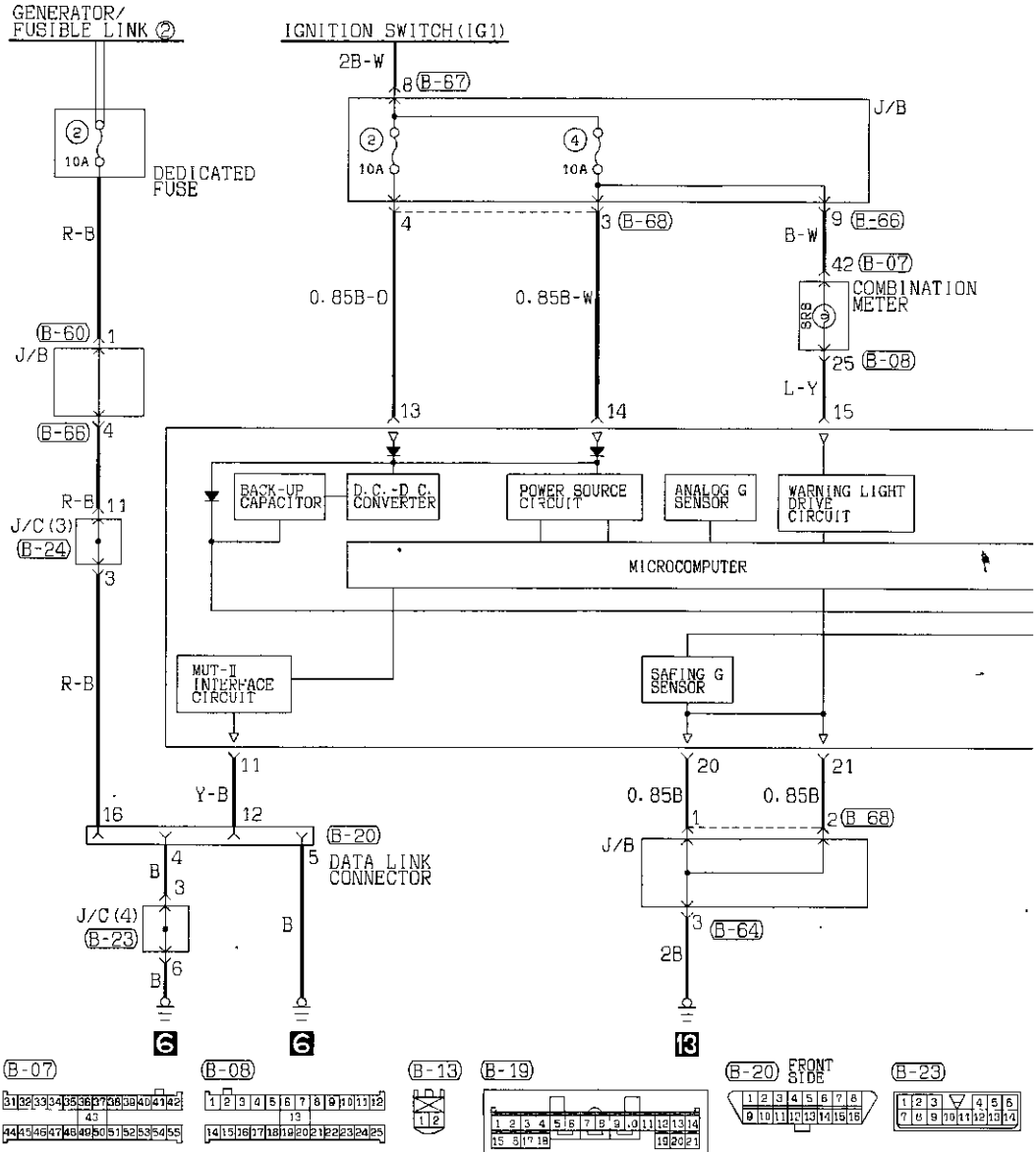


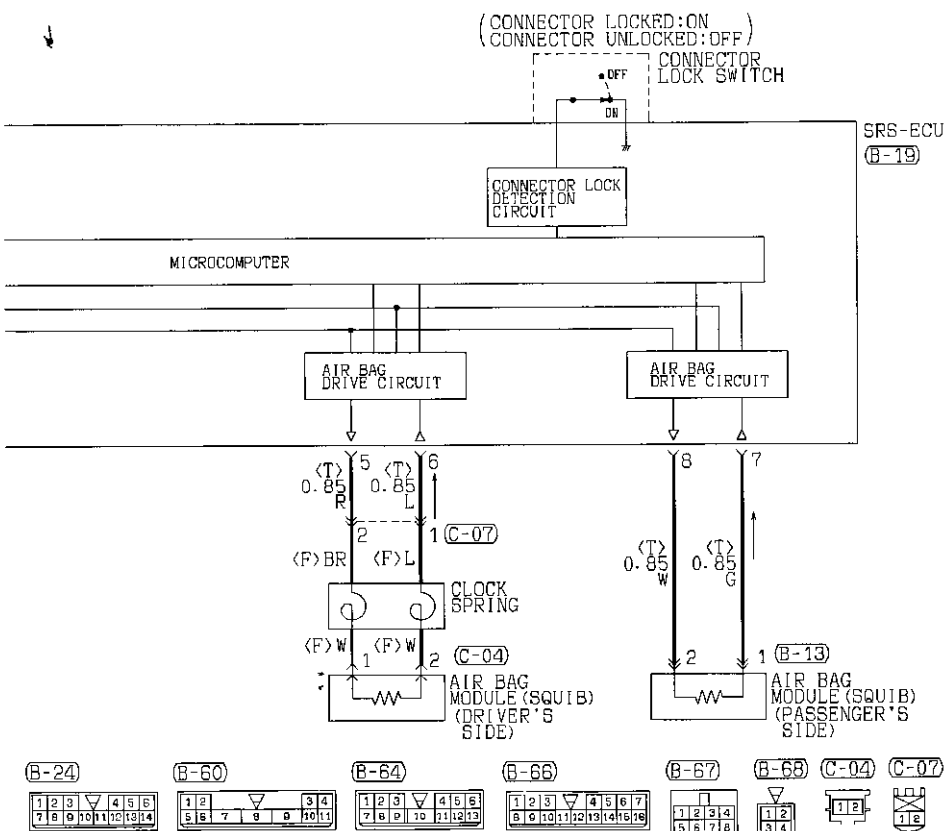
C-04 Air bag module (driver's side)
C-06 Ignition switch
C-07 Clock spring

CIRCUIT DIAGRAM

Caution

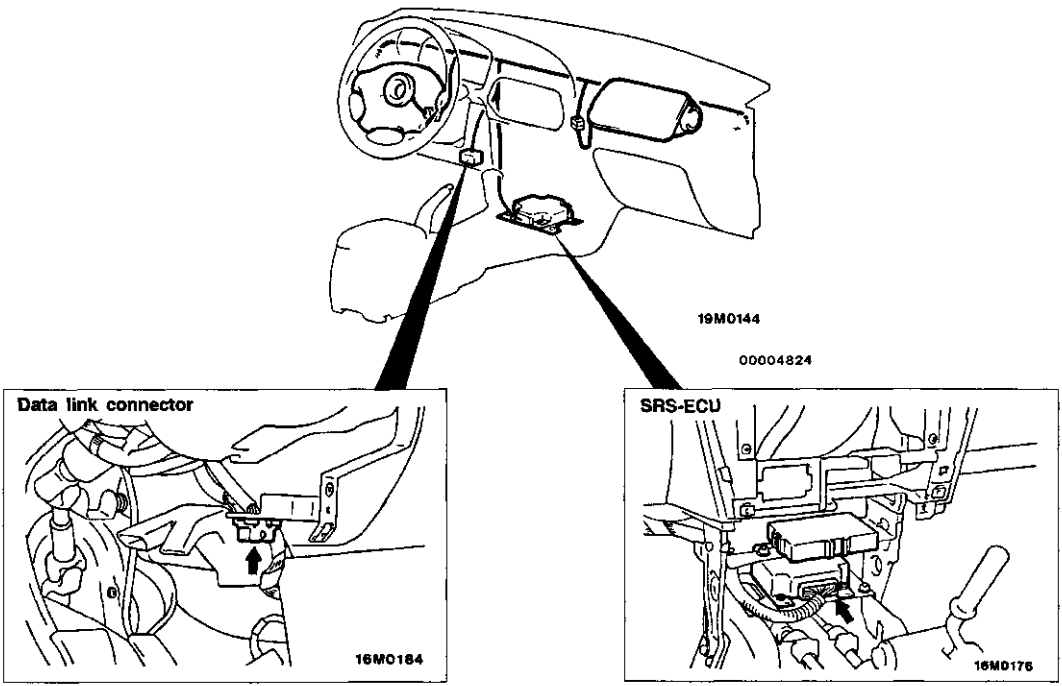
1. **Do not repair, splice, or modify SRS wiring (except for specific repairs to the body wiring harness shown on page 52B-10): replace wiring if necessary, after reading and following all precautions and procedures in this manual.**




(CONNECTOR LOCKED:ON
CONNECTOR UNLOCKED:OFF)
CONNECTOR LOCK SWITCH
OFF
ON
SRS-ECU
B-19
CONNECTOR LOCK DETECTION CIRCUIT
MICROCOMPUTER
AIR BAG DRIVE CIRCUIT
AIR BAG DRIVE CIRCUIT
⟨T⟩ 0.85 R
⟨T⟩ 0.85 L
5
6
2
1
C-07
⟨F⟩BR
⟨F⟩L
CLOCK SPRING
⟨F⟩W
⟨F⟩W
1
2
C-04
AIR BAG MODULE(SQUIB) (DRIVER'S SIDE)
8
7
⟨T⟩ 0.85 W
⟨T⟩ 0.85 G
2
1
B-13
AIR BAG MODULE(SQUIB) (PASSENGER'S SIDE)
B-24
B-60
B-64
B-66
B-67
B-68
C-04
C-07

wC15M00AB

COMPONENT LOCATION

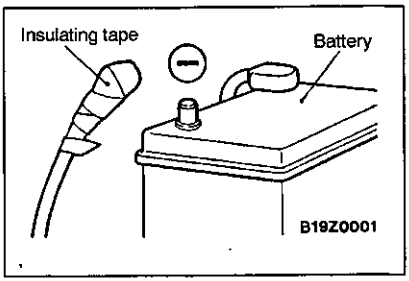


SRS SERVICE PRECAUTIONS

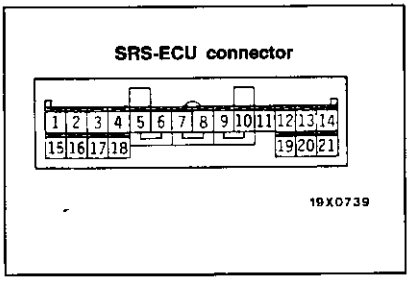
52400030146

1. In order to avoid injury to yourself or others from accidental deployment of the air bag during servicing, read and carefully follow all the precautions and procedures described in this manual.
2. Do not use any electrical test equipment on or near SRS components, except those specified on P.52B-12 and P.52B-12.
3. **Never Attempt to Repair the Following Components:**
   - SRS air bag control unit (SRS-ECU)
   - Clock Spring
   - Air Bag Module

   If any of these components are diagnosed as faulty, they should only be replaced, in accordance with the INDIVIDUAL COMPONENT SERVICE procedures in this manual, starting at page 52B-25.



4. **After disconnecting the battery cable, wait 60 seconds or more before proceeding with the following work. The SRS system is designed to retain enough voltage to deploy the air bag for a short time even after the battery has been disconnected, so serious injury may result from unintended air bag deployment if work is done on the SRS system immediately after the battery cables are disconnected.**



5. Do not attempt to repair the wiring harness connectors of the SRS. If any of the connectors are diagnosed as faulty, replace the wiring harness. If the wires are diagnosed as faulty, replace or repair the wiring harness according to the following table.

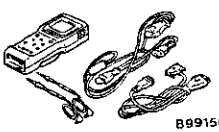
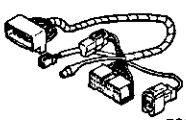
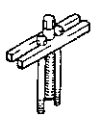
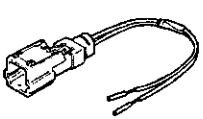
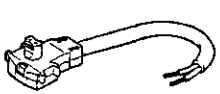
SRS-ECU terminal No.	Destination of harness	Corrective action
1 to 4	-	-
5	Body wiring harness → Clock spring → Air bag module (Driver's side)	Correct or replace each wiring harness. Replace clock spring.
6		
7	Body wiring harness → Air bag module (Front passenger's side)	Correct or replace each wiring harness.
8		
9,10	-	-
11	Body wiring harness → Date link connector	Correct or replace each wiring harness.
12	-	-
13	Body wiring harness → Junction block (fuse No.2)	Correct or replace each wiring harness.
14	Body wiring harness → Junction block (fuse No.4)	
15	Body wiring harness → SRS warning light	
16 to 19	-	-
20	Body wiring harness → Ground	Correct or replace body wiring harness.
21		

6. SRS components should not be subjected to heat over 93 °C (200 °F), so remove the SRS-ECU, air bag module and clock spring before drying or baking the vehicle after painting.
7. Whenever you finish servicing the SRS, check warning light operation to make sure that the system functions properly. (Refer to P.52B-2.)
8. Make certain that the ignition switch is OFF when the scan tool is connected or disconnected.
9. If you have any questions about the SRS, please contact the MMSA tech Line.

NOTE
SERIOUS INJURY CAN RESULT FROM UNINTENDED AIR BAG DEPLOYMENT, SO USE ONLY THE PROCEDURES AND EQUIPMENT SPECIFIED IN THIS MANUAL.

SPECIAL TOOLS

52400070131

Tool	Tool number and name	Supersession	Application
 B991502	MB991502 Scan tool (MUT-II)	MB991496-OD	• Reading diagnostic trouble codes • Erasing diagnostic trouble codes • Reading vehicle data for a specific period • Reading erase times [Refer to MUT-II OPERATING INSTRUCTIONS]
 B991613	MB991613 SRS check harness		Checking the SRS electrical circuitry with a digital multi-meter
 B990803	MB990803 Steering wheel puller	General service tool	Removal of steering wheel
 B686560	MB686560 SRS air bag adapter harness A	General service tool	• Deployment of air bag module inside the vehicle • Deployment of air bag module (front passemger's side) outside the vehicle
 B628919	MR203491 or MB628919 SRS air bag adapter harness B	General service tool	Deployment of air bag module (driver's side) outside the vehicle

TEST EQUIPMENT

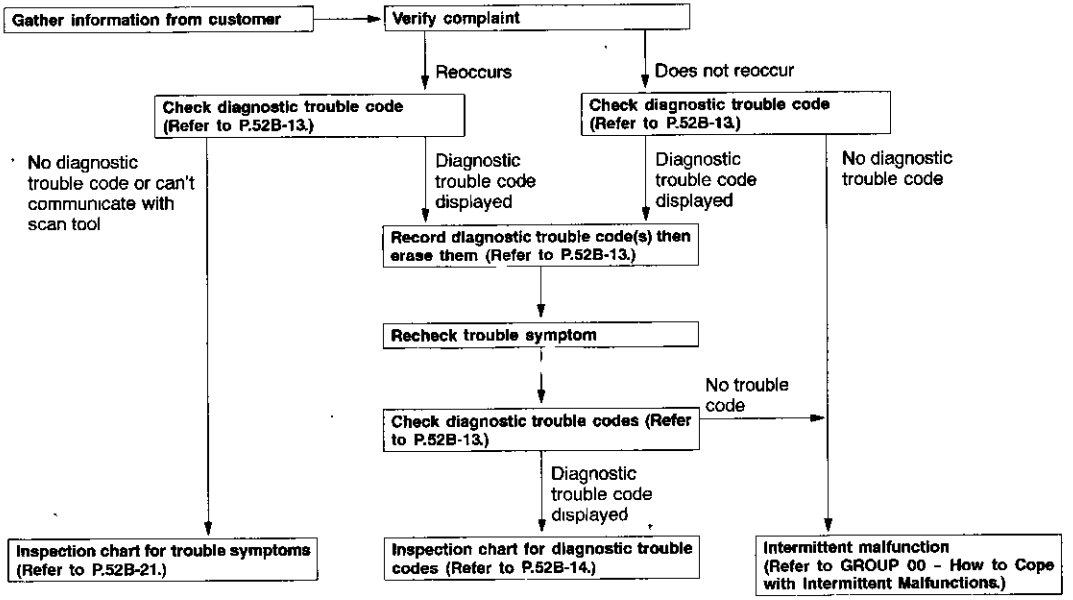
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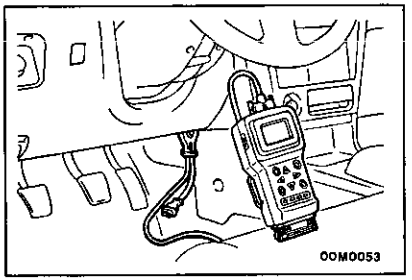
Tool	Tool name	Use
	Digital multi-meter Use a multi-meter for which the maximum test current is 2 mA or less at the minimum range of resistance measurement	Checking the SRS electrical circuitry with SRS Check Harness

TROUBLESHOOTING

52400310110

DIAGNOSTIC TROUBLESHOOTING FLOW





DIAGNOSTIC FUNCTION

52400320106

DIAGNOSTIC TROUBLE CODE CHECK

Connect the scan tool to the data link connector then check diagnostic trouble codes.

Caution
Make certain that the ignition switch is OFF when the scan tool is connected or disconnected.

ERASING DIAGNOSTIC TROUBLE CODES

Connect the scan tool to the data link connector then erase the diagnostic trouble codes.

INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES

52400330116

Inspect according to the inspection chart that is appropriate for the diagnostic trouble code.

Code No.	On-board diagnostic item		Reference page
14	Analog G-sensor system in the SRS-ECU		52B-14
15,16	Safing G-sensor system in the SRS-ECU		52B-14
21, 22, 61, 62	Driver's side air bag module (squib) system		52B-15
24, 25, 64, 65	Front passenger's side air bag module (squib) system		52B-16
31, 32	SRS-ECU capacitor system		52B-16
34*	Connector lock system		52B-16
35	SRS-ECU (deployed air bag) system		52B-17
41*	IG_1 (A) power circuit system		52B-17
42*	IG_1 (B) power circuit system		52B-18
43	SRS warning light drive circuit system	Light does not illuminate.*	52B-19
		Light does not switch off.	52B-19
44*	SRS warning light drive circuit system		52B-20
45	SRS-ECU non-volatile memory (EEPROM) and A/D converter system		52B-20
51, 52	Driver's side air bag module (squib ignition drive circuit) system		52B-20
54, 55	Front passenger's side air bag module (squib ignition drive circuit) system		52B-20

NOTE
(1) *: If the vehicle condition returns to normal, the diagnostic trouble code will be automatically erased, and the SRS warning light will return to normal.
(2) If the vehicle has a discharged battery it will store the diagnostic trouble codes 41 or 42. When these diagnostic trouble codes are displayed, check the battery.

INSPECTION PROCEDURE CLASSIFIED BY DIAGNOSTIC TROUBLE CODE

Code No.14 Analog G-sensor system in the SRS-ECU	**Probable cause**
The SRS-ECU monitors the output of the analog G-sensor inside the SRS-ECU. It outputs this code when any of the following are detected. • When the analog G-sensor is not operating • When the characteristics of the analog G-sensor are abnormal • When the output from the analog G-sensor is abnormal	• Malfunction of SRS-ECU

Replace the SRS-ECU.

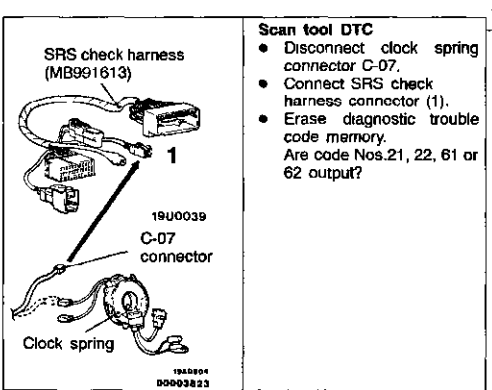
Code No.15 or 16 Safing G-sensor system in the SRS-ECU	**Probable cause**
This code is output if there is a short or open circuit inside the SRS-ECU between the terminals of the safing G-sensor. The trouble causes for each diagnostic trouble code No. are as follows.	• Malfunction of SRS-ECU

Code No.	Trouble symptom
15	Short circuit in the safing G-sensor
16	Open circuit in the safing G-sensor

Replace the SRS-ECU.

Code No.21, 22, 61 or 62 Driver's side air bag module (squib) system	Probable cause
These diagnostic trouble codes are output if there is abnormal resistance between the input terminals of the driver's side air bag module (squib). The trouble causes for each diagnostic trouble code No. are as follows.	• Malfunction of clock spring • Malfunction of wiring harnesses or connectors • Malfunction of driver's side air bag module (squib) • Malfunction of SRS-ECU

Code No.	Trouble symptom
21	• Short in driver's side air bag module (squib) or harness short • Short in clock spring
22	• Open circuit in driver's side air bag module (squib) or open harness • Open circuit in clock spring • Malfunction of connector contact
61	• Short in driver's side air bag module (squib) harness leading to the power supply
62	• Short in driver's side air bag module (squib) harness leading to the ground



Scan tool DTC
- Disconnect clock spring connector C-07.
- Connect SRS check harness connector (1).
- Erase diagnostic trouble code memory.

Are code Nos.21, 22, 61 or 62 output?

Yes → **Check the following connectors:** C-07, B-19 — NG → **Repair**

OK → Check trouble symptoms.

NG → Check the harness wire between the SRS-ECU and clock spring. — NG → **Repair**

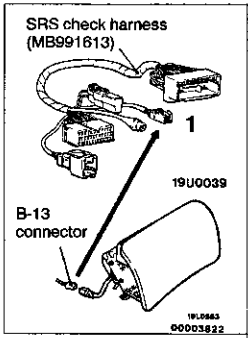
OK → Replace the SRS-ECU.

No → Check the clock spring. (Refer to P52B-32.) — NG → **Repair**

OK → Replace the driver's side air bag module.

Code No.24, 25, 64 or 65 Front passenger's side air bag module (squib) system	Probable cause
These diagnostic trouble codes are output if there is abnormal resistance between the input terminals of the front passenger's side air bag module (squib) The trouble causes for each diagnostic trouble code No. are as follows.	• Malfunction of wiring harnesses or connectors • Malfunction of front passenger's side air bag module (squib) • Malfunction of SRS-ECU

Code No.	Trouble symptom
24	• Short in front passenger's side air bag module (squib) or harness short
25	• Open circuit in front passenger's side air bag module (squib) or open harness • Malfunction of connector contact
64	• Short in front passenger's side air bag module (squib) harness leading to the power supply
65	• Short in front passenger's side air bag module (squib) harness leading to the ground



Scan tool DTC
- Disconnect front passenger's side air bag module connector B-13.
- Connect SRS check harness connector (1).
- Erase diagnostic trouble code memory.

Are code Nos.24, 25, 64 or 65 output?

Yes → **Check the following connectors:** B-13, B-19
- NG → **Repair**
- OK → Check trouble symptoms.
  - NG → Check the harness wire between the front passenger's side air bag module (squib) and SRS-ECU.
    - NG → **Repair**
    - OK → Replace the SRS-ECU.

No → Replace the front passenger's side air bag module.

Code No.31 or 32 SRS-ECU capacitor system	Probable cause
These diagnostic trouble codes are output if the voltage at the SRS-ECU capacitor terminals is higher (No.31) or lower (No 32) than the specified value for 5 seconds or more. However, if the diagnostic trouble code Nos. 41 and 42 are being output due to a drop in battery voltage, code No 32 will not be detected.	• Malfunction of SRS-ECU

Replace the SRS-ECU.

Code No.34 Connector lock system	Probable cause
This diagnostic trouble code is output if a poor connection at the SRS-ECU is detected. However, if the vehicle condition returns to normal, diagnostic trouble code No.34 will be automatically erased, and the SRS warning light will switch off.	• Malfunction of connectors • Malfunction of SRS-ECU

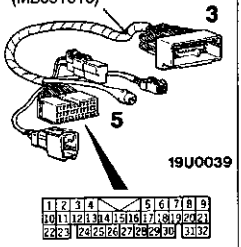
Check the following connector: B-19
- NG → **Repair**
- OK → Replace the SRS-ECU.

Code No.35 SRS-ECU (deployed air bag) system	Probable cause
This diagnostic trouble code is output after the air bag deploys. If this code is output before the air bag has deployed, the cause is probably a malfunction inside the SRS-ECU.	• Malfunction of SRS-ECU

Replace the SRS-ECU.

Code No.41 IG_1 (A) power circuit system	Probable cause
This diagnostic trouble code is output if the voltage between the IG_1 (A) terminal and ground is lower than the specified value for a continuous period of 5 seconds or more. However, if the vehicle condition returns to normal, diagnostic trouble code No.41 will be automatically erased, and the SRS warning light will switch off.	• Malfunction of wiring harnesses or connectors • Malfunction of SRS-ECU

SRS check harness (MB991613)



Measure at SRS check harness connector (5).
- Disconnect SRS-ECU connector B-19.
- Connect SRS check harness connector (3).
- Continuity between terminal (20) and ground
  OK: Continuity
- Continuity between terminal (21) and ground
  OK: Continuity

NG → **Check the following connectors:** B-64, B-68, B-19 → NG → **Repair**

OK → Check trouble symptoms.

NG → Check the harness wire between the SRS-ECU and ground, and repair if necessary

OK

Measure at SRS check harness connector (5).
- Disconnect SRS-ECU connector B-19.
- Connect SRS check harness connector (3).
- Ignition switch: ON
- Voltage between terminal (14) and body ground
  OK: 9 V or more

NG → **Check the following connectors:** B-19, B-68 → NG → **Repair**

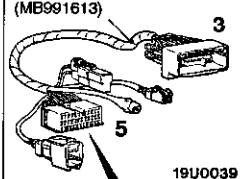
OK → Check trouble symptoms.

NG → Check the harness wire between the SRS-ECU and ignition switch IG_1, and repair if necessary.

OK → Replace the SRS-ECU.

Code No.42 IG_1 (B) power circuit system	Probable cause
This diagnostic trouble code is output if the voltage between the IG_1 (B) terminal and ground is lower than the specified value for a continuous period of 5 seconds or more. However, if the vehicle condition returns to normal, diagnostic trouble code No.42 will be automatically erased, and the SRS warning light will switch off.	• Malfunction of wiring harnesses or connectors • Malfunction of SRS-ECU

SRS check harness (MB991613)



Measure at SRS check harness connector (5).
- Disconnect SRS-ECU connector B-19
- Connect SRS check harness connector (3).
- Continuity between terminal (20) and ground
  OK: Continuity
- Continuity between terminal (21) and ground
  OK: Continuity

NG → **Check the following connectors:** B-64, B-68, B-19 → NG → **Repair**

OK → Check trouble symptoms.

NG → Check the harness wire between the SRS-ECU and ground, and repair if necessary.

OK

Measure at SRS check harness connector (5).
- Disconnect SRS-ECU connector B-19.
- Connect SRS check harness connector (3).
- Ignition switch: ON
- Voltage between terminal (13) and body ground
  OK: 9 V or more

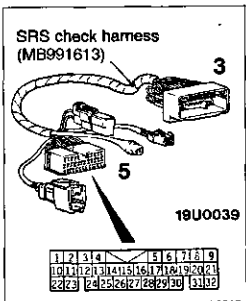
NG → **Check the following connectors:** B-19, B-68 → NG → **Repair**

OK → Check trouble symptoms.

NG → Check the harness wire between the SRS-ECU and ignition switch IG_1, and repair if necessary.

OK → Replace the SRS-ECU.

Code No.43 SRS warning light drive circuit system (Light does not illuminate.)	Probable cause
This diagnostic trouble code is output when an open circuit occurs for a continuous period of 5 seconds while the SRS-ECU is monitoring the SRS warning light and the light is OFF (transistor OFF). However, if this code is output due to an open circuit, if the vehicle condition returns to normal, this diagnostic trouble code No.43 will be automatically erased, and the SRS warning light will return to normal.	• Malfunction of wiring harnesses or connectors • Blown bulb • Malfunction of SRS-ECU • Malfunction of combination meter



Measure at SRS check harness connector (5).
- Disconnect SRS-ECU connector B-19.
- Connect SRS check harness connector (3).
- Continuity between terminals (20) and ground
  OK: Continuity
- Continuity between terminals (21) and ground
  OK: Continuity

NG → **Check the following connectors:** B-64, B-68, B-19 → NG → **Repair**

OK → Check trouble symptoms.

NG → Check the harness wire between the SRS-ECU and ground, and repair if necessary.

OK →

Measure at SRS check harness connector (5).
- Disconnect SRS-ECU connector B-19.
- Connect SRS check harness connector (3).
- Ignition switch: ON
- Connect terminal (15) to the body ground.
  OK: Light illuminates

NG → Blown bulb inspection → NG → **Repair**

OK → **Check the following connectors:** B-19, B-08, B-07, B-66 → NG → **Repair**

OK → Check trouble symptoms.

NG → Check the harness wire between the SRS-ECU and ignition switch (IG_1). → NG → **Repair**

OK → Replace the combination meter.

OK → Replace the SRS-ECU.

Code No.43 SRS warning light drive circuit system (Light does not switch off.)	Probable cause
This diagnostic trouble code is output when a short to ground occurs in the harness between the light and the SRS-ECU while SRS-ECU is monitoring the SRS warning light and the light is ON.	• Malfunction of wiring harnesses or connectors • Malfunction of SRS-ECU • Malfunction of combination meter

SRS warning light inspection
- Ignition switch: ON
- Does light switch off when SRS-ECU connector B-19 is disconnected?

No → **Check the following connectors:** B-19, B-08 → NG → **Repair**

OK → Check trouble symptoms.

NG → Check the harness wire between the SRS-ECU and combination meter, and repair if necessary.

Yes → Replace the SRS-ECU.

Code No.44 SRS warning light drive circuit system	Probable cause
This diagnostic trouble code is output when a short occurs in the light drive circuit or a malfunction of the output transistor inside the SRS-ECU is detected while the SRS-ECU is monitoring the SRS warning light drive circuit. However, if the vehicle conditions return to normal, the diagnostic trouble code No. 44 will be automatically erased, and the SRS warning light will switch off.	• Malfunction of wiring harnesses or connectors • Malfunction of SRS-ECU

Check the SRS warning light drive circuit system. (Refer to P.52B-19 and P.52B-19.) → OK → Replace the SRS-ECU.

Code No.45 SRS-ECU non-volatile memory (EEPROM) and A/D converter system	Probable cause
This diagnostic trouble code is output if there is a malfunction in the SRS-ECU non-volatile memory (EEPROM) and A/D converter.	• Malfunction of SRS-ECU

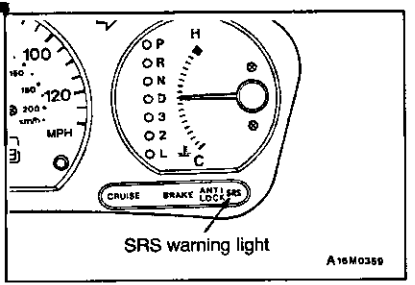
Replace the SRS-ECU.

Code No.51 or 52 Driver's side air bag module (squib ignition drive circuit) system	Probable cause
This diagnostic trouble code is output if a short (No.51) or an open circuit (No.52) is detected in the circuit for the driver's seat.	• Malfunction of SRS-ECU

Replace the SRS-ECU.

Code No.54 or 55 Front passenger's side air bag module (squib ignition drive circuit) system	Probable cause
This diagnostic trouble code is output if a short (No.54) or an open circuit (No.55) is detected in the circuit for the passenger's seat.	• Malfunction of SRS-ECU

Replace the SRS-ECU.



SRS WARNING LIGHT CHECK

1. Check to be sure that the SRS warning light illuminates when the ignition switch is in the ON position.
2. Check to be sure that it illuminates for approximately 7 seconds and then switches off.
3. If the above is not the case, inspect for diagnostic trouble codes.

INSPECTION CHART FOR TROUBLE SYMPTOMS

52400340119

Get an understanding of the trouble symptoms and check according to the inspection procedure chart.

Trouble symptom		Inspection procedure No.	Reference page
Communication with scan tool is not possible.	Communication with all systems is not possible.	1	52B-21
	Communication is not possible with SRS only.	2	52B-21
When the ignition key is turned to "ON" (engine stopped), the SRS warning light does not illuminate.		Refer to diagnosis code No.43.	52B-19
After the ignition switch is turned to ON, the SRS warning light is still on after approximately 7 seconds have passed.		Refer to diagnosis code No.43.	52B-19

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

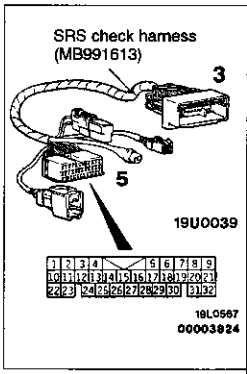
Inspection Procedure 1

Communication with scan tool is not possible. (Communication with all systems is not possible.)	**Probable cause**
The cause is probably a power supply system (including ground circuit) of the diagnostic line.	• Malfunction of wiring harnesses or connectors

Refer to GROUP 13A - Troubleshooting.

Inspection Procedure 2

Communication with scan tool is not possible. (Communication is not possible with SRS only.)	**Probable cause**
If communication is not possible with the SRS only, the cause is probably an open circuit in the on-board diagnostic output circuit of the SRS or in the power circuit (including ground circuit).	• Malfunction of wiring harnesses or connectors • Malfunction of SRS-ECU



Measure at SRS check harness connector (5).
- Disconnect SRS-ECU connector B-19.
- Connect SRS check harness connector (3).
- Continuity between terminals (20) and ground
  OK: Continuity
- Continuity between terminals (21) and ground
  OK: Continuity

NG → **Check the following connectors:** B-64, B-68, B-19 → NG → **Repair**

OK → Check trouble symptoms.

NG → Check the harness wire between the SRS-ECU and ground, and repair if necessary.

OK

Measure at SRS check harness connector (5)
- Disconnect SRS-ECU connector B-19.
- Connect SRS check harness connector (3).
- Ignition switch: ON
- Voltage between terminal (13) and body ground
  OK: 9 V or more
- Voltage between terminal (14) and body ground
  OK: 9 V or more

NG → **Check the following connectors:** B-19, B-68 → NG → **Repair**

OK → Check trouble symptoms.

NG → Check the harness wire between the SRS-ECU and ignition switch IG_1, and repair if necessary.

OK

Check the harness wire between the SRS-ECU and data link connector.

NG → **Repair**

OK

Replace the SRS-ECU.

SRS MAINTENANCE

52400390206

The SRS must be inspected by an authorized dealer up to 10 years after the date of vehicle registration.
(Refer to GROUP 00 - Maintenance Service.)

POST-COLLISION DIAGNOSIS

52400110130

To inspect and service the SRS after a collision (whether or not the air bags have deployed), perform the following steps.

SRS-ECU MEMORY CHECK

1. Connect the scan tool to the data link connector (16-pin).

   Caution
   Turn off ignition switch before connecting or disconnecting the scan tool.

2. Read (and write down) all displayed diagnostic trouble codes. (Refer to P.52B-14.)

   NOTE
   If the battery power supply has been disconnected or disrupted by the collision, the scan tool cannot communicate with the SRS-ECU. Check the battery, then inspect and, if necessary, repair the body wiring harness before proceeding.

3. Read the data list (fault duration and how many times memories are erased) using the scan tool.

Data list

No	Service Data Item	Applicability
92	Number indicating how often the memory is cleared	Maximum time to be stored: 250
93	How long a problem has lasted (How long it takes from the occurrence of the problem till the first air bag squib igniting signal)	Maximum time to be stored: 9,999 minutes (approximately 7 days)
94	How long a problem has lasted (How long it takes from the first air bag squib igniting signal till now)	

4. Erase the diagnostic trouble codes and after waiting 5 seconds or more read (and write down) all displayed diagnostic trouble codes. (Refer to P.52B-14.)

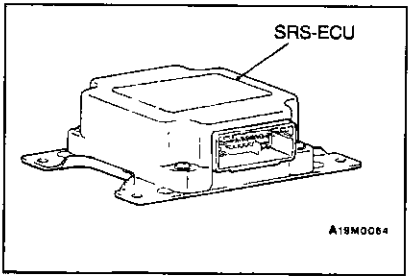
REPAIR PROCEDURE

WHEN AIR BAG DEPLOYS IN A COLLISION.

1. Replace the following parts with new ones.
   - SRS-ECU (Refer to P.52B-26.)
   - Air bag module (Refer to P.52B-27.)
2. Check the following parts and replace if there are any malfunctions.
   - Clock spring (Refer to P.52B-27.)
   - Steering wheel, steering column and intermediate joint
     (1) Check wiring harness (built into steering wheel) and connectors for damage, and terminals for deformation.
     (2) Install air bag module to check fit or alignment with steering wheel.
     (3) Check steering wheel for noise, binds or difficult operation and excessive free play.
3. Check harnesses for binding, connectors for damage, poor connections, and terminals for deformation. (Refer to P.52B-10.)

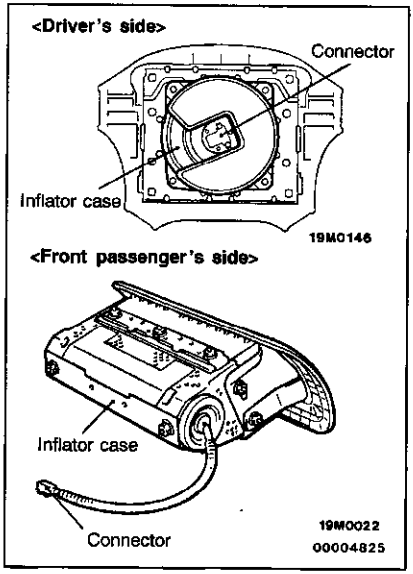
WHEN AIR BAG DOES NOT DEPLOY IN LOW-SPEED COLLISION.

Check the SRS components. If the SRS components are showing any visible damage such as dents, cracks, or deformation, replace them with new ones. Concerning parts removed for inspection, replacement with new parts and cautionary points for working, refer to appropriate INDIVIDUAL COMPONENT SERVICE, P.52B-25.



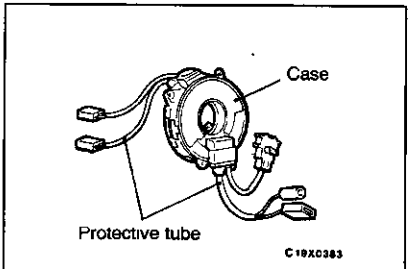
SRS-ECU

1. Check SRS-ECU case and brackets for dents, cracks or deformation.
2. Check connector for damage, and terminals for deformation.



Air bag modules

1. Check pad cover for dents, cracks or deformation.
2. Check connector for damage, terminals deformities, and harness for binding.
3. Check air bag inflator case for dents, cracks or deformities.
4. Install air bag module to steering wheel to check fit or alignment with the steering wheel.



Clock spring

1. Check clock spring connectors and protective tubes for damage, and terminals for deformation.
2. Visually check the case for damage.

Steering wheel, steering column and intermediate joint

1. Check wiring harness (built into steering wheel) and connectors for damage, and terminals for deformation.
2. Install air bag module to check fit or alignment with steering wheel.
3. Check steering wheel for noise, binding or difficult operation and excessive free play.

Harness connector (body wiring harness)

Check harnesses for binding, connectors for damage, poor connection, and terminals for deformation. (Refer to P.52B-10.)

INDIVIDUAL COMPONENT SERVICE

52400290278

If the SRS components are to be removed or replaced as a result of maintenance, troubleshooting, etc., follow the appropriate procedure in this section. (SRS Air Bag Control Unit: refer to P.52B-26, Air Bag Modules and Clock Spring: refer to P.52B-27.)

Caution

1. **SRS components should not be subjected to heat over 93°C (200 °F), so remove the SRS-ECU, air bag modules and clock spring before drying or baking the vehicle after painting. Recheck SRS system operability after reinstalling them. (Refer to GROUP 00 - Maintenance Service.)**
2. **If the SRS components are removed for the purpose of check, sheet metal repair, painting, etc., they should be stored in a clean, dry place until they are reinstalled.**

SRS AIR BAG CONTROL UNIT (SRS-ECU)

52400210105

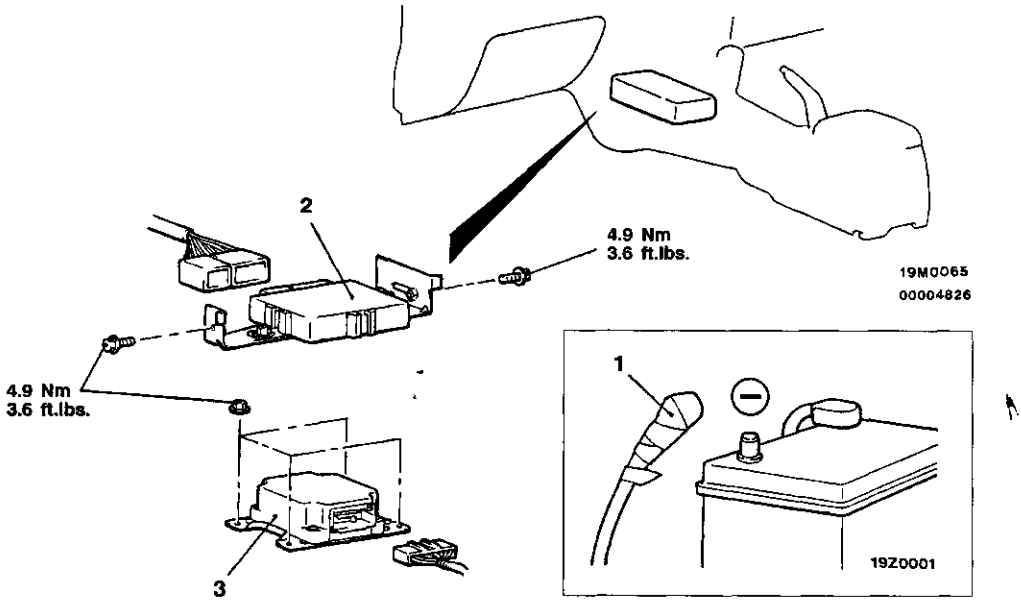
Caution

1. **Never attempt to disassemble or repair the SRS-ECU. If faulty, replace it.**
2. **Do not drop or subject the SRS-ECU to impact or vibration. If denting, cracking, deformation, or rust are discovered in the SRS-ECU, replace it with a new SRS-ECU. Discard the old one.**
3. **After deployment of an air bag, replace the SRS-ECU with a new one.**
4. **Never use an ohmmeter on or near the SRS-ECU, and use only the special test equipment described on P.52B-12 and P.52B-12.**

REMOVAL AND INSTALLATION

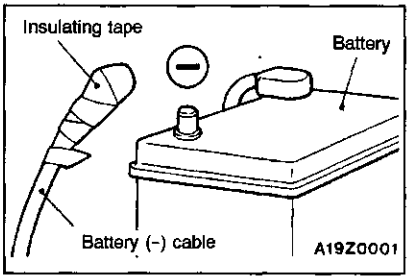
Pre-removal Operation
- Turn the ignition key to the "LOCK" position.
- Floor Console Removal (Refer to GROUP 52A.)

Post-installation Operation
- Floor Console Installation (Refer to GROUP 52A.)



Removal steps

◀A▶ ▶B◀ • Post-installation inspection
1. Negative (–) battery cable connection
2. ABS-ECU <Vehicles with ABS>
▶A◀ 3. SRS-ECU



REMOVAL SERVICE POINT

◀A▶ NEGATIVE (–) BATTERY CABLE DISCONNECTION

Disconnect the negative battery cable from the battery and tape the terminal.

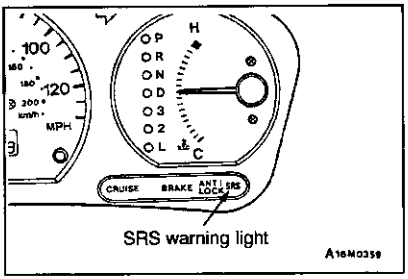
Caution

Wait at least 60 seconds after disconnecting the battery cable before doing any further work. (Refer to P.52B-11.)

INSTALLATION SERVICE POINTS

▶A◀ SRS-ECU INSTALLATION

Caution
The SRS may not activate if SRS-ECU is not installed properly, which could result in serious injury or death to the vehicle's driver or front passenger.



SRS warning light
A16M0359

▶B◀ POST-INSTALLATION INSPECTION

1. Turn the ignition key to the "ON" position.
2. Does the "SRS" warning light illuminate for about 7 seconds, and then remain off for at least 5 seconds after turning off?
3. If yes, SRS system is functioning properly.
   If no, refer to page 52B-13.

INSPECTION

52400220086

- Check the SRS-ECU and brackets for dents, cracks or deformation.
- Check the SRS-ECU connector for damage, and terminals for deformation.

Caution
If a dent, crack, deformation or rust is discovered, replace the SRS-ECU with a new one.

NOTE
Refer to page 52B-13 for inspection of SRS-ECU for other than physical damage.

AIR BAG MODULES AND CLOCK SPRING

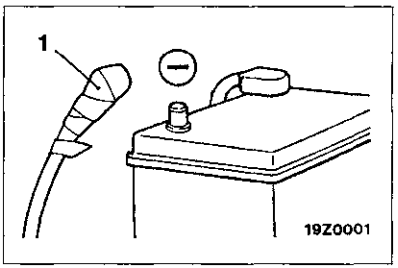
52400240136

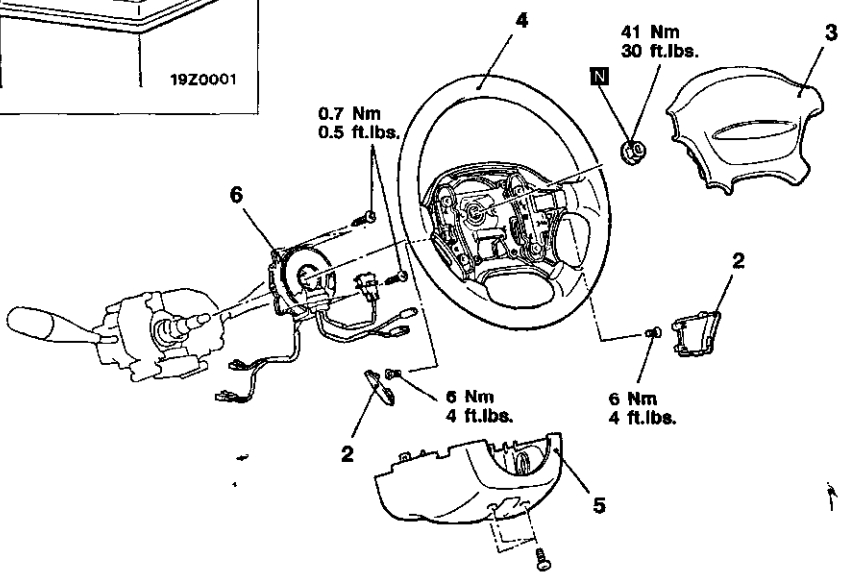
Caution
1. **Never attempt to disassemble or repair the air bag modules or clock spring.**
   If faulty, replace it.
2. **Do not drop the air bag modules or clock spring or allow contact with water, grease or oil.**
   Replace it if a dent, crack, deformation or rust is detected.
3. **The air bag modules should be stored on a flat surface and placed so that the pad surface is facing upward.**
   Do not place anything on top of it.
4. **Do not expose the air bag modules to temperatures over 93°C (200 °F).**
5. **After deployment of an air bag, replace the air bag modules. Inspect the clock spring, and replace it with a new part if it is faulty.**
6. **Wear gloves and safety glasses when handling air bags that have already deployed.**
7. **An undeployed air bag module should only be disposed of in accordance with the procedures (Refer to P.52B-34.)**

REMOVAL AND INSTALLATION

<Air bag module (driver's side), clock spring>

Pre-removal Operation
- After setting the steering wheel and the front wheels to the straight ahead position, remove the ignition key.





00004827

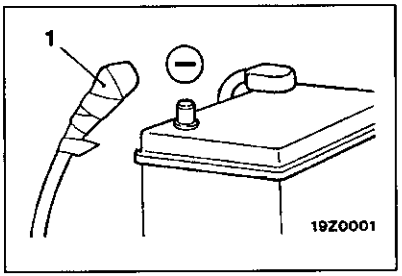
Air bag module removal steps

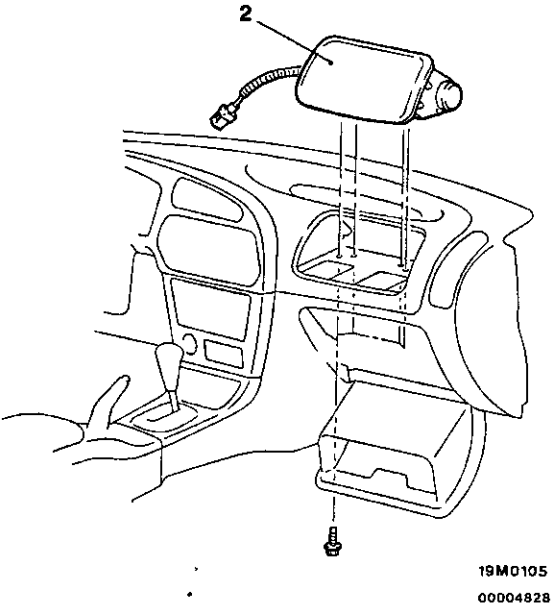
- ▶D◀ • Post-installation inspection
- ◀A▶ 1. Negative (-) battery cable connection
- 2. Cover
- ◀B▶ 3. Air bag module
- ▶A◀ • Pre-installation inspection

Clock spring removal steps

- ▶D◀ • Post-installation inspection
- ◀A▶ 1. Negative (-) battery cable connection
- 2. Cover
- ◀B▶ 3. Air bag module
- ◀C▶ ▶C◀ 4. Steering wheel
- 5. Column cover lower
- ◀D▶ ▶B◀ 6. Clock spring
- ▶A◀ • Pre-installation inspection

<Air bag module (front passenger's side)>

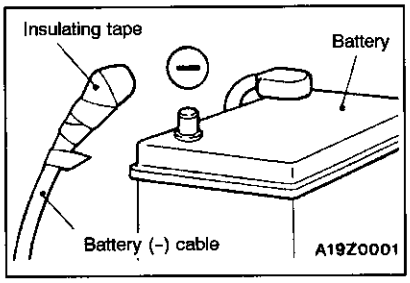




Air bag module removal steps

◀A▶ ▶D◀ • Post-installation inspection
1. Negative (-) battery cable connection

◀E▶ 2. Air bag module
▶A◀ • Pre-installation inspection

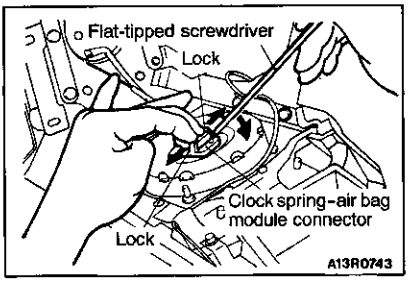


REMOVAL SERVICE POINTS

◀A▶ NEGATIVE (–) BATTERY CABLE DISCONNECTION

Disconnect the negative battery cable from the battery and tape the terminal.

Caution
Wait at least 60 seconds after disconnecting the battery cable before doing any further work. (Refer to P.52B-11.)



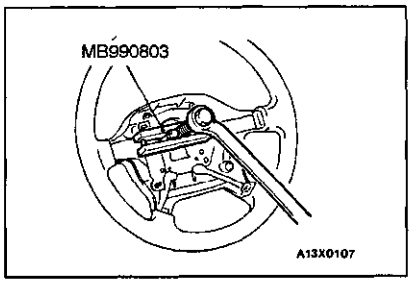
◀B▶ AIR BAG MODULE REMOVAL (DRIVER'S SIDE)

When disconnecting the connector of the clock spring from the air bag module, press the air bag's lock toward the outer side to spread it open. Use a flat-tipped screwdriver to pry gently as shown in the figure at the left, to remove the connector .

Caution
1. **When disconnecting the air bag module-clock spring connector, take care not to apply excessive force to it.**

TSB Revision

2. **The removed air bag module should be stored in a clean, dry place with the pad cover face up.**



◀C▶ STEERING WHEEL REMOVAL

Caution
Do not hammer on the steering wheel. Doing so may damage the collapsible column mechanism.

◀D▶ CLOCK SPRING REMOVAL

Caution
The removed clock spring should be stored in a clean, dry place.

◀E▶ AIR BAG MODULE REMOVAL (FRONT PASSENGER'S SIDE)

Caution
The removed air bag module should be stored in a clean, dry place with the pad cover face up.

INSTALLATION SERVICE POINTS

▶A◀ PRE-INSTALLATION INSPECTION

1. When installing the new air bag modules and clock spring, refer to "INSPECTION" (P.52B-32).

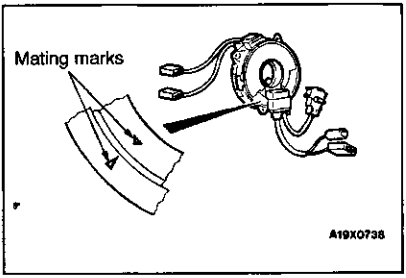
   Caution
   Dispose of air bag modules only according to the specified procedure. (Refer to P.52B-34.)

2. Connect the battery (-) terminal.
3. Connect the scan tool to the data link connector.

   Caution
   Turn off the ignition switch before connecting or disconnecting the scan tool.

4. Turn the ignition key to the "ON" position.
5. Conduct diagnostic test using the scan tool to ensure entire SRS operates properly.
6. Turn the ignition key to the "LOCK" position. Disconnect the negative battery cable and tape the terminal to prevent accidental connection and air bag(s) deployment.

   Caution
   Wait at least 60 seconds after disconnecting the battery cable before doing any further work. (Refer to P.52B-11.)



▶B◀ CLOCK SPRING INSTALLATION

Align the mating marks of the clock spring. Turn the front wheels to the straightahead position. Then install the clock spring to the column switch.

Mating Mark Alignment

Turn the clock spring clockwise fully. Then turn it back approx. 3 4/5 turns counterclockwise to align the mating marks.

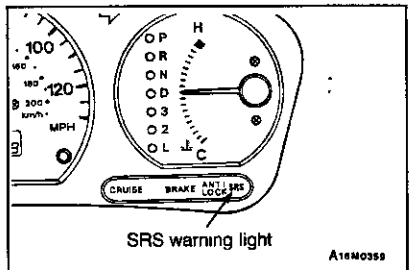
Caution
If the clock spring's mating marks are not properly aligned, the steering wheel may not rotate completely during a turn, or the flat cable within the clock spring may be severed, obstructing normal operation of the SRS and possibly leading to serious injury to the vehicle's driver.

▶C◀ STEERING WHEEL INSTALLATION

1. Before installing the steering wheel, be sure to first turn the vehicle's front wheels to the straight-ahead position and align the mating marks of the clock spring.

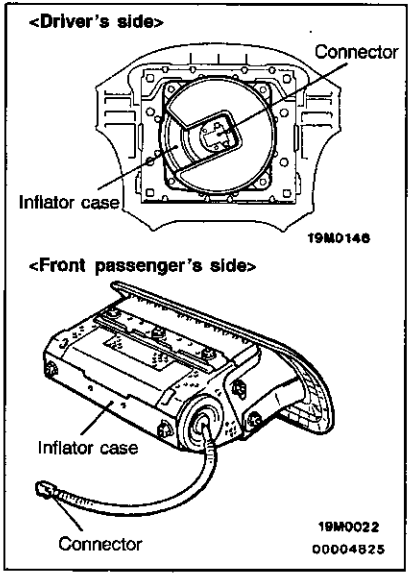
   Caution
   When installing the steering wheel, ensure that the harness of the clock spring does not become caught or tangled.

2. After securing the steerings wheel, turn the steering wheel all the way in both directions to confirm that steering wheel rotation is normal.



▶D◀ POST-INSTALLATION INSPECTION

1. Turn the ignition key to the "ON" position.
2. Does the "SRS" warning light illuminate for about 7 seconds, and then remain off for at least 5 seconds after turning off?
3. If yes, SRS system is functioning properly.
   If no, consult page 52B-13.



INSPECTION

52400250139

AIR BAG MODULE CHECK

If any component damage is found during the following inspection, replace the air bag module with a new one. Dispose of the old one according to the specified procedure. (Refer to P.52B-34.)

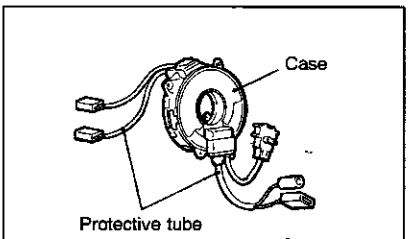
Caution

Never attempt to measure the circuit resistance of the air bag modules (squib) even if you are using the specified tester. If the circuit resistance is measured with a tester, accidental air bags deployment will result in serious personal injury.

1. Check pad cover for dents, cracks or deformation.
2. Check connectors for damage, terminals for deformation, and harness for binds.
3. Check air bag inflator case for dents, cracks or deformation.
4. Install the air bag module to steering wheel or dash to check fit and alignment with the wheel.

Caution

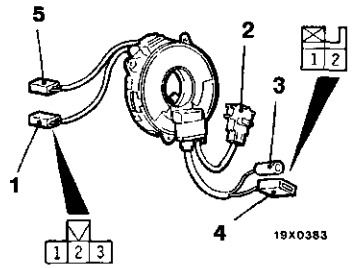
If dents, cracks, deformation, or rust are discovered in the air bag module, replace it with a new one. Dispose of the old one according to the specified procedure. (Refer to P.52B-34.)



CLOCK SPRING CHECK

1. Check connectors and protective tube for damage, and terminals for deformation.
2. Visually check the case for damage.

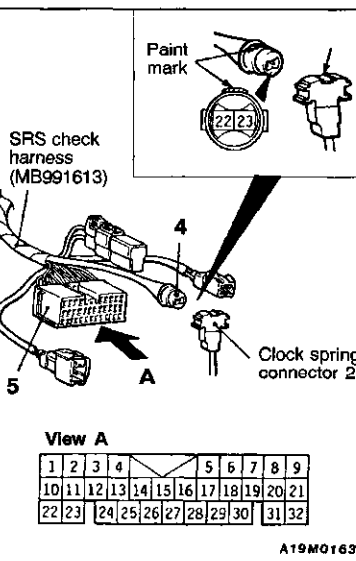
If even one abnormality is discovered, replace the clock spring with a new one.



19X0382 00000061

3. Check for continuity between the No.1 connector of the clock spring and connectors No.3 and 4

No.1 connector			No.3 connector	No.4 connector	
Terminal 1	Terminal 2	Terminal 3		Terminal 1	Terminal 2
To auto-cruise control unit	To ACC power	To horn relay	To horn switch	To auto-cruise control switch	



4. Align the paint mark of the SRS check harness connector No.4 with the notch in clock spring connector No.2 (arrow in the illustration) to connect the connectors Nos.2 and 4.
5. Check continuity between the terminals 22 and 23 of the SRS check harness connector No.5.

AIR BAG MODULE DISPOSAL PROCEDURES

52400120133

Before disposing of an air bag or a vehicle equipped with an air bag, follow the procedures below to deploy the air bag (s).

UNDEPLOYED AIR BAG MODULE DISPOSAL

Caution

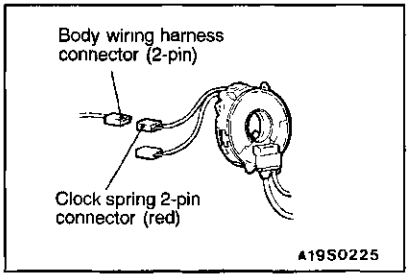
1. **If the vehicle is to be scrapped or otherwise disposed of, deploy the air bags inside the vehicle. If the vehicle will continue to be used and only the air bag modules are to be disposed of, deploy the air bags outside the vehicle.**
2. **Since a large amount of smoke is produced when the air bag is deployed, avoid residential areas whenever possible.**
3. **Since there is loud noise when the air bags are deployed, avoid residential areas whenever possible. If anyone is nearby, give warning of the impending noise.**
4. **Suitable ear protection should be worn by personnel performing these procedures or by people in the immediate area.**

DEPLOYMENT INSIDE THE VEHICLE

(when disposing of a vehicle)

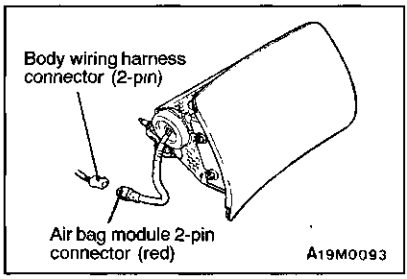
1. Move the vehicle to an isolated spot.
2. Disconnect the negative (-) and positive (+) battery cables from the battery terminals, and then remove the battery from the vehicle.

   Caution
   Wait at least 60 seconds after disconnecting the battery cables before doing any further work. (Refer to P.52B-11.)

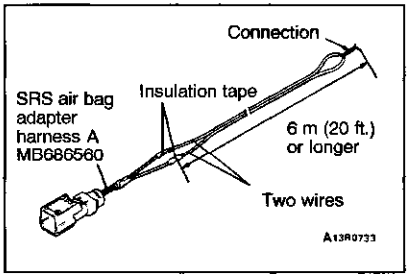


3. To deploy the air bag module (driver's side):
   (1) Remove the steering column cover lower.
   (2) Remove the connection between the clock spring 2-pin connector (red) and the body wiring harness connector.

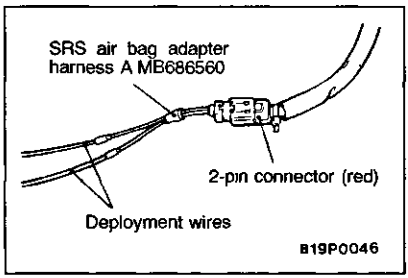
   NOTE
   If the clock spring connector is disconnected from the body wiring harness, both electrodes of the clock spring connector will be automatically shorted to prevent unintended deployment of the air bag due to static electricity, etc.



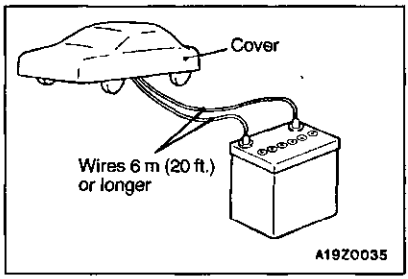
4. To deploy the air bag module (front passenger's side):
   (1) Remove the glove box. (Refer to P.52B-29.)
   (2) Remove the connection between the air bag module (front passenger's side) connector (red 2-pin) and the body wiring harness connector.



5. Connect two wires, each six meters (20 feet) or longer, to the two leads of SRS air bag adapter harness A and cover the connections with insulation tape. The other ends of the two wires should be connected to each other (short-circuited), to prevent sudden unexpected deployment of the air bag.



6. Connect the clock spring or air bag module (front passenger's side) 2-pin connector (red) to SRS air bag adapter harness A and move the deployment wires out of the vehicle.



7. To suppress the operation sound as much as possible, completely close all door windows, close the door and put the cover on the vehicle.

   Caution
   If the glass is scratched, air bag deployment could cause it to crack and fly out of the vehicle, so always put a cover over the vehicle.

8. At a location as far away from the vehicle as possible, disconnect the two connected wires from each other, and connect them to the two terminals of the battery (which has been removed from the vehicle) to deploy the air bag.

   Caution
   1. **Before deploying the air bag in this manner, first check to be sure that there is no one in or near the vehicle. Wear safety glasses.**
   2. **The inflator will be quite hot immediately following the deployment, so wait at least 30 minutes to allow it to cool before attempting to handle it. Although not poisonous, do not inhale gas from air bag deployment. See Deployed Air Bag Module Disposal Procedures (Refer to P.52B-39) for post-deployment handling instructions.**
   3. **If the air bag module fails to deploy when the procedures above are followed, do not go near the module. Contact the MMSA Tech Line.**

9. After deployment, dispose of the air bag module according to the Deployed Air Bag Module Disposal Procedures. (Refer to P.52B-39.)

DEPLOYMENT OUTSIDE THE VEHICLE

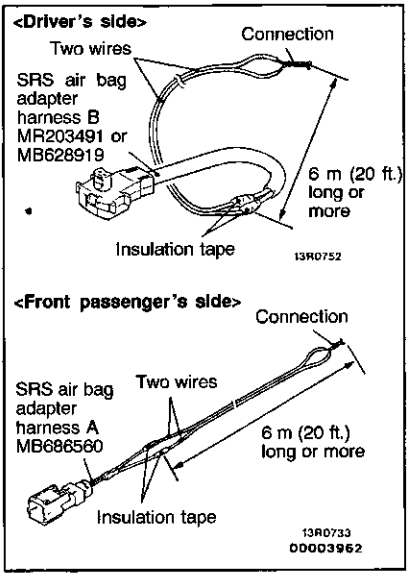
Caution
1. **Deploy the air bag in a wide, flat area at least 6 m (20 feet) away from obstacles and other people.**
2. **Do not perform deployment outside, if a strong wind is blowing, and if there is even a slight breeze, the air bag module should be placed and deployed downwind from the battery.**

1. Disconnect the negative (-) and positive (+) battery cables from the battery terminals, and then remove the battery from the vehicle.

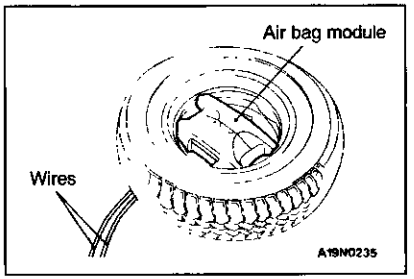
   Caution
   Wait at least 60 seconds after disconnecting the battery cables before doing any further work. (Refer to P.52B-11.).

2. Remove the air bag module from the vehicle. (Refer to P.52B-27.)

   Caution
   Store the air bag module on a flat surface with the pad cover facing up. Do not place anything on top of it.



3. Connect two wires, each six meters (20 feet) or longer, to the two leads of SRS air bag adapter harness B <driver's side> or SRS air bag adapter harness A <front passenger's side>, and cover the connections with insulation tape. The other ends of the two wires should be connected to each other (short-circuited), to prevent sudden unexpected deployment of the air bag module.



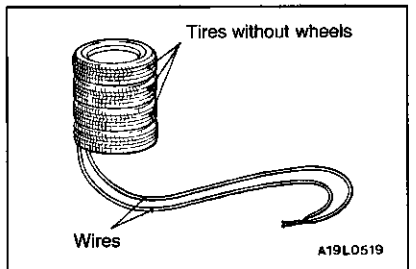
4. Prepare the air bag modules as follows:

<Air bag module (driver's side)>

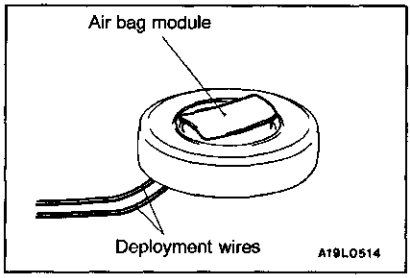
(1) Take the SRS air bag adapter harness B that is connected to the wires, pass it beneath an old tire wheel assembly, and connect it to the air bag module.

(2) Pass the thick wire through the air bag module mounting hole, and then secure the air bag module to an old tire with a wheel in it so that the pad on the module is facing upwards.

Caution
Leave some space below the wheel for the adaptor harness. If there is no space, the reaction when the air bag deploys could damage the adaptor harness.



(3) Place three old tires with no wheels on top of the tire secured to the air bag module.

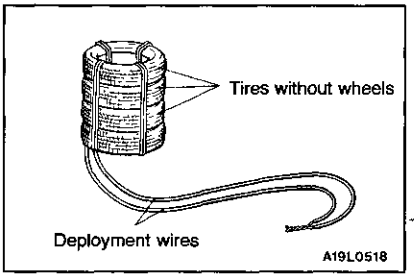


<Air bag module (front passenger's side)>

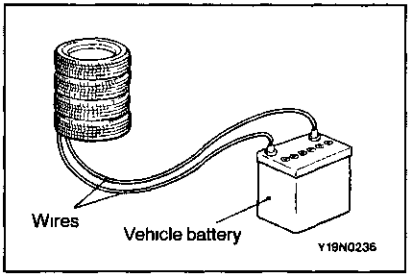
(1) Connect the deployment wires to the SRS air bag adaptor harness A, pass it beneath the tire and wheel assembly, and connect it to the air bag module.
(2) Pass the thick wires into the hole of the air bag module bracket, and secure it to the wheel of the old tire with wheel (4 locations), with the air bag facing upwards.

Caution

1. **Leave some space below the wheel for the deployment wires.**
   If there is no space, the reaction of the air bag deployment could result in damage of the adaptor harness.
2. **During deployment takes place, do not have the connector of the SRS air bag adaptor harness A inserted between the tires.**



(3) Place four old tires without wheels on top of the tire secured to the air bag module, and secure all tires together with ropes (4 locations).



5. At a location as far away from the air bag module as possible, and from a shielded position, disconnect the two connected wires from each other, and connect them to the two terminals of the battery (which has been removed from the vehicle) to deploy the air bag.

Caution

1. **Before deployment, check carefully to be sure that no one is nearby.**
2. **The inflator will be quite hot immediately following the deployment, so wait at least 30 minutes to allow it to cool before attempting to handle it. Although not poisonous, do not inhale gas from air bag deployment. See Deployed Air Bag Module Disposal Procedures (P.52B-39) for post-deployment handling instructions.**
3. **If the air bag fails to deploy, do not go near the module. Contact the MMSA Tech Line.**

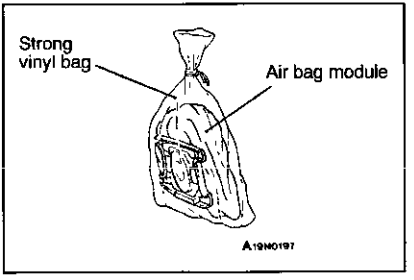
6. After deployment, dispose of the air bag module according to the Deployed Air Bag Module Disposal Procedures on the next page.

DEPLOYED AIR BAG MODULE DISPOSAL

After deployment, the air bag module should be disposed of in the same manner as any other scrap parts, adhering to local laws and/or legislation. Observe the following precautions during air bag disposal:

1. The inflator will be quite hot immediately following deployment, so wait at least 30 minutes to allow it cool before attempting to handle it.
2. Do not put water or oil on the air bag after deployment.
3. There may be material on the deployed air bag module, that could irritate the eye and/or skin. Wear gloves and safety glasses when handling a deployed air bag module.

Caution
If after following these precautions, any material does get into the eyes or on the skin, immediately rinse the affected area with a large amount of clean water. If any irritation develops, seek medical attention.



4. Tightly seal the air bag module in a strong vinyl bag for disposal.
5. Be sure to always wash your hands after completing this operation.

CHASSIS ELECTRICAL

CONTENTS

54109000112

AIR CONDITIONING ..... Refer to GROUP 55

ANTENNA 67

ANTI-LOCK BRAKING SYSTEM ..... Refer to GROUP 35B

AUTO-CRUISE CONTROL SYSTEM ..... Refer to GROUP 17

BATTERY 3

- ON-VEHICLE SERVICE 3
  - Battery Charging 3
  - Battery Check 3
  - Battery Testing Procedure 4

CIGARETTE LIGHTER 50

- CIGARETTE LIGHTER 50
- GENERAL INFORMATION 50
- TROUBLESHOOTING 50

CLOCK 51

- CLOCK 51
- SPECIAL TOOL 51

COMBINATION METERS 13

- COMBINATION METERS 21
- GENERAL INFORMATION 13
- ON-VEHICLE SERVICE 17
  - Engine Coolant Temperature Gauge Simple Check 19
  - Engine Coolant Temperature Gauge Unit Check 20
  - Fuel Gauge Simple Check 18
  - Fuel Gauge Unit Check 18
  - Speedometer Check 17
  - Tachometer Check 17
- SEALANT 14
- SERVICE SPECIFICATIONS 13
- SPECIAL TOOLS 14
- TROUBLESHOOTING 15

CONTINUED ON NEXT PAGE

WARNINGS REGARDING SERVICING OF SUPPLEMENTAL RESTRAINT SYSTEM (SRS) EQUIPPED VEHICLES

WARNING!

(1) Improper service or maintenance of any component of the SRS, or any SRS-related component, can lead to personal injury or death to service personnel (from inadvertent firing of the air bag) or to the driver and passenger (from rendering the SRS inoperative).

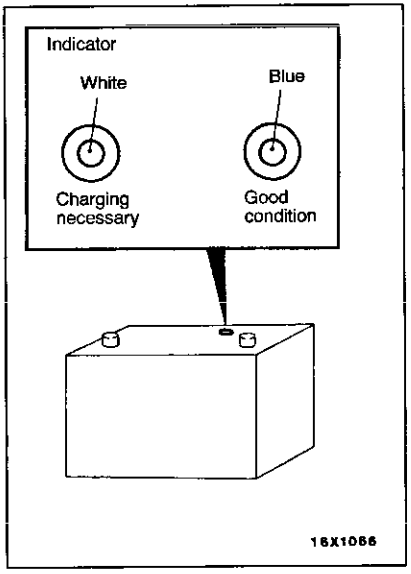
(2) Service or maintenance of any SRS component or SRS-related component must be performed only at an authorized MITSUBISHI dealer.

(3) MITSUBISHI dealer personnel must thoroughly review this manual, and especially its GROUP 52B - Supplemental Restraint System (SRS) and GROUP 00 - Maintenance Service before beginning any service or maintenance of any component of the SRS or any SRS-related component.

NOTE

The SRS includes the following components: SRS-ECU, SRS warning light, air bag module, clock spring and interconnecting wiring. Other SRS-related components (that may have to be removed/installed in connection with SRS service or maintenance) are indicated in the table of contents by and asterisk (*).

DOOR GLASS AND REGULATOR (POWER WINDOWS) ..... Refer to GROUP 42
DOOR HANDLE AND LATCH (DOOR LOCKING SYSTEM) ..... Refer to GROUP 42
DOOR MIRROR (REMOTE CONTROLLED MIRROR) ..... Refer to GROUP 51
FOG LIGHT 36
FOG LIGHT 39
GENERAL INFORMATION 36
ON-VEHICLE SERVICE 36
Bulb Replacement 38
Fog Light Aiming 36
SERVICE SPECIFICATIONS 36
SPECIAL TOOL 36
TROUBLESHOOTING 36
HAZARD WARNING LIGHT SWITCH 48
HAZARD WARNING LIGHT SWITCH 48
SPECIAL TOOL 48
HEADLIGHT AND TURN-SIGNAL LIGHT 24
GENERAL INFORMATION 24
HEADLIGHT AND FRONT TURN-SIGNAL LIGHT 33
ON-VEHICLE SERVICE 28
Bulb Replacement 32
Headlight Aiming 28
Luminous Intensity Measurement 32
SERVICE SPECIFICATIONS 25
SPECIAL TOOLS 25
TROUBLESHOOTING 26
HEATER ..... Refer to GROUP 55
HIGH MOUNTED STOP LIGHT 44
HIGH MOUNTED STOP LIGHT 44
TROUBLESHOOTING 44
HORN 49
GENERAL INFORMATION 49
HORN 49
TROUBLESHOOTING 49
IGNITION SWITCH* 5
GENERAL INFORMATION 5
IGNITION SWITCH 10
SPECIAL TOOLS 5
TROUBLESHOOTING 6
INTERIOR LIGHT 45
GENERAL INFORMATION 45
INTERIOR LIGHT 46
TROUBLESHOOTING 45
RADIATOR (RADIATOR FAN MOTOR) ..... Refer to GROUP 14
RADIO AND TAPE PLAYER 52
RADIO AND TAPE PLAYER 65
SPECIAL TOOL 52
TROUBLESHOOTING 52
REAR COMBINATION LIGHT 40
GENERAL INFORMATION 40
REAR COMBINATION LIGHT 43
SPECIAL TOOLS 41
TROUBLESHOOTING 41
REAR WINDOW DEFOGGER 68
ON-VEHICLE SERVICE 68
Printed-heater Line Check 68
REAR WINDOW DEFOGGER SWITCH .. 69
RHEOSTAT 47
RHEOSTAT 47
SPECIAL TOOL 47
SPEAKER 66
SUNROOF ..... Refer to GROUP 42
SUPPLEMENTAL RESTRAINT SYSTEM (SRS) ..... Refer to GROUP 52B
WINDSHIELD WIPER AND WASHER ..... Refer to GROUP 51



BATTERY

54100100057

ON-VEHICLE SERVICE

BATTERY CHECK

BATTERY VISUAL INSPECTION (1)

The battery contains a visual test indicator which gives a blue signal when an adequate charge level exists, and a white signal when charging is required.

BATTERY VISUAL INSPECTION (2)

Make sure ignition switch is in OFF position and all battery fed accessories are OFF.

1. Disconnect (-) ground cable from battery before disconnecting (+) cable.
2. Remove the battery from the vehicle.

   Caution
   Care should be taken in the event battery case is cracked or leaking to protect hands from the electrolyte. A suitable pair of rubber gloves (not the household type) should be worn when removing battery by hand.

3. Inspect battery carrier for damage caused by loss of acid from battery. If acid damage is present, it is necessary to clean area with a solution of clean warm water and baking soda. Scrub area with a stiff bristle brush. Wipe clean with a cloth moistened with ammonia or baking soda in water.
4. Clean the battery, especially the top with same solutions as described in step 3.
5. Inspect battery case and cover for cracks. If cracks are present, battery must be replaced.
6. Clean the battery post with a suitable battery post cleaning tool.
7. Clean the inside surfaces of the terminal clamps with a suitable battery terminal cleaning tool. Replace damaged or frayed cables and broken terminal clamps.
8. Install the battery in the vehicle.
9. Connect (+) cable first, then (-) cable.
10. Tighten the hold down nut securely.

BATTERY CHARGING

54100110074

Caution
When batteries are being charged, an explosive gas forms beneath the cover of each cell. Do not smoke near batteries on charge or which have recently been charged.
Do not break live circuits at the terminals of the batteries on charge. A spark will occur where the live circuit is broken.
Keep all open flames away from the battery.

Battery electrolyte temperature may temporarily be allowed to rise to 55°C (131°F). Increase of electrolyte temperature above 55°C (131°F) is harmful to the battery, causing deformation of battery cell, decrease in life of battery, etc.

CHARGE RATE

If the test indicator is white, the battery should be charged as outlined below.
When the dot appears or when maximum charge shown below is reached, charging should be stopped.

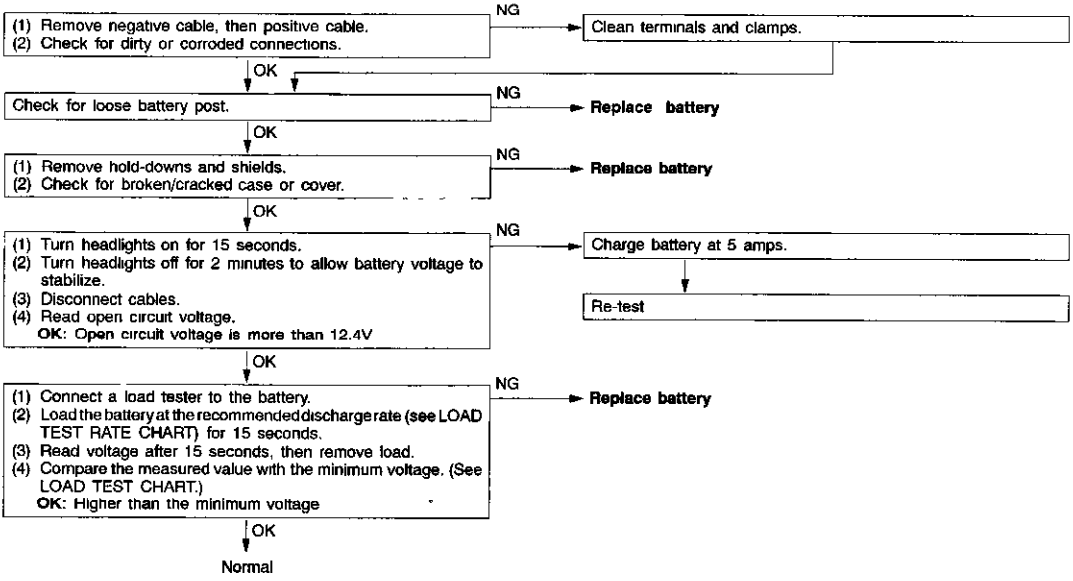
Charge Rate Chart

Battery	55B24L (433 amps)
Slow charging	5 amps 10 hrs.
	10 amps 5 hrs.
Fast charging	20 amps 2.5 hrs.
	30 amps 1.5 hrs.

BATTERY TESTING PROCEDURE

54100120091

TEST STEP



LOAD TEST CHART

Temperature °C (°F)	21 (70) and above	16 (60)	10 (50)	4 (40)	-1 (30)	-7 (20)	-12 (10)	-18 (0)
Minimum voltage	9.6	9.5	9.4	9.3	9.1	8.9	8.7	8.5

LOAD TEST RATE CHART

Load test (AMPS)	210 amps
Cranking rating (0°F)	433 amps
Reserve capacity	79 minutes
Application	55B24L

IGNITION SWITCH

54300010240

GENERAL INFORMATION

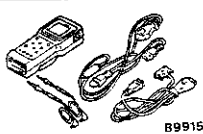
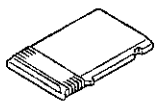
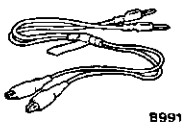
OPERATION

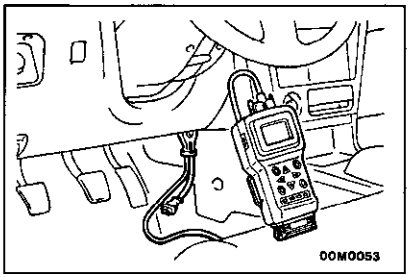
Ignition key reminder warning buzzer circuit

- When, with the ignition key inserted in the key cylinder (with the key reminder switch at OFF), the driver's door is opened (door switch is switched ON), the ECU detective circuit will activate.
- This system is controlled by either ETACS-ECU or BUZZER-ECU on non-ETACS equipped vehicles.
- With the detective circuit activated, buzzer output from the drive circuit makes the buzzer sound intermittently to remind the ignition key is still in the ignition switch.

SPECIAL TOOLS

54300060214

Tool	Tool number and name	Supersession	Application
 B991502	MB991502 Scan tool (MUT-II)	MB991496-OD	ETACS-ECU input signal checking
 B991325	ROM pack		ETACS-ECU input signal checking
 B991529	MB991529 Diagnostic trouble code check harness	Tool not necessary if scan tool <MUT-II> is available	ETACS-ECU input signal checking (when using a voltmeter)



TROUBLESHOOTING

54300700093

DIAGNOSTIC FUNCTION

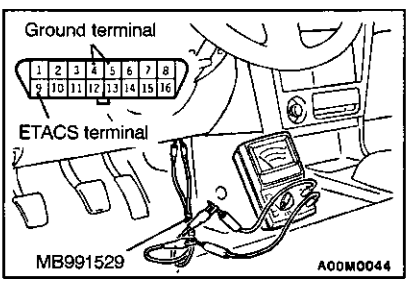
INPUT SIGNAL INSPECTION POINTS <VEHICLES WITH ETACS-ECU>

When Using the Scan Tool

1. Connect the scan tool to the data link connector.

   Caution
   The ignition switch should always be turned OFF when connecting and disconnecting the scan tool.

2. If buzzer of the scan tool sounds once when a switch is operated (ON/OFF), the ETACS-ECU input signal for that switch circuit system is normal.



When Using the Voltmeter

1. Use the special tool to connect a voltmeter between the ground terminal and the ETACS terminal of data link connector.
2. If the voltmeter indicator deflects once when a switch is operated (ON/OFF), the ECU input signal for that switch circuit system is normal.

INSPECTION CHART FOR TROUBLE SYMPTOMS

54300720709

Trouble symptom		Inspection procedure No.	Reference page
Communication with scan tool is not possible. <Vehicles with ETACS-ECU>	Communication with all systems is not possible.	1	54-7
	Communication with the one-shot pulse input signal only is not possible.	2	54-7
Ignition key reminder warning buzzer	While the ignition key reminder warning buzzer sounds, the buzzer does not stop sounding when the ignition key is turned to the ON position. (The buzzer does not sound by closing the driver's door.)	3	54-7
	The ignition key reminder warning buzzer does not stop sounding by removing the ignition key. (The buzzer does not sound by closing the driver's door.)	4	54-8
	The ignition key reminder warning buzzer does not sound when the ignition key is inserted and the driver's door is opened. (The ignition key is turned to OFF position.)	5	54-9

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

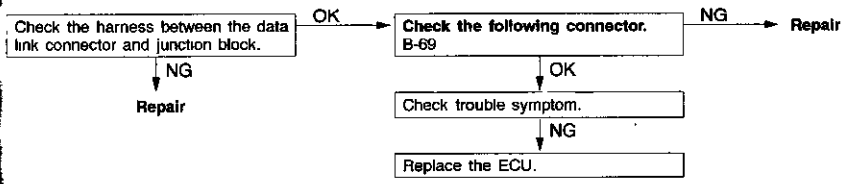
INSPECTION PROCEDURE 1

Communication with scan tool is not possible. (Communication with all systems is not possible.)	Probable cause
The reason is probably a defect in the power supply system (including ground) for the diagnostic line.	• Malfunction of connector • Malfunction of harness wire

Refer to GROUP 13A - Trouble-shooting.

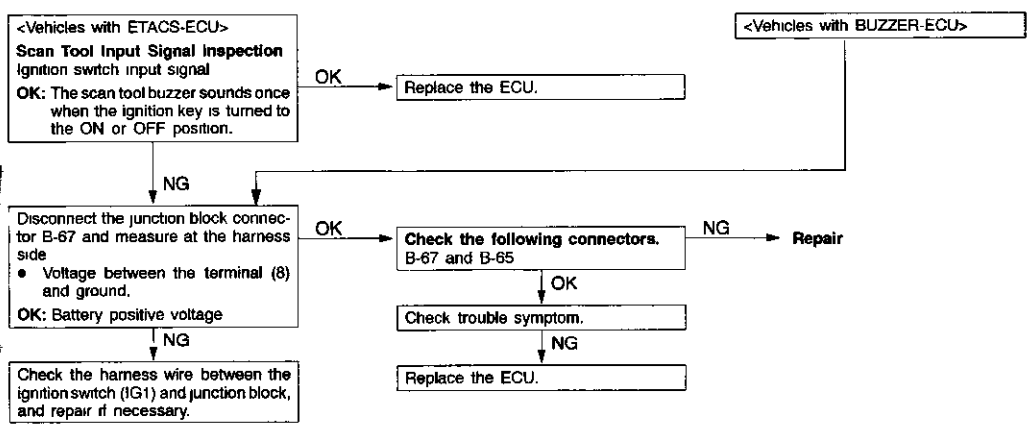
INSPECTION PROCEDURE 2

Communication with scan tool is not possible. (Communication with the one-shot pulse input signal only is not possible.)	Probable cause
The cause is probably a defective one-shot pulse input signal circuit system of the diagnostic line.	• Malfunction of connector • Malfunction of harness wire • Malfunction of ECU



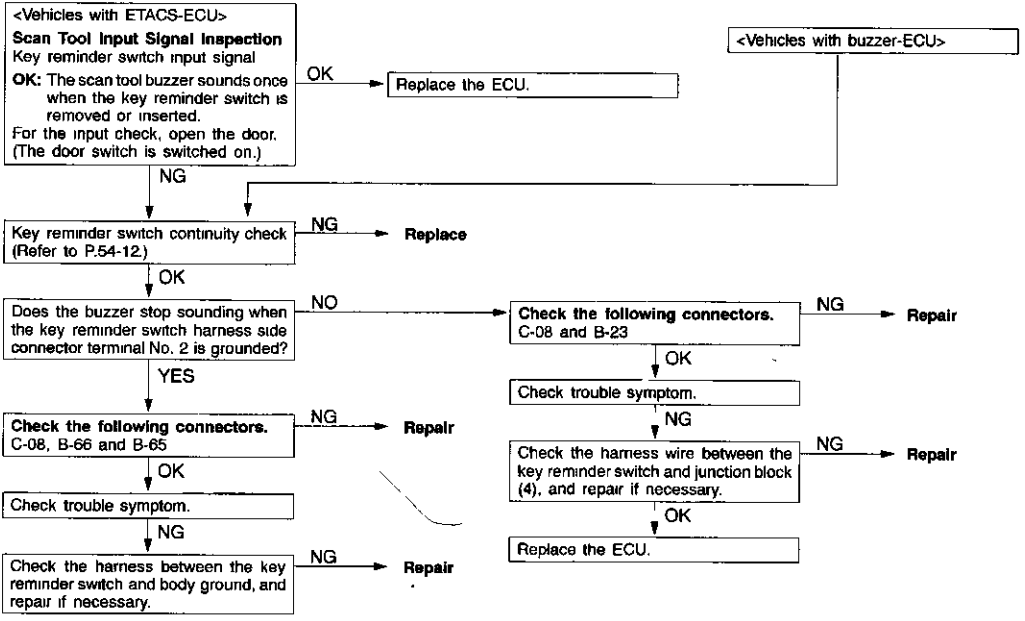
INSPECTION PROCEDURE 3

• While key hole illumination light is illuminated, ignition key is turned to the ON position but key hole illumination light does not switch off. (However, it switches off after 10 seconds.) • While the ignition key reminder warning buzzer sounds, the buzzer does not stop sounding when the ignition key is turned to the ON position. (The buzzer does not sound by closing the driver's door.)	Probable cause
The cause is probably a defective ignition switch input circuit or a defective ECU.	• Malfunction of connector • Malfunction of harness wire • Malfunction of ECU



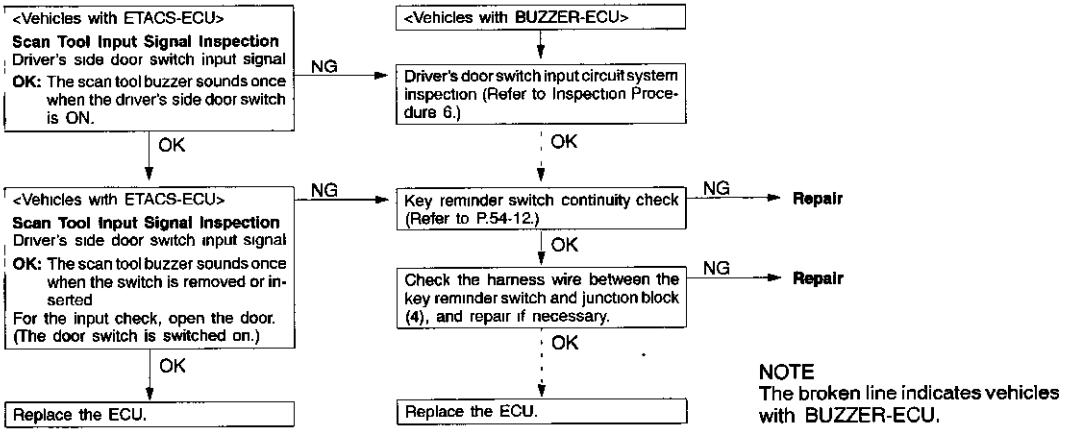
INSPECTION PROCEDURE 4

The ignition key reminder warning buzzer does not stop sounding by removing the ignition key. (The buzzer does not sound by closing the driver's door.)	Probable cause
It is possible that there is a malfunction of the key reminder switch input circuit or the ECU.	• Malfunction of key reminder switch • Malfunction of connector • Malfunction of harness wire • Malfunction of ECU



INSPECTION PROCEDURE 5

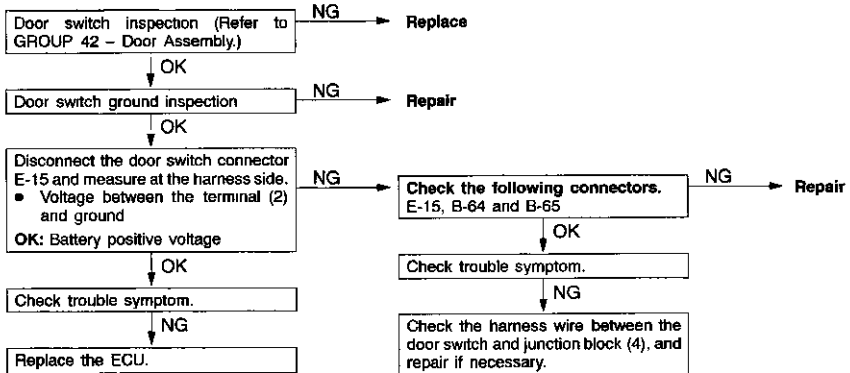
The ignition key reminder warning buzzer does not sound when the ignition key is inserted in the key cylinder and the driver's door is opened. (The ignition key is turned to OFF position.)	Probable cause
It is possible that there is a malfunction of the door switch input circuit or the key reminder switch input circuit, in case the ignition key hole illumination light is defective.	• Malfunction of driver's side door switch • Malfunction of bulb • Malfunction of connector • Malfunction of harness wire • Malfunction of ECU



NOTE
The broken line indicates vehicles with BUZZER-ECU.

INSPECTION PROCEDURE 6

Driver's side door switch input circuit system inspection

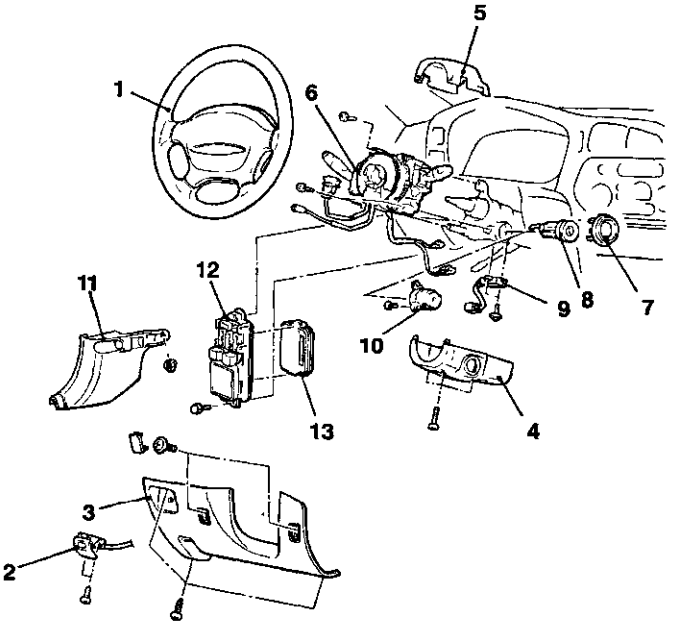


IGNITION SWITCH

54300210312

REMOVAL AND INSTALLATION

CAUTION: SRS
Before removal of air bag module and clock spring, refer to the following items:
GROUP 52B - SRS Service Precautions
GROUP 52B - Air Bag Module and Clock Spring



A16M0326

Steering lock cylinder removal steps

1. Steering wheel (Refer to GROUP 37A - Steering Wheel and Shaft)
2. Hood lock release handle
3. Instrument under cover
4. Column cover, lower
5. Column cover, upper
6. ▶A◀ Clock spring and column switch assembly
7. Ring cover
8. ◀A▶ Steering lock cylinder

Key reminder switch removal steps

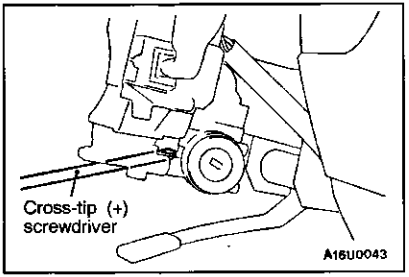
4. Column cover, lower
5. Column cover, upper
9. Key reminder switch

Ignition switch removal steps

4. Column cover, lower
5. Column cover, upper
10. Ignition switch

BUZZER-ECU or ETACS-ECU removal steps

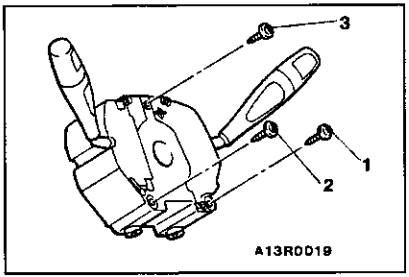
11. Cowl side trim (LH)
12. Junction block
13. BUZZER-ECU or ETACS-ECU



REMOVAL SERVICE POINT

◀A▶ STEERING LOCK CYLINDER REMOVAL

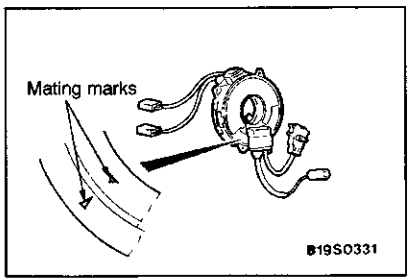
1. Insert the key in the steering lock cylinder and turn it to the "ACC" position.
2. Using a cross-tip (+) screwdriver (small) or similar tool, push the lock pin of the steering lock cylinder inward and then pull the steering lock cylinder toward you.



INSTALLATION SERVICE POINT

▶A◀ CLOCK SPRING AND COLUMN SWITCH ASSEMBLY INSTALLATION

1. Tighten the screws in the order shown.



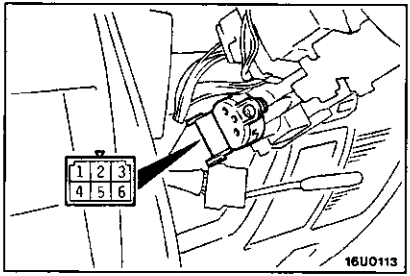
2. Align the clock spring mating marks and, after turning the front wheels to the straight-ahead position, install the clock springs to the column switch.

Mating Mark Alignment

Turn the clock spring clockwise fully, and then turn back it approx. 3 4/5 turns counterclockwise to align the mating marks.

Caution

If the clock spring's mating marks are not properly aligned, the steering wheel may not rotate completely during a turn, or the flat cable within the clock spring may be severed, obstructing normal operation of the SRS and possibly leading to serious injury to the vehicle's driver.



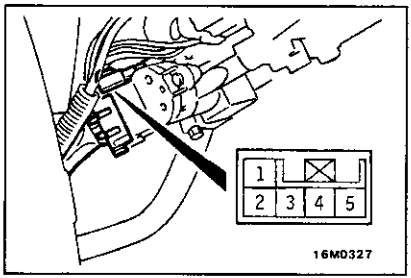
INSPECTION

54300220117

IGNITION SWITCH CONTINUITY CHECK

1. Remove the column cover lower and upper.
2. Disconnect the wiring connector from the ignition switch and connect an ohmmeter to the switch side connector.
3. Operate the ignition switch and check the continuity.

Ignition key position	Terminal No.				
	1	2	3	5	6
LOCK					
ACC		○		○	
ON	○	○	○	○	
START		○	○		○



KEY REMINDER SWITCH CONTINUITY CHECK

54300770056

1. Remove the column cover lower and upper.
2. Disconnect the wiring connector from the key reminder switch or from the key hole illumination light and connect an ohmmeter to the switch side connector.
3. Check the continuity when the ignition key is pulled out of and inserted into the steering lock cylinder.

Ignition key	Terminal No.	
	2	5
Removed	○	○
Inserted		

COMBINATION METERS

54300010189

GENERAL INFORMATION

OPERATION

Fuel gauge

- When the ignition key is at the "ON" position, the fuel gauge is activated.
- When there is much fuel, the unit's resistance is small and the current flowing in the circuit is great, so the gauge's indicator indicates in the "F" area.
- When there is little fuel, the unit's resistance is high and the current flowing in the circuit is small, so the gauge's indicator indicates in the "E" area.

Engine coolant temperature gauge

- When the ignition key is at the "ON" position, the engine coolant temperature gauge is activated.
- When the engine coolant temperature is high, the unit's resistance is low and there is a great flow of current in the circuit, so the gauge's indicator indicates in the "H" area.
- When the engine coolant temperature is low, the unit's resistance is high and there is a small flow of current in the circuit, so the gauge's indicator indicates in the "C" area.

Electric type speedometer

- With the ignition switch turned to "ON" position, speedometer operates.
- The electric type speedometer uses an electric circuit to pulse the wave of the electric signal from the vehicle speed sensor. After calculating vehicle speed, the speedometer driver circuit drives the pointer.

Brake warning light

This warning light illuminates when the ignition key is in "ON" position, and goes off after the engine has started. This indicator comes on when the parking brake is applied or brake fluid level falls below the specific level.

Oil pressure warning light

This warning light illuminates when the ignition key is in "ON" position, and goes off after the engine has started. This indicator comes on when the engine stalls or trouble occurs in the oil circulating system while driving.

Low fuel warning light

With the ignition key turned to the "ON" position, the fuel level sensor resistance becomes small by its exposure from the fuel, when the fuel level comes down.
When the resistance value becomes lower than the specified value, the fuel warning light comes on to indicate that the fuel residual quantity is small.

SERVICE SPECIFICATIONS

54300030109

Items		Standard values
Speedometer indication error mph	20	19 - 22
	40	38 - 44
	60	57 - 66
	80	76 - 88
	100	94 - 110
Tachometer indication error rpm	700	±100
	3,000	±150
	5,000	±250
	6,000	±300
Fuel gauge unit resistance Ω	Float point "F"	0.9 - 5.1
	Float point "E"	102.3 - 117.7
Fuel gauge unit float height mm (in.)	A (Float point "F")	17.4 (.69)
	B (Float point "E")	130.2 (5.1)

Items		Standard values
Fuel gauge resistance Ω	Power supply and ground	192 ± 19.2
	Power supply and fuel gauge	89 ± 8.9
	Fuel gauge and ground	103 ± 10.3
Engine coolant temperature gauge resistance Ω	Power supply and ground	187 ± 18.7
	Power supply and engine coolant temperature gauge	90 ± 4.5
	Engine coolant temperature gauge and ground	247 ± 24.7
Engine coolant temperature gauge unit resistance [at 70°C (158°F)] Ω		104 ± 13.5

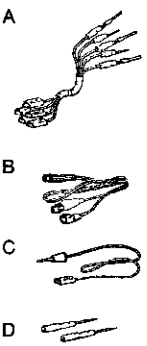
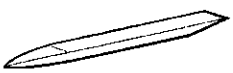
SEALANT

54300050020

Items	Specified sealants
Engine coolant temperature gauge unit threaded portion	3M Adhesive nut locking No. 4171 or equivalent

SPECIAL TOOLS

54300060221

Tool	Tool number and name	Supersession	Application
	MB991223 Harness set A: MB991219 Test harness B: MB991220 LED harness C: MB991221 LED adapter D: MB991222 Probe	MB991223	Fuel gauge simple check A: Connector pin contact pressure check B,C: Power circuit check D: Commercial tester connection
	MB990784 Ornament remover	General service tool	Removal of meter bezel

TROUBLESHOOTING

5430072021t

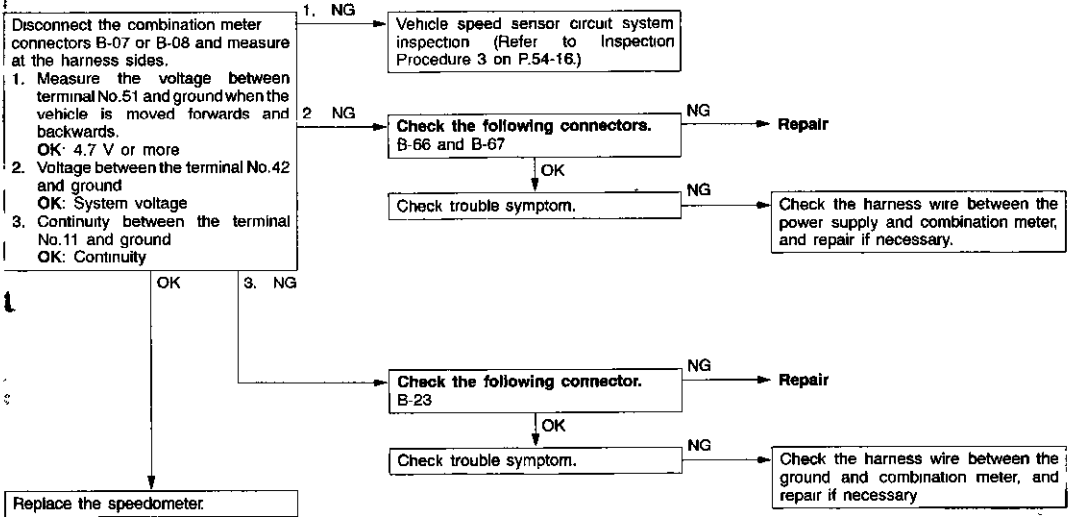
INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom	Inspection procedure	Reference page
Speedometer does not work.	1	54-15
Tachometer does not work.	2	54-16

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

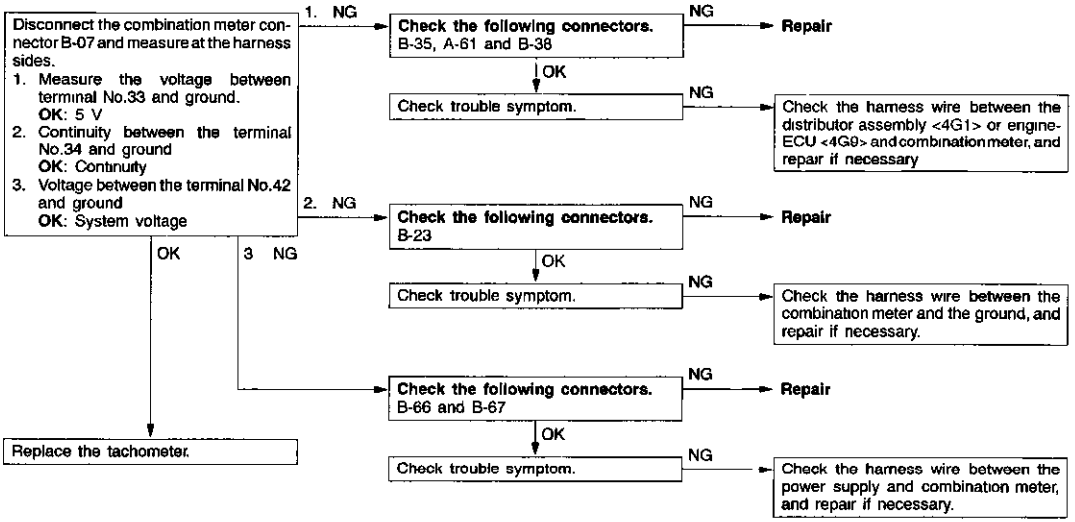
Inspection Procedure 1

Speedometer does not work.	Probable cause
The cause may be a defective vehicle speed sensor circuit system or a defective speedometer Vehicle speed sensor is also used by the engine-ECU and A/T-ECU.	• Malfunction of vehicle speed sensor • Malfunction of speedometer • Malfunction of harness or connector



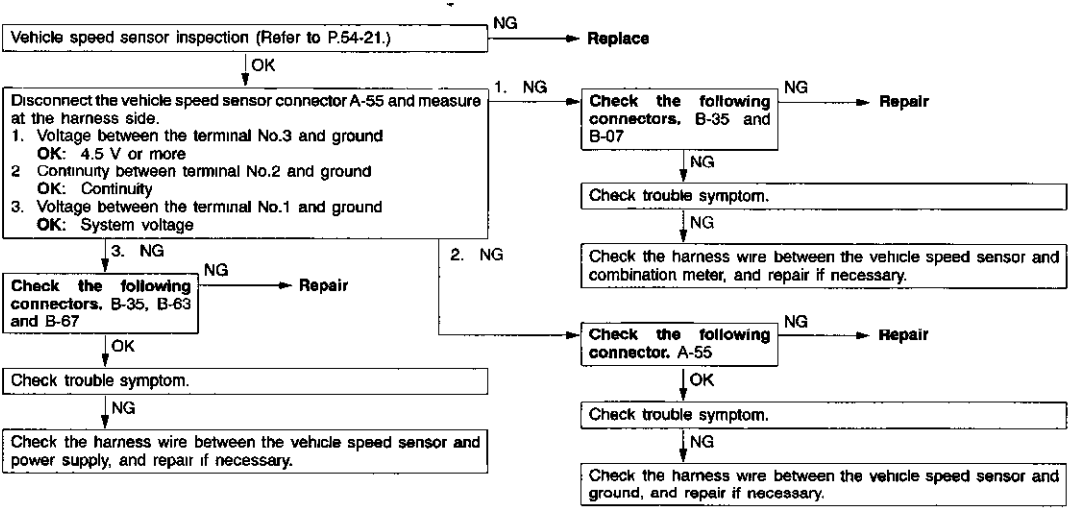
Inspection Procedure 2

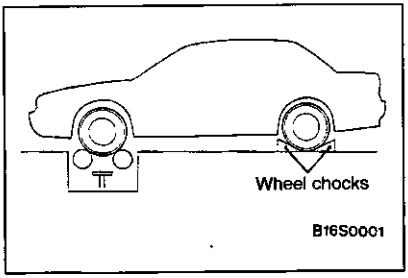
Tachometer does not work.	Probable cause
The ignition signal may not be input from the engine, or there may be a malfunction in the power supply or ground circuit.	• Malfunction of tachometer • Malfunction of harness or connector



Inspection Procedure 3

Vehicle speed sensor circuit system inspection



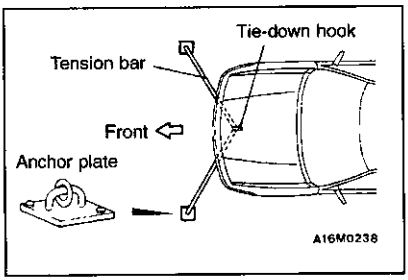


ON-VEHICLE SERVICE

54300090084

SPEEDOMETER CHECK

1. Adjust tire pressure to the specified level. (Refer to GROUP 31 – Service Specifications.)
2. Set the vehicle onto a speedometer tester and use wheel chocks to hold the rear wheels.
3. Make sure the parking brake has been applied.



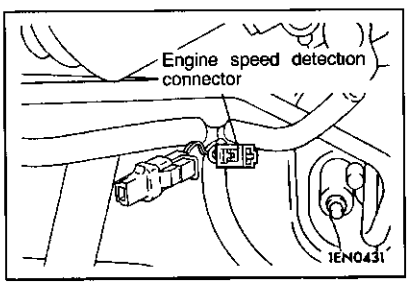
4. To prevent the front wheel from moving from side to side, attach tension bars to the tie-down hook, and secure both ends to anchor plates.
5. To prevent the vehicle from launching, attach a chain or wire to the rear retraction hook, and make sure the end of the chain or wire is secured firmly.
6. Check if the speedometer indicator range is within the standard values.

Caution
Do not operate the clutch suddenly. Do not increase/decrease speed rapidly while testing.

Standard values:

Standard indication mph	Allowable range mph
20	19 - 22
40	38 - 44
60	57 - 66
80	76 - 88
100	94 - 110

7. If not to the standard value, inspect for proper tire size. If not correct, replace tires with original size tires and retest. If correct, replace the speedometer. If still not to standard value, replace vehicle speed sensor.



TACHOMETER CHECK

54300100084

1. Insert a paper clip in the engine speed detection connector from the harness side, and attach an external high quality tachometer.

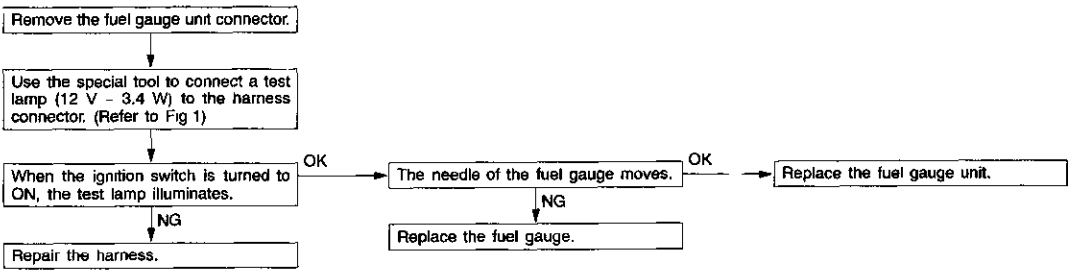
NOTE
For tachometer check, use an external high quality inductive tachometer.

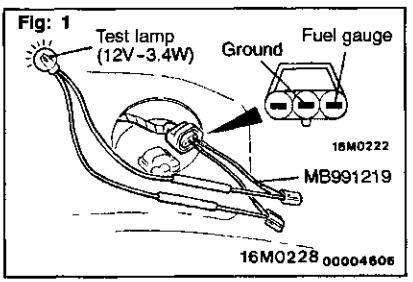
2. Compare the readings of the vehicle tachometer and the external tachometer at every engine speed, and check if the variations are within the standard values.

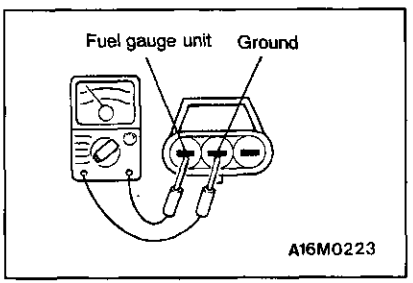
Standard values:
700 r/min : ±100 r/min
3,000 r/min : ±150 r/min
5,000 r/min : ±250 r/min
6,000 r/min : ±300 r/min

FUEL GAUGE SIMPLE CHECK

54300110100







FUEL GAUGE UNIT CHECK

54300120141

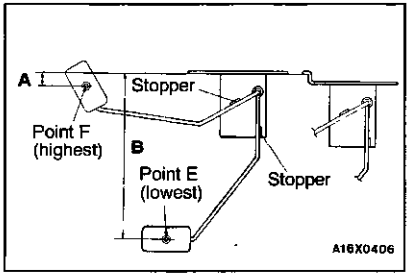
Remove the fuel gauge unit from the fuel tank. (Refer to GROUP 13F.)

FUEL GAUGE UNIT RESISTANCE

1. Check that the resistance value between the fuel gauge terminal and ground terminal is at standard value when fuel gauge unit float is at point F (highest) and point E (lowest).

   Standard value:
   Point F: 0.9 - 5.1 Ω
   Point E: 102.3 - 117.7 Ω

2. Check that resistance value changes smoothly when float moves slowly between point F (highest) and point E (lowest).
3. If all checks are correct, proceed to fuel gauge unit float height check. If any check is not correct, replace the fuel gauge unit.

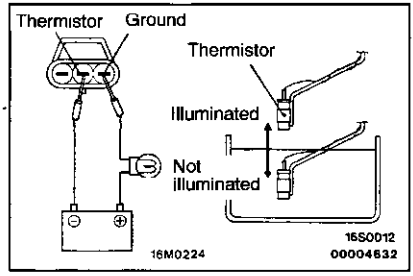


FUEL GAUGE UNIT FLOAT HEIGHT

1. Move float and measure the height A at point F (highest) and B at point E (lowest) with float arm touching stopper.

   Standard value:
   A: 17.4 mm
   B: 130.2 mm

2. Adjust the float arm to the standard value, then proceed to the thermistor check.



THERMISTOR

1. Connect fuel gauge unit (thermistor) to battery via test lamp (12 V - 3.4 W). Immerse in water.
2. Condition is good if lamp goes off when the thermistor is immersed in water and comes on when it is taken out of water.

   Caution
   After finishing this test, wipe the unit dry and install it in the fuel tank.

3. If all checks are correct, the fuel gauge unit is OK. If any check is not correct, replace the fuel gauge unit.

ENGINE COOLANT TEMPERATURE GAUGE SIMPLE CHECK

54300140116

Remove the engine coolant gauge unit connector.

↓

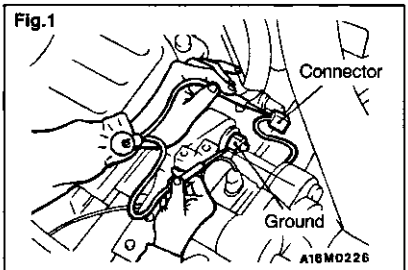
Connect a test lamp (12 V - 3.4 W) between the harness side connector and the ground. (Refer to Fig.1)

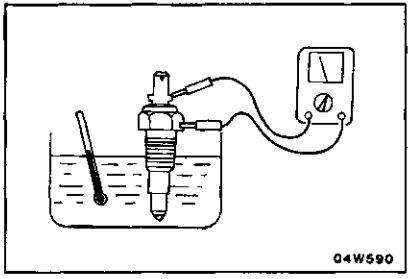
↓

When the ignition switch is turned to "ON", the test lamp illuminates.

- OK → The needle of the engine coolant temperature gauge moves.
  - NG → Replace the engine coolant temperature gauge.
  - OK ↓ Replace the engine coolant temperature gauge unit.
- NG ↓ Repair the harness.

Fig.1



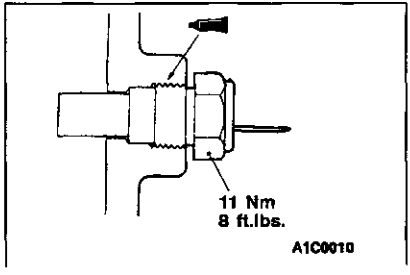


ENGINE COOLANT TEMPERATURE GAUGE UNIT CHECK

54300150263

1. Bleed the engine coolant.
   (Refer to GROUP 00 – Maintenance Service.)
2. Remove the engine coolant temperature gauge unit.
3. Immerse the unit in 70°C water to measure the resistance.

   Standard value: 104 ± 13.5 Ω
4. If within the standard value, the sensor is OK. Re-install it, then check the engine coolant temperature gauge. (Refer to P.54-21.) If not within the standard value, replace it.



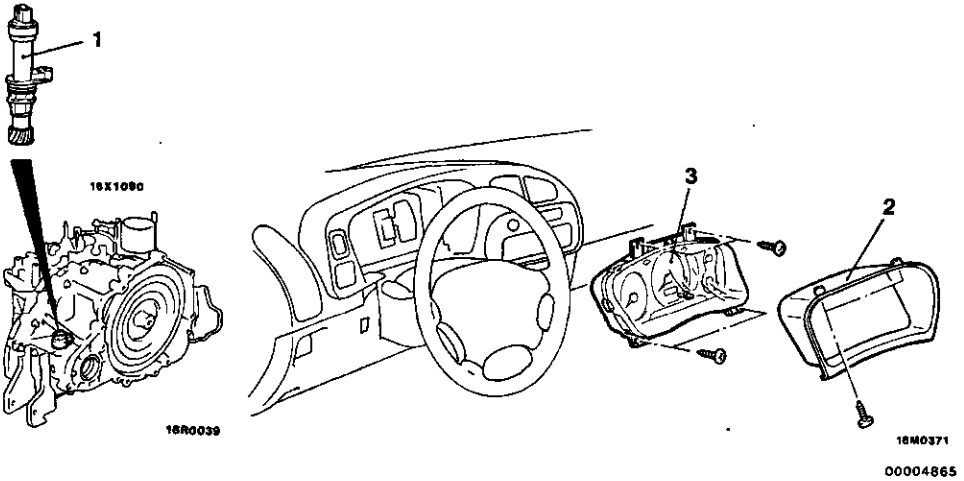
5. After checking, apply the specified adhesive around the thread of engine coolant temperature gauge unit.

   Specified sealant:
   3M Adhesive Nut Locking No. 4171 or equivalent
6. Add engine coolant.
   (Refer to GROUP 00 – Maintenance Service.)

COMBINATION METERS

54300290118

REMOVAL AND INSTALLATION

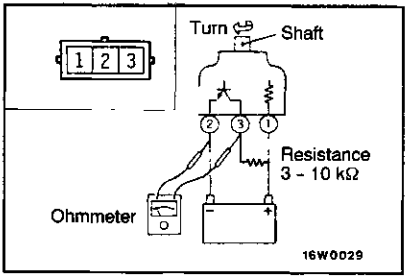


Vehicle speed sensor removal steps

- Air Cleaner, Air Intake Hose
1. Vehicle speed sensor

Combination meter removal steps

2. Meter bezel
3. Combination meter

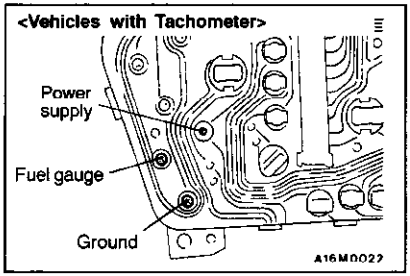


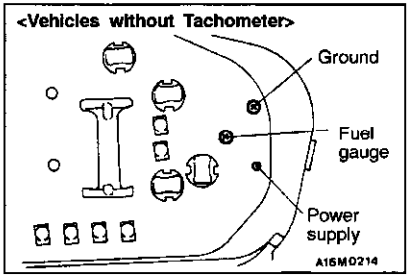
INSPECTION

54300640057

VEHICLE SPEED SENSOR CHECK

1. Remove the vehicle speed sensor and connect a 3 - 10 kΩ resistance as shown in the illustration.
2. Turn the shaft of the vehicle speed sensor and check that there is voltage between terminals 2 - 3. (1 turn = 4 pulses)
3. If within the standard value, the vehicle speed sensor is OK.
   If not within the standard value, replace the vehicle speed sensor.





FUEL GAUGE RESISTANCE CHECK

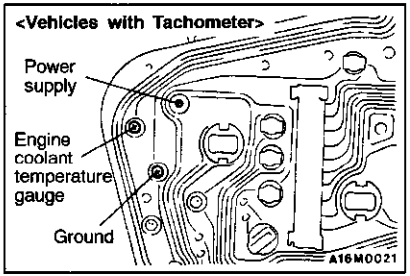
54300300088

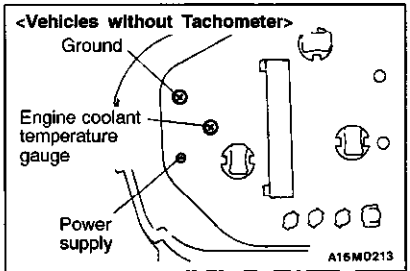
1. Remove the power supply tightening screw.
2. Use an ohmmeter to measure the resistance value between the terminals.

   Standard value:
   Power supply - Ground: 192 ± 19.2
   Power supply - Fuel gauge: 89 ± 8.9
   Fuel gauge - Ground: 103 ± 10.3

3. If within the standard value, the fuel gauge is OK.
   If not within the standard value, replace the fuel gauge.

Caution
When inserting the testing probe into the power supply terminal, be careful not to touch the printed board.





ENGINE COOLANT TEMPERATURE GAUGE RESISTANCE CHECK

54300300095

1. Remove the power supply tightening screw.
2. Use an ohmmeter to measure the resistance value between the terminals.

   Standard value:
   Power supply - Ground: 187 ± 18.7
   Power supply - Engine coolant temperature gauge: 90 ± 4.5
   Engine coolant temperature gauge - Ground: 247 ± 24.7

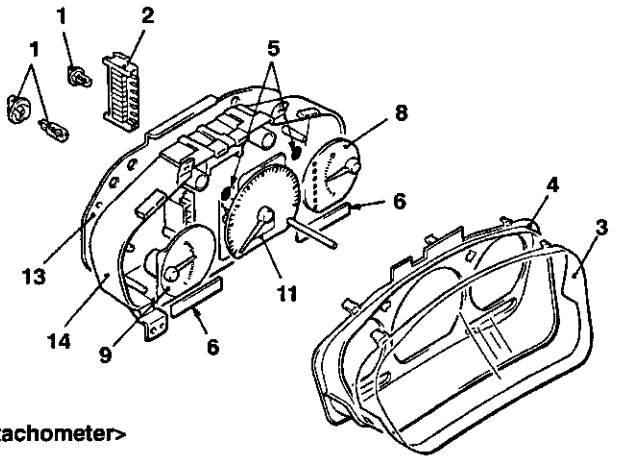
3. If within the standard value, the engine coolant temperature gauge is OK.
   If not within the standard value, replace the engine coolant temperature gauge.

Caution
When inserting the testing probe into the power supply terminal, be careful not to touch the printed board.

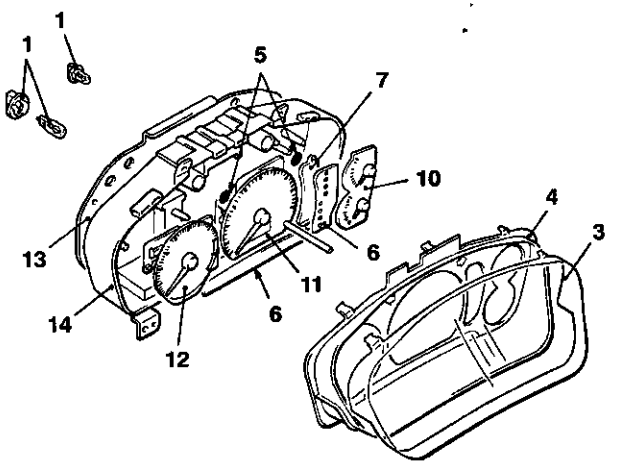
DISASSEMBLY AND REASSEMBLY

54300310074

<Vehicle without tachometer>



<Vehicle with tachometer>



16M0330

00004794

Disassembly steps

1. Bulb, socket
2. Automatic transaxle indicator
3. Meter glass
4. Meter window plate
5. Turn-signal indicator lens
6. Indicator lens
7. Indicator prism
8. Engine coolant temperature gauge
9. Fuel gauge
10. Fuel and engine coolant temperature gauge
11. Speedometer
12. Tachometer
13. Printed circuit board
14. Meter case

HEADLIGHT AND TURN-SIGNAL LIGHT

54200010179

GENERAL INFORMATION

OPERATION

Low-beam and high-beam

- Turn the lighting switch to "second position," and the contact point of the headlight relay will be closed to turn on the headlight relay.
- Pull the dimmer switch to "LO," and the low-beam will be lit. Pull the switch to "HI," and the high-beam will be lit.

Passing

- When the low-beam is lit, pull the passing switch to "ON," and the high-beam will be lit together with the low-beam.
- When the dimmer switch is at "LO" and the lighting switch is at "OFF" or "first position," and the passing switch is pulled "ON," the contact point of the headlight relay will be closed, turning on the headlight relay, and the low-beam and high-beam will be simultaneously lit.
- When the dimmer switch is at "HI" and the lighting switch is at "OFF" or "first position," and the passing switch is pulled "ON," the contact point of the headlight relay will be closed, turning on the headlight relay, and the high-beam will be simultaneously lit.

Low-beam and High-beam indicator light

- When the high-beam is lit or when the passing switch is activated, the high-beam indicator light will be lit.

Turn-signal lights

When operation is normal

- When the ignition switch is switched to the "ON" position, battery voltage is applied (via the hazard warning light switch) to the turn-signal and hazard-flasher unit.
- When the turn-signal switch is switched to the "LH" (or "RH") position, transistor (within the flasher unit) is switched ON and the relay contact (also within the flasher unit) is switched ON. As a result, the "LH" (or "RH") turn-signal lights and turn-signal indicator light illuminate.
- At the same time, charging to the capacitor(within the flasher unit) begins, and charging continues until the lower-limit potential (set by microcomputer within the flasher unit) is reached.
- When the capacitor becomes fully charged, the microprocessor (within the flasher unit) output reverses and transistor is switched OFF; the relay contact is also switched OFF, and, as a result, the "LH" (or "RH") turn-signal lights and turn-signal indicator light are switched OFF.
- At the same time that transistor (within the flasher unit) is switched OFF, the capacitor begins discharging, and, when discharging finishes, the output of the microcomputer (within the flasher unit) once again reverses and transistor (within the flasher unit) is switched ON, after which the "LH" (or "RH") turn-signal lights and turn-signal indicator light illuminate.
- As a result of the continued repetition of the steps described above, the "LH" (or "RH") turn-signal lights and turn-signal indicator light flash ON and OFF repeatedly.

If one light's wiring is damaged or disconnected

- If the bulb for one turn-signal light is damaged or disconnected, the resistance for the entire light circuitry increases, resulting in a decrease of the voltage at the resistor (parallel connection with capacitor) part within the flasher unit.
- As a result of this being detected, the lower-limit potential set by the microcomputer (within the flasher unit) is increased, with the result that the time required for charging of the capacitor becomes shorter.
- As a result, the ON and OFF cycles of transistor (within the flasher unit) also become shorter, and thus the number of flashes of the lights becomes greater.

Hazard-warning lights

- When the hazard warning light switch is switched to the "ON" position, the relay contact of the flasher unit is switched ON and OFF repeatedly, in the same manner as for the operation of the turn-signal lights, and the left and right turn-signal lights and turn-signal indicator lights simultaneously flash repeatedly.

NOTE

The number of flashes of the hazard-warning lights does not change if there is damaged or disconnected wiring of one light.

Conditions for switch-ON of headlight relay

Ignition switch	Lighting switch	Dimmer/passing switch	Headlight relay
"ACC" or "ON"	"Second position"	At rest	ON
"ACC" or "ON"	"LO" or "OFF"	"PASS"	ON

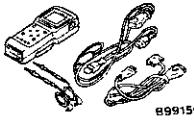
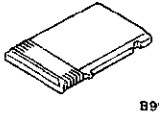
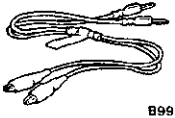
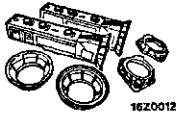
SERVICE SPECIFICATIONS

54200030137

Items	Limit
Headlight intensity	20,000 cd or more

SPECIAL TOOLS

54200060266

Tool	Tool number and name	Supersession	Application
 B991502	MB991502 Scan tool (MUT-II)	MB991496-OD	ETACS-ECU input signal checking
 B991325	ROM pack		ETACS-ECU input signal checking
 B991529	MB991529 Diagnostic trouble code check harness	Tool not necessary if scan tool <MUT-II> is available	ETACS-ECU input signal checking (when using a voltmeter)
 16Z0012	Headlight aimer	General service tool	Headlight aiming

TROUBLESHOOTING

54200070238

TROUBLESHOOTING HINTS

Headlight

1. None of the headlight comes on.
   (1) Tail light comes on.
   - Check the headlight relay. (Refer to P.54-33.)
   - Check the lighting switch. (Refer to P.54-34.)

   (2) The tail light neither comes on nor does the charging warning light go out.
   - Check the fusible link No. 6.
2. Low-beam does not come on on either side.
   - Check the grounding circuit.
   - Check each headlight.
3. High-beam does not come on on either side but comes on when the passing switch is ON.
   - Check the dimmer switch. (Refer to P.54-34.)
4. High-beam indicator light does not come on. However, high-beam is lit when the dimmer switch is at "HI" position or the passing switch is activated.
   - Check the dedicated fuse No. 7.
   - Check the bulb.
5. When passing is activated, the headlights will not come on. However, the headlights will come on when the dimmer switch is at either "LO" or "HI."
   - Check the passing switch. (Refer to P.54-34.)

Turn-signal light

1. The turn-signal lights and hazard-warning lights do not operate at all.
   - Check the hazard warning light switch contact (power supply side).
   - Check the flasher unit.
2. All turn-signal lights at the left (or right) side do not function.
   The hazard-warning lights function normally.
   - Check the hazard warning light switch contact (turn-signal side).
   - Check the turn-signal switch. (Refer to P.54-34.)
3. The number of flashes of the turn-signal lights is excessive.
   - Check the bulbs.
4. The hazard-warning lights do not function.
   The turn-signal lights function normally.
   - Check the hazard warning light switch contact (hazard-warning light side).

INSPECTION CHART FOR TROUBLE SYMPTOMS

54200910158

Trouble symptoms		Inspection procedure	Reference page
Communication with Scan Tool is impossible. <Vehicles with ETACS-ECU>	Communication with all systems is impossible.	1	54-27
	Communication with one-shot pulse input signal only is impossible.	2	54-27
The lighting monitor buzzer does not sound under the following conditions while tail lights or headlights illuminate. • When the ignition switch is turned to OFF and the driver's side door is open.		3	54-27

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

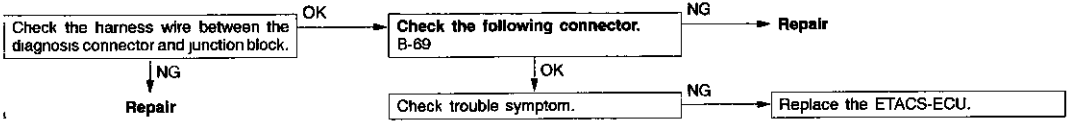
Inspection Procedure 1

Communication with the scan tool is impossible. (Communication with all systems is impossible.)	Probable cause
The cause is probably a defective power supply system (including ground) for the diagnosis line.	• Malfunction of connector • Malfunction of harness wire

Refer to GROUP 13A - Troubleshooting.

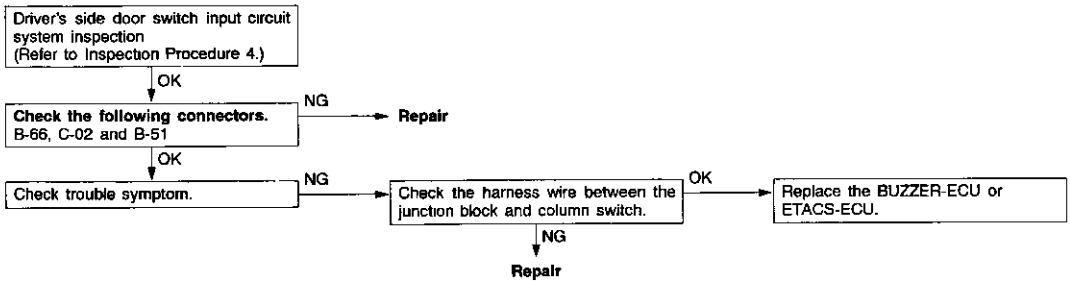
Inspection Procedure 2

Communication with the scan tool is impossible. (Communication with the one-shot pulse input signal only is impossible.)	Probable cause
The cause is probably a defective one-shot pulse input circuit system of the diagnosis line.	• Malfunction of connector • Malfunction of harness wire • Malfunction of ETACS-ECU



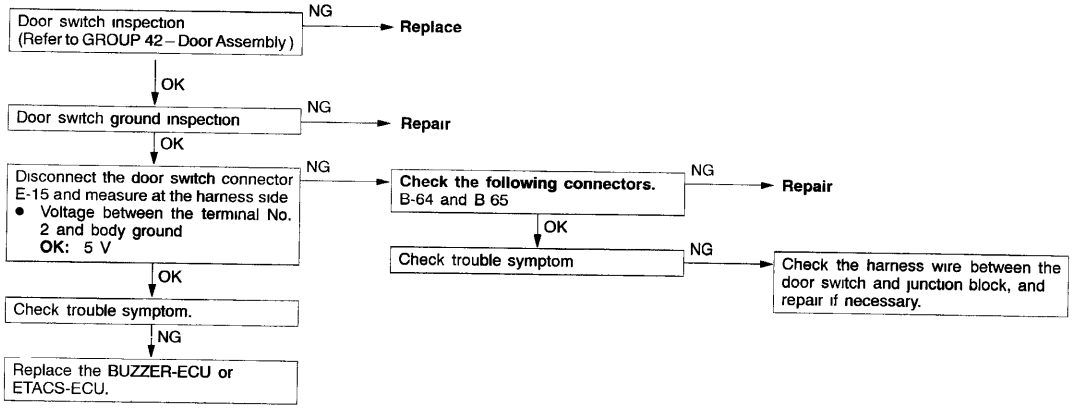
Inspection Procedure 3

The ignition switch is turned to the "OFF" position and the driver's side door is opened while the tail lights or headlight are operating, but the light reminder warning buzzer does not sound.	Probable cause
The cause is probably a defective lighting switch input circuit system or a defective driver's side door switch input circuit system.	• Malfunction of driver's side door switch • Malfunction of harness or connector • Malfunction of BUZZER-ECU or ETACS-ECU



Inspection Procedure 4

Driver's side door switch input circuit system inspection



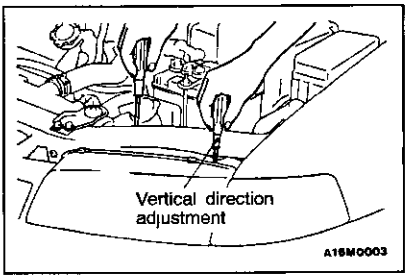
ON-VEHICLE SERVICE

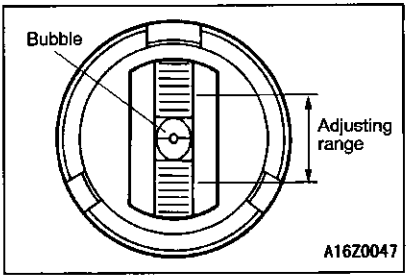
54200090104

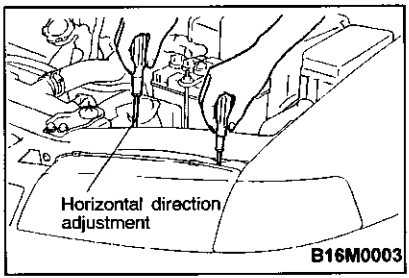
AIMING WITH GAUGES ON THE HEADLIGHT <4-door models>

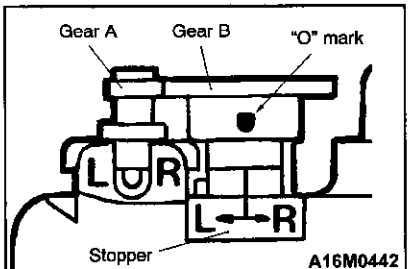
PRE-AIMING INSTRUCTIONS

1. Inspect for badly rusted or faulty headlight assemblies.
2. These conditions must be corrected before a satisfactory adjustment can be made.
3. Place vehicle on a lever floor.
4. Bounce front suspension through three (3) oscillations by applying body weight to hood or bumper.
5. Inspect tire inflation. Adjust inflation as necessary.
6. Rock vehicle sideways to allow vehicle to assume its normal position.
7. If fuel tank is not full, place a weight in trunk of vehicle to simulate weight of a full tank [3 kg (6.5 lbs.) per gallon.]
8. There should be no other load in the vehicle other than driver or substituted weight of approximately 70 kg (150 lbs.) placed in driver's position.
9. Thoroughly clean headlight lenses.









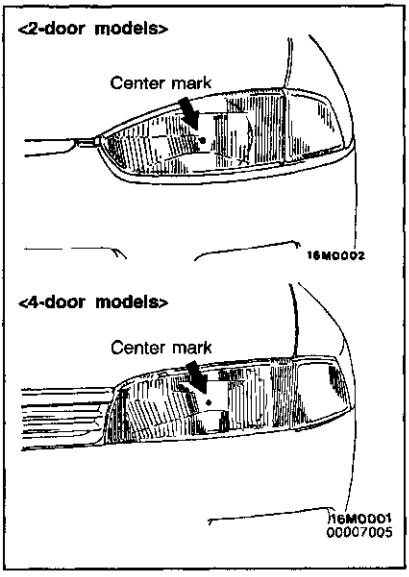
VERTICAL ADJUSTING

Adjust the vertical angle by rotating the vertical adjusting screw so that the bubble in the vertical adjusting gauge locates inside the adjusting range.

HORIZONTAL ADJUSTING

1. Check that gear (A) and gear (B) are engaged. If they are not engaged, press down the stopper until the gears engage.
2. Turn the horizontal adjusting screw to align the "O" mark of gear (B) with the stopper line and the headlight housing line.

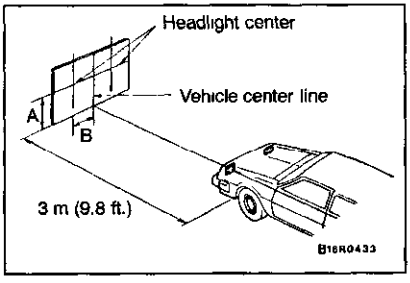
NOTE
If this aiming is impossible due to the body damage, refer to "Aiming with screen."



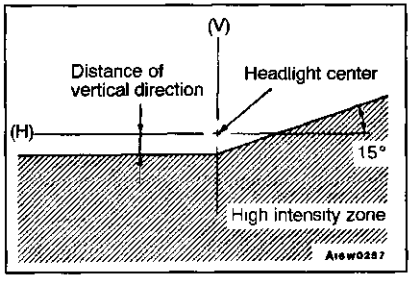
AIMING WITH SCREEN OR WALL

HEADLIGHT AIM PREPARATION

1. Set the distance between the screen and the bulb center marks of the headlight as shown in the illustration.



2. Four lines of adhesive tape or equivalent markings are required on screen or wall:
   (1) Position a vertical tape or mark so that it is aligned with the vehicle center line.
   (2) Position a horizontal tape or mark with reference to center line of headlight bulb dimension A.
   (3) Position a vertical tape on the screen with reference to the center line of each headlight bulb dimension B.



VISUAL HEADLIGHT ADJUSTMENT

1. A properly aimed lower beam will appear on the aiming screen 3 m (9.8 ft.) in front of the vehicle. The shaded area as shown in the illustration indicates high intensity zone.

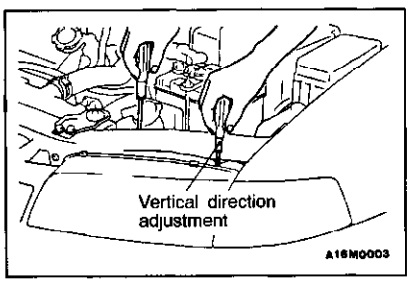
   Standard value:
   (Vertical direction)
   36 mm (1.42 in.) below horizontal (H)
   (Horizontal direction)
   Position where the 15° sloping section intersects the vertical line (V)

   NOTE
   The position 3 m (9.8 feet) in front of the vehicle indicates the position from the headlight center mark.

2. When adjusting headlight, disconnect the other headlight harness.
3. Adjust low beam of the headlights to match the low beam pattern on the aiming screen.

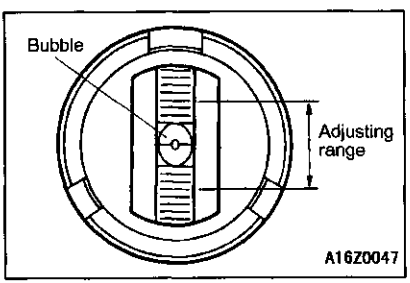
   Caution
   Do not cover a headlight for more than three minutes, or the plastic headlight lens will be deformed.

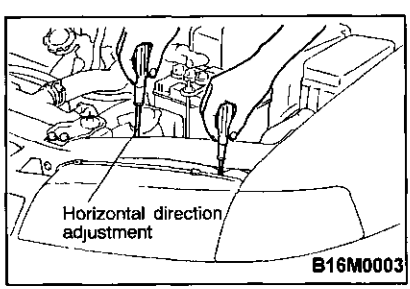
NOTE
If the visual headlight adjustment at low beam is made, the adjustment at high beam is not necessary.



VERTICAL ADJUSTING <4-door models>

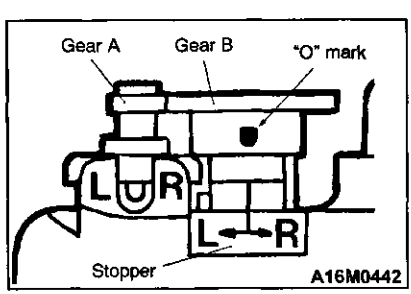
1. Adjust the vertical angle by rotating the vertical adjusting screw so that the bubble in the vertical adjusting gauge locates inside the adjusting range.
2. Check to see if the light distribution projected on the aiming screen is the same as the light distribution pattern described in Visual Headlight Adjustment.
3. If they differ, turn the vertical adjusting screw to adjust the vertical angle until the light distribution coincides with the correct lighting pattern.





HORIZONTAL ADJUSTING <4-door models>

1. Check that gear (A) and gear (B) are engaged. If they are not engaged, press down the stopper until the gears engage.
2. Check to see if the light distribution projected on the aiming screen is the same as the light distribution pattern described in Visual Headlight Adjustment.
3. If they differ, turn the vertical adjusting screw to adjust the vertical angle until the light distribution coincides with the correct lighting pattern.
4. Turn the horizontal adjusting screw to align the "O" mark of gear (B) with the stopper line and the headlight housing line.
5. Pull the stopper up to disengage gears (A) and (B).



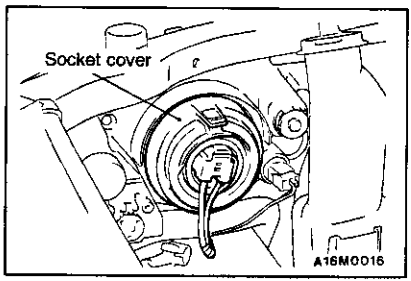
LUMINOUS INTENSITY MEASUREMENT

Measure the luminous intensity of headlights with a photometer in accordance with the instruction manual prepared by the manufacturer of the photometer and make sure that the luminous intensity is within the following limit.

Limit: 20,000 cd or more

NOTE

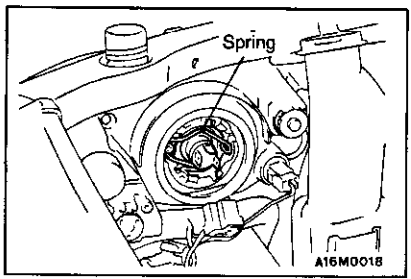
(1) When measuring the luminous intensity of headlight, keep the engine at 2,000 r/min and have the battery charged.
(2) If there are specific regulations for luminous intensity of headlights in the region where the vehicle is operated, make sure that the intensity conforms to the requirements of such regulations.



BULB REPLACEMENT

54200130127

1. Disconnect the connector.
2. Remove the socket cover.



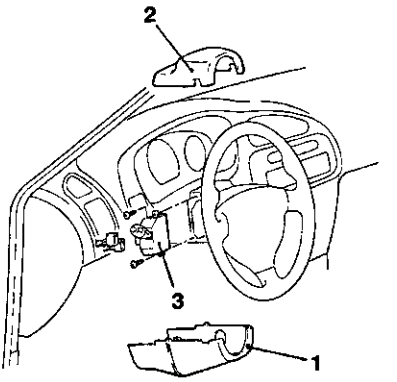
3. Unhook the spring securing the bulb, and then remove the bulb.

Caution
Do not touch the surface of the bulb with hands or dirty gloves as the bulb may pop after a short time. If the surface does become dirty, clean it with alcohol, and let it dry thoroughly before installing.

HEADLIGHT AND FRONT TURN-SIGNAL LIGHT

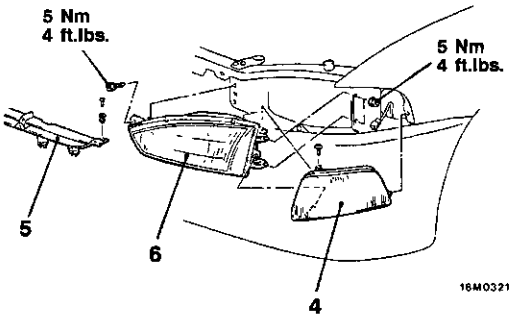
54200240097

REMOVAL AND INSTALLATION



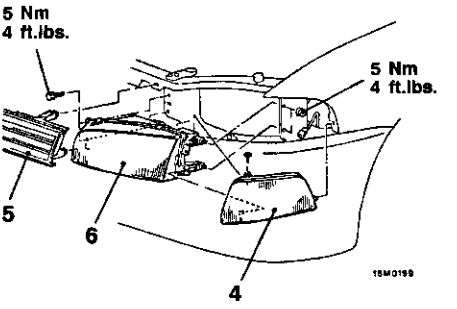
16M0334

<2-door models>



16M0321

<4-door models>



00004795

Lighting switch removal steps

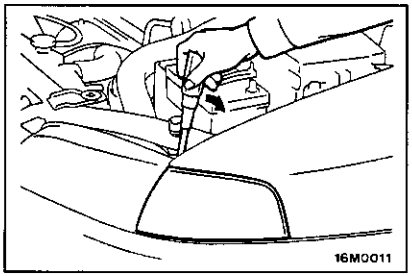
1. Column cover, lower
2. Column cover, upper
3. Lighting switch

◀A▶

◀B▶ ▶A◀

Headlight removal steps

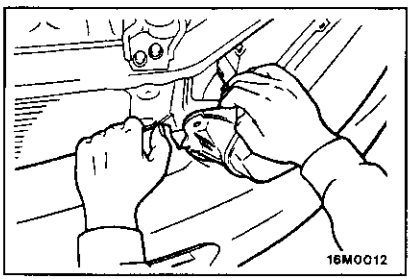
4. Front turn-signal light
5. Radiator grille (Refer to GROUP 51.)
6. Headlight



REMOVAL SERVICE POINT

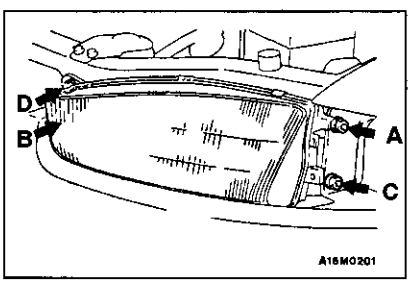
◀A▶ FRONT TURN-SIGNAL LIGHT REMOVAL

Pry a screwdriver into the direction shown to move the front turn-signal light forwards.



◀B▶ HEADLIGHT REMOVAL <2-door models>

1. Pull the bumper towards you.
2. Pull the inside of headlight towards you.
3. Pull the outside of headlight towards you.
4. Remove the headlight.

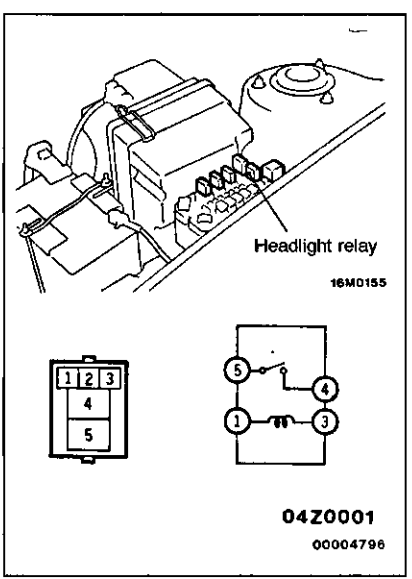


INSTALLATION SERVICE POINTS

▶A◀ HEADLIGHT INSTALLATION

Tighten the mounting bolts and nuts in A, B, C, D order.

NOTE
The bolt marked by "B" applies to 4-door models only.

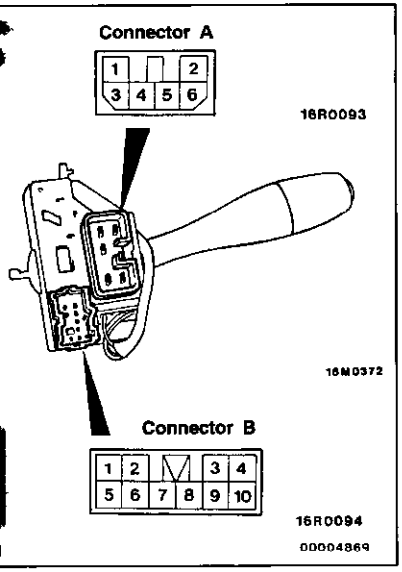


INSPECTION

54200820093

HEADLIGHT RELAY CHECK

Battery voltage	Terminal No.			
	1	3	4	5
Supplied	⊕	⊖	○	○
Not supplied	○	○		



LIGHTING SWITCH, DIMMER/PASSING SWITCH AND TURN-SIGNAL LIGHT SWITCH CHECK

54200800059

Switch position		Connector A-terminal No.					Connector B-terminal No.					
		1	2	3	4	6	3	5	6	7	8	9
LIGHTING SWITCH	OFF											
	First position							○		○		
	Second position	○						○		○		
									○			
DIMMER/ PASSING SWITCH	HI			○	○							
	LOW				○	○						
	PASSING	○	○	○	*1 ○	○ *2						
TURN-SIGNAL LIGHT SWITCH	RH										○	○
	OFF											
	LH						○				○	

NOTE

1. *1 indicates continuity when the dimmer switch is at the low beam position.
2. *2 indicates continuity when the dimmer switch is at the high beam position.

HAZARD WARNING LIGHT SWITCH CONTINUITY CHECK

54200670094

Refer to P.54-47.

FOG LIGHT

54200010186

GENERAL INFORMATION

OPERATION

- If the fog light switch is set at the "ON" position when the lighting switch is at the "second position" and the dimmer switch is at the "low beam" position, current flows through the headlight relay, dedicated fuse, fog light relay, fog light switch, diode, dimmer switch and ground, causing the fog light relay contacts to close.
- Once the fog light relay contacts have closed, current flows through the dedicated fuse, fog light relay (contacts), fog light and ground, causing the fog lights to go on.

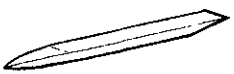
SERVICE SPECIFICATIONS

54200030144

Items		Standard value
Fog light aiming	Vertical direction	100 mm (4 in.) below horizontal (H)
	Horizontal direction	Parallel to direction of vehicle travel

SPECIAL TOOL

54200060273

Tool	Tool number and name	Suppression	Application
	MB990784 Ornament remover	General service tool	Fog light switch removal

TROUBLESHOOTING

54200070245

TROUBLESHOOTING HINTS

Fog lights do not come on.

- Check the dedicated fuse No. 5 or No. 9.
- Check the fog light relay. (Refer to P.54-38.)
- Check the fog light switch. (Refer to P.54-38.)
- Check the dimmer switch. (Refer to P.54-34.)

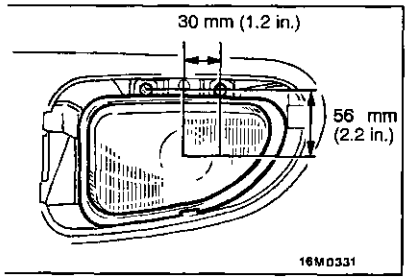
ON-VEHICLE SERVICE

54200110077

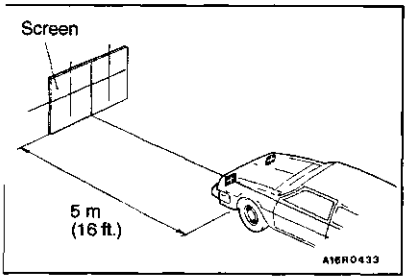
FOG LIGHT AIMING

1. Check for badly rusted or loose fog light.
2. These conditions must be corrected before a satisfactory adjustment can be made.
3. Place vehicle on a level floor.
4. Bounce front suspension through three oscillations by applying body weight to hood or bumper.
5. Check the tire inflation pressure. Adjust as necessary.
6. Rock the vehicle sideways to allow vehicle to assume its normal position.
7. If fuel tank is not full, place a weight in trunk of vehicle to simulate weight of a full tank [3 kg (6.5 lbs.) par gallon].
8. There should be no other load in the vehicle other than driver or substituted weight of approximately 70 kg (150 lbs.) placed in driver's position.
9. Thoroughly clean fog light lenses.

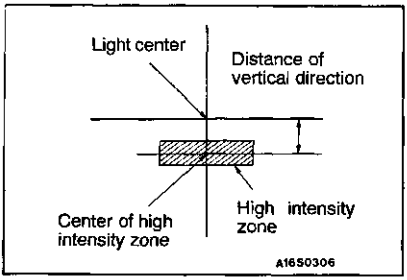
10. Remove the fog light bezel.



11. Measure the center of the fog lights as shown in the illustration.

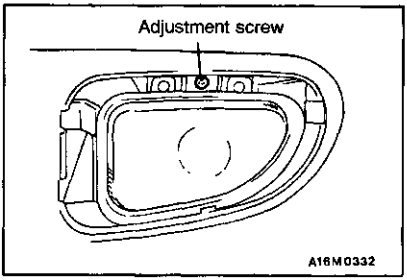


12. Set the distance between the screen and the center of the fog lights as shown in the illustration.



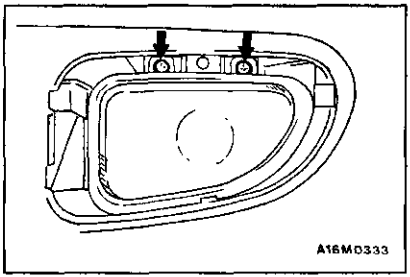
13. Check if the beam shining onto the screen is at the standard value.

Standard value:
Vertical direction
100 mm (4 in.) below horizontal (H)
Horizontal direction
Parallel to direction of vehicle travel



NOTE
The horizontal direction is non-adjustable. If the deviation of the light beam axis exceeds the standard value, check for improper/defective mounting location.

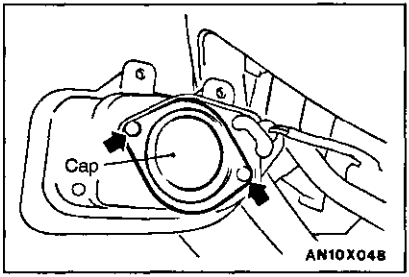
Caution
When making the aiming adjustment, be sure to block the beam of those lights which are not being adjusted.



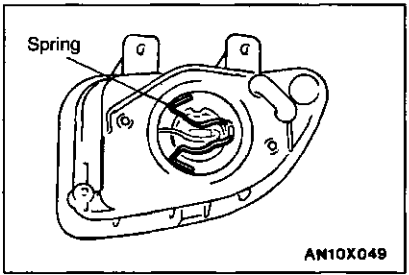
BULB REPLACEMENT

54200130134

1. Remove the fog light bezel.
2. Remove the fog light unit fixing screw, and pull the light unit to remove it.



3. Remove the cap.



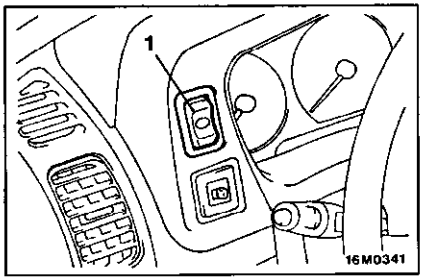
4. Unhook the spring securing the bulb and then remove the bulb.

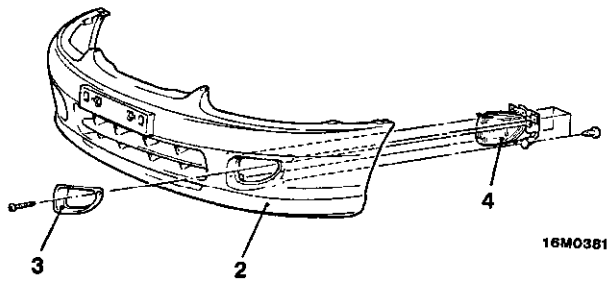
Caution
Do not touch the surface of the bulb with hands or dirty gloves. If the surface does become dirty, clean it with alcohol, and let it dry thoroughly before installing.

FOG LIGHT

54200150109

REMOVAL AND INSTALLATION

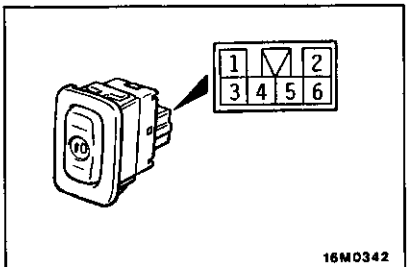




1. Fog light switch

Fog light removal steps

2. Front bumper (Refer to GROUP 51.)
3. Fog light bezel
4. Fog light assembly

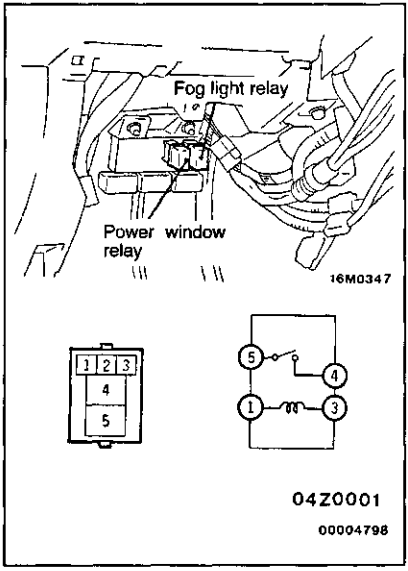


INSPECTION

54200740061

FOG LIGHT SWITCH CONTINUITY CHECK

Switch position	Terminal No.						
	1		2	3	4	5	6
OFF		ILL					
ON		ILL					



FOG LIGHT RELAY CONTINUITY CHECK 54200750064

Battery voltage	Terminal No.			
	1	3	4	5
Power is not supplied	○	○		
Power is supplied	⊕	⊖	○	○

REAR COMBINATION LIGHT

54200010193

GENERAL INFORMATION

OPERATION

Tail light

- When the lighting switch is set to the "first position" or "second position" position, electricity flows via dedicated fuse No. 7 to each light, and each light illuminates.

Back-up light

- When, with the ignition switch at the "ON" position, the shift lever (or the selector lever) is moved to the "R" position, the back-up light switch (M/T) is switched ON (or the park/neutral position switch (A/T) is switched to the "R" position), and the back-up light illuminates.

Stop light

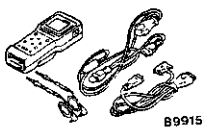
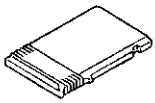
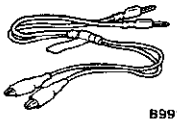
- Battery voltage is always applied to the stop light switch through dedicated fuse No. 11.
- When the brake pedal is pressed, the stop light switch will be turned "ON" to turn on the stop lights.

Lighting monitor buzzer

- When, with the tail light illuminated (lighting switch-first position), the ignition switch is turned off and the driver's door is opened (door switch is switched ON), the ECU detective circuit will function.
- With the detective circuit activated, buzzer output makes the buzzer sound continuously to remind that the tail light is illuminated.
- The key reminder buzzer has a function priority to the lighting monitor buzzer. With the key inserted in the key cylinder, buzzer sounds intermittently.

SPECIAL TOOLS

54200060280

Tool	Tool number and name	Supersession	Application
 B991502	MB991502 Scan tool (MUT-II)	MB991496-OD	ETACS-ECU input signal checking
 B991325	ROM pack		ETACS-ECU input signal checking
 B991529	MB991529 Diagnostic trouble code check harness	Tool not necessary if scan tool <MUT-II> is available	ETACS-ECU input signal checking (When using a voltmeter)

TROUBLESHOOTING

54300720716

INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom		Inspection procedure No.	Reference page
Communication with scan tool is not possible.<Vehicles with ETACS-ECU>	Communication with all systems is not possible.	1	54-40
	Communication with one-shot pulse input signal only is not possible.	2	54-40
While the tail lights or headlight are illuminated, driver's side door is opened but the light reminder warning buzzer does not sound. (With the ignition key inserted in the key cylinder, the ignition key reminder warning buzzer sounds.)		3	54-41

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

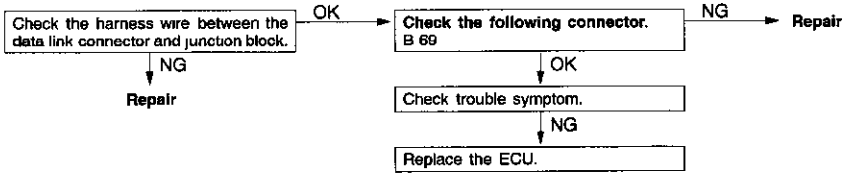
INSPECTION PROCEDURE 1

Communication with scan tool is not possible. (Communication with all systems is not possible.)	**Probable cause**
The cause is probably a defect in the power supply system (including ground) for the diagnostic line.	• Malfunction of connector • Malfunction harness wire

Refer to GROUP 13A - Troubleshooting.

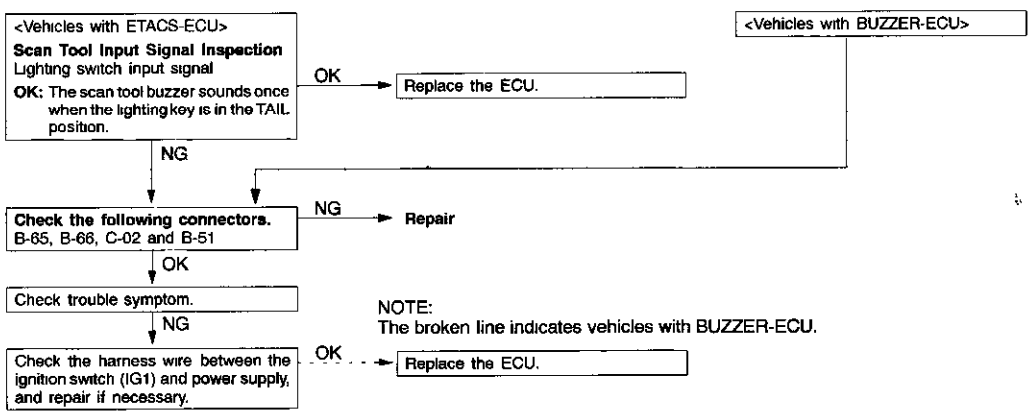
INSPECTION PROCEDURE 2

Communication with scan tool is not possible. (Communication with one-shot pulse input signal only is not possible.)	Probable cause
The cause probably a defective one-shot pulse input signal circuit system of the diagnostic line.	• Malfunction of connector • Malfunction of harness wire • Malfunction of ECU



INSPECTION PROCEDURE 3

While the tail lights or headlight are illuminated, driver's side door is opened but the light reminder warning buzzer does not sound. (With the ignition key inserted in the key cylinder, the ignition key reminder warning buzzer sounds.)	Probable cause
The cause is probably a defective lighting switch input circuit system or a defective ECU. While the ignition key reminder warning buzzer sounds, the taillight or headlight are turned ON but the light reminder warning buzzer does not sound.	• Malfunction of connector • Malfunction of harness wire • Malfunction of ECU



TROUBLESHOOTING HINTS

54200070252

Tail light

All lights do not illuminate.

(1) The headlights also do not illuminate.
- Check fusible link No. 4.

(2) The headlights illuminate.
- Check dedicated fuse No. 7.

Back-up light

Even if the shift lever (or the selector lever) is moved to "R" position, the back-up light will not come on.
- Check the back-up light switch <M/T>
- Check the park/neutral position switch <A/T> (Refer to GROUP 23A-On-vehicle Service)
- Check the back-up light bulb.

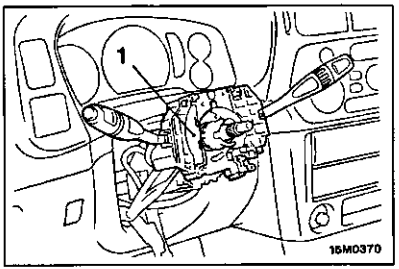
Stop light

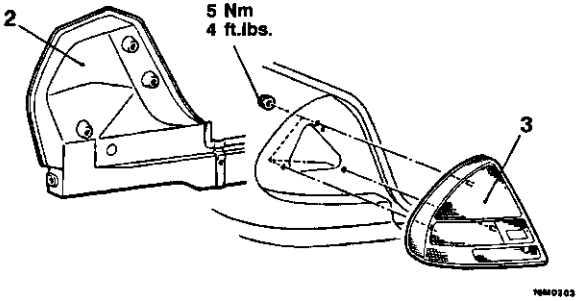
1. The stop lights do not come on.
   - Check the stop light switch (Refer to GROUP 35A - On-vehicle Service).
   - Check the dedicated fuse No. 11.
2. Some stop lights do not come on.
   - Check the ground circuit.

REAR COMBINATION LIGHT

54200390068

REMOVAL AND INSTALLATION





1. Column switch <Lighting switch and turn-signal light switch> (Refer to P.54-32.)

Rear combination light removal steps

2. Rear end trim (Refer to GROUP 52A)
3. Rear combination light

INSPECTION

54200760067

LIGHTING SWITCH AND TURN-SIGNAL LIGHT SWITCH CONTINUITY CHECK

Refer to P.54-34.

HIGH MOUNTED STOP LIGHT

54200070269

TROUBLESHOOTING

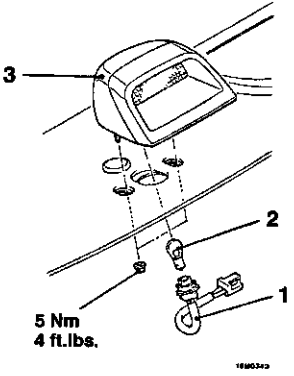
Refer to Rear Combination Light - Troubleshooting Hints.

HIGH MOUNTED STOP LIGHT

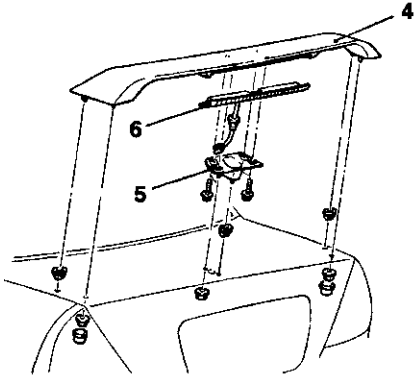
54200510105

REMOVAL AND INSTALLATION

<On rear shelf>



<On rear spoiler>



18M0128

00004800

Removal steps for light on rear shelf

1. Socket assembly
2. Bulb
3. High mounted stop light

Removal steps for light on rear spoiler

4. Rear spoiler
5. Center stay
6. LED panel

INTERIOR LIGHT

54200010209

GENERAL INFORMATION

OPERATION

Luggage compartment light

- Battery voltage is always applied (via fusible link No. 2 and dedicated fuse No. 2) to the luggage compatment light.
- When the trunk lid is opened, the trunk lid latch switch is switched "ON" and the luggage compartment light illuminates.

Dome light

- The dome light is always illuminated when the dome light switch is at the "ON" position.
- The dome light illuminates when any door is opened while the dome light switch is at the "DOOR" position.
- The dome light does not illuminate when the dome light switch is switched OFF regardless of door positions.

TROUBLESHOOTING

54200070276

TROUBLESHOOTING HINTS

Luggage compartment light

Luggage compartment light does not come on.

- Check the bulb.
- Check the trunk lid latch switch. (Refer to GROUP 42 - Trunk Lid.)

Dome light

The dome light does not illuminate.

1. The clock also stopped.
   - Check dedicated fuse No. 2.
2. The dome light does not illuminate when with the dome light switch at the "DOOR" position, any door is opened.
   - Check the bulb.
   - Check the dome light switch.
3. The dome light does not illuminate when with the dome light switch at the "DOOR" position, a certain door or doors is/are opened.
   - Check the door switch [the door switch(es) for the door(s) that does not activate the dome light when opened].

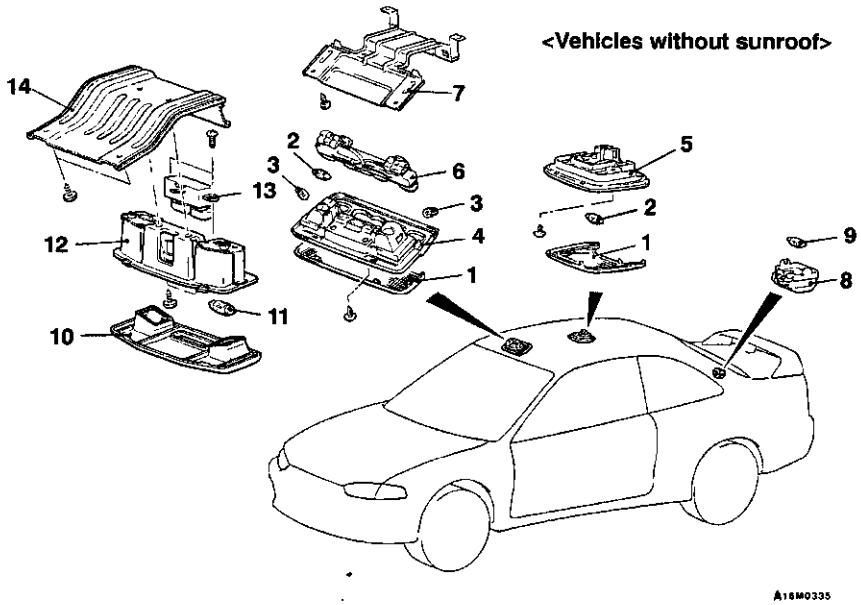
INTERIOR LIGHT

54200630054

REMOVAL AND INSTALLATION

<Vehicles with map light> <Vehicles with sunroof>

<Vehicles without sunroof>



Dome light removal steps

1. Dome light lens
2. Dome light bulb
3. Reading light bulb
4. Dome light and sunroof switch body <Vehicles with sunroof>
5. Dome light switch body <Vehicles without sunroof>
6. Dome light and reading light switch <Vehicles with sunroof>
7. Dome light bracket <Vehicles with sunroof>

Luggage compartment light removal steps

8. Luggage compartment light assembly
9. Luggage compartment light bulb

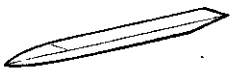
Map light removal steps

10. Map light lens
11. Map light bulb
12. Map light body
13. Map light switch
14. Map light bracket

RHEOSTAT

54200060297

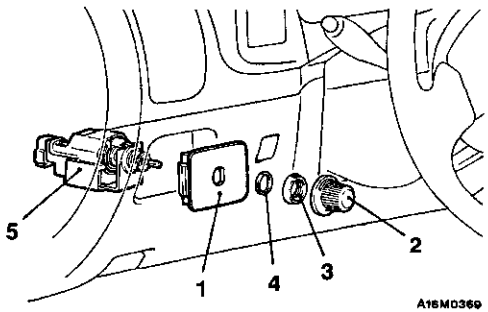
SPECIAL TOOL

Tool	Tool number and name	Supersession	Use
	MB990784 Ornament remover	General service tool	Removal of switch garnish

RHEOSTAT

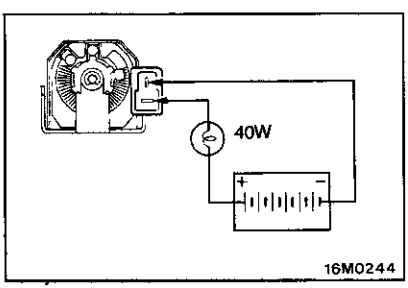
54200600130

REMOVAL AND INSTALLATION



Removal steps

1. Switch garnish
2. Knob
3. Ring nut
4. Plate
5. Rheostat



INSPECTION

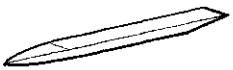
54200610195

1. Connect the battery and the test bulb (40W) as shown in the illustration.
2. Operate the rheostat, and if the brightness changes smoothly without switching off, then the rheostat function is normal.

HAZARD WARNING LIGHT SWITCH

54200060303

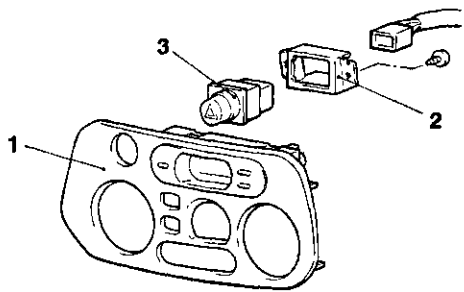
SPECIAL TOOL

Tool	Tool number and name	Supersession	Use
	MB990784 Ornament remover	General service tool	Heater control panel removal

HAZARD WARNING LIGHT SWITCH

54200660077

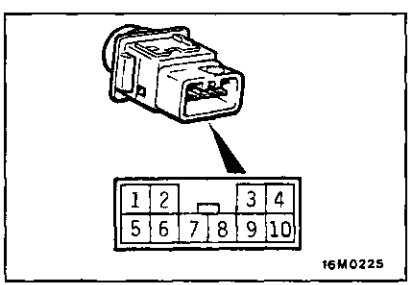
REMOVAL AND INSTALLATION



A16M0284

Removal steps

1. Heater control panel
2. Switch holder
3. Hazard warning light switch



16M0225

INSPECTION

54200670087

Switch position	Terminal No.								
	1	2	4	5	6	7	9		10
OFF									
ON									

HORN

54300010257

GENERAL INFORMATION

OPERATION

- Battery voltage is always applied to the horn relay through dedicated fuse No. 4.
- When the horn switch is turned "ON", the contact point of horn relay will be closed to turn "ON" the horn relay. While the horn switch is "ON", the horn sounds.

TROUBLESHOOTING

54300070279

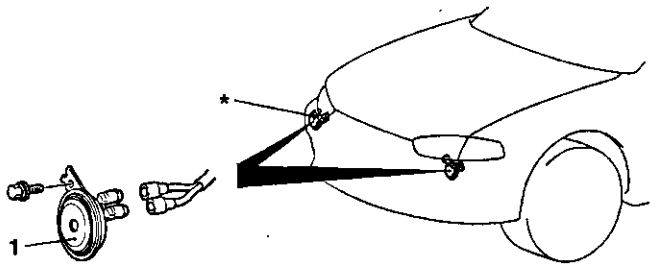
TROUBLESHOOTING HINTS

1. Horn does not sound.
   - Check the dedicated fuse No. 4.
   - Check the horn relay.
   - Check the horn switch.
   - Check the horn.
   - Check the ground circuit.
   - Check connectors and wiring harness.
2. Only one horn sounds.
   - Check the horn.
   - Check connectors and wiring harness.

HORN

54300790021

REMOVAL AND INSTALLATION



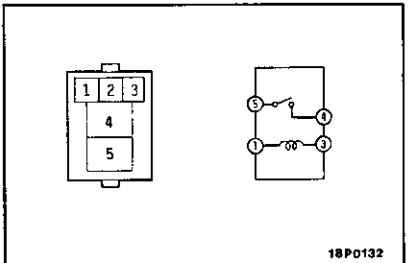
A16M0348

Removal steps

- Front bumper (Refer to GROUP 51.)

1. Horn

NOTE
The horn marked by * applies to 4-door models and 2-door 1.8L models.



18P0132

INSPECTION

54300650039

HORN RELAY CONTINUITY CHECK

Battery voltage	Terminal No.			
	1	3	4	5
Power is not supplied				
Power is supplied				

CIGARETTE LIGHTER

54300010202

GENERAL INFORMATION

OPERATION

- If the plug is pressed into the socket, the plug will remain in, and the cigarette lighter will be turned "ON".
- The element area of the plug is heated. The plug will automatically return to turn "OFF" the cigarette lighter.

TROUBLESHOOTING

54300070613

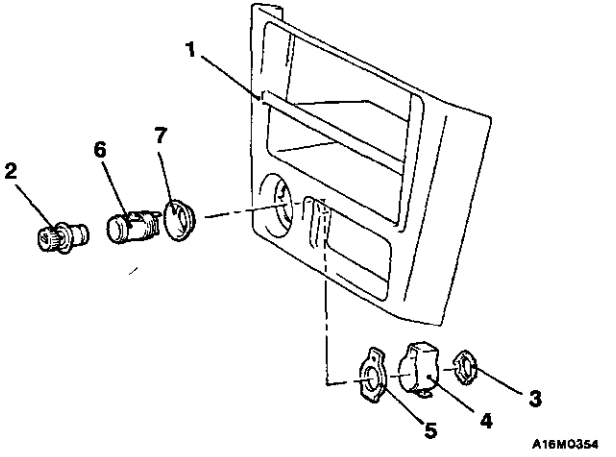
TROUBLESHOOTING HINTS

1. Cigarette lighter does not operate.
   - Check the cigarette lighter. (Refer to P.54-50.)
2. Cigarette lighter illumination light does not come on or is dim.
   - Check the rheostat. (Refer to P.54-46.)

CIGARETTE LIGHTER

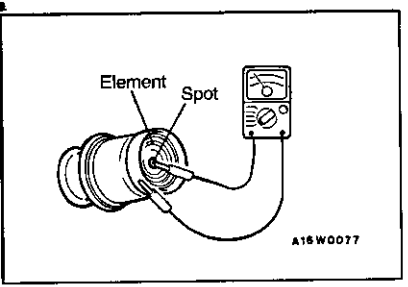
54300560080

REMOVAL AND INSTALLATION



Removal steps

1. Audio panel
2. Plug
3. Fixing ring
4. Socket case
5. Socket washer
6. Socket
7. Protector



INSPECTION

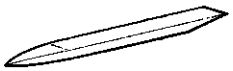
54300570083

- Take out the plug, and check for a worn edge on the element spot connection, and for shreds of tobacco or other material on the element.
- Using an ohmmeter, check the continuity of the element.

CLOCK

54200060310

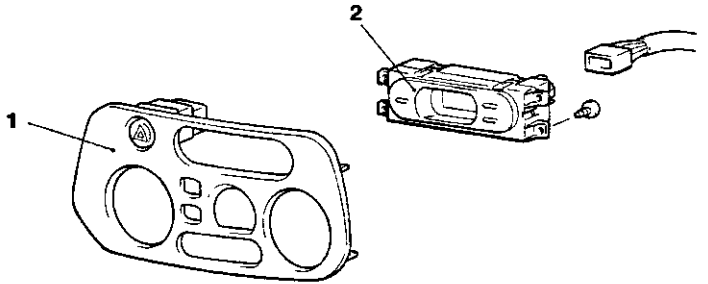
SPECIAL TOOL

Tool	Tool number and name	Supersession	Use
	MB990784 Ornament remover	General service tool	Heater control panel removal

CLOCK

54300590041

REMOVAL AND INSTALLATION



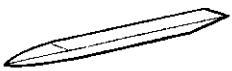
Removal steps

1. Heater control panel
2. Clock

RADIO AND TAPE PLAYER

54400060040

SPECIAL TOOL

Tool	Tool number and name	Supersession	Use
	MB990784 Ornament remover	General service tool	Audio panel removal

TROUBLESHOOTING

54400070135

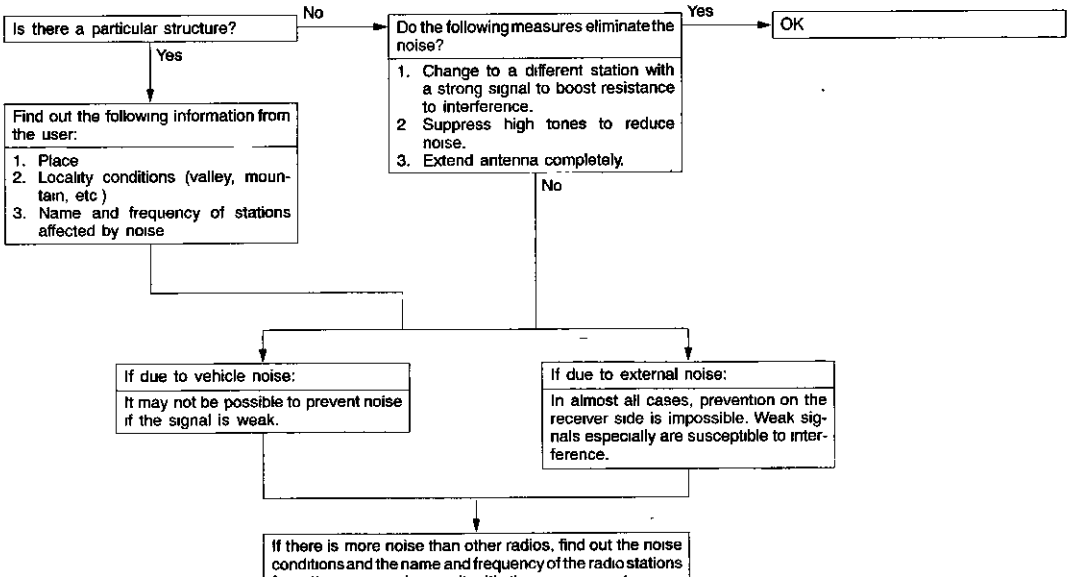
QUICK-REFERENCE TROUBLESHOOTING CHART

Items	Problem symptom	Relevant chart
Noise	Noise appears at certain places when travelling (AM).	A-1
	Noise appears at certain places when travelling (FM).	A-2
	Mixed with noise, only at night (AM).	A-3
	Broadcasts can be heard but both AM and FM have a lot of noise.	A-4
	There is more noise either on AM or on FM.	A-5
	There is noise when starting the engine.	A-6
	Some noise appears when there is vibration or shocks during travelling.	A-7
	Noise sometimes appears on FM during travelling.	A-8
	Ever-present noise.	A-9
Radio	When switch is set to ON, no power is available.	B-1
	No sound from one speaker.	B-2
	There is noise but no reception for both AM and FM or no sound from AM, or no sound from FM.	B-3
	Insufficient sensitivity.	B-4
	Distortion on AM or on both AM and FM.	B-5
	Distortion on FM only.	B-6
	Too few automatic select stations.	B-7
	Insufficient memory (preset stations are erased).	B-8
Tape player	Cassette tape is not accepted.	C-1
	No sound.	C-2
	No sound from one speaker.	C-3
	Sound quality is poor, or sound is weak.	C-4
	Cassette tape will not be ejected.	C-5
	Uneven revolution. Tape speed is fast or slow.	C-6
	Faulty auto reverse.	C-7
	Tape gets caught in mechanism.	C-8

CHART

A. NOISE

A-1 Noise appears at certain places when travelling (AM).



A-2 Noise appears at certain places when traveling (FM).

Do the following measures eliminate the noise? → Yes → OK

- Change to a different station with a strong signal to boost resistance to interference.
- Suppress high tones to reduce noise
- Extend antenna completely.

↓ No

If there is more noise than other radios, find out the noise conditions and the name and frequency of the radio stations from the user, and consult with the service center

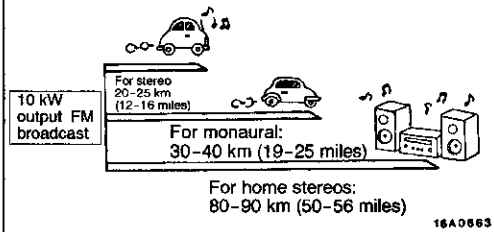
NOTE

About FM waves:

FM waves have the same properties as light, and can be deflected and blocked. Wave reception is not possible in the shadow of obstructions such as buildings or mountains.

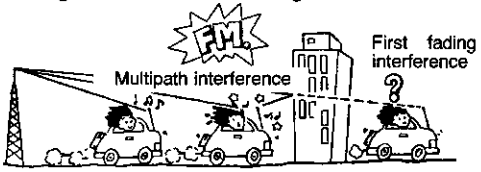
1. The signal becomes weak as the distance from the station's transmission antenna increases. Although this may vary according to the signal strength of the transmitting station and intervening geographical formation or buildings, the area of good reception is approx. 20-25 km (12-16 miles) for stereo reception, and 30-40 km (19-25 miles) for monaural reception.
2. The signal becomes weak when an area of shadow from the transmitting antenna (places where there are obstructions such as mountains or buildings between the antenna and the car), and noise will appear. <This is called first fading, and gives a steady buzzing noise.>
3. If a direct signal hits the antenna at the same time as a signal reflected by obstructions such as mountains or buildings, interference of the two signals will generate noise. During travelling, noise will appear each time the vehicle's antenna passes through this kind of obstructed area. The strength and interval of the noise varies according to the signal strength and the conditions of deflection. <This is called multipath noise, and is a repetitious buzzing.>
4. Since FM stereo transmission and reception has a weaker field than monaural, it is often accompanied by a hissing noise.

FM Broadcast Good Reception Areas



16A0563

FM Signal Characteristics and Signal Interference

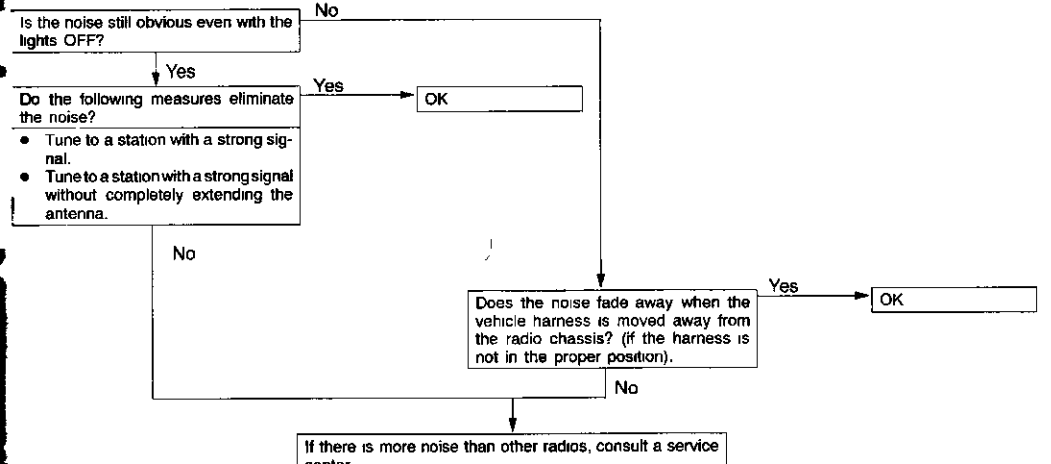


16A0564

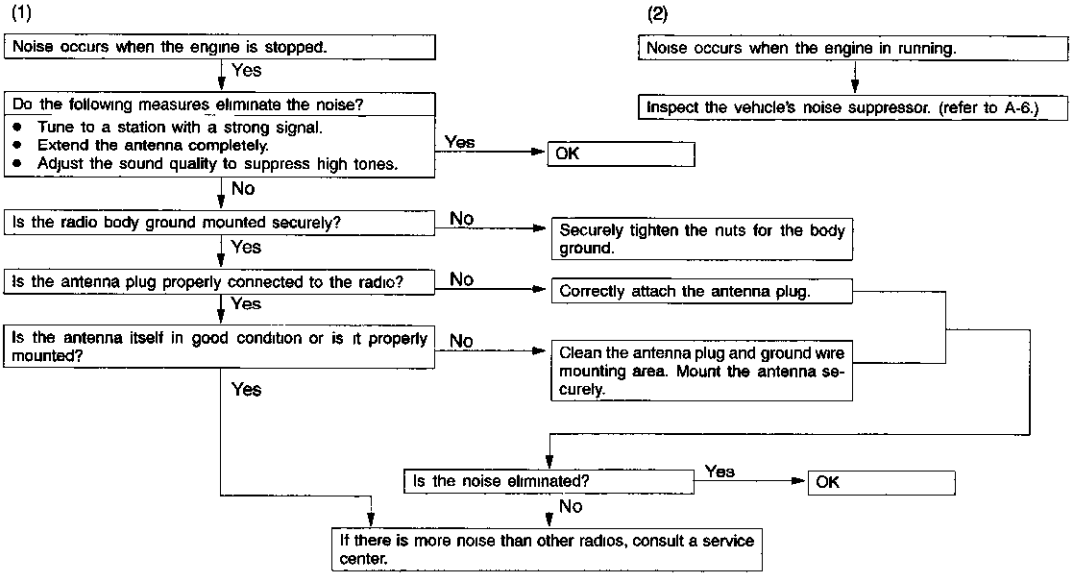
A-3 Mixed with noise, only at night (AM).

The following factors can be considered as possible causes of noise appearing at night.

1. Factors due to signal conditions: Due to the fact that long-distance signals are more easily received at night, even stations that are received without problem during the day may experience interference in a general worsening of reception conditions. The weaker a station is the more susceptible it is to interference, and a change to a different station or the appearance of a beating sound* may occur.
   Beat sound*: Two signals close in frequency interfere with each other, creating a repetitious high-pitched sound. This sound is generated not only by sound signals but by electrical waves as well.
2. Factors due to vehicle noise: Generator noise may be a cause.



A-4 Broadcasts can be heard but both AM and FM have a lot of noise.

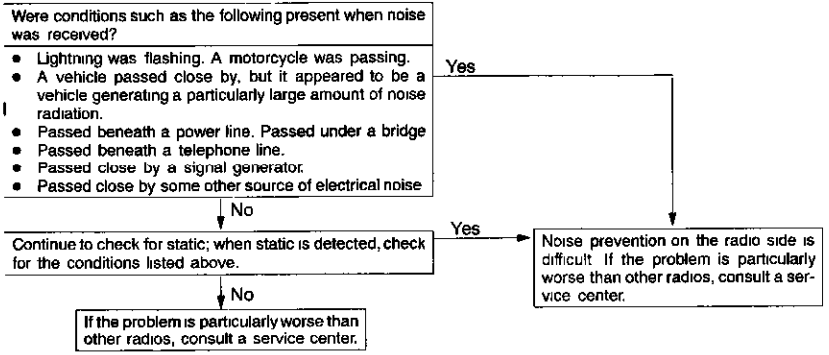


NOTE
About noise encountered during FM reception only.
Due to differences in FM and AM systems, FM is not as susceptible as AM to interference from engines, power lines, lightning, etc. On the other hand, there are cases due to the characteristics of FM waves of noise or distortion generated by typical noise interference (first fading and multi-path). (Refer to A-2.)

<Noise (hissing) occurs in weak signal areas such as mountainous regions, but this is not due to a problem with the radio.>

A-5 There is more noise either on AM or on FM.

1. There is much noise only on AM
   Due to differences in AM and FM systems, AM is more susceptible to noise interference.



2. There is much noise only on FM
   Due to differences in FM and AM systems, FM is not as susceptible as AM to interference from engines, power lines, lightning, etc. On the other hand, there are cases due to the characteristics of FM waves of noise or distortion generated by typical noise interference (first fading and multipath). (Refer to A-2) <Noise (hissing) occurs in weak signal areas such as mountainous regions, but this is not due to a problem with the radio.>

A-6 There is noise when starting the engine.

Noise type Sounds are in parentheses ( ).	Conditions	Cause	Remedy
AM, FM: Ignition noise (Popping, snapping, cracking, buzzing)	• Increasing the engine speed causing the popping sound to speed up, and volume decreases. • Disappears when the ignition switch is turned to ACC.	• Mainly due to the spark plug circuit. • Due to engine noise.	• Use engine analyzer to diagnose ignition system. • Check or replace the ground cable. (Refer to Fig. 1.) • Check or replace the noise capacitor.
Other electrical components	-	Noise may appear as electrical components become older.	Repair or replace electrical components.
Static electricity (Cracking, crinkling)	• Disappears when the vehicle is completely stopped. • Severe when transmission is engaged and vehicle is moving.	Occurs when parts or wiring move for some reason and contact metal parts of the body.	Return parts or wiring to their proper position.
	• Various noises are produced depending on the body part of the vehicle.	Due to detachment from the body of the front hood, bumpers, exhaust pipe and muffler, suspension, etc.	Tighten the mounting bolts securely. Cases where the problem is not eliminated by a single response to one area are common, due to several body parts being imperfectly grounded.

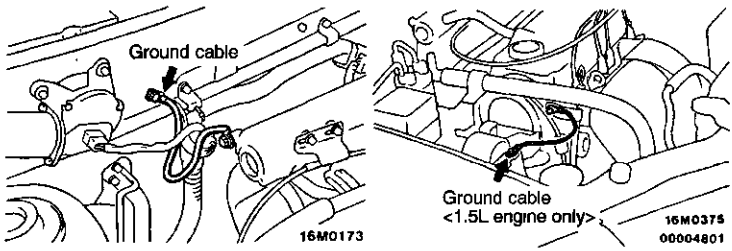
Caution

1. **Connecting a high tension cable to the noise filter may destroy the noise filter and should never be done.**
2. **Check that there is no external noise. Since failure caused by this may result in misdiagnosis due to inability to identify the noise source, this operation must be performed.**
3. **Noise prevention should be performed by suppressing strong sources of noise step by step.**

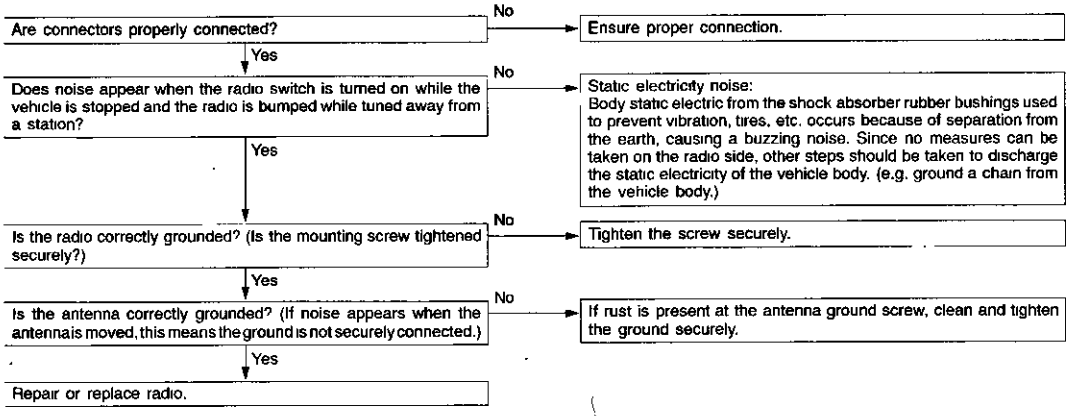
NOTE

1. Capacitor
   The capacitor does not pass D.C. current, but as the number of waves increases when it passes A.C. current, impedance (resistance against A.C.) decreases, and current flow is facilitated. A noise suppressing condenser which takes advantage of this property is inserted between the power line for the noise source and the ground. This suppresses noise by grounding the noise component (A.C. or pulse signal) to the body of the vehicle.
2. Coil
   The coil passes D.C. current, but impedance rises as the number of waves increases relative to the A.C. current. A noise suppressing coil which takes advantage of this property is inserted into the power line for the noise source, and works by preventing the noise component from flowing or radiating out of the line.

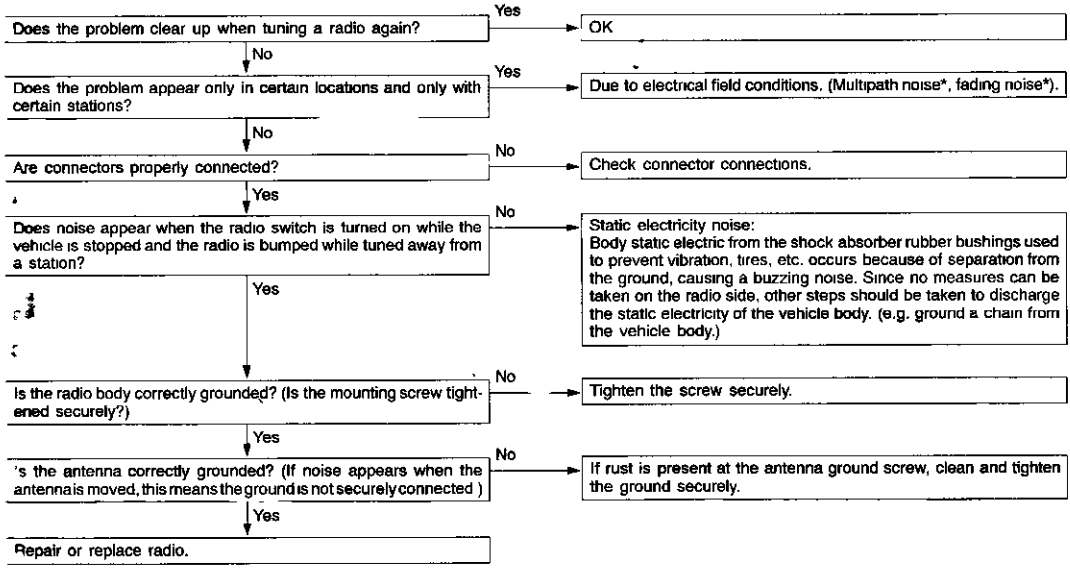
(Fig. 1)



A-7 Some noise appears when there is vibration or shocks during travelling.



A-8 Noise sometimes appears on FM during travelling.



* About multipath noise and fading noise
Because the frequency of FM waves is extremely high, it is highly susceptible to effects from geological formations and buildings. These effects disrupt the broadcast signal and obstruct reception in several ways.

- Multipath noise
  This describes the echo that occurs when the broadcast signal is reflected by a large obstruction and enters the receiver with a slight time delay relative to the direct signal (repetitious buzzing).
- Fading noise
  This is a buzzing noise that occurs when the broadcast beam is disrupted by obstructing objects and the signal strength fluctuates closely within a narrow range.

A-9 Ever-present noise.

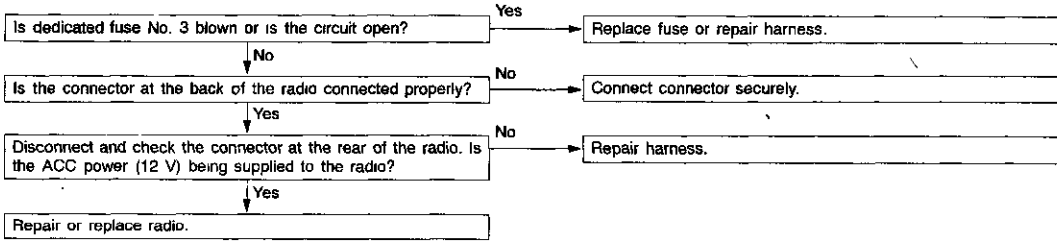
Noise is often created by the following factors, and often the radio is OK when it is checked individually.

- Traveling conditions of the vehicle
- Terrain of area traveled through
- Surrounding buildings
- Signal conditions
- Time period

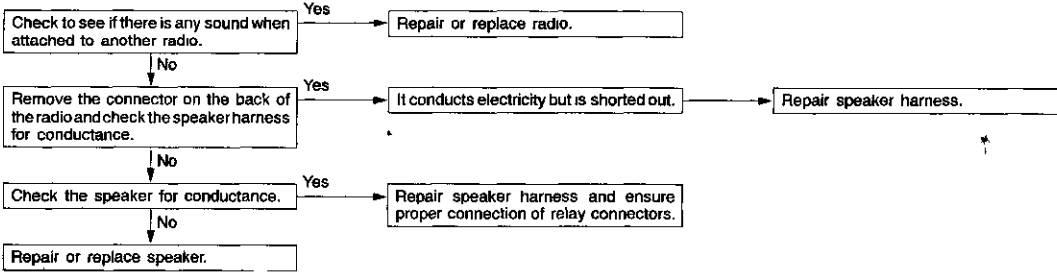
For this reason, if there are still problems with noise even after the measures described in steps A-1 to A-8 have been taken, get information on the factors listed above as well as determining whether the problem occurs with AM or FM, the station names, frequencies, etc., and contact a service center.

B. RADIO

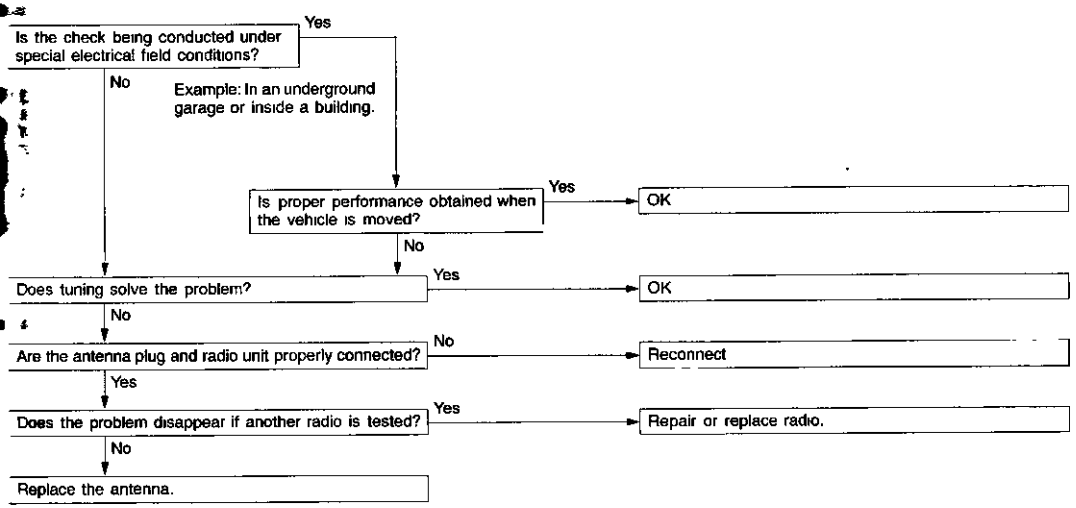
B-1 No power is supplied when the switch is set to ON.



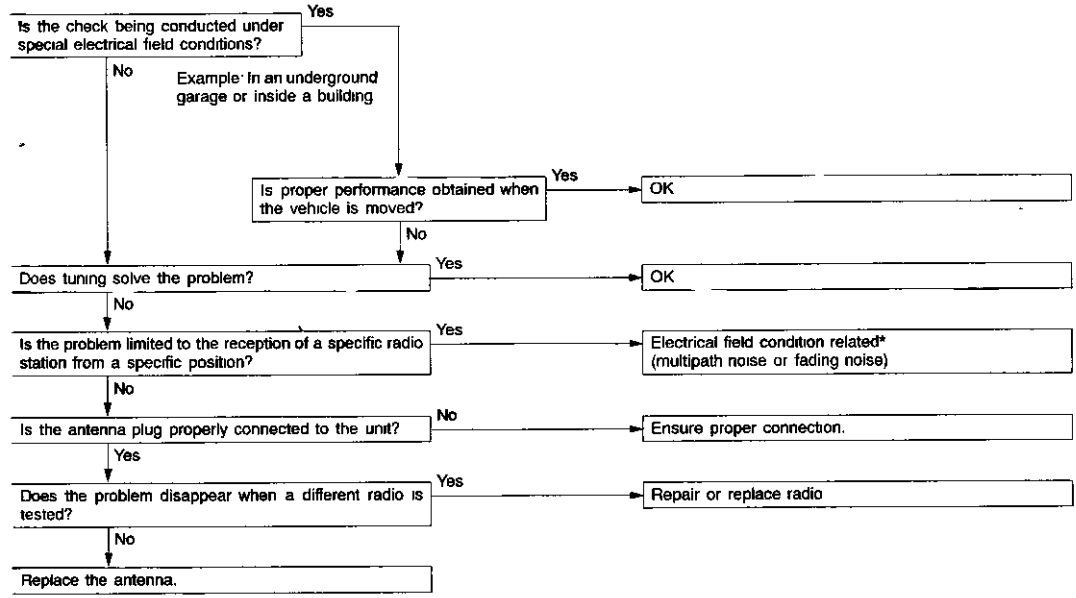
B-2 No sound from one speaker.



B-3 There is noise but no reception for both AM and FM or no sound from AM, or no sound from FM.

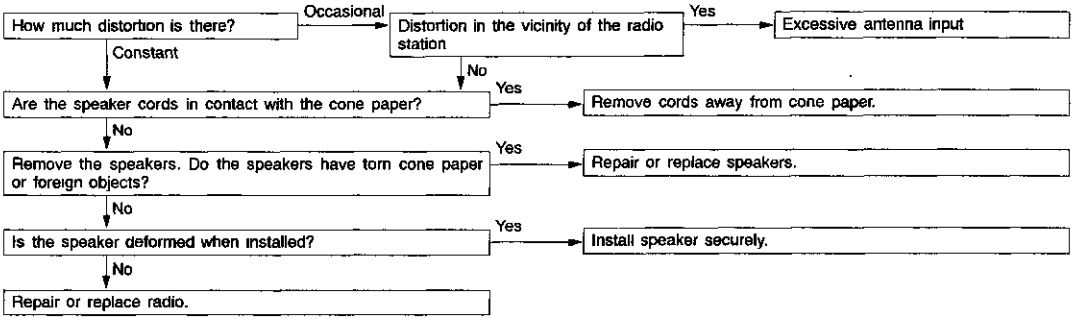


B-4 Insufficient sensitivity.

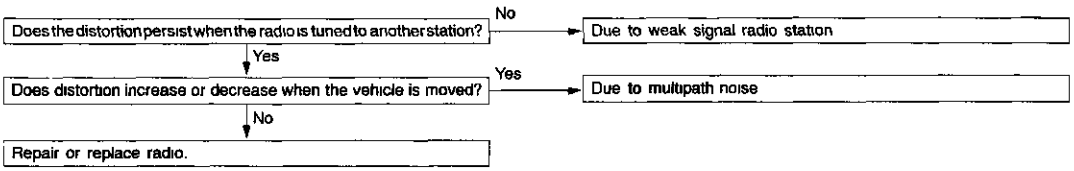


* For multipath noise and fading noise problems, refer to P.54-53.

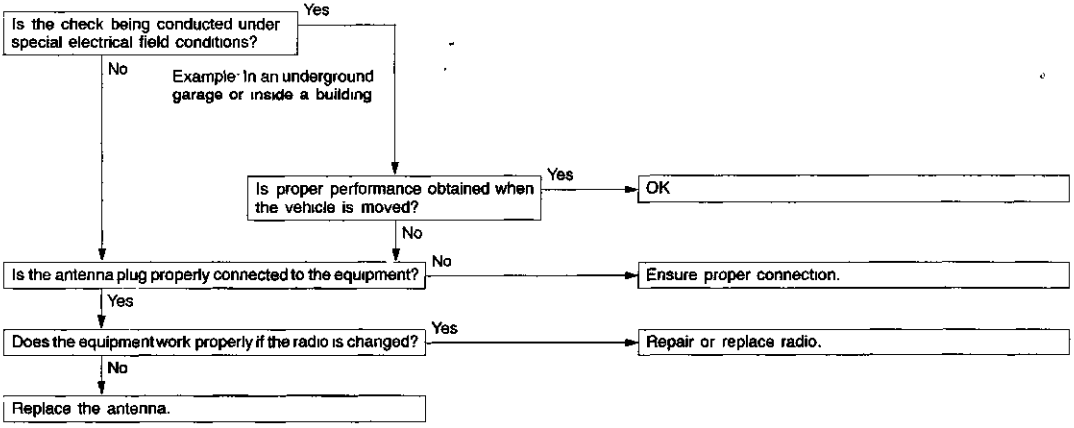
B-5 Distortion on AM or on both AM and FM.



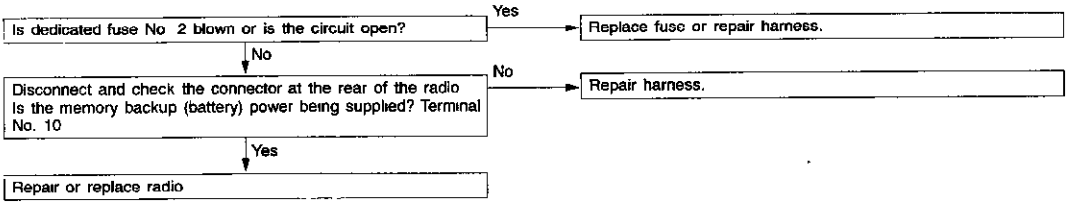
B-6 Distortion on FM only



B-7 Too few automatic select stations.

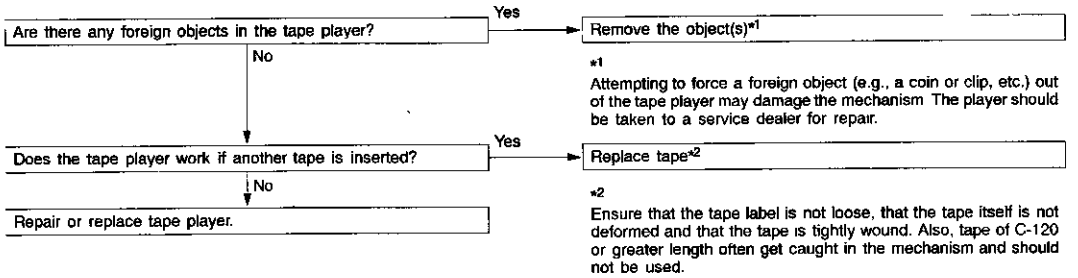


B-8 Insufficient memory (preset stations are erased).



C. TAPE PLAYER

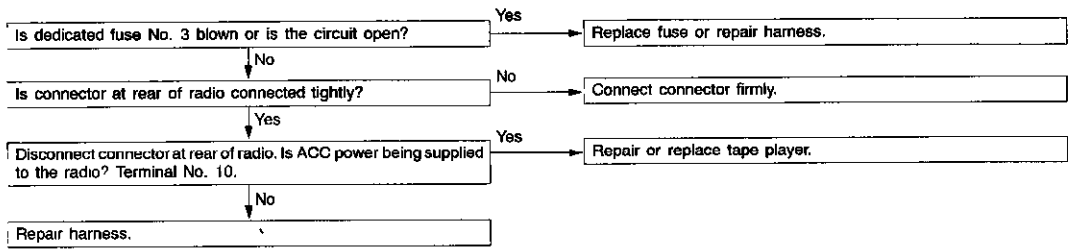
C-1 Cassette tape is not accepted.



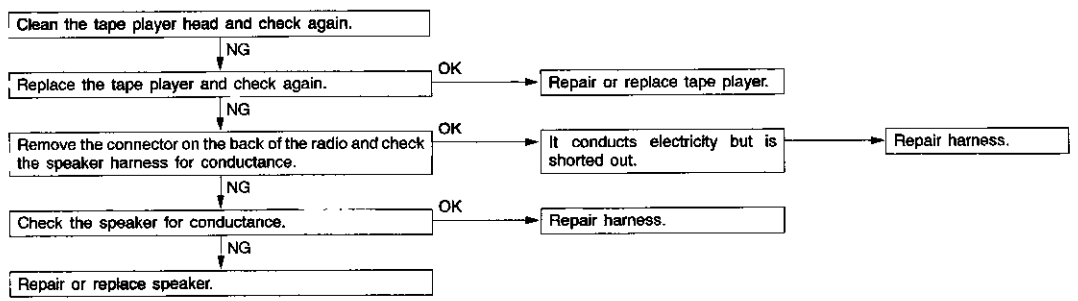
*1
Attempting to force a foreign object (e.g., a coin or clip, etc.) out of the tape player may damage the mechanism The player should be taken to a service dealer for repair.

*2
Ensure that the tape label is not loose, that the tape itself is not deformed and that the tape is tightly wound. Also, tape of C-120 or greater length often get caught in the mechanism and should not be used.

C-2 No sound (even after a tape has been inserted).



C-3 No sound from one speaker.



C-4 Sound quality is poor, or sound is weak.

Does the player play properly when another tape* is inserted?
- Yes → OK
- No

*:
- Ensure that the tape label is not loose, that the tape itself is not deformed and that the tape is tightly wound.
- Tapes of C-120 or greater length often get caught in the mechanism and should not be used.

Does the player play properly when the tape player head is cleaned?
- Yes → OK
- No

Is proper operation obtained when the tape player is replaced?
- Yes → Repair or replace tape player.
- No

Repair or replace speaker.

C-5 Cassette tape will not be ejected.

The problems covered here are all the result of the use of a bad tape (deformed or not properly tightened) or of a malfunction of the tape player itself. Malfunctions involving the tape becoming caught in the mechanism and ruining the case are also possible, and attempting to force the tape out of the player can cause damage to the mechanism. The player should be taken to a service dealer for repair.

C-6 Uneven revolution. Tape speed is fast or slow.

Does the player play OK if the tape*1 is changed?
- Yes → OK
- No

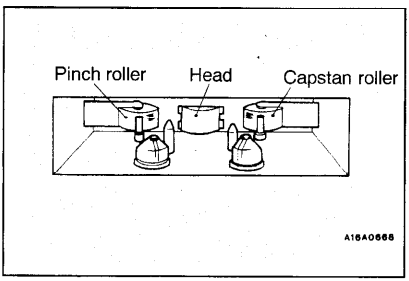
*1
Ensure that the tape label is not loose, that the tape itself is not deformed and that the tape is tightly wound. Also, tape of C-120 or greater length often get caught in the mechanism and should not be used.

Are there any foreign objects *2 inside the tape player?
- Yes → Remove foreign object(s).
- No

*2
Attempting to force a foreign object (e.g., a coin or clip, etc.) out of the tape player may damage the mechanism. The player should be taken to a service dealer for repair.

Is the head or capstan roller dirty? (Refer to the illustration below.)
- Yes → Clean.
- No

Repair or replace tape player.



C-7 Faulty auto reverse.

Does the player play OK if the tape* is changed?
- Yes → OK
- No

*:
- Ensure that the tape label is not loose, that the tape itself is not deformed and that the tape is tightly wound.
- Tapes of C-120 or greater length often get caught in the mechanism and should not be used.

Does the problem only occur while the vehicle is being driven?
- No → Repair or replace tape player.
- Yes

Is the tape player properly installed to the vehicle?
- No → Ensure tape player installation.
- Yes

Repair or replace tape player.

C-8 Tape gets caught in mechanism*1.

*1
When the tape is caught in the mechanism the case may not eject. When this occurs, do not try to force the tape out as this may damage the tape player mechanism. Take the cassette to a service dealer for repair.

Does the player play OK if the tape*2 is changed?
- Yes → Tape used is bad.
- No

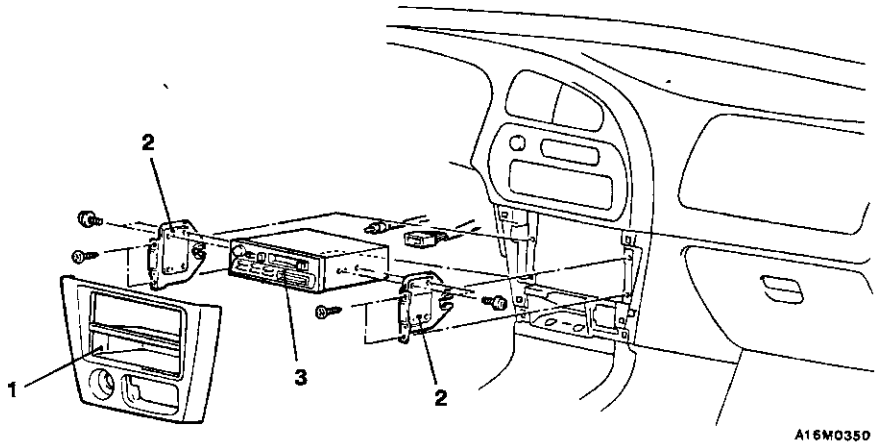
*2
Ensure that the tape label is not loose, that the tape itself is not deformed and that the tape is tightly wound. Also, tapes of C-120 or greater length often get caught in the mechanism and should not be used.

Repair or replace tape player.

RADIO AND TAPE PLAYER

54400140065

REMOVAL AND INSTALLATION



A16M0350

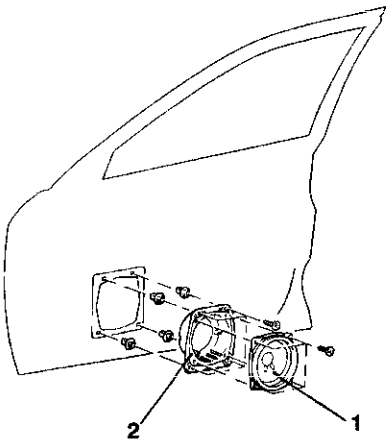
Removal steps

1. Audio panel
2. Radio bracket
3. Radio and tape player

SPEAKER

REMOVAL AND INSTALLATION

<FRONT SPEAKER>

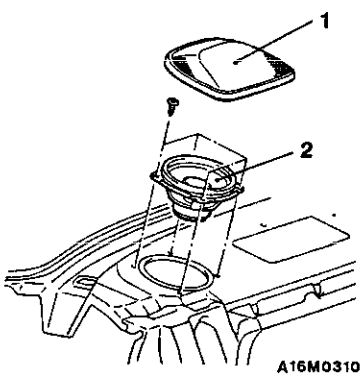


Removal steps

- Front door trim (Refer to GROUP 42.)

1. Front speaker
2. Speaker cover

<REAR SPEAKER>



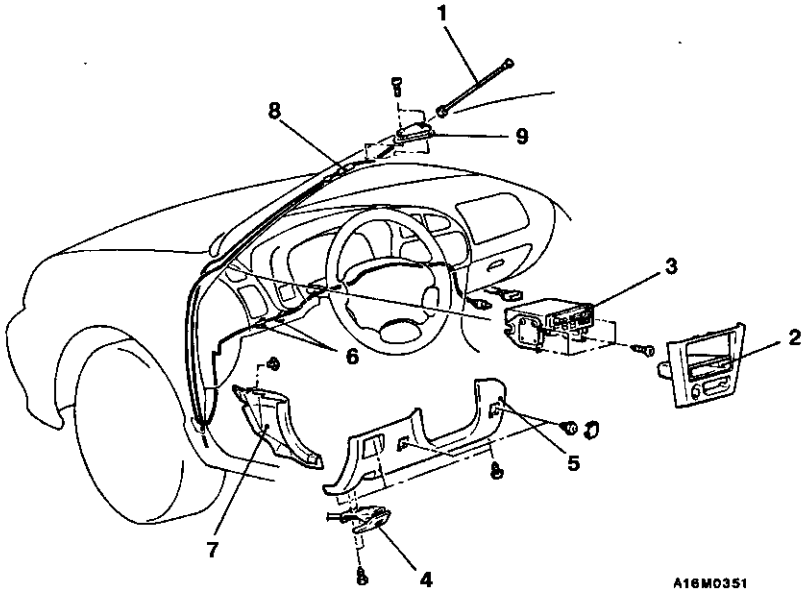
Removal steps

1. Rear speaker garnish
2. Rear speaker

ANTENNA

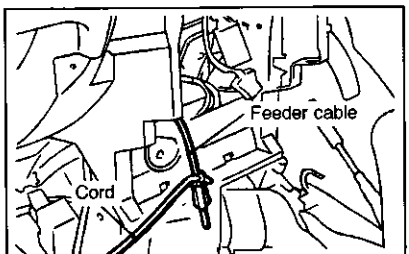
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REMOVAL AND INSTALLATION



Removal steps

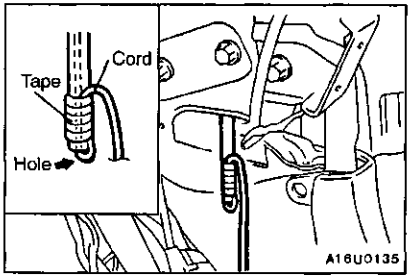
1. Antenna rod
2. Audio panel
3. Radio and tape player assembly
4. Hood lock release handle
5. Driver side lower cover
6. Clip
7. Cowl side trim
◀A▶ 8. Antenna assembly
9. Antenna base gasket



REMOVAL SERVICE POINT

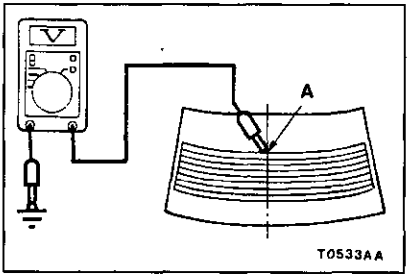
◀A▶ ANTENNA ASSEMBLY REMOVAL

1. Tie a cord to the end of the feeder cable.



2. Pull out the antenna base until the end of the drain pipe can be seen.
3. Pass the cord through the hole in the end of the drain pipe and wrap it with vinyl tape.

   Caution
   Wrap it securely so that the cord will not come off.
4. Slowly pull out the antenna base little by little to remove it.



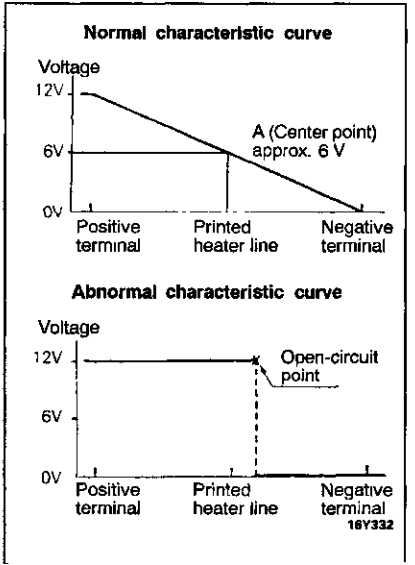
REAR WINDOW DEFOGGER

54300180033

ON-VEHICLE SERVICE

PRINTED-HEATER LINE CHECK

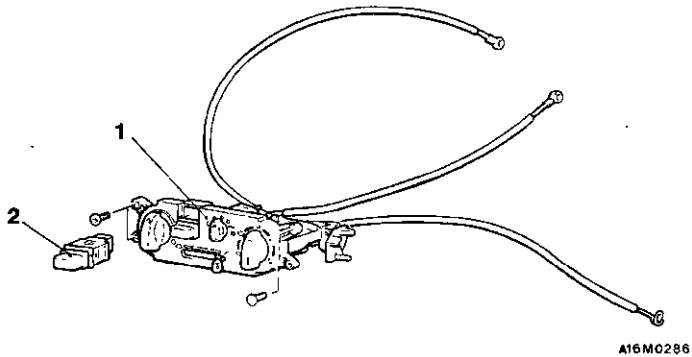
1. Run engine at 2,000 r/min. Check heater element with battery fully charged.
2. Turn ON rear window defogger switch. Measure heater element voltage with circuit tester at rear window glass center A.
   Condition is good if it indicates about 6 V.
3. If 12 V is indicated at A, there is a break to the negative terminal side.
   Move test bar slowly to negative terminal to detect where voltage suddenly changes to 0 V.
4. If 0 V is indicated at A, there is a break in the positive terminal side. Detect where the voltage changes suddenly (12 V) in the same method described above.



REAR WINDOW DEFOGGER SWITCH

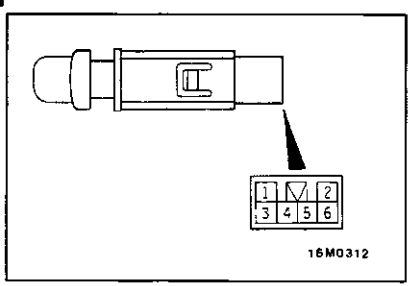
54300620153

REMOVAL AND INSTALLATION



Removal steps

1. Heater control assembly (Refer to GROUP 55.)
2. Rear window defogger switch



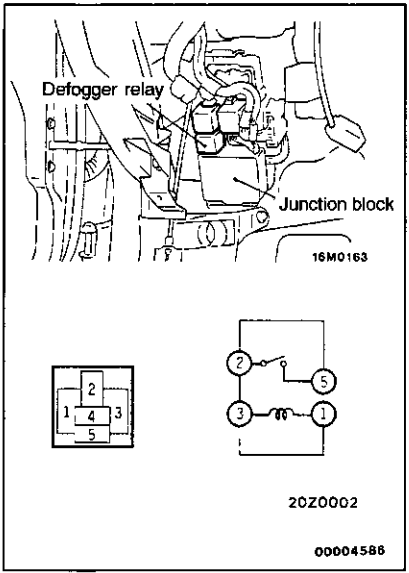
INSPECTION

54300670066

DEFOGGER SWITCH CONTINUITY CHECK

Switch position	Terminal No.							
	1		3	4	5	2		6
OFF		ILL					IND	
ON		ILL					IND	

NOTE
*: The switch will turns off in 13 - 17 minutes after it turns on.



REAR WINDOW DEFOGGER RELAY CONTINUITY CHECK

54300680076

Battery voltage	Terminal No.			
	1	2	3	5
Power is not supplied	○		○	
Power is supplied	⊕		⊖	
		○		○

HEATER, AIR CONDITIONING AND VENTILATION

CONTENTS

55209000051

BLOWER ASSEMBLY AND RESISTOR* ... 20

COMPRESSOR AND TENSION PULLEY 24

CONDENSER AND CONDENSER FAN MOTOR 31

EVAPORATOR 22

GENERAL INFORMATION 3

- Operation 4
- Safety Precautions 3

HEATER CONTROL ASSEMBLY AND A/C SWITCH 16

HEATER UNIT AND HEATER CORE* 19

LUBRICANTS 4

ON-VEHICLE SERVICE 7

- Charging 9
- Compressor Noise Check 14
- Compressor Drive Belt Adjustment 8
- Dual Pressure Switch Check 8
- Idle-up Operation Check 15
- Magnetic Clutch Test 7
- Performance Test 12
- Power Relay Check 15
- Receiver Drier Test 7
- Refrigerant Leak Repair 14
- Sight Glass Refrigerant Level Test 7

CONTINUED ON NEXT PAGE

WARNINGS REGARDING SERVICING OF SUPPLEMENTAL RESTRAINT SYSTEM (SRS) EQUIPPED VEHICLES

WARNING!

(1) **Improper service or maintenance of any component of the SRS, or any SRS-related component, can lead to personal injury or death to service personnel (from inadvertent firing of the air bag) or to the driver and passenger (from rendering the SRS inoperative).**

(2) **Service or maintenance of any SRS component or SRS-related component must be performed only at an authorized MITSUBISHI dealer.**

(3) **MITSUBISHI dealer personnel must thoroughly review this manual, and especially its GROUP 52B - Supplemental Restraint System (SRS) and GROUP 00 - Maintenance Service before beginning any service or maintenance of any component of the SRS or any SRS-related component.**

NOTE

The SRS includes the following components: SRS-ECU, SRS warning light, air bag module, clock spring and interconnecting wiring. Other SRS-related components (that may have to be removed/installed in connection with SRS service or maintenance) are indicated in the table of contents by and asterisk (*)

REFRIGERANT LINE 29
SERVICE SPECIFICATIONS 4
SPECIAL TOOLS 5
TROUBLESHOOTING 5
VENTILATORS* 33

GENERAL INFORMATION

55200010114

The heater system uses a two-way-flow full-air-mix system that features high performance and low operating noise. If includes an independent face air blowing function and a cool air bypass function.

The A/C system is basically the same as the conventional system, but a new refrigerant system has been adopted as a response to restrictions on the use of chlorofluorocarbons.

Items		Specifications
Heater unit	Type	Two-way-flow full-air-mix system
Heater control assembly		Dial type
Compressor	Model	Scroll type <MSC90>
Dual pressure switch kPa (psi)	High-pressure switch	ON → OFF: 3,138 (455.2), OFF → ON: 2,550 (369.9)
	Low-pressure switch	ON → OFF: 196 (28.4), OFF → ON: 221 (32.1)
Refrigerant and quantity g (oz.)		R-134a (HFC-134a), Approx. 555 - 595 (19.6 - 21.0)

SAFETY PRECAUTIONS

Because R-134a refrigerant is a hydrofluorocarbon (HFC) which contains hydrogen atoms in place of chlorine atoms, it will not cause damage to the ozone layer.
Refrigerant R-134a is transparent and colorless in both the liquid and vapor state. Since it has a boiling point of -29.8°C (-21.6°F) at atmospheric pressure, it will be a vapor at all normal temperatures and pressures. The vapor is heavier than air, non-flammable, and nonexplosive. The following precautions must be observed when handling R-134a.

Caution
Wear safety goggles when servicing the refrigeration system.

R-134a evaporates so rapidly at normal atmospheric pressures and temperatures that it tends to freeze anything it contacts. For this reason, extreme care must be taken to prevent any liquid refrigerant from contacting the skin and especially the eyes. Always wear safety goggles when servicing the refrigeration part of the A/C system. Keep a bottle of sterile mineral oil handy when working on the refrigeration system.

1. Should any liquid refrigerant get into the eyes, use a few drops of mineral oil to wash them out. R-134a is rapidly absorbed by the oil.
2. Next splash the eyes with plenty of cold water.
3. Call your doctor immediately even though irritation has ceased after treatment.

Caution
Do not heat R-134a above 40°C (104°F)

In most instances, moderate heat is required to bring the pressure of the refrigerant in its container above the pressure of the system when charging or adding refrigerant.
A bucket or large pan of hot water not over 40°C (104°F) is all the heat required for this purpose. Do not heat the refrigerant container with a blow torch or any other means that would raise temperature and pressure above this temperature. Do not weld or steam clean on or near the system components or refrigerant lines.

Caution
Keep R-134a containers upright when charging the system.

When metering R-134a into the refrigeration system keep the supply tank or cans in an upright position. If the refrigerant container is on its side or upside down, liquid refrigerant will enter the system and damage the compressor.

Caution
1. **The leak detector for R-134a should be used to check for refrigerant gas leaks.**
2. **Do not allow liquid refrigerant to touch bright metal.**

Refrigerant will tarnish bright metal and chrome surfaces, and in combination with moisture can severely corrode all metal surfaces.

OPERATION

Condenser fan and radiator fan control

- For the operation of each fan, refer to GROUP 14 - Troubleshooting.

Compressor control

When operating the air conditioning switch

- The air thermo sensor, which senses the temperature of the air flowing out of the evaporator, deactivates the compressor at -2°C (28°F) or below.
  Here, the engine coolant temperature sensor senses the temperature of engine coolant, and turnes off the compressor at 115°C (239°F) or higher temperatures.
- The dual pressure switch turns OFF when the refrigerant pressure becomes excessively high or low, thus protecting the compressor circuit. (See Table below)
- When these two sensors are all activated, the dual pressure switch is ON, and the ignition switch, blower switch, and air conditioning switch are ON, the A/C compressor relay is energized.

When operating the air outlet changeover control knob

- When the air outlet changeover control knob is moved to DEF or DEF/FOOT position, the micro switch, which is connected in series to the air conditioning switch, is turned on. The other compressor control than the above is the same as that when operating the air conditioning switch.

A/C Compressor Relay ON Conditions

Ignition switch (IG2)		ON	Remarks (1)A/C compressor relay is de-energized when any one switch, sensor or control unit shown on the left turns OFF (HI). (2)The * marked device measures the temperature of the outlet air, and according to the control characteristics of the magnetic clutch for the compressor, the automatic compressor-ECU outputs the "HI" signal (12V). When air of -2°C (28°F) or less blows out of the evaporator, the compressor magnet clutch will be turned off.
Blower switch		ON	
Air conditioning switch or micro switch		ON	
Air thermo sensor		*	
Engine coolant temperature sensor		ON [108°C (226°F) or below]	
Dual pressure switch	Low-pressure side	ON [221 kPa (32.1 psi) or higher]	
	High-pressure side	ON [2,550 kPa (369.9 psi) or below]	
A/C compressor relay driving transistor (within automatic compressor-ECU and engine control module)		ON	

SERVICE SPECIFICATIONS

55200030134

Items	Standard value
Idle speed r/min	750±100
Idle up speed r/min	850±100
Resistor (for blower motor) Ω	LO. 2.21, ML: 0.97, MH: 0.35
Air gap (Magnetic clutch) mm (in.)	0.3 - 0.5 (.012 - .020)

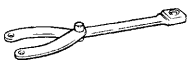
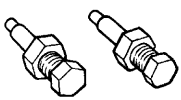
LUBRICANTS

55200040120

Items	Specified lubricants	Quantity
Each connection of refrigerant line	SUN PAG 56	As required
Compressor refrigerant unit lubricant cm^3 (ft.oz.)	SUN PAG 56	120 (4.1)

SPECIAL TOOLS

55200060058

Tool	Tool number and name	Supersession	Application
	MB991367 Special spanner	MB991367-01	Armature mounting nut of compressor removal and installation
	MB991386 Pin	MIT217213	

TROUBLESHOOTING

55200070136

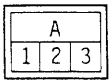
TROUBLESHOOTING PROCEDURES

Trouble symptom	Problem cause	Remedy	Reference page
When the ignition switch is "ON", the A/C does not operate.	A/C compressor relay is defective	Replace A/C compressor relay	55-15
	Magnetic clutch is defective	Replace the armature plate, rotor or clutch coil	55-7
	Refrigerant leak or overfilling of refrigerant	Replenish the refrigerant, repair the leak or take out some of the refrigerant	55-7
	Dual pressure switch is defective	Replace the dual pressure switch	55-8
	A/C switch is defective	Replace the A/C switch	55-18
	Blower switch is defective	Replace the blower switch	55-18
	Refrigerant temperature switch is defective	Replace the refrigerant temperature switch	55-27
	Automatic compressor-ECU is defective	Replace the automatic compressor-ECU	55-6
When the air outlet changeover control knob is moved to DEF or DEF/FOOT position, the air conditioning does not operate.	A/C compressor relay is defective.	Replace the A/C compressor relay.	55-6
	Magnetic clutch is defective	Replace the armature plate, rotor or clutch coil	55-6
	Refrigerant leak or overfilling of refrigerant	Refill the refrigerant, repair the leak or take out some of the refrigerant	55-6
	Dual pressure switch is defective	Replace the dual pressure switch	55-6
	Micro switch is defective	Replace the heater control panel illumination light and micro switch	55-6
	Blower switch is defective	Replace the blower switch	55-6
	Refrigerant temperature switch is defective	Replace the refrigerant temperature switch	55-27
	Automatic compressor-ECU is defective	Replace the automatic compressor-ECU	55-6

Trouble symptom	Problem cause	Remedy	Reference page
When the A/C is operating, temperature inside the passenger compartment doesn't decrease (cool air is not emitted).	Refrigerant leak	Replenish the refrigerant and repair the leak	55-7
	Dual pressure switch is defective	Replace the dual pressure switch	55-8
	Refrigerant temperature switch is defective	Replace the refrigerant temperature switch	55-27
	Automatic compressor-ECU is defective	Replace the automatic compressor-ECU	55-6
Blower fan and motor doesn't turn	Blower relay is defective	Replace the blower relay	55-15
	Blower fan and motor is defective	Replace the blower fan and motor	55-21
	Resistor (for blower motor) is defective	Replace the resistor	55-21
	Blower switch is defective	Replace the blower switch	55-18
Blower fan and motor doesn't stop turning.	Short circuit of the harness between the blower fan and motor and the blower switch	Repair the harness	-
	Blower switch is defective	Replace the blower switch	55-18
	Blower relay is defective	Replace the blower relay	55-15
When the A/C is operating condenser fan does not turn.	Condenser fan motor is defective	Replace the condenser fan motor	55-33
	Condenser fan relay is defective	Replace the condenser fan relay	55-15
	Dual pressure switch is defective	Replace the dual pressure switch	55-8

INSPECTION AT THE AUTOMATIC COMPRESSOR-ECU TERMINAL

55201030027



20M0065

TERMINAL NO.	CHECK ITEM	CHECKING REQUIREMENTS	NORMAL CONDITION
1	Output from ECU to A/C compressor relay	A/C compressor relay: OFF	Battery voltage
		A/C compressor relay ON	0 V
2	Input from A/C switch to ECU	A/C switch: OFF	0 V
		A/C switch: ON	Battery voltage
3	Ground	Always	0V

TROUBLESHOOTING HINTS

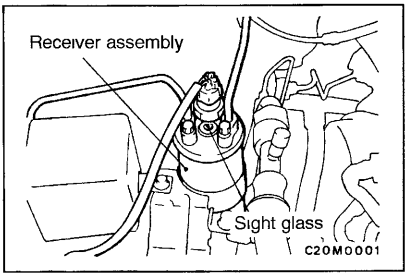
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Condenser fan and radiator fan control

- Refer to GROUP 14 - Troubleshooting.

Compressor control

- Refer to P.55-5.



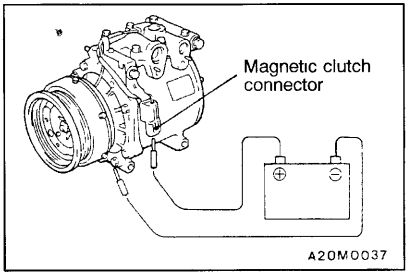
ON-VEHICLE SERVICE

55200840119

SIGHT GLASS REFRIGERANT LEVEL TEST

The sight glass is a refrigerant level indicator. To check the refrigerant level, clean the sight glass and start the vehicle engine. Push the A/C button to operate the compressor, place the blower switch to high and move the temperature control lever to max cool. After operating for a few minutes in this manner, check the sight glass.

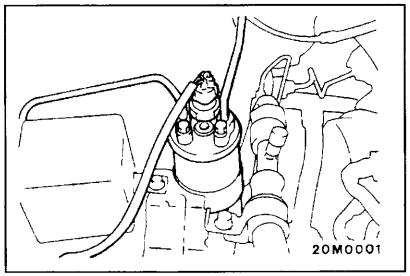
1. If the sight glass is clear, the magnetic clutch is engaged, the compressor discharge line is warm and the compressor inlet line is cool; the system has a full charge.
2. If the sight glass is clear, the magnetic clutch is engaged and there is no significant temperature difference between compressor inlet and discharge lines; the system has lost some refrigerant.
3. If the sight glass shows foam or bubbles, the system could be low on charge. The system should be checked for leaks, evacuated and recharged with refrigerant.



MAGNETIC CLUTCH TEST

55200850044

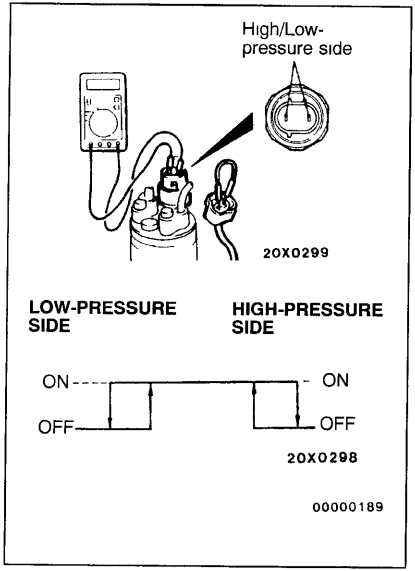
1. Disconnect the connector (1P) to the magnetic clutch.
2. Connect battery (+) voltage directly to the connector for the magnetic clutch.
3. If the magnetic clutch is normal, there will be "click". If the pulley and armature do not make contact ('click'), there is a malfunction.



RECEIVER DRIER TEST

55200860047

1. Operate the unit and check the piping temperature by touching the receiver assembly outlet and inlet.
   If there is a difference in the temperatures, the receiver assembly is restricted.
   Replace the receiver assembly.



DUAL PRESSURE SWITCH CHECK

55201040112

1. Remove the dual pressure switch connector and connect the high/low-pressure side terminals located on the harness side as shown in the illustration.
2. Install a gauge manifold to the high-pressure side service valve of the refrigerant line. (Refer to Performance Test.)
3. When the high/low-pressure sides of the dual pressure switch are at operation pressure (ON) and there is continuity between the respective terminals, then the condition is normal. If there is no continuity, replace the switch.

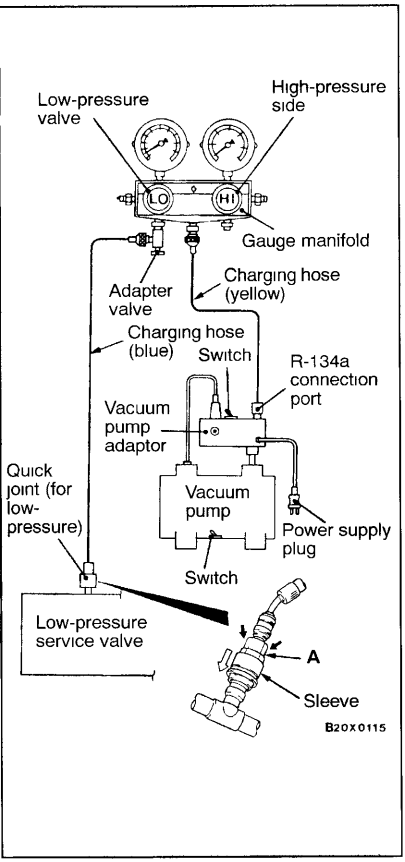
Unit: kPa (psi)

Items	Switch position	
	OFF → ON	ON → OFF
Low-pressure side	221 (32)	196 (28)
High-pressure side	2,550 (370)	3,138 (455)

COMPRESSOR DRIVE BELT ADJUSTMENT

55200100118

Refer to GROUP 11A - On-vehicle Service <Vehicles with power steering>, <Vehicles without power steering>, or GROUP 11C - On-vehicle Service.



CHARGING

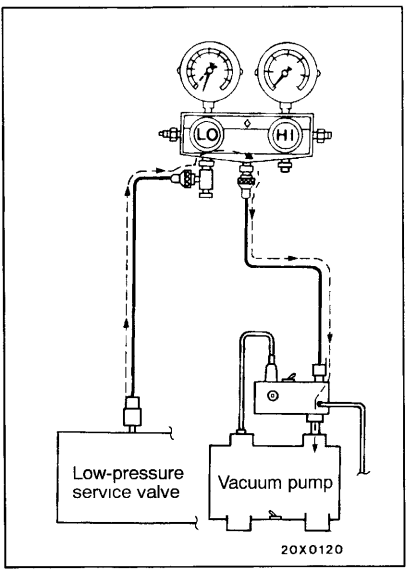
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1. With the handles turned in all the way (valve closed), install the adaptor valve to the low-pressure side of the gauge manifold.
2. Connect the charging hose (blue) to the adaptor valve.
3. Connect the quick joint (for low-pressure) to the charging hose (blue).
4. Connect the quick joint (for low-pressure) to the low-pressure service valve.

   NOTE
   The low-pressure service valve should be connected to the suction hose.

   Caution
   1. Use tools that are suited to R-134a.
   2. To install the quick joint, press section "A" firmly against the service valve until a click is heard. When connecting, run your hand along the hose while pressing to ensure that there are no bends in the hose.
5. Close the high and low-pressure valves of the gauge manifold.
6. Install the vacuum pump adaptor to the vacuum pump.
7. Connect the vacuum pump plug to the vacuum pump adaptor.
8. Connect the charging hose (yellow) to the R-134a connection port of the vacuum pump adaptor.
9. Tighten the adaptor valve handle (valve open).
10. Open the low-pressure valve of the gauge manifold.
11. Turn the power switch of the vacuum pump to the ON position.

    NOTE
    Even if the vacuum pump power switch is turned ON, the vacuum pump will not operate because of the power supply connection in step (7).

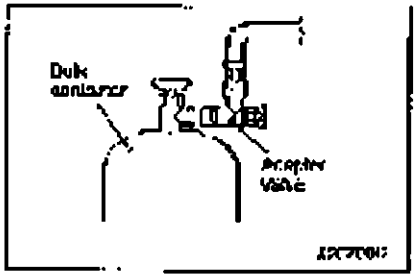


12. Turn the vacuum pump adaptor switch to the R-134a side to start the vacuum pump.

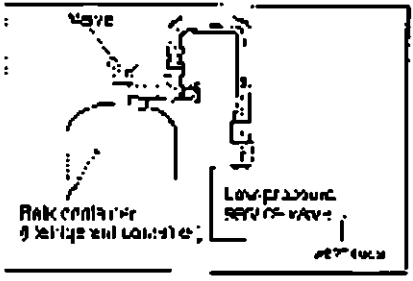
    Caution
    Do not operate the compressor for evacuation.
13. Evacuate to a vacuum reading of 100 kPa (29.5 in.Hg) or higher (takes approx. 10 minutes).
14. Turn the vacuum pump adaptor switch OFF and allow to stand it for 5 minutes.

    Caution
    Do not operate the compressor in the vacuum condition; damage may occur.
15. Carry out a leak test. (Good if the negative pressure does not drop.)

    Caution
    If the negative pressure drops, increase the tightness of the connections, and then repeat the evacuation procedure from step (12).



16. Turn the handle of the adaptor valve back all the way (valve closed), remove it from the gauge manifold and install the bulk container.



17. Open the valve of the bulk container.
18. Tighten the handle of the adaptor valve (valve open) to charge the system with refrigerant.

    Caution
    If the bulk container is inverted, liquid refrigerant may be drawn into the compressor damaging it by hydraulic lock. Keep the bulk container upright to ensure that refrigerant is charged in gas state.

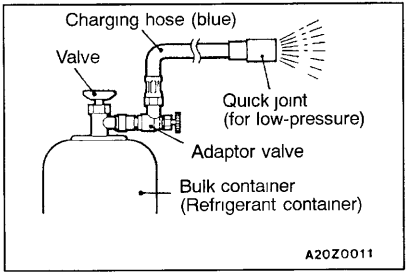
19. If the refrigerant is not drawn in, turn the handle of the adaptor valve back all the way (valve closed).
20. Check for gas leaks using a leak detector.
    If a gas leak is detected, re-tighten the connections, and then repeat the charging procedure from evacuating in step (12).

    Caution
    The leak detector for R-134a should be used.

21. Start the engine.
22. Operate the A/C and set to the lowest temperature (MAX. COOL).
23. Fix the engine speed at 1,500 rpm.
24. Tighten the handle of the adaptor valve (valve open) to charge the required volume of refrigerant.

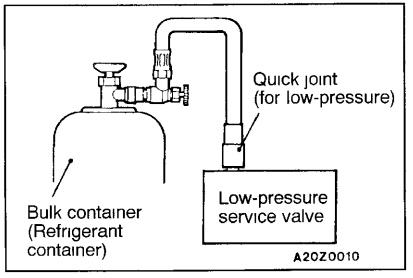
    Caution
    If the bulk container can is inverted, liquid refrigerant may be drawn into the compressor damaging it by hydraulic lock. Keep the bulk container upright to ensure that refrigerant is charged in gas state.

25. After charging with refrigerant, turn the handle of the adaptor valve back all the way (valve closed).
26. Tighten the charging valve handle (valve closed).
    Remove the quick joint for low-pressure from the low-pressure service valve.



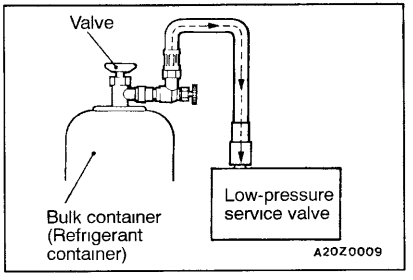
CORRECTING LOW REFRIGERANT LEVEL IN CASE THE BULK CONTAINER IS USED.

1. Install the adaptor valve with the handle turned all the way in (valve close) to the bulk container.
2. Connect the charging hose (blue) to the adaptor valve.
3. Connect the charging hose (blue) to the quick joint (for low-pressure).
4. Open the valve of the bulk container.
5. Turn the handle of the adaptor valve to bleed the air.



6. Install the quick joint (for low-pressure) to the low-pressure service valve.

   NOTE
   The low-pressure service valve should be connected to the suction hose.



7. Start the engine.
8. Operate the air conditioner and set at the lowest temperature (MAX. COOL).
9. Fix the engine speed at 1,500 r/min.
10. Tighten the handle of the adaptor valve (valve open), and replenish refrigerant while checking the quantity through the sight glass.

    Caution
    If the bulk container is inverted, liquid refrigerant may be draw into the compressor damaging it by hydraulic lock. Keep the bulk container upright to ensure that refrigerant is changed in gas state.

11. After replenishing is completed, turn the handle of the adaptor valve all the way in (valve close), and remove the quick joint.

METHOD BY USING REFRIGERANT RECOVERY AND RECYCLING UNIT

Using the refrigerant recovery and recycling unit, refill the refrigerant.

NOTE
Refer to that Refrigerant Recovery and Recycling Unit Instruction Manual for operation of the unit.

DISCHARGING SYSTEM

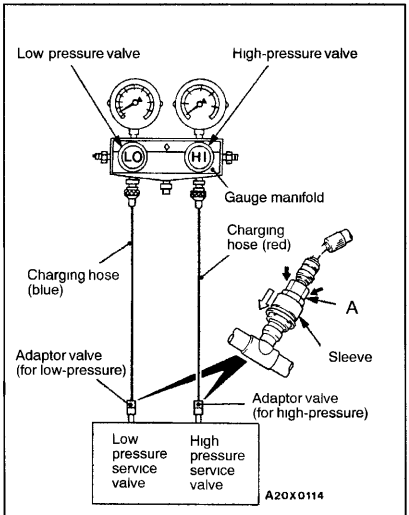
Use the refrigerant recovery unit to discharge refrigerant gas from the system.

NOTE
Refer to that Refrigerant Recovery and Recycling Unit Instruction Manual for operation of the unit.

REFILLING OF OIL IN THE A/C SYSTEM

Too little oil will provide inadequate compressor lubrication and cause a compressor failure. Too much oil will increase discharge air temperature.
When a compressor is installed at the factory, it contains 150 cm^3 (5.1 fl.oz.) of refrigerant oil. While the A/C system is in operation, the oil is carried through the entire system by the refrigerant. Some of this oil will be trapped and retained in various parts of the system.
When the following system components are changed, it is necessary to add oil to the system to replace the oil being removed with the component.

Compressor oil: SUN PAG 56
Quantity:
Evaporator: 60 cm^3 (2.0 fl.oz.)
Condenser: 15 cm^3 (.5 fl.oz.)
Suction hose: 10 cm^3 (.3 fl.oz.)
Receiver: 10 cm^3 (.3 fl.oz.)



PERFORMANCE TEST

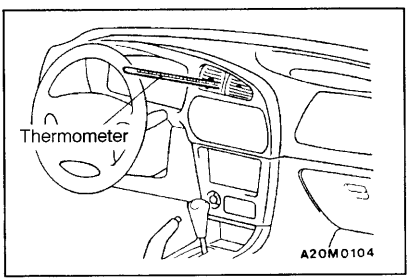
55200140110

1. The vehicles to be tested should be in a place that is not in direct sunlight.
2. Close the high and low-pressure valve of the gauge manifold.
3. Connect the charging hose (blue) to the low-pressure valve and connect the charging hose (red) to the high-pressure valve of the gauge manifold.
4. Install the quick joint (for low-pressure) to the charging hose (blue), and connect the quick joint (for high-pressure) to the charging hose (red).
5. Connect the quick joint (for low-pressure) to the low-pressure service valve and connect the quick joint (for high-pressure) to the high-pressure service valve.

   NOTE
   The high-pressure service valve is on discharge pipe B, and the low-pressure service valve is on the suction hose.

Caution
To connect the quick joint, press section A firmly against the service valve until a click is heard. When connecting, run your hand along the hose while pressing to ensure that there are no bends in the hose.

6. Start the engine.
7. Set the A/C controls as follows:
   A/C switch: A/C - ON position
   Mode selection: Face position
   Temperature control: Max. cooling position
   Air selection: Recirculation position
   Blower switch: HI (Fast) position
8. Adjust engine speed to 1,000 r/min with A/C clutch engaged.
9. Engine should be warmed up with doors and windows closed.



10. Insert a thermometer in the center air outlet and operate the engine for 20 minutes.
11. Note the discharge air temperature.

    NOTE
    If the clutch cycles, take the reading before the clutch disengages.

Performance Temperature Chart

Garage ambient temperature °C (°F)	20 (68)	25 (77)	35 (95)	40 (104)
Discharge air temperature °C (°F)	2.5-4 5 (37-40)	2 5-4.5 (33-40)	4.0-6.5 (39-44)	6 5-9.0 (44-48)
Compressor high pressure kPa (psi)	765-960 (111 0-139.3)	765-960 (111.0-139.3)	1,325-1,420 (192.2-206.0)	1,570-1,765 (227.8-256.1)
Compressor low pressure kPa (psi)	40-135 (5 8-19.6)	40-135 (5.8-19.6)	80-175 (11.6-25 4)	155-255 (22.5-37.0)

REFRIGERANT LEAK REPAIR 55200150021

LOST CHARGE

If the system has lost all charge due to a leak:
1. Evacuate the system. (See procedure.)
2. Charge the system with approximately one pound of refrigerant.
3. Check for leaks.
4. Discharge the system.
5. Repair leaks.
6. Replace receiver drier.

Caution
Replacement filter-drier units must be sealed while in storage. The drier used in these units will absorb water/water vapor quickly upon exposure to the atmosphere. When installing a drier, have all tools and supplies ready for quick reassembly to avoid keeping the system open any longer than necessary.

7. Evacuate and charge system.

LOW CHARGE

If the system has not lost all of its refrigerant charge; locate and repair all leaks. If it is necessary to increase the system pressure to find the leak (because of an especially low charge) add refrigerant. If it is possible to repair the leak without discharging the refrigerant system, use the procedure for correcting low refrigerant level.

COMPRESSOR NOISE CHECK 55200870088

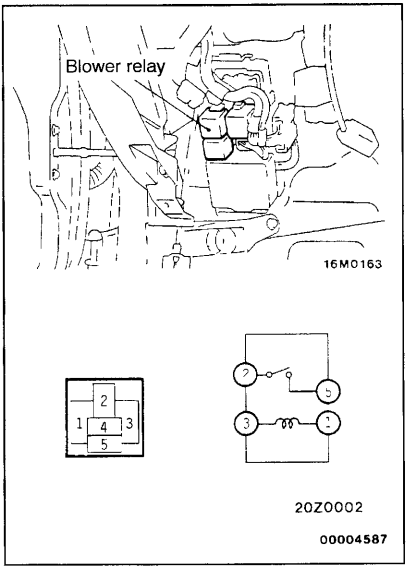
You must first know the conditions when the noise occurs. These conditions are: weather, vehicle speed, in gear or neutral, engine temperature or any other special conditions.
Noises that develop during A/C operation can often be misleading. For example: what sounds like a failed front bearing or connecting rod, may be caused by loose bolts, nuts, mounting brackets, or a loose clutch assembly. Verify accessory drive belt tension (power steering or alternator).
Improper accessory drive belt tension can cause a misleading noise when the compressor is engaged and little or no noise when the compressor is disengaged.
Drive belts are speed-sensitive. That is, at different engine speeds, and depending upon belt tension, belts can develop unusual noises that are often mistaken for mechanical problems within the compressor.

HANDLING TUBING AND FITTINGS

Kinks in the refrigerant tubing or sharp bends in the refrigerant hose lines will greatly reduce the capacity of the entire system. High pressures are produced in the system when it is operating. Extreme care must be exercised to make sure that all connections are pressure tight. Dirt and moisture can enter the system when it is opened for repair or replacement of lines or components. The following precautions must be observed. The system must be completely discharged before opening any fitting or connection in the refrigeration system. Open fittings with caution even after the system has been discharged. If any pressure is noticed as a fitting is loosened, allow trapped pressure to bleed off very slowly.
Never attempt to rebend formed lines to fit. Use the correct line for the installation you are servicing. A good rule for the flexible hose lines is keep the radius of all bends at least 10 times the diameter of the hose.
Sharper bends will reduce the flow of refrigerant. The flexible hose lines should be routed so that they are at least 80 mm (3 in.) from the exhaust manifold. It is good practice to inspect all flexible hose lines at least once a year to make sure they are in good condition and properly routed.
O-rings used on connections are not reusable.

ADJUSTMENT

1. Select a quiet area for testing. Duplicate conditions as much as possible. Switch compressor on and off several times to clearly identify compressor noise. To duplicate high ambient conditions (high head pressure), restrict air flow through condenser. Install manifold gauge set to make sure discharge pressure doesn't exceed 2,070 kPa (300 psi).
2. Tighten all compressor mounting bolts, clutch mounting bolt, and compressor drive belt. Check to assure clutch coil is tight (no rotation or wobble).
3. Check refrigerant hoses for rubbing or interference that can cause unusual noises.
4. Check refrigerant charge. (Refer to P.5-7.)
5. Recheck compressor noise as in Step 1.
6. If noise still exists, loosen compressor mounting bolts and retorque. Repeat Step 1.
7. If noise continues, replace compressor and repeat Step 1.

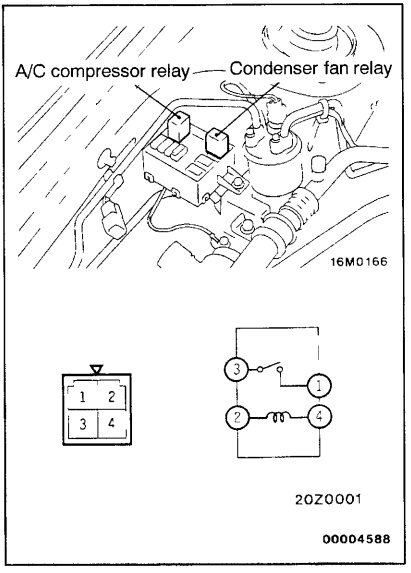


POWER RELAY CHECK

55200880135

BLOWER RELAY

Battery voltage	Terminal No.			
	1	3	2	5
Power is not supplied	○	○		
Power is supplied	⊕	⊖	○	○



A/C COMPRESSOR RELAY, CONDENSER FAN RELAY

Battery voltage	Terminal No			
	2	4	1	3
Power is not supplied	○	○		
Power is supplied	⊕	⊖	○	○

IDLE-UP OPERATION CHECK

55200160130

1. Before inspection and adjustment, set vehicle in the following condition:
   - Engine coolant temperature: 80-90°C (176-194°F)
   - Lights, electric cooling fan and accessories: Set to OFF
   - Transmission: Neutral (N or P for vehicles with A/T)
   - Steering wheel: Straightforward

2. Check whether or not the idling speed is the standard value.

   Standard value: 750 ± 50 r/min

3. When the A/C is running after turning the A/C switch to ON, and the blower switch to the MH or HI position, check to be sure that the idle speed is at the standard value.

   Standard value: 850 ± 50 r/min

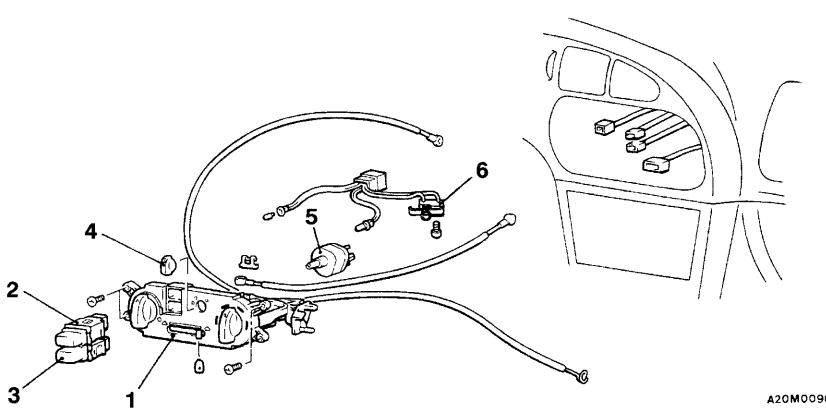
   NOTE
   Idle speed is controlled by the IAC system and is not adjustable. If, idle speed is not within specifications, check the IAC system. (Refer to GROUP 13A - On-vehicle Service.)

HEATER CONTROL ASSEMBLY AND A/C SWITCH

55200240100

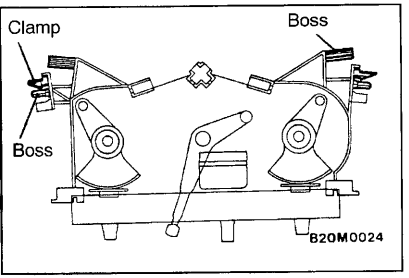
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Driver's side Lower Cover and Heater Control Panel Removal and Installation
- Floor Console Assembly Removal and Installation (Refer to GROUP 52A)
- Foot Distribution Duct Removal and Installation (Refer to P.55-33)



Removal steps

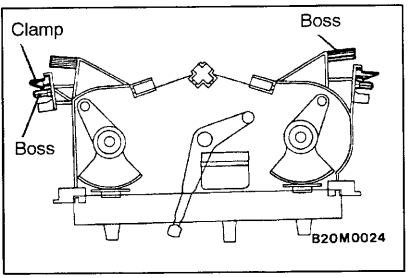
◀A▶ ▶A◀ 1 Heater control assembly
2 Rear window defogger switch
3. A/C switch
4. Knob
5 Blower switch
6. Heater control panel illumination light and micro switch



REMOVAL SERVICE POINT

◀A▶ HEATER CONTROL ASSEMBLY REMOVAL

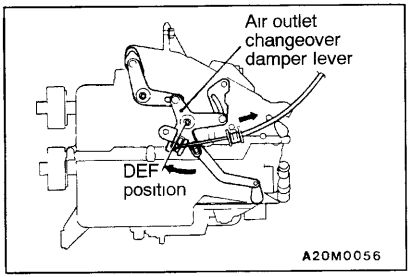
1. Remove the heater control assembly mounting screws.
2. Bend the two clamps and the four bosses, which are inserted into the center reinforcement.
3. Remove the heater control assembly.



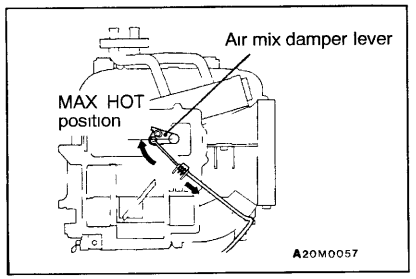
INSTALLATION SERVICE POINT

▶A◀ HEATER CONTROL ASSEMBLY INSTALLATION

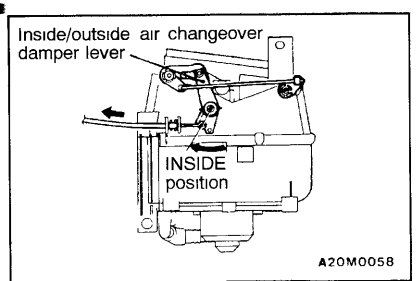
1. Cut off the bosses and clips shown before installing a new heater control assembly.
2. Install the heater control assembly mounting screws.



3. Follow the steps below to install the air outlet changeover damper lever cable.
   (1) Set the air outlet changeover control knob on the heater control assembly to the DEF position.
   (2) Set the air outlet changeover damper lever of the heater unit to the DEF position as shown in the illustration, and then connect the cable to the lever pin.
   (3) Push the outer cable in the direction of the arrow so that there is no looseness, and then secure it with clip.

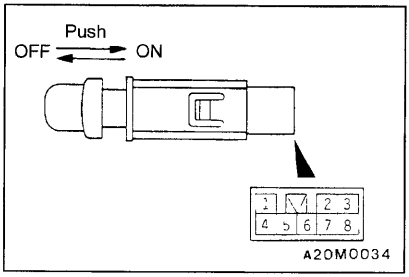


4. Follow the steps below to install the air mix damper lever cable.
   (1) Set the temperature control knob on the heater control assembly to the MAX HOT position.
   (2) Set the air mix damper lever of the heater unit to the MAX HOT position as shown in the illustration, and then connect the cable to the lever pin.
   (3) Push the outer cable in the direction of the arrow so that there is no looseness, and then secure it with clip.



5. Follow the steps below to install the inside/outside air changeover damper lever cable.
   (1) Set the inside/outside air changeover control knob on the heater control assembly to the INSIDE position.
   (2) Set the inside/outside air changeover damper lever of the heater unit to the INSIDE position as shown in the illustration, and then connect the cable to the lever pin.
   (3) Push the outer cable in the direction of the arrow so that there is no looseness, and then secure it with clip.

6. After installation, ensure that each damper operates smoothly by operating the heater control assembly knob.

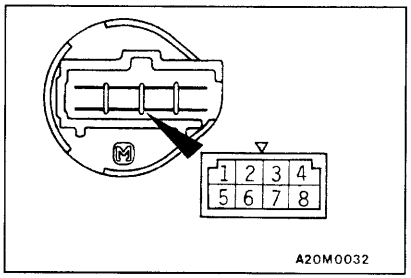


INSPECTION

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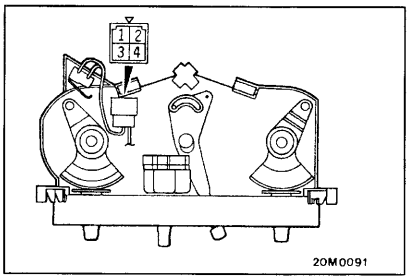
A/C SWITCH CONTINUITY CHECK

Switch position	Terminal No.						
	1	ILL	2	IND	4	5	7
OFF	○	○			○		
ON	○	○			○		
			○	○		○	○



BLOWER SWITCH CONTINUITY CHECK

Switch position	Terminal No.						
	1	2	3	5	6	7	8
OFF							
• (LO)	○		○	○			○
• (ML)	○			○	○		○
• (MH)	○	○		○			○
• (HI)	○			○		○	○



MICRO SWITCH CONTINUITY CHECK

Air outlet changeover control knob position	Terminal No	
	1	3
DEF, DEF/FOOT	○	○
Other positions		

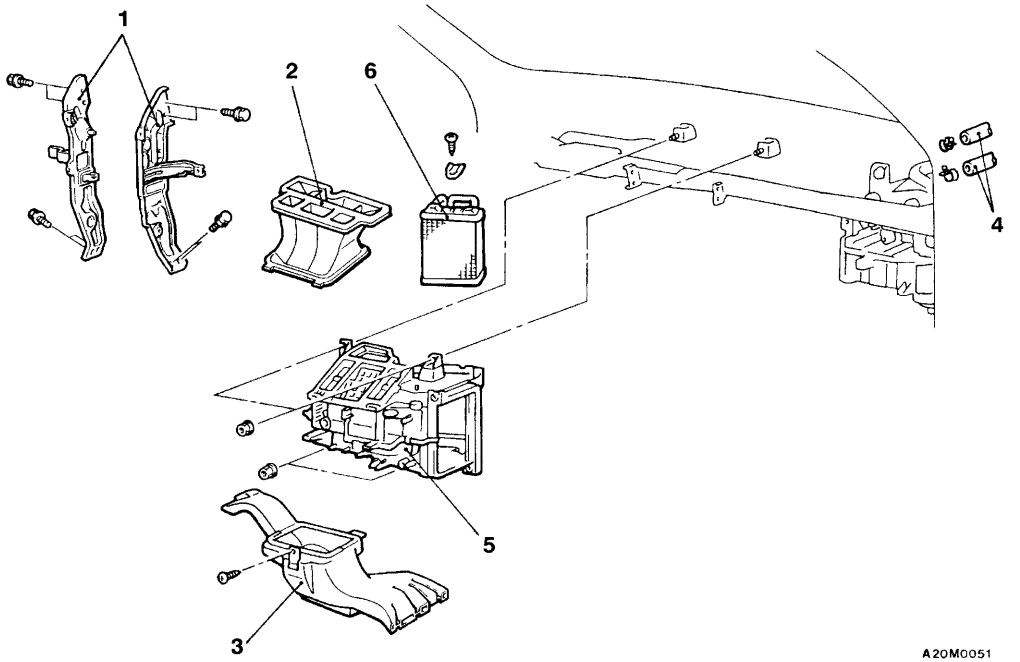
HEATER UNIT AND HEATER CORE

55100190242

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Draining and Refilling Engine Coolant (Refer to GROUP 00 - Maintenance Service)
- Air Cleaner Cover and Air Intake Hose Removal and Installation
- Instrument Panel Removal and Installation (Refer to GROUP 52A)
- Joint Duct Removal and Installation <Vehicles without A/C> (Refer to P55-20)
- Evaporator Removal and Installation <Vehicles with A/C> (Refer to P55-22)

Caution: SRS
When removing and installing the floor console assembly from vehicles equipped with SRS, do not let it bump against the SRS-ECU or the components.



A20M0051

Removal steps

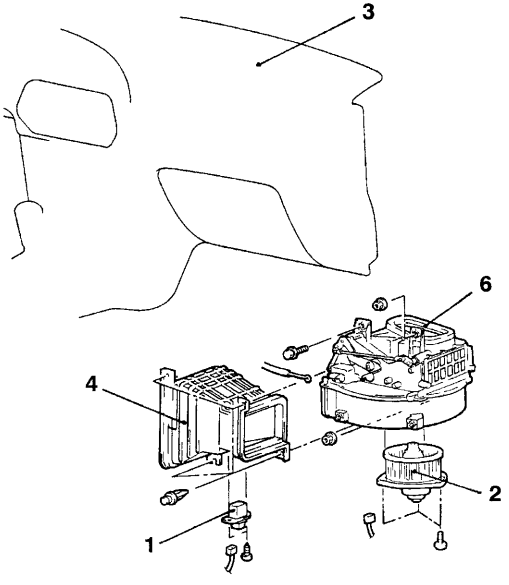
1. Center reinforcement
2. Center ventilation duct
3. Foot distribution duct
4. Heater hose connection
5. Heater unit
6. Heater core

BLOWER ASSEMBLY AND RESISTOR

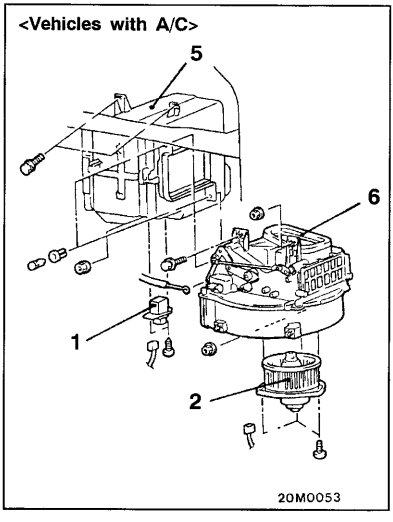
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REMOVAL AND INSTALLATION

Caution: SRS
When removing and installing the floor console assembly from vehicles equipped with SRS, do not let it bump against the SRS-ECU or the components.



20M0078

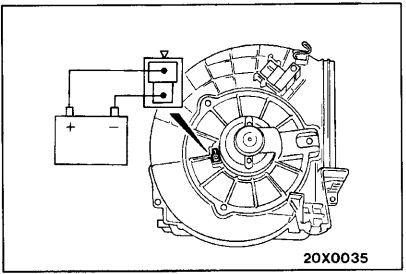


00004806

1. Resistor
2. Blower fan and motor

Blower unit removal steps

3. Instrument panel (Refer to GROUP 52A.)
4. Joint duct <Vehicles without A/C>
5. Evaporator <Vehicles with A/C> (Refer to P.55-22)
6. Blower unit assembly

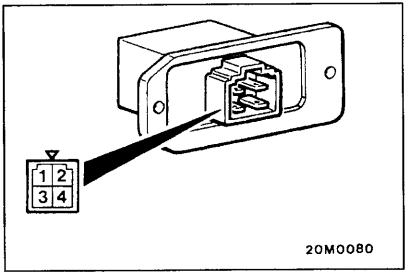


INSPECTION

55200560015

BLOWER FAN AND MOTOR CHECK

When battery voltage is applied between the terminals, check that the motor operates. Also, check that that there is no abnormal noise.



RESISTOR CHECK

Use a circuit tester to measure the resistance between the terminals as indicated below. Check that the measured value is at the standard value.

Standard value:

Measurement terminal	Standard value Ω
Between terminals 3 and 2 (LO)	2.21
Between terminals 3 and 4 (ML)	0.97
Between terminals 3 and 1 (MH)	0.35

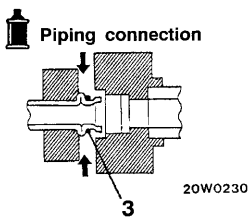
EVAPORATOR <VEHICLES WITH A/C>

55200360103

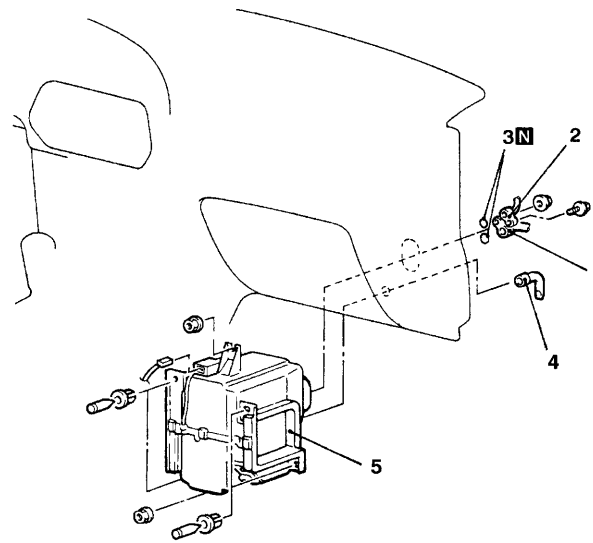
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Discharging and Charging of Refrigerant (Refer to P.55-9)
- Glove Box and Glove Box Frame Removal and Installation (Refer to GROUP 52A - Instrument Panel)

Caution: SRS
When removing and installing the floor console assembly from vehicles equipped with SRS, do not let it bump against the SRS-ECU or the components.



Compressor oil: SUN PAG 56



20M0054

00004589

Removal steps

◀A▶ 1. Suction hose connection
◀A▶ 2. Discharge pipe connection
3. O-ring
4. Drain hose
▶A◀ 5. Evaporator

REMOVAL SERVICE POINT

◀A▶ SUCTION HOSE, DISCHARGE PIPE DISCONNECTION

Plug the disconnected hose and the evaporator nipple not to let foreign matter get into them.

Caution
Seal the hoses completely, otherwise the compressor oil and receiver will absorb water vapor easily.

INSTALLATION SERVICE POINT

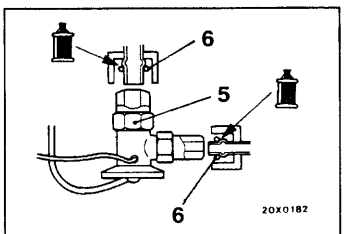
▶A◀ EVAPORATOR INSTALLATION

When replacing the evaporator, refill it with a specified amount of compressor oil and install it (to the vehicle).

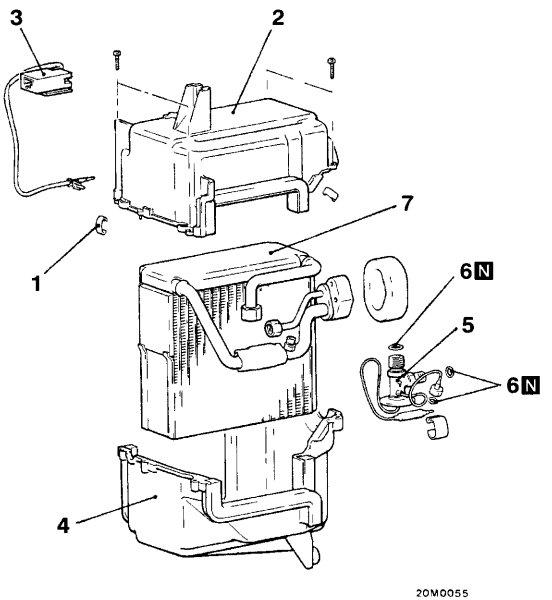
Compressor oil: SUN PAG 56
Quantity: 60 cm^3 (2.0 fl.oz.)

DISASSEMBLY AND REASSEMBLY

55200380093



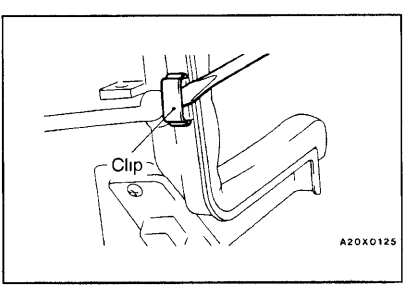
Compressor oil: SUN PAG 56



00004590

Disassembly steps

◀A▶ 1 Clip
2. Evaporator cover (upper)
3 Thermostat (Automatic compressor-ECU)
4 Evaporator cover (lower)
5 Expansion valve
6. O-ring
7. Evaporator



DISASSEMBLY SERVICE POINT

◀A▶ CLIP REMOVAL

Remove the clips with a flat-tipped screwdriver covered with a shop towel to prevent damage to case surfaces.

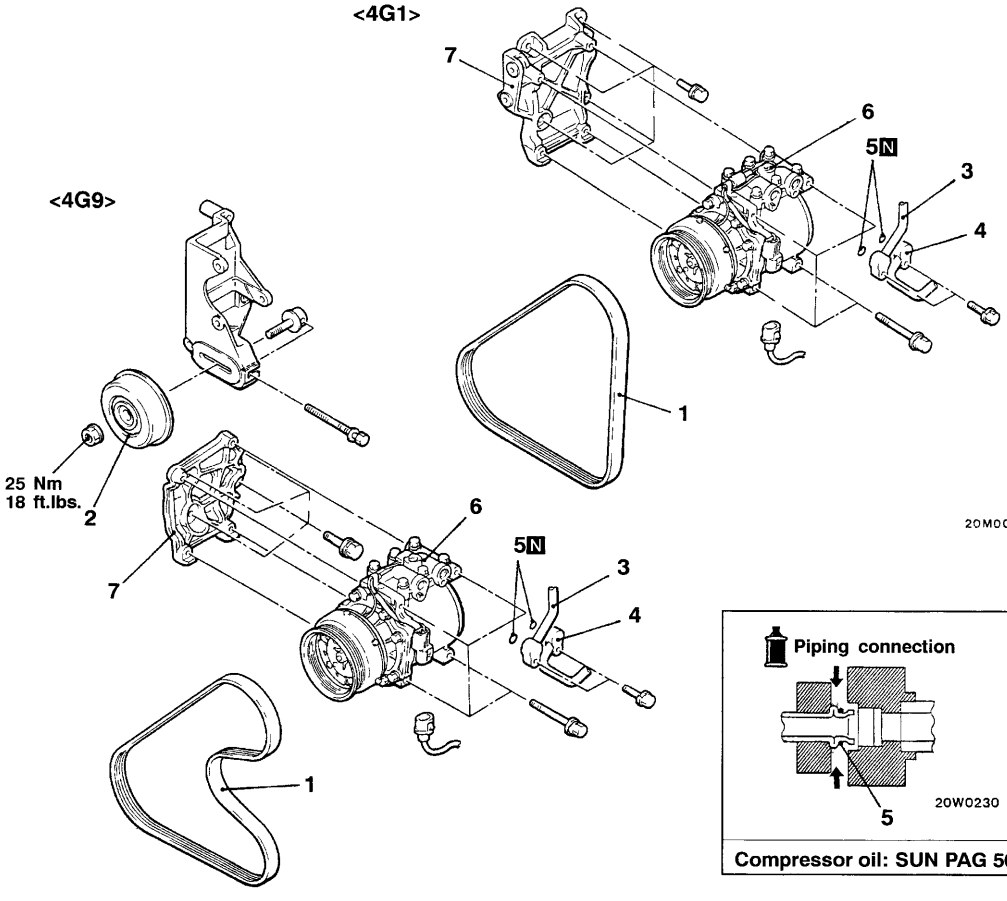
COMPRESSOR AND TENSION PULLEY

55200410327

REMOVAL AND INSTALLATION

Pre-removal Operation
- Discharging of Refrigerant (Refer to P55-9)

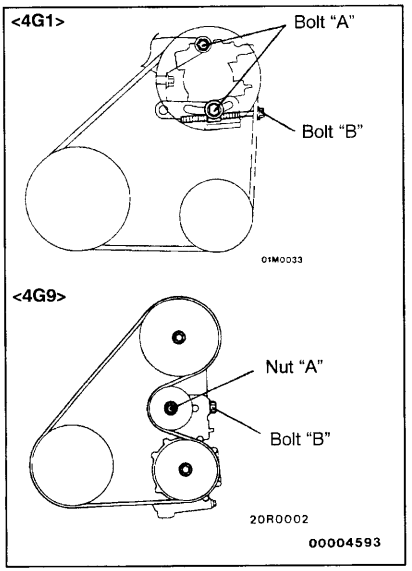
Post-installation Operation
- Drive Belt Tension Adjustment (Refer to GROUP 00 - Maintenance Service.)
- Charging of Refrigerant (Refer to P55-9)



00004592

Removal steps

◀A▶ 1. Drive belt
2. Tension pulley <4G9>
◀B▶ 3. Suction hose connection
◀B▶ 4. Discharge hose connection
5. O-ring
◀C▶ ▶A◀ 6. Compressor
7. Compressor bracket



REMOVAL SERVICE POINTS

◀A▶ DRIVE BELT REMOVAL

1. Loosen the bolts "A" <4G1> or nut "A" <4G9> for holding.
2. Loosen the bolt "B" for adjustment.
3. Remove the drive belt.

◀B▶ SUCTION HOSE, DISCHARGE HOSE DISCONNECTION

Plug the disconnected hose and the compressor nipple not to let foreign matter get into them.

Caution
Seal the hoses completely, otherwise the compressor oil and receiver will absorb water vapour easily.

◀C▶ COMPRESSOR REMOVAL

When doing this work, be careful not to spill the compressor oil.

INSTALLATION SERVICE POINT

▶A◀ COMPRESSOR INSTALLATION

If a new compressor is installed, first adjust the amount of oil according to the procedures described below, and then install the compressor.

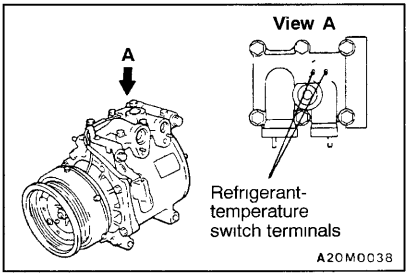
(1) Measure the amount {X cm^3 (X fl.oz.)} of oil within the removed compressor.

(2) Drain (from the new compressor) the amount of oil calculated according to the following formula, and then install the new compressor.
New compressor oil amount

120 cm^3 - X cm^3 = Y cm^3
(4.1 fl.oz. - X fl.oz. = Y fl.oz.)

NOTE
(1) Y cm^3 (Y fl.oz.) indicates the amount of oil in the refrigerant line, the condenser, the evaporator etc.
(2) When replacing the following parts at the same times as the compressor, subtract the rated oil amount of the each part from Y cm^3 (Y fl.oz.) and discharge from the new compressor.

Quantity
Evaporator: 60 cm^3 (2.0 fl.oz.)
Condenser: 15 cm^3 (.5 fl.oz.)
Suction hose: 10 cm^3 (.3 fl.oz.)
Receiver: 10 cm^3 (.3 fl.oz.)

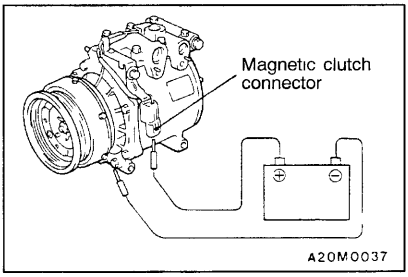


INSPECTION

55200930052

REFRIGERANT-TEMPERATURE SWITCH SIMPLE CHECK

When the A/C is off, check that there is continuity between the refrigerant-temperature switch terminals. If no, replace the compressor assembly.



COMPRESSOR MAGNETIC CLUTCH OPERATION INSPECTION

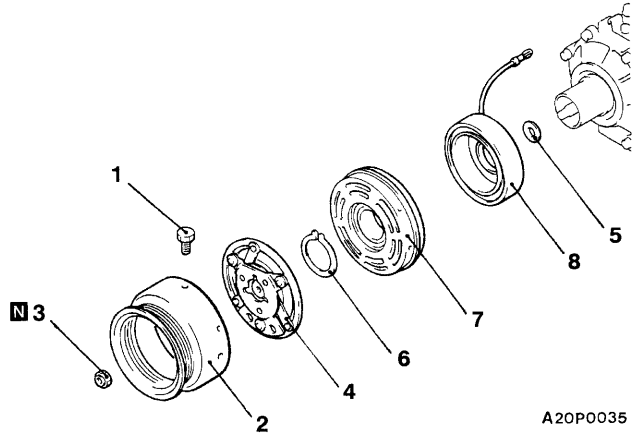
55200850075

Connect the battery (+) terminal to the compressor side terminal, and ground the battery (-) terminal to the body of the compressor. The condition is normal if the sound of the magnetic clutch (click) can be heard.

MAGNETIC CLUTCH

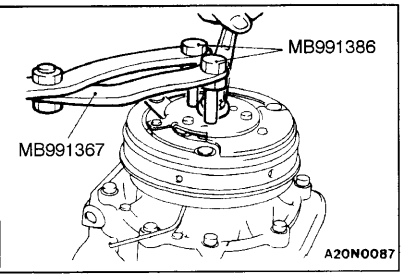
55200460124

DISASSEMBLY AND REASSEMBLY



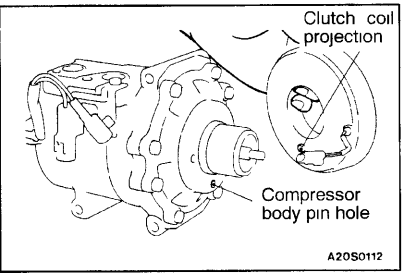
Disassembly steps

1. Bolt
2. Pulley
- ◀A▶ ▶E◀ ● Air gap adjustment
- ◀A▶ ▶D◀ 3. Nut
- ◀A▶ ▶C◀ 4. Armature plate
5. Shims
- ▶B◀ 6. Snap ring
7. Rotor
- ▶A◀ 8. Clutch coil



DISASSEMBLY SERVICE POINT

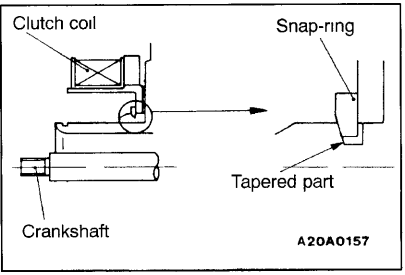
◀A▶ NUT REMOVAL



REASSEMBLY SERVICE POINTS

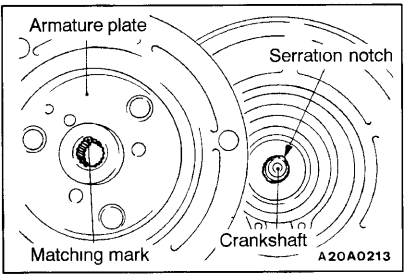
▶A◀ CLUTCH COIL INSTALLATION

When installing the clutch coil to the A/C compressor body, install so that the pin hole of the A/C compressor body and the clutch coil projection are aligned.



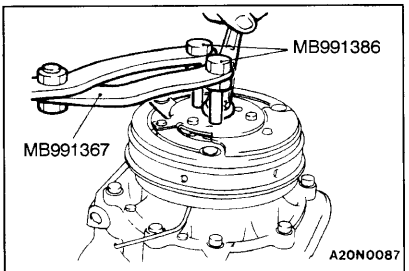
▶B◀ SNAP RING INSTALLATION

Install the snap ring so that the tapered surface is to the outside.



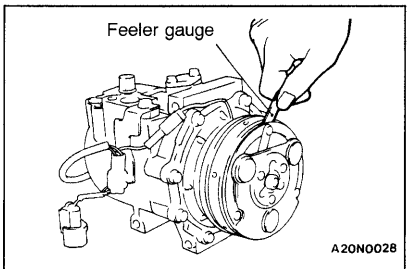
▶C◀ ARMATURE PLATE INSTALLATION

Align the mating mark of the crankshaft spline and the mating mark of the armature plate, and then fit them together.



▶D◀ NUT INSTALLATION

Use the special tool to hold the magnet clutch, and tighten the nut in the same manner as removal.



▶E◀ AIR GAP ADJUSTMENT

Check whether or not the air gap of the clutch is within the standard value.

Standard value: 0.3 - 0.5 mm (.012 - .020 in.)

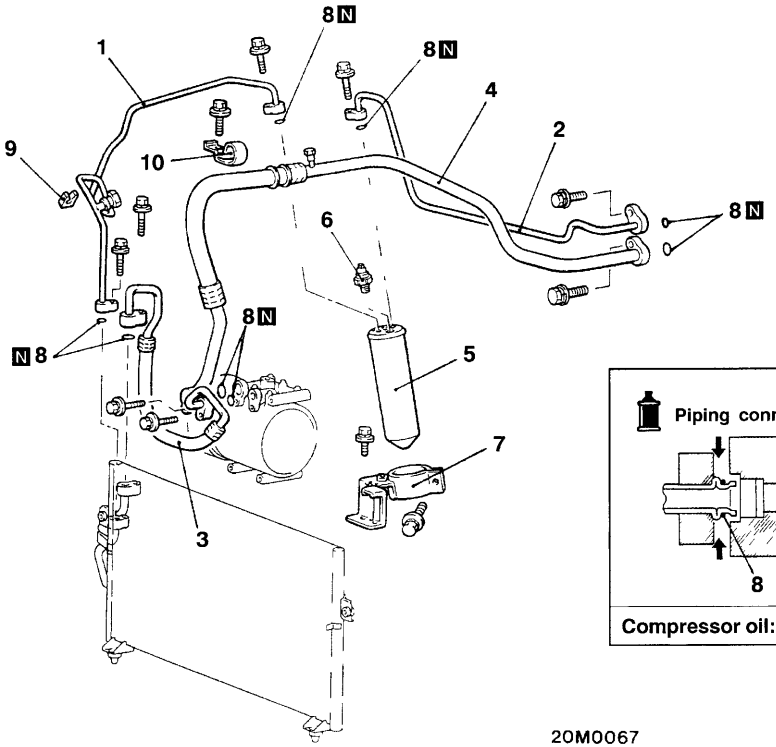
NOTE
If there is a deviation of the air gap from the standard value, make the necessary adjustment by adjusting the number of shims.

REFRIGERANT LINE

55200640139

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Discharging and Charging of Refrigerant (Refer to P55-9)



00004594

◀A▶ 1 Discharge pipe A
◀A▶ 2. Discharge hose B
◀A▶ 3. Discharge hose
◀A▶ 4 Suction hose
◀A▶ ▶A◀ 5. Receiver assembly
6 Dual pressure switch
7. Receiver bracket
8 O-ring
9 Clip
10 Clamp

REMOVAL SERVICE POINT

◀A▶ HOSE/PIPE/RECEIVER ASSEMBLY DISCONNECTION

Plug the disconnected hose, the receiver, the evaporator and the compressor nipple not to let foreign matter get into them.

Caution
Seal the hoses completely, otherwise the compressor oil and receiver will absorb water vapor easily.

INSTALLATION SERVICE POINT

▶A◀ SUCTION HOSE/RECEIVER ASSEMBLY INSTALLATION

When replacing the suction hose or receiver assembly, refill them with a specified amount of compressor oil, and then install them.

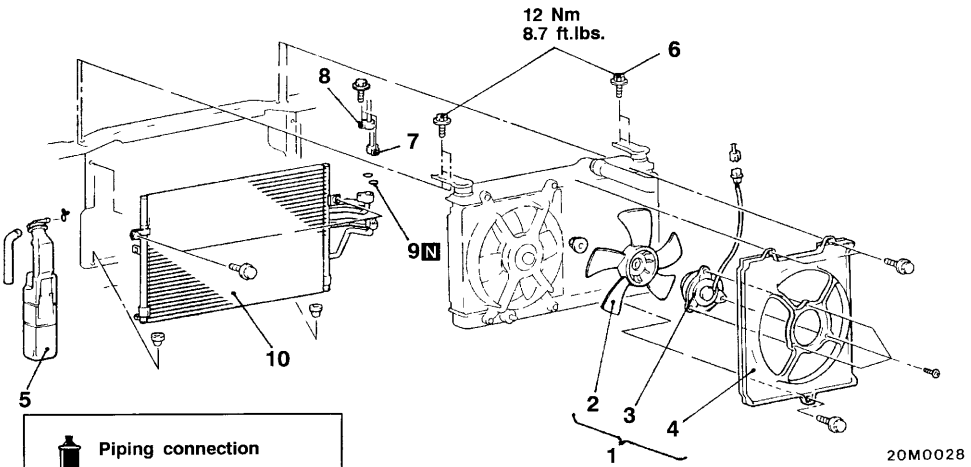
Compressor oil: SUN PAG 46

Quantity:
Suction hose: 10 cm³ (.3 fl.oz.)
Receiver assembly: 10 cm³ (.3 fl.oz.)

CONDENSER AND CONDENSER FAN MOTOR

55200670121

REMOVAL AND INSTALLATION



00004596

Condenser fan motor removal steps

1. Condenser fan motor and shroud assembly
2. Condenser fan
3. Condenser fan motor
4. Shroud

Condenser removal steps

- Discharging and charging of refrigerant (Refer to P.55-9.)

5. Reserve tank
6. Upper insulator installation bolt
7. Discharge pipe A connection ◀A▶
8. Discharge hose connection ◀A▶
9. O-ring
10. Condenser ◀B▶ ▶A◀

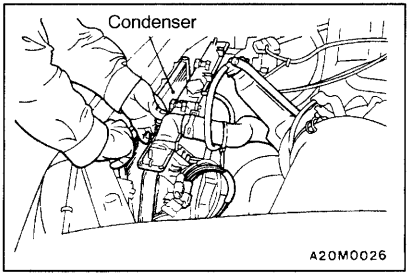
REMOVAL SERVICE POINTS

◀A▶ DISCHARGE PIPE "A" /DISCHARGE HOSE DISCONNECTION

Plug the disconnected pipe, hose and the condenser nipple not to let foreign matter get into them.

Caution

Seal the hoses completely, otherwise the compressor oil and receiver will absorb water vapor easily.



◀B▶ CONDENSER REMOVAL

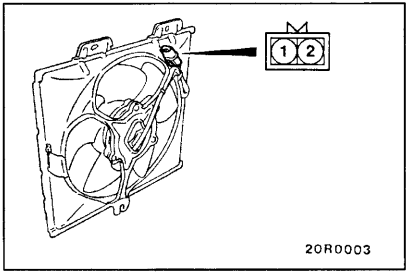
Move the radiator to the engine side and then lift up the condenser to remove it.

INSTALLATION SERVICE POINT

▶A◀ CONDENSER INSTALLATION

When replacing the condenser, refill it with a specified amount of compressor oil and install it. (to the vehicle).

Compressor oil: SUN PAG 56
Quantity: 15 cm^3 (.5 fl.oz.)



INSPECTION

55200680087

CONDENSER FAN MOTOR CHECK

Check to be sure that the condenser fan motor operates when battery voltage is applied to terminal 1 and terminal 2 is grounded.

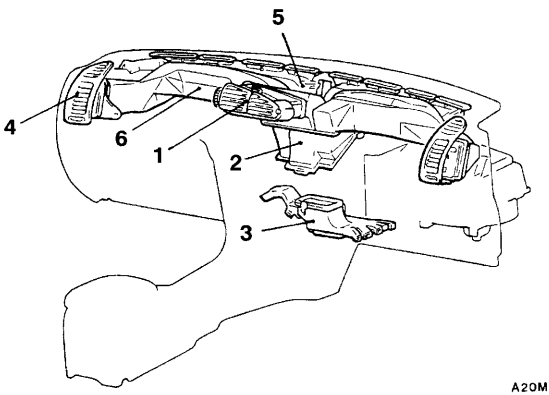
VENTILATORS

55300160188

REMOVAL AND INSTALLATION

Caution: SRS
When removing and installing the floor console assembly from vehicles equipped with SRS, do not let it bump against the SRS-ECU or the components.

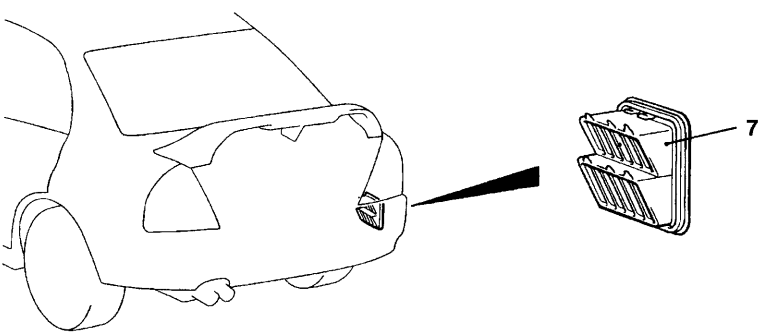
<Instrument panel>



A20M0079

1. Center air outlet assembly (Refer to GROUP 52A - Instrument Panel.)
2. Center ventilation duct (Refer to P.55-19)
3. Foot distribution duct
4. Side air outlet assembly (Refer to GROUP 52A - Instrument Panel.)
5. Defroster nozzle (Refer to GROUP 52A - Instrument Panel.)
6 Distribution duct (Refer to GROUP 52A - Instrument Panel)

<Air outlet>



A20M0039

Rear ventilation duct removal steps

- Rear bumper (Refer to GROUP 51.)
- Trunk side trim (Refer to GROUP 52A.)

7. Rear ventilation duct

COMPONENT LOCATIONS

CONTENTS

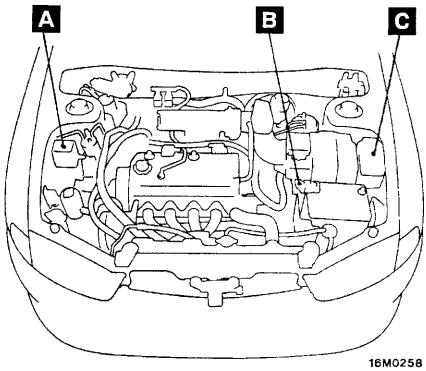
70109000143

Control Unit 12
Diode 16
Fusible Link and Fuse 2
Grounding 4
Grounding Cable 6
Inspection Terminal 3
Other Devices 17
Relay 6
Sensor 9
Solenoid and Solenoid Valve 14

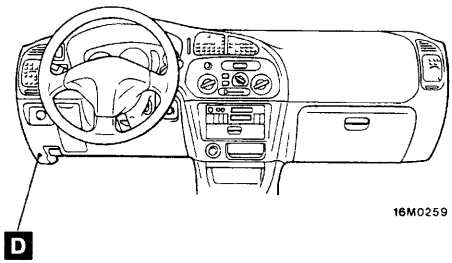
FUSIBLE LINK AND FUSE

70100010138

Name	Symbol	Name	Symbol
Dedicated fuses (No. 1 - 11)	C	Fusible links (No. 1 - 7)	C
Dedicated fuse (No. 12)	A	Fusible link (No. 8)	B
Dedicated fuse (No. 16)	D	Multi-purpose fuses	D

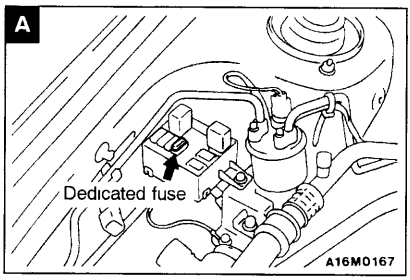


16M0258

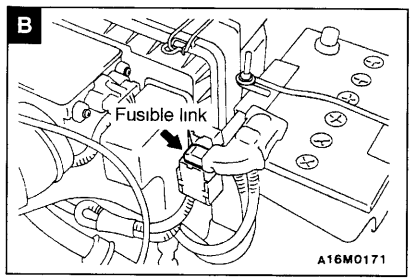


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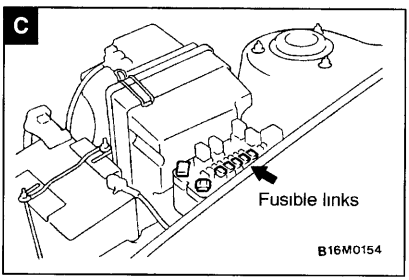
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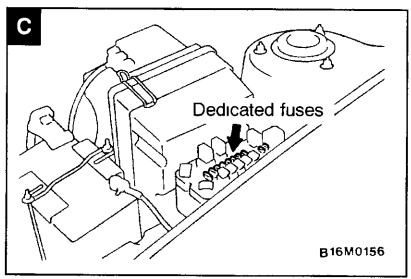
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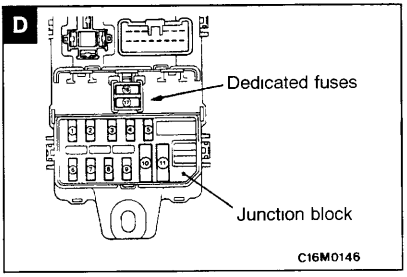
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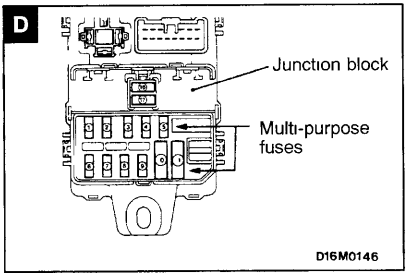


B16M0154



B16M0156

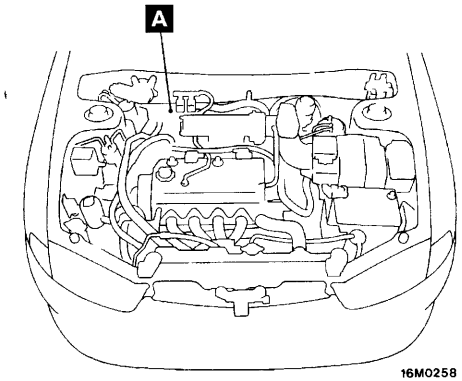


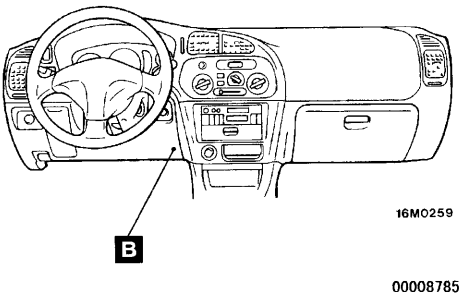


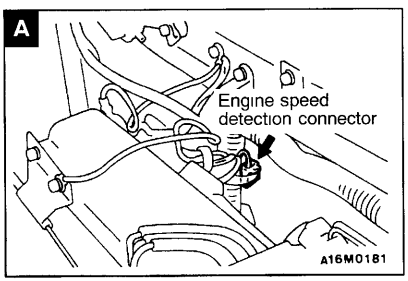
INSPECTION TERMINAL

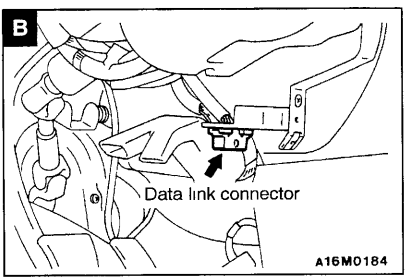
70100020421

Name	Symbol	Name	Symbol
Data link connector	B	Engine speed detection connector	A



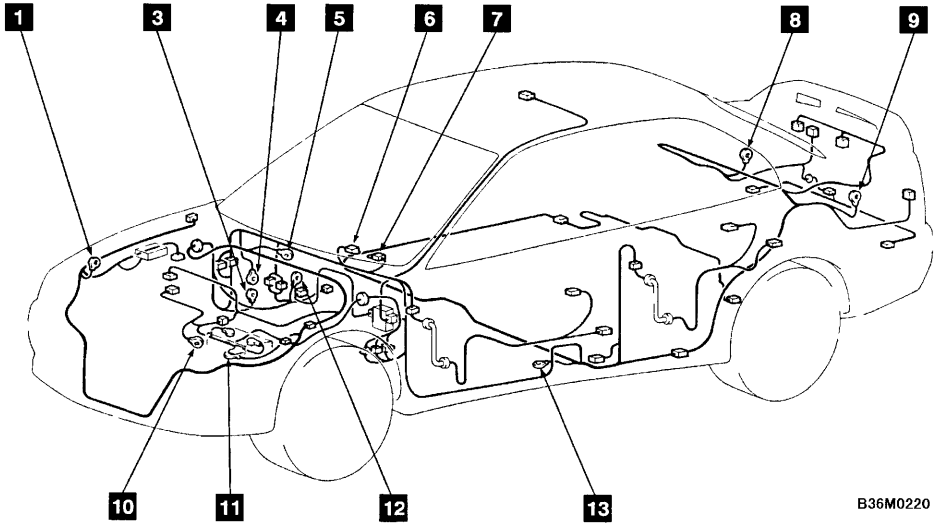




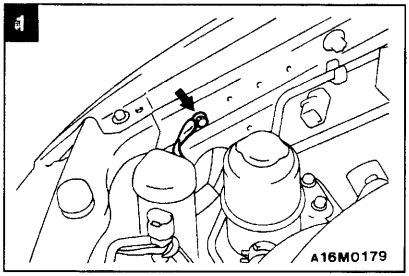


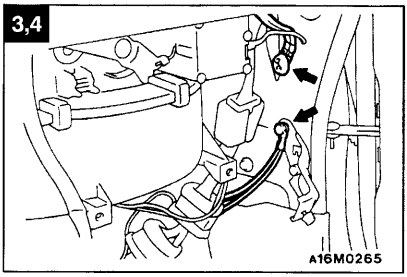
GROUNDING

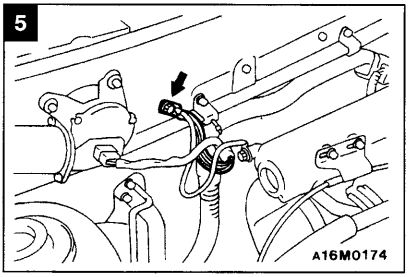
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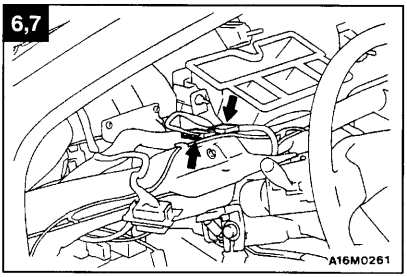


NOTE
1 - 13 numbers correspond to body ground point No. in CIRCUIT DIAGRAMS.

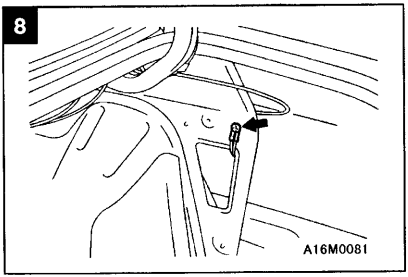




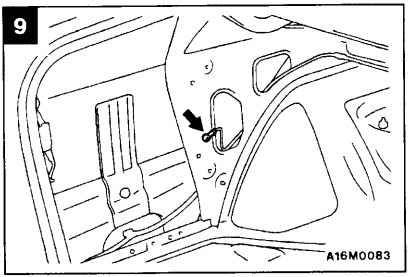




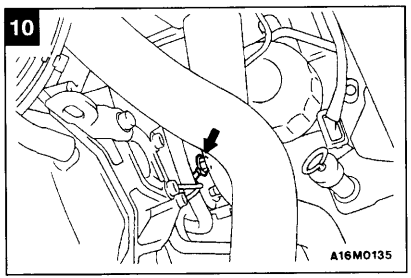
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A16M0081

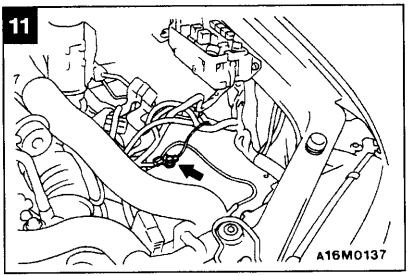
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A16M0083

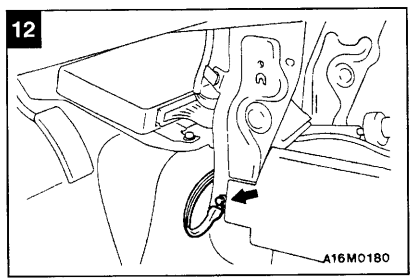
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A16M0135

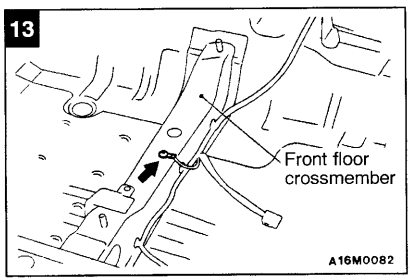
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A16M0137

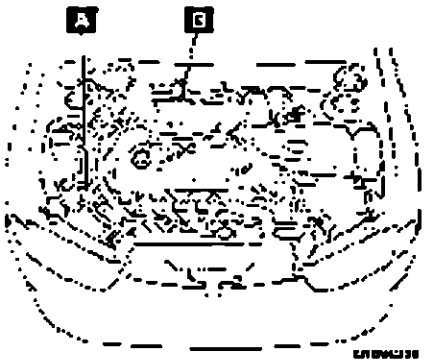
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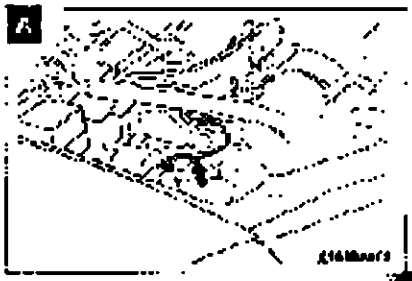

A16M0180

13


Front floor
crossmember
A16M0082

GROUNDING CABLE

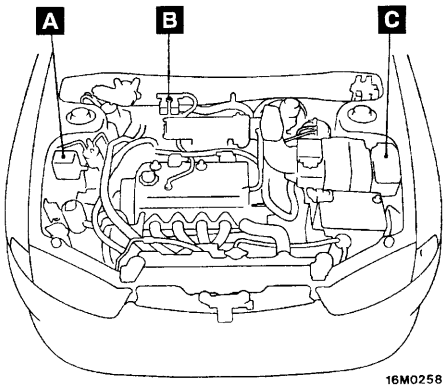


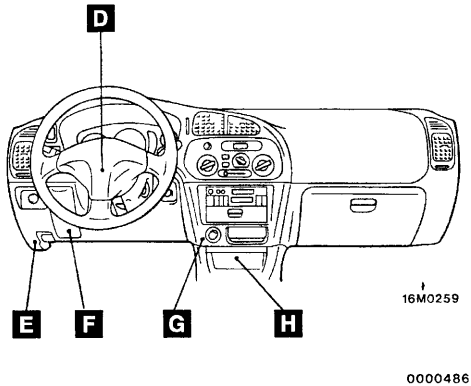


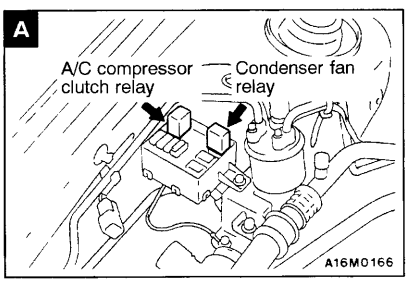


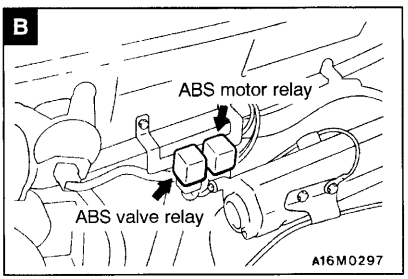
RELAY

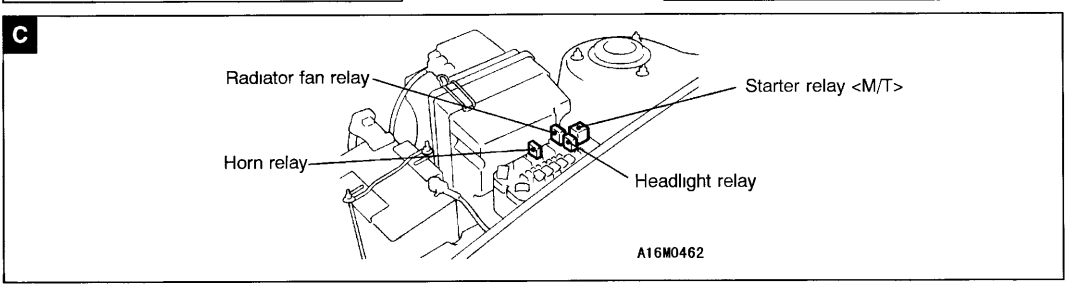
Name	Symbol	Name	Symbol
A/C compressor relay	A	Horn relay	C
ABS motor relay	B	Multipoint fuel injection relay	G
ABS valve relay	B	Power window relay	F
Blower relay	E	Radiator fan relay	D
Condenser fan relay	A	Starter relay <M/T>	C
Defogger relay	E	Transaxle control relay	H
Fog light relay	F	Turn signal and hazard warning flasher unit	E
Fuel pump relay	G	Windshield intermittent wiper relay	D
Headlight relay	C		

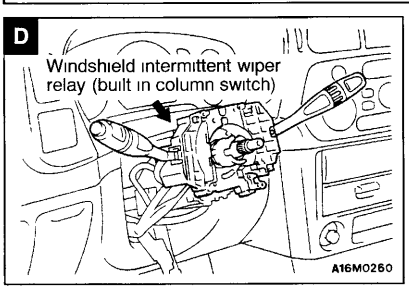

A
B
C
16M0258

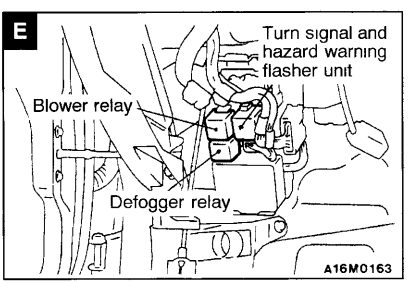

D
E
F
G
H
16M0259
00004861


A
A/C compressor clutch relay
Condenser fan relay
A16M0166

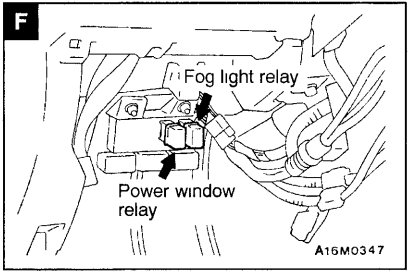

B
ABS motor relay
ABS valve relay
A16M0297


C
Radiator fan relay
Starter relay <M/T>
Horn relay
Headlight relay
A16M0462

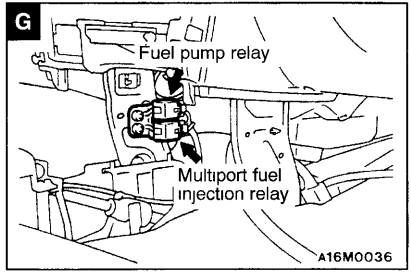

D
Windshield intermittent wiper relay (built in column switch)
A16M0260


E
Turn signal and hazard warning flasher unit
Blower relay
Defogger relay
A16M0163

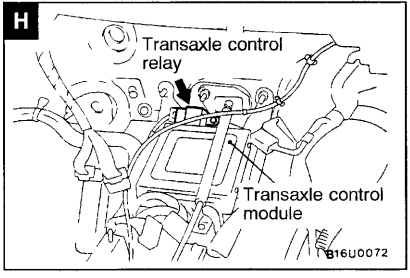
F


Fog light relay
Power window relay
A16M0347

G


Fuel pump relay
Multiport fuel injection relay
A16M0036

H

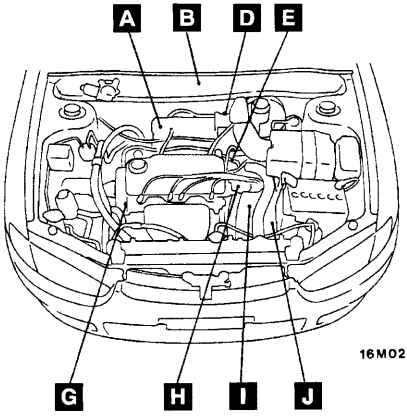

Transaxle control relay
Transaxle control module
B16U0072

SENSOR

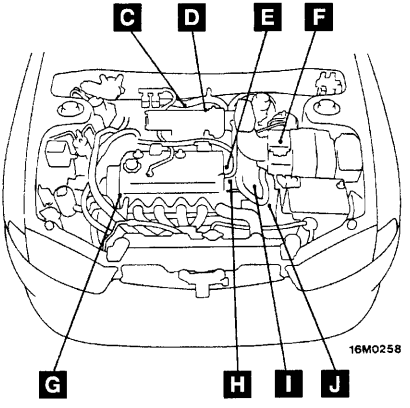
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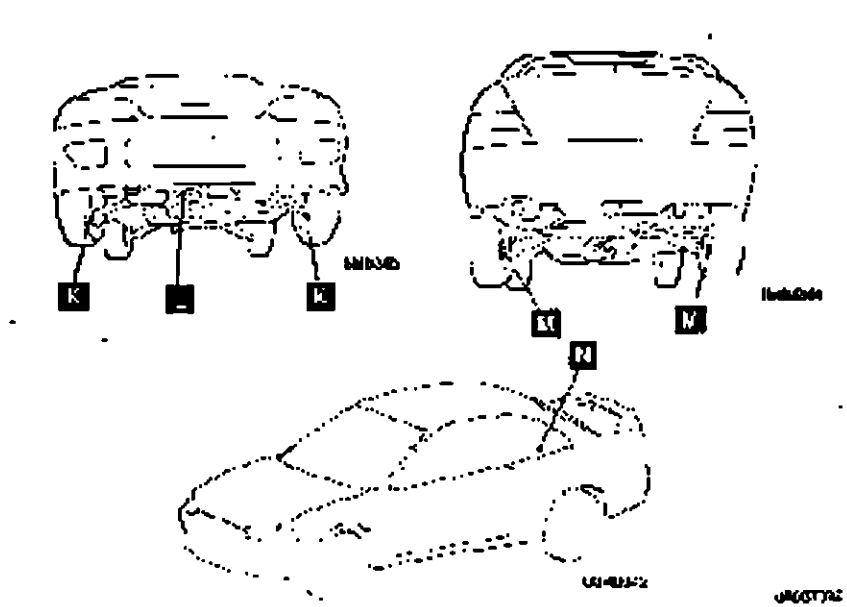
Name		Symbol	Name		Symbol
A/T fluid temperature sensor		J	Heated oxygen sensor <Federal>	Front	L
ABS speed sensor	Front	K		Rear	L
	Rear	M	Ignition failure sensor <1.8L Engine>		H
Camshaft position sensor <1.5L Engine>		H	Input shaft speed sensor <A/T>		I
Camshaft position sensor <1 8L Engine>		H	Intake air temperature sensor <1.5L Engine>		A
Crankshaft position sensor <1 5L Engine>		G	Manifold absolute pressure sensor <1 5L Engine>		B
Crankshaft position sensor <1.8L Engine>		G	Manifold differential pressure sensor <1.8L Engine>		C
Engine coolant temperature sensor <1.5L Engine>		E	Output shaft speed sensor <A/T>		I
Engine coolant temperature sensor <1.8L Engine>		E	Throttle position sensor <1.5L Engine>		D
Fuel tank differential pressure sensor		N	Throttle position sensor <1.8L Engine>		D
Heated oxygen sensor <California>	Front	L	Vehicle speed sensor		I
	Rear	L	Volume air flow sensor <1.8L Engine>		F

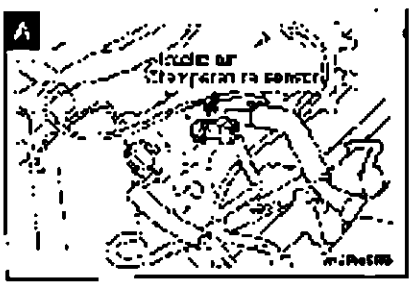
<1.5L Engine>

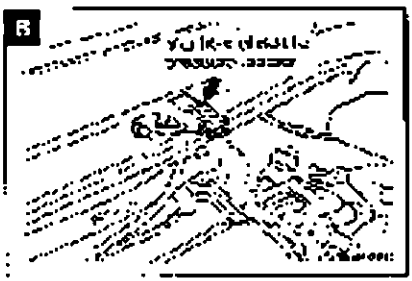


<1.8L Engine>

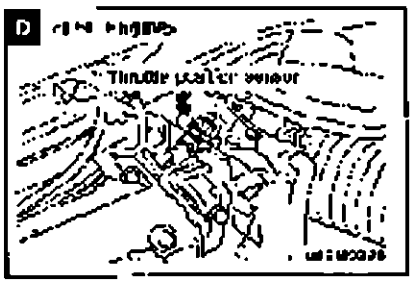



K
K
K
M
N

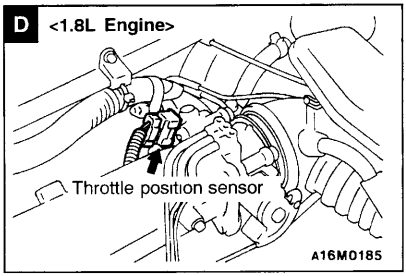

A


B

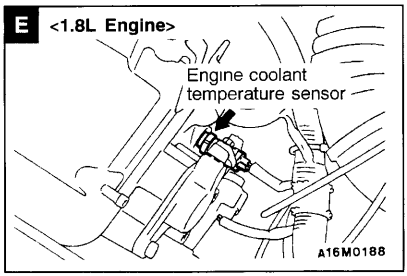

C


D
Throttle position sensor

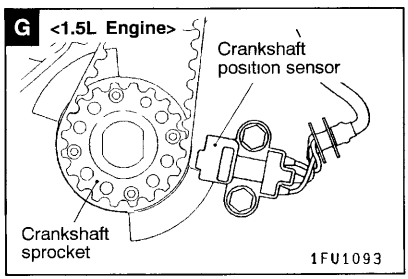
D <1.8L Engine>



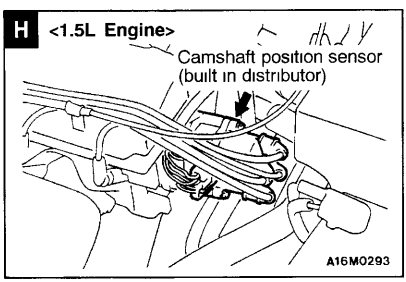
E <1.8L Engine>



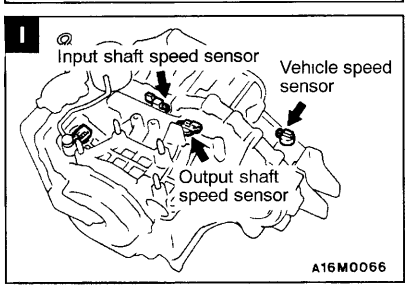
G <1.5L Engine>



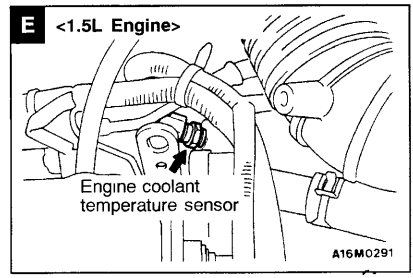
H <1.5L Engine>



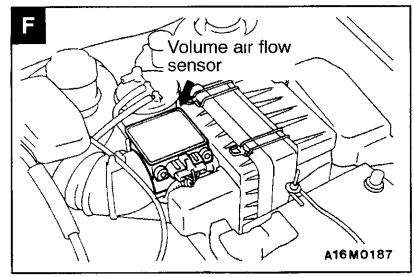
I



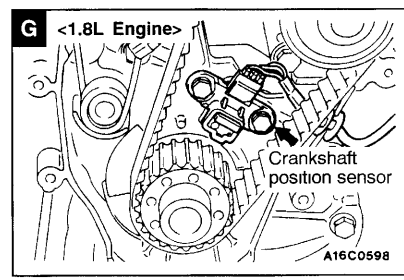
E <1.5L Engine>



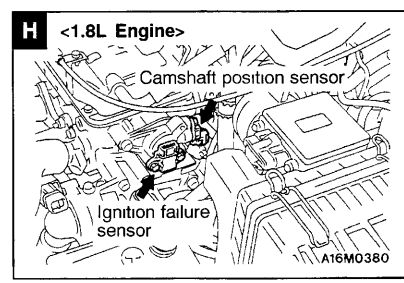
F



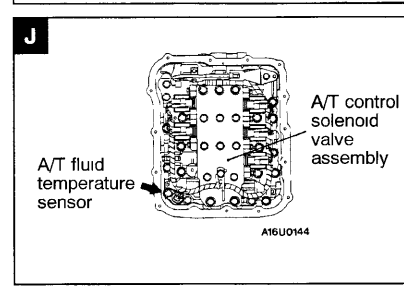
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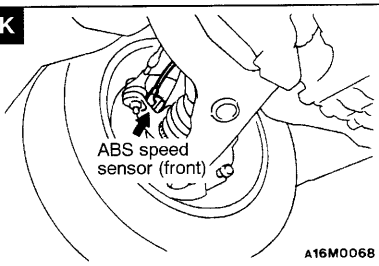
H <1.8L Engine>



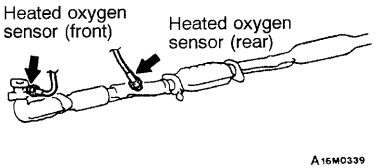
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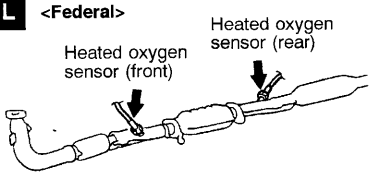
K



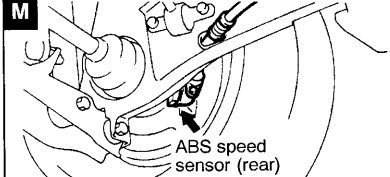
L <California>



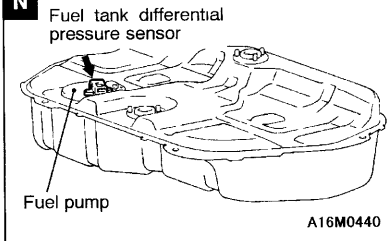
L <Federal>



M



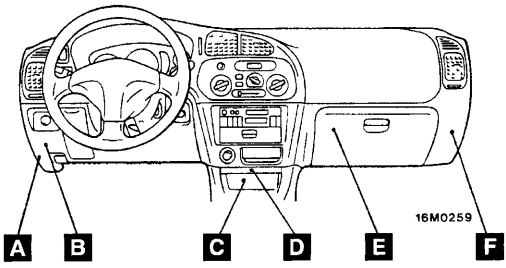
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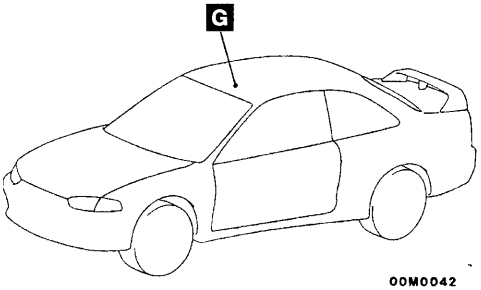


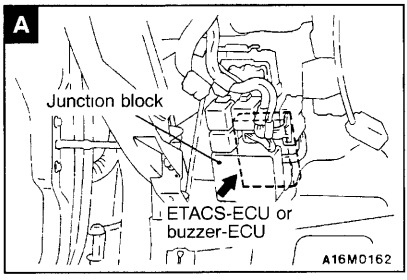
CONTROL UNIT

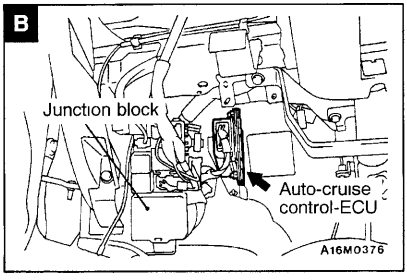
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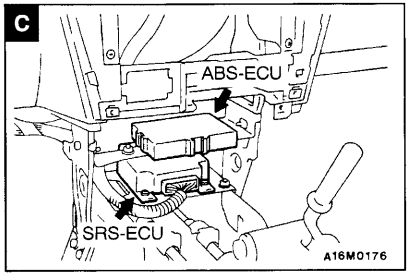
Name	Symbol	Name	Symbol
ABS-ECU	C	ETACS-ECU	A
Auto-cruise control-ECU	B	SRS-ECU	C
Automatic compressor-ECU <A/C>	E	Sunroof-ECU	G
Buzzer-ECU	A	Transaxle control module	D
Engine control module	F		

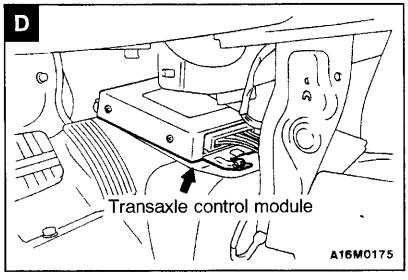

A
B
C
D
E
F
16M0259

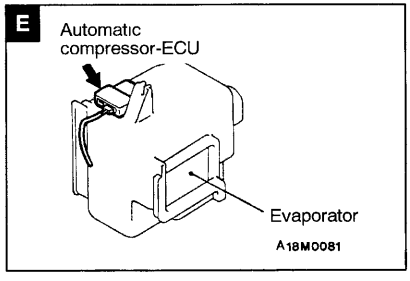

G
00M0042
00004864

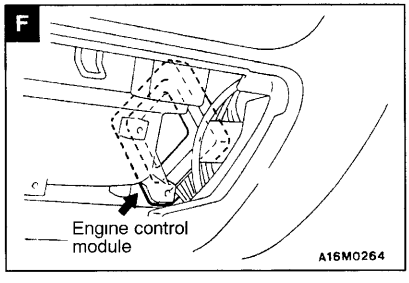

A
Junction block
ETACS-ECU or
buzzer-ECU
A16M0162

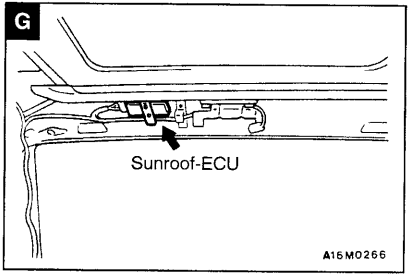

B
Junction block
Auto-cruise
control-ECU
A16M0376


C
ABS-ECU
SRS-ECU
A16M0176


D
Transaxle control module
A16M0175


E
Automatic
compressor-ECU
Evaporator
A18M0081

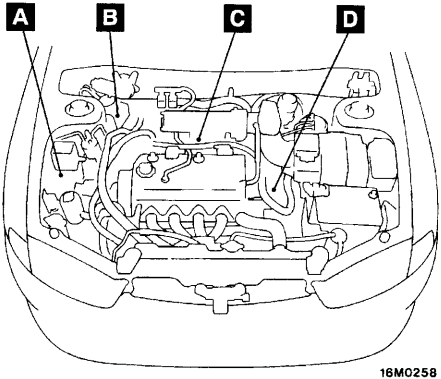

F
Engine control
module
A16M0264

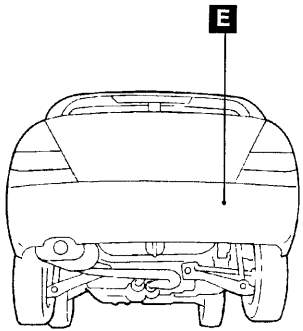


SOLENOID AND SOLENOID VALVE

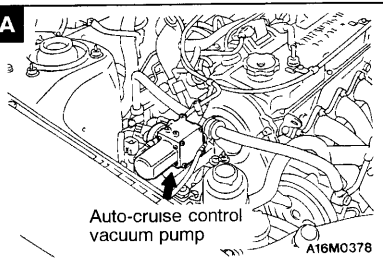
70100080474

Name	Symbol	Name	Symbol
A/T control solenoid valve assembly	D	EGR solenoid <1.8L Engine>	C
ABS solenoid valve	B	Evaporative emission purge solenoid <1.5L Engine>	C
Auto-cruise control vacuum pump	A	Evaporative emission purge solenoid <1.8L Engine>	C
ABS solenoid valve (built in hydraulic unit)	C	Evaporative emission ventilation solenoid	E

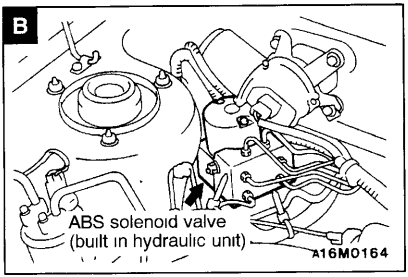




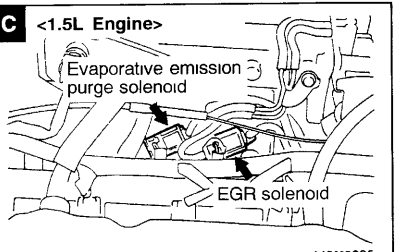
A



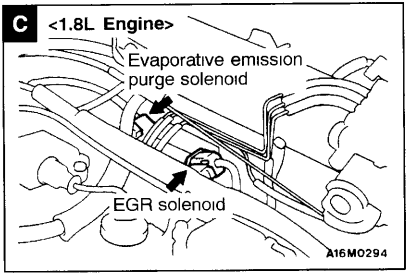
B



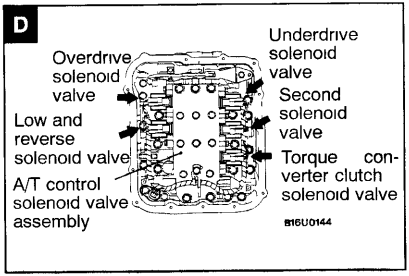
C <1.5L Engine>



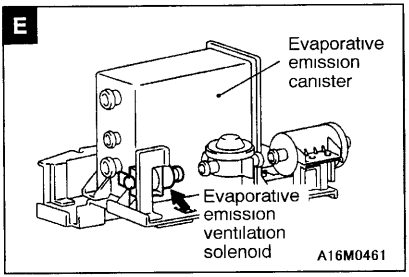
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D



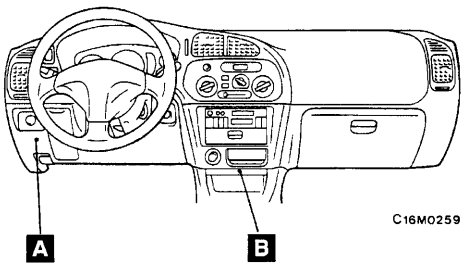
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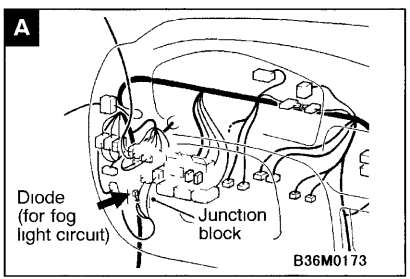


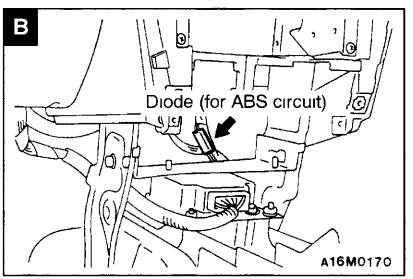
DIODE

70100090316

Name	Symbol	Name	Symbol
Diode (for ABS circuit)	B	Diode (for fog light circuit)	A



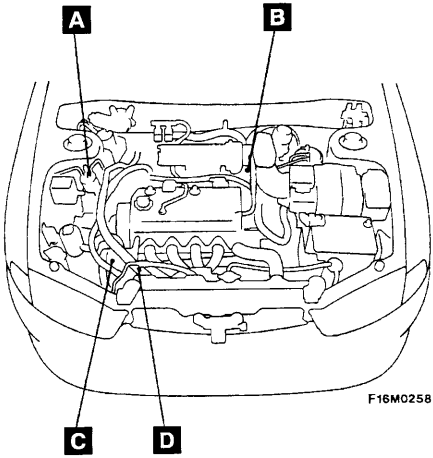


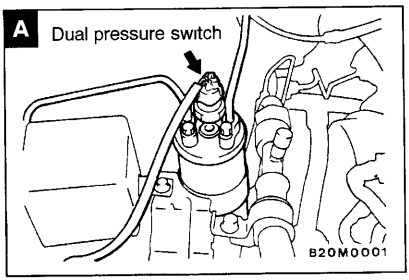


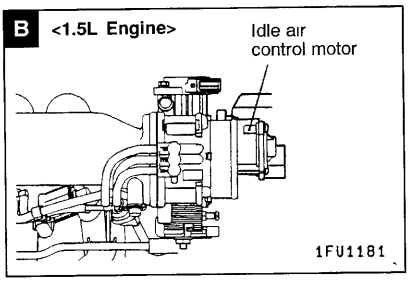
OTHER DEVICES

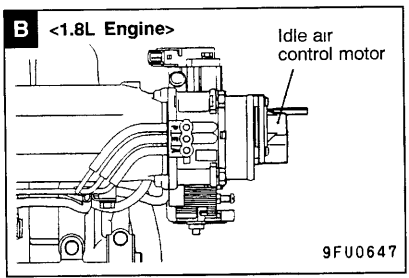
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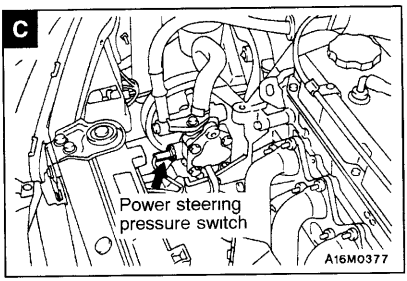
Name	Symbol	Name		Symbol
A/C refrigerant temperature switch	D	Idle air control motor	1 5L Engine	B
			1.8L Engine	B
Dual pressure switch	A	Power steering pressure switch		C



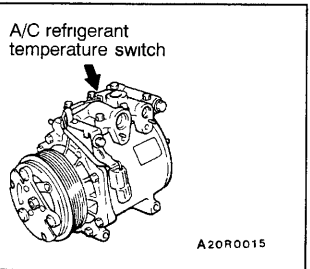








D



CONFIGURATION DIAGRAMS AND SPLICE LOCATIONS

CONTENTS

80109000326

CONFIGURATION DIAGRAMS 80A

SPLICE LOCATIONS 80B

CONFIGURATION DIAGRAMS

CONTENTS

80109000128

Dash Panel 14

Door
- <2-Door Models> 24
- <4-Door Models> 25

Engine Compartment
- <1.5L Engine> 6
- <1.8L Engine> 10

How to Read Configuration Diagrams 4

Instrument Panel 19

Interior
- <2-Door Models> 20
- <4-Door Models> 21

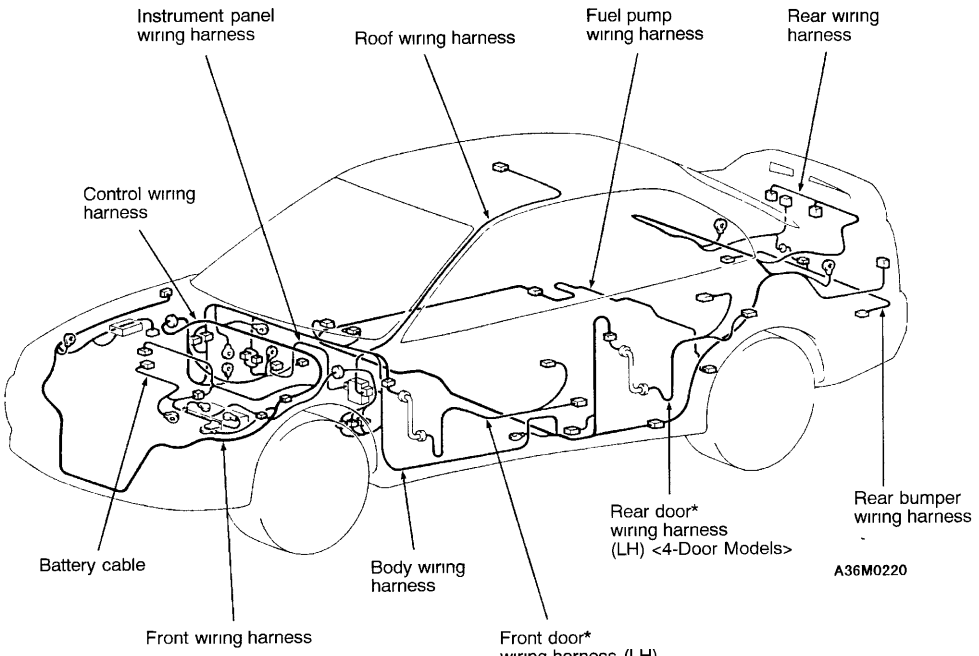
Luggage Compartment
- <2-Door Models> 22
- <4-Door Models> 23

Overall Configuration Diagram 3

Steering Column 18

OVERALL CONFIGURATION DIAGRAM

80100010380



NOTE
(1) This illustration shows only the major wiring harness.
(2) The * symbol indicates also equipped at the right side.

HOW TO READ CONFIGURATION DIAGRAMS

80100020260

The wiring harness diagrams clearly show the connector locations and harness routings at each site on actual vehicles.

Denotes connector No
The same connector No is used throughout the circuit diagrams to facilitate connector location searches
The first alphabetical symbol indicates the location site of the connector and a number that follows is the unique number.
Numbers are assigned to parts in clockwise order on the diagram

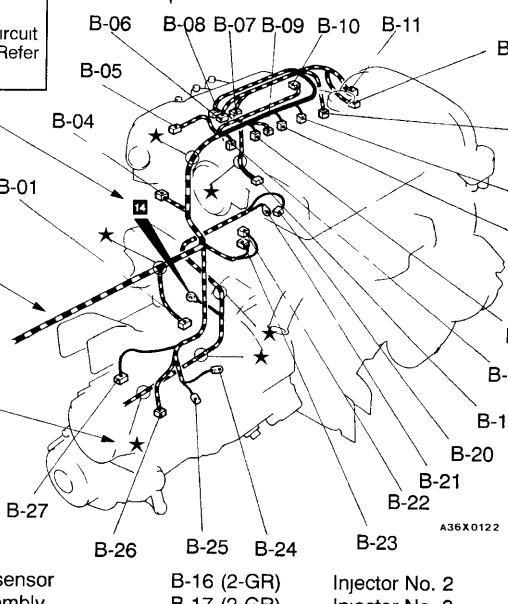
Example. A-12
- Number specific to connector (serial number)
- Connector location site symbol
  - A Engine compartment
  - B Dash panel
  - C Steering column
  - D Instrument panel
  - E Interior
  - F Luggage compartment
  - G Door

Denotes ground point
Same ground number is used throughout circuit diagrams to facilitate search of ground point Refer to GROUNDING LOCATION

Denotes a section covered by a corrugated tube

The mark ★ shows the standard mounting position of wiring harness

Indicates the device to which the connector is connected



B-01 (3-B)	Vehicle speed sensor	B-16 (2-GR)	Injector No. 2
B-02 (6)	Distributor assembly	B-17 (2-GR)	Injector No. 3
B-03 (2)	Distributor assembly	B-18 (2-GR)	Injector No. 4
B-04 (6-B)	Idle air control motor	B-19 (4)	Heated oxygen sensor (front)
B-05 (4-B)	Throttle position sensor	B-20 (1-BR)	Starter motor

*Denotes connector No and connector color (except milk white) to facilitate connector identification

Example (2-B)
- Connector color (milk white if no color is indicated)
- Number of connector pins

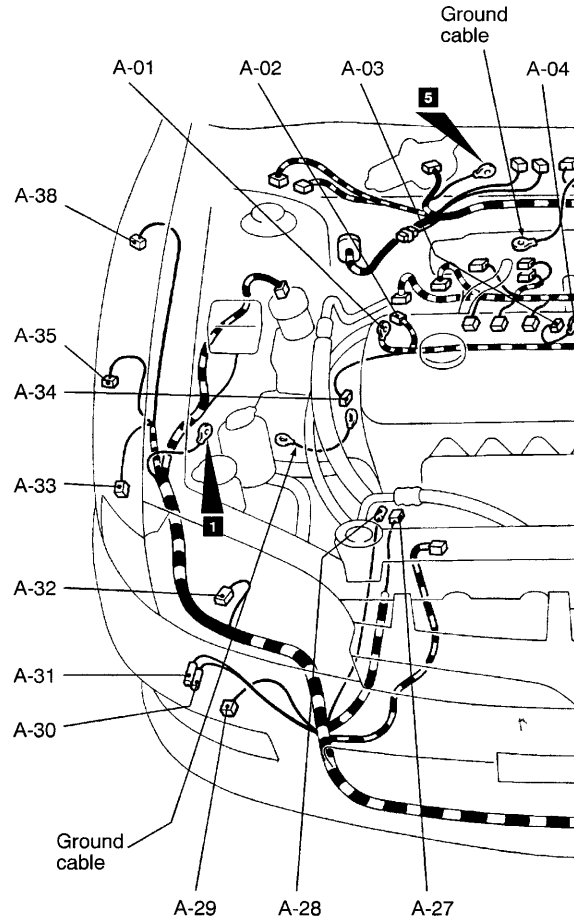
* Typical connector colors
- B Black
- Y Yellow
- L Blue
- G Green
- R Red
- BR Brown
- V Violet
- O Orange
- GR Gray

ENGINE COMPARTMENT <1.5L Engine>

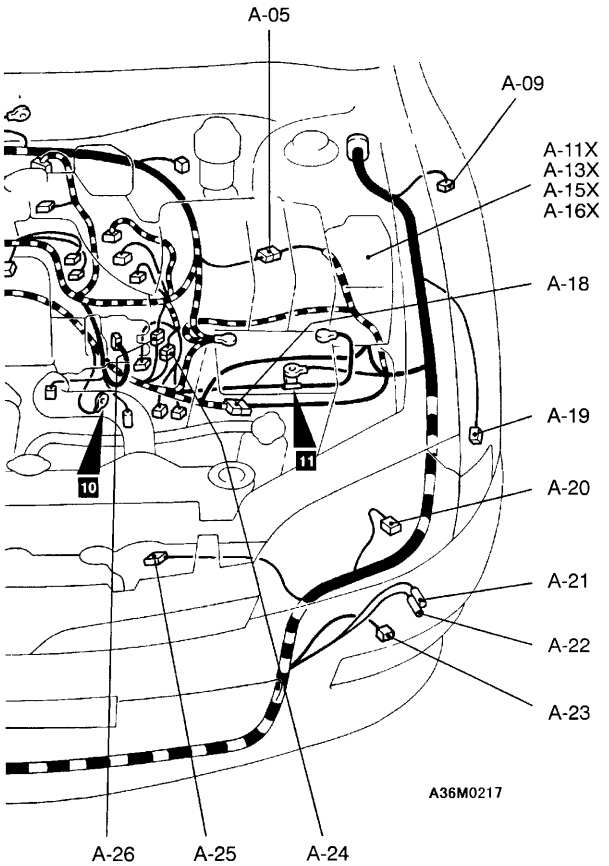
80100031332

Connector symbol

A -01 to -38



A-01 (1)	Generator	A-15X (5)	Headlight relay
A-02 (4-GR)	Generator	A-16X (5)	Starter relay <M/T>
A-03 (1-B)	Starter	A-18 (2-B)	Front wiring harness and battery cable assembly combination
A-04 (1)	Starter		
A-05 (8-B)	Front wiring harness and control wiring harness combination	A-19 (3-GR)	Front turn signal light (LH)
		A-20 (3-B)	Headlight (LH)
A-09 (2-B)	ABS speed sensor (Front: LH)	A-21 (1)	Horn (LH)
A-11X (5)	Horn relay	A-22 (1)	Horn (LH)
A-13X (5)	Radiator fan relay	A-23 (2-B)	No connection

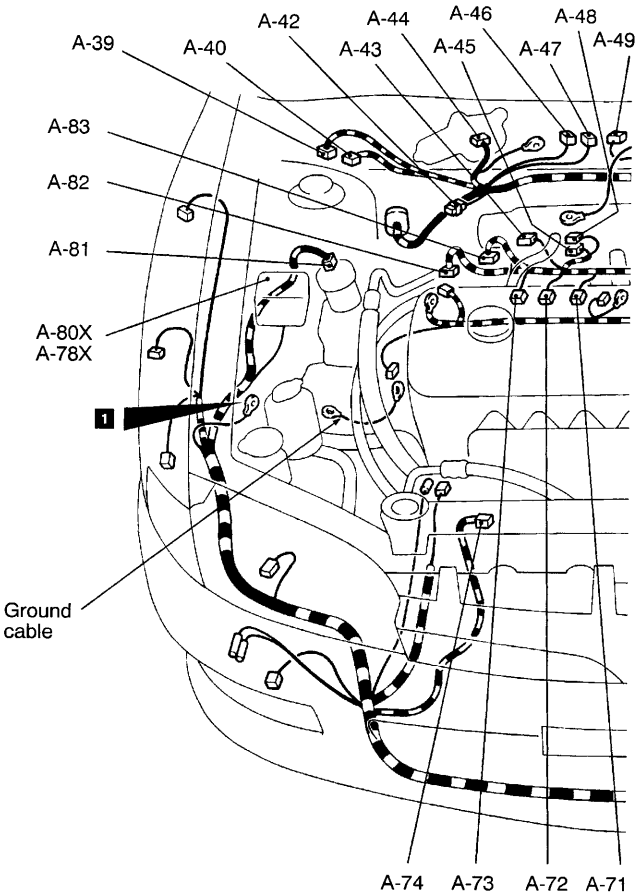


Connector color code
B : Black
Y . Yellow
L : Blue
G : Green
R : Red
BR : Brown
V : Violet
O . Orange
GR : Gray

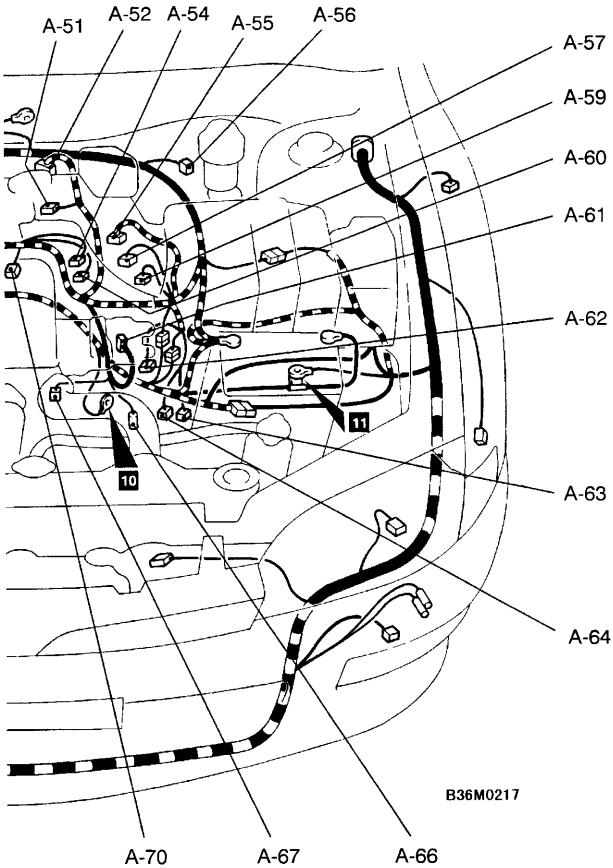
A-24 (4-GR)	Control wiring harness and battery cable assembly combination <A/T>	A-29 (2-B)	No connection
A-25 (2-B)	Radiator fan motor	A-30 (1)	Horn (RH)
A-26 (4-GR)	Control wiring harness and battery cable assembly combination <M/T>	A-31 (1)	Horn (RH)
		A-32 (3-B)	Headlight (RH)
A-27 (1-B)	Magnetic clutch and refrigerant temperature switch <A/C>	A-33 (3-GR)	Front turn signal light (RH)
		A-34 (1-B)	Oil pressure switch
A-28 (1)	Power steering pressure switch	A-35 (2-B)	Windshield washer motor
		A-38 (2-B)	ABS speed sensor (Front RH)

Connector symbol

A -39 to -83



A-39 (2-B)	ABS hydraulic unit
A-40 (8-B)	ABS hydraulic unit
A-42 (1-L)	Engine speed detection connector
A-43 (2-B)	Intake air temperature sensor
A-44 (4-B)	Windshield wiper motor
A-45 (2-B)	Evaporative emission purge solenoid
A-46 (5-B)	ABS valve relay
A-47 (5-B)	ABS motor relay
A-48 (2-BR)	EGR solenoid
A-49 (3-B)	Manifold absolute pressure sensor
A-51 (6-B)	Idle air control motor
A-52 (4-B)	Throttle position sensor
A-54 (1-B)	Engine coolant temperature gauge unit
A-55 (3-B)	Vehicle speed sensor
A-56 (2-B)	Brake fluid level switch
A-57 (3-GR)	Output shaft speed sensor <A/T>
A-59 (2-B)	Back-up light switch <M/T>
A-60 (2-B)	Engine coolant temperature sensor
A-61 (7-B)	Distributor assembly



Connector color code
B : Black
Y : Yellow
L : Blue
G : Green
R : Red
BR : Brown
V : Violet
O : Orange
GR : Gray

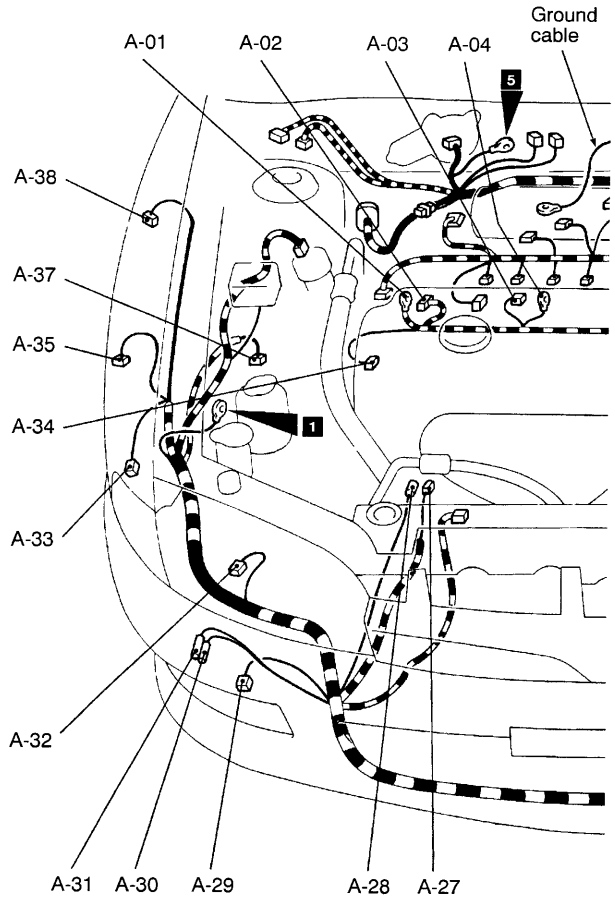
A-62 (3-B)	Input shaft speed sensor <A/T>
A-63 (10-B)	Park/neutral position switch <A/T>
A-64 (10-GR)	A/T control solenoid valve assembly
A-66 (1-B)	Capacitor
A-67 (4-B)	Heated oxygen sensor (Front) <California>
A-70 (2-GR)	Injector No. 4
A-71 (2-GR)	Injector No. 3
A-72 (2-GR)	Injector No. 2
A-73 (2-GR)	Injector No. 1
A-74 (2-B)	Condenser fan motor
A-78X (4)	Condenser fan relay
A-80X (4)	A/C compressor relay
A-81 (2)	Dual pressure switch
A-82 (3-B)	Crankshaft position sensor
A-83 (4-B)	Heated oxygen sensor (Front) <Federal> or Heated oxygen sensor (Rear) <California>

ENGINE COMPARTMENT <1.8L Engine>

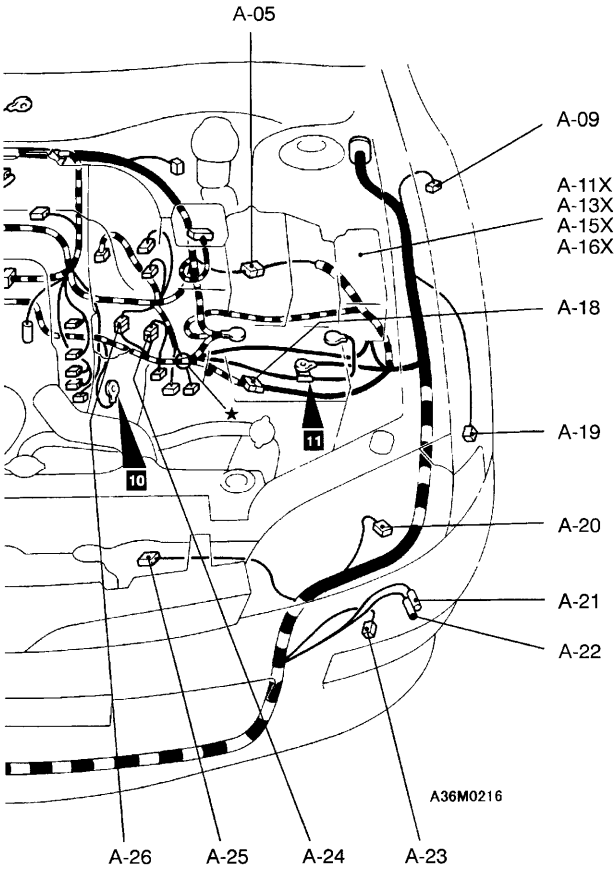
80100031349

Connector symbol

A -01 to -38



A-01 (1)	Generator
A-02 (4-GR)	Generator
A-03 (1-B)	Starter
A-04 (1)	Starter
A-05 (8-B)	Front wiring harness and control wiring harness combination
A-09 (2-B)	ABS speed sensor (Front: LH)
A-11X (5)	Horn relay
A-13X (5)	Radiator fan relay
A-15X (5)	Headlight relay
A-16X (5)	Starter relay <M/T>
A-18 (2-B)	Front wiring harness and battery cable assembly combination
A-19 (3-GR)	Front turn signal light (LH)
A-20 (3-B)	Headlight (LH)
A-21 (1)	Horn (LH)
A-22 (1)	Horn (LH)
A-23 (2-B)	Fog light (LH)

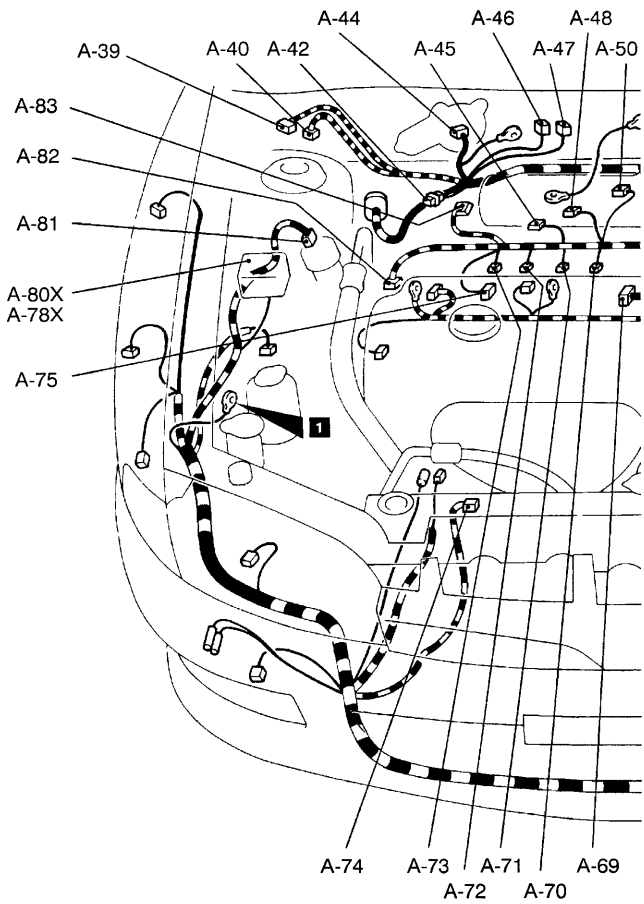


Connector color code
B : Black
Y : Yellow
L : Blue
G : Green
R : Red
BR : Brown
V : Violet
O : Orange
GR : Gray

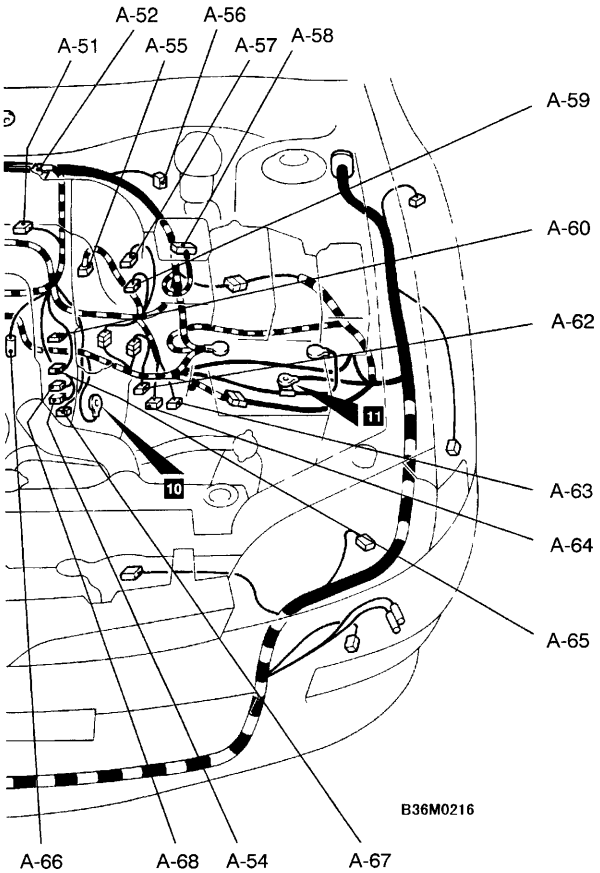
A-24 (4-GR)	Control wiring harness and battery cable assembly combination <A/T>	A-30 (1)	Horn (RH)
A-25 (2-B)	Radiator fan motor	A-31 (1)	Horn (RH)
A-26 (4-GR)	Control wiring harness and battery cable assembly combination <M/T>	A-32 (3-B)	Headlight (RH)
A-27 (1-B)	Magnetic clutch and refrigerant temperature switch <A/C>	A-33 (3-GR)	Front turn signal light (RH)
A-28 (1)	Power steering pressure switch	A-34 (1-B)	Oil pressure switch
A-29 (2-B)	Fog light (RH)	A-35 (2-B)	Windshield washer motor
		A-37 (4-B)	Auto-cruise control vacuum pump
		A-38 (2-B)	ABS speed sensor (Front: RH)

Connector symbol

A -39 to -83



A-39 (2-B)	ABS hydraulic unit	A-52 (4-B)	Throttle position sensor
A-40 (8-B)	ABS hydraulic unit	A-54 (1-B)	Engine coolant temperature gauge unit
A-42 (1-L)	Engine speed detection connector	A-55 (3-B)	Vehicle speed sensor
A-44 (4-B)	Windshield wiper motor	A-56 (2-B)	Brake fluid level switch
A-45 (2-B)	Evaporative emission purge solenoid	A-57 (3-GR)	Output shaft speed sensor <A/T>
A-46 (5-B)	ABS valve relay	A-58 (7-B)	Volume air flow sensor
A-47 (5-B)	ABS motor relay	A-59 (2-B)	Back-up light switch <M/T>
A-48 (2-BR)	EGR solenoid	A-60 (2-B)	Engine coolant temperature sensor
A-50 (3-B)	Manifold differential pressure sensor	A-62 (3-B)	Input shaft speed sensor <A/T>
A-51 (6-B)	Idle air control motor	A-63 (10-B)	Park/neutral position switch <A/T>



Connector color code
B : Black
Y : Yellow
L : Blue
G : Green
R : Red
BR : Brown
V : Violet
O : Orange
GR : Gray

A-64 (10-GR)	A/T control solenoid valve assembly	A-73 (2-GR)	Injector No. 1
A-65 (3-B)	Camshaft position sensor	A-74 (2-B)	Condenser fan motor
A-66 (1-B)	Capacitor	A-75 (3-GR)	Ignition coil 2
A-67 (4-B)	Heated oxygen sensor (Front) <California>	A-78X (4)	Condenser fan relay
		A-80X (4)	A/C compressor relay
A-68 (4-B)	Ignition failure sensor	A-81 (2)	Dual pressure switch
A-69 (3-GR)	Ignition coil 1	A-82 (3-B)	Crankshaft position sensor
A-70 (2-GR)	Injector No. 4	A-83 (4-B)	Heated oxygen sensor (Front) <Federal> or Heated oxygen sensor (Rear) <California>
A-71 (2-GR)	Injector No. 3		
A-72 (2-GR)	Injector No. 2		

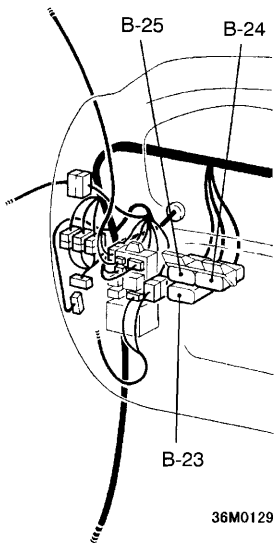
DASH PANEL

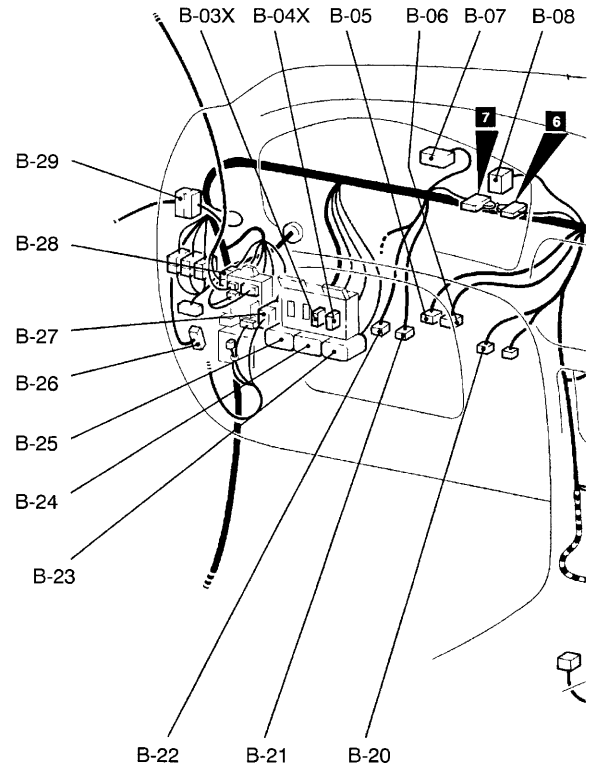
80100060736

Connector symbol

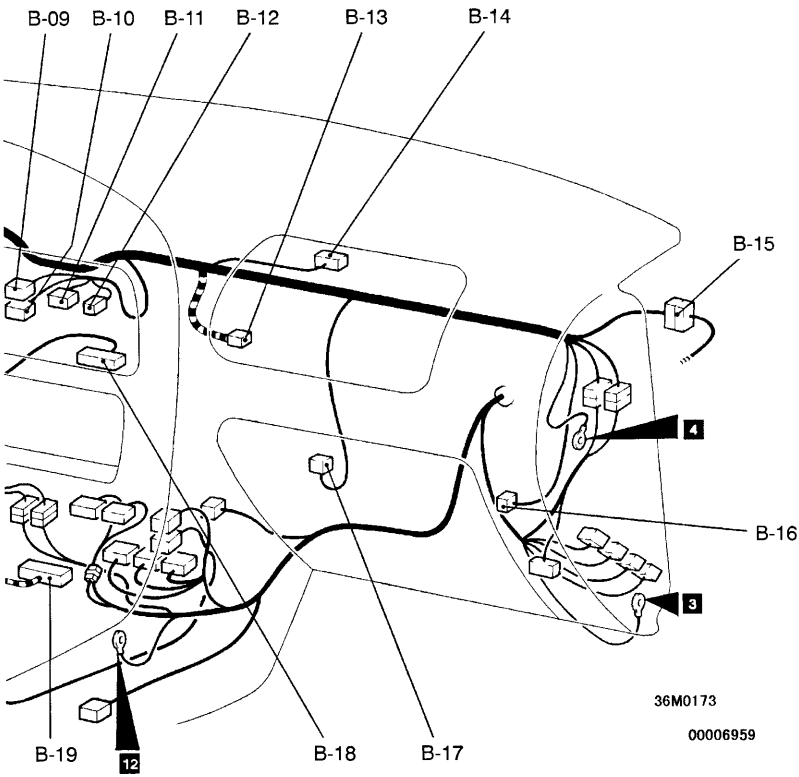
B -01X to -29

<Vehicles without relay box in passenger compartment>





B-03X (5)	Power window relay	B-12 (4)	Heater control panel illumination light and micro switch
B-04X (5)	Fog light relay		
B-05 (2)	Stop light switch <Without auto-cruise>	B-13 (2-R)	Air bag module (squib) (Passenger's side)
B-06 (4)	Stop light switch <With auto-cruise>		
B-07 (25)	Combination meter	B-14 (3)	Automatic compressor-ECU
B-08 (25)	Combination meter	B-15 (22)	Body wiring harness and front door wiring harness (RH) combination
B-09 (6-B)	Defogger switch		
B-10 (8)	A/C switch	B-16 (2)	Blower motor
B-11 (8)	Blower switch	B-17 (4)	Resistor

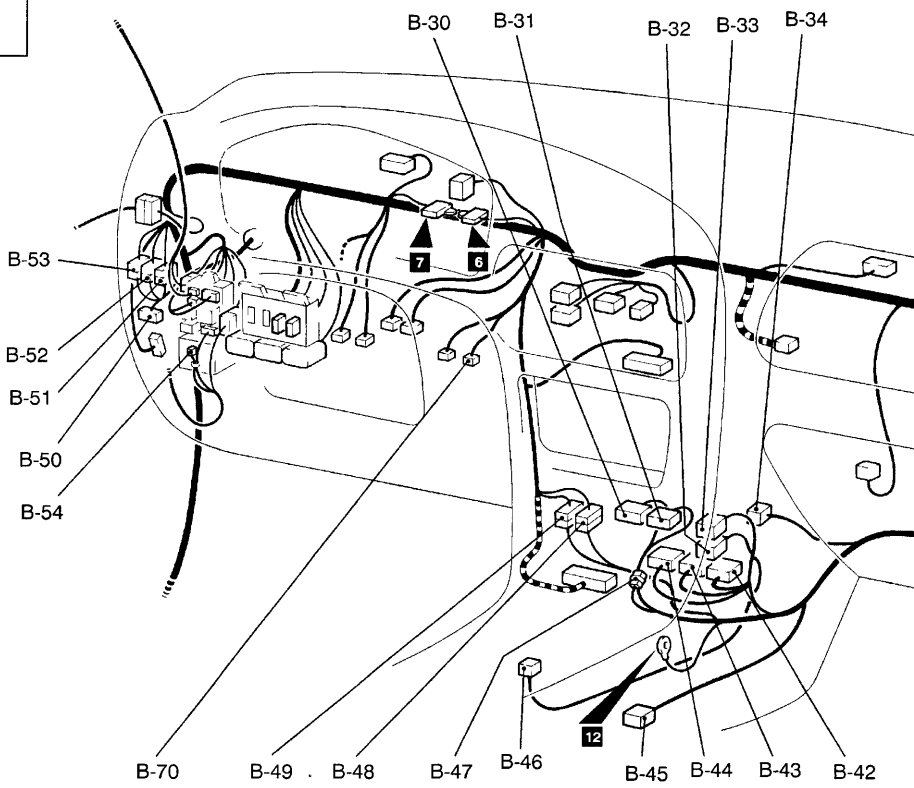


Connector color code
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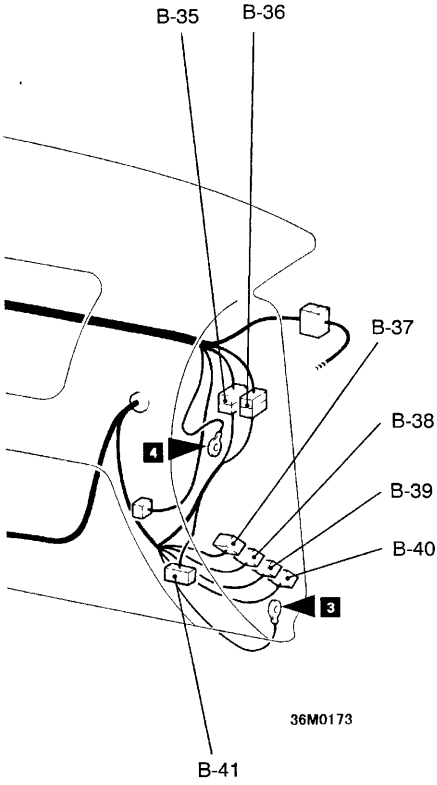
B-18 (14)	Radio and tape player
B-19 (21-Y)	SRS-ECU
B-20 (16-B)	Data link connector
B-21 (2)	Clutch pedal position switch <M/T>
B-22 (2)	Clutch pedal position switch <With auto-cruise>
B-23 (14-L)	Joint connector (4)
B-24 (14)	Joint connector (3)
B-25 (14)	Joint connector (2)
B-26 (16-B)	Auto-cruise control-ECU
B-27 (18)	Body wiring harness and instrument panel wiring harness combination
B-28 (6)	Body wiring harness and roof wiring harness combination
B-29 (22)	Body wiring harness and front door wiring harness (LH) combination

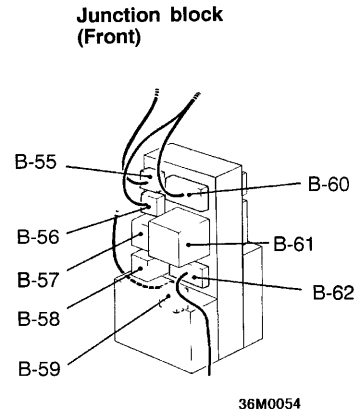
Connector symbol

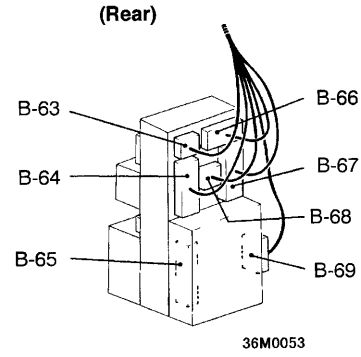
B -30 to -70



B-30 (16) ABS-ECU
B-31 (26-Y) ABS-ECU
B-32 (4) Multiport fuel injection relay
B-33 (4) Fuel pump relay
B-34 (4-B) Transaxle control relay
B-35 (13) Body wiring harness and control wiring harness combination
B-36 (16-B) Body wiring harness and control wiring harness combination
B-37 (22-Y) Engine control module
B-38 (12-Y) Engine control module
B-39 (16-Y) Engine control module
B-40 (26-Y) Engine control module
B-41 (19-B) Joint connector (5)
B-42 (22-L) Transaxle control module
B-43 (16-L) Transaxle control module
B-44 (26-L) Transaxle control module
B-45 (4) Heated oxygen sensor (Rear) <Federal>
B-46 (2) A/T selector lever position illumination light
B-47 (2-B) Diode (for ABS circuit)
B-48 (16-B) Body wiring harness and control wiring harness combination
B-49 (14) Body wiring harness and control wiring harness combination <A/T>
B-50 (19-B) Joint connector (1)
B-51 (20) Body wiring harness and front wiring harness combination
B-52 (6) Body wiring harness and front wiring harness combination







00006960

Connector color code
B : Black
Y : Yellow
L : Blue
G : Green
R : Red
BR : Brown
V : Violet
O : Orange
GR : Gray

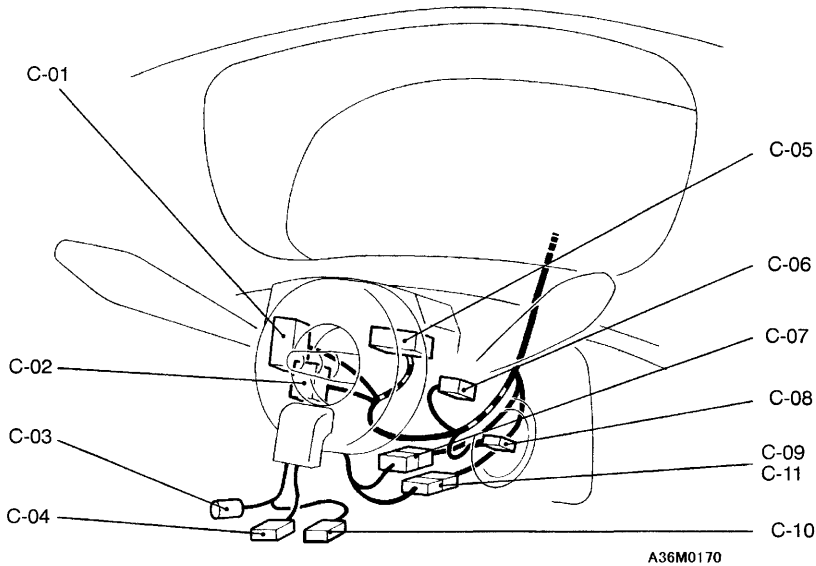
B-53 (14)	Body wiring harness and front wiring harness combination
B-54 (2-B)	Diode (for fog light circuit)
B-55 (2)	Roof wiring harness and junction block combination
B-56 (1)	Front wiring harness and junction block combination
B-57 (5)	Blower relay
B-58 (5)	Defogger relay
B-59 (4)	Dedicated fuse
B-60 (11)	Front wiring harness and junction block combination
B-61 (3)	Turn signal and hazard flasher unit
B-62 (14)	Instrument panel wiring harness and junction block combination
B-63 (10)	Body wiring harness and junction block combination
B-64 (13)	Body wiring harness and junction block combination
B-65 (12)	Junction block and ETACS-ECU or junction block and Buzzer-ECU
B-66 (16)	Body wiring harness and junction block combination
B-67 (8)	Body wiring harness and junction block combination
B-68 (4)	Body wiring harness and junction block combination
B-69 (8)	ETACS-ECU
B-70 (12)	Data link connector

STEERING COLUMN

80100210032

Connector symbol

C



Connector color code
B : Black
Y : Yellow
L : Blue
G : Green
R : Red
BR : Brown
V : Violet
O : Orange
GR : Gray

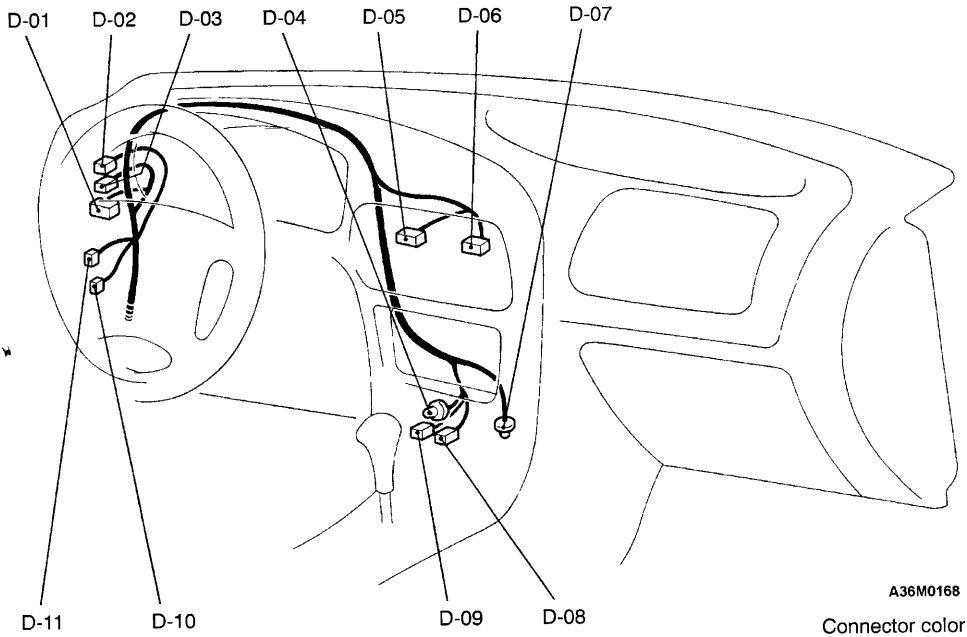
C-01 (6)	Column switch
C-02 (10)	Column switch
C-03 (1)	Horn switch
C-04 (2)	Air bag module (squib) (Driver's side)
C-05 (12)	Column switch
C-06 (6)	Ignition switch
C-07 (2)	Clock spring
C-08 (5)	Steering lock switch
C-09 (3)	Clock spring (without auto-cruise)
C-10 (2)	Auto-cruise control switch
C-11 (4)	Clock spring (with auto-cruise)

INSTRUMENT PANEL

80100070289

Connector symbol

D



A36M0168

Connector color code
B : Black
Y : Yellow
L : Blue
G : Green
R : Red
BR : Brown
V : Violet
O : Orange
GR : Gray

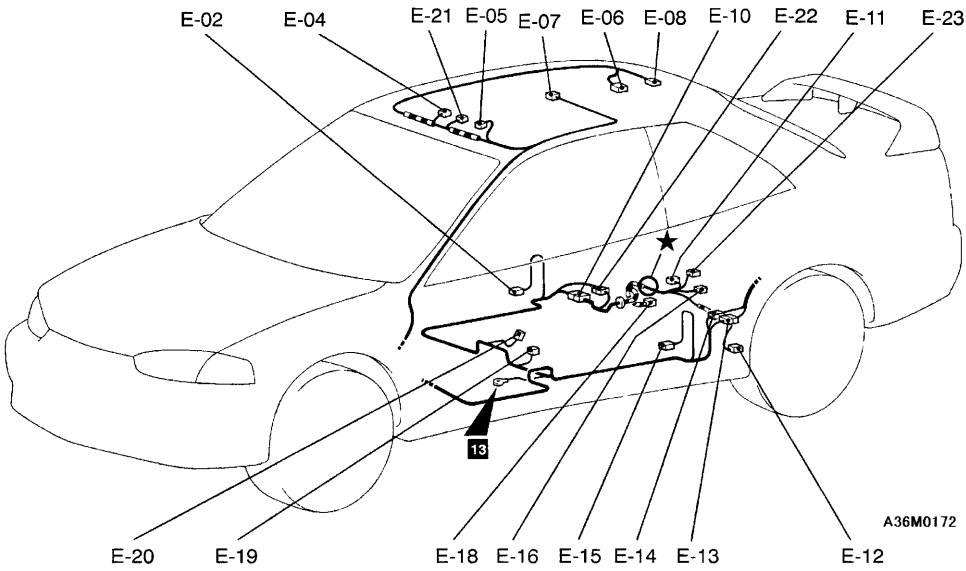
D-01 (9)	Remote controlled mirror switch
D-02 (8)	No connection
D-03 (6)	Fog light switch
D-04 (2)	Cigarette lighter illumination light
D-05 (10)	Hazard warning light switch
D-06 (4)	Clock
D-07 (2)	Ashtray illumination light
D-08 (1)	Cigarette lighter
D-09 (1-B)	Cigarette lighter
D-10 (2)	Rheostat <Without auto-cruise>
D-11 (3)	Rheostat <With auto-cruise>

INTERIOR <2-Door Models>

80100200145

Connector symbol

E



Connector color code
B : Black
Y : Yellow
L : Blue
G : Green
R : Red
BR : Brown
V : Violet
O : Orange
GR : Gray

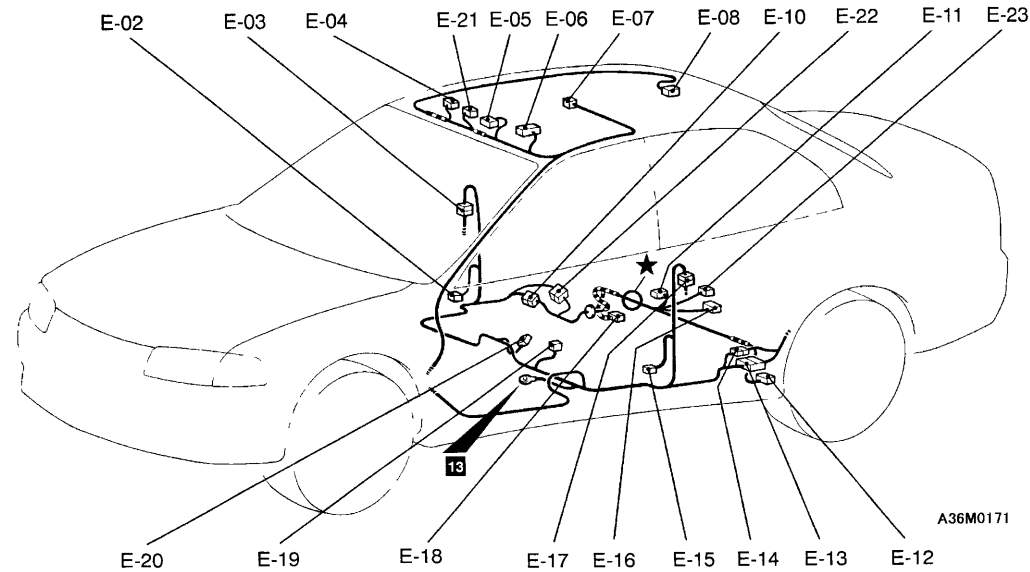
E-02 (2)	Front door switch (RH)
E-04 (2)	Dome light <With sunroof>
E-05 (6)	Sunroof switch
E-06 (18)	Sunroof-ECU
E-07 (2)	Dome light <Without sunroof>
E-08 (8)	Sunroof motor
E-10 (10)	Body wiring harness and fuel pump wiring harness combination
E-11 (2)	Fuel pump
E-12 (2-B)	ABS speed sensor (Rear: LH)
E-13 (18)	Body wiring harness and rear wiring harness combination
E-14 (2)	Body wiring harness and rear wiring harness combination
E-15 (2)	Front door switch (LH)
E-16 (3-B)	Fuel gauge unit
E-18 (2-B)	ABS speed sensor (Rear: RH)
E-19 (2)	Seat belt buckle switch
E-20 (1-B)	Parking brake switch
E-21 (1)	Map light <Without sunroof>
E-22 (3)	Body wiring harness and fuel pump wiring harness combination
E-23 (3-B)	Fuel tank differential pressure sensor

INTERIOR <4-Door Models>

80100200152

Connector symbol

E



Connector color code

B	Black
Y	: Yellow
L	: Blue
G	: Green
R	: Red
BR	: Brown
V	: Violet
O	: Orange
GR	: Gray

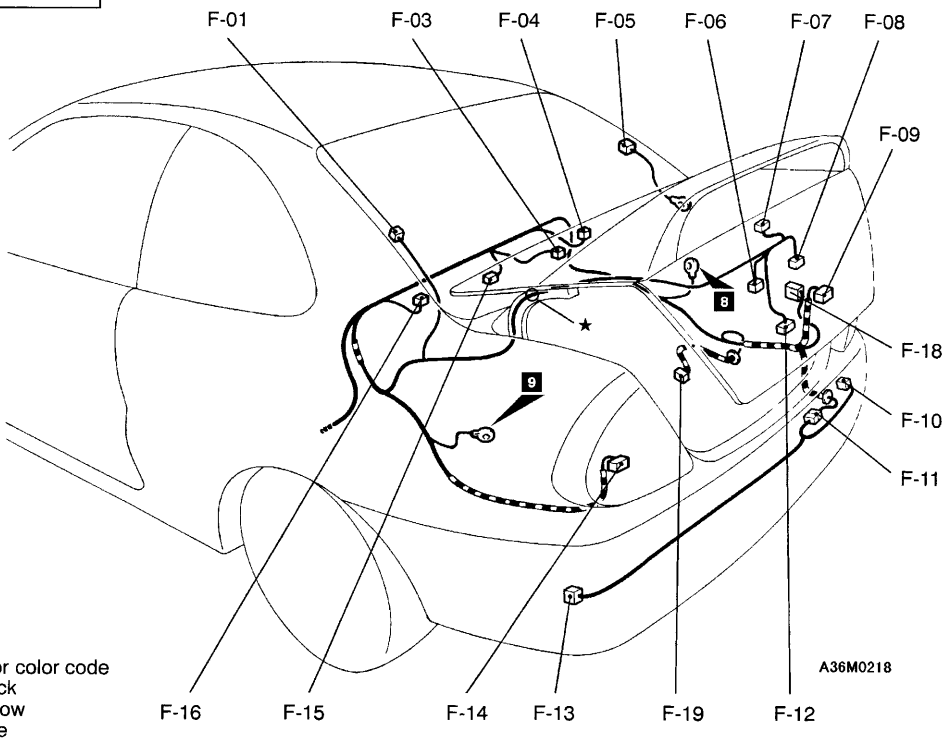
E-02 (2)	Front door switch (RH)
E-03 (6)	Body wiring harness and rear door wiring harness (RH) combination
E-04 (2)	Dome light <With sunroof>
E-05 (6)	Sunroof switch
E-06 (18)	Sunroof-ECU
E-07 (2)	Dome light <Without sunroof>
E-08 (8)	Sunroof motor
E-10 (10)	Body wiring harness and fuel pump wiring harness combination
E-11 (2)	Fuel pump
E-12 (2-B)	ABS speed sensor (Rear. LH)
E-13 (18)	Body wiring harness and rear wiring harness combination
E-14 (2)	Body wiring harness and rear wiring harness combination
E-15 (2)	Front door switch (LH)
E-16 (3-B)	Fuel gauge unit
E-17 (6)	Body wiring harness and rear door wiring harness (LH) combination
E-18 (2-B)	ABS speed sensor (Rear: RH)
E-19 (2)	Seat belt buckle switch
E-20 (1-B)	Parking brake switch
E-21 (1)	Map light <Without sunroof>
E-22 (3)	Body wiring harness and fuel pump wiring harness combination
E-23 (3-B)	Fuel tank differential pressure sensor

LUGGAGE COMPARTMENT <2-Door Models>

80100150471

Connector symbol

F

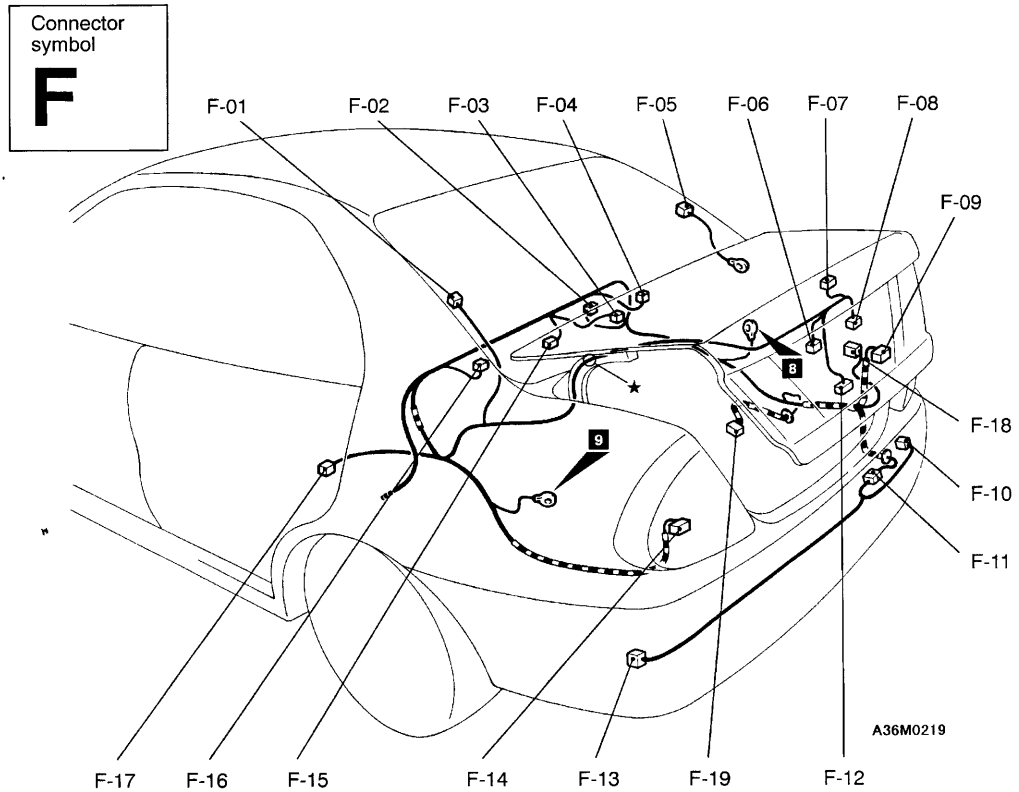


Connector color code
B : Black
Y : Yellow
L : Blue
G : Green
R : Red
BR : Brown
V : Violet
O : Orange
GR : Gray

F-01 (1-B)	Defogger (+)
F-03 (2)	High-mounted stop light (on rear shelf)
F-04 (2-B)	Rear speaker (RH)
F-05 (1-B)	Defogger (-)
F-06 (2-GR)	License plate light (LH)
F-07 (2)	High-mounted stop light (on rear spoiler)
F-08 (2-GR)	License plate light (RH)
F-09 (6)	Rear combination light (RH)
F-10 (2)	Rear side-marker light (RH)
F-11 (4)	Rear wiring harness and rear bumper wiring harness combination
F-12 (1-B)	Trunk lid latch switch
F-13 (2)	Rear side-marker light (LH)
F-14 (6)	Rear combination light (LH)
F-15 (2)	Luggage compartment light
F-16 (2-B)	Rear speaker (LH)
F-18 (6-B)	CD changer
F-19 (2-B)	Evaporative emission ventilation solenoid

LUGGAGE COMPARTMENT <4-DOOR MODELS>

80100150488



Connector color code
B : Black
Y : Yellow
L : Blue
G : Green
R : Red
BR : Brown
V : Violet
O : Orange
GR : Gray

F-01 (1-B)	Defogger (+)
F-02 (1-B)	Rear door switch (RH)
F-03 (2)	High-mounted stop light (on rear shelf)
F-04 (2-B)	Rear speaker (RH)
F-05 (1-B)	Defogger (-)
F-06 (2-GR)	License plate light (LH)
F-07 (2)	High-mounted stop light (on rear spoiler)
F-08 (2-GR)	License plate light (RH)
F-09 (6)	Rear combination light (RH)
F-10 (2)	Rear side-marker light (RH)
F-11 (4)	Rear wiring harness and rear bumper wiring harness combination
F-12 (1-B)	Trunk lid latch switch
F-13 (2)	Rear side-marker light (LH)
F-14 (6)	Rear combination light (LH)
F-15 (2)	Luggage compartment light
F-16 (2-B)	Rear speaker (LH)
F-17 (1-B)	Rear door switch (LH)
F-18 (6-B)	CD changer
F-19 (2-B)	Evaporative emission ventilation solenoid

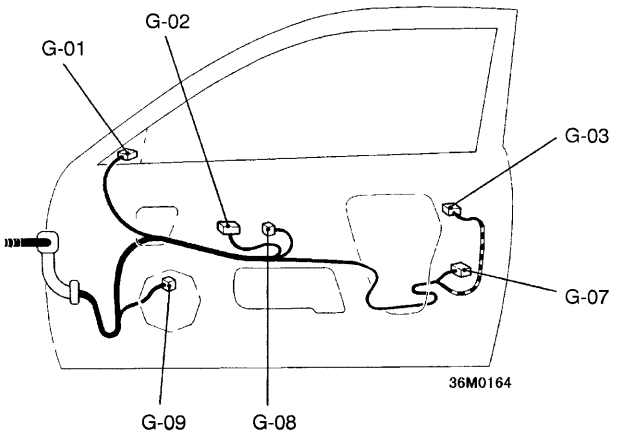
DOOR <2-Door Models>

80100140423

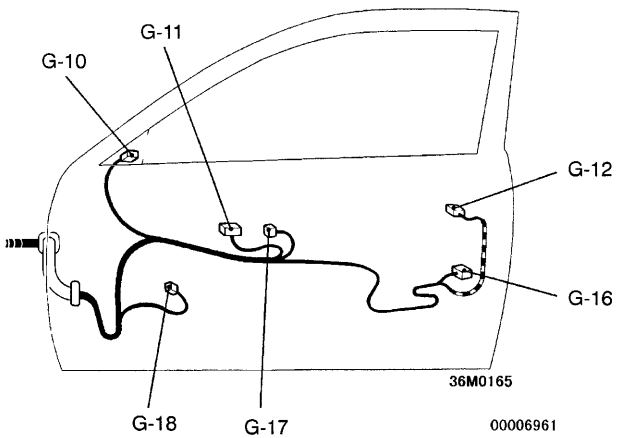
Connector symbol

G

<Passenger's side door>



<Driver's side door>



Connector color code
B : Black
Y : Yellow
L : Blue
G : Green
R : Red
BR : Brown
V : Violet
O : Orange
GR : Gray

G-01 (3)	Remote controlled mirror (RH)	G-10 (3)	Remote controlled mirror (LH)
G-02 (8)	Front power window sub switch	G-11 (10)	Front power window main switch
G-03 (3)	Door lock key cylinder switch (RH)	G-12 (3)	Door lock key cylinder switch (LH)
G-07 (6-B)	Front door lock actuator (RH)	G-16 (6-B)	Front door lock actuator (LH)
G-08 (2)	Front power window motor (RH)	G-17 (2)	Front power window motor (LH)
G-09 (2-B)	Front speaker (RH)	G-18 (2-B)	Front speaker (LH)

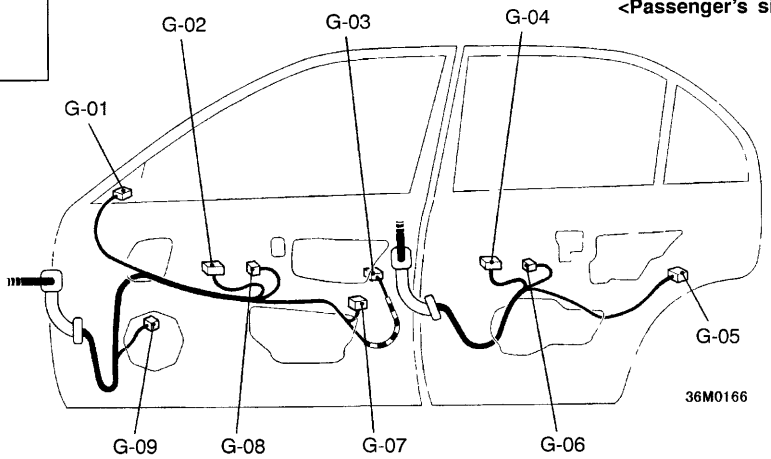
DOOR <4-Door Models>

80100140430

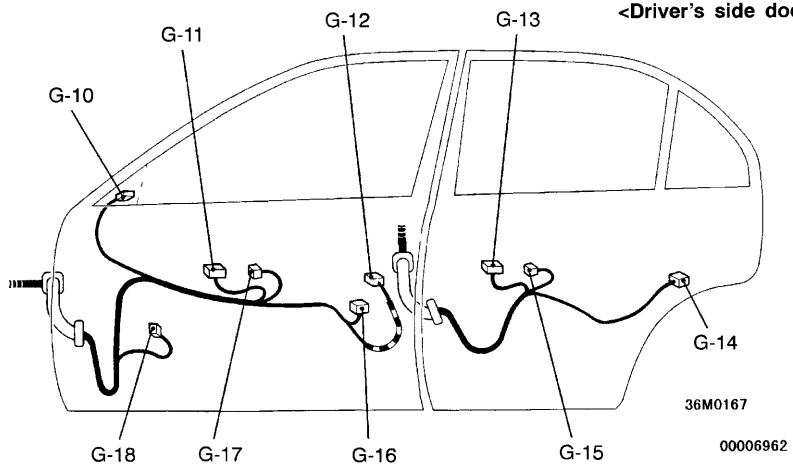
Connector symbol

G

<Passenger's side door>



<Driver's side door>



G-01 (3)	Remote controlled mirror (RH)	G-10 (3)	Remote controlled mirror (LH)
G-02 (8)	Front power window sub switch	G-11 (14)	Front power window main switch
G-03 (3)	Door lock key cylinder switch (RH)	G-12 (3)	Door lock key cylinder switch (LH)
G-04 (8)	Rear power window sub switch (RH)	G-13 (8)	Rear power window sub switch (LH)
G-05 (6-B)	Rear door lock actuator (RH)	G-14 (6-B)	Rear door lock actuator (LH)
G-06 (2)	Rear power window motor (RH)	G-15 (2)	Rear power window motor (LH)
G-07 (6-B)	Front door lock actuator (RH)	G-16 (6-B)	Front door lock actuator (LH)
G-08 (2)	Front power window motor (RH)	G-17 (2)	Front power window motor (LH)
G-09 (2-B)	Front speaker (RH)	G-18 (2-B)	Front speaker (LH)

SPLICE LOCATIONS

CONTENTS

80209000015

Dash Panel 6

Door

<2-door Models> 11

<4-door Models> 12

Engine Compartment

<1.5L Engine> 5

<1.8L Engine> 5

How to Read Splice Locations 2

Index 3

Instrument Panel 8

Interior

<2-door Models> 9

<4-door Models> 9

Luggage Compartment

<2-door Models> 10

<4-door Models> 10

Steering Column 8

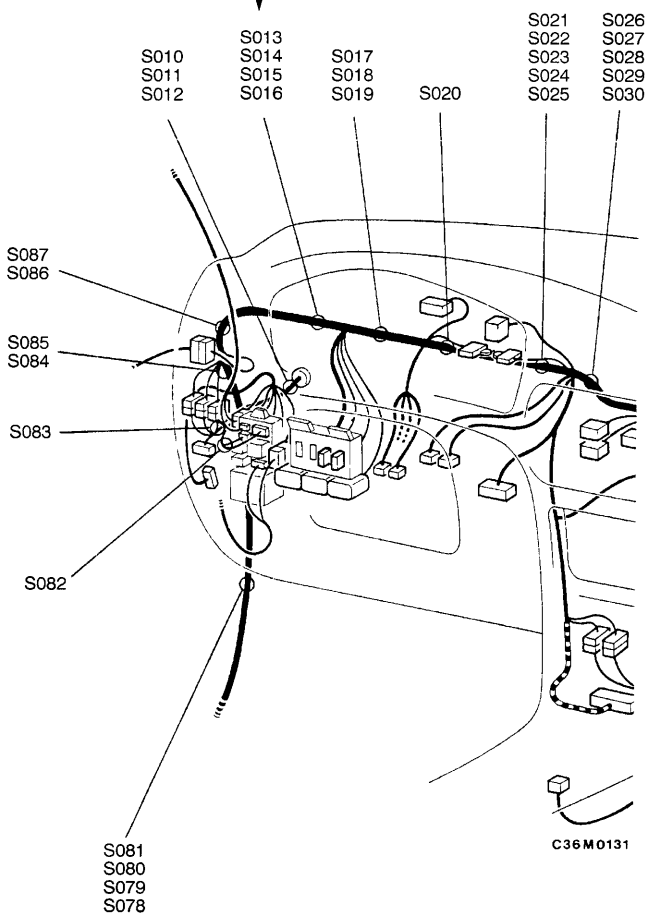
HOW TO READ SPLICE LOCATIONS

80200010017

"Splice locations" describes splice points of each wiring harness on an actual vehicle.

Indicates a splice point number.
The splice point numbers are identical to those in "Circuit Diagrams", considering easiness to use.
In addition, the splice point numbers are usually numbered clockwise.

Example S 013
- Sequential number
- Prefix meaning splice point



INDEX

80200090042

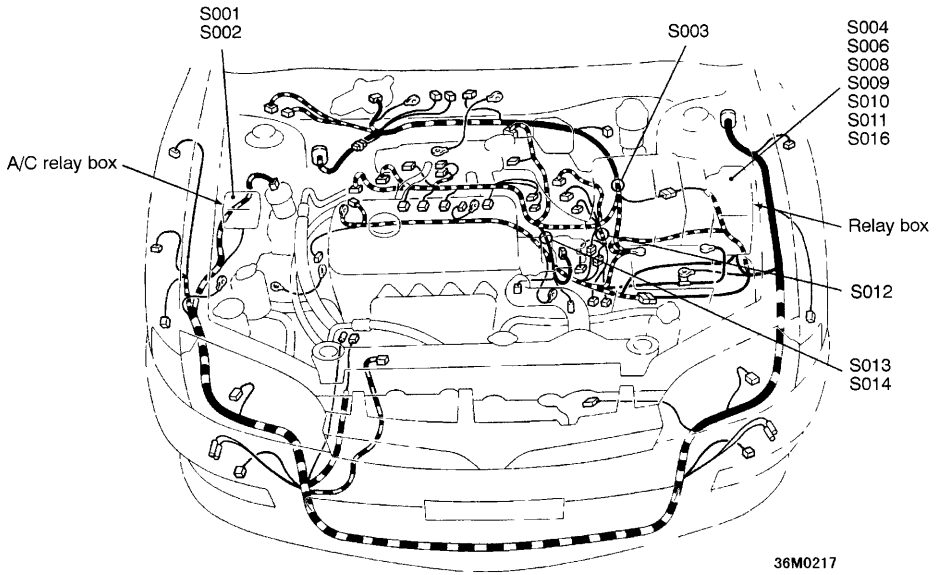
This index shows what page each splice location is described on.

Splice location No.	Page	Splice location No.	Page	Splice location No.	Page	Splice location No.	Page
S001	80B-5	S041	80B-6	S081	80B-7	S121	80B-10
S002	80B-5	S042	80B-6	S082	80B-7	S122	80B-10
S003	80B-5	S043	80B-6	S083	80B-6	S123	80B-10
S004	80B-5	S044	80B-6	S084	80B-6	S124	80B-10
S006	80B-5	S045	80B-7	S085	80B-7	S125	80B-10
S008	80B-5	S046	80B-7	S086	80B-6	S126	80B-10
S009	80B-5	S047	80B-7	S087	80B-6	S127	80B-10
S010	80B-5	S048	80B-7	S088	80B-6	S128	80B-10
S011	80B-5	S049	80B-7	S089	80B-6	S129	80B-10
S012	80B-5	S050	80B-7	S090	80B-6	S130	80B-10
S013	80B-5	S051	80B-7	S091	80B-6	S131	80B-10
S014	80B-5	S052	80B-7	S093	80B-6	S132	80B-10
S015	80B-5	S053	80B-7	S094	80B-6	S133	80B-10
S016	80B-5	S054	80B-7	S095	80B-6	S134	80B-10
S017	80B-6	S055	80B-7	S096	80B-6	S135	80B-10
S018	80B-6	S056	80B-7	S097	80B-6	S136	80B-10
S019	80B-6	S057	80B-7	S098	80B-6	S137	80B-10
S020	80B-6	S058	80B-7	S099	80B-6	S138	80B-10
S021	80B-6	S059	80B-7	S100	80B-6	S139	80B-11, 12
S022	80B-6	S060	80B-7	S101	80B-6	S140	80B-11, 12
S023	80B-6	S061	80B-7	S102	80B-6	S141	80B-11, 12
S024	80B-6	S062	80B-7	S103	80B-6	S142	80B-11, 12
S025	80B-6	S063	80B-7	S104	80B-8	S143	80B-9
S026	80B-6	S064	80B-7	S105	80B-8	S144	80B-9
S027	80B-6	S065	80B-7	S106	80B-8		
S028	80B-6	S066	80B-7	S107	80B-8		
S029	80B-6	S067	80B-7	S108	80B-8		
S030	80B-6	S068	80B-7	S109	80B-8		
S031	80B-6	S069	80B-7	S110	80B-8		
S032	80B-6	S070	80B-7	S111	80B-8		
S033	80B-6	S071	80B-7	S112	80B-8		
S034	80B-6	S072	80B-7	S113	80B-8		
S035	80B-6	S073	80B-7	S114	80B-8		
S036	80B-6	S074	80B-7	S115	80B-8		
S037	80B-6	S075	80B-7	S116	80B-8		
S038	80B-6	S076	80B-7	S117	80B-8		
S039	80B-6	S077	80B-7	S118	80B-9		
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		S079	80B-7	S120	80B-9		
		S080	80B-6				

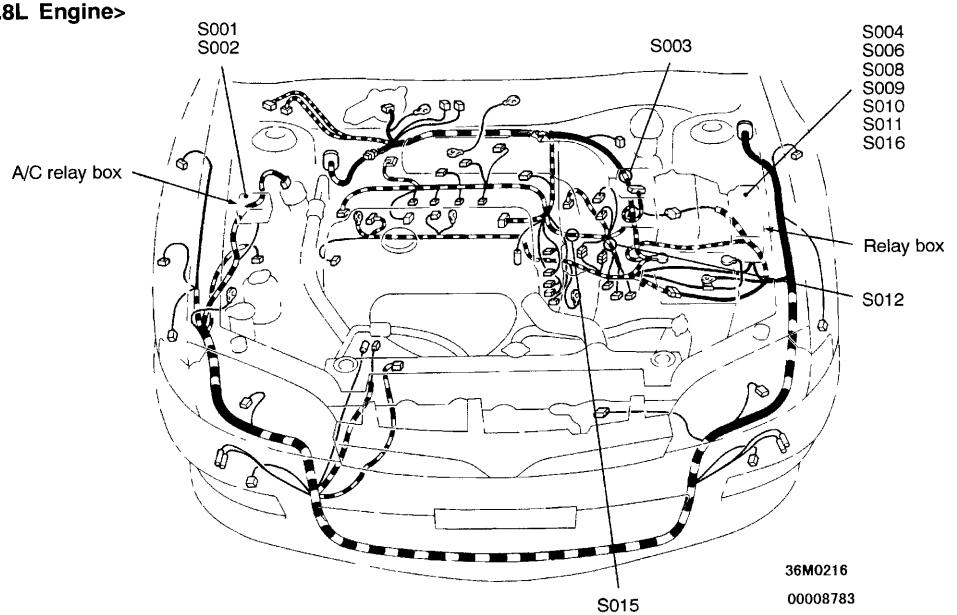
ENGINE COMPARTMENT

80200020065

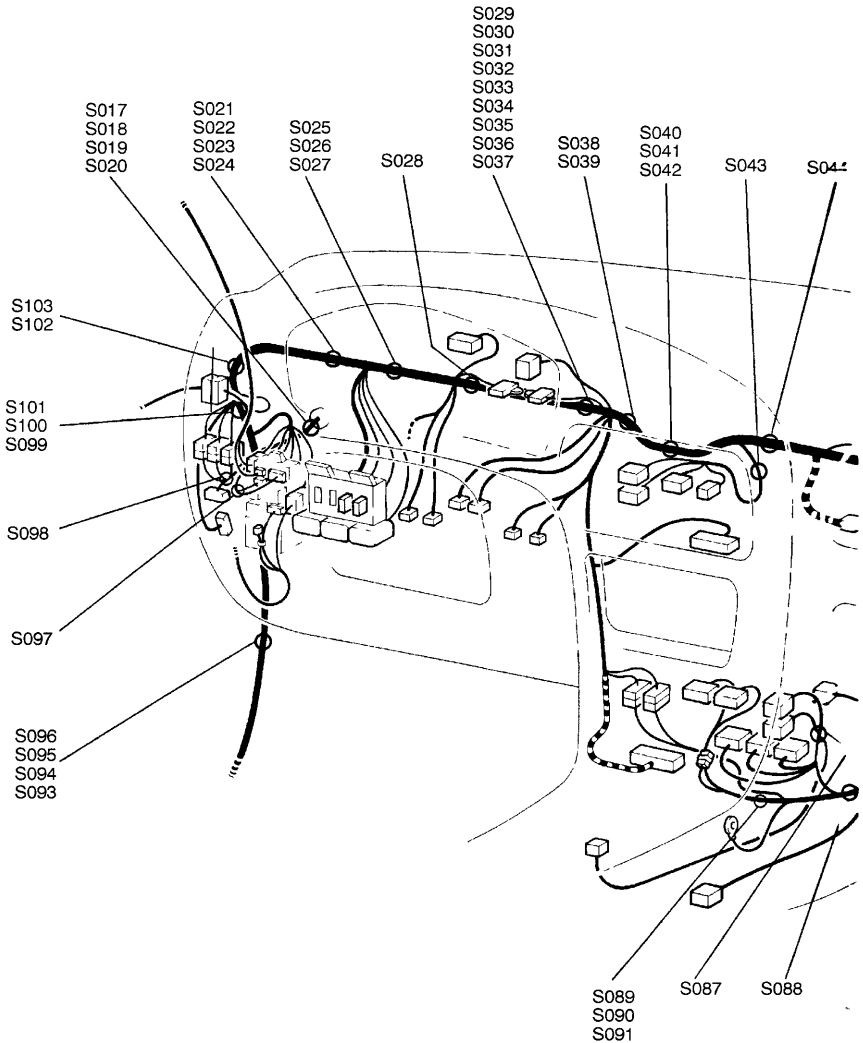
<1.5L Engine>

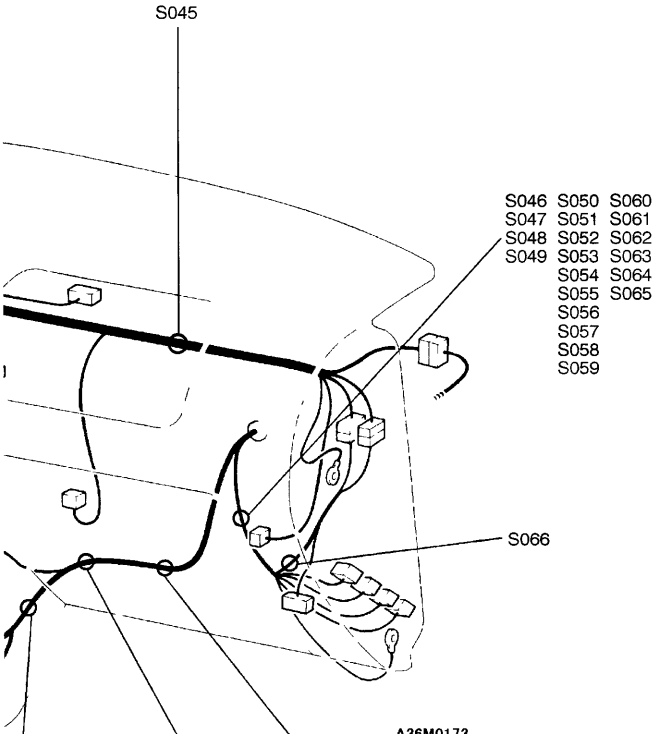


<1.8L Engine>



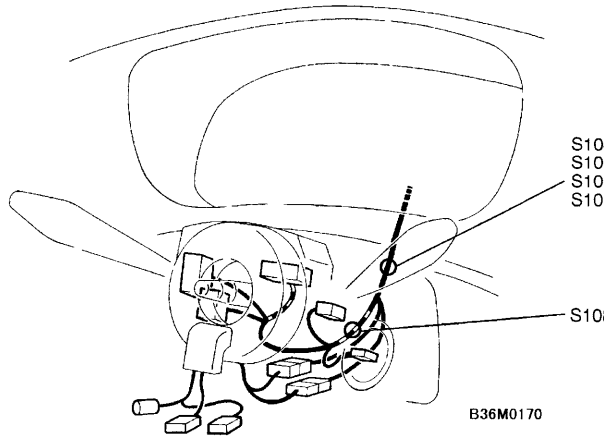
DASH PANEL


S029
S030
S031
S032
S033
S034
S035
S036
S037
S017
S018
S019
S020
S021
S022
S023
S024
S025
S026
S027
S028
S038
S039
S040
S041
S042
S043
S044
S103
S102
S101
S100
S099
S098
S097
S096
S095
S094
S093
S089
S090
S091
S087
S088


S045
S046 S050 S060
S047 S051 S061
S048 S052 S062
S049 S053 S063
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S057
S058
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S083
S084
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S071

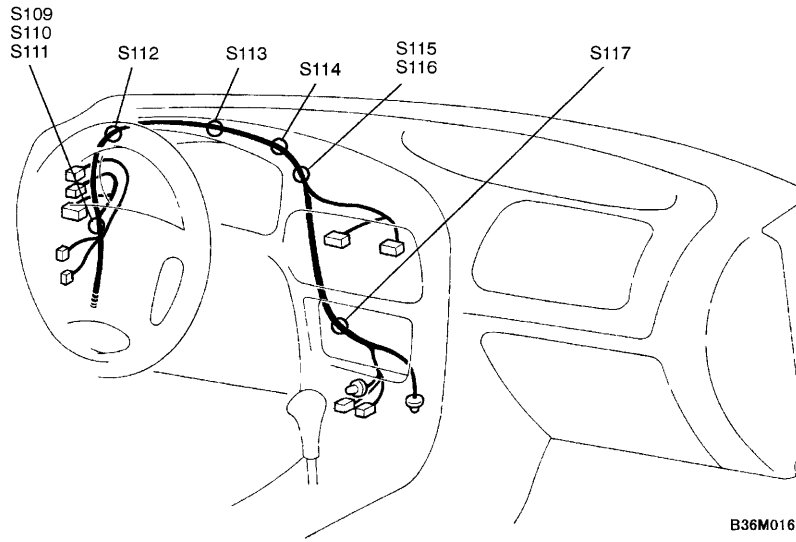
STEERING COLUMN

80200040047



INSTRUMENT PANEL

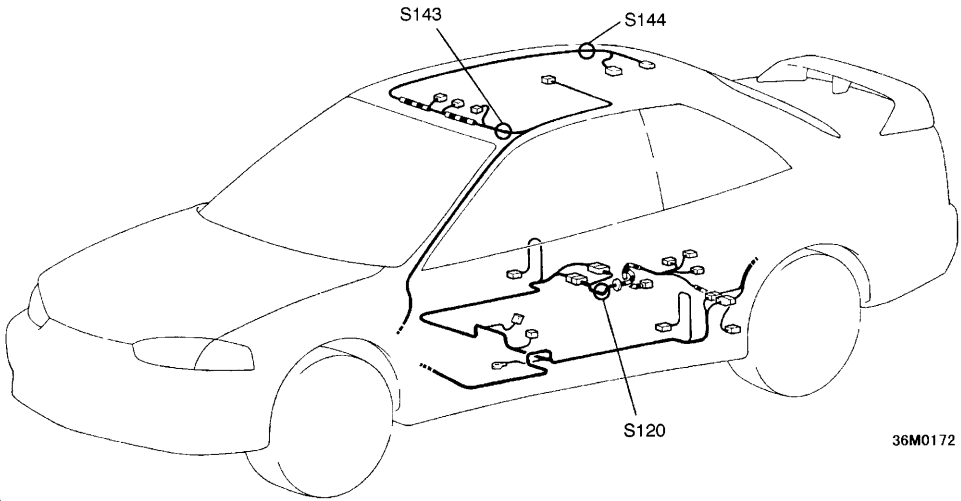
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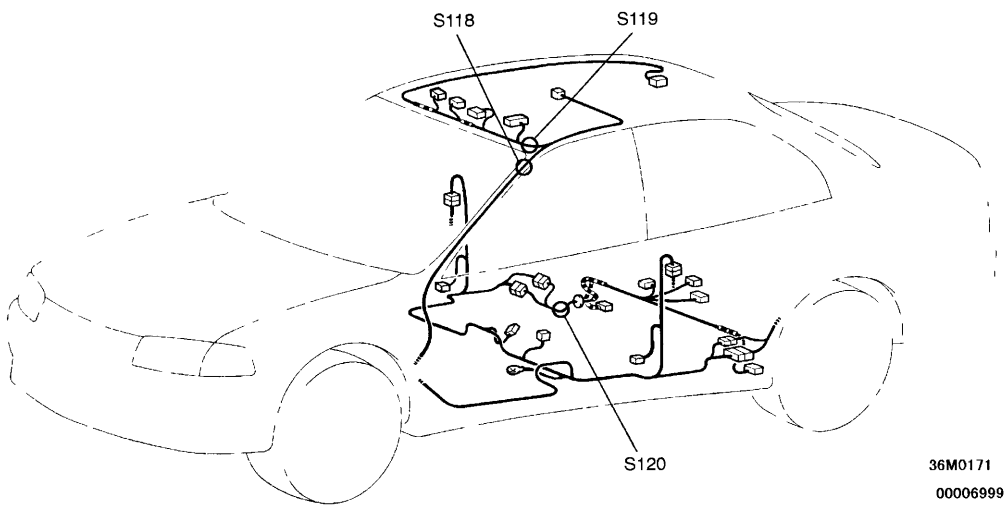
INTERIOR

80200060029

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<4-door Models>

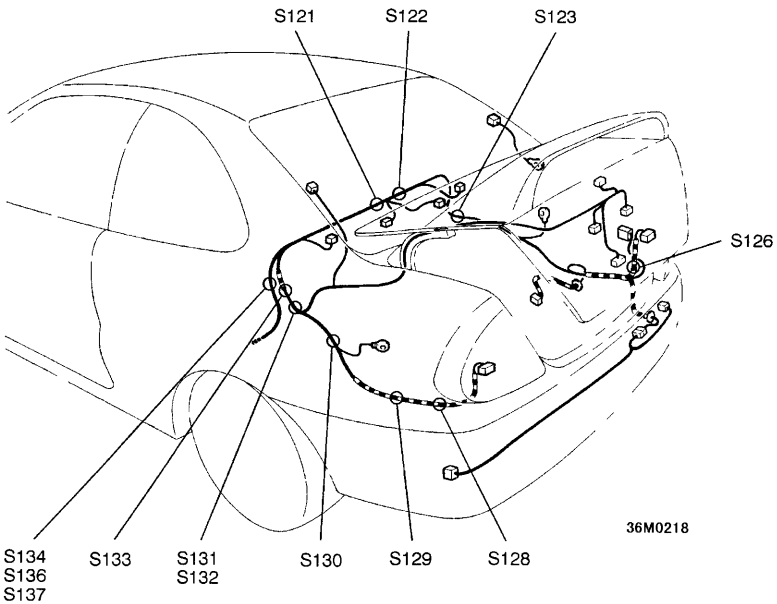


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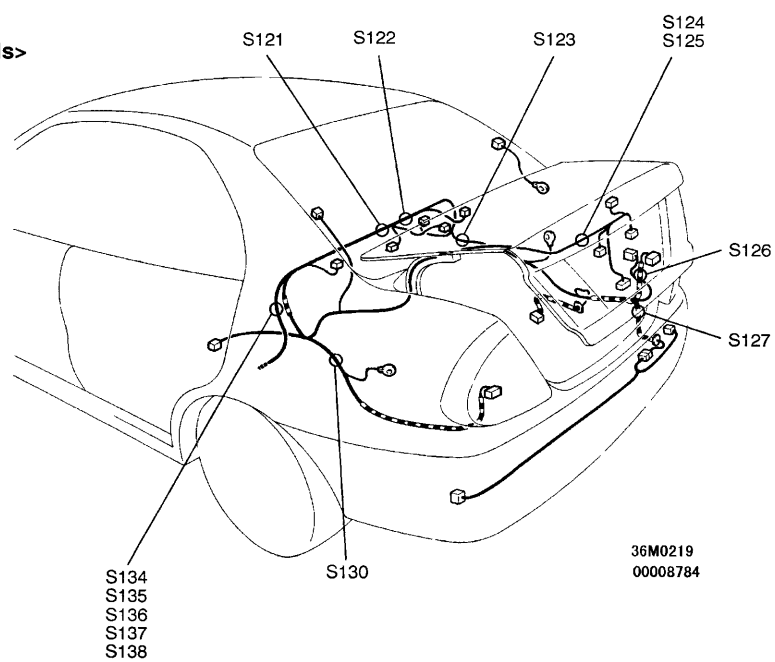
LUGGAGE COMPARTMENT

80200070039

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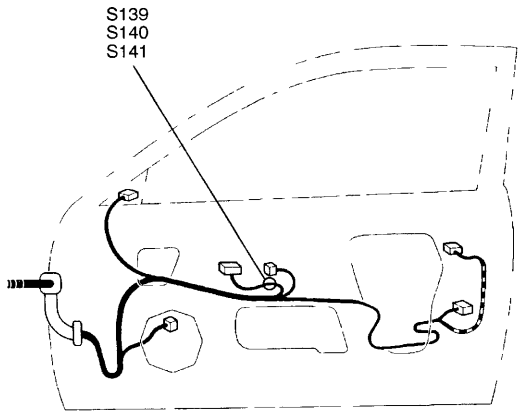


DOOR

80200080049

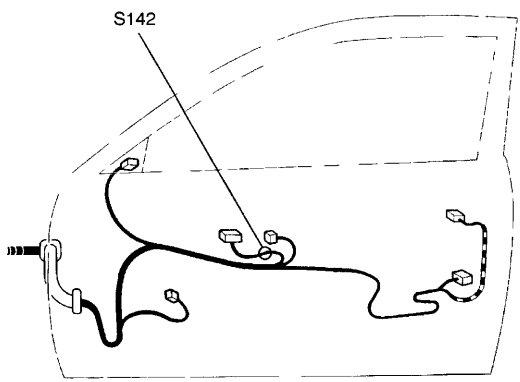
<2-door Models>

(Passenger's side door)



36M0164

(Driver's side door)

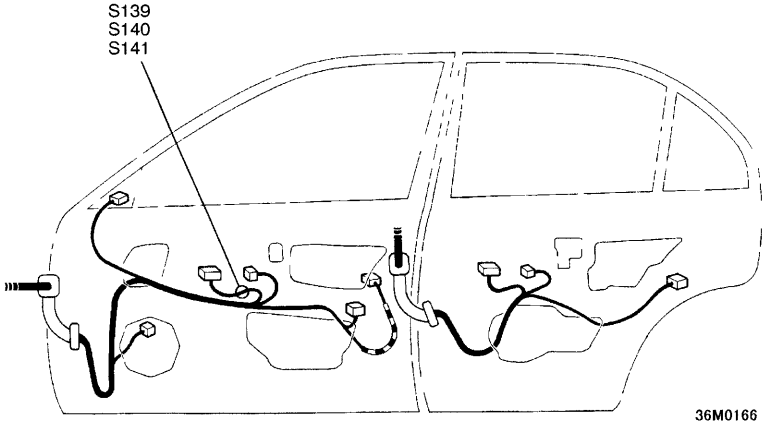


36M0165

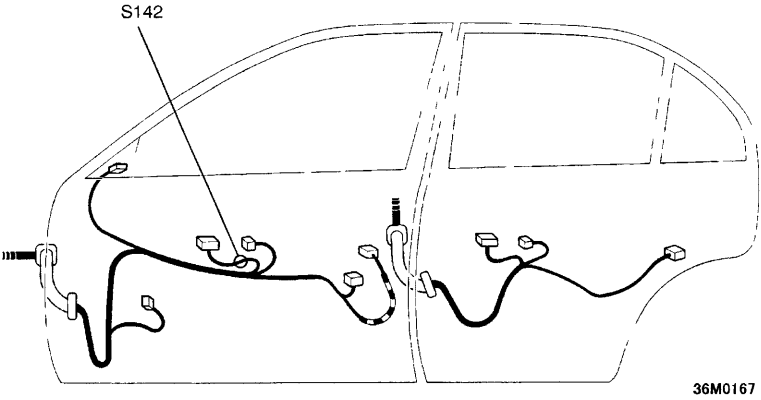
00007001

<4-door Models>

(Passenger's side door)



(Driver's side door)



CIRCUIT DIAGRAMS

CONTENTS

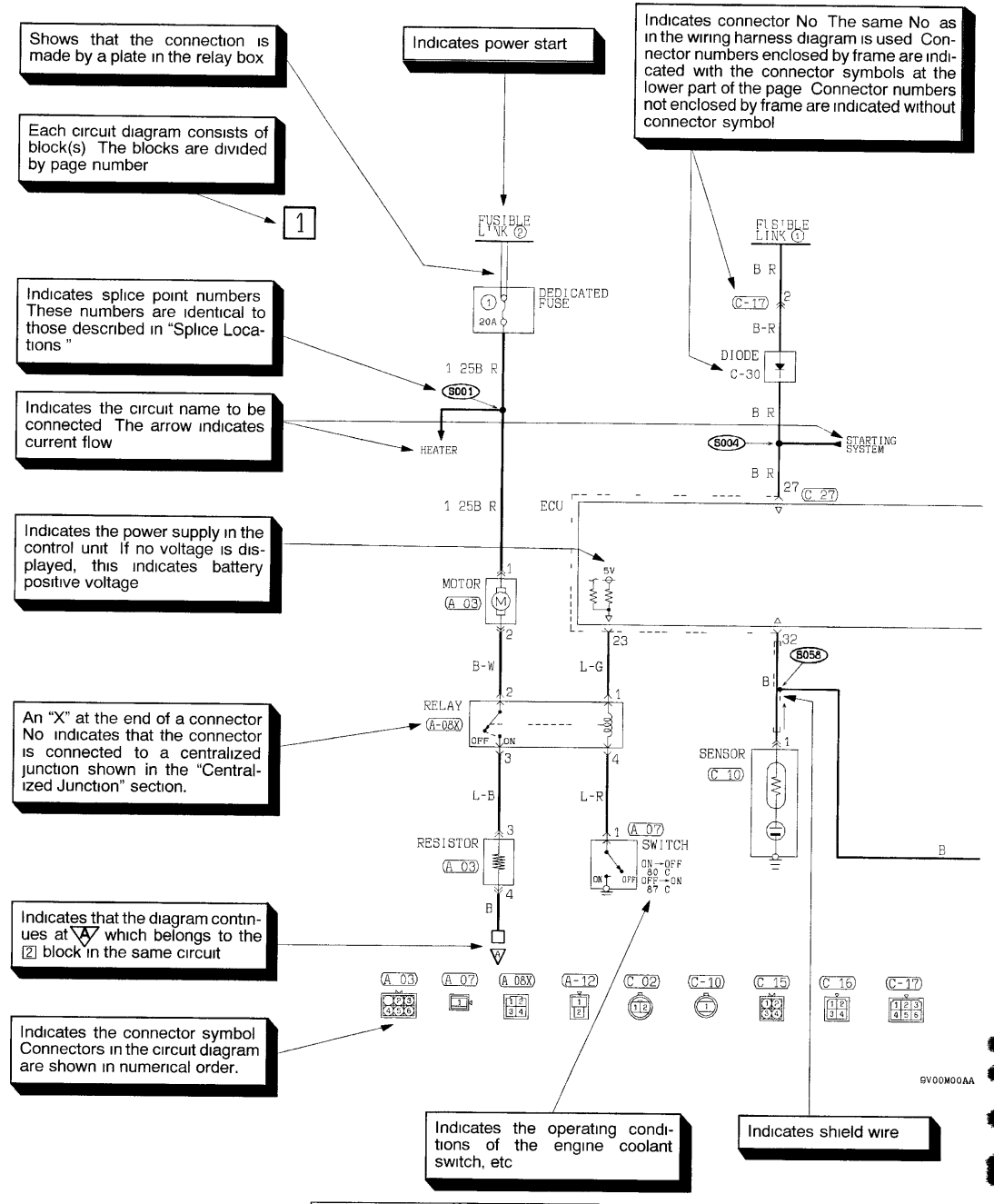
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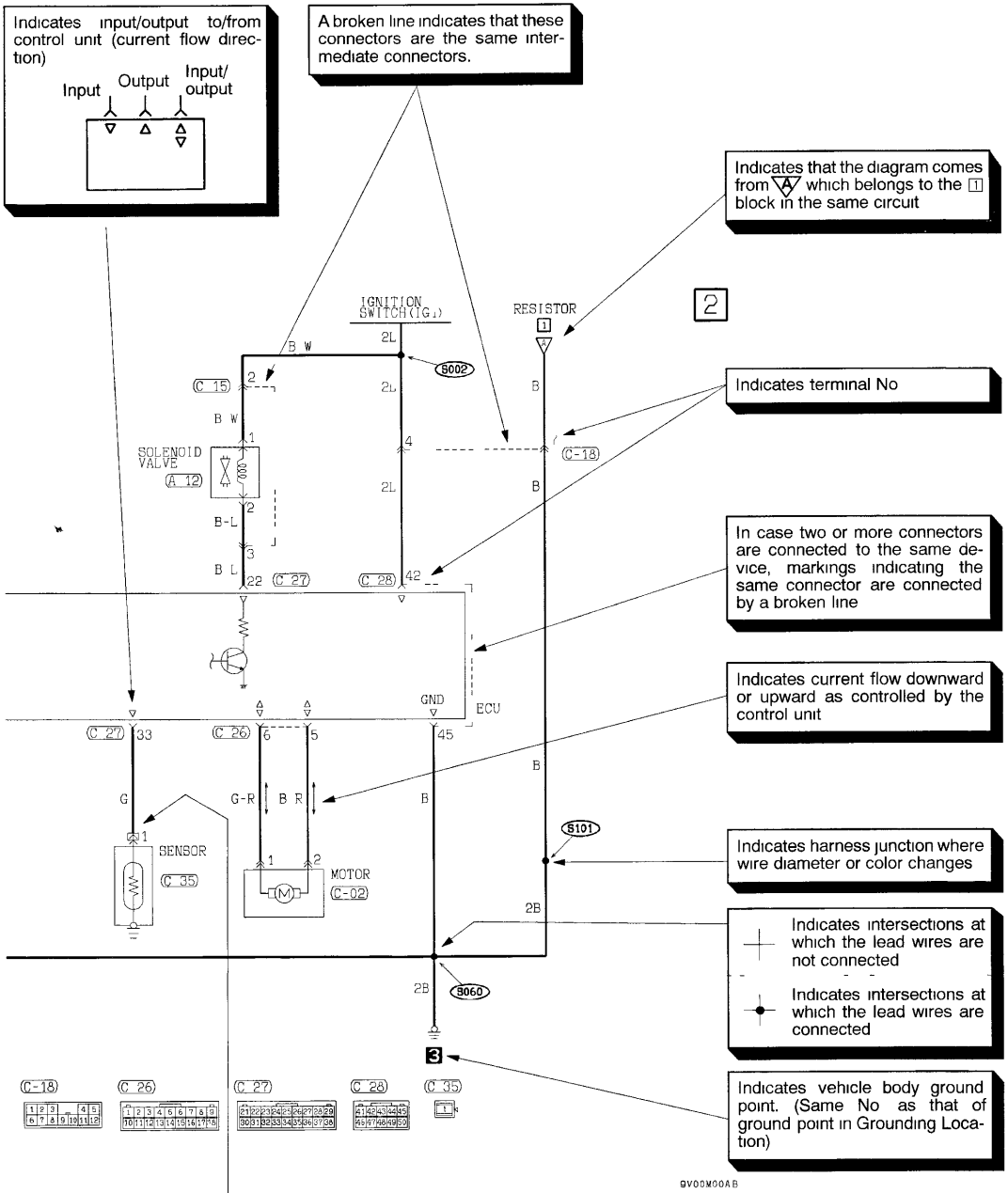
Air Conditioning System 88
Anti-lock Braking System (ABS) 112
Auto-cruise Control System 106
Back-up Light 70
Brake Warning Light 74
Buzzer 118
Central Door Locking System 82
Centralized Junction 13
Charging System 30
Cigarette Lighter 98
Clock 99
Cooling System 49
Dome Light and Luggage Compartment Light 65
ELC 4-speed Automatic Transaxle 50
Fog Light 60
Fuel Warning Light 74
Headlight 58
Heater 86
Horn 71
How to Read Circuit Diagrams 2
Ignition System
<1.5L Engine> 27
<1.8L Engine> 28
Joint Connector (J/C) 10
Junction Block (J/B) 8
Meters and Gauges 72
MFI System
<1.5L Engine> 32
<1.8L Engine> 40
Oil Pressure Warning Light 74
Power Distribution System 20
Power Windows
<2-door Models> 76
<4-door Models> 78
Radio and Tape Player 96
Rear Window Defogger 94
Remote Controlled Mirror 95
Rheostat 117
Starting System 25
Stop Light 69
Sunroof
<2-door Models> 100
<4-door Models> 102
Supplemental Restraint System (SRS) 104
Taillight, Parking and Side-marker Light and License Plate Light 62
Turn-signal Light and Hazard Warning Light 66
Windshield Wiper and Washer
<Vehicles with Intermittent Wiper> 93
<Vehicles without Intermittent Wiper> 92

HOW TO READ CIRCUIT DIAGRAMS

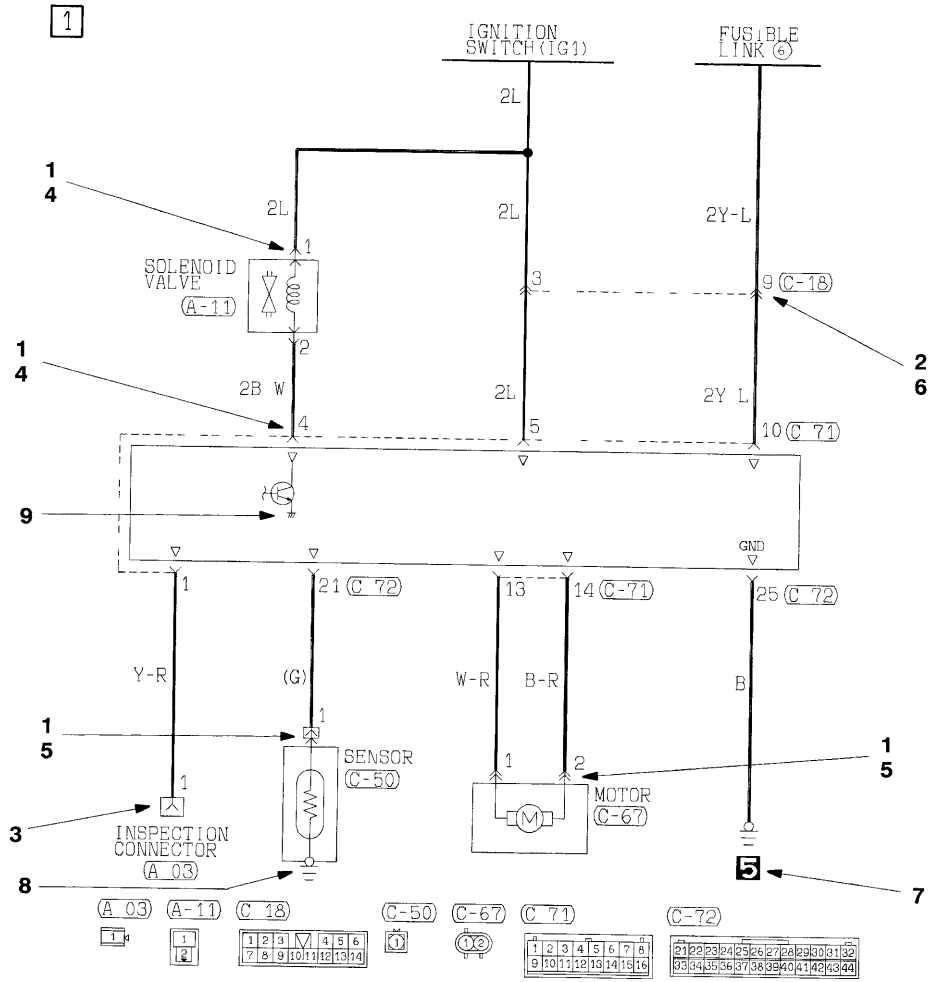
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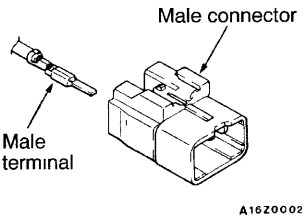
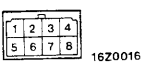
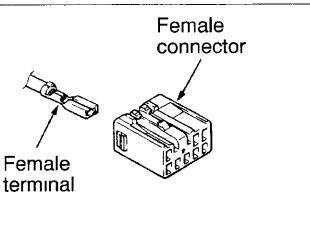
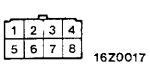
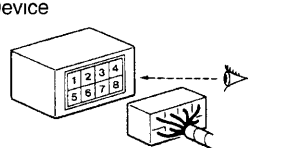
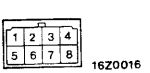
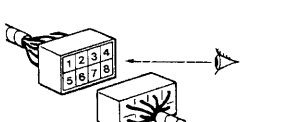
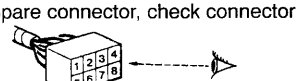
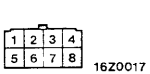
The circuit of each system is shown from the fuse (or fusible link) to ground. The power supply is shown at the top and the ground at the bottom to help understand of how the current flows.

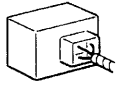
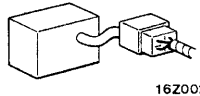
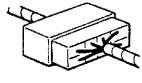
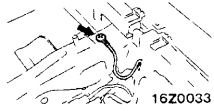
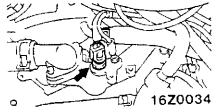
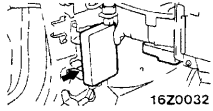



Indicates input/output to/from control unit (current flow direction)
Input
Output
Input/ output
A broken line indicates that these connectors are the same intermediate connectors.
Indicates that the diagram comes from A which belongs to the 1 block in the same circuit
IGNITION SWITCH(IG1)
RESISTOR
2
Indicates terminal No
SOLENOID VALVE
(A 12)
(C 15)
(C-18)
S002
In case two or more connectors are connected to the same device, markings indicating the same connector are connected by a broken line
(C 27)
(C 28)
ECU
GND
Indicates current flow downward or upward as controlled by the control unit
(C 26)
SENSOR
(C 35)
MOTOR
(C-02)
S101
Indicates harness junction where wire diameter or color changes
Indicates intersections at which the lead wires are not connected
Indicates intersections at which the lead wires are connected
S060
3
Indicates vehicle body ground point. (Same No as that of ground point in Grounding Location)
GV00M00AB
Indicates that the terminal is a spare one if the device (sensor in this case) is not provided.

CONNECTOR/GROUNDING INDICATIONS



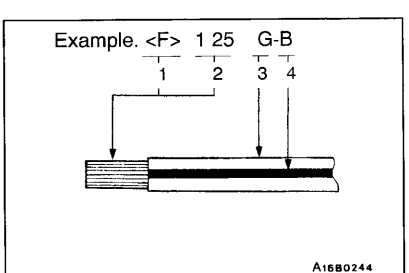
Item	No.	Connector/Grounding	Symbol	Contents
Connector and terminal marking	-		Male terminal  Male connector 	The male and female terminals are indicated as shown. The connector with male terminal(s) is indicated by two connector contour lines. The connector with female terminal(s) is indicated by a single connector contour line.
			Female terminal  Female connector 	
Connector symbol marking	1	Device 		The symbol indicates the connector is viewed as shown. At a device connection, the connector symbol on the device side is shown. For an intermediate connector, the male connector symbol is shown. For spare connectors and check connectors, no device is connected, and so the harness-side connector symbol is shown for these connectors. For the data link connector, its contents differ from the previous description. Refer to "scan tool operation instruction" in detail.
	2	Intermediate connector 		
	3	Spare connector, check connector 		

Item	No.	Connector/Grounding	Symbol	Contents
Connector connection marking	4	Direct connection type  16Z0026	 16Z0023	Connection between a device and the harness is either by direct insertion in the device (direct connection type) or by connection with a harness connector furnished on the device side (harness connection type). The two types are indicated as illustrated.
	5	Harness connection type  16Z0027	 16Z0024	
	6	Intermediate connector  16Z0028	 16Z0025	
Ground markings	7	Body ground  16Z0033	 16Z0018	Grounding is either by body ground, device ground or control unit interior ground. These are indicated as illustrated.
	8	Device ground  16Z0034	 16Z0019	
	9	Ground in control unit  16Z0032	 16Z0020	

WIRE COLOR CODES

Wire colors are identified by the following color codes.

Code	Wire Color	Code	Wire Color
B	Black	P	Pink
BR	Brown	R	Red
G	Green	SB	Sky blue
GR	Gray	V	Violet
L	Blue	W	White
LG	Light green	Y	Yellow
O	Orange	-	-



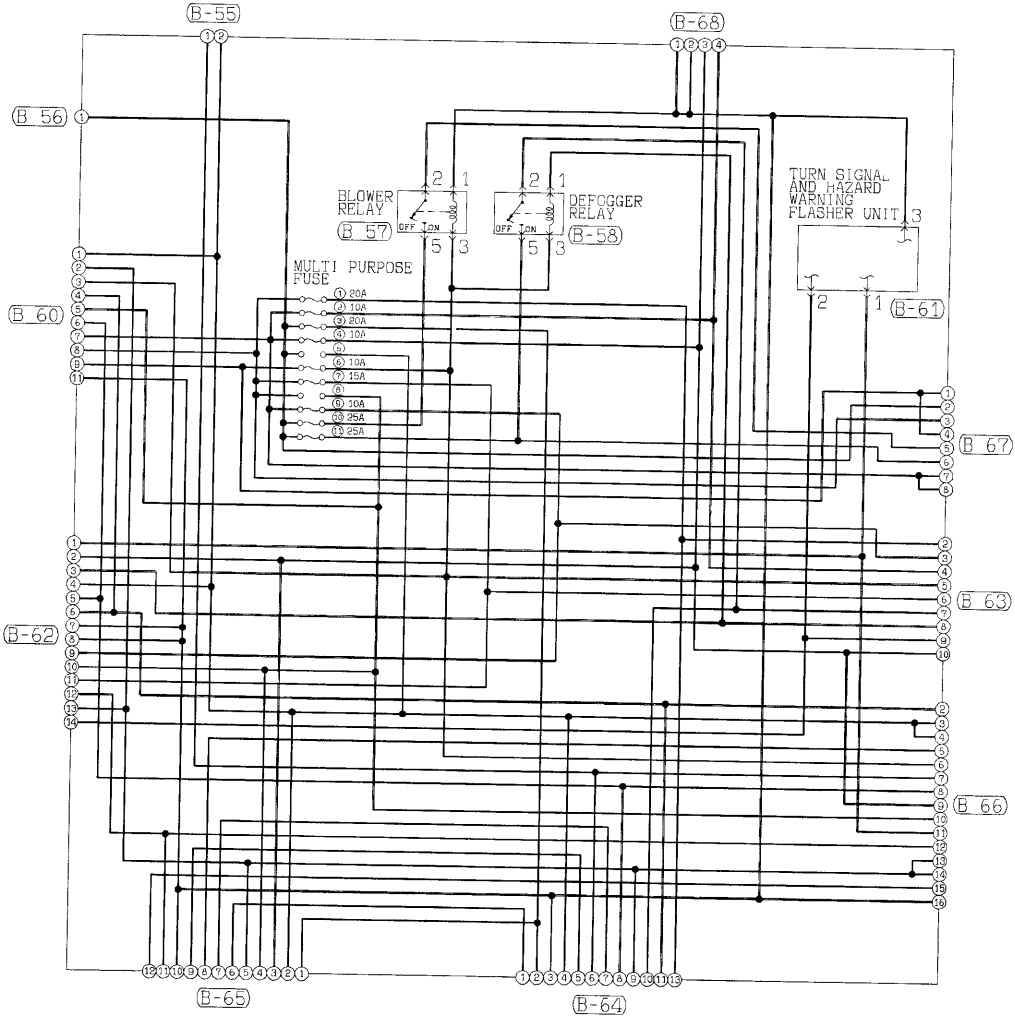
If a cable has two colors, the first of the two color code characters indicates the basic color (color of the cable coating) and the second indicates the marking color.

No.	Meaning
1	<F> Flexible wire
	<T>: Twisted wire
2	Wire size (mm^2)*
3	Basic color (color of the cable coating)
4	Marking color

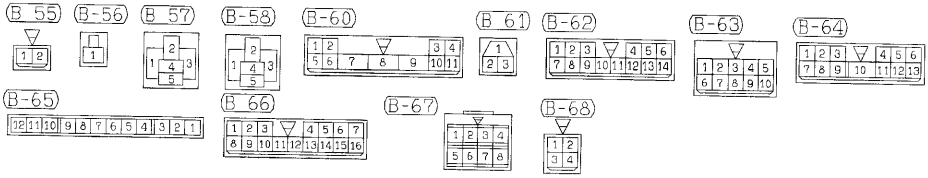
NOTE
*. No code indicates 0.5 mm^2 (0.0008 in^2)
Cable color code in parentheses indicates 0.3 mm^2 (0.0005 in^2).

JUNCTION BLOCK (J/B)

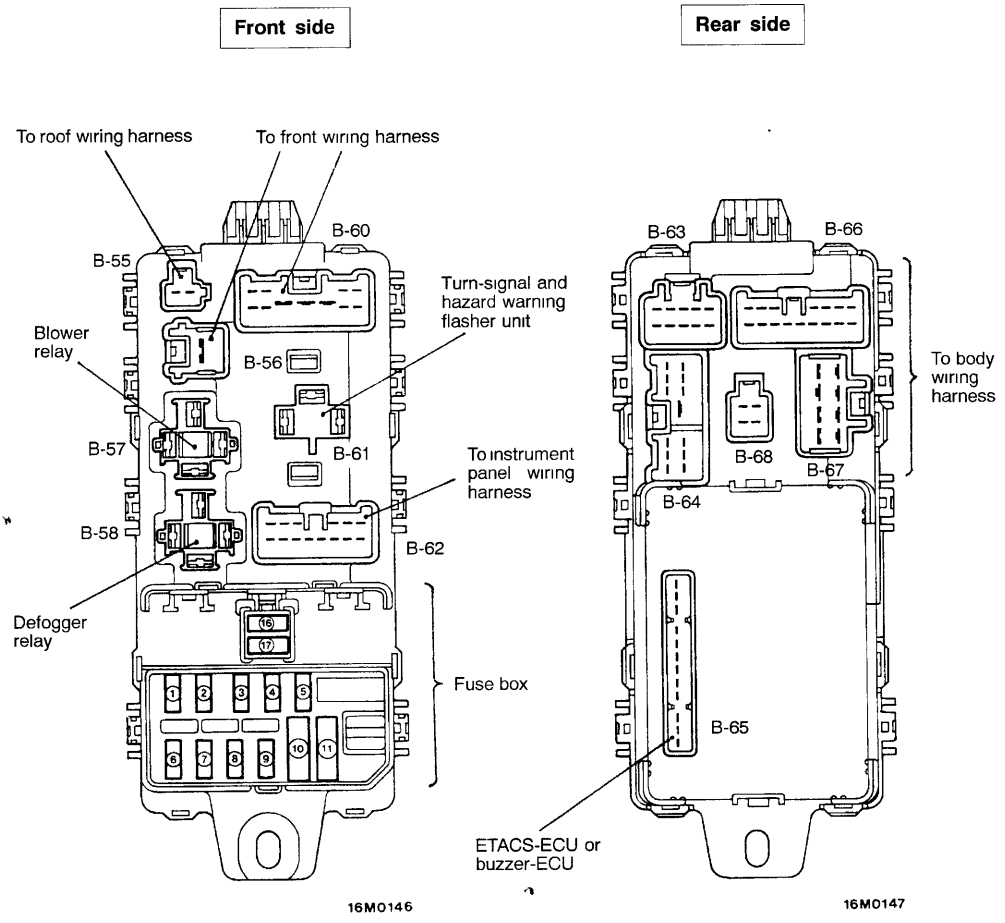
90100020375



Remark
Connector numbers are keyed to the configuration diagram(DASH PANEL) and each circuit diagram



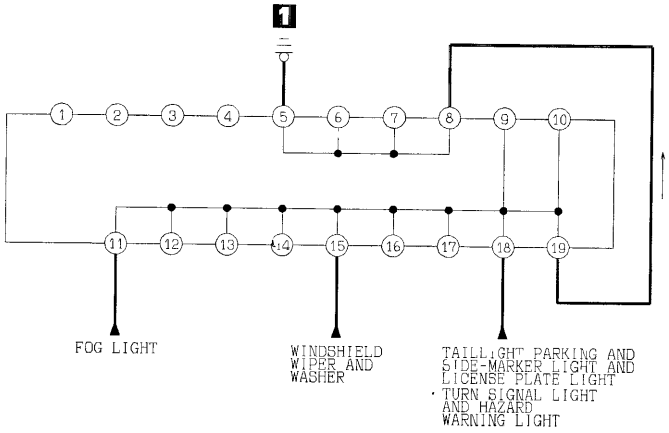
8C00M01AA


Front side
Rear side
To roof wiring harness
To front wiring harness
B-55
B-60
Turn-signal and hazard warning flasher unit
Blower relay
B-56
B-57
B-61
To instrument panel wiring harness
B-58
B-62
Defogger relay
16
17
Fuse box
1
2
3
4
5
6
7
8
9
10
11
B-63
B-66
To body wiring harness
B-68
B-67
B-64
B-65
ETACS-ECU or buzzer-ECU
16M0146
16M0147

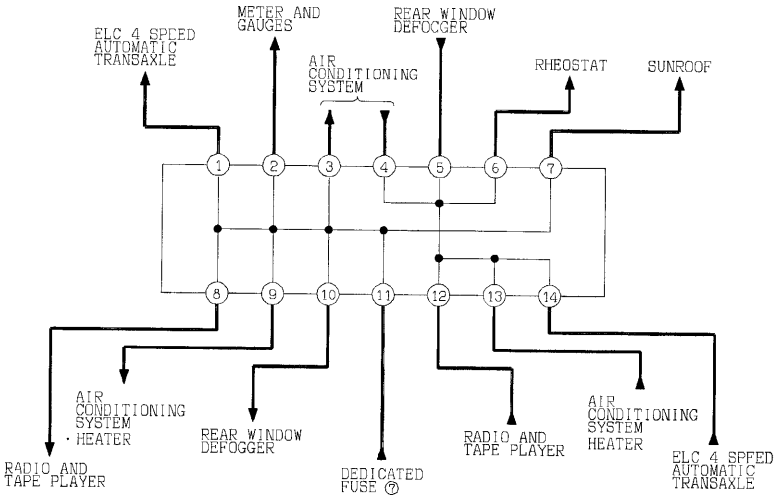
JOINT CONNECTOR (J/C)

90101420204

J/C (1)
(B 50)



J/C (2)
(B 25)



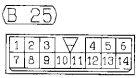
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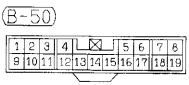
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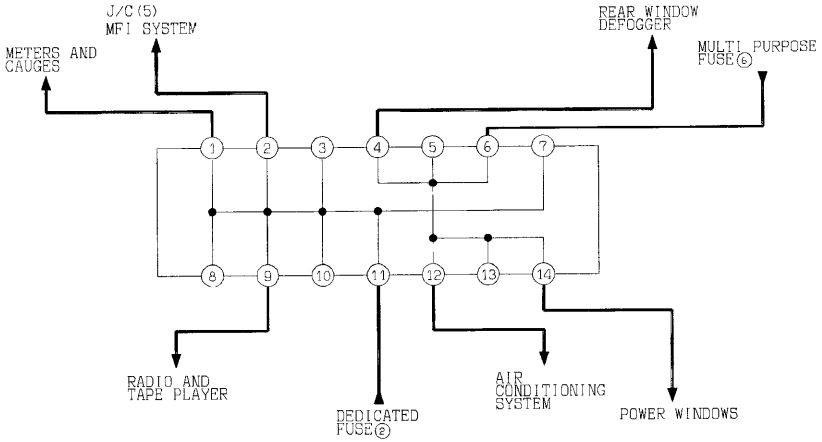


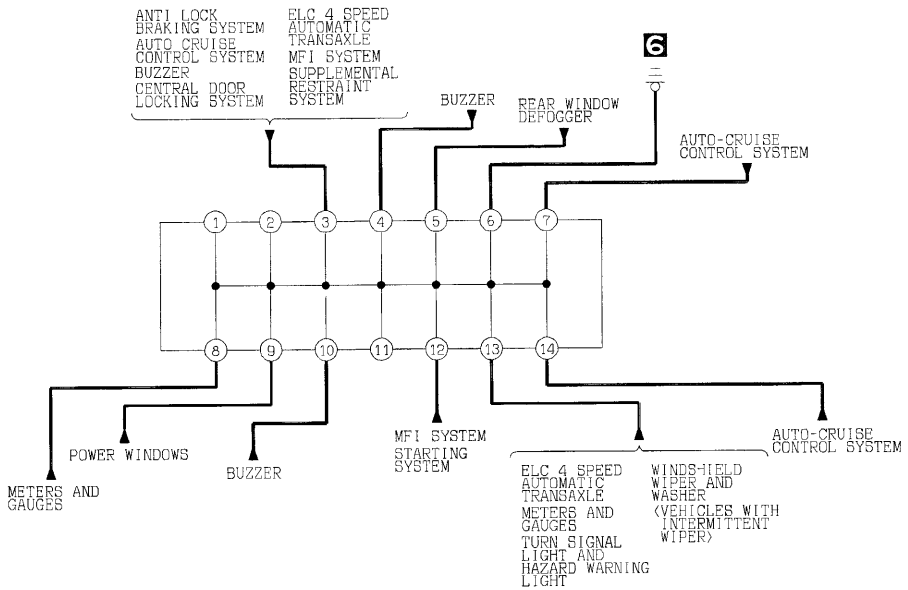
(B 25)



(B-50)

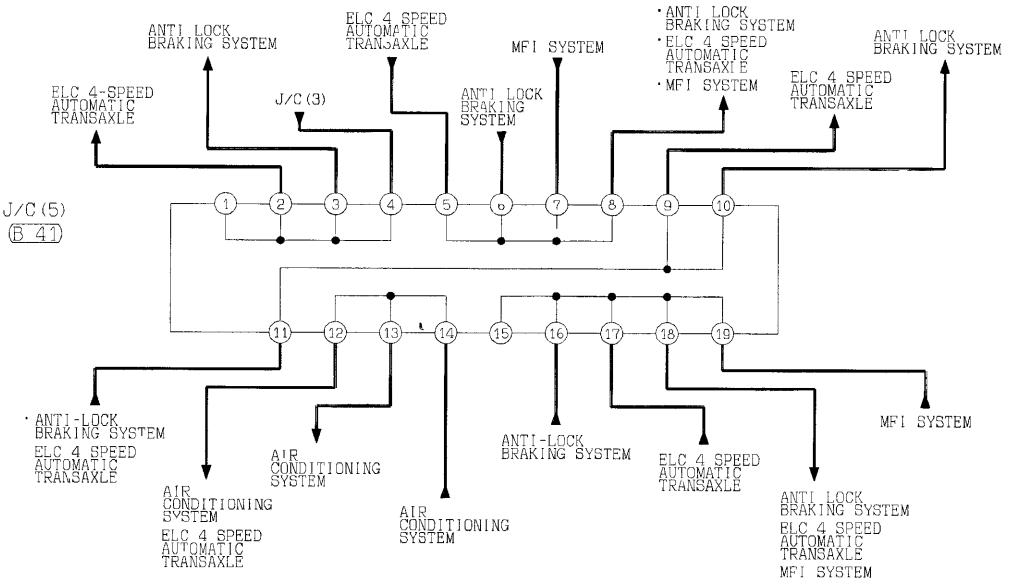






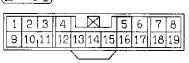
REMARK
IN ACTUAL VEHICLES, ANY OF THE TERMINALS CONNECTED IN J/C ARE USED THE TERMINALS DESCRIBED IN THE CIRCUIT DIAGRAM MAY NOT BE IDENTICAL TO THOSE OF THE VEHICLES.

JOINT CONNECTOR (J/C) (CONTINUED)



REMARK
IN ACTUAL VEHICLES, ANY OF THE TERMINALS CONNECTED IN J/C ARE USED THE TERMINALS DESCRIBED IN THE CIRCUIT DIAGRAM MAY NOT BE IDENTICAL TO THOSE OF THE VEHICLES

B 41



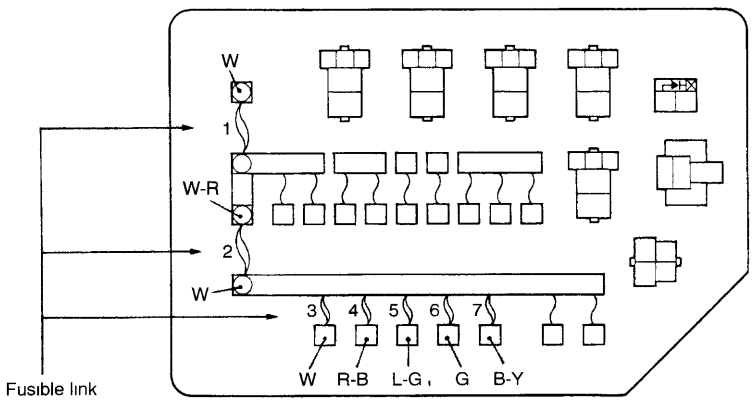
CENTRALIZED JUNCTION

90100030590

FUSIBLE LINK

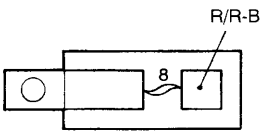
No.	Circuit	Housing color	Rated capacity (A)
1	Dedicated fuse No (16) and multi-purpose fuses No.(3), (10), (11)	Yellow	60
2	Fusible link No.(1), dedicated fuses No.(1), (2) and charging system	Blue	100
3	Ignition switch	Pink	30
4	Dedicated fuses No.(7), (9), charging system, fog light and headlight	Green	40
5	Air conditioning system and cooling system	Pink	30
6	Power windows	Pink	30
7	ELC 4-speed automatic transaxle and MFI system	Blue	20
8	Anti-lock braking system	Yellow	60

(Relay box in engine compartment)



A16M0141

(Connected directly to battery positive terminal)

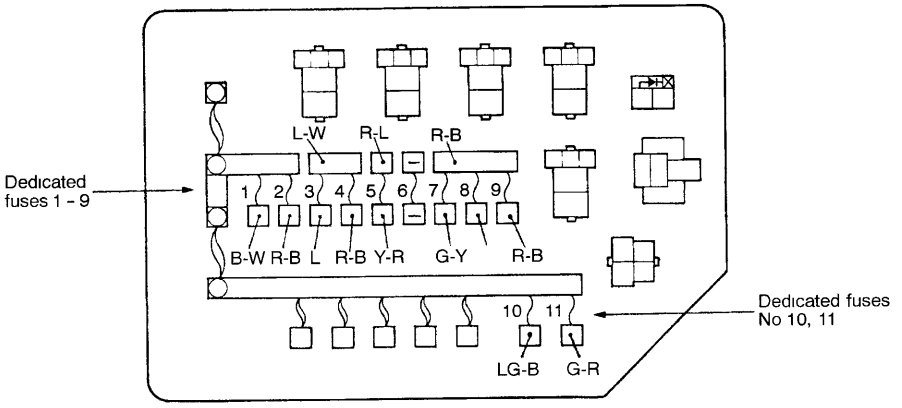


A16M0145

DEDICATED FUSE

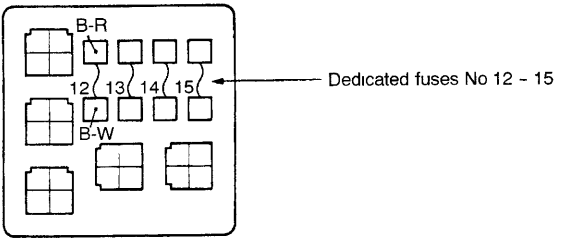
Power supply circuit	No.	Rated capacity (A)	Housing color	Circuit
Battery (Fusible link No.2)/Generator	1	25	Transparent	Air conditioning system and cooling system
	2	10	Red	Clock, dome light and luggage compartment light, ECU power supply, meters and gauges, radio and tape player
Ignition switch (ACC)	3	10	Red	Auto-cruise control system, clock, radio and tape player
	4	10	Red	Horn
Headlight relay (Fusible link No 4)	5	10	Red	Fog light and headlight
-	6	-	-	-
Battery (Fusible link No.4)/Generator (Fusible links No.2, 4)	7	10	Red	Illumination light, tail light, parking and side-marker light and license plate light
-	8	-	-	-
Battery (Fusible link No.4)/Generator (Fusible links No.2, 4)	9	15	Blue	Fog light
Battery/Generator (Fusible link No.2)	10	10	Red	Turn-signal light and hazard warning light
	11	15	Blue	Stop light
Battery/Generator (Dedicated fuse No.1)	12	10	Red	Air conditioning system
-	13	-	-	-
-	14	-	-	-
-	15	-	-	-
Battery/Generator (Fusible link No.1)	16	20	Yellow	Sunroof
-	17	-	-	-

(Relay box in engine compartment)



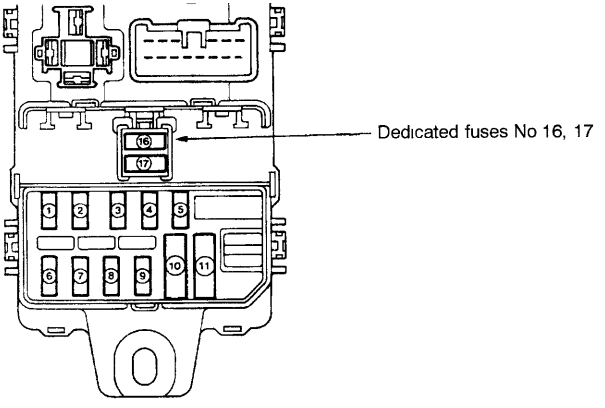
B16M0141

(A/C relay box in engine compartment)



A16M0142

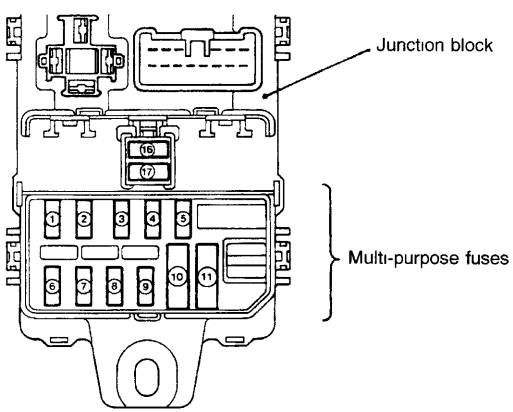
(In junction block)



A16M0146

MULTI-PURPOSE FUSE (In junction block)

Power supply circuit		No.	Rated capacity (A)	Housing color	Load circuit
Ignition switch	ACC	1	20	Yellow	Intermittent wiper relay, windshield washer motor and wiper motor
	IG1	2	10	Red	A/T indicator light, back-up light, CD changer, input shaft speed sensor, output shaft speed sensor, SRS-ECU and transaxle control module
Battery (Fusible links No. 1, 2)/ Generator (Fusible link No.1)		3	20	Yellow	ETACS-ECU and MUT-II
Ignition switch	IG1	4	10	Red	ABS-ECU, ABS motor relay, ABS hydraulic unit, auto-cruise control-ECU, buzzer-ECU, combination meter, ETACS-ECU, SRS-ECU, sunroof-ECU <4-door models> and vehicle speed sensor
Battery (Fusible link No 1, 2)/ Generator (Fusible link No.1)		5	-	-	-
Ignition switch	IG2	6	10	Red	A/C switch, ABS-ECU, ABS valve relay, automatic compressor-ECU, blower relay, defogger relay, defogger switch, sunroof-ECU <2-door models> and power window relay
	ACC	7	15	Blue	Cigarette lighter and remote controlled mirror
		8	-	-	-
	IG1	9	10	Red	Turn-signal and hazard warning flasher unit
Battery (Fusible links No 1, 2)/ Generator (Fusible link No.1)		10	25	Transparent	Blower motor
		11	25	Transparent	Defogger and defogger switch

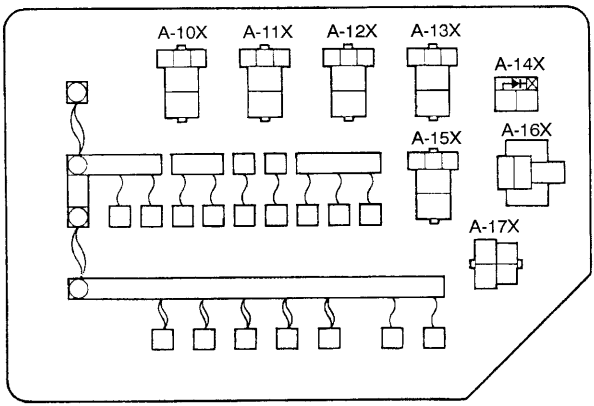


B16M0146

CENTRALIZED RELAY

(Relay box in engine compartment)

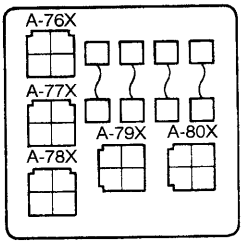
Connector No.	Name	Connector No.	Name
A-10X	-	A-14X	-
A-11X	Horn relay	A-15X	Headlight relay
A-12X	-	A-16X	Starter relay <M/T>
A-13X	Radiator fan relay	A-17X	-



16M0141

(A/C relay box in engine compartment)

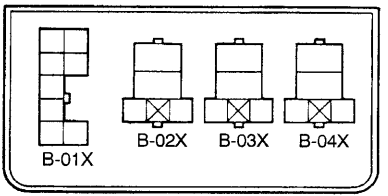
Connector No.	Name	Connector No.	Name
A-76X	-	A-79X	-
A-77X	-		
A-78X	Condenser fan relay	A-80X	A/C compressor relay



16M0142

(Relay box in passenger compartment)

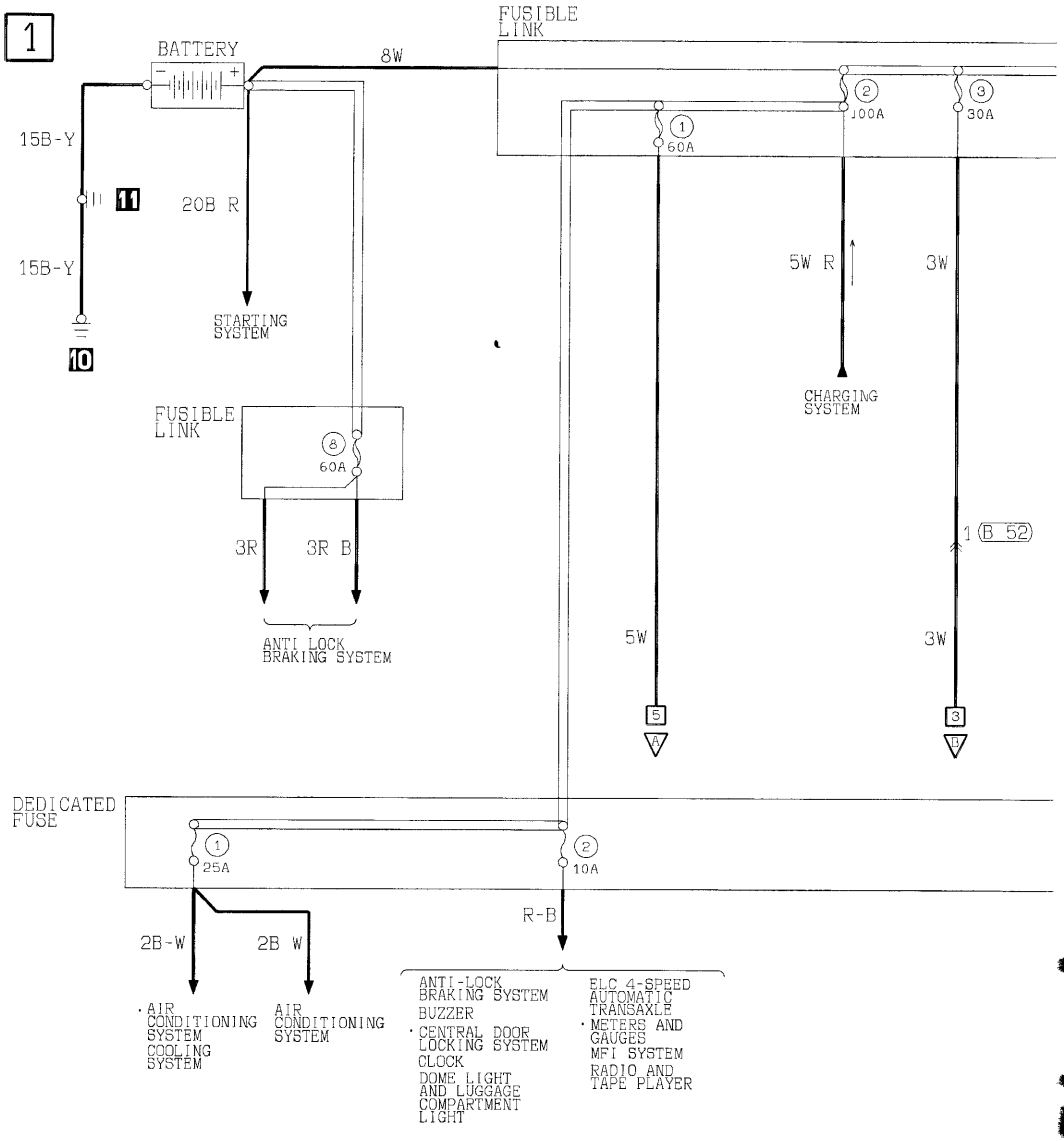
Connector No.	Name	Connector No.	Name
B-01X	-	B-03X	Power window relay
B-02X	-	B-04X	Fog light relay



16M0143

POWER DISTRIBUTION SYSTEM

90100040753

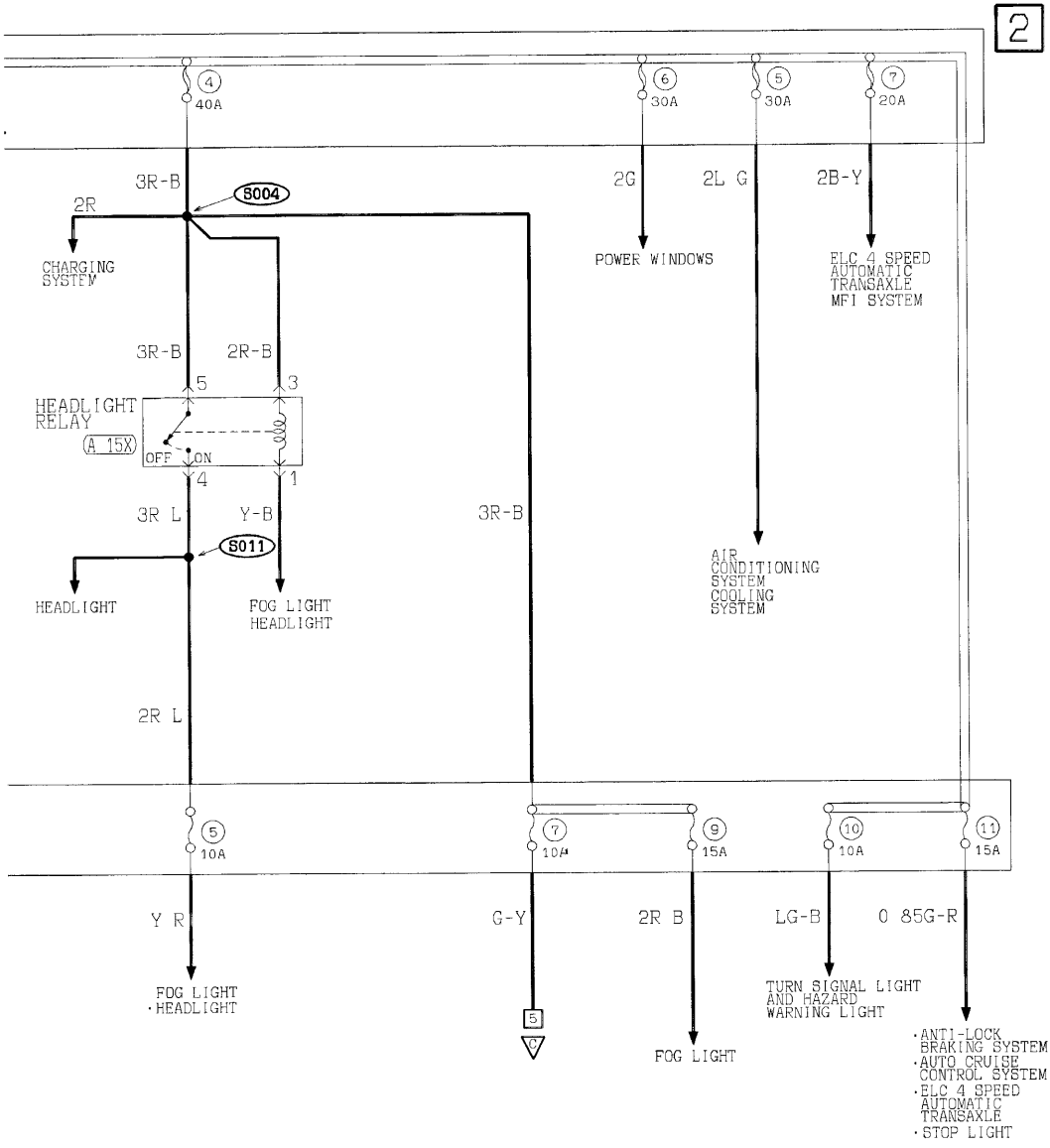


A-15X



B 52

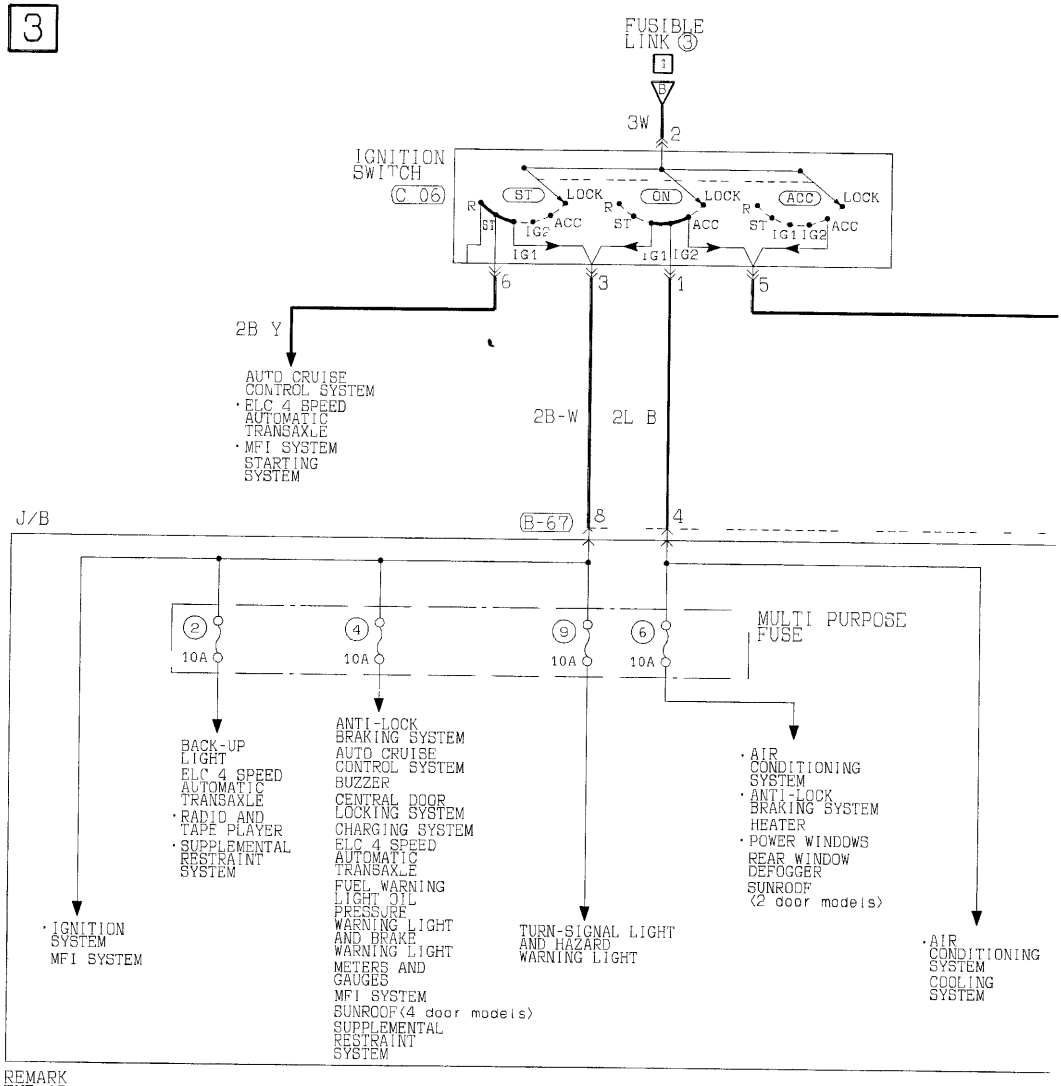




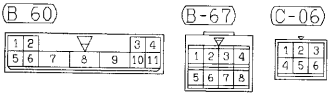
Wire color code
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BR :Brown O :Orange GR :Gray R :Red P :Pink V :Violet

9C01M00AB

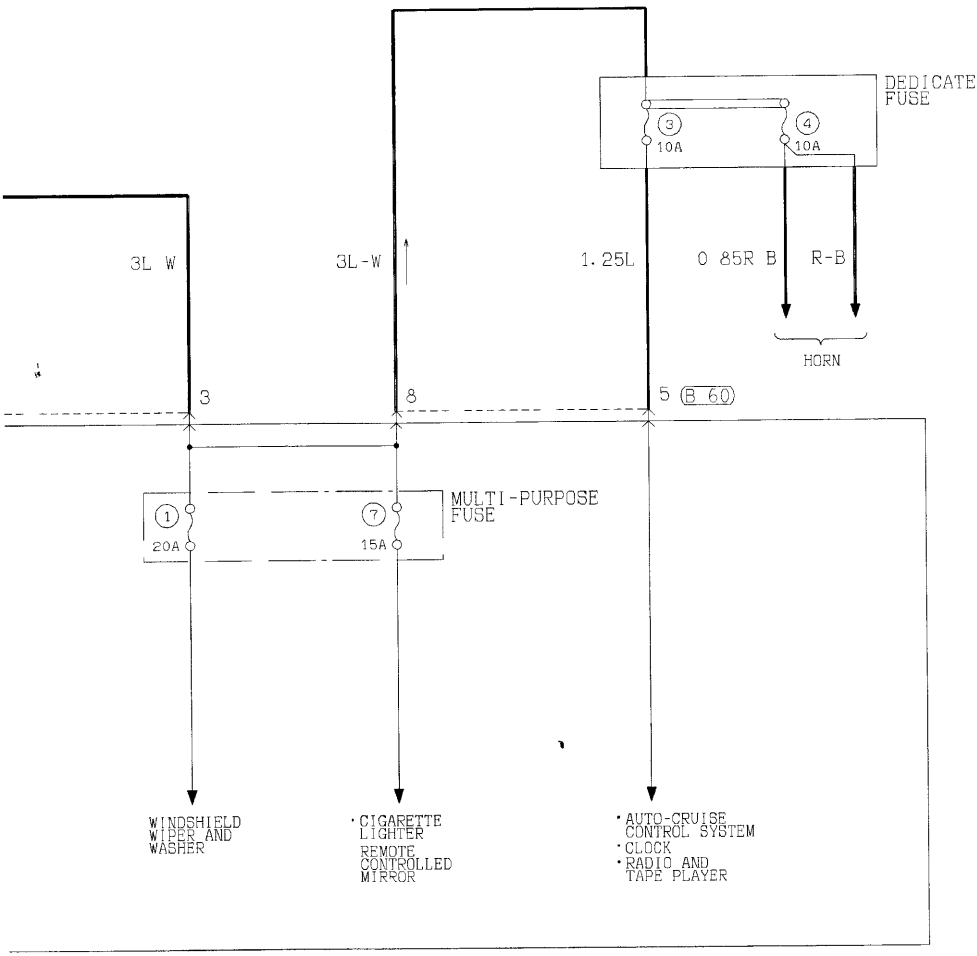
POWER DISTRIBUTION SYSTEM (CONTINUED)



REMARK
THE ABOVE CIRCUIT DIAGRAM SHOWS THE CURRENT FLOW AT THE IGNITION KEY POSITION "ACC", "ON" AND "ST" COMBINED.
BE SURE TRACE THE APPROPRIATE CIRCUIT DEPENDING ON THE IGNITION KEY POSITION



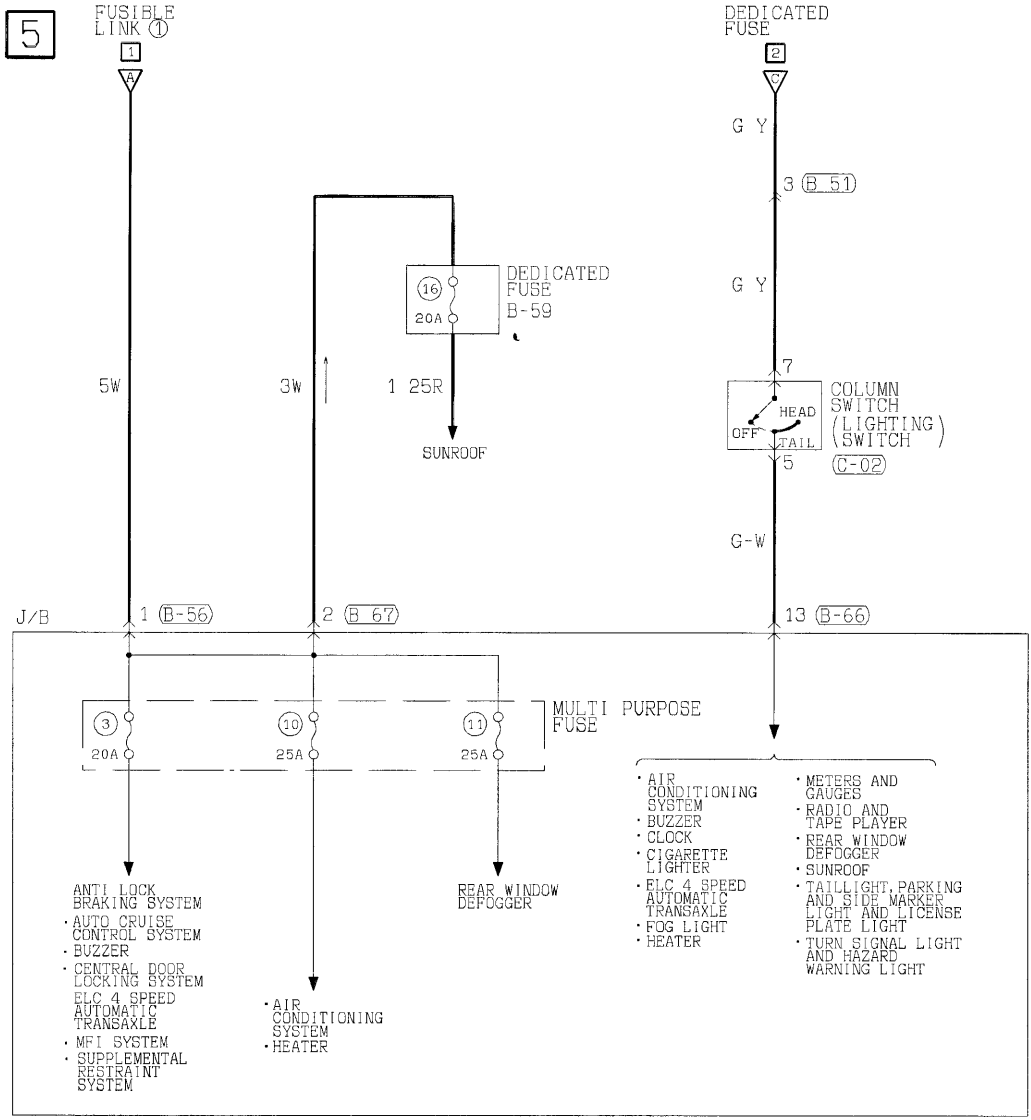
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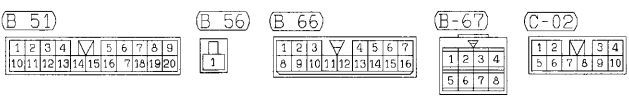


Wire color code
B Black LG:Light green G :Green L .Blue W White Y Yellow SB Sky blue
BR Brown O :Orange GR:Gray R Red P Pink V .Violet

9C01M00BB

POWER DISTRIBUTION SYSTEM (CONTINUED)



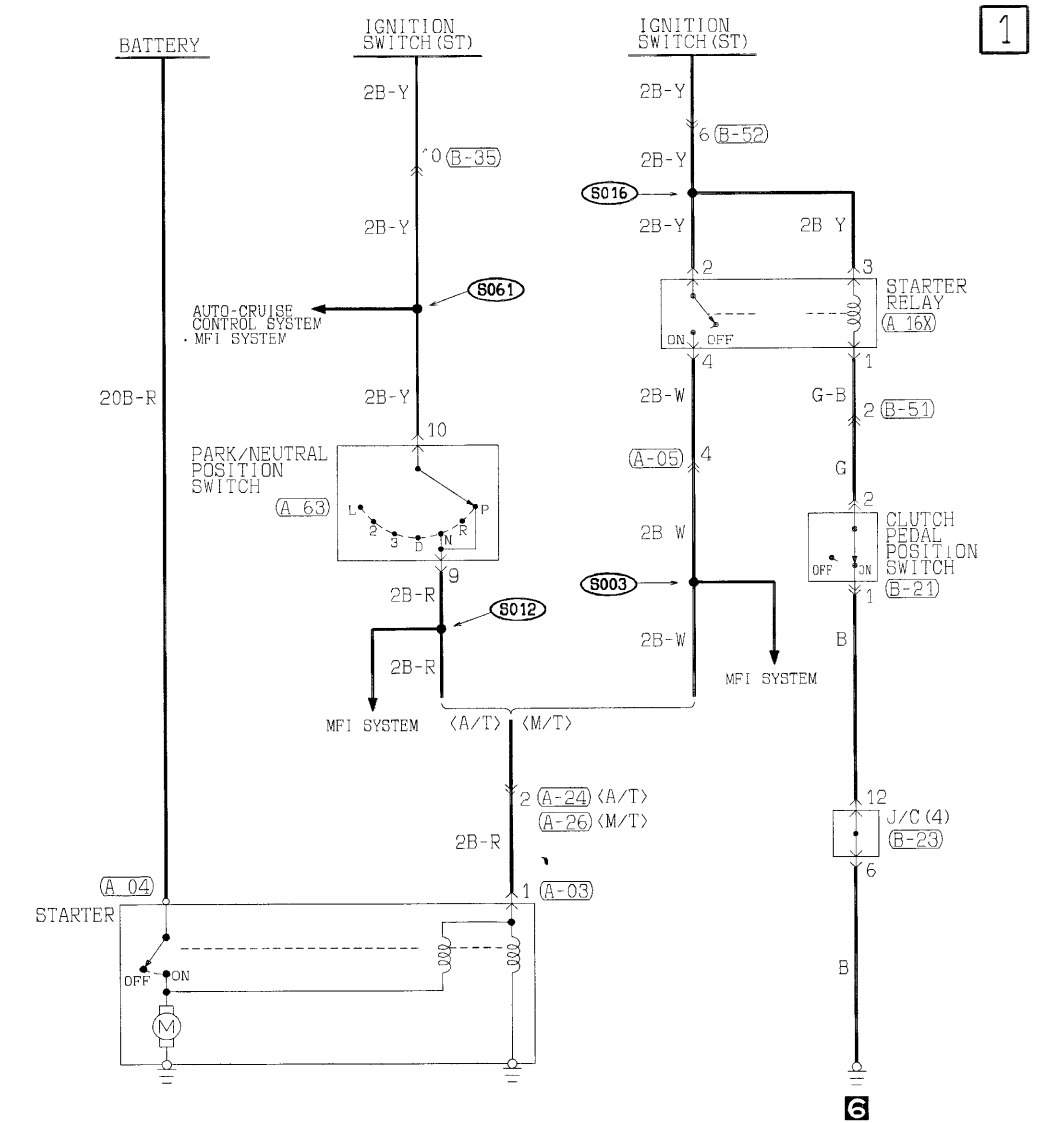


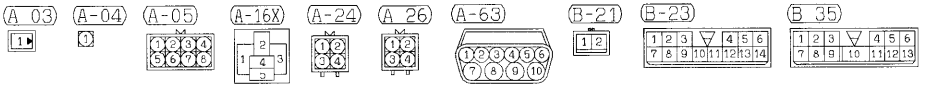
W re color code

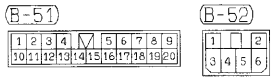
B Black	LG Light green	G :Green	L Blue	W :White	Y :Yellow	SB Sky blue	
BR Brown	O Orange	GR:Gray	R Red	P :Pink	V Violet		

STARTING SYSTEM

90100051054







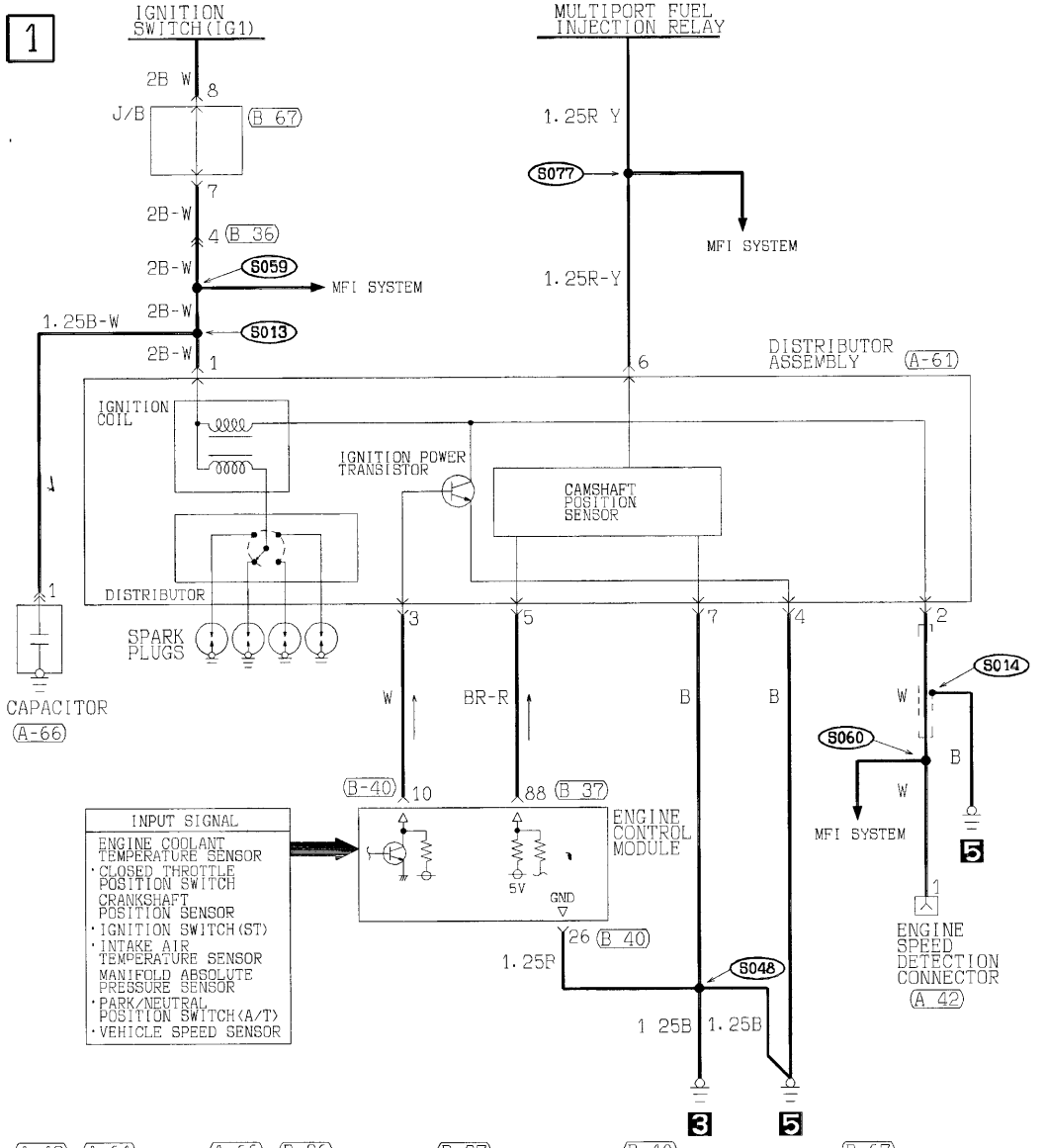
Wire color code

B Black	LG Light green	G Green	L Blue
BR Brown	O Orange	GR Gray	R Red
W White	SB Sky blue	P Pink	Y Yellow
V Violet			

9C02M00AA

IGNITION SYSTEM <1.5L Engine>

90100060971



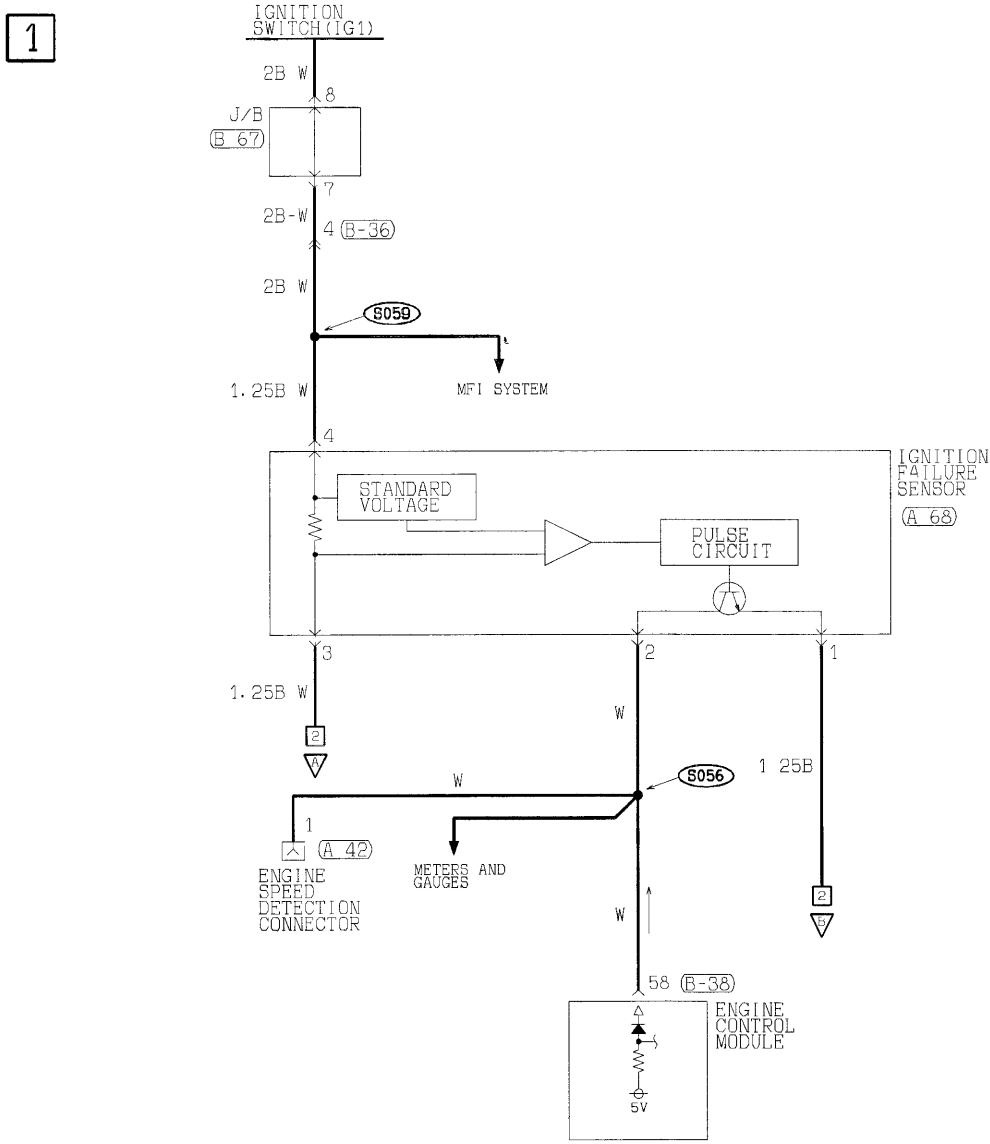
Wire color code

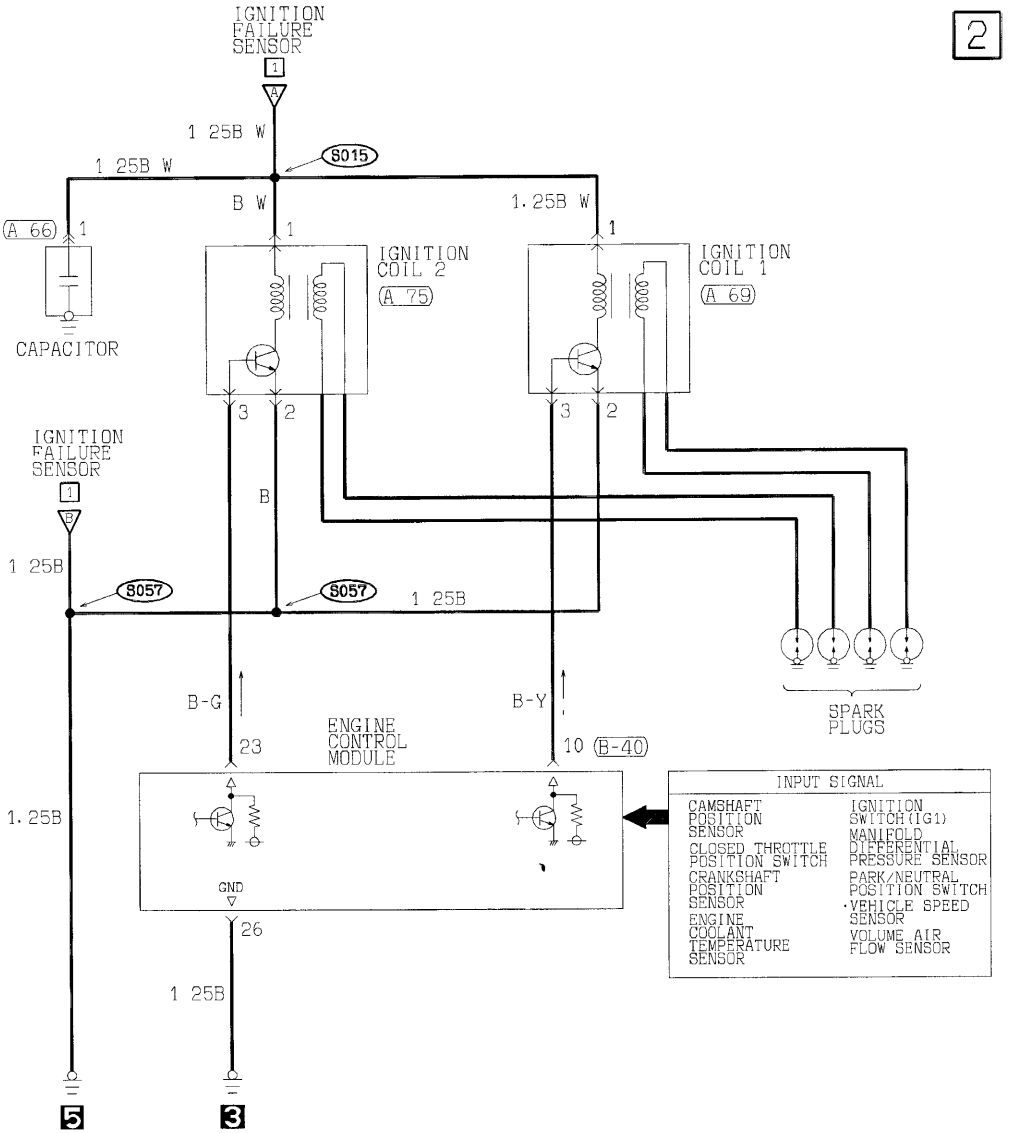
B :Black	LG :Light green	G :Green	L :Blue	W :White	Y :Yellow	SB:Sky blue		
BR :Brown	O :Orange	GR :Gray	R :Red	P :Pink	V :Violet			

9C03M00AA

IGNITION SYSTEM <1.8L Engine>

90100060988



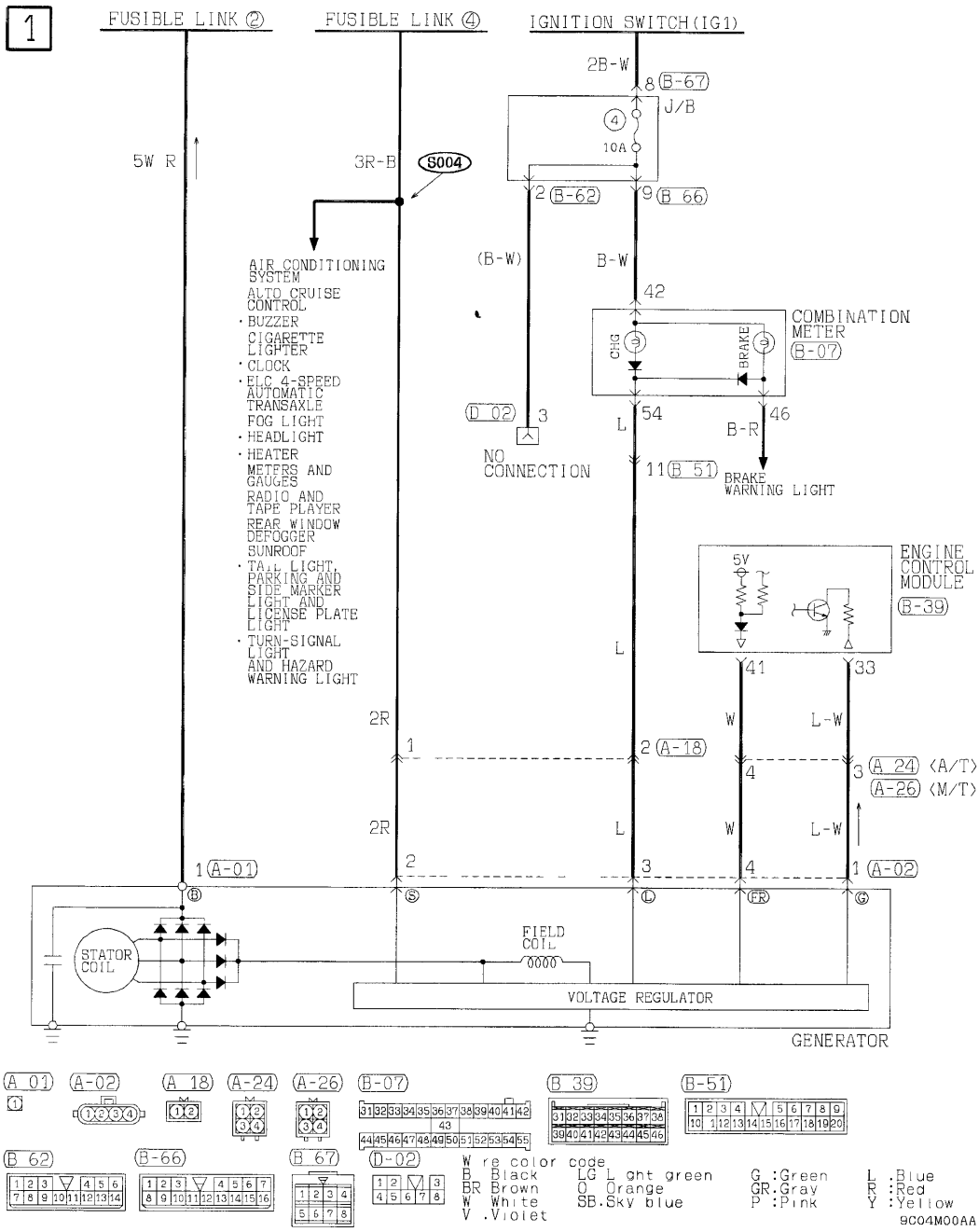


W re color code
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BR Brown O Orange GR:Gray R Red P Pink V :V olet

9C03M01AB

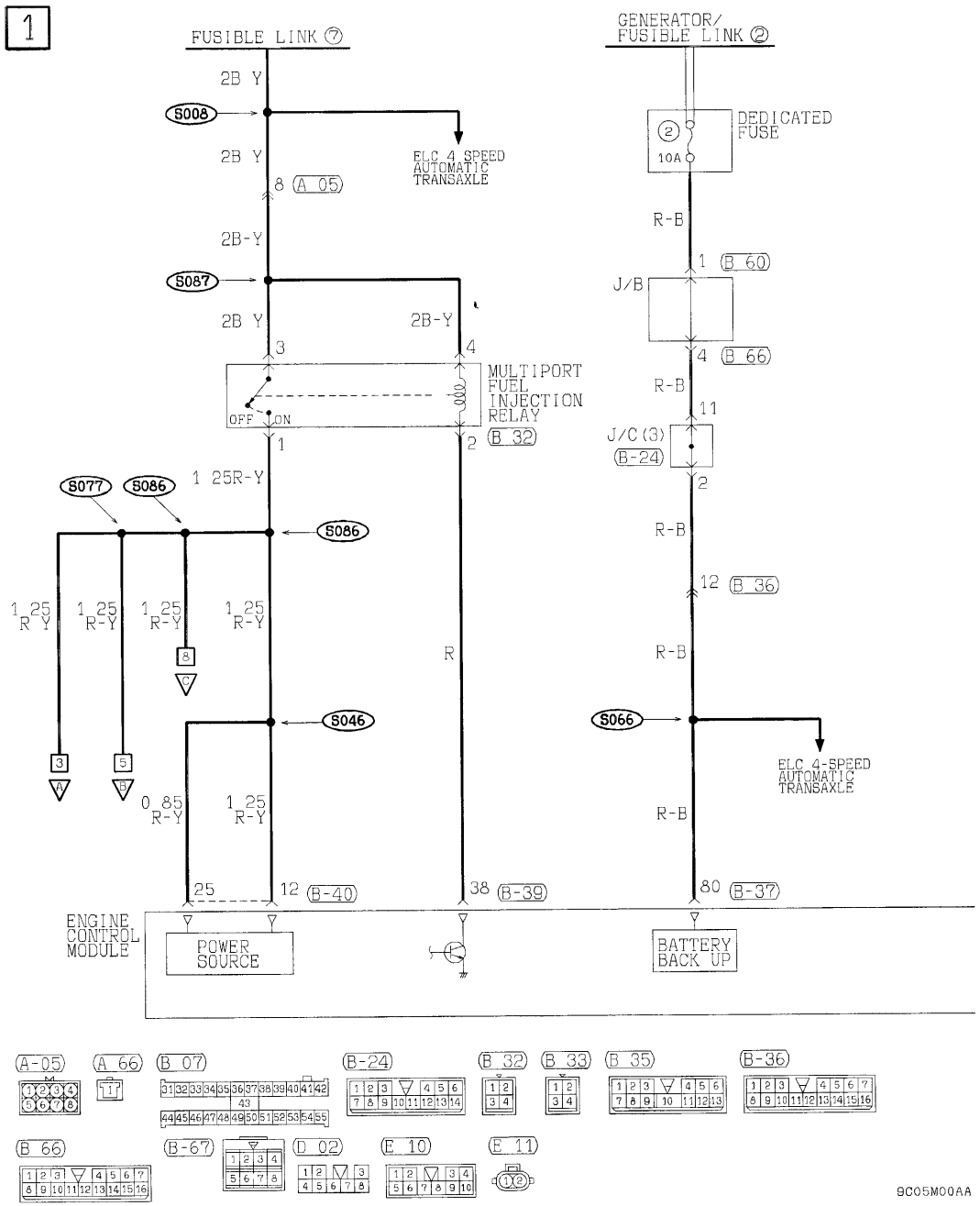
CHARGING SYSTEM

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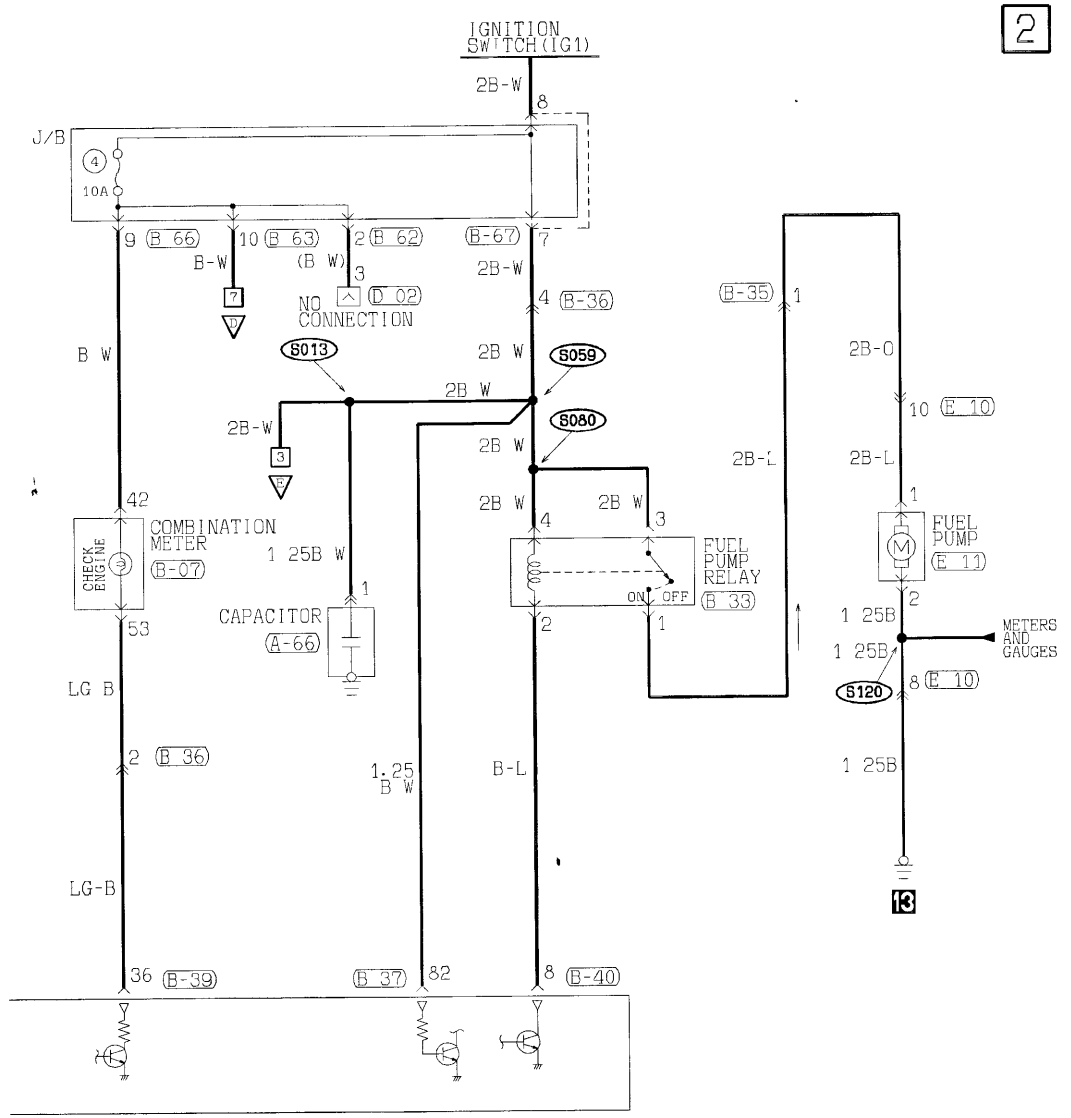


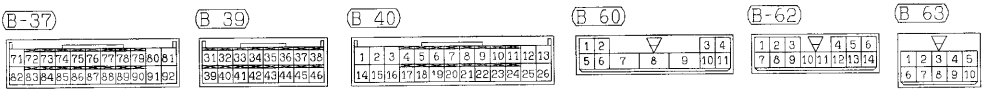
MFI SYSTEM <1.5L Engine>

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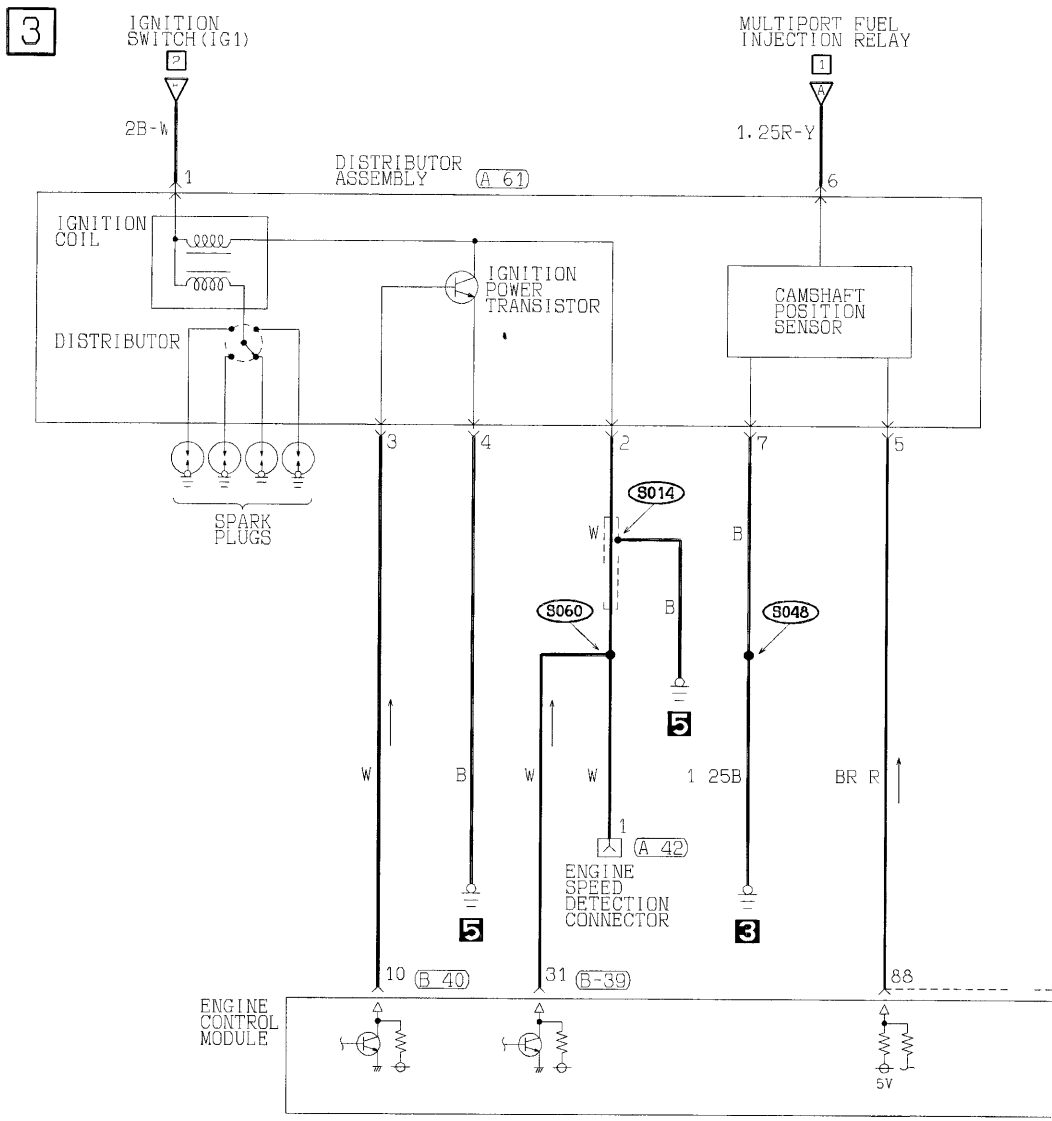


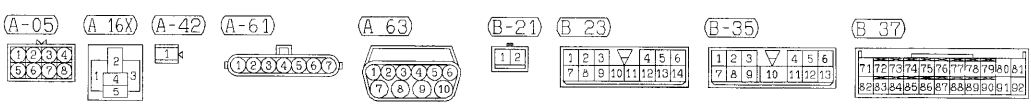


Wire color code
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BR Brown O Orange GR Gray R Red P Pink V Violet

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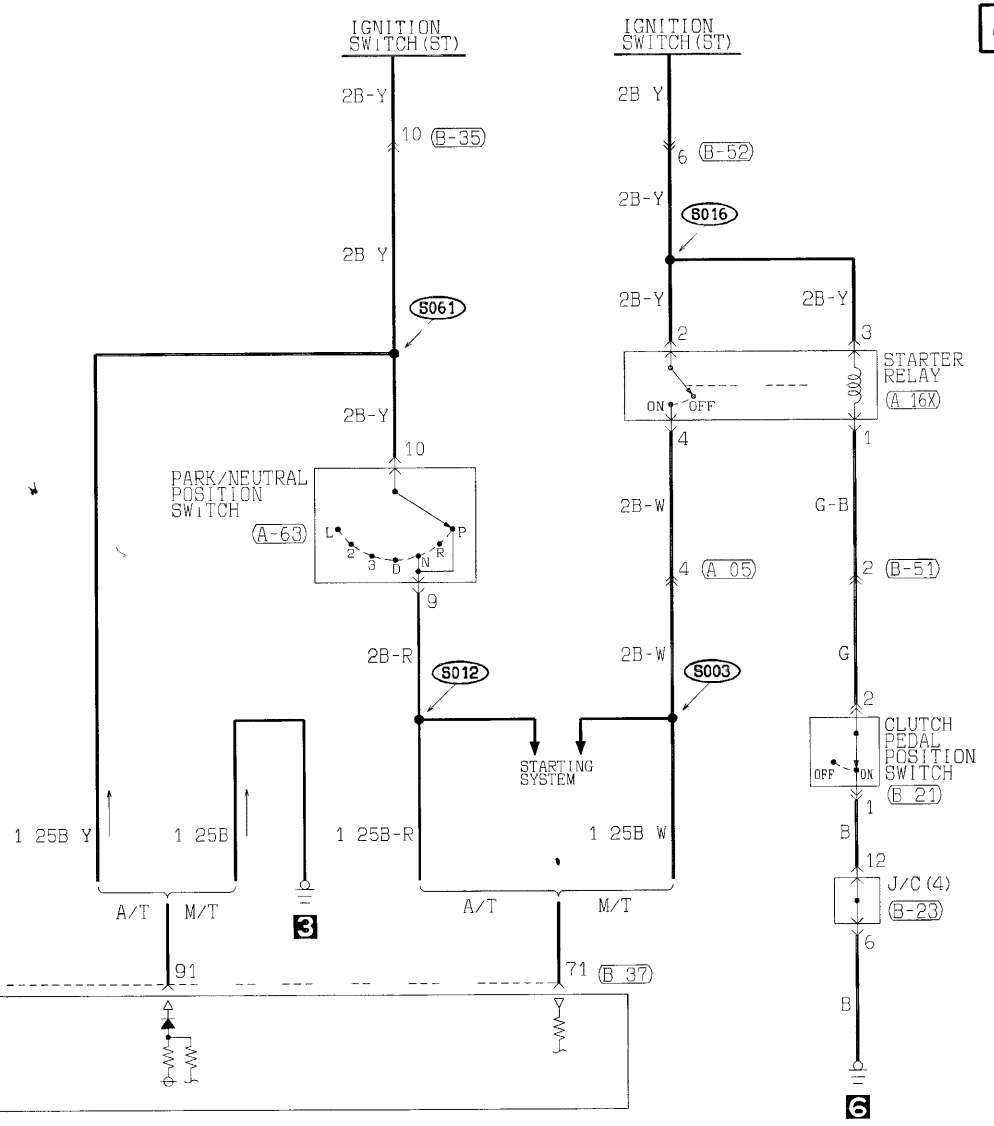
MFI SYSTEM <1.5L Engine> (CONTINUED)



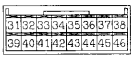


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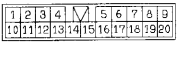
(B 39)



(B-40)



(B-51)



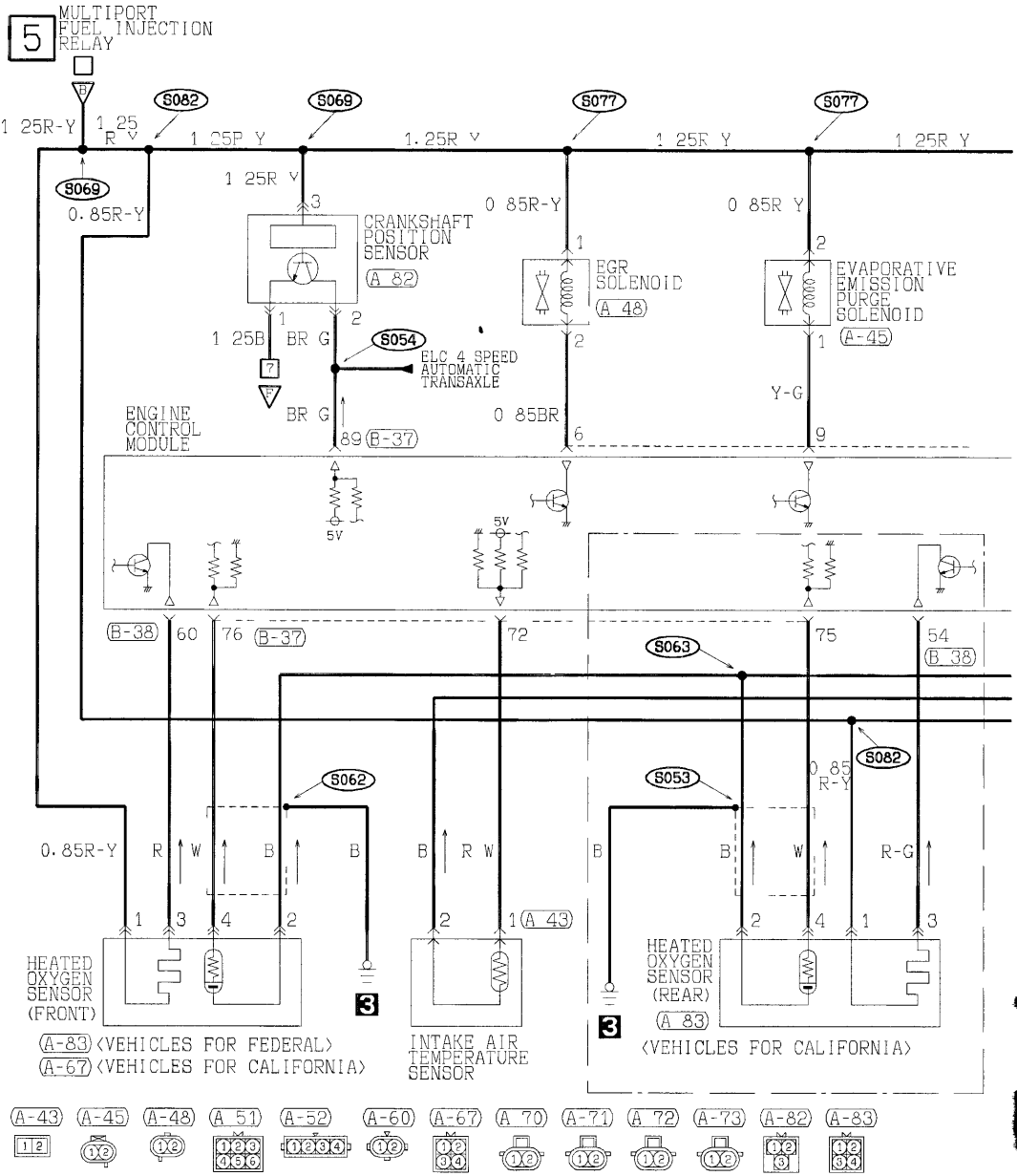
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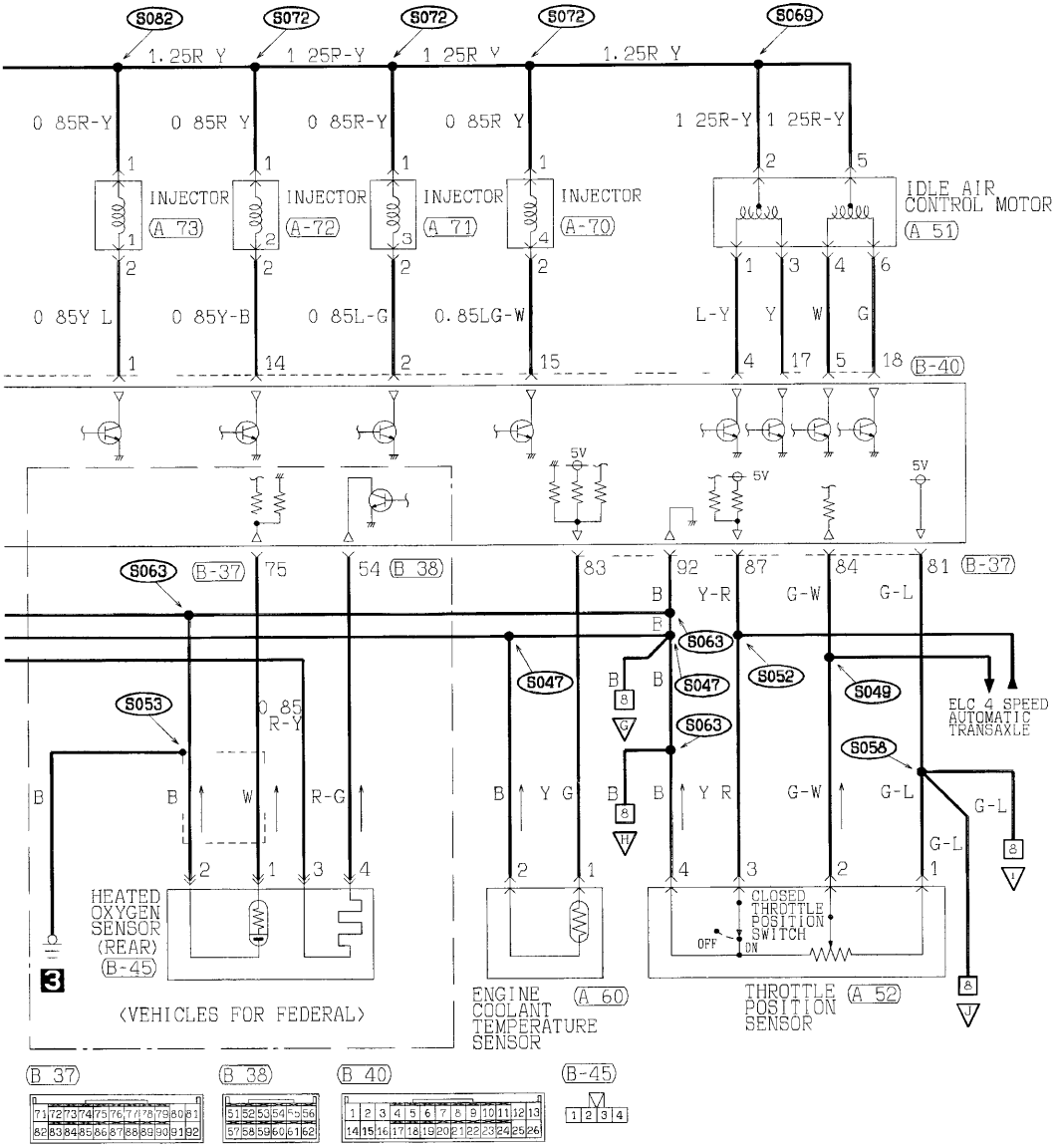
Wire color code

B :Black	LG Light green	G Green	L Blue	W :White	Y :Yellow	SB Sky blue	
BR:Brown	O Orange	GR Gray	R Red	P :Pink	V :Violet		

MFI SYSTEM <1.5L Engine> (CONTINUED)

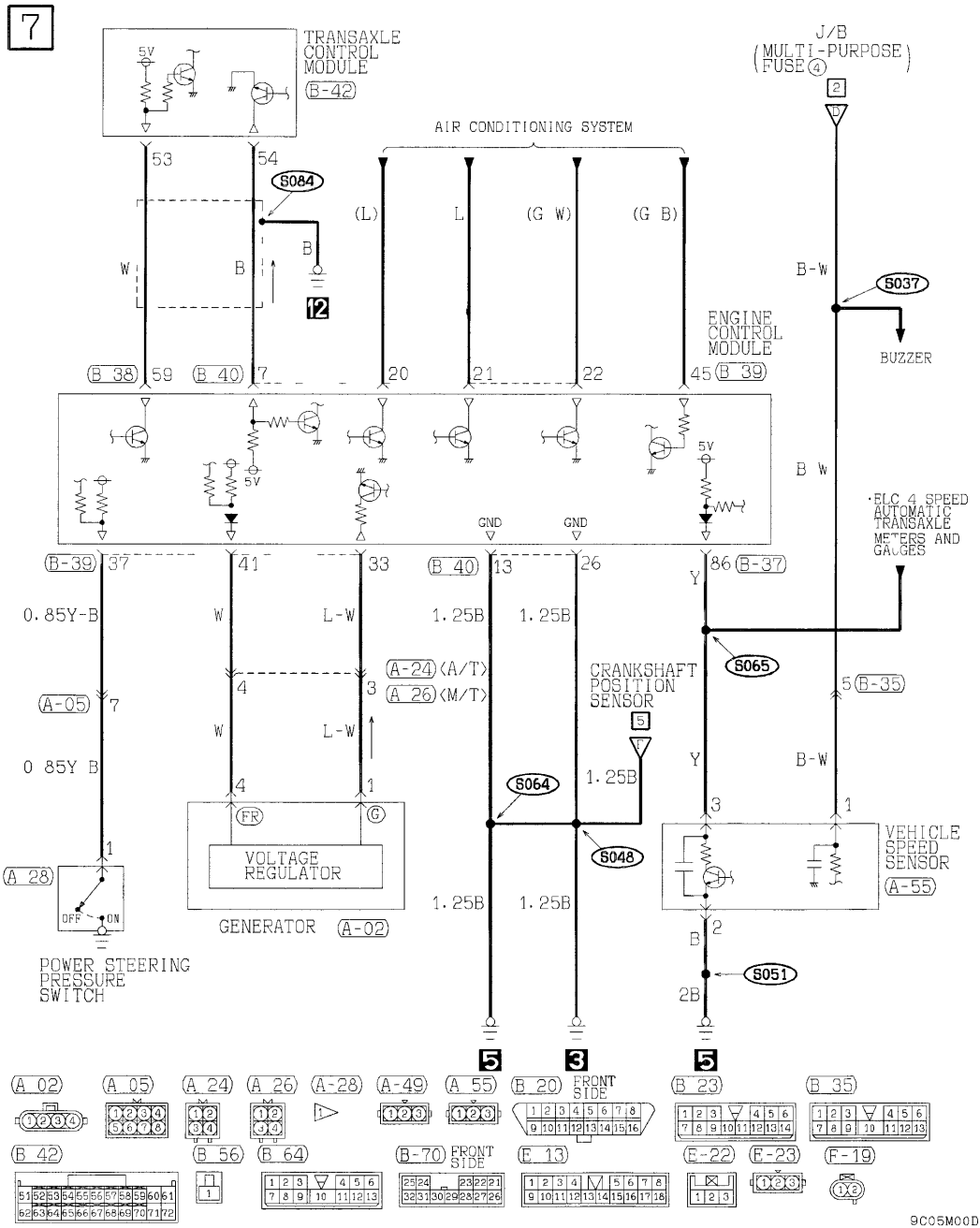


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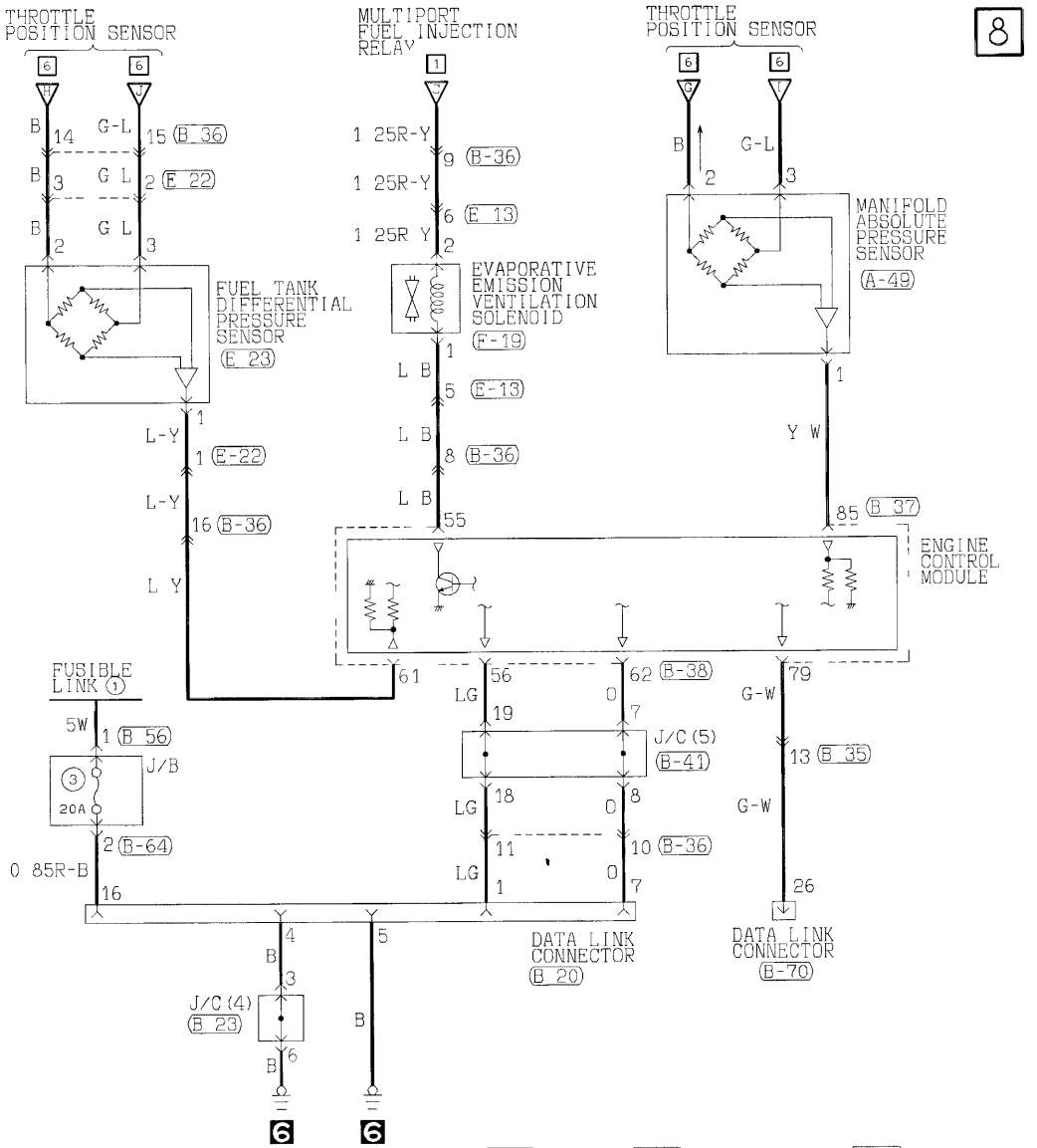


Wire color code
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BR:Brown O Orange GR.Gray R Red P Pink V Violet

MFI SYSTEM <1.5L Engine> (CONTINUED)



9C05M00DA

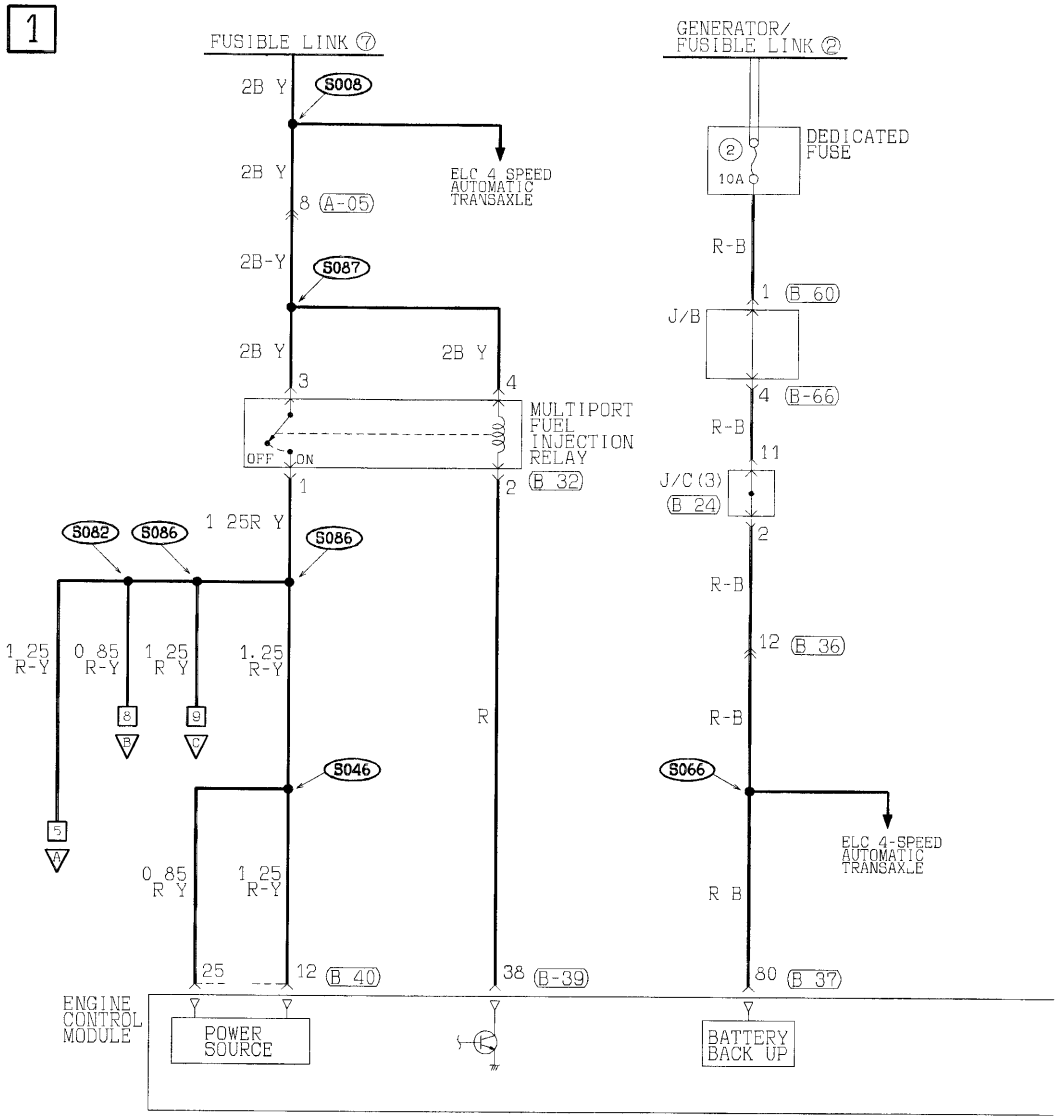


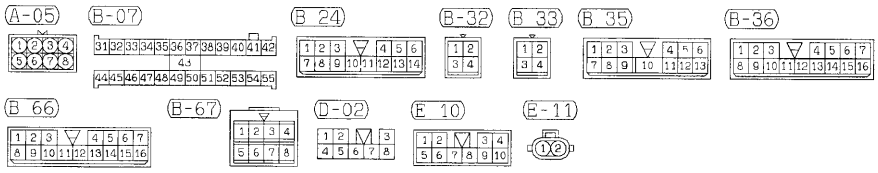
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BR·Brown O Orange GR Gray R Red P·Pink V Violet

9C05M00DB

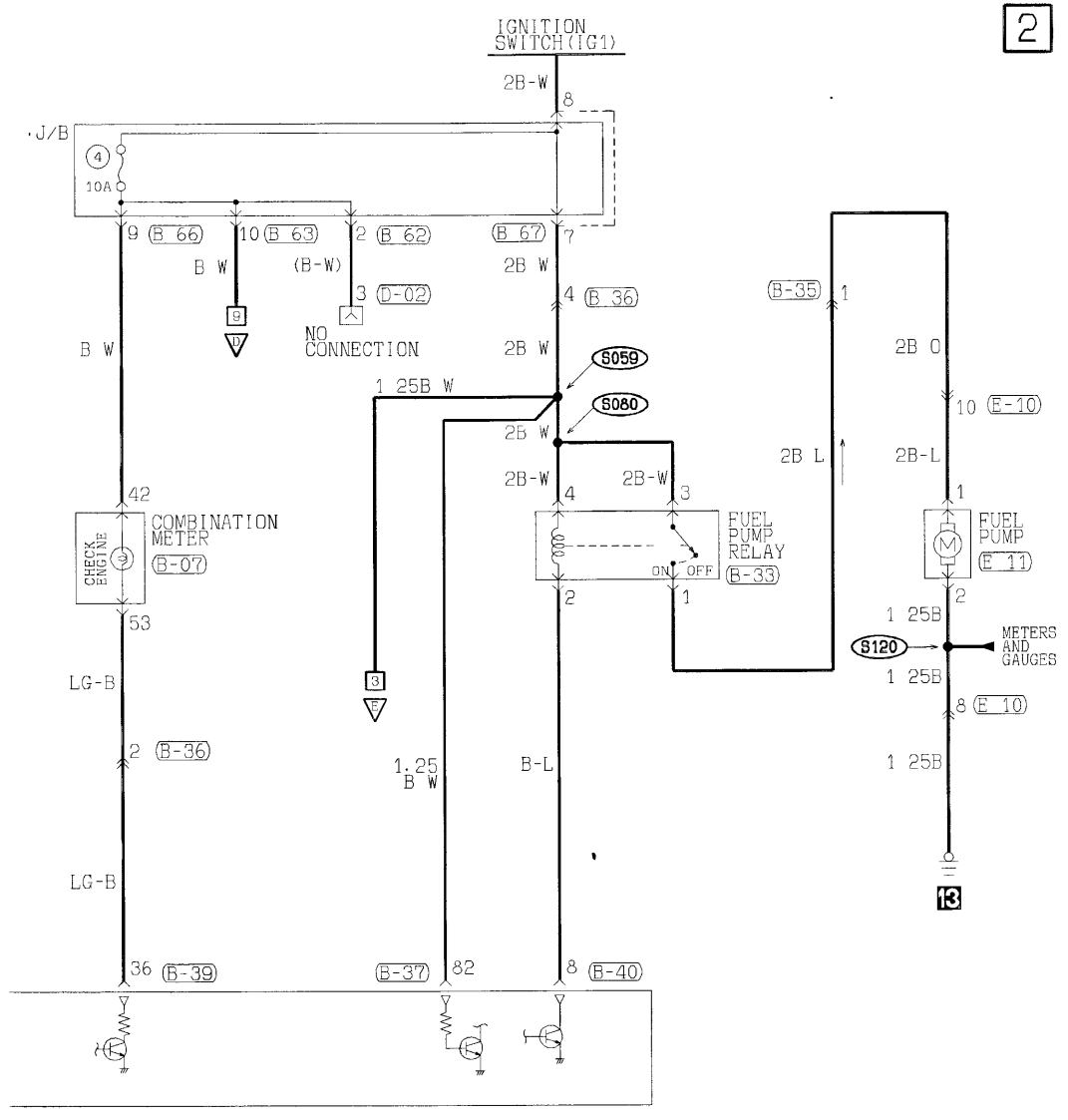
MFI SYSTEM <1.8L Engine>

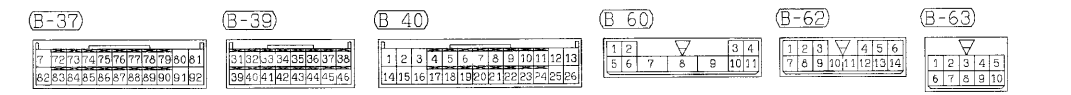
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9C05M01AA

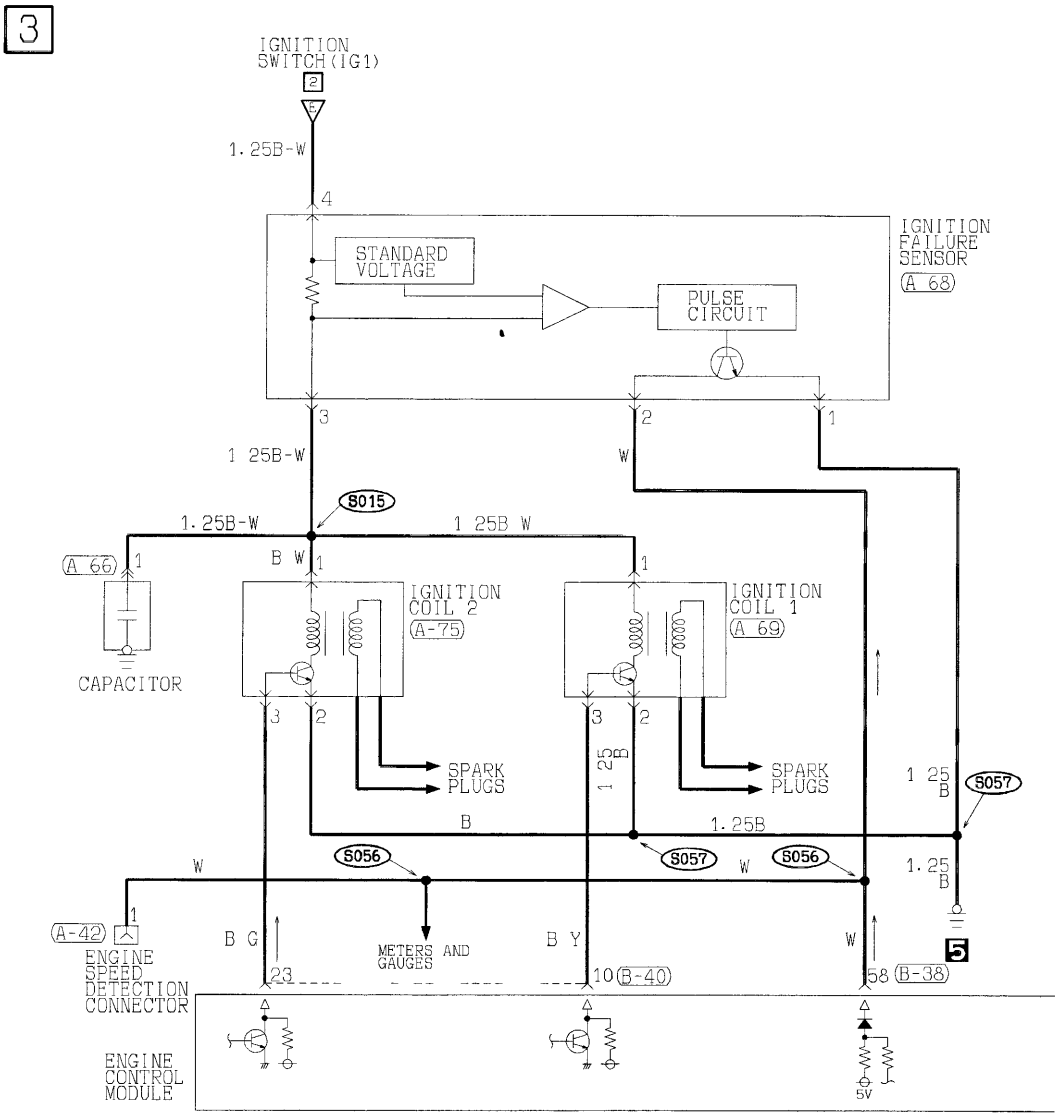




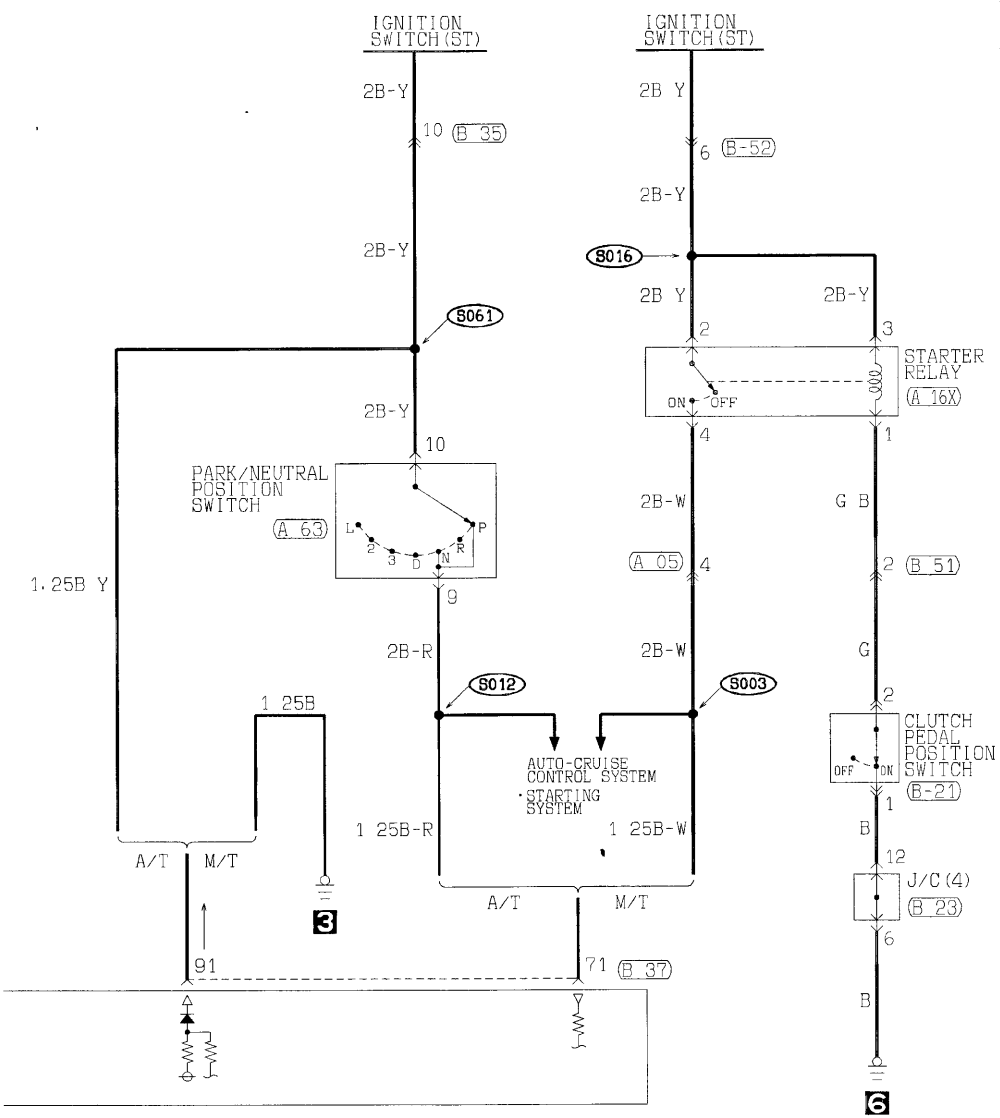
Wire color code
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BR :Brown O :Orange GR :Gray R :Red P :Pink V :Violet

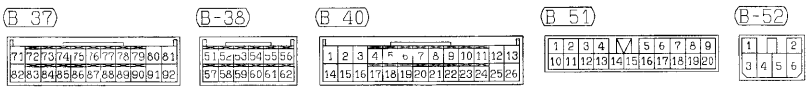
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MFI SYSTEM <1.8L Engine> (CONTINUED)



4



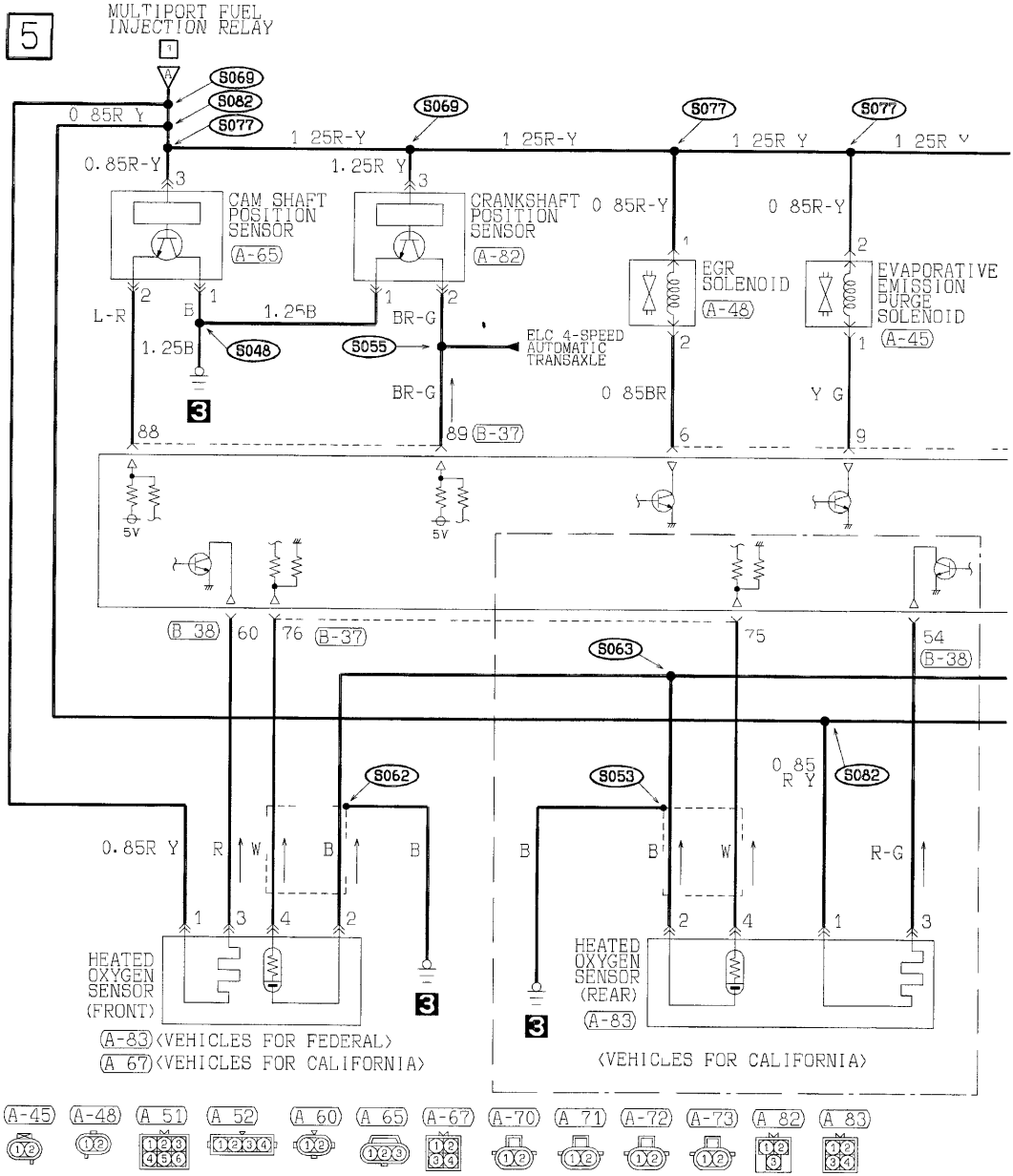


Wire color code

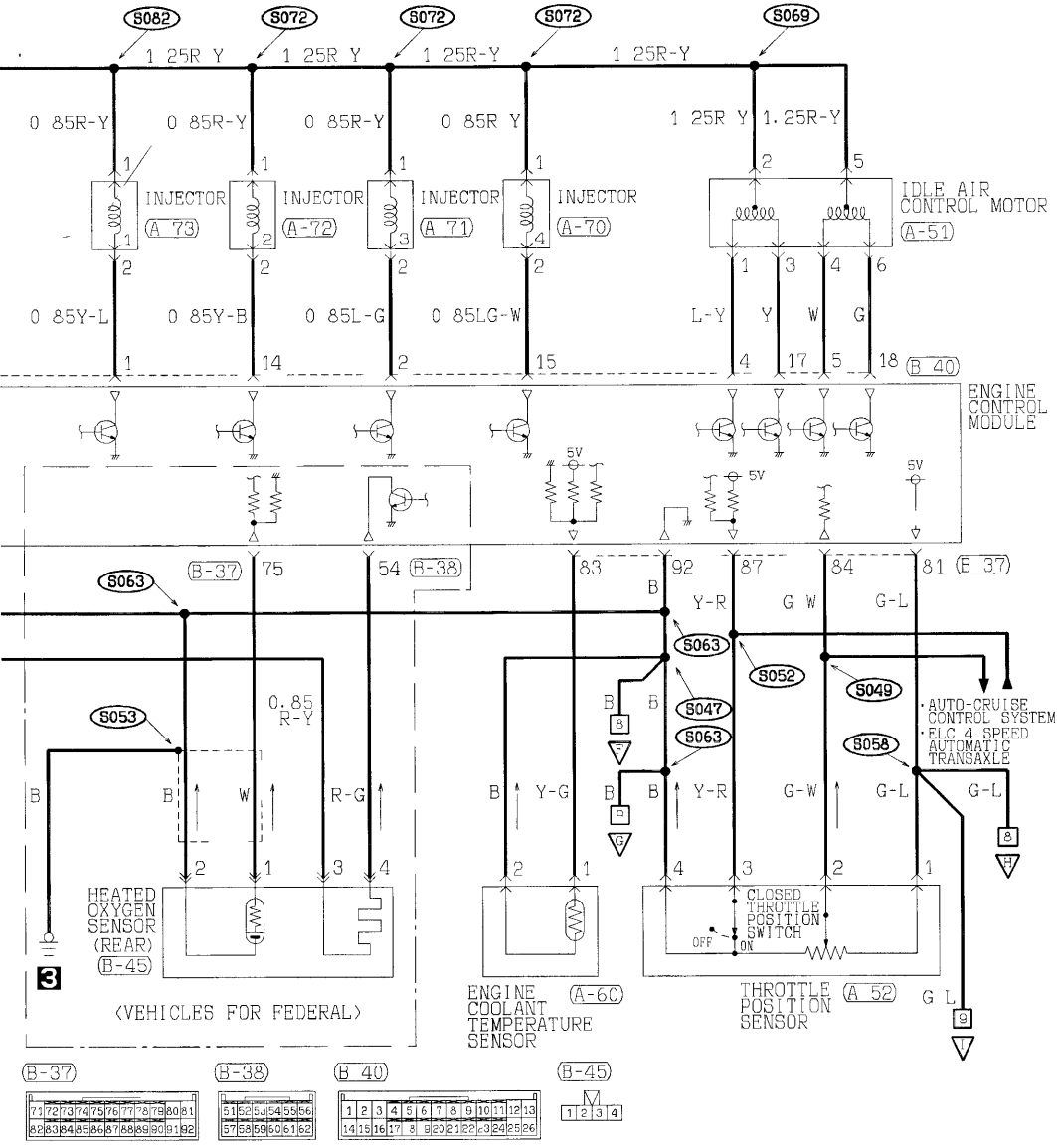
B: Black	LG: Light green	G: Green	L: Blue	W: White	Y: Yellow	SB: Sky blue	
BR: Brown	O: Orange	GR: Gray	R: Red	P: Pink	V: Violet		

9C05M01BB

MFI SYSTEM <1.8L Engine> (CONTINUED)



6



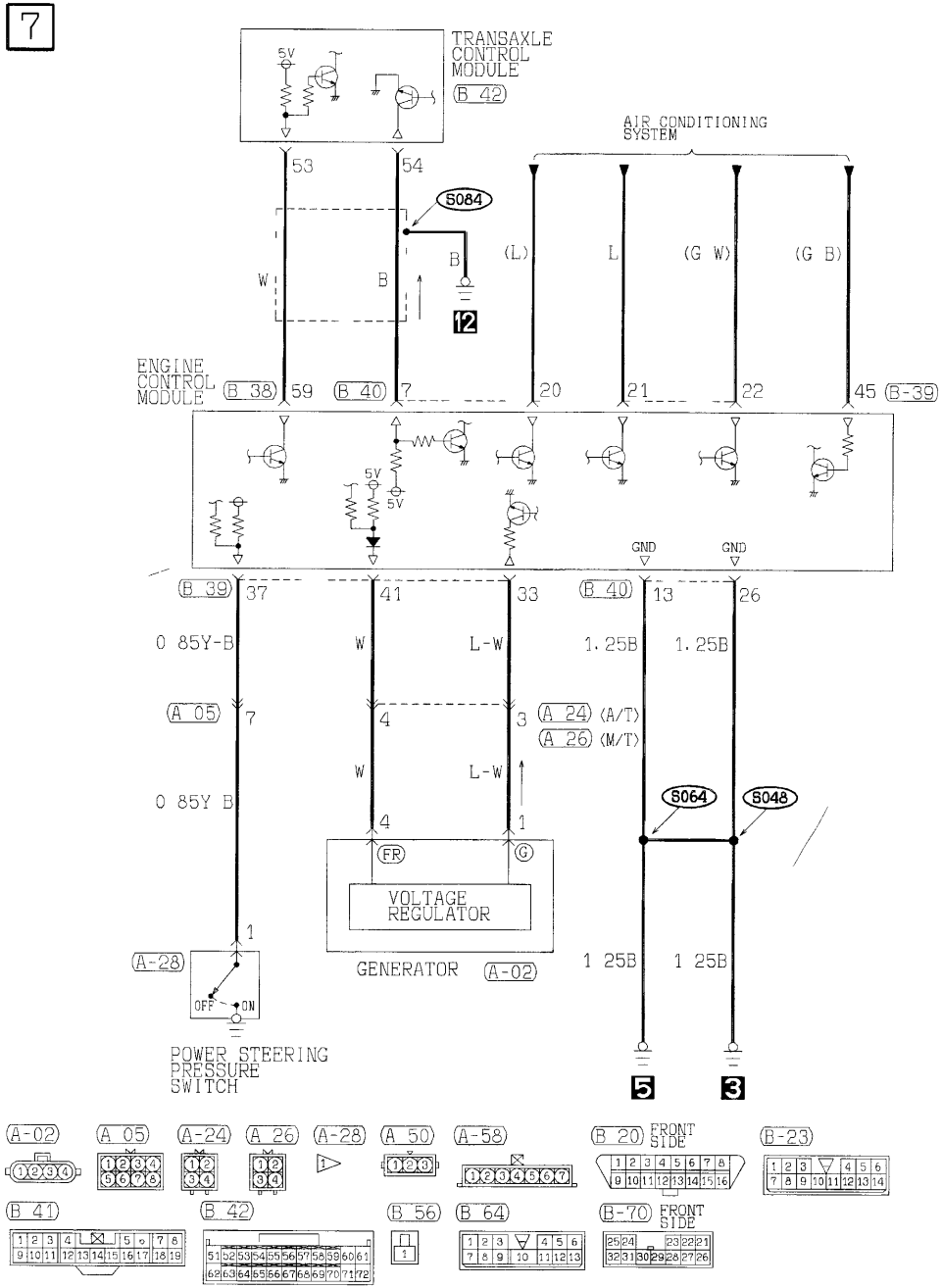
Wire color code

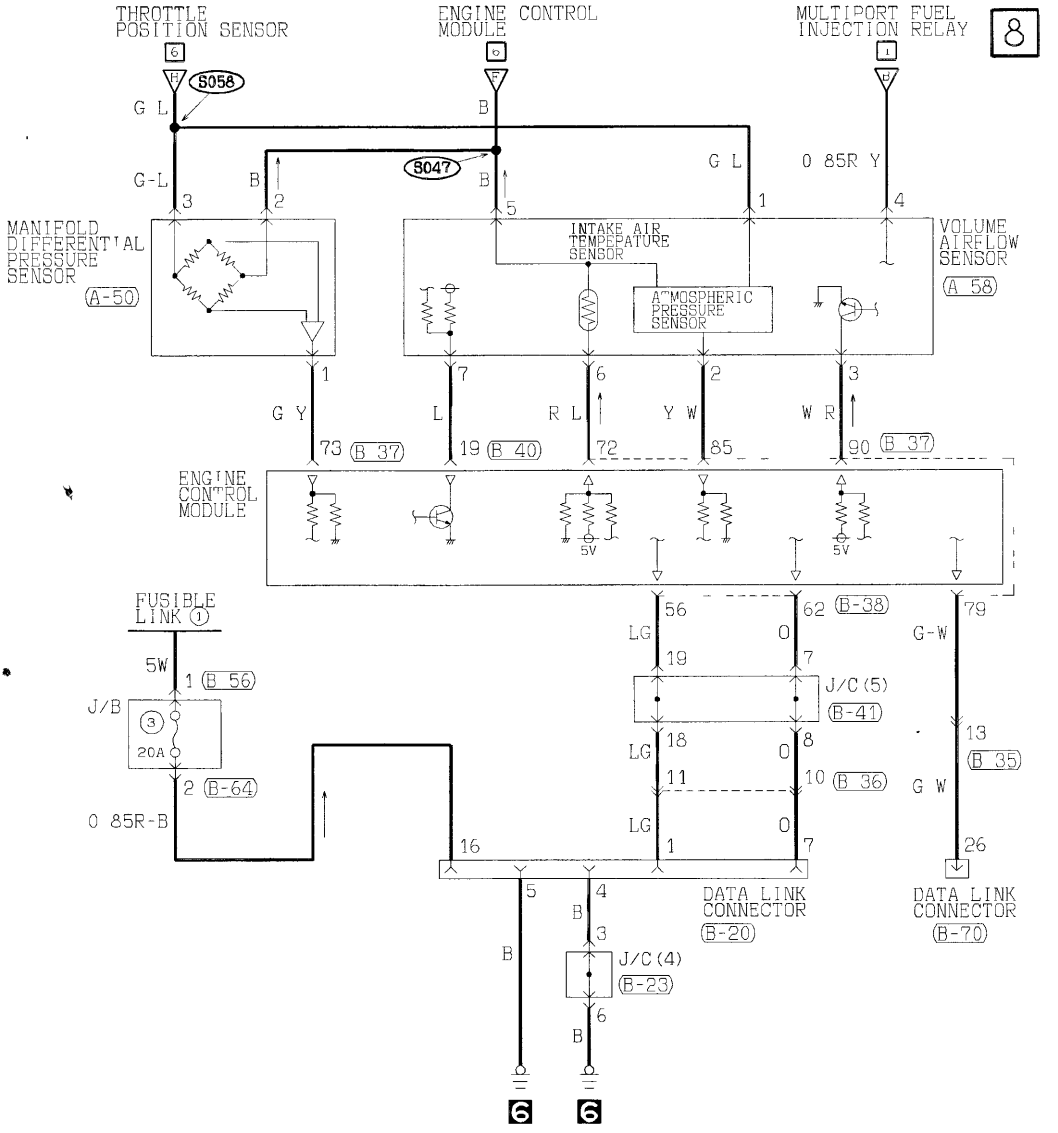
B :Black	LG Light green	G :Green	L Blue	W Wh te	Y .Yellow	SB Sky blue
BR.Brown	O Orange	GR:Gray	R Red	P Pink	V Violet	

9C05M01CB

MFI SYSTEM <1.8L Engine> (CONTINUED)

7





B-35

1	2	3		4	5	6
7	8	9	10	11	12	13

B-36

1	2	3		4	5	6	7
8	9	10	11	12	13	14	15	16

B 37

71	72	73	74	75	76	77	78	79	80	81									
82	83	84	85	86	87	88	89	90	91	92									

B 38

51	52	53	54	55	56														
57	58	59	60	61	62														

B 39

31	32	33	34	35	36	37	38												
39	40	41	42	43	44	45	46												

B-40

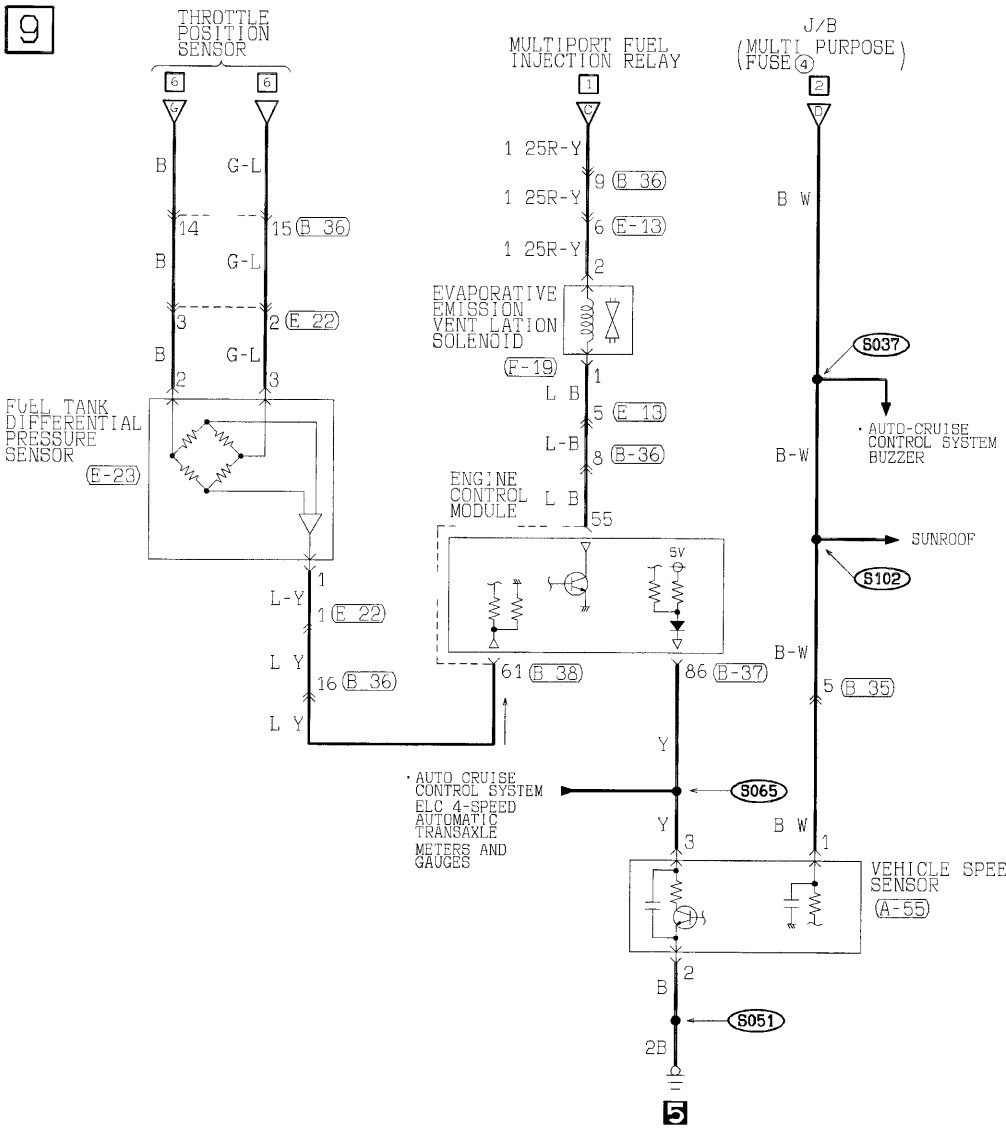
1	2	3	4	5	6	7	8	9	10	11	12	13							
14	15	16	17	18	19	20	21	22	23	24	25	26							

Wire color code

B Black	LG Light green	G Green	L Blue	W White	Y Yellow	SB Sky blue	
BR Brown	O Orange	GR Gray	R Red	P Pink	V Violet		

9C05M01DB

MFI SYSTEM <1.8L Engine> (CONTINUED)



A 55 B 35 B-36 B 37 B-38 E-13 E-22 E 23

F-19

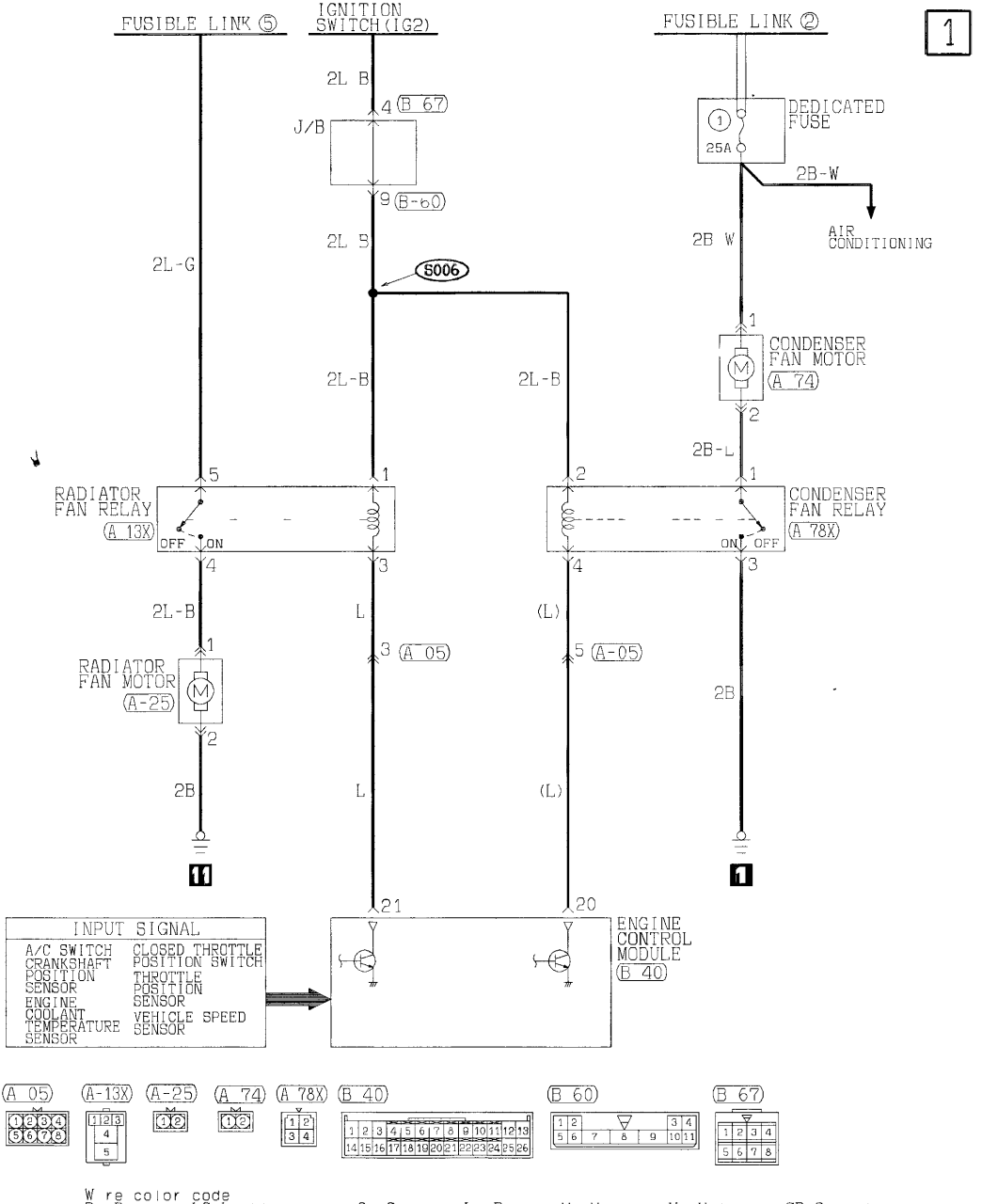
Wire color code

B Black	LG Light green	G Green	L Blue		
BR Brown	O Orange	GR Gray	R Red		
W White	SB Sky blue	P Pink	Y Yellow		
V Violet					

9C05M

COOLING SYSTEM

90100100796

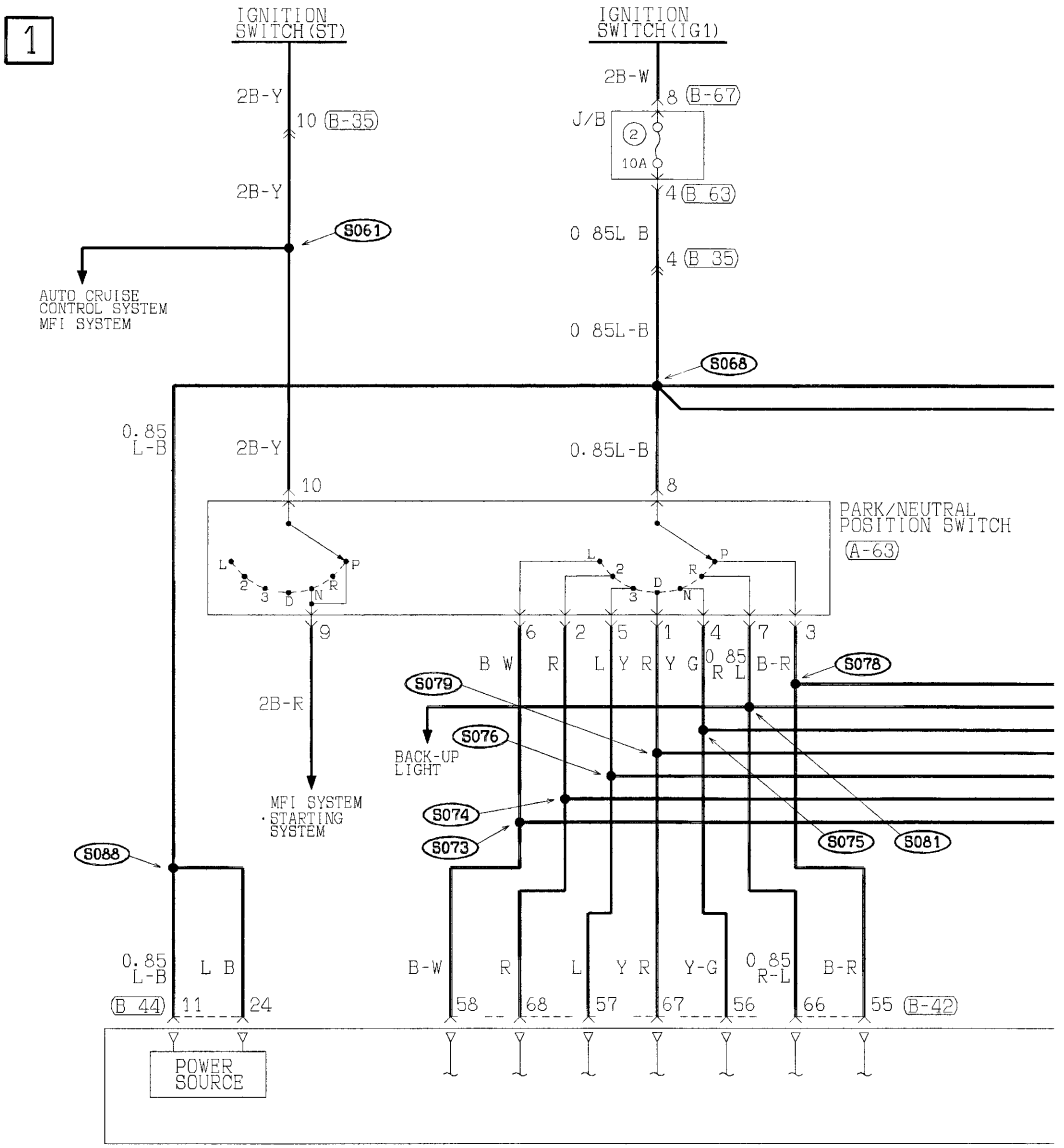


W re color code
B :Black LG Light green G :Green L :Blue W Wh te Y :Yellow SB Sky blue
BR Brown O Orange GR Gray R :Red P Pink V :V olet

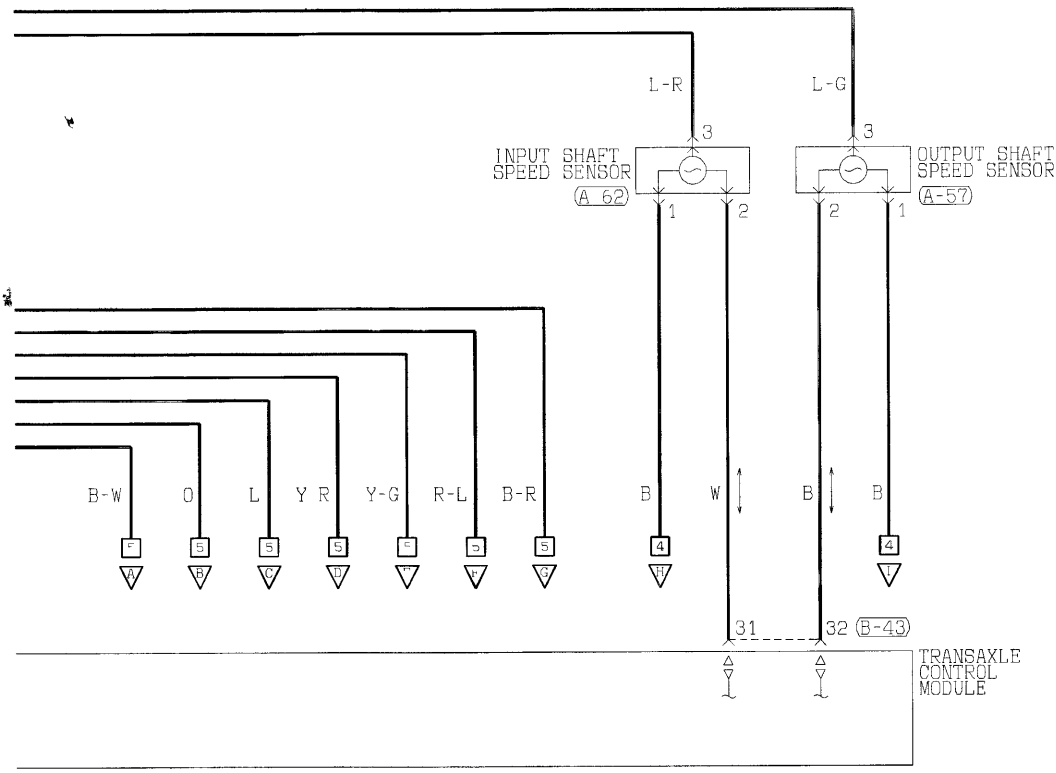
9C06M00AA

ELC 4-SPEED AUTOMATIC TRANSAXLE

90100120754



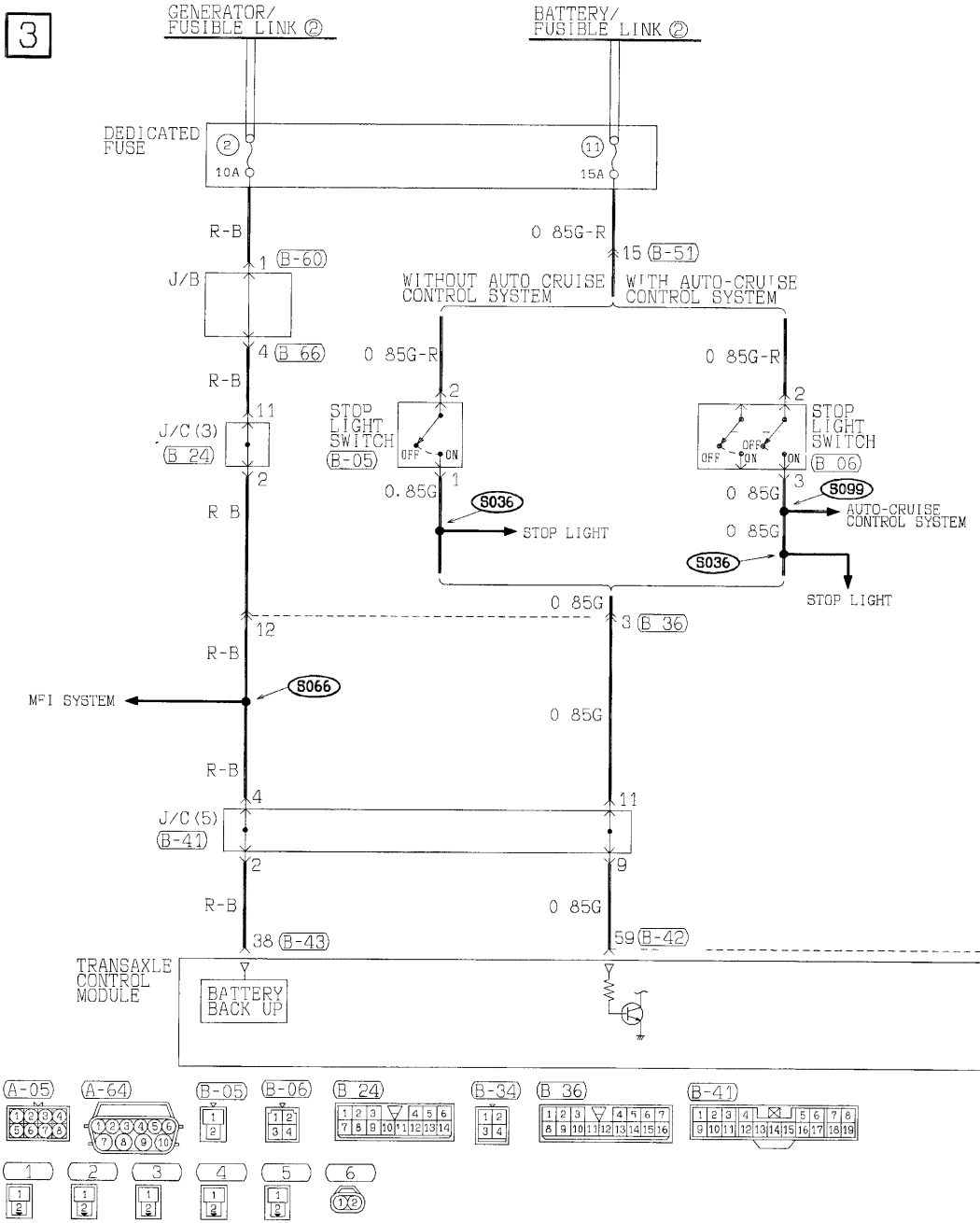
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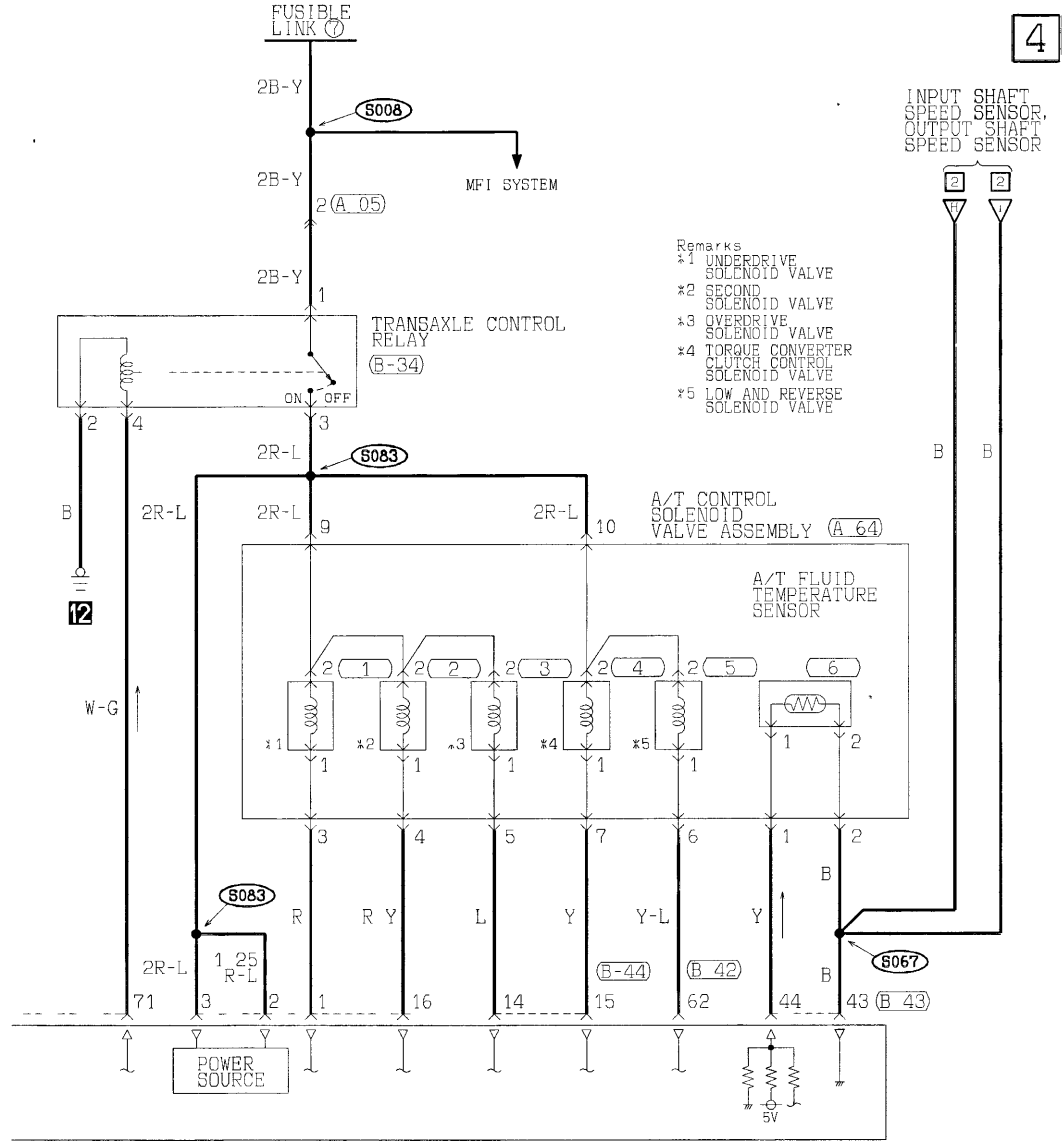
Wire color code
B :Black LG L ght green G :Green L :Blue W White Y :Yellow SB Sky blue
BR:Brown O Orange GR.Gray R Red P P nk V :Violet

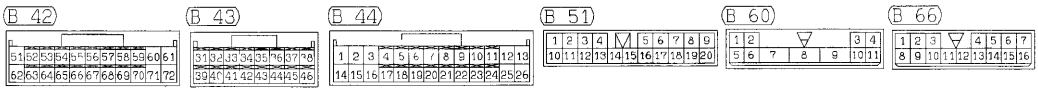
9C07M00AB

ELC 4-SPEED AUTOMATIC TRANSAXLE (CONTINUED)



9C07M00BA

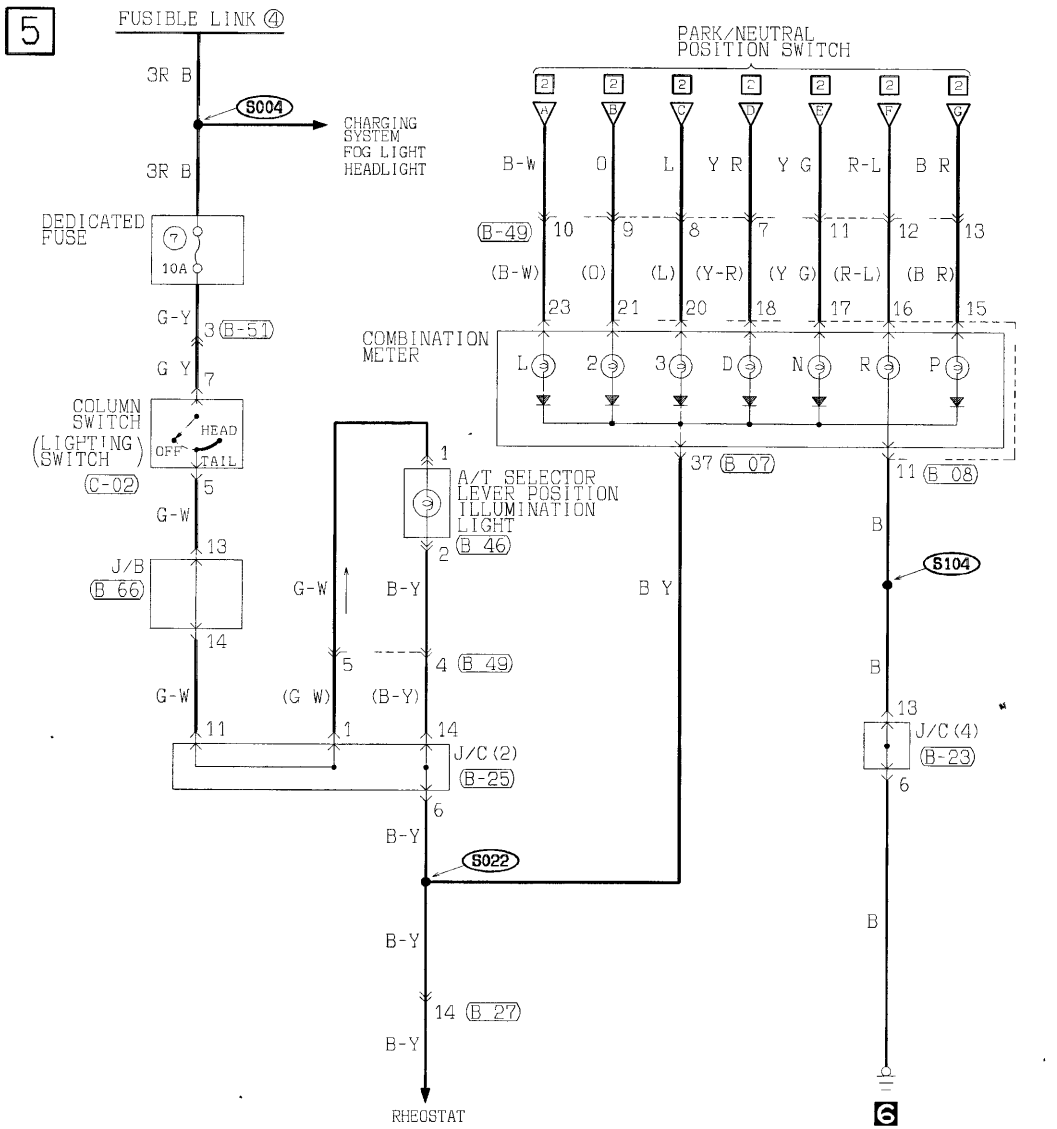


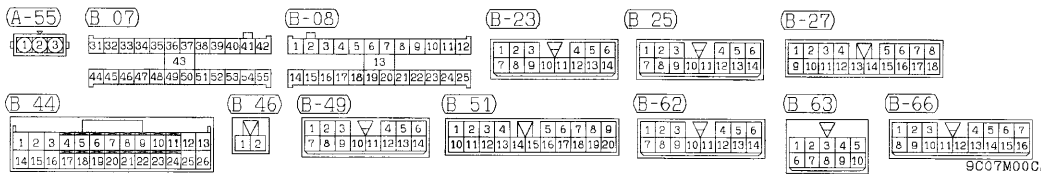


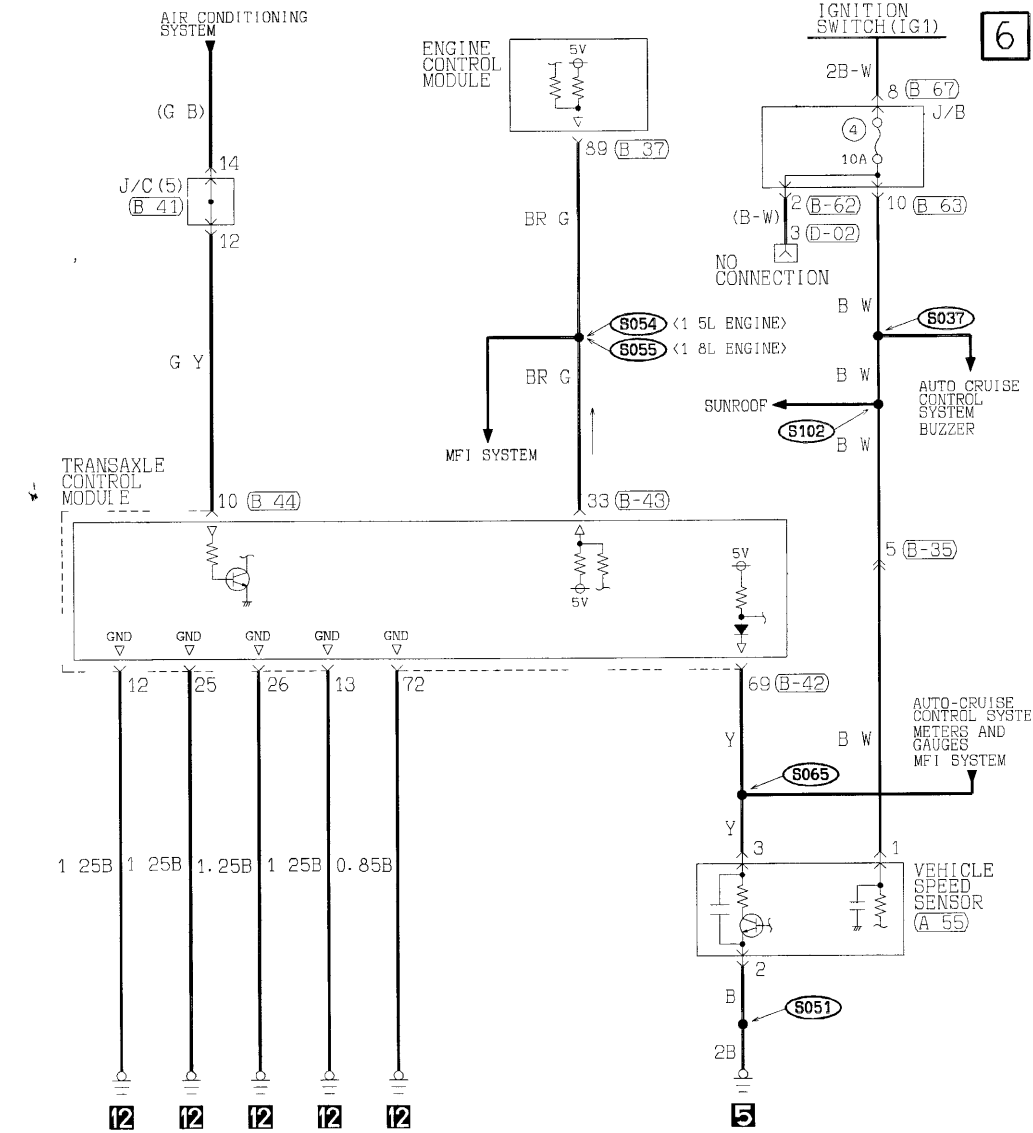
W re color code
B :Black LG :Light green G :Green L :Blue W :Wh te Y :Yellow SB :Sky blue
BR :Brown O :Orange GR :Gray R :Red P :P nk V :Violet

9C07M00BB

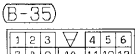
ELC 4-SPEED AUTOMATIC TRANSAXLE (CONTINUED)







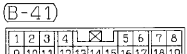
(B-35)



(B 37)



(B-41)



(B 42)



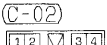
(B 43)



(B 67)



(C-02)



(D 02)



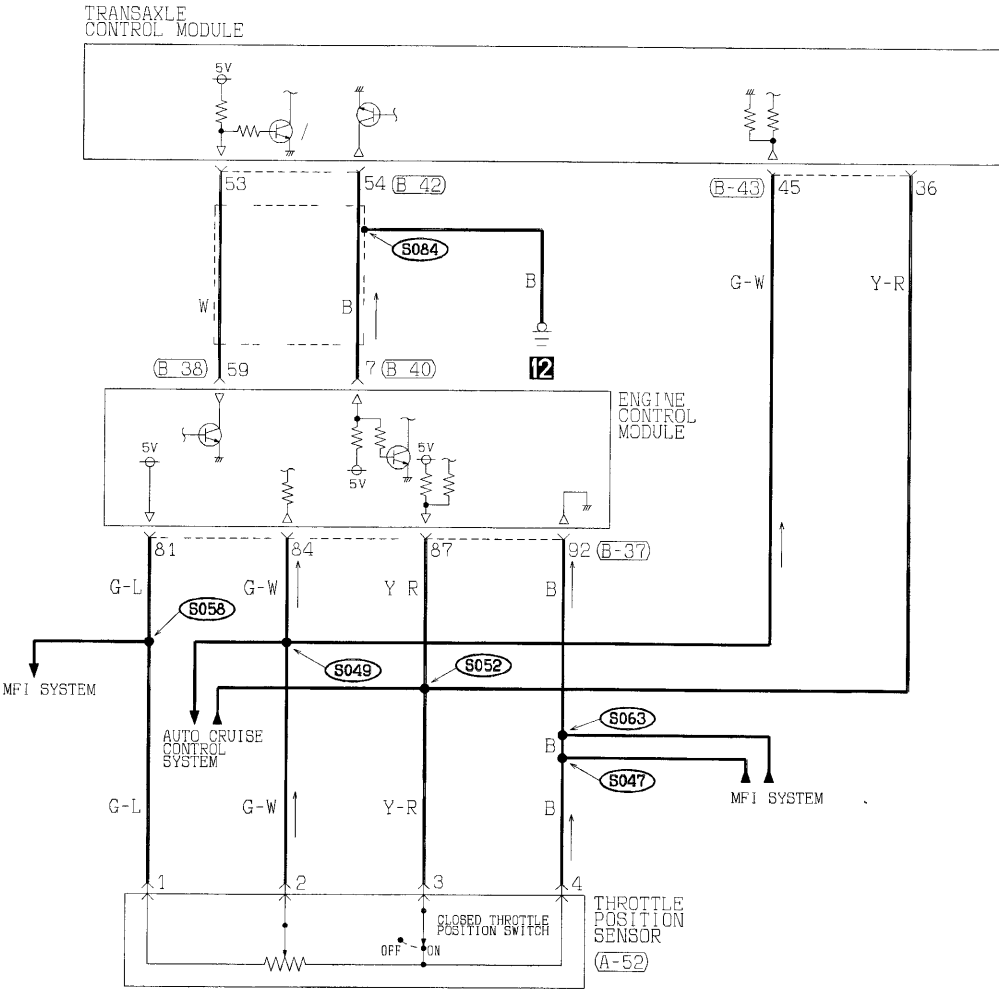
Wire color code

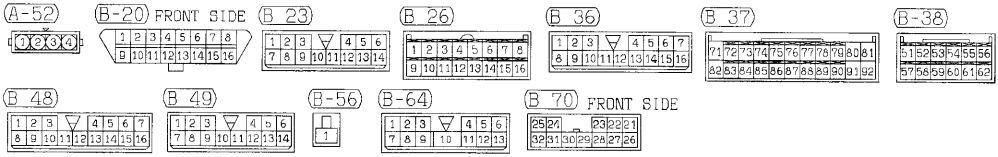
B Black	LG Light green	G Green	L Blue
BR Brown	O Orange	GR Gray	R Red
W White	SB Sky blue	P Pink	Y Yellow
V Violet			

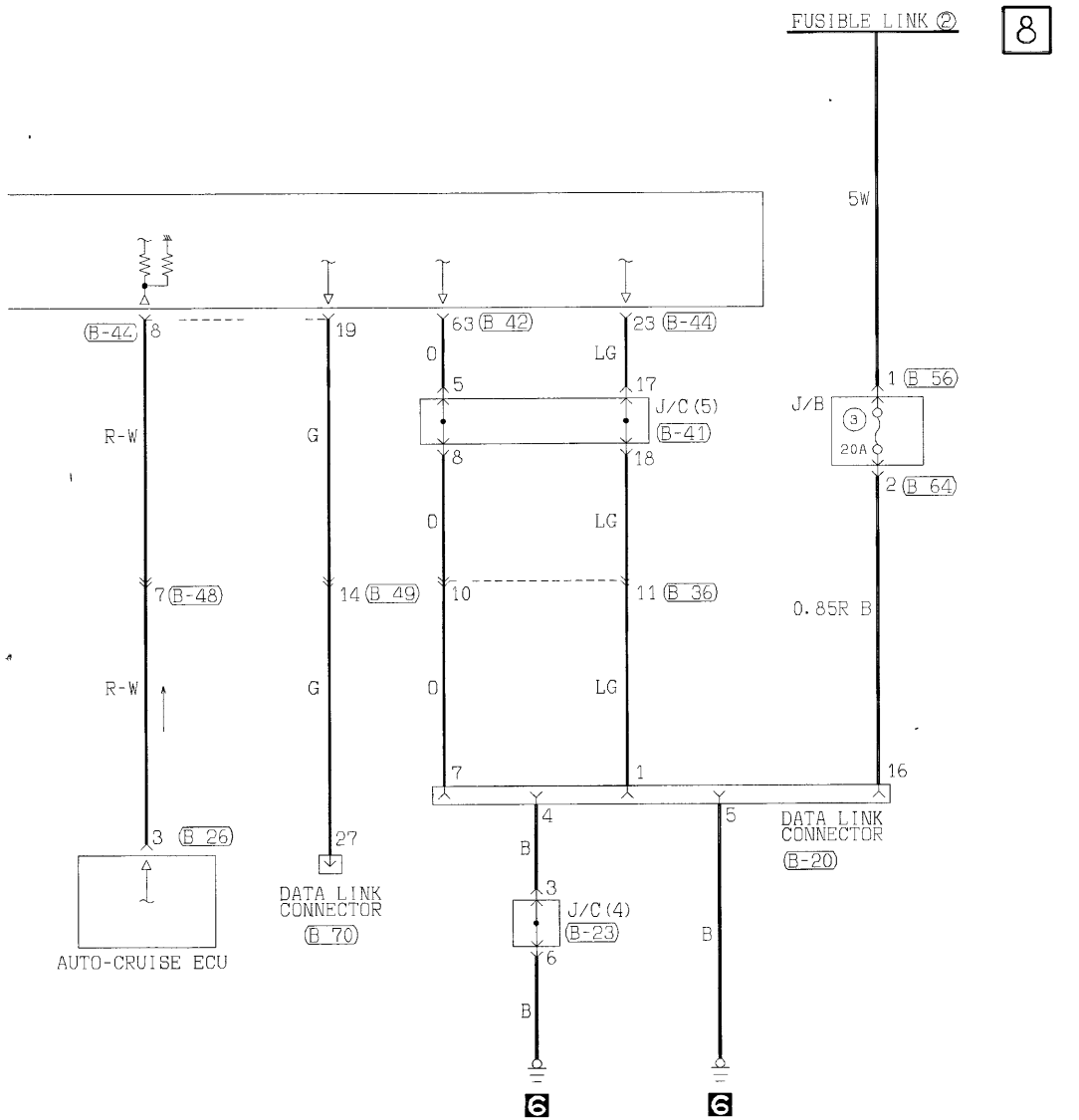
9C07M00CB

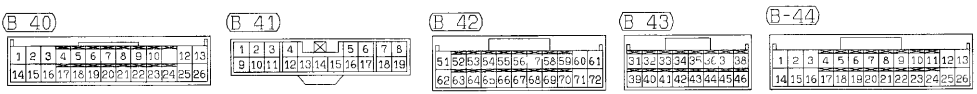
ELC 4-SPEED AUTOMATIC TRANSAXLE (CONTINUED)

7







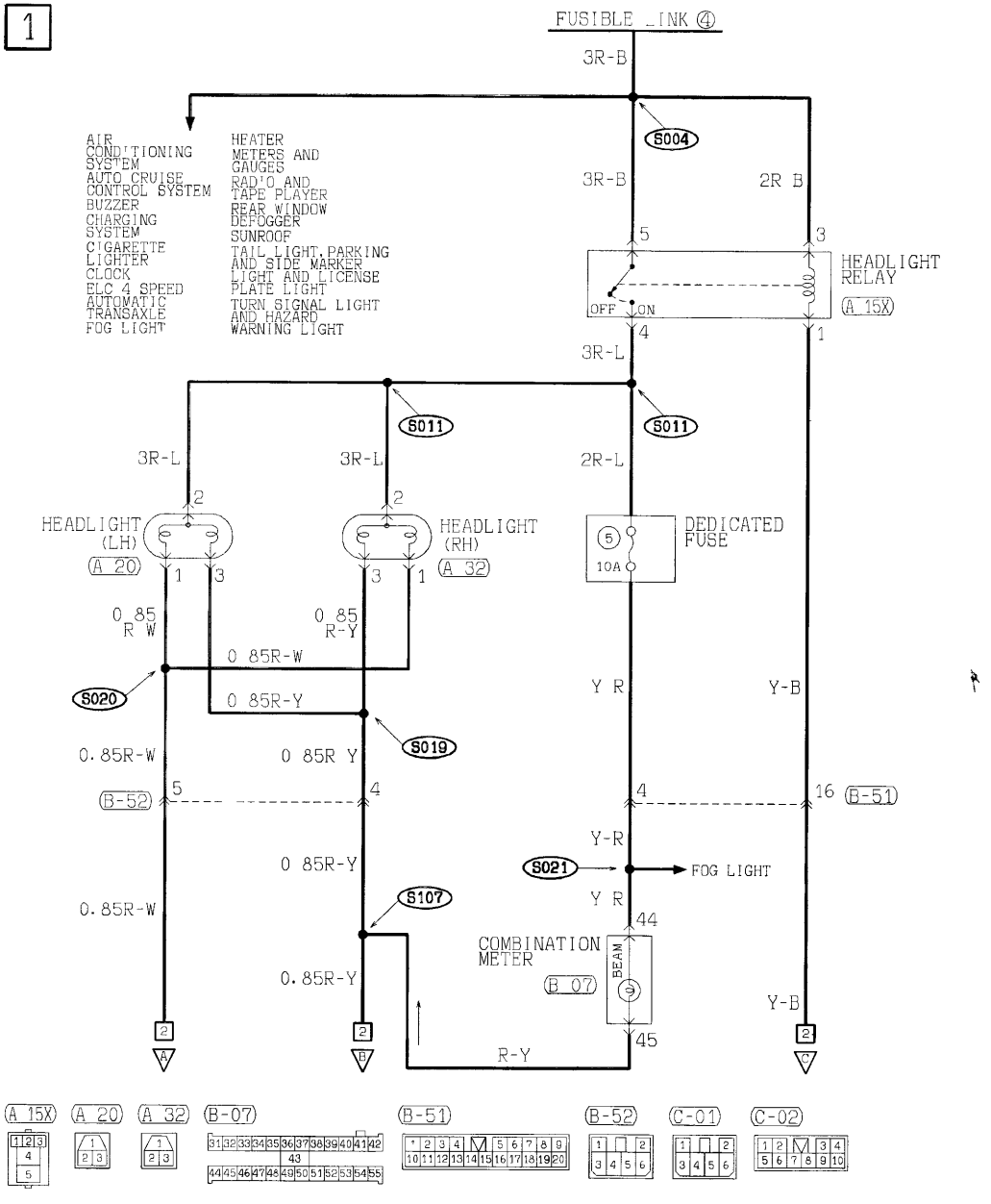


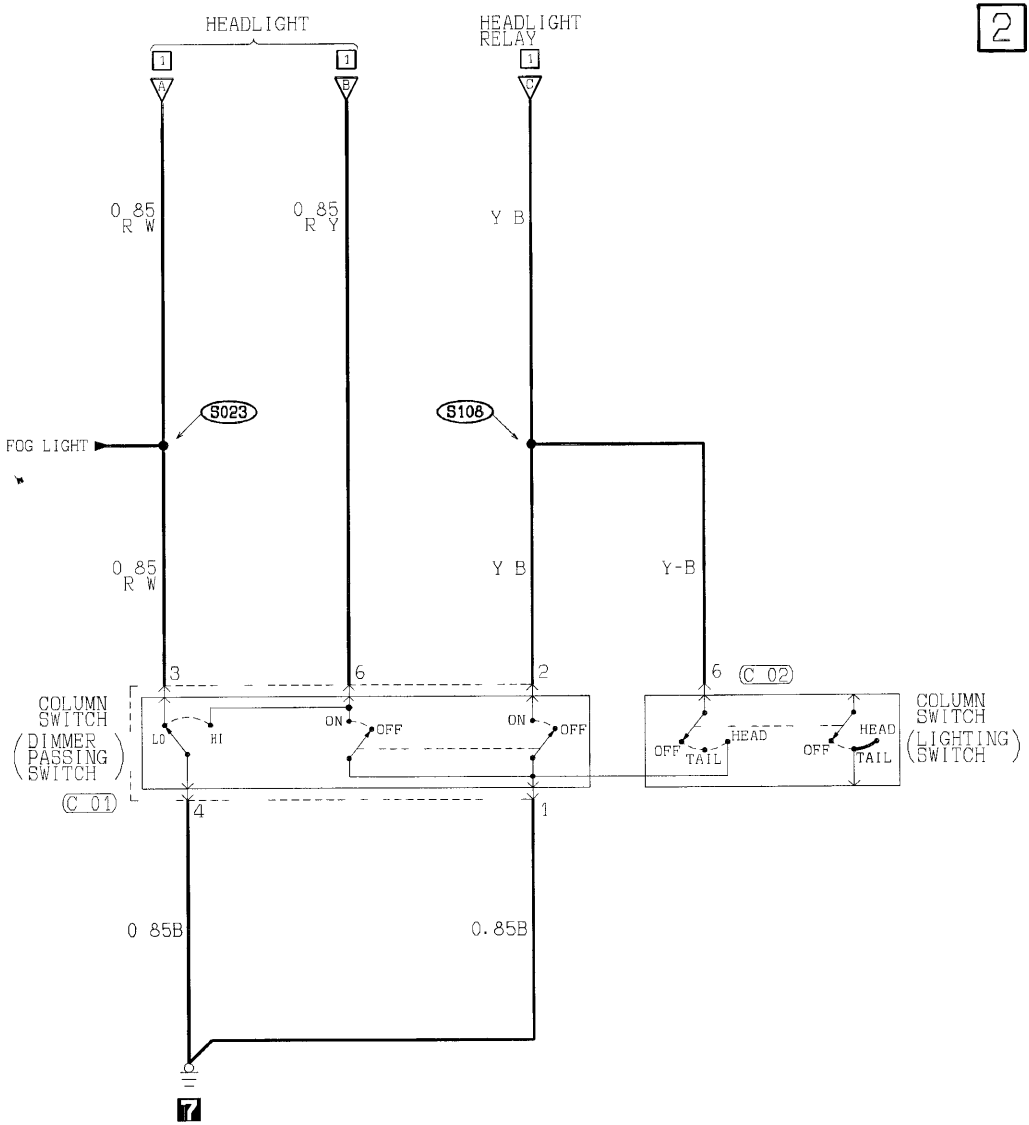
Wire color code
B : Black LG: Light green G : Green L Blue W White Y Yellow SB: Sky blue
BR Brown O : Orange GR: Gray R Red P Pink V Violet

9C07M00DB

HEADLIGHT

90100150821



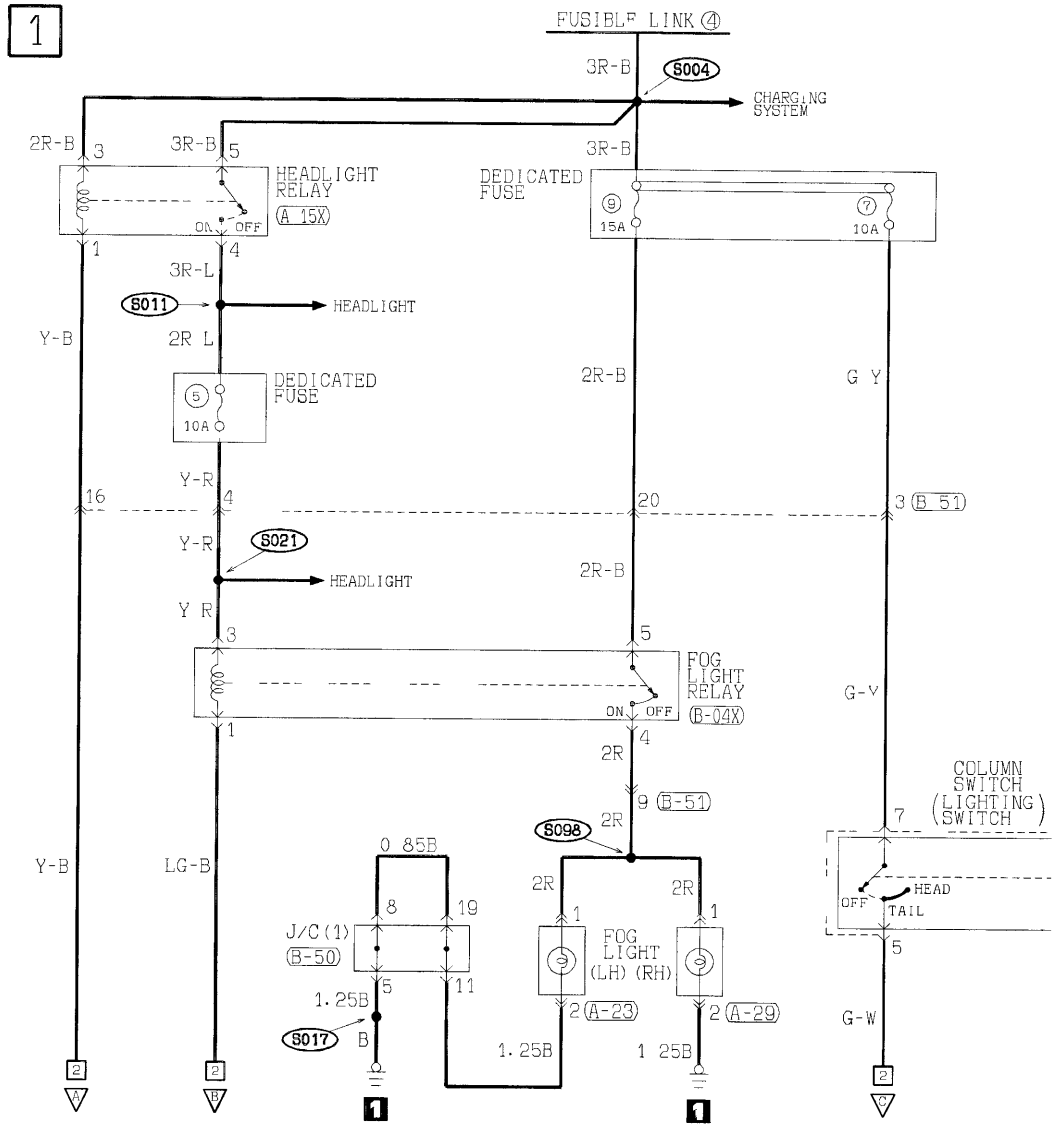


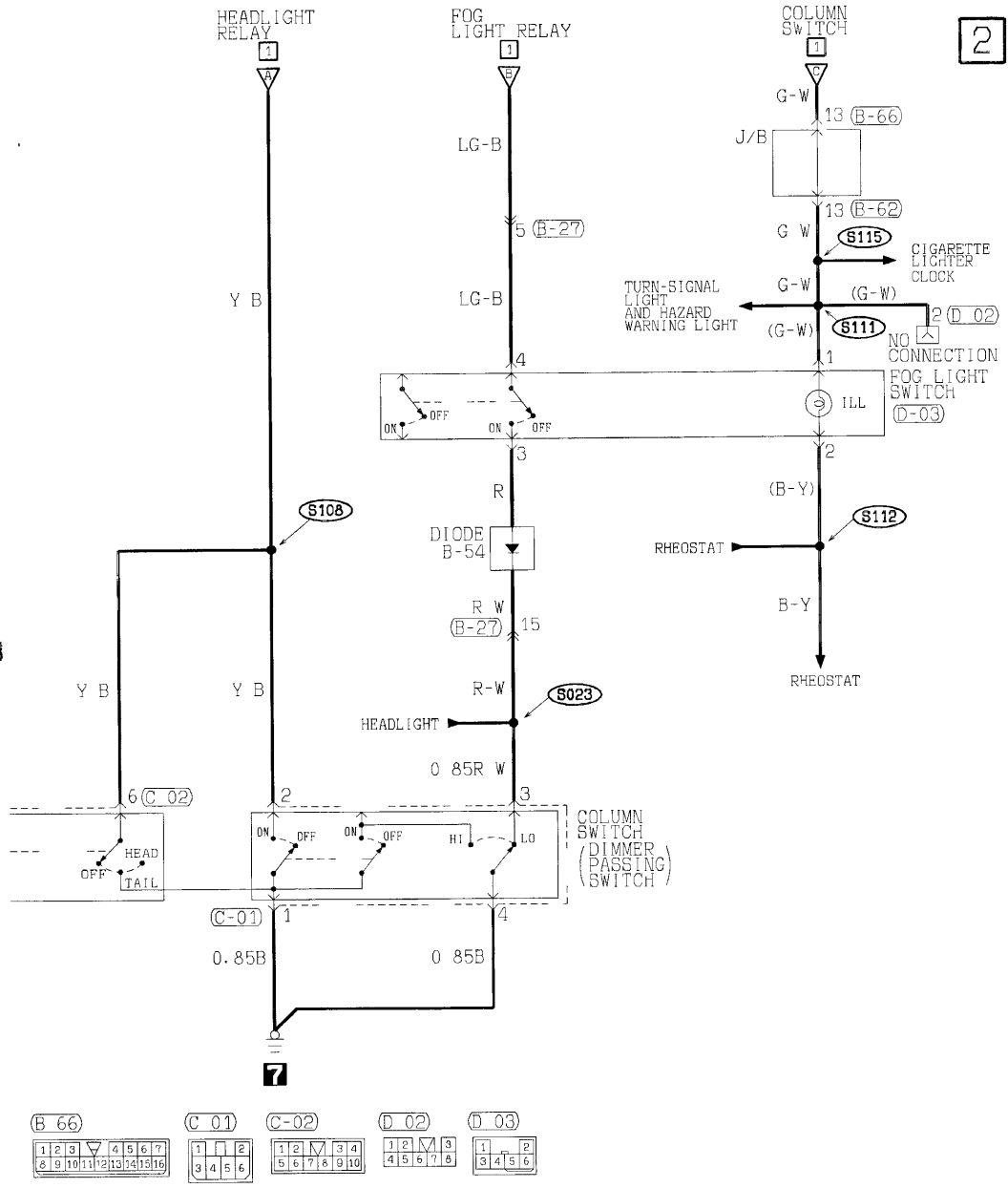
Wire color code
B Black LG Light green G :Green L .Blue W White Y .Yellow SB.Sky blue
BR.Brown O Orange GR:Gray R Red P .P nk V Violet

9C08M00AB

FOG LIGHT

90100180288

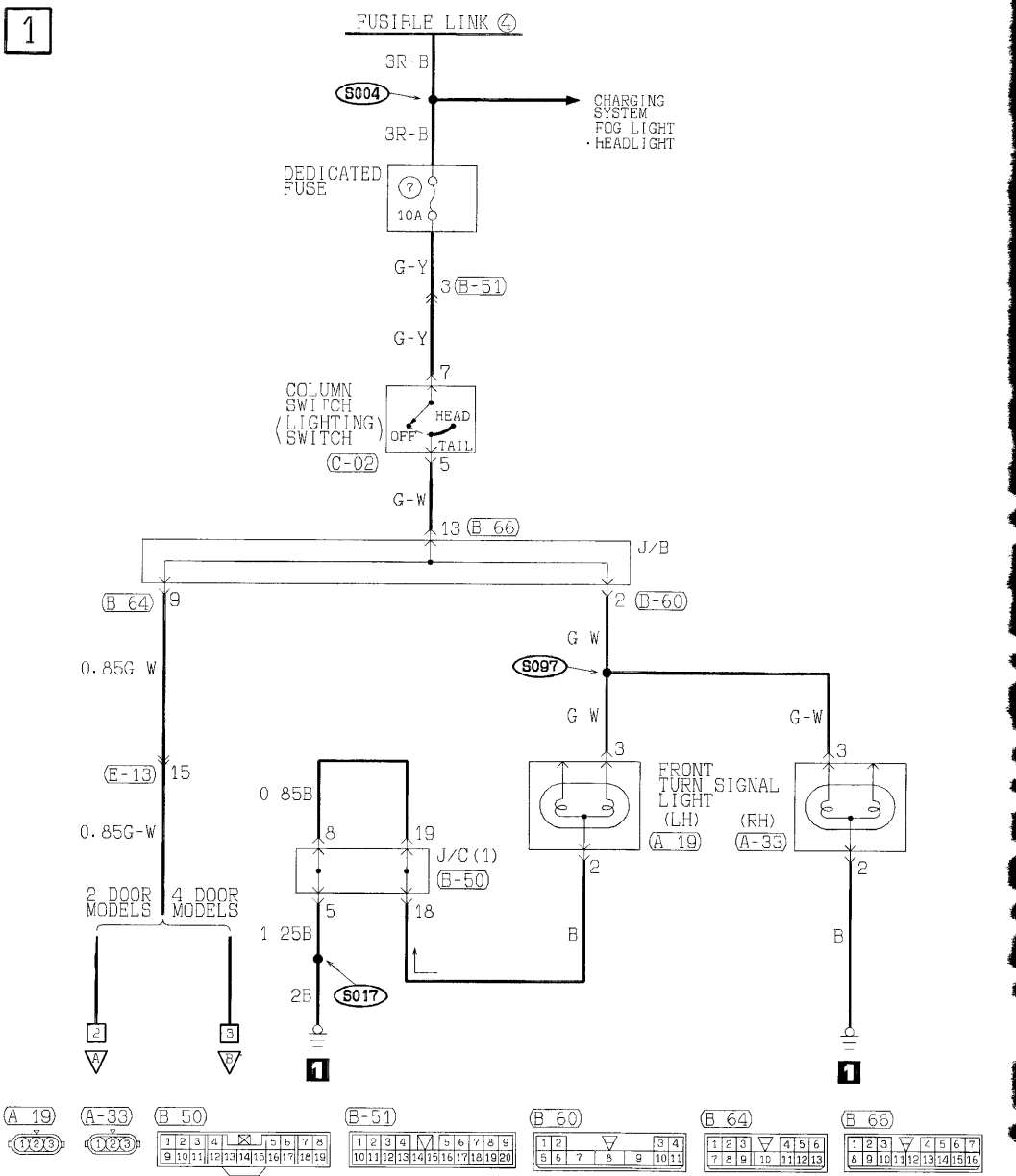


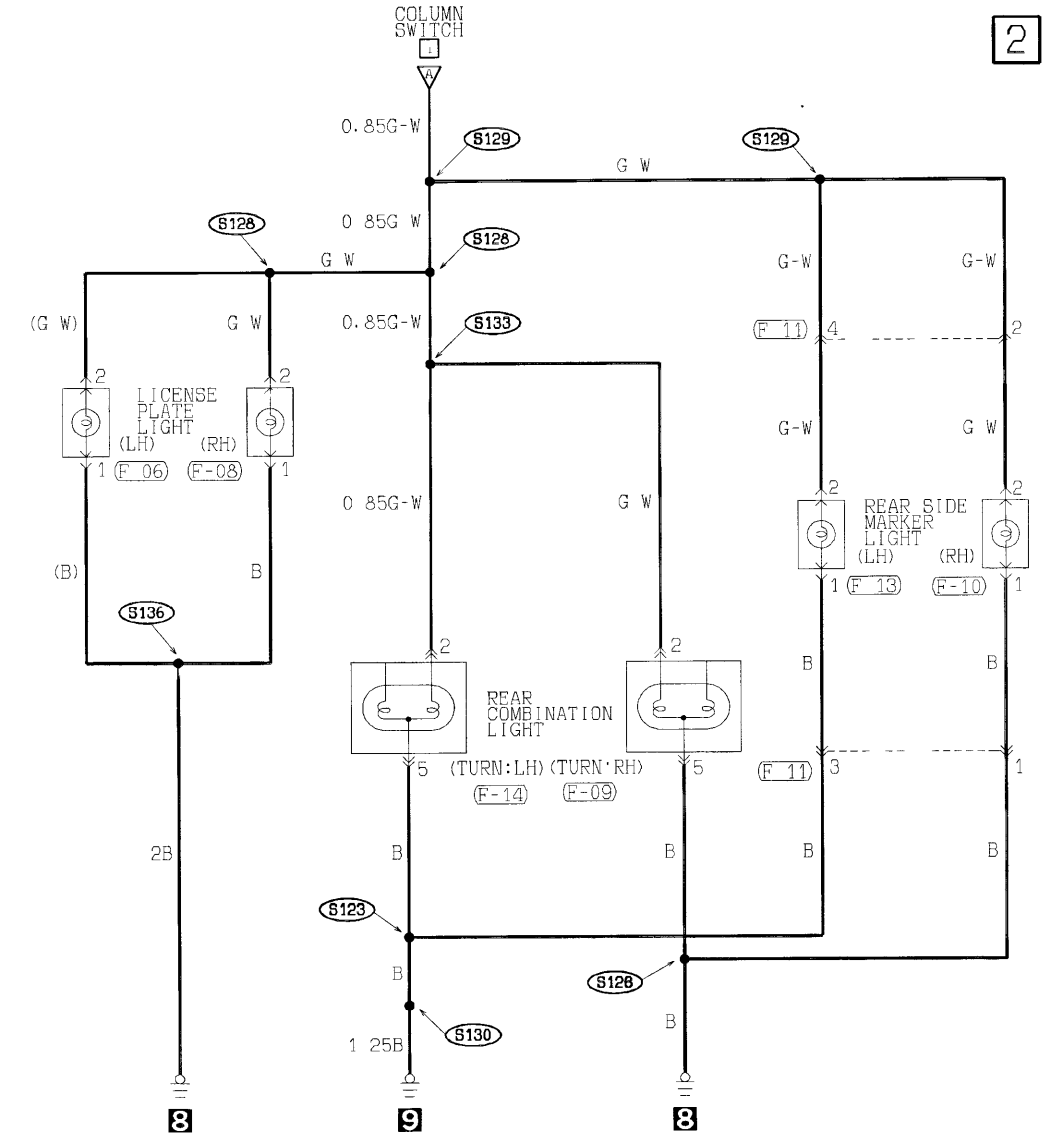


W re color code
B Black LG Light green G Green L :Blue W :White Y :Yellow SB:Sky blue
BR Brown O Orange GR Gray R :Red P :Pink V :Violet

TAILLIGHT, PARKING AND SIDE-MARKER LIGHT AND LICENSE PLATE LIGHT

90101370097

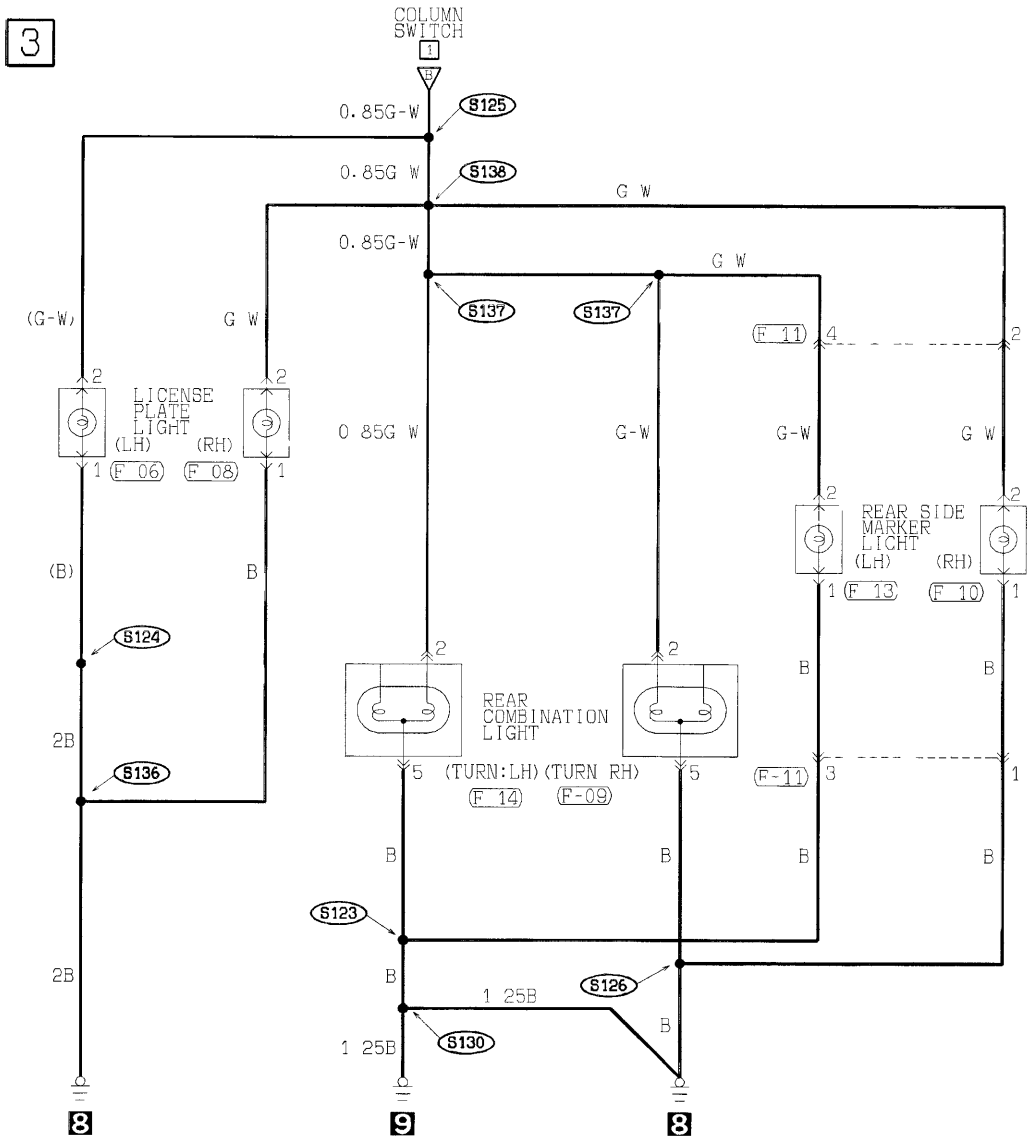




C-02 E-13 F-06 F-08 F-09 F 10 F-11 F-13 F 14

W re color code
B Black LG·Light green G Green L Blue W White Y Yellow SB Sky blue
BR·Brown O ·Orange GR Gray R Red P ·Pink V Violet

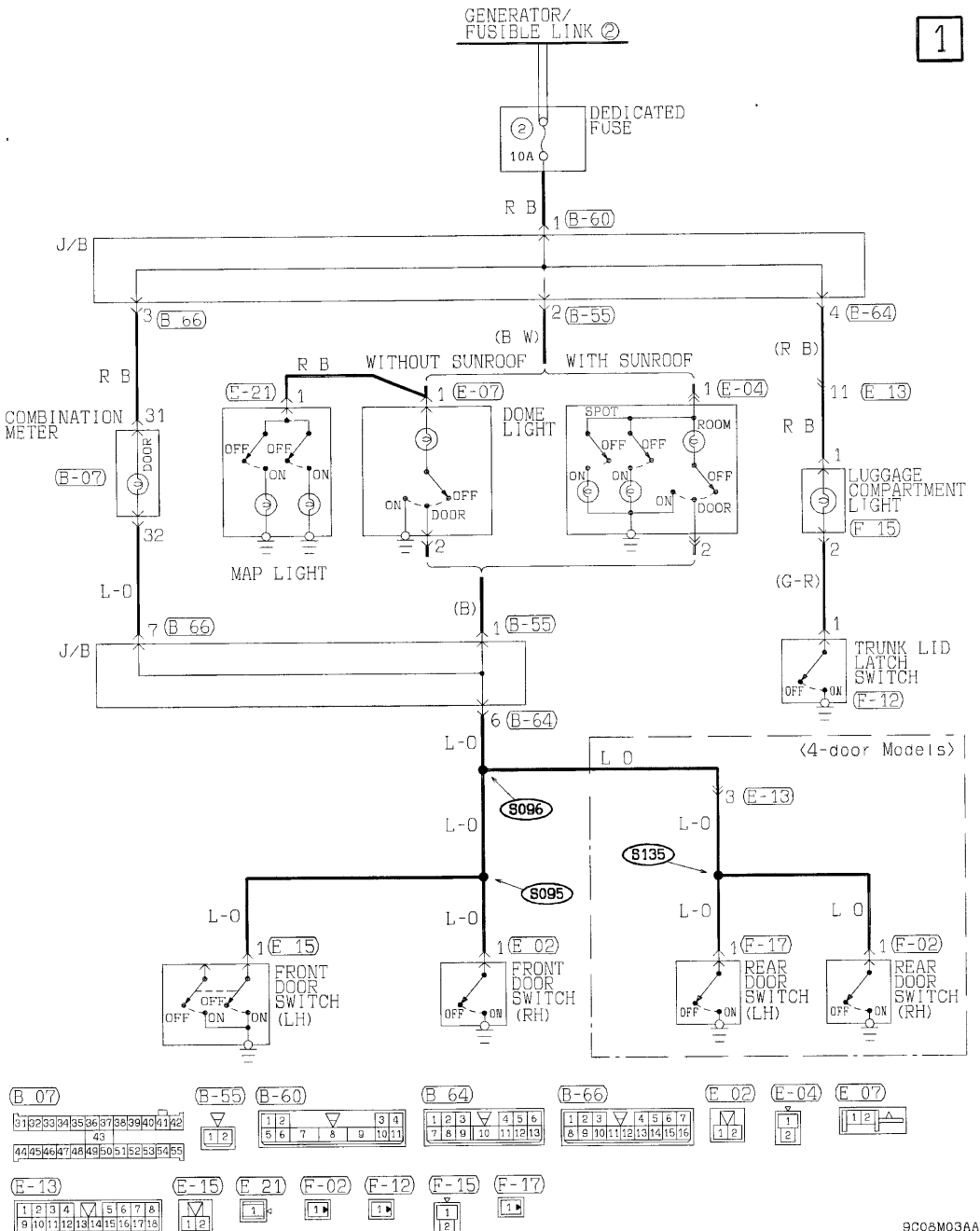
TAILLIGHT, PARKING AND SIDE-MARKER LIGHT AND LICENSE PLATE LIGHT (CONTINUED)



Wire color code
B :Black LG:L ght green G .Green L :Blue W White Y Yellow SB.Sky blue
BR Brown O :Orange GR.Gray R :Red P .Pink V .Violet

DOME LIGHT AND LUGGAGE COMPARTMENT LIGHT

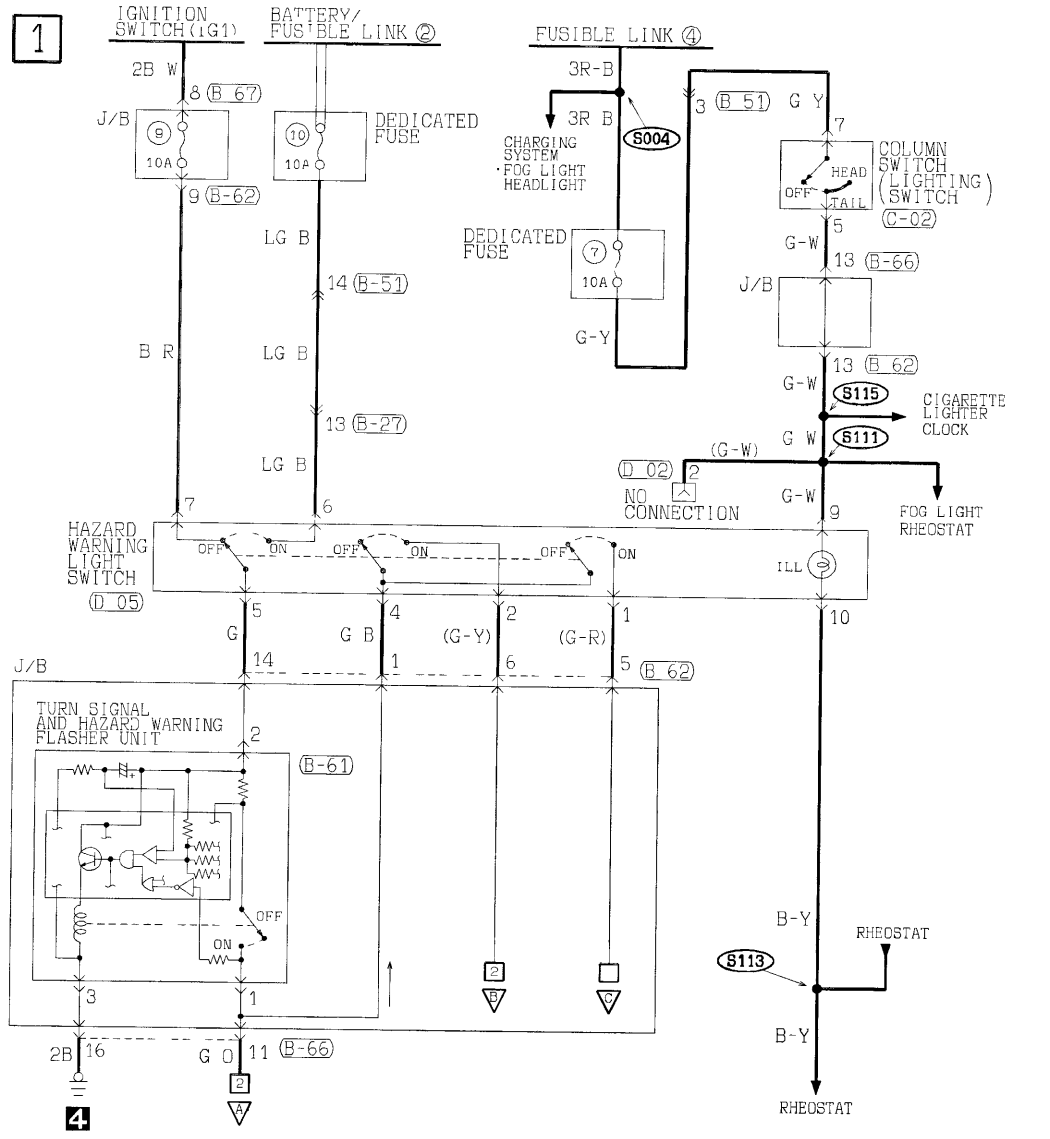
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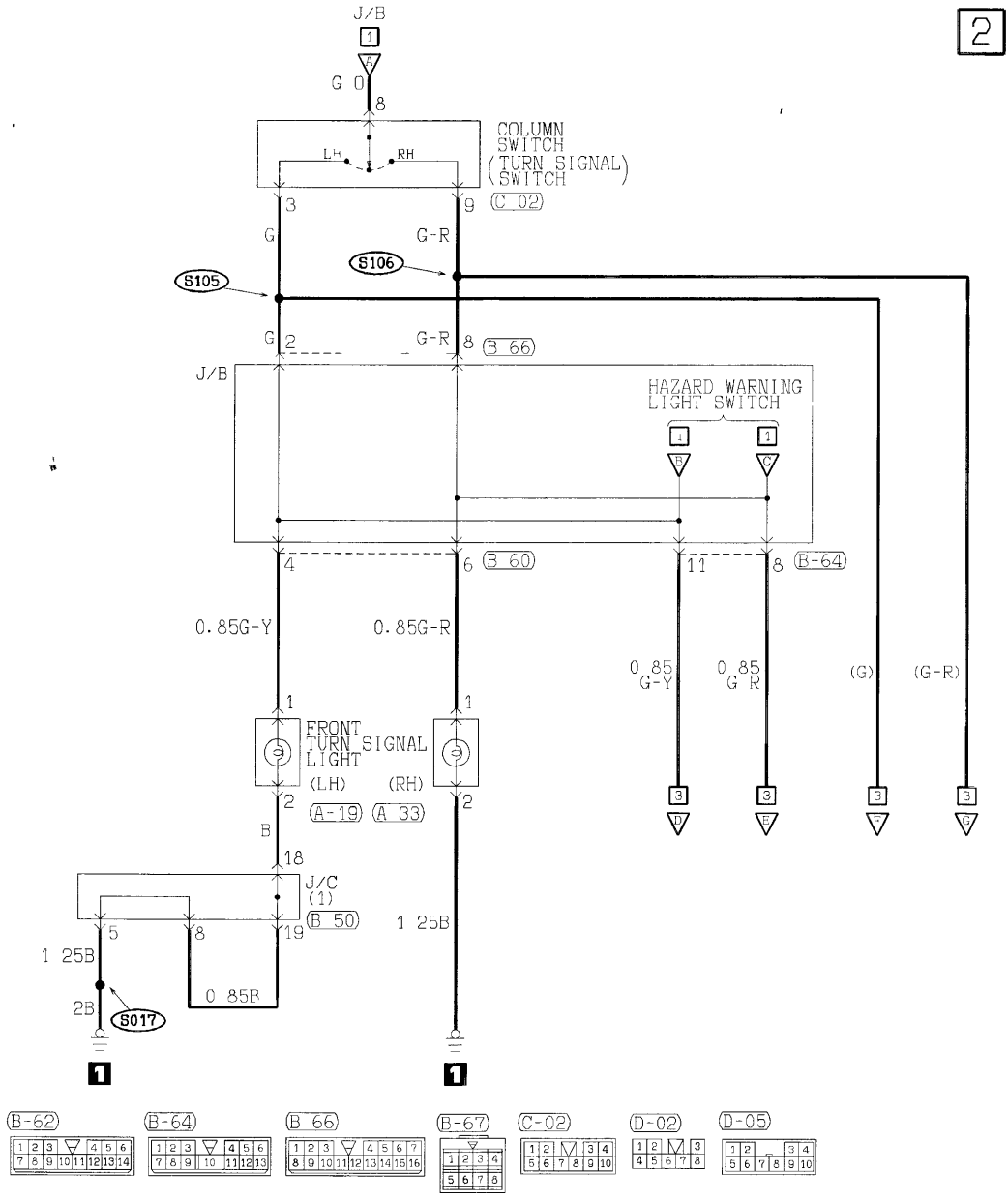


9C08M03AA

TURN-SIGNAL LIGHT AND HAZARD WARNING LIGHT

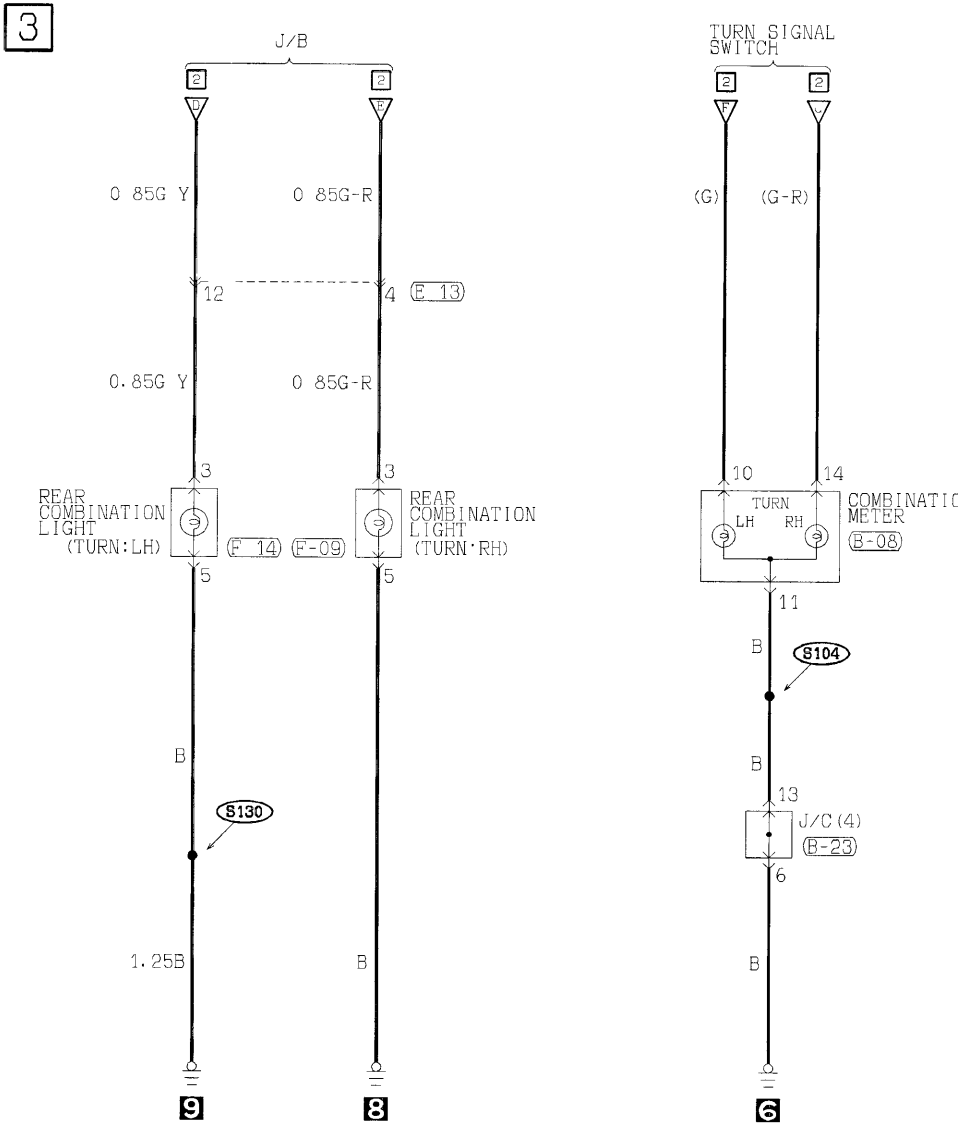
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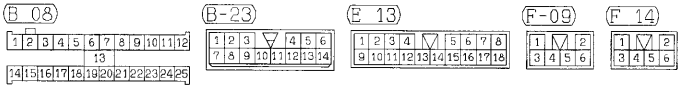




W re color code
B .Black LG.Light green G .Green L .Blue W .White Y .Yellow SB.Sky blue
BR Brown O Orange GR Gray R Red P .Pink V .Violet

TURN-SIGNAL LIGHT AND HAZARD WARNING LIGHT (CONTINUED)

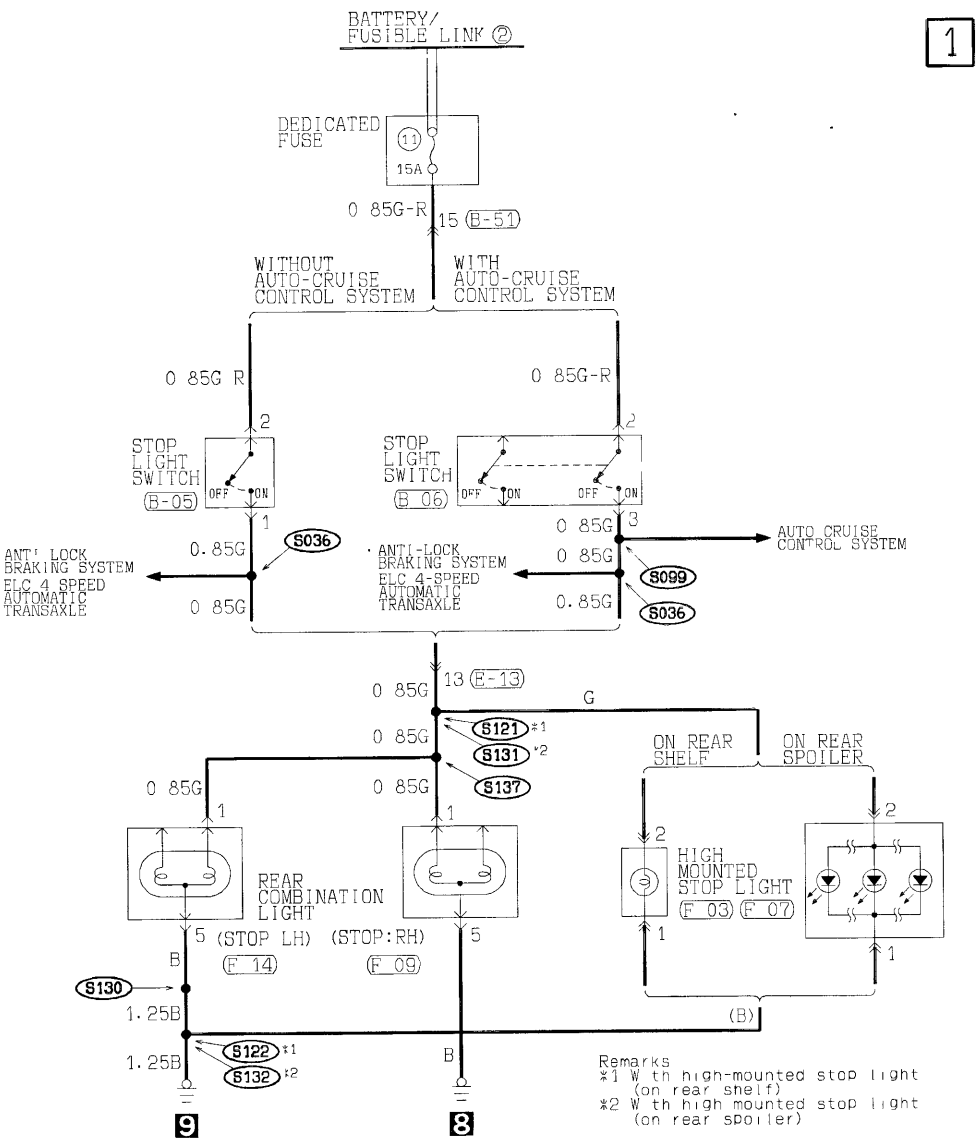


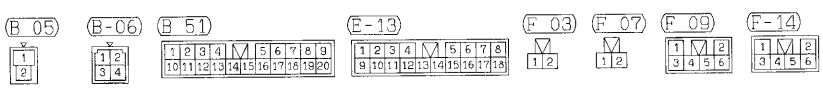


W re color code
B Black LG:Light green G ·Green L :Blue W Wh te Y Yellow SB·Sky blue
BR·Brown O :Orange GR·Gray R :Red P P nk V Violet

STOP LIGHT

90100300622





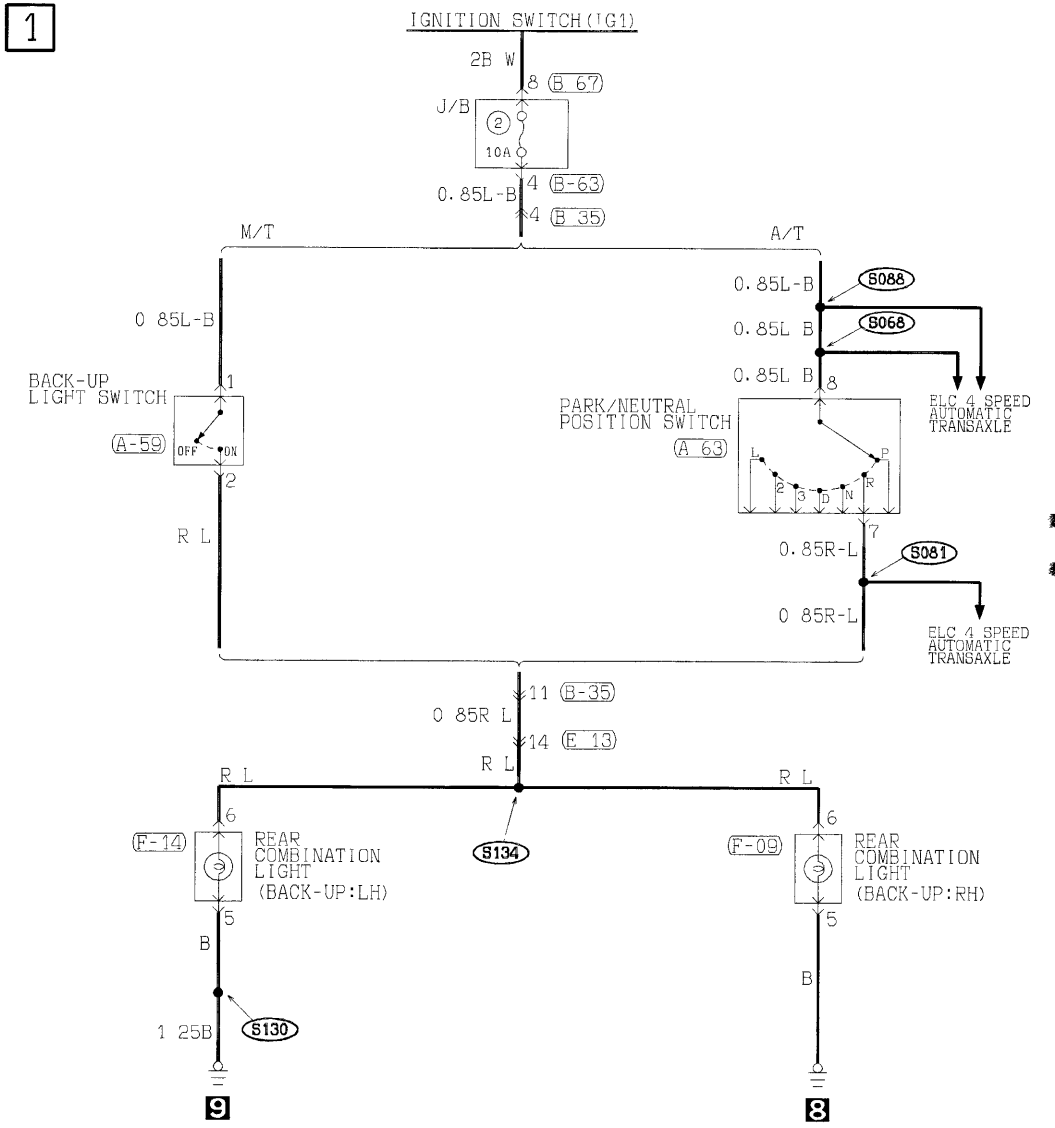
Wire color code

B Black	LG Light green	G Green	L :Blue	W White	Y :Yellow	SB Sky blue	
BR Brown	O .Orange	GR Gray	R :Red	P :Pink	V :V olet		

9C09M01AA

BACK-UP LIGHT

9010031064



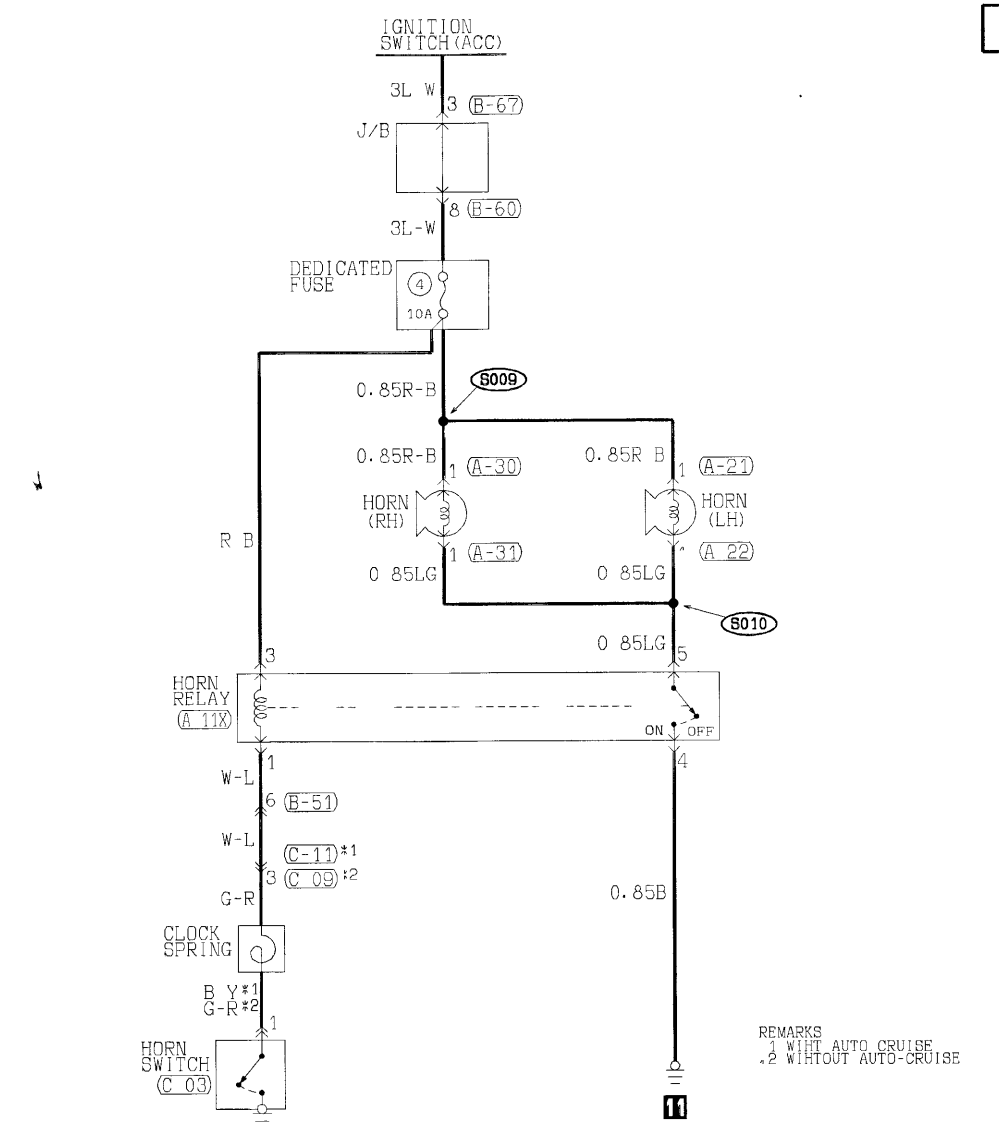
Wire color code
B Black LG Light green G .Green L Blue W .White Y .Yellow SB.Sky blue
BR Brown O Orange GR Gray R Red P :Pink V .Violet

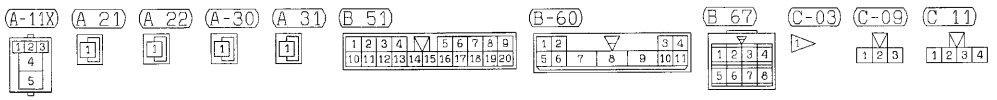
9C09M02AA

HORN

90100330669

1



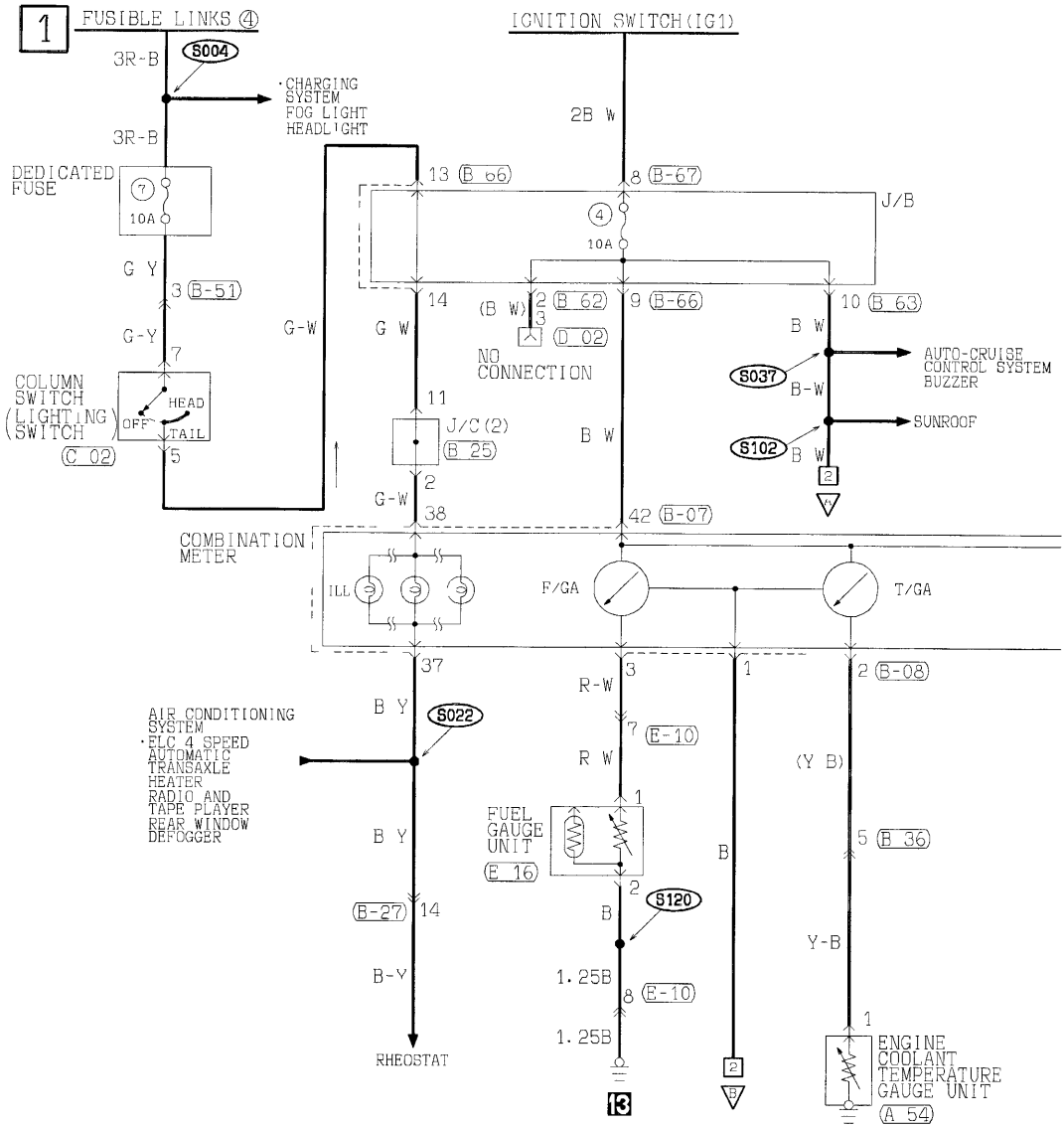


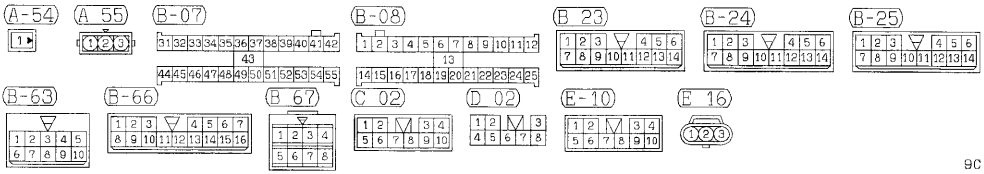
Wire color code
B Black LG Light green G :Green L :Blue W :White Y :Yellow SB.Sky blue
BR Brown O Orange GR:Gray R .Red P .Pink V .V olet

9C09M03AA

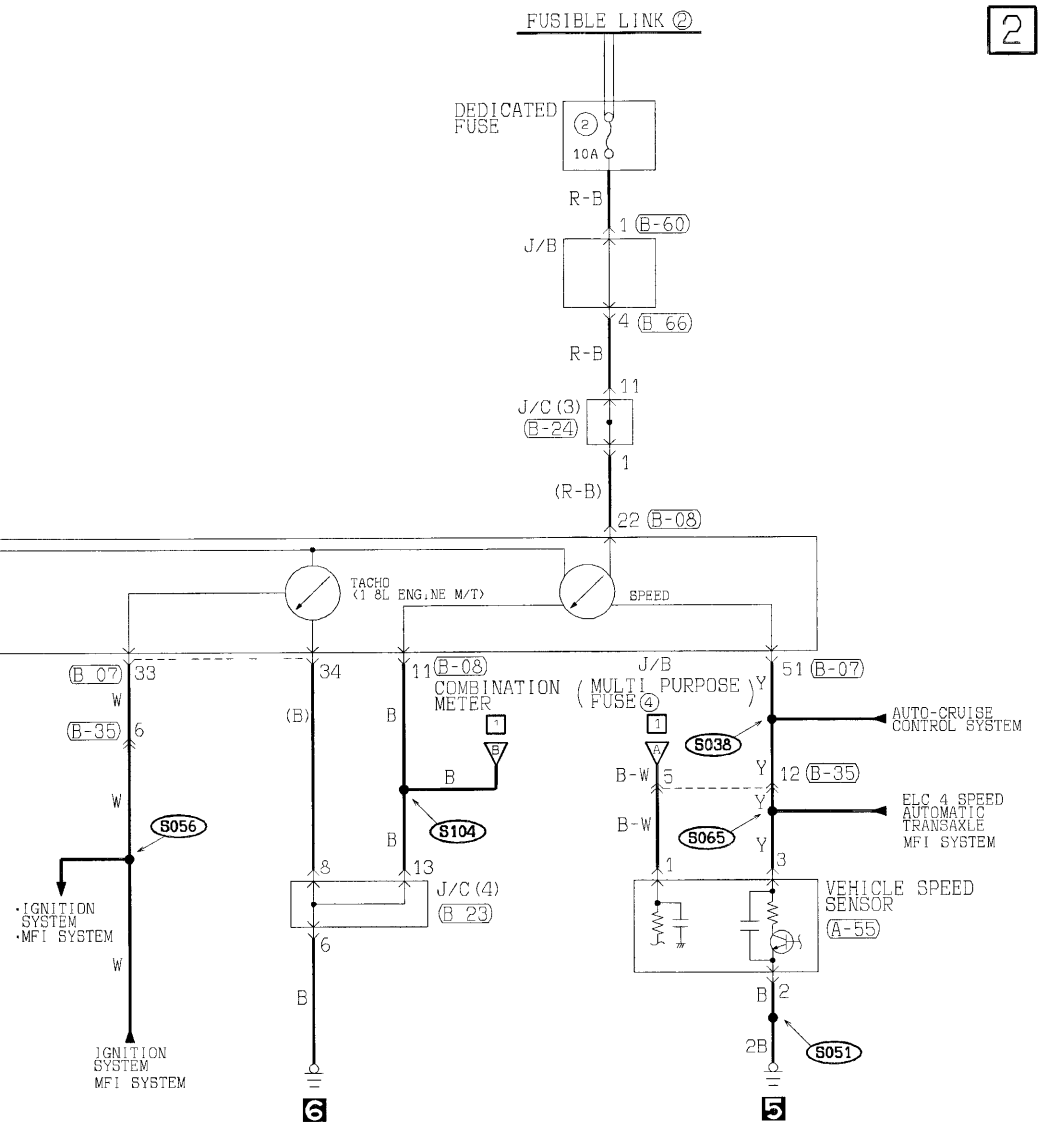
METERS AND GAUGES

90100350733





9C10M00AA

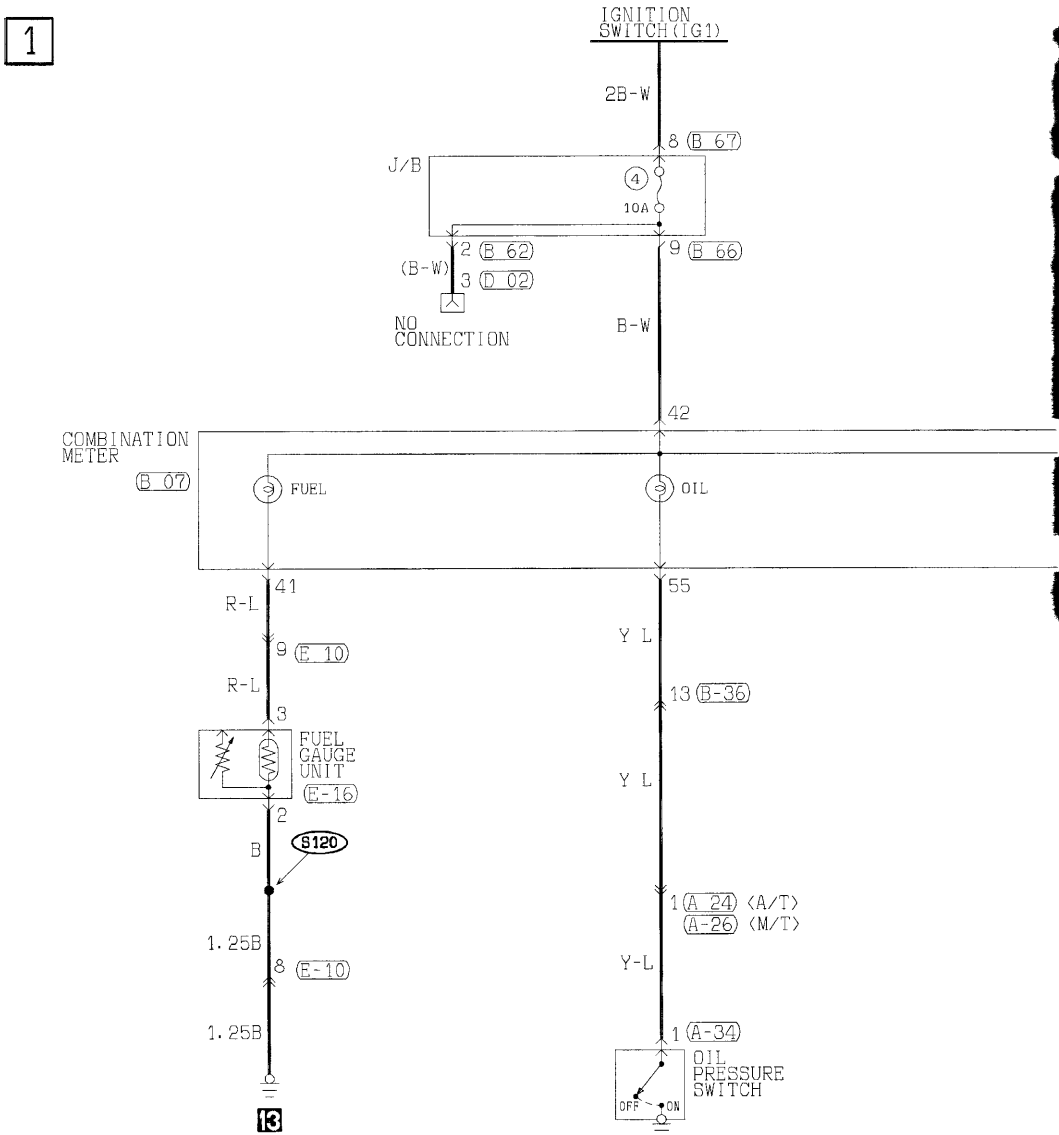


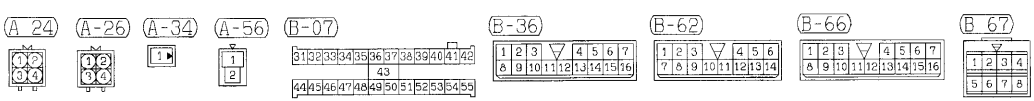
W re color code
B ·Black LG L ght green G :Green L :Blue W ·White Y :Yellow SB Sky blue
BR Brown O Orange GR Gray R ·Red P Pink V :Violet

9C10M00AB

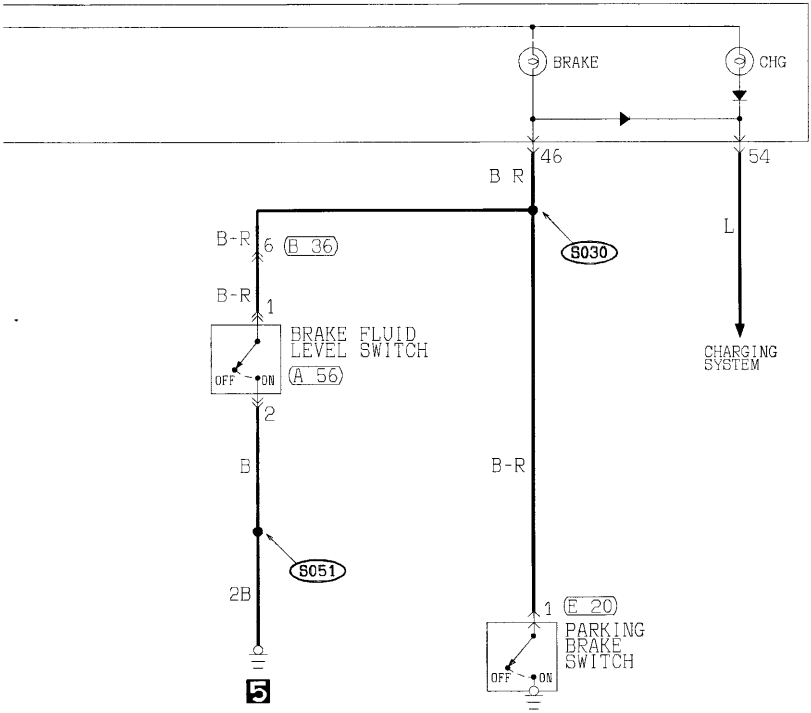
FUEL WARNING LIGHT, OIL PRESSURE WARNING LIGHT AND BRAKE WARNING LIGHT

90101180S





2



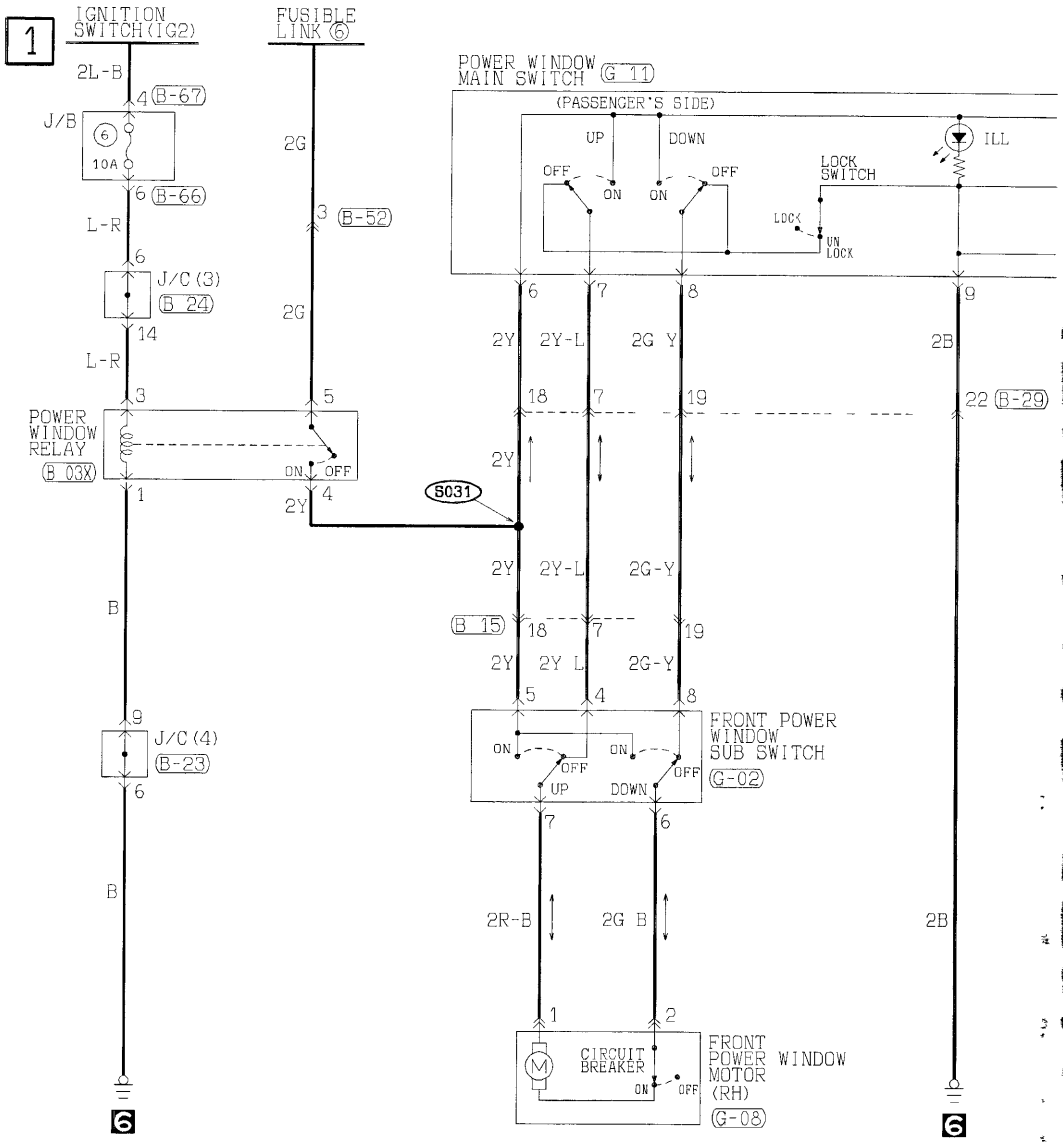
D 02
E-10
E-16
E 20

W re color code
B Black LG L ght green G Green L Blue W White Y .Yellow SB Sky blue
BR Brown O Orange GR Gray R .Red P .Pink V .Violet

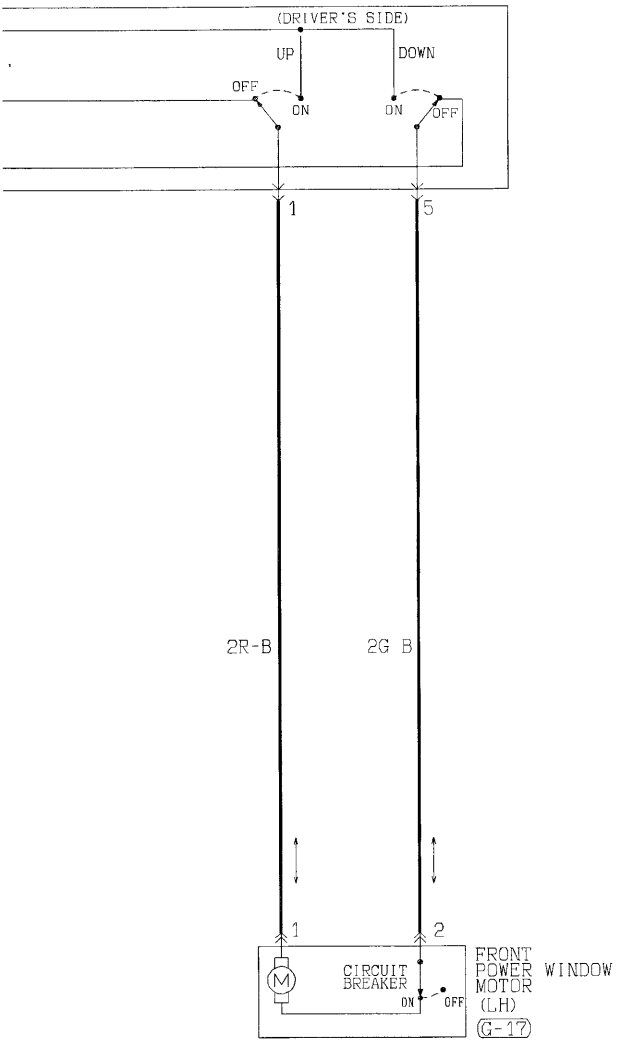
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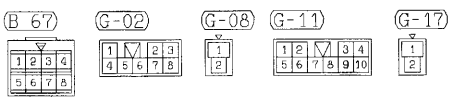
POWER WINDOWS <2-door Models>

90100460658



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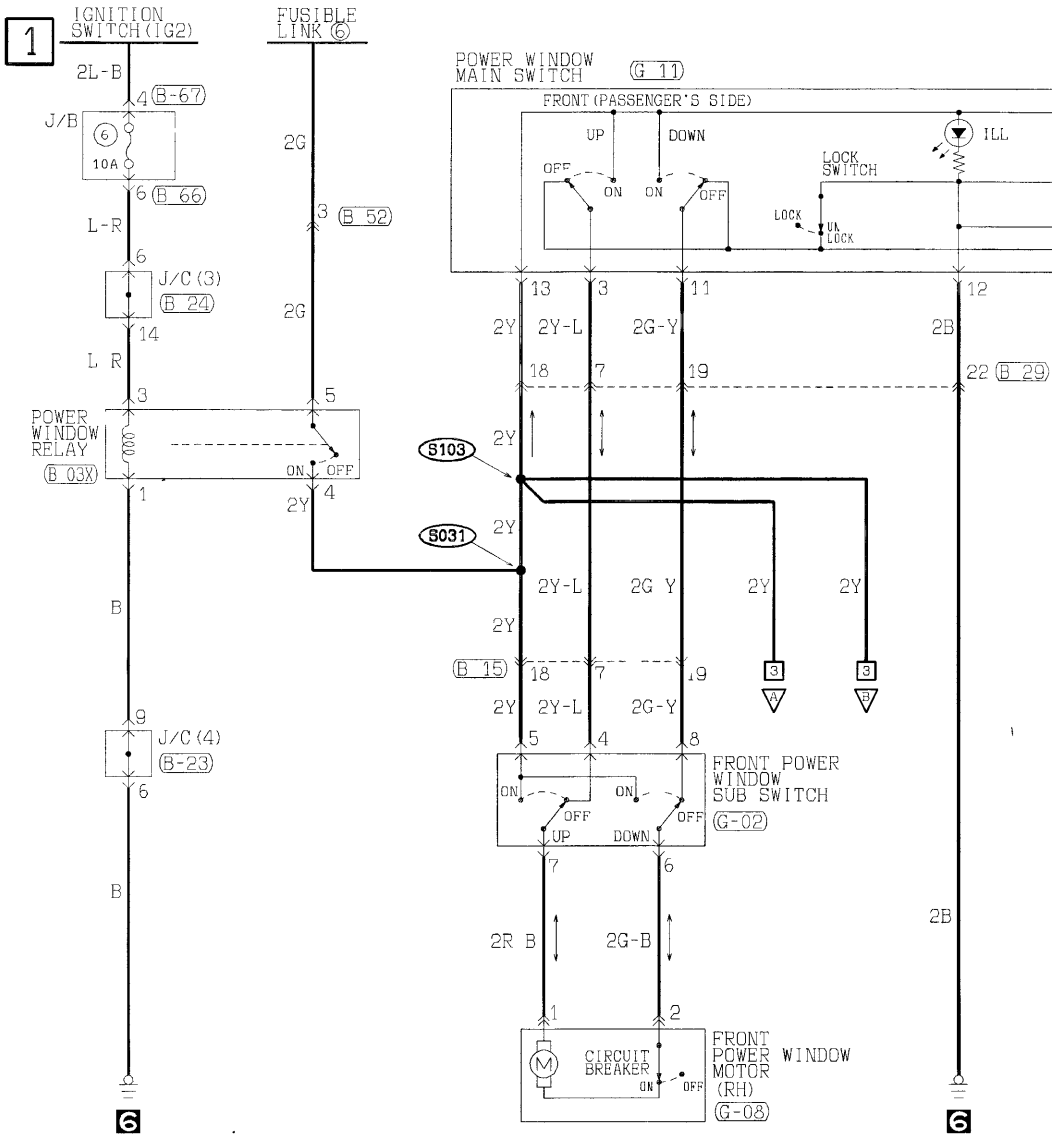




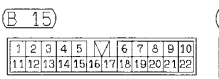
W re color code
B Black LG L ght green G ·Green L Blue W White Y Yellow SB·Sky blue
BR Brown O Orange GR.Gray R Red P Pink V Violet

POWER WINDOWS <4-door Models>

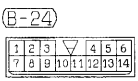
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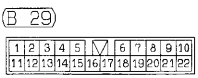




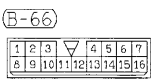




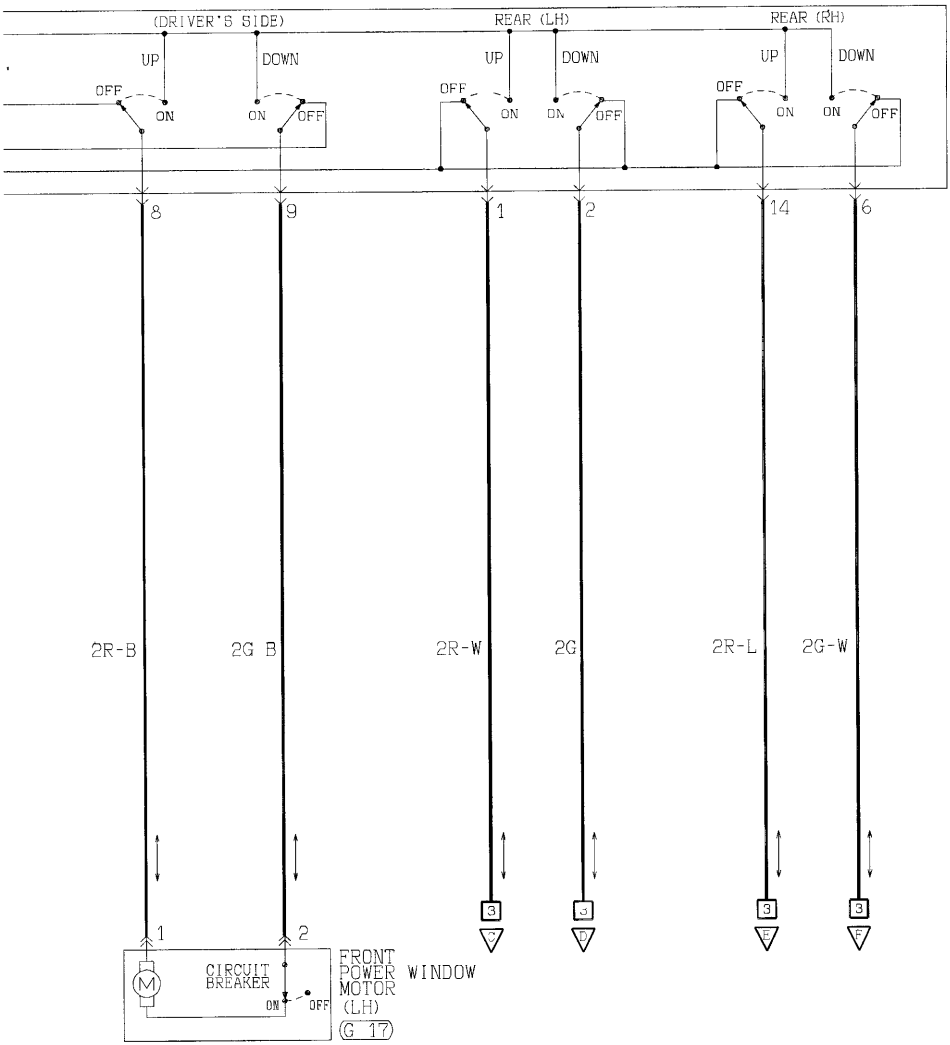


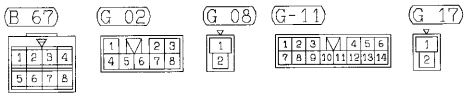






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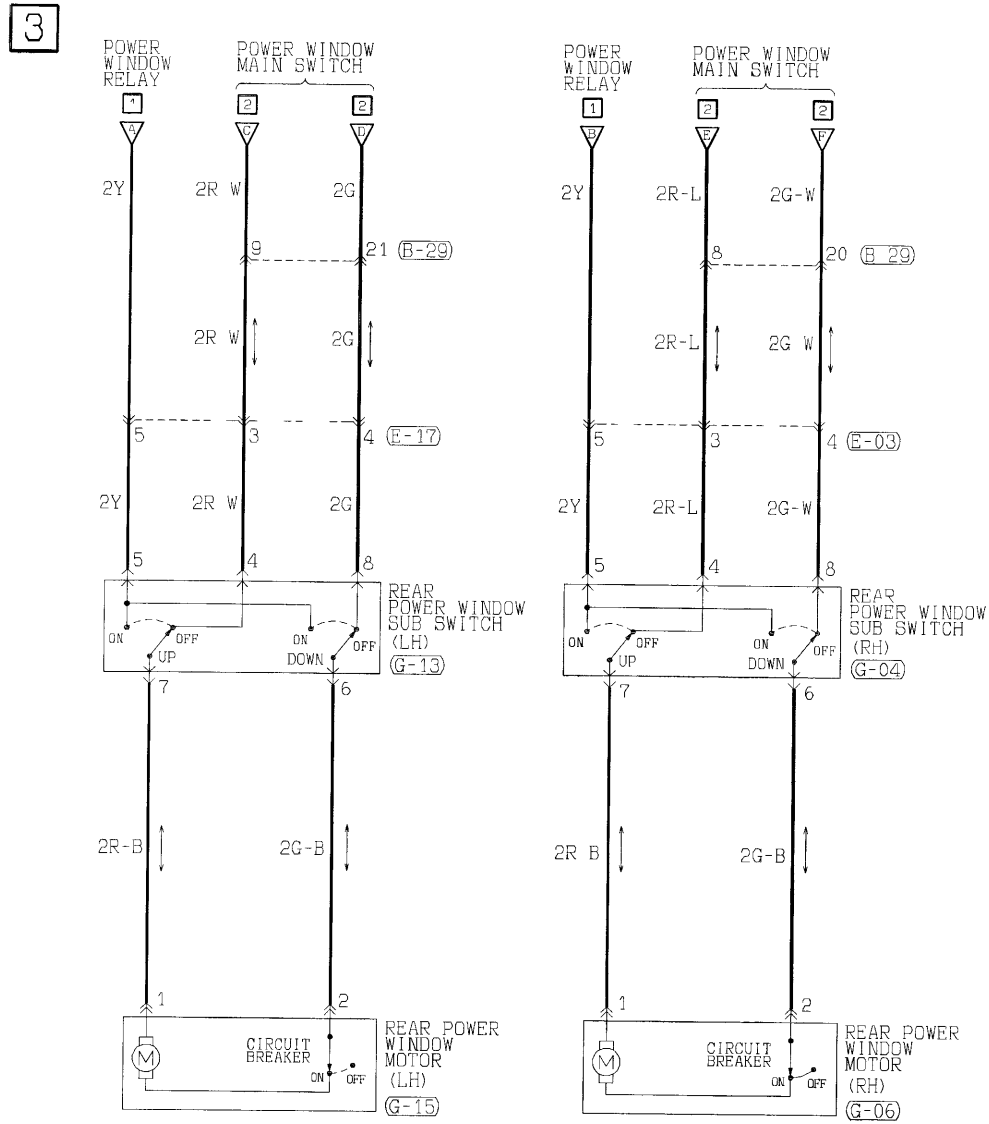


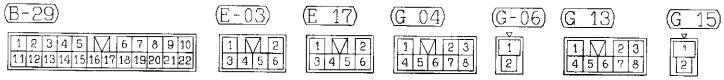


Wire color code
B Black LG Light green G Green L :Blue W :White Y Yellow SB:Sky blue
BR Brown O Orange GR Gray R :Red P :Pink V Violet

9C11M01AB

POWER WINDOWS <4-door Models> (CONTINUED)

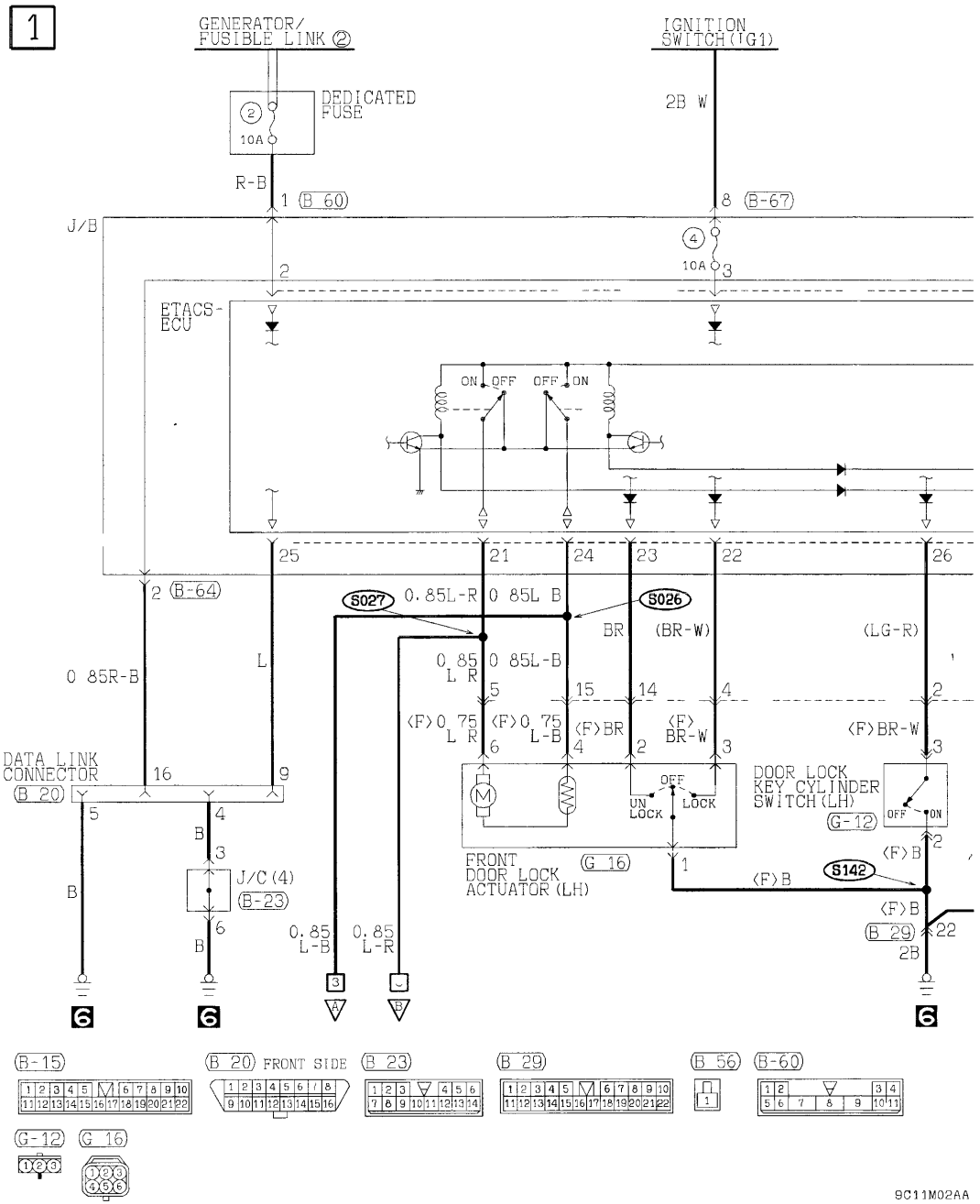




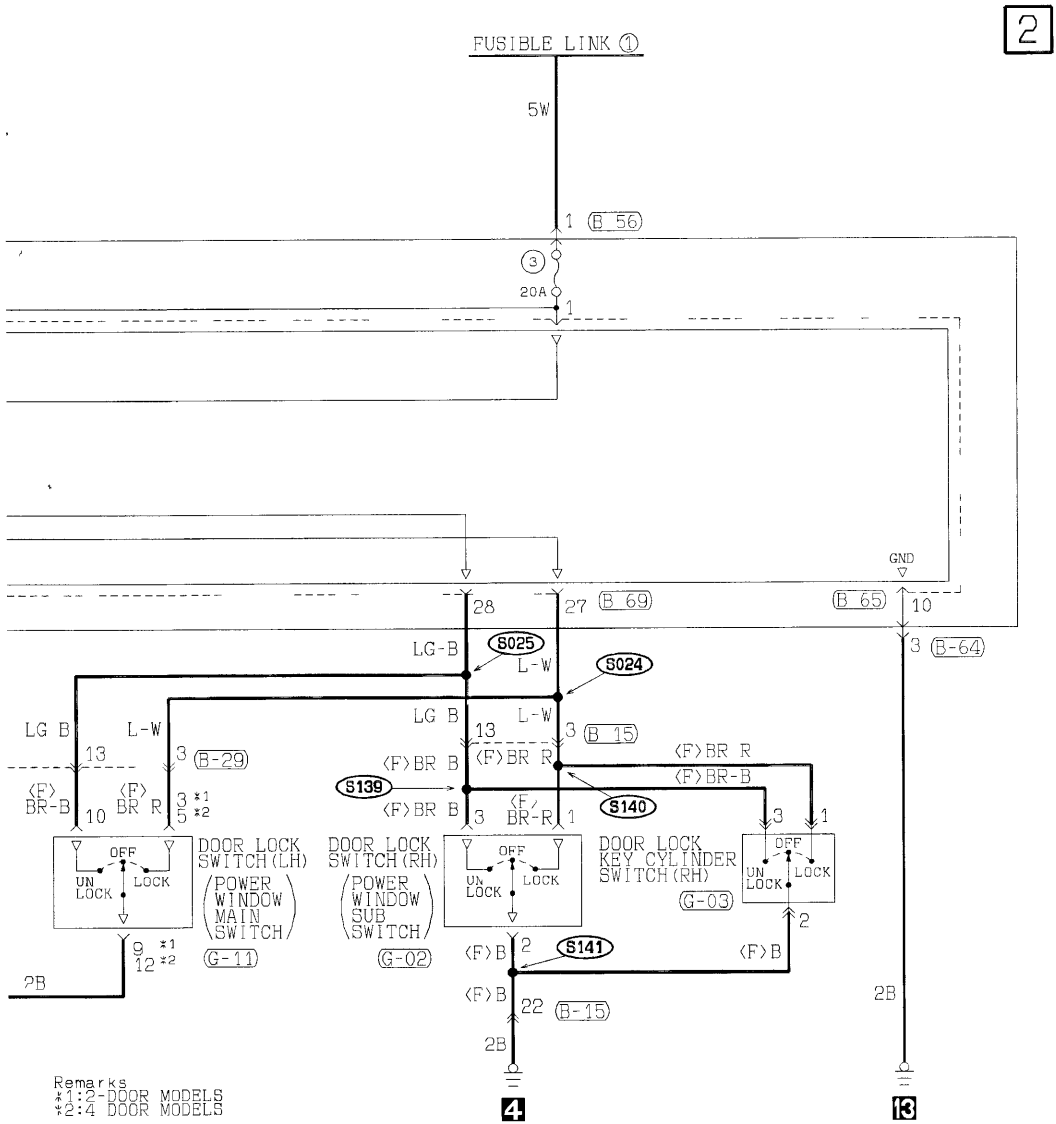
W re color code
B :Black LG L gnt green G Green L :Blue W White Y Yellow SB Sky blue
BR.Brown O Orange GR.Gray R :Red P Pink V .Violet

CENTRAL DOOR LOCKING SYSTEM

90100471102

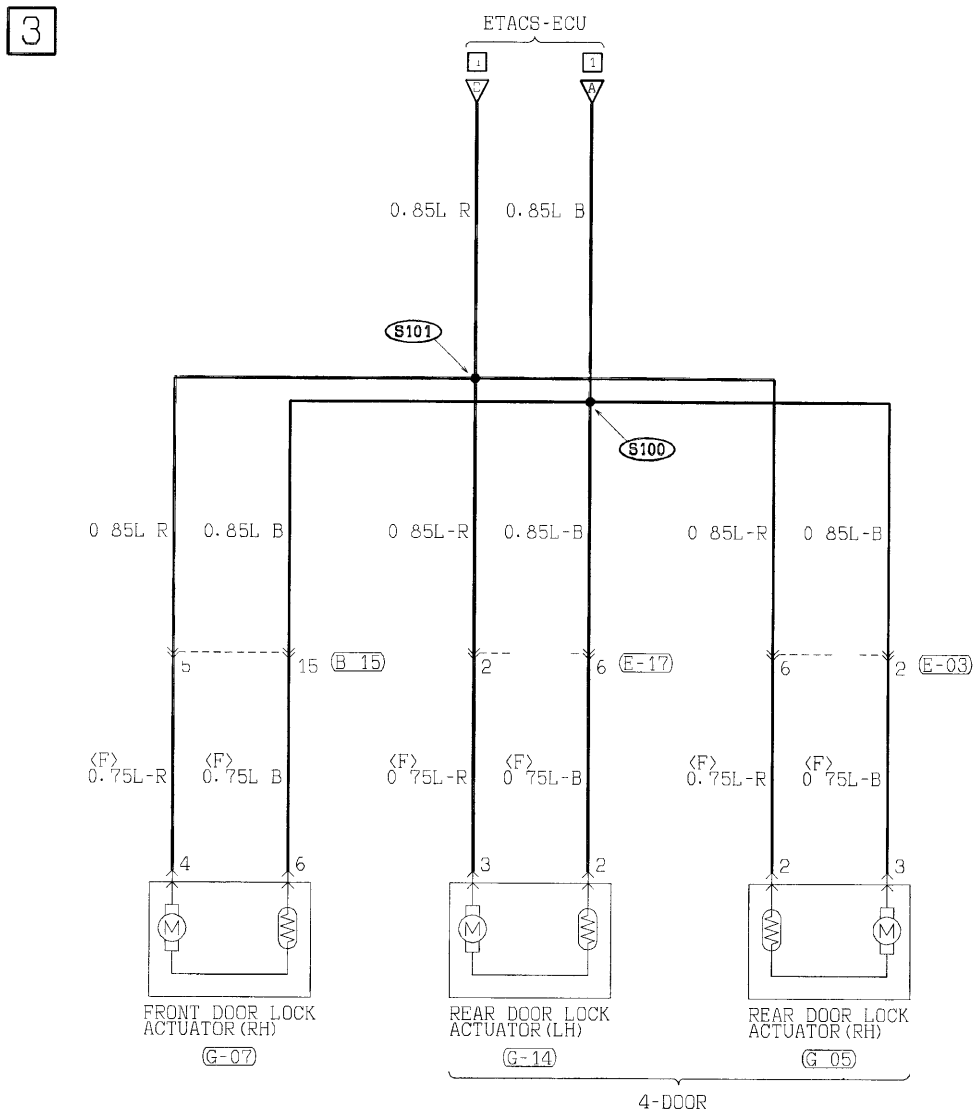


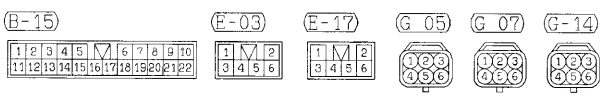
9C11M02AA


2
FUSIBLE LINK ①
5W
1 B 56
③
20A
1
GND
28
27 B 69
B 65
10
3 B-64
LG-B
S025
L-W
S024
LG B
L-W
13
3 B-29
LG B
L-W
13
3 B 15
⟨F⟩BR B
⟨F⟩BR R
S139
S140
⟨F⟩BR R
⟨F⟩BR-B
⟨F⟩ BR-B
10
⟨F⟩ BR R
3 *1
5 *2
⟨F⟩BR B
3
⟨F⟩ BR-R
1
3
1
OFF
UN LOCK
LOCK
DOOR LOCK SWITCH(LH)
(POWER WINDOW MAIN SWITCH)
G-11
DOOR LOCK SWITCH(RH)
(POWER WINDOW SUB SWITCH)
G-02
DOOR LOCK KEY CYLINDER SWITCH(RH)
G-03
9 *1
12 *2
2B
⟨F⟩B
2
S141
⟨F⟩B
2
⟨F⟩B
22 B-15
2B
2B
Remarks
*1:2-DOOR MODELS
*2:4 DOOR MODELS
4
13
B 64
B 65
B 67
B 69
G-02
G-03
G 11
2-DOOR
4-DOOR
Wire color code
B :Black
BR Brown
LG:Light green
O :Orange
G :Green
GR Gray
L :Blue
R :Red
W :White
P :Pink
Y :Yellow
V :Violet
SB.Sky blue

9C11M02AB

CENTRAL DOOR LOCKING SYSTEM (CONTINUED)

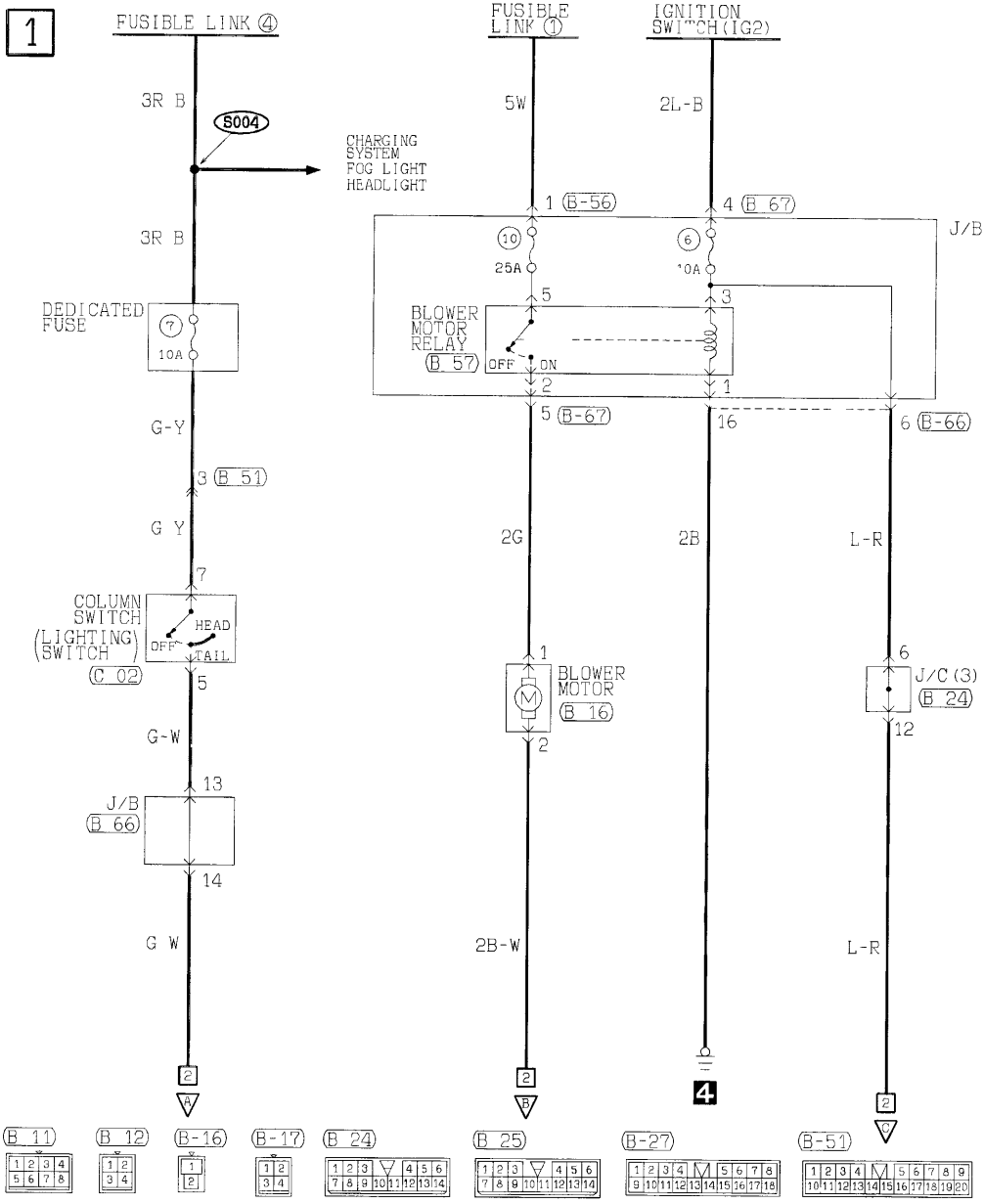


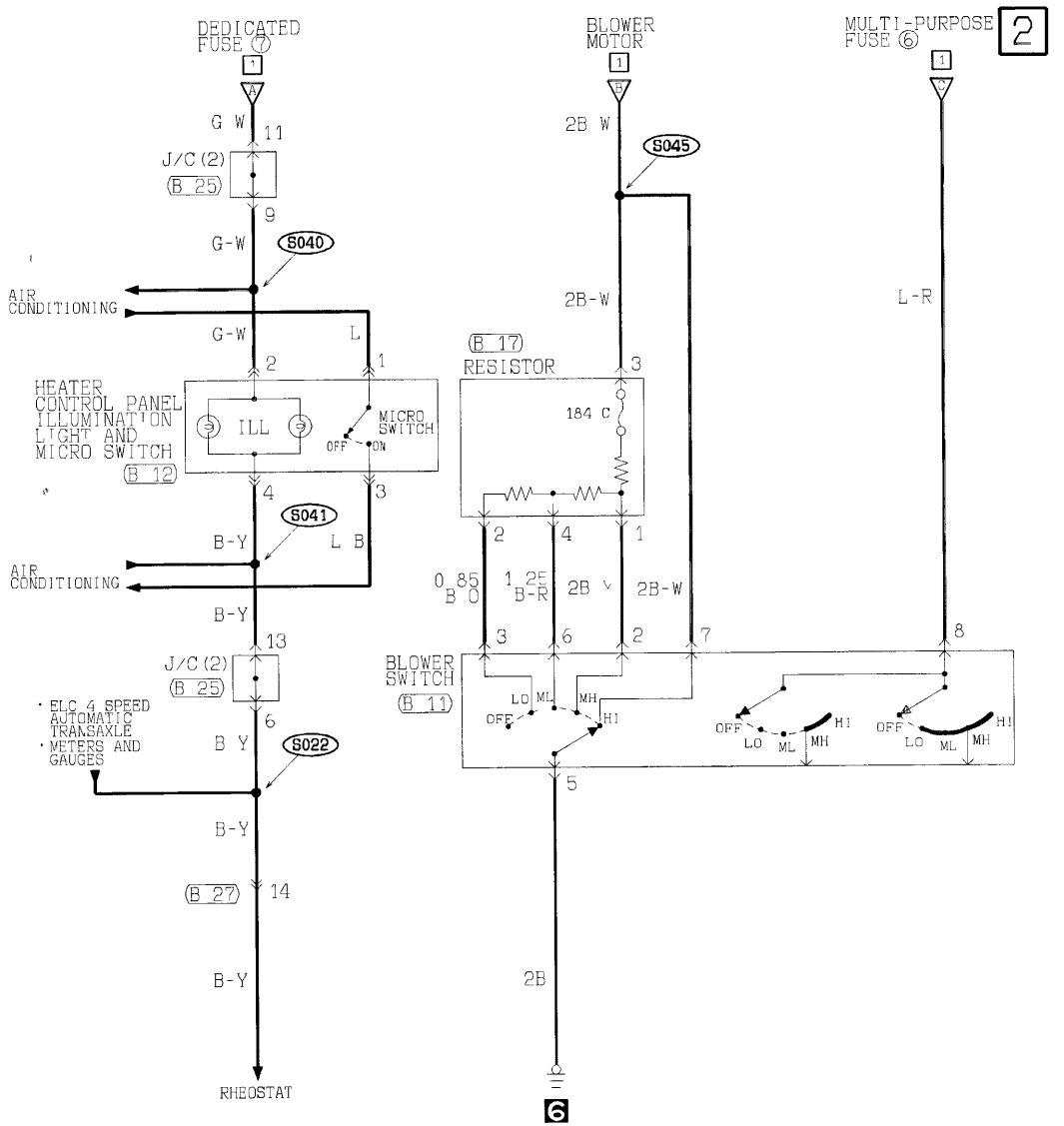


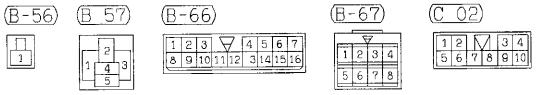
Wire color code
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BR:Brown O :Orange GR:Gray R Red P Pink V Violet

HEATER

90101330323





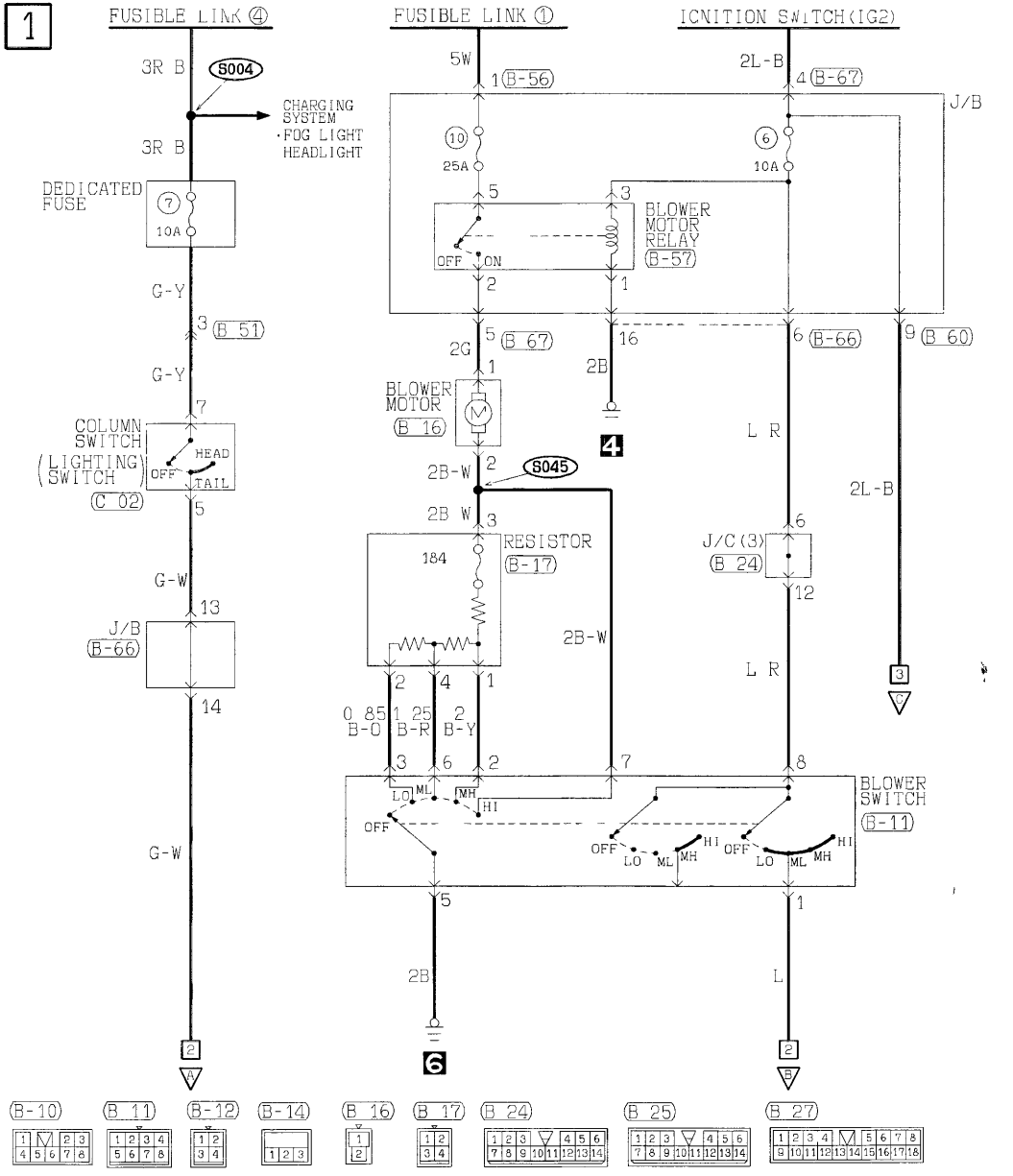


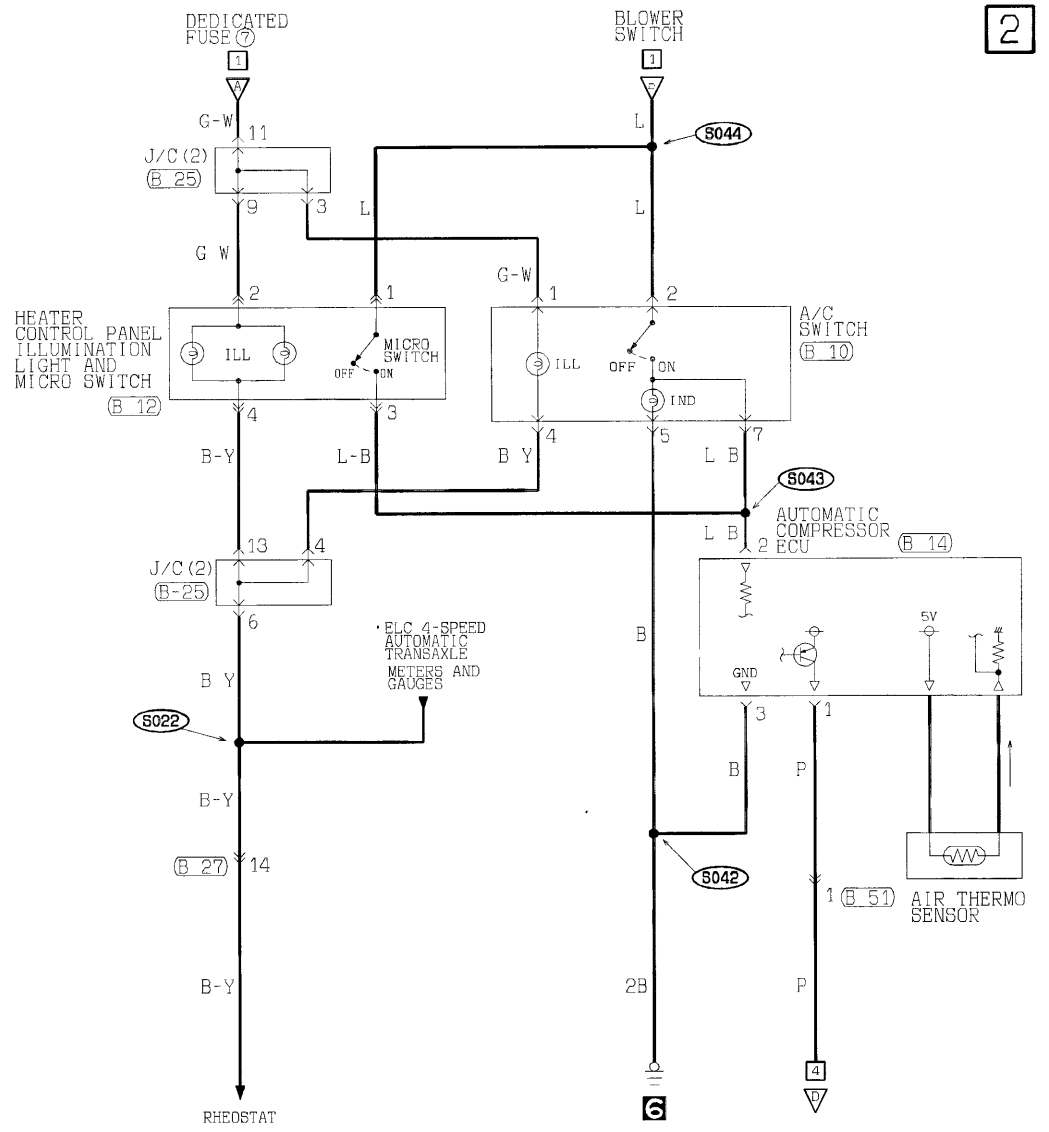
Wire color code

B Black	LG Light green	G Green	L Blue	W White	Y Yellow	SB Sky blue	
BR Brown	O Orange	GR Gray	R Red	P Pink	V Violet		

AIR CONDITIONING SYSTEM

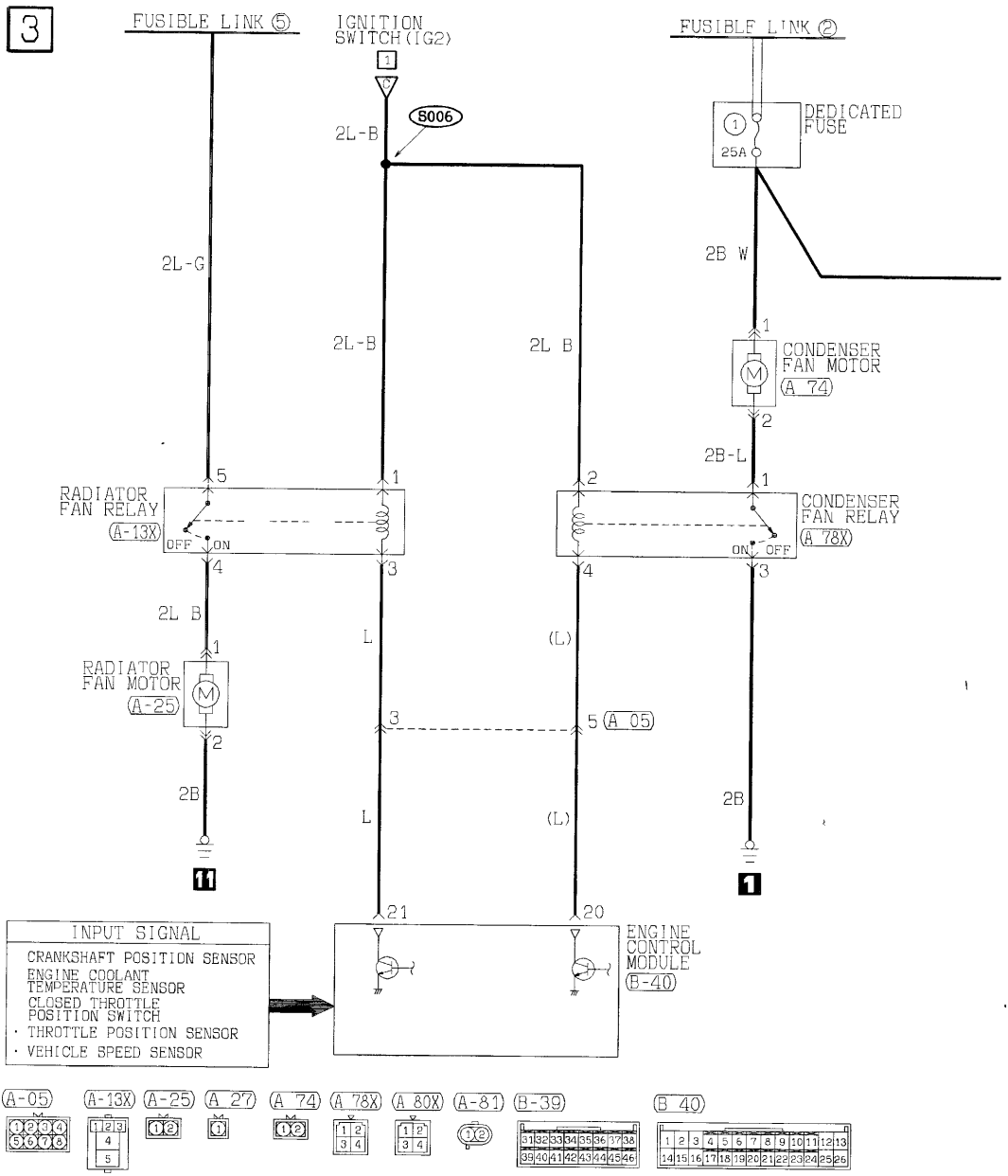
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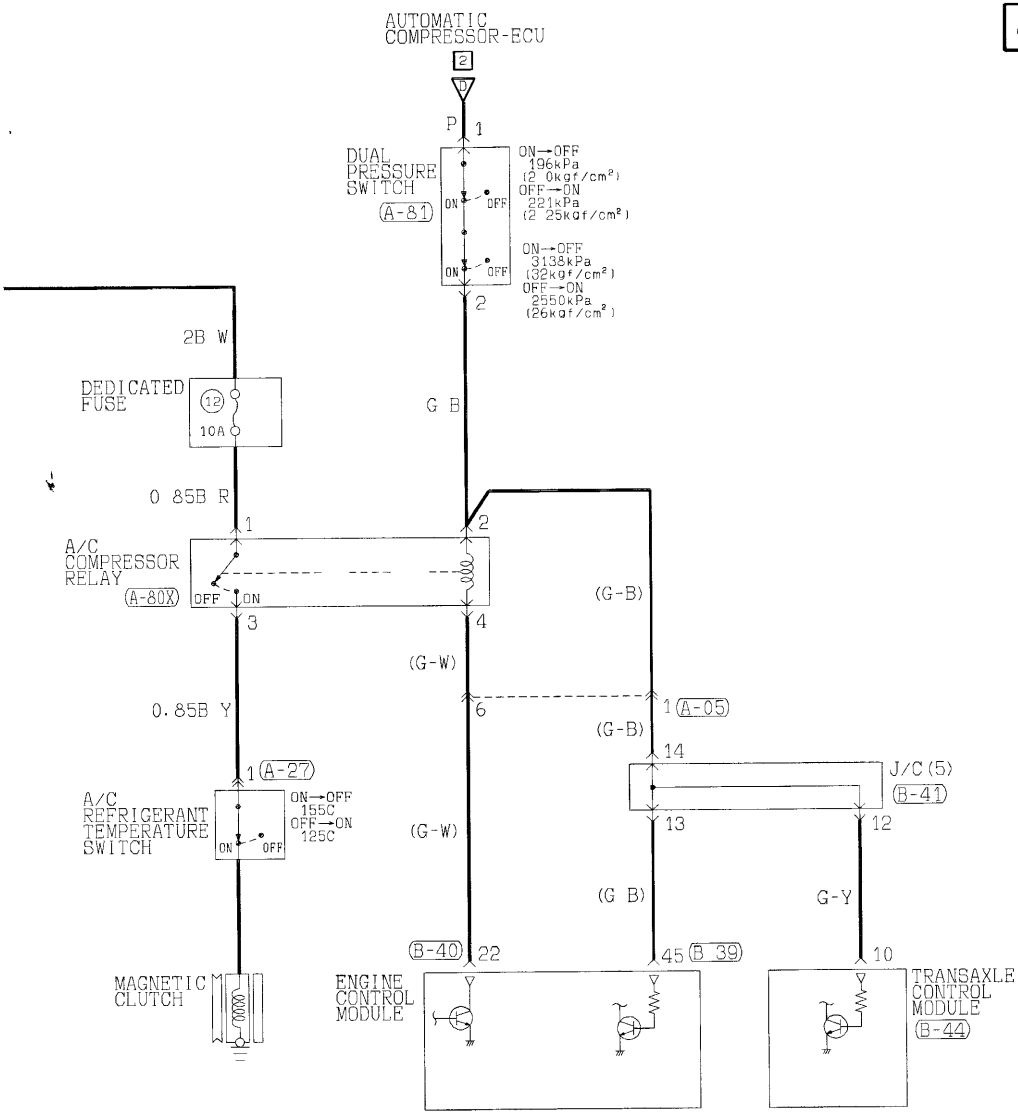


Wire color code
B Black LG Light green G Green L Blue W .White Y :Yellow SB Sky blue
BR:Brown O Orange GR Gray R Red P Pink V .Violet

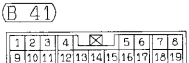
AIR CONDITIONING SYSTEM (CONTINUED)



4



B 41



B-44

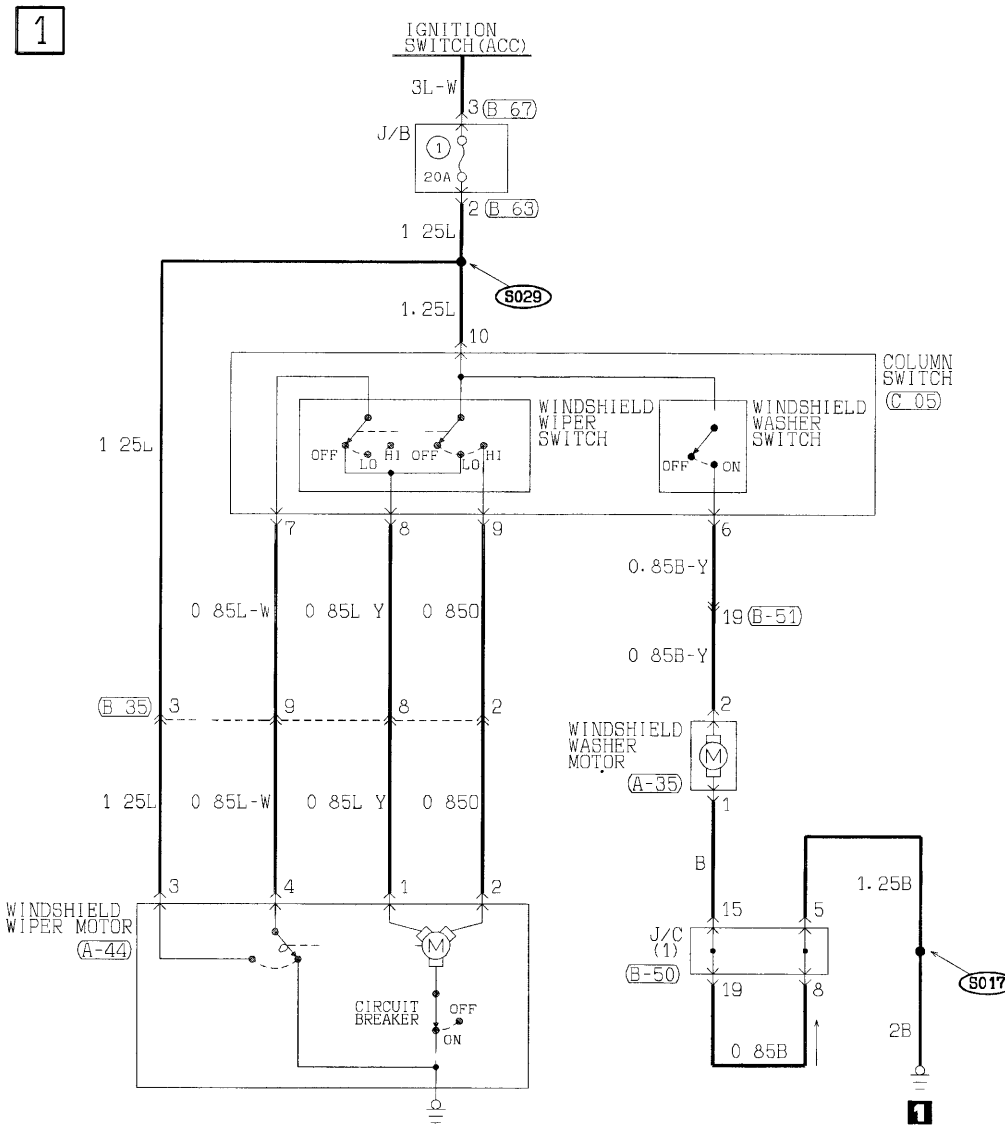


Wire color code

B: Black	LG: Light green	G: Green	L: Blue	W: White	Y: Yellow	SB: Sky blue	
BR: Brown	O: Orange	GR: Gray	R: Red	P: Pink	V: Violet		

WINDSHIELD WIPER AND WASHER <Vehicles without Intermittent Wiper>

90100610619



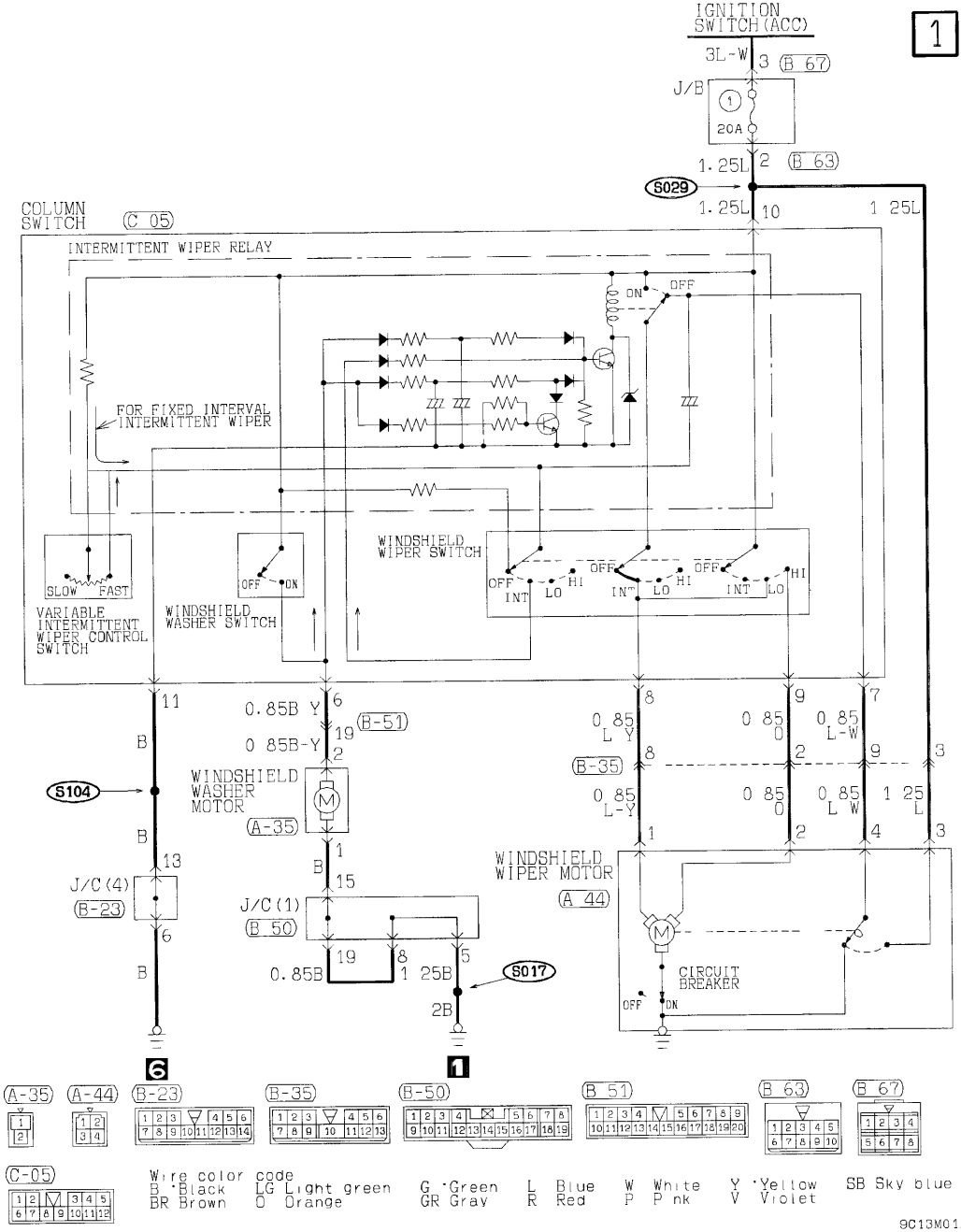
(A-35) (A-44) (B-35) (B-50) (B-51) (B 63) (B-67) (C 05)

W re color code
B :Black LG:Light green G :Green L :Blue W :White Y :Yellow SB Sky blue
BR Brown O :Orange GR.Gray R :Red P :Pink V :Violet

9C13M00AA

WINDSHIELD WIPER AND WASHER <Vehicles with Intermittent Wiper>

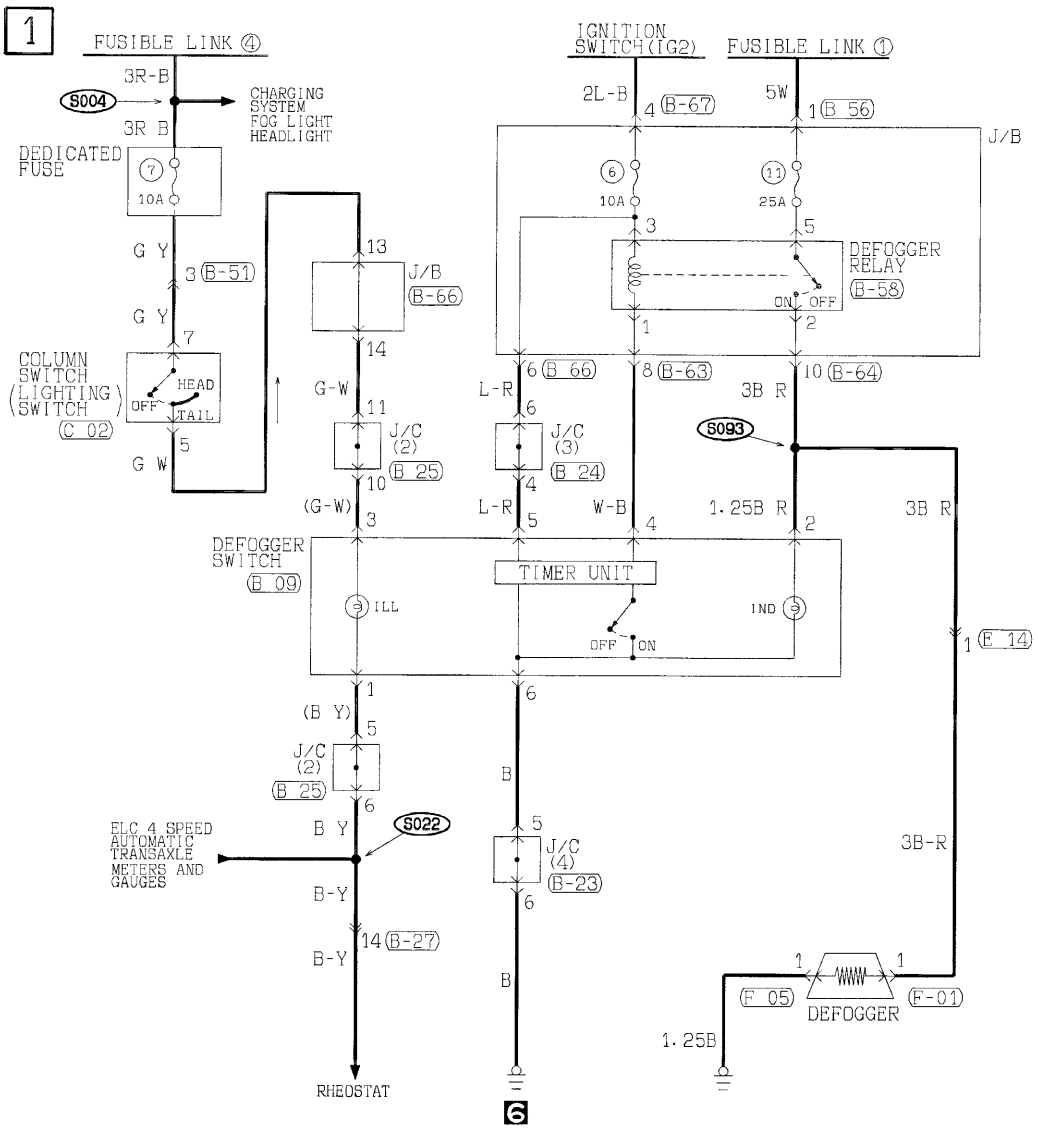
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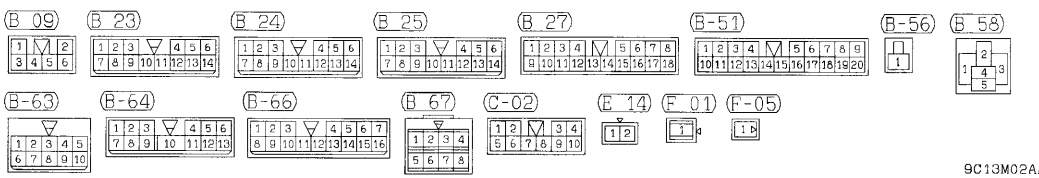


9C13M01AA

REAR WINDOW DEFOGGER

90100640564

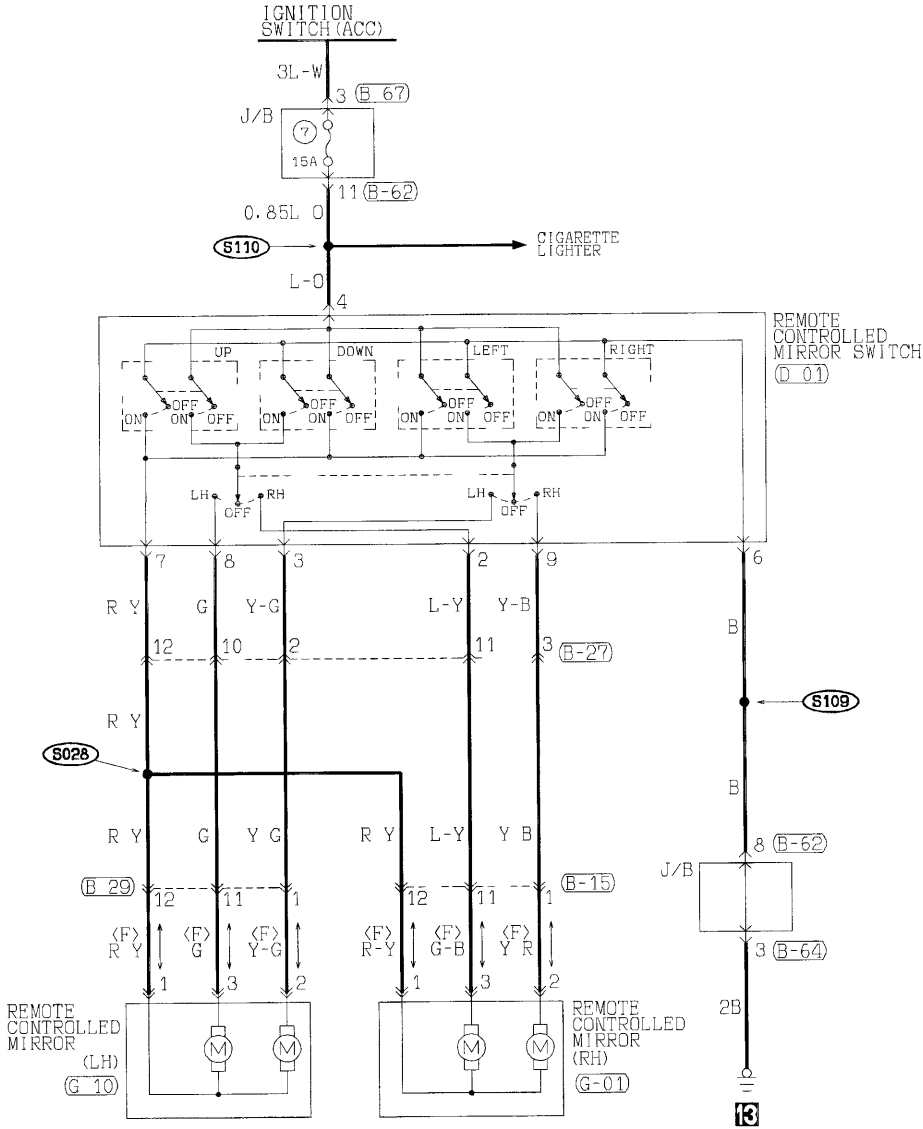




9C13M02AA

REMOTE CONTROLLED MIRROR

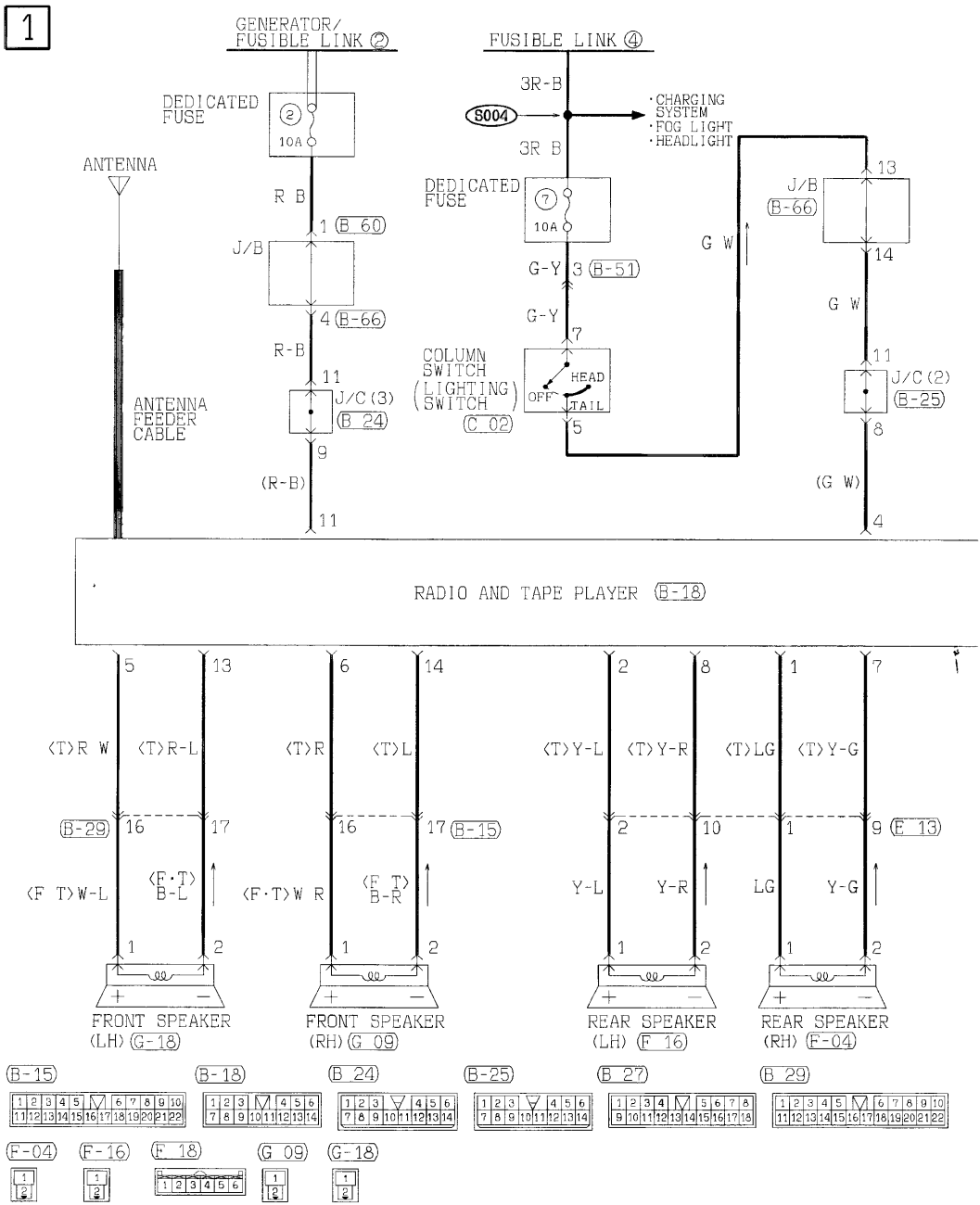
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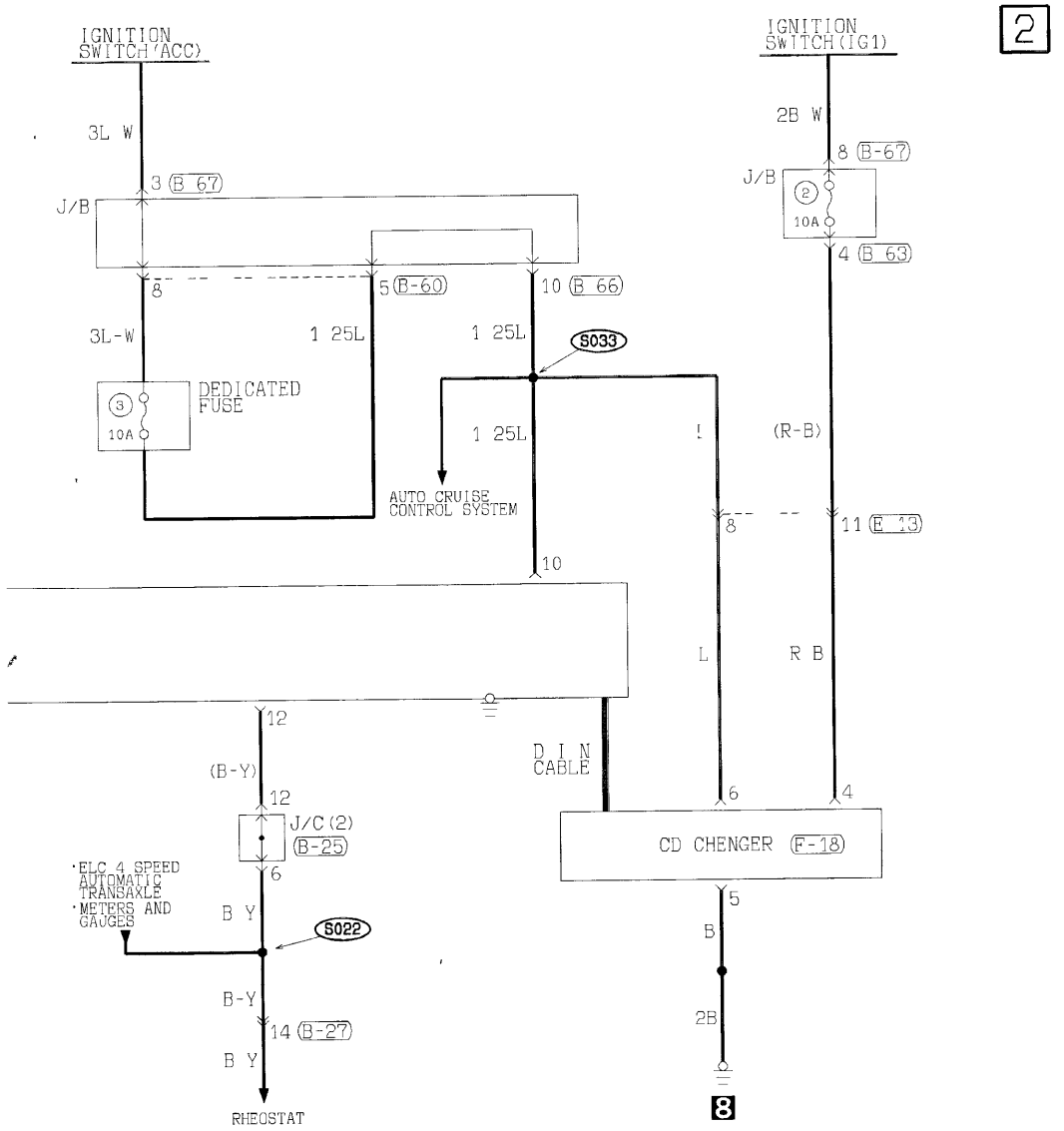
9C13M03AA

RADIO AND TAPE PLAYER

90100721184

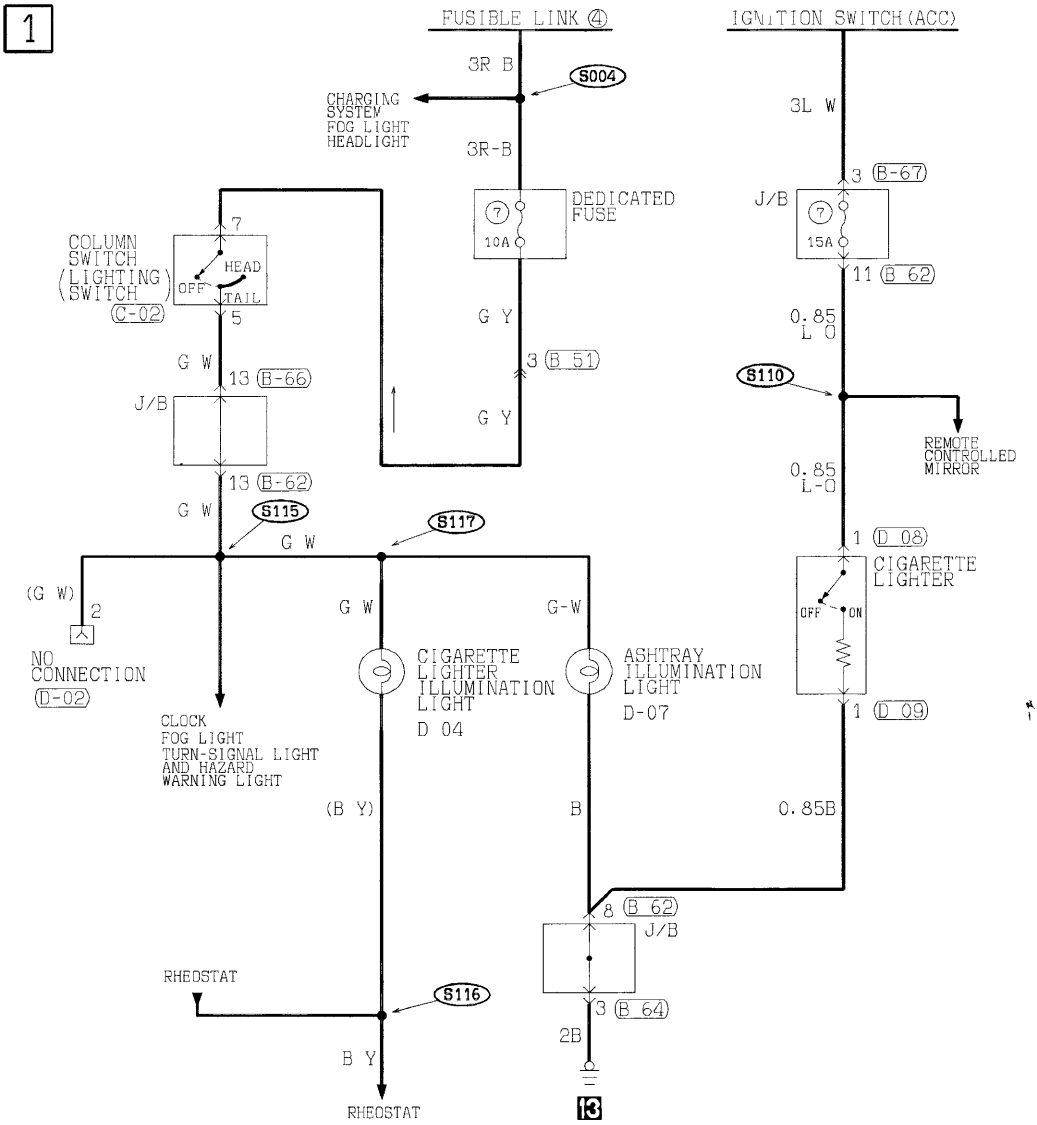


9C14M00AA


2
IGNITION SWITCH (ACC)
IGNITION SWITCH (IG1)
3L W
2B W
8 (B-67)
3 (B-67)
J/B
J/B
2
10A
4 (B-63)
8
5 (B-60)
10 (B-66)
3L-W
1 25L
1 25L
S033
3
10A
DEDICATED FUSE
1 25L
(R-B)
AUTO CRUISE CONTROL SYSTEM
8
11 (E-13)
10
L
R B
12
D I N CABLE
(B-Y)
12
6
4
J/C (2) (B-25)
CD CHENGER (F-18)
6
5
·ELC 4 SPEED AUTOMATIC TRANSAXLE
·METERS AND GAUGES
B Y
S022
B
B-Y
2B
14 (B-27)
B Y
RHEOSTAT
8
B 51
B-60
B-63
B 66
B 67
C 02
E-13
Wire color code
B Black
BR Brown
LG Light green
O Orange
G Green
GR Gray
L Blue
R Red
W White
P Pink
Y Yellow
V Violet
SB Sky blue
9C14M00AB

CIGARETTE LIGHTER

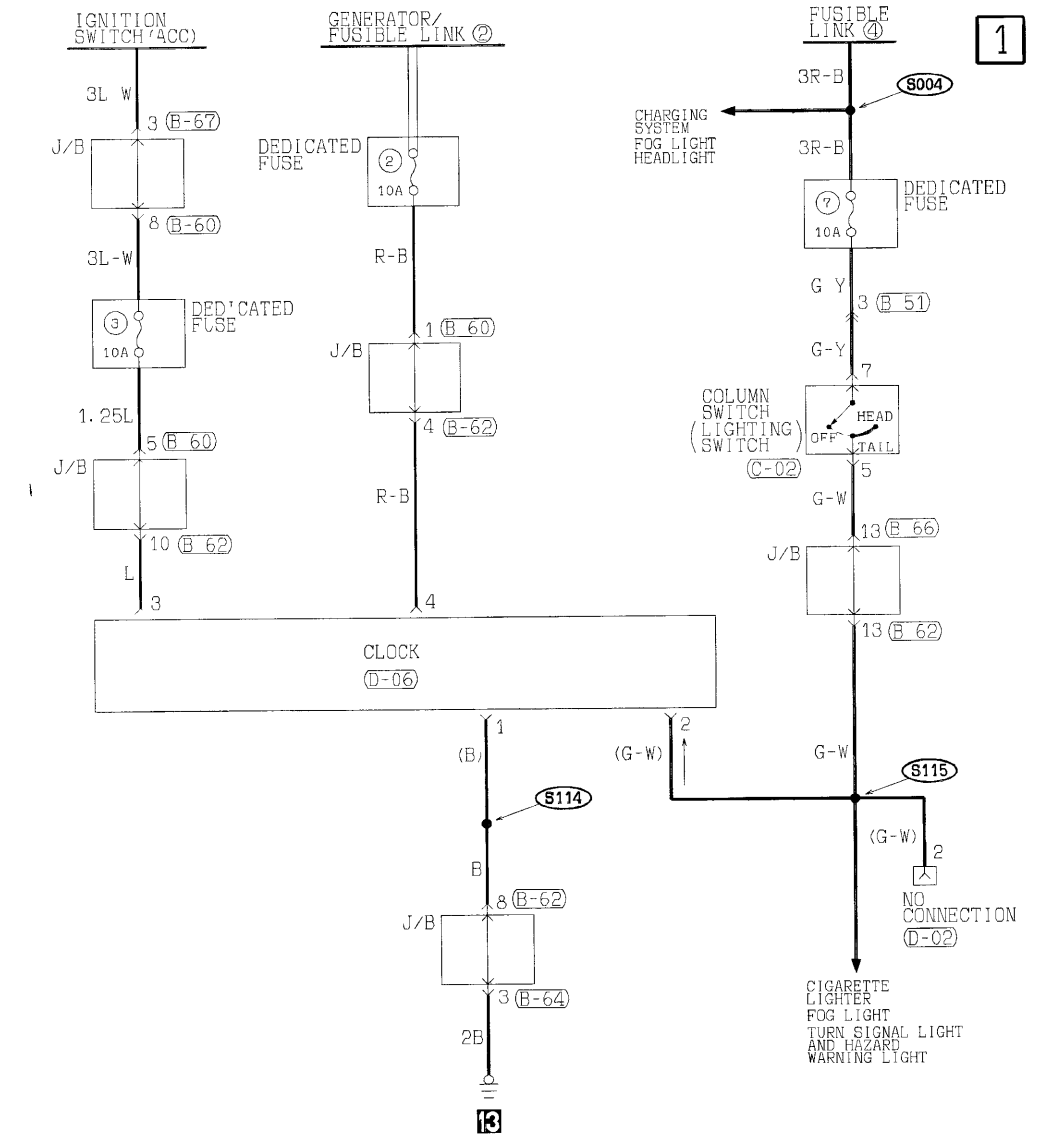
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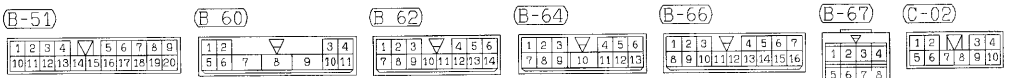


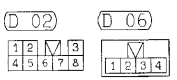
9C14M01AA

CLOCK

90100770393







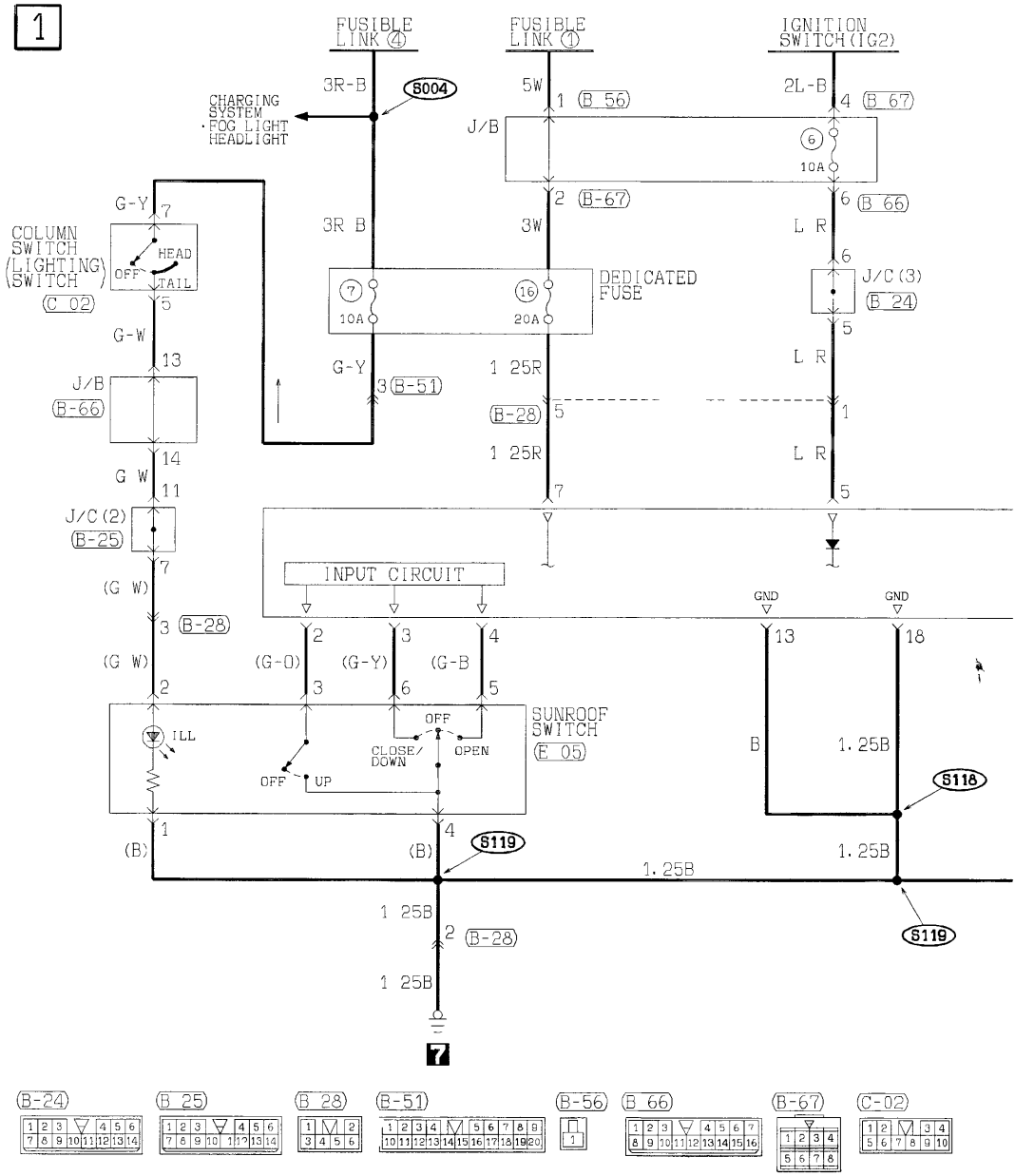
Wire color code

B	Black	LG	Light green	G	Green	L	Blue
BR	Brown	O	Orange	GR	Gray	R	Red
W	White	SB	Sky blue	P	Pink	Y	Yellow
V	Violet						

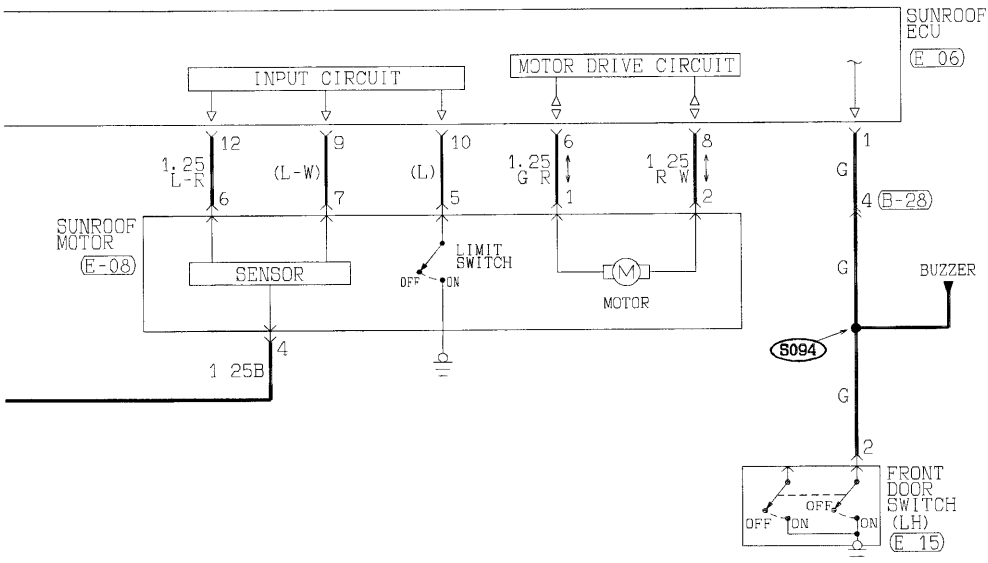
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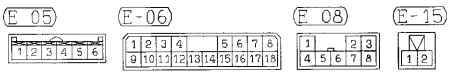
SUNROOF <2-door Models>

90100990423



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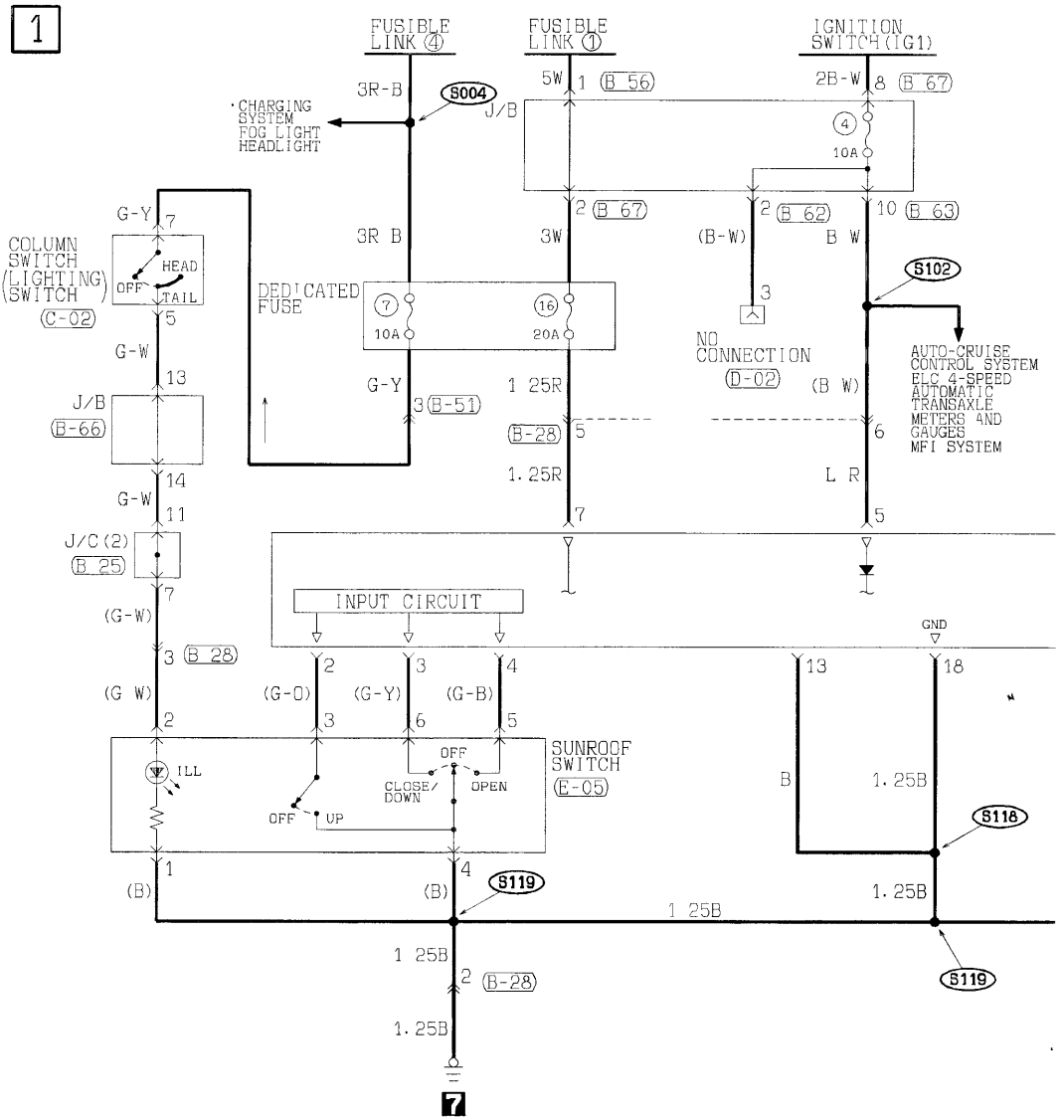




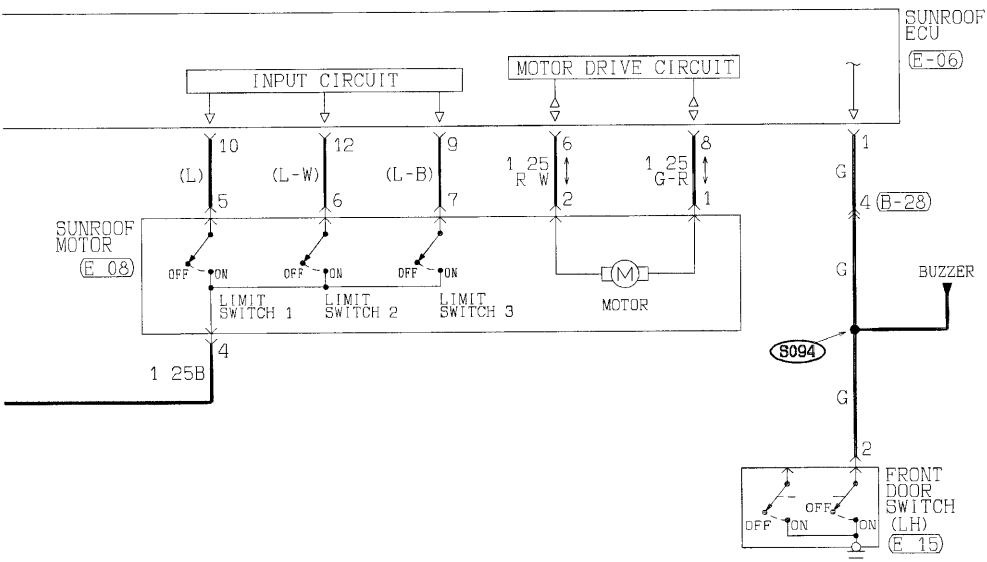
W re color code
B Black LG:Light green G :Green L :Blue W :White Y Yellow SB:Sky blue
BR Brown O :Orange GR Gray R :Red P :Pink V Violet

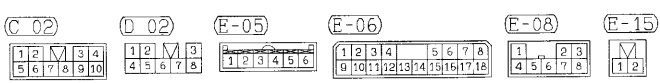
SUNROOF <4-door Models>

90100990430



2



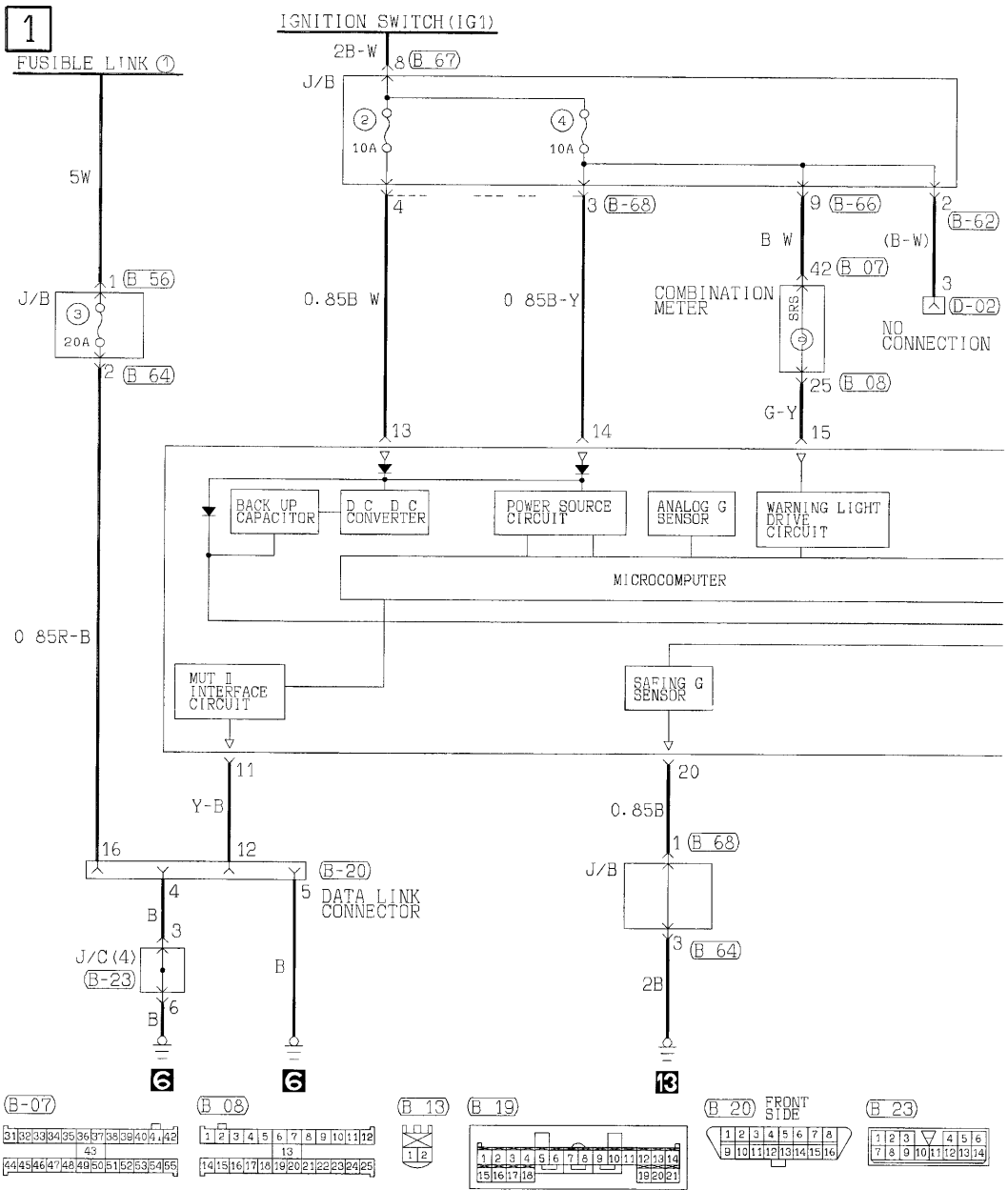


Wire color code
B :Black LG:Light green G :Green L :Blue W :White Y :Yellow SB:Sky blue
BR :Brown O :Orange GR :Gray R :Red P :Pink V :Violet

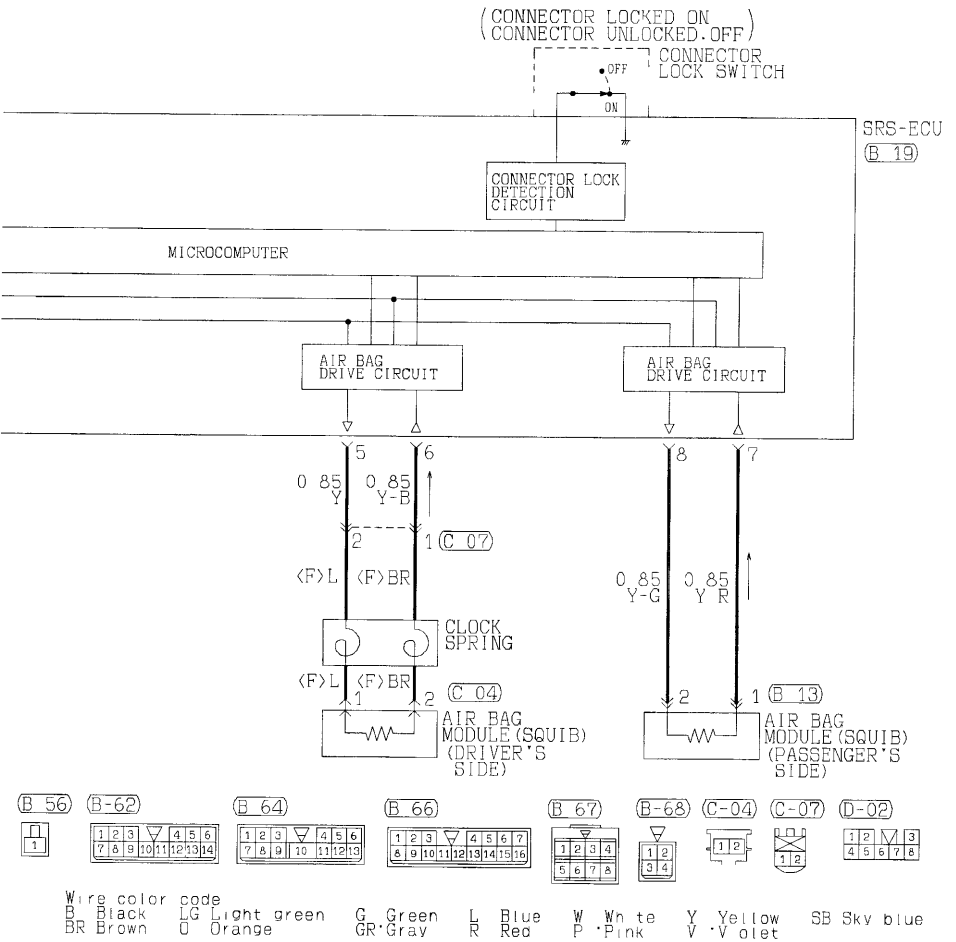
9C15M01AB

SUPPLEMENTAL RESTRAINT SYSTEM (SRS)

90100970656



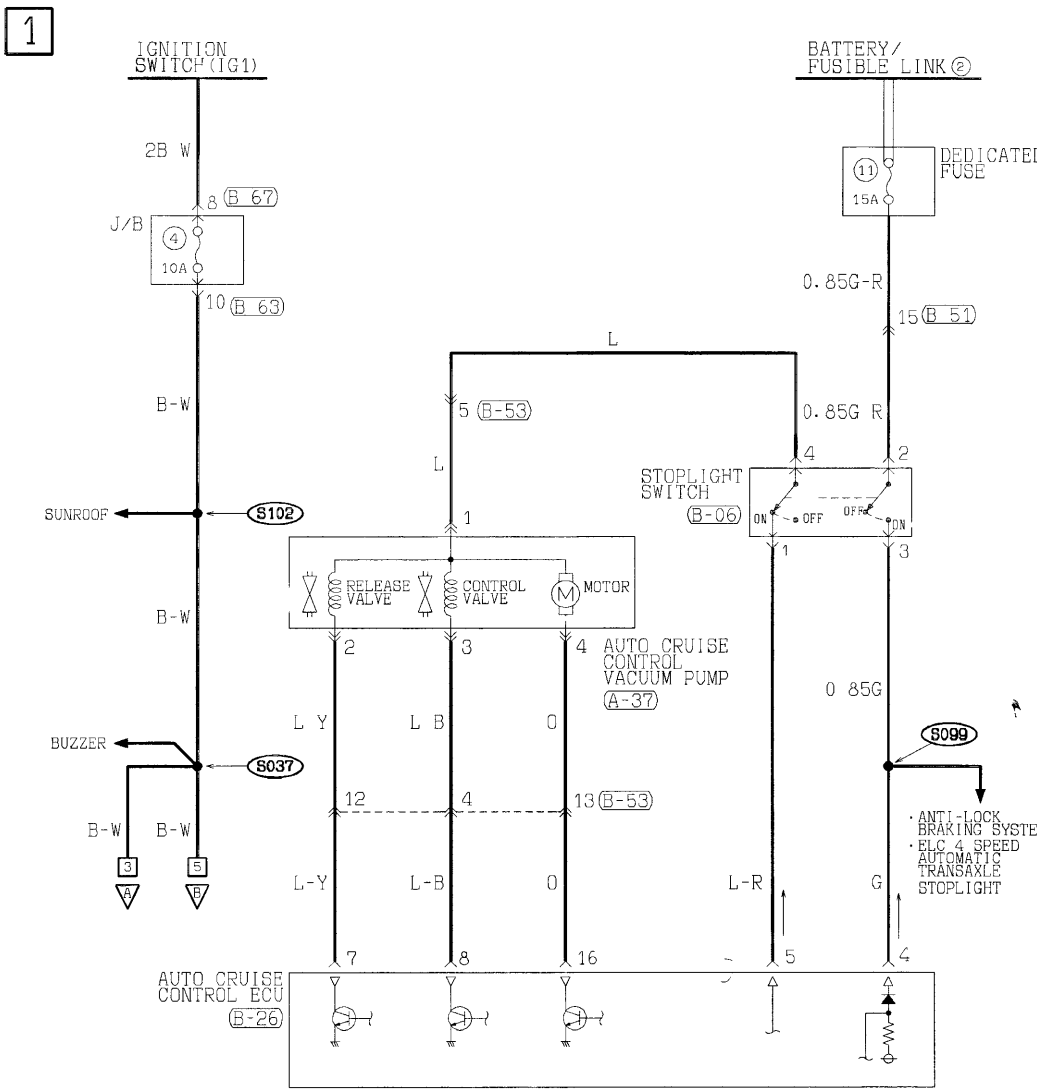
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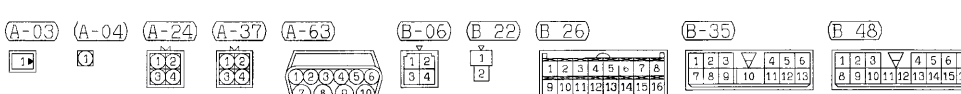

(CONNECTOR LOCKED ON
CONNECTOR UNLOCKED.OFF)
CONNECTOR LOCK SWITCH
OFF
ON
SRS-ECU
B 19
CONNECTOR LOCK DETECTION CIRCUIT
MICROCOMPUTER
AIR BAG DRIVE CIRCUIT
AIR BAG DRIVE CIRCUIT
5
6
8
7
0.85 Y
0.85 Y-B
0.85 Y-G
0.85 Y-R
2
1 C 07
(F)L
(F)BR
CLOCK SPRING
(F)L
(F)BR
1
2
C 04
AIR BAG MODULE (SQUIB) (DRIVER'S SIDE)
2
1 B 13
AIR BAG MODULE (SQUIB) (PASSENGER'S SIDE)
B 56
B-62
B 64
B 66
B 67
B-68
C-04
C-07
D-02
Wire color code
B Black
LG Light green
G Green
L Blue
W White
Y Yellow
SB Sky blue
BR Brown
O Orange
GR Gray
R Red
P Pink
V Violet

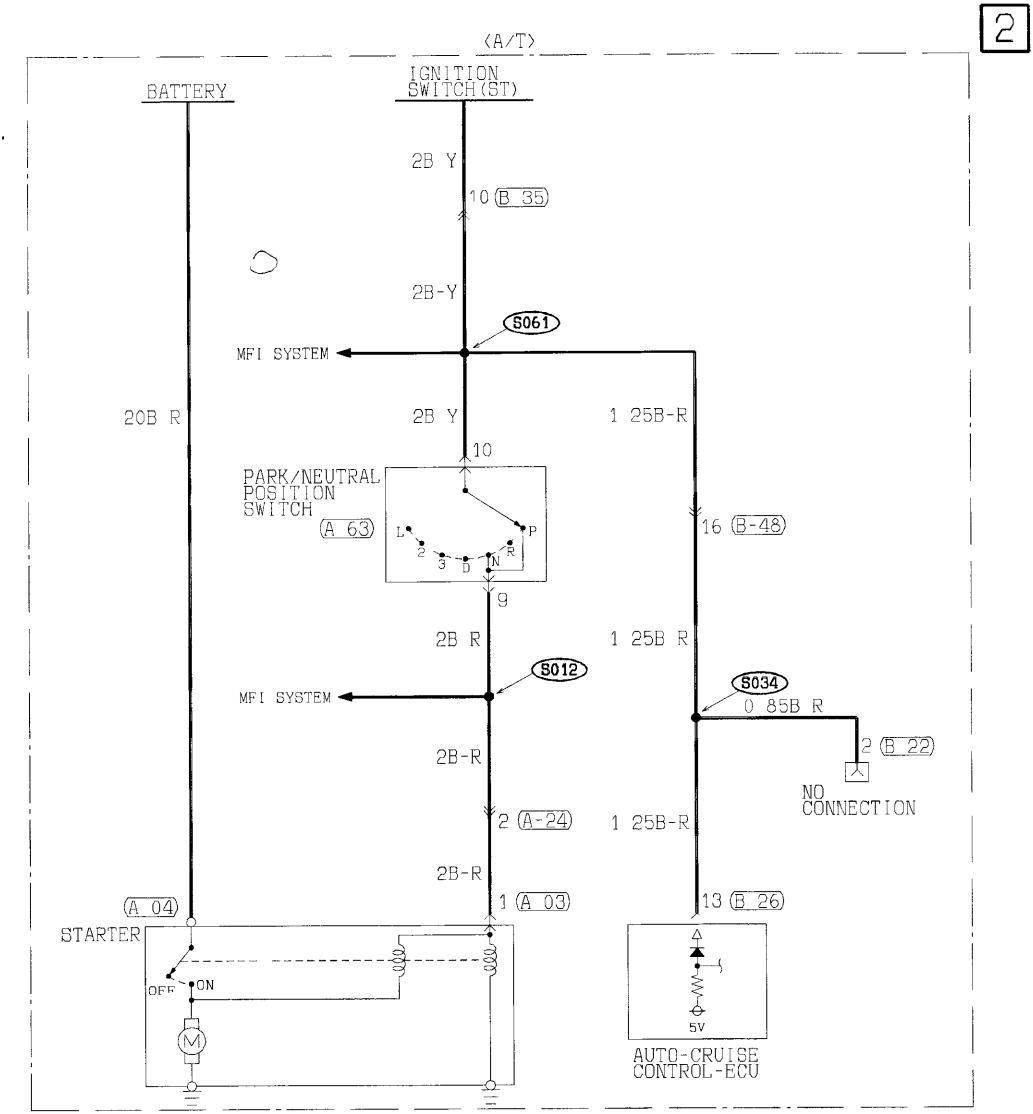
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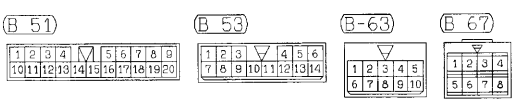
AUTO-CRUISE CONTROL SYSTEM

90100930746



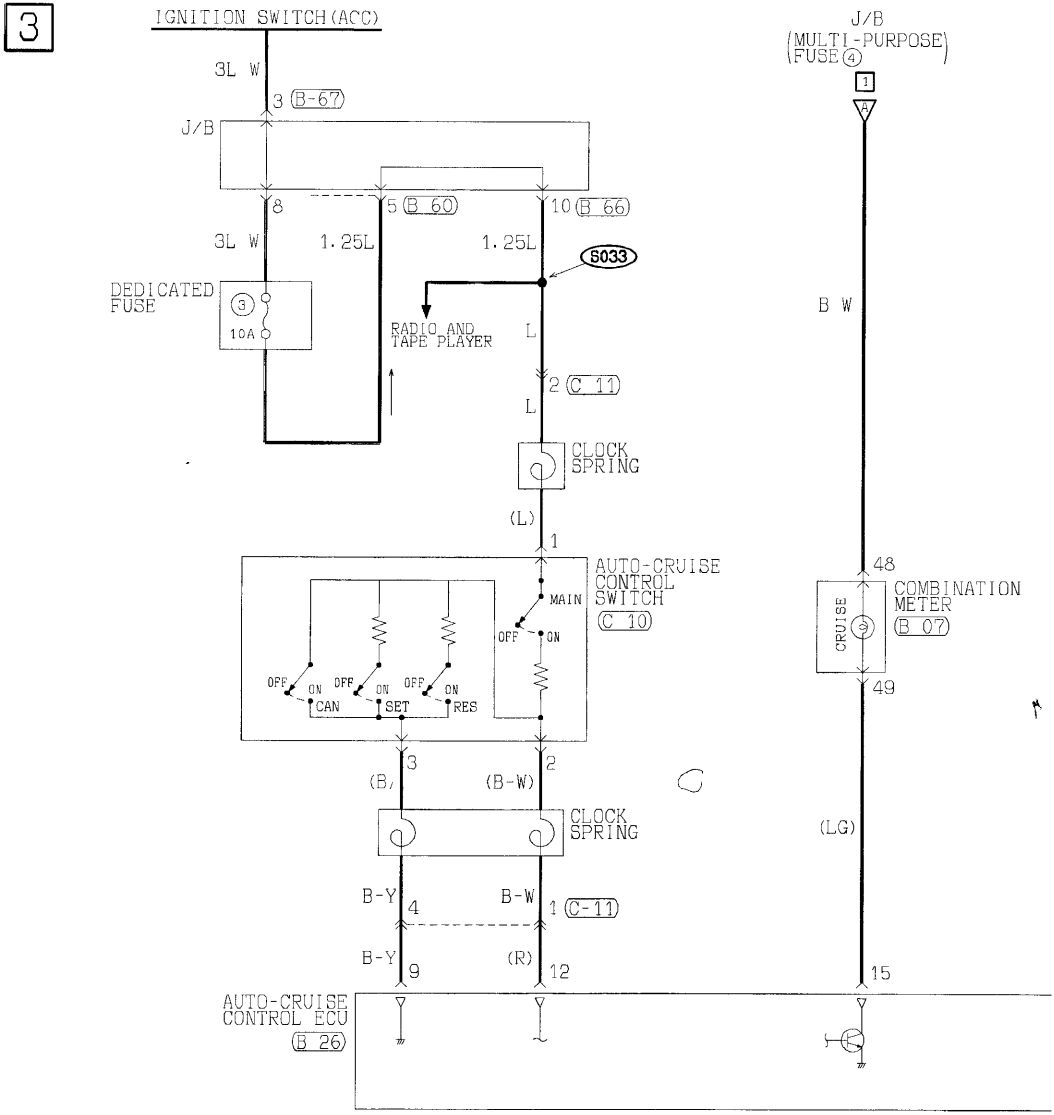






W re color code
B Black LG L ght green G Green L Blue W White Y Yellow SB Sky blue
BR Brown O Orange GR.Gray R Red P .P nk V :V olet

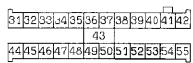
AUTO-CRUISE CONTROL SYSTEM (CONTINUED)



(A 52)



(B-07)



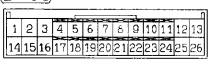
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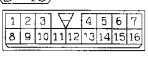
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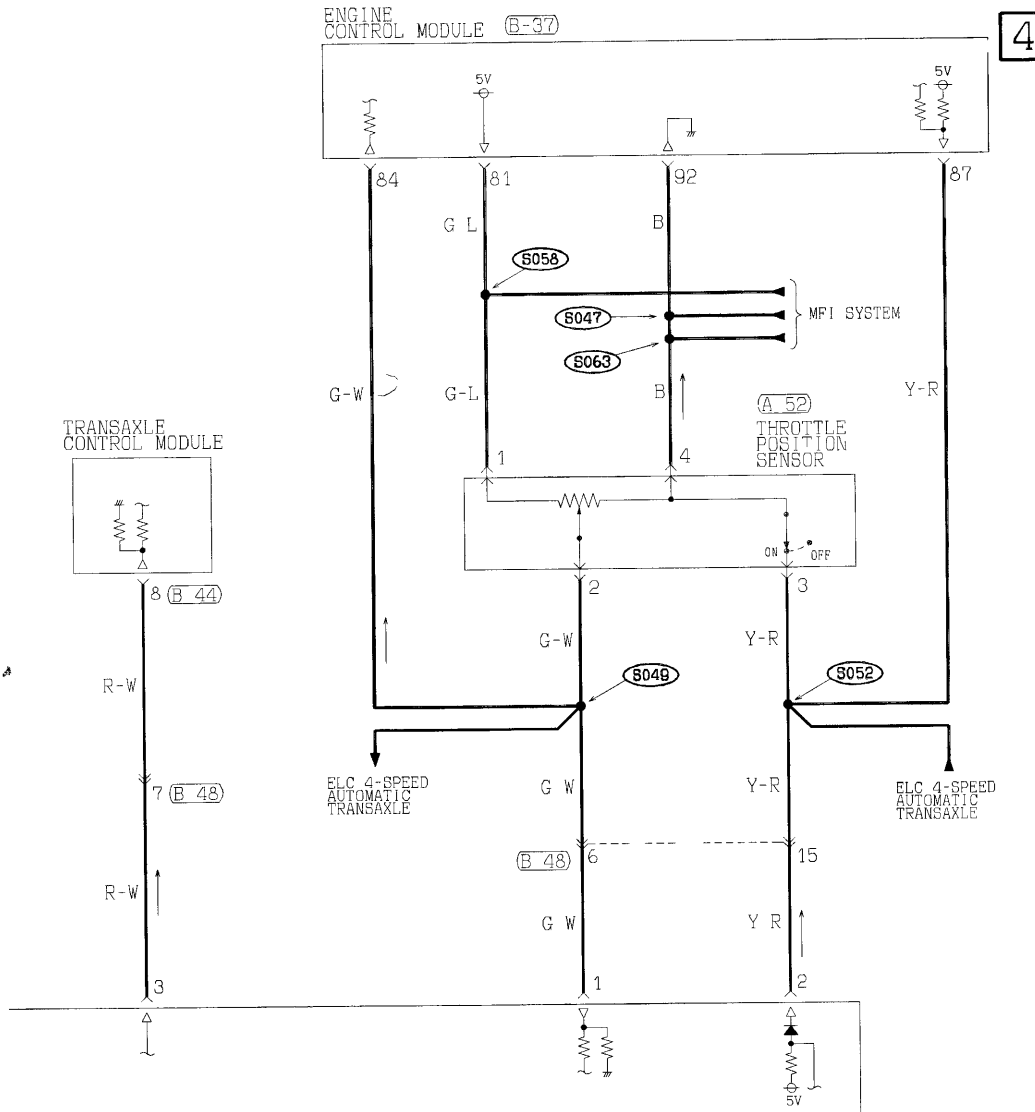


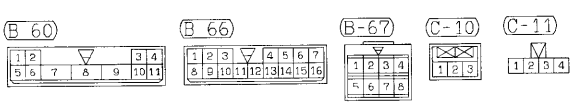
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(B 48)

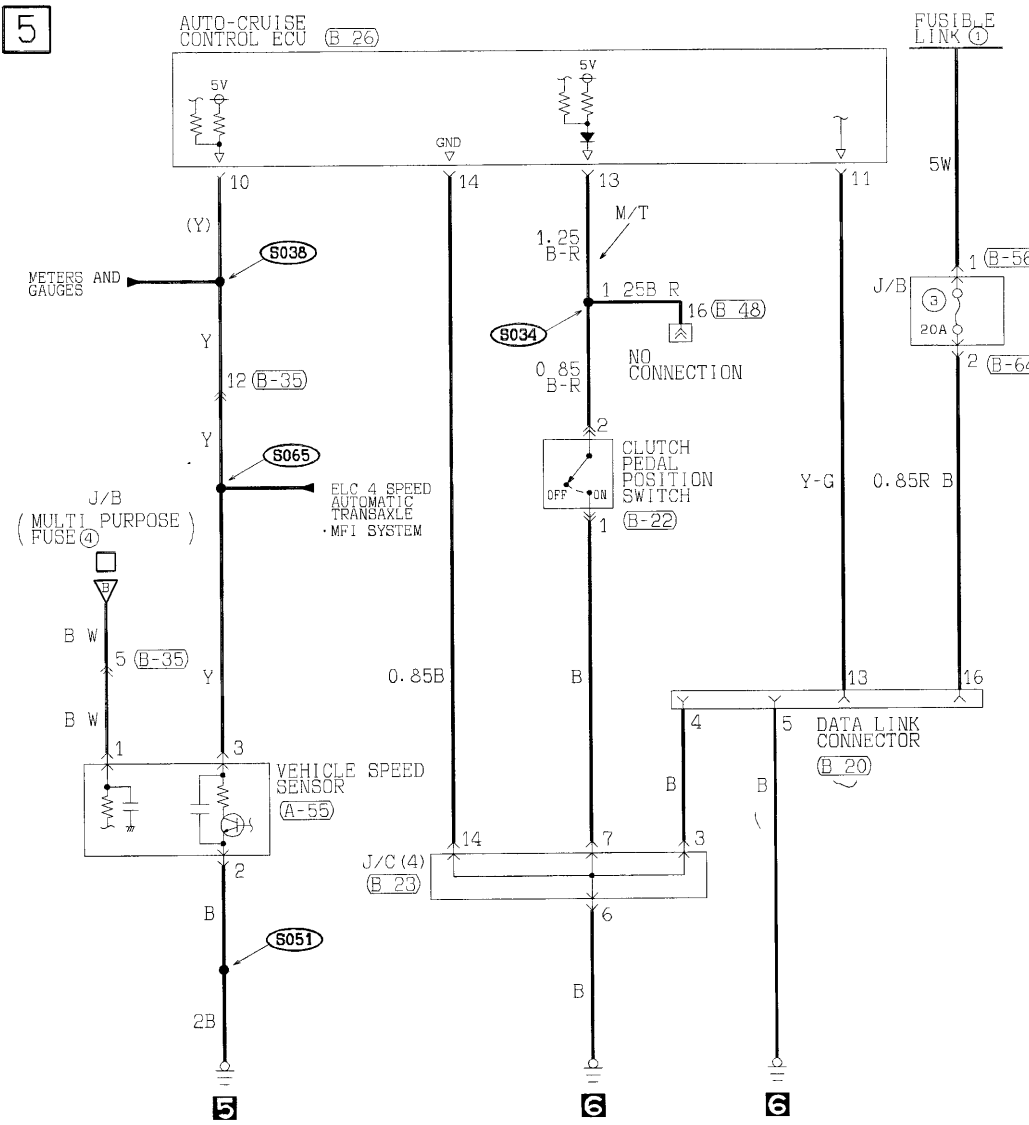


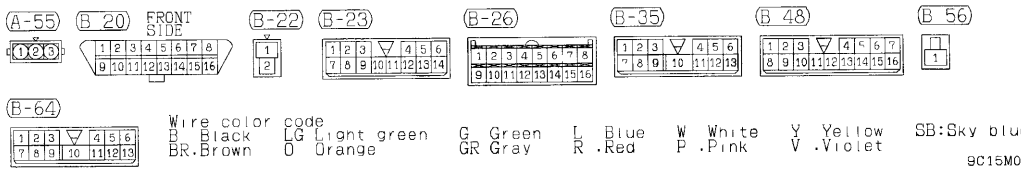




Wire color code
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BR Brown O : Orange GR Gray R Red P Pink V Violet

AUTO-CRUISE CONTROL SYSTEM (CONTINUED)



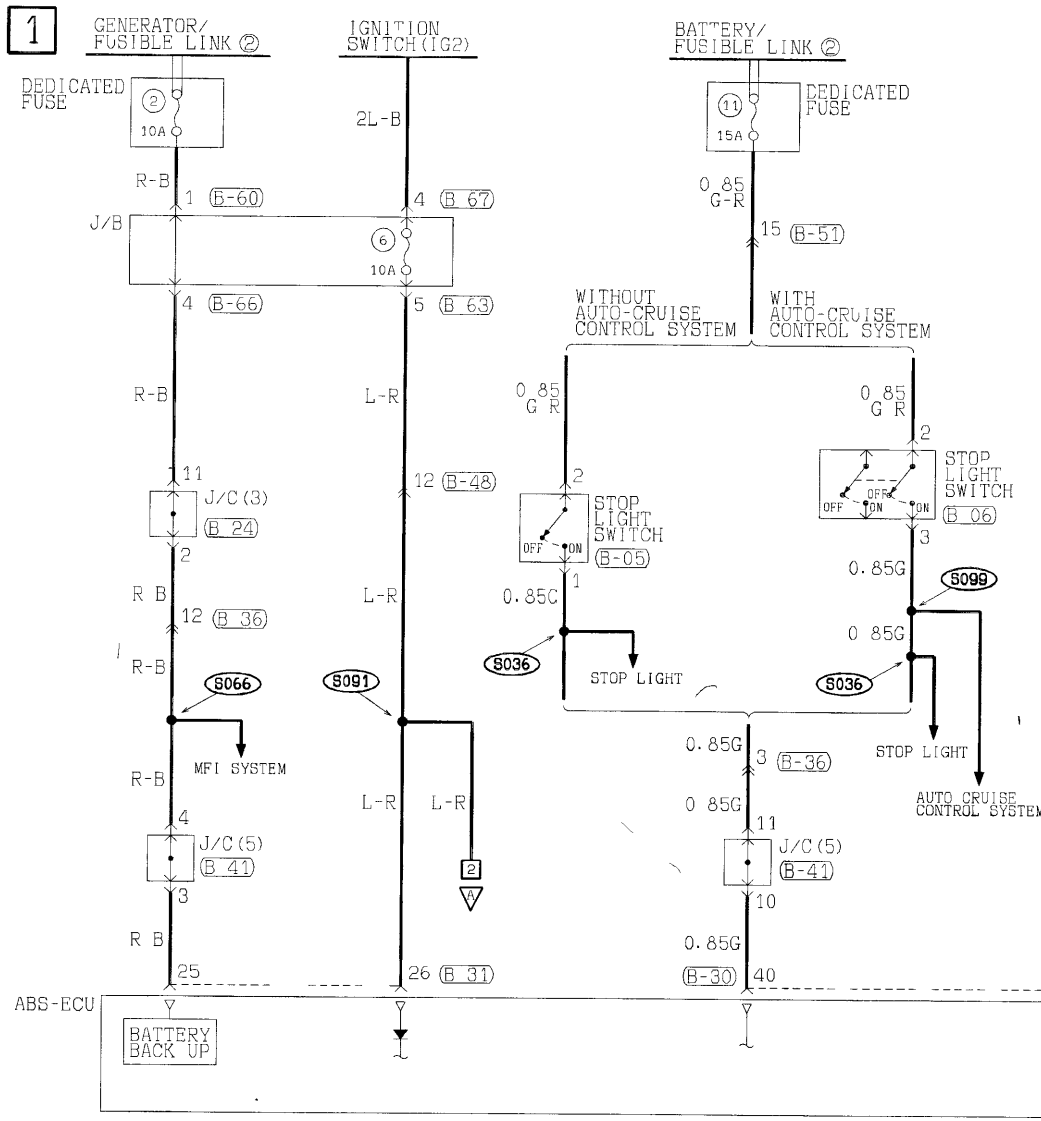


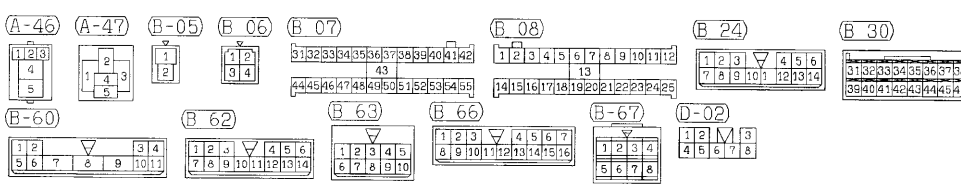
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BR.Brown O Orange GR Gray R .Red P .Pink V .Violet

9C15M03CA

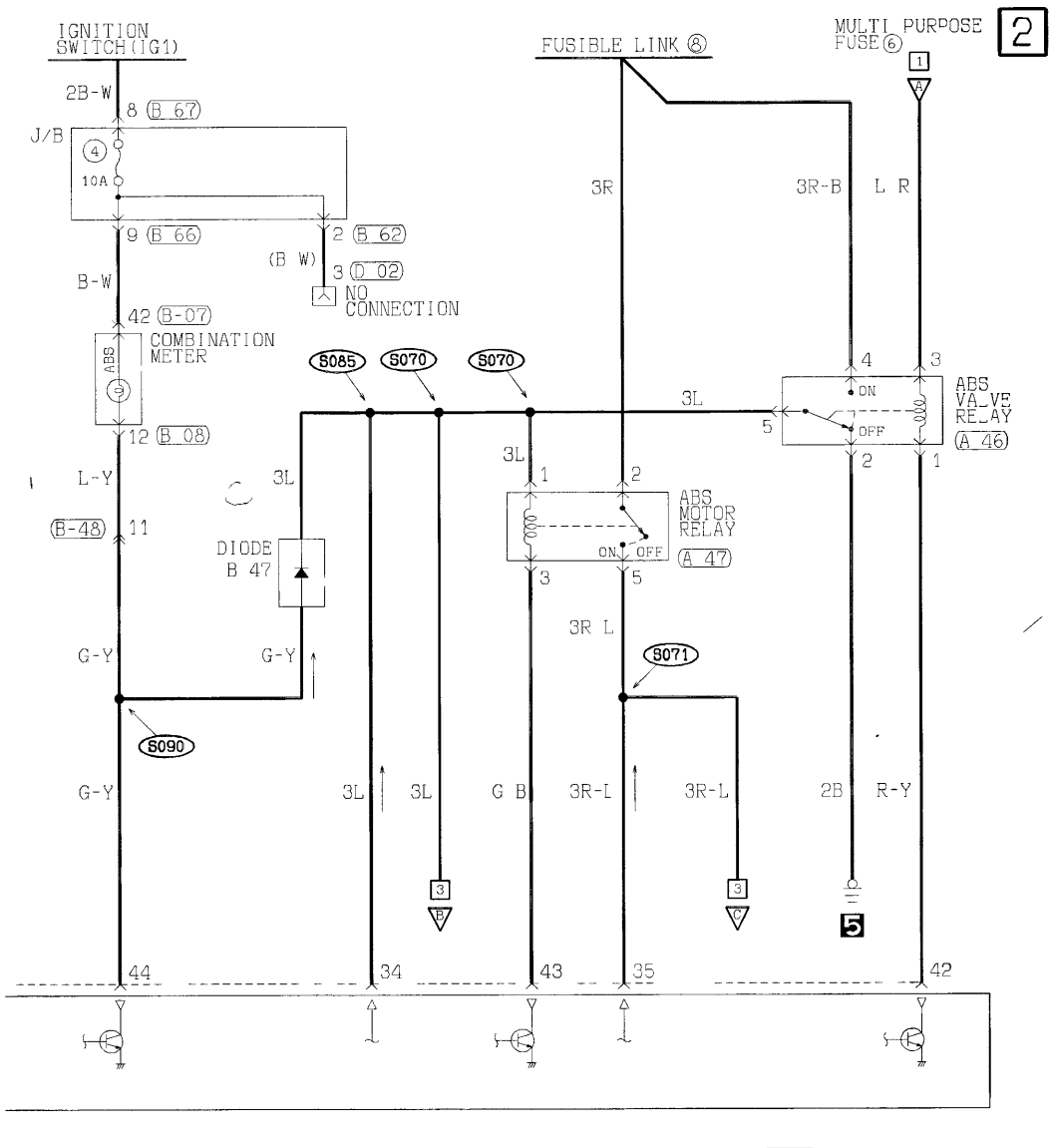
ANTI-LOCK BRAKING SYSTEM (ABS)

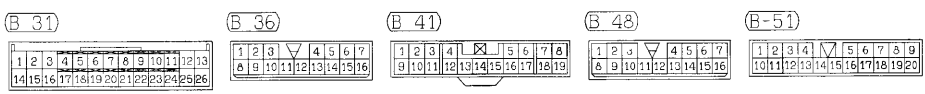
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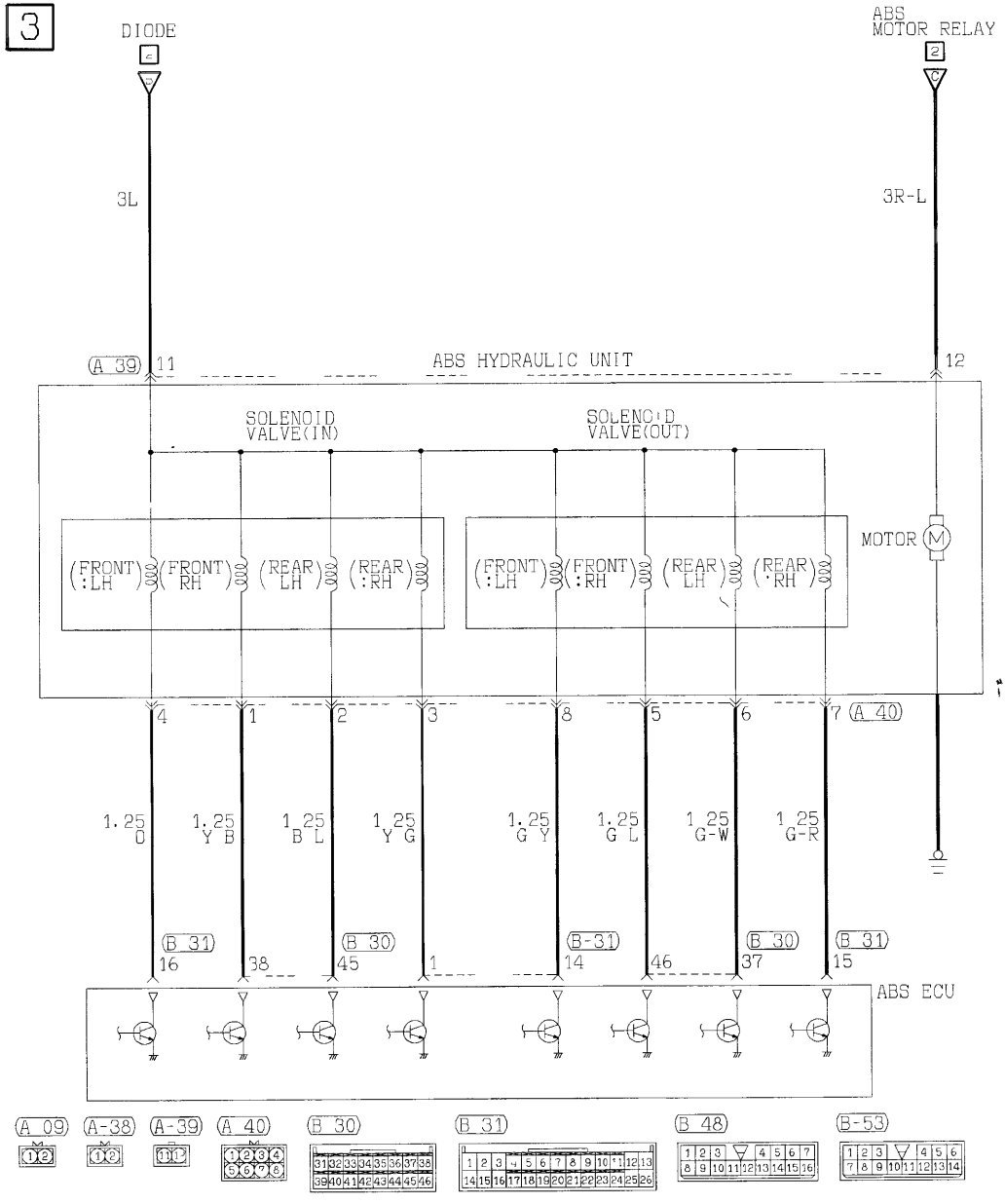


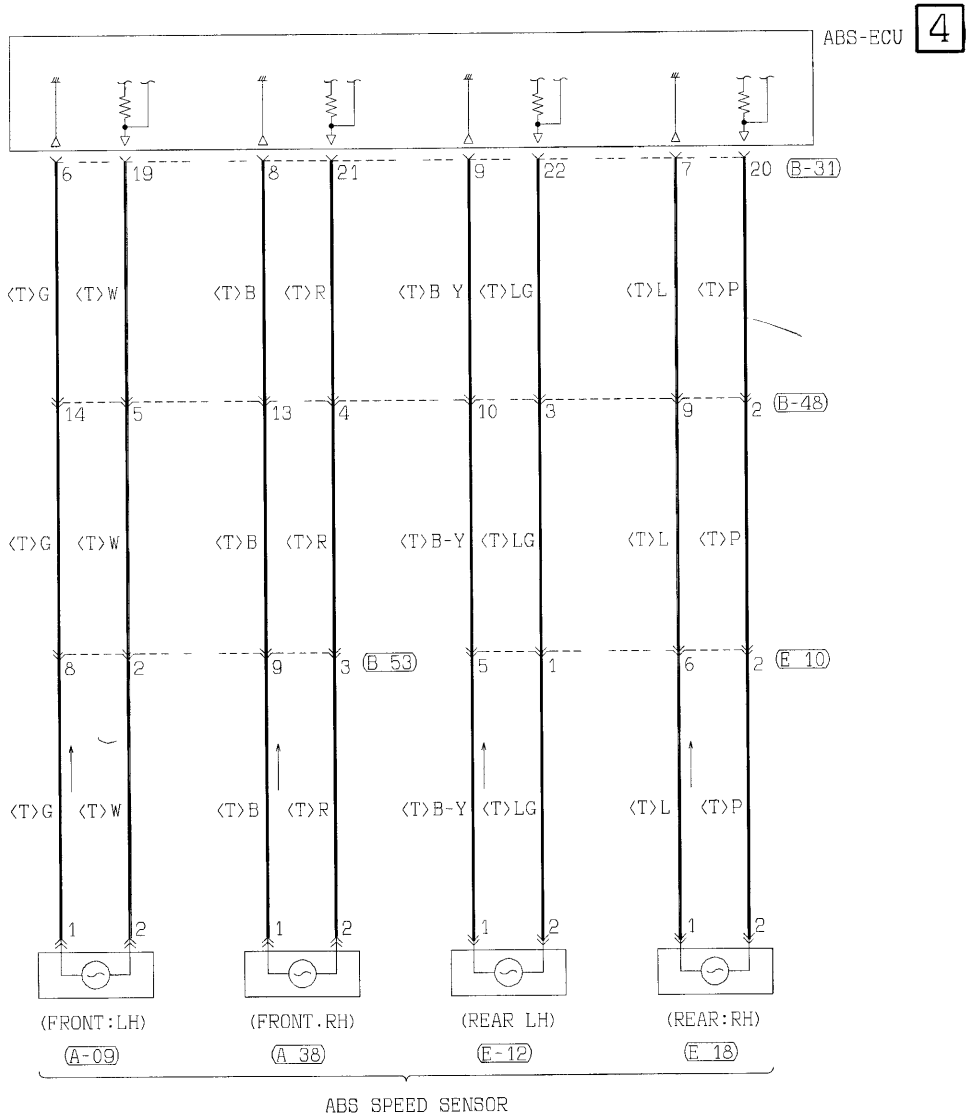


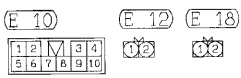
Wire color code

B :Black	LG :Light green	G :Green	L :Blue	W :White	Y :Yellow	SB :Sky blue	
BR :Brown	O :Orange	GR :Gray	R :Red	P :Pink	V :Violet		

ANTI-LOCK BRAKING SYSTEM (ABS) (CONTINUED)

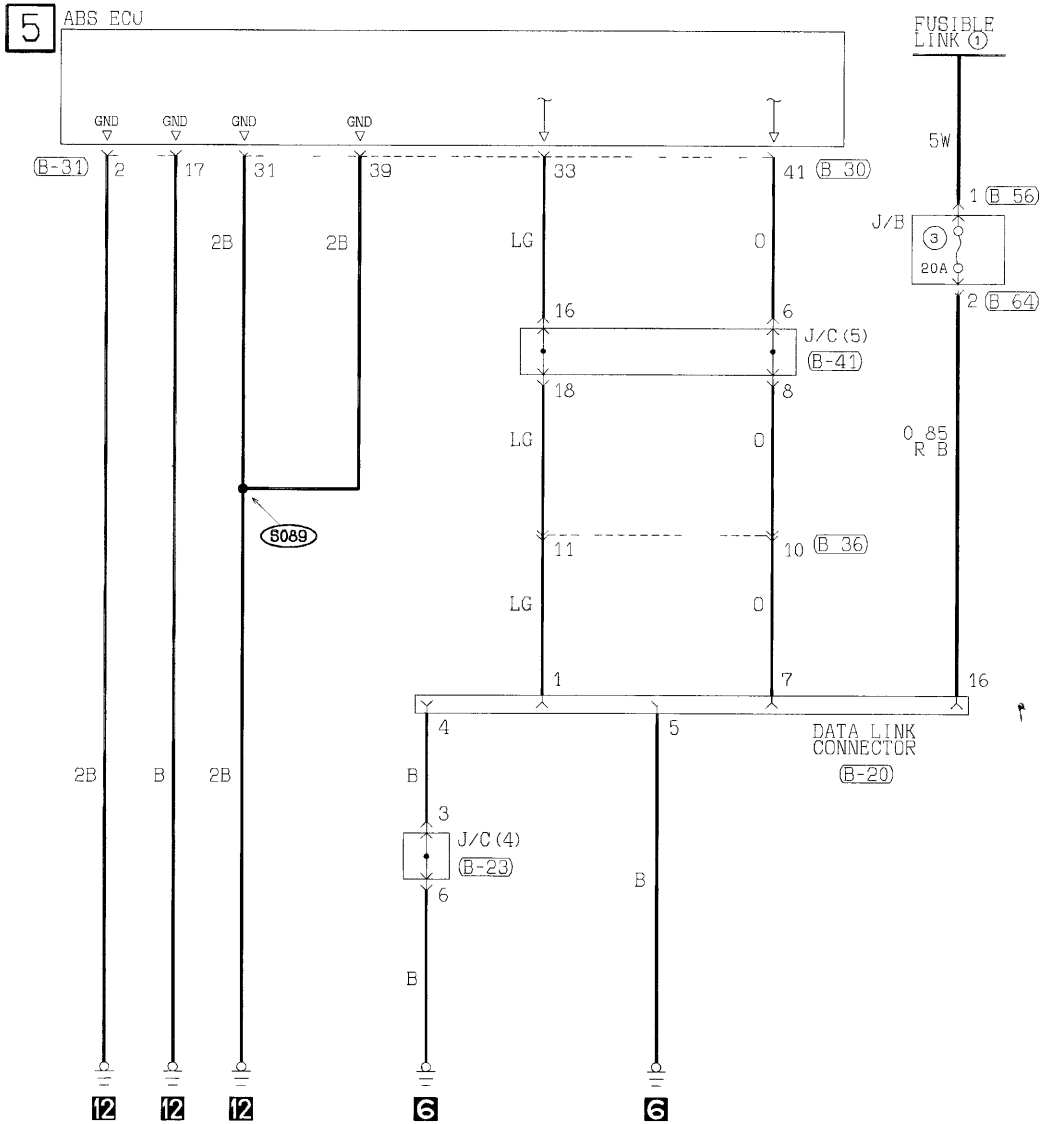


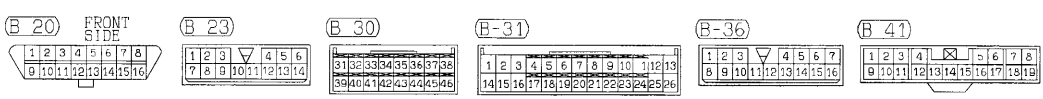


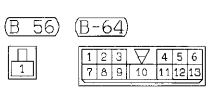


Wire color code
B .Black LG:Light green G Green L Blue W .White Y .Yellow SB Sky blue
BR Brown O :Orange GR.Gray R Red P Pink V Violet

ANTI-LOCK BRAKING SYSTEM (ABS) (CONTINUED)





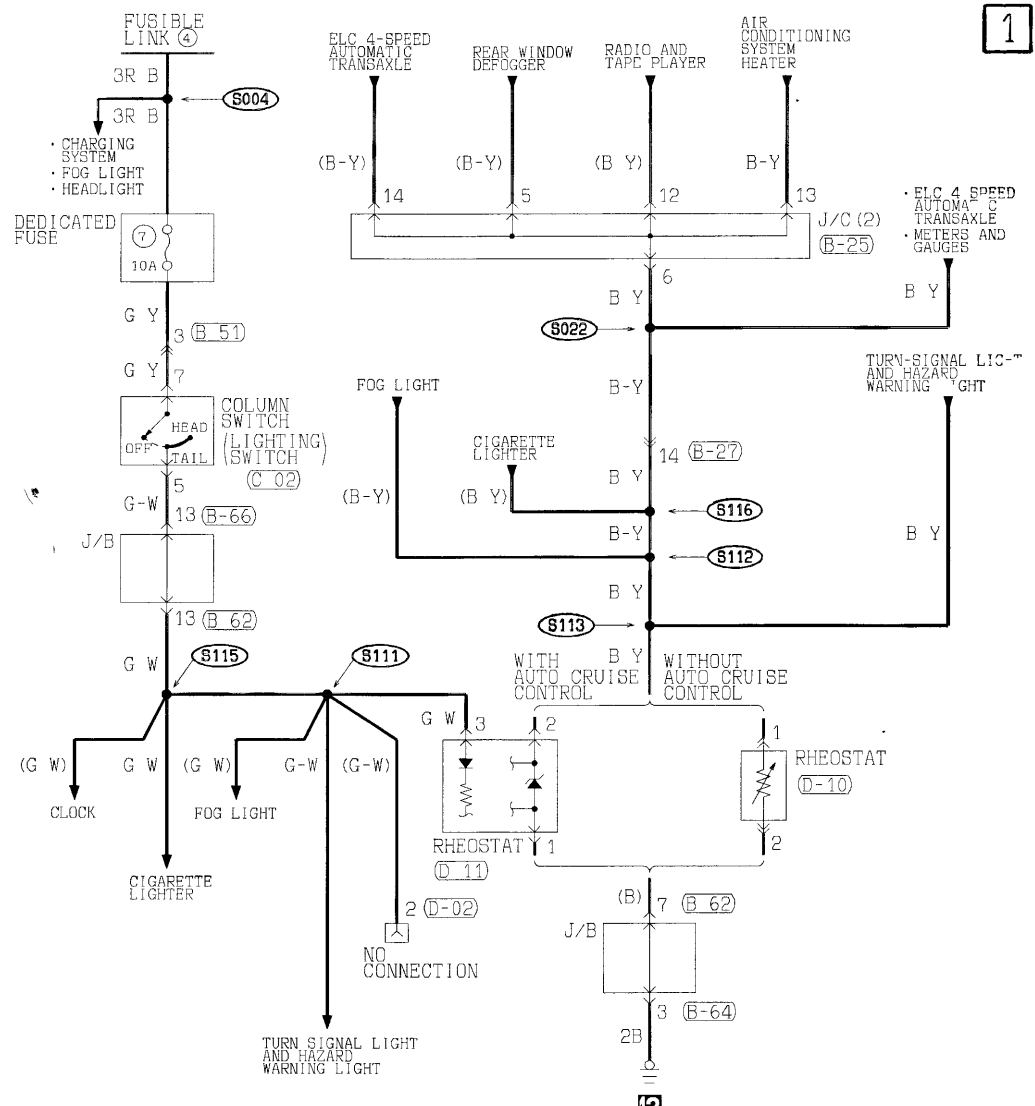


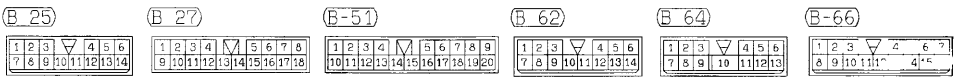
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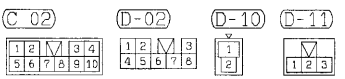
B : Black	LG : Light green	G : Green	L : Blue
BR : Brown	O : Orange	GR : Gray	R : Red
W : White	SB : Sky blue	P : Pink	Y : Yellow
V : Violet			

RHEOSTAT

90101110248







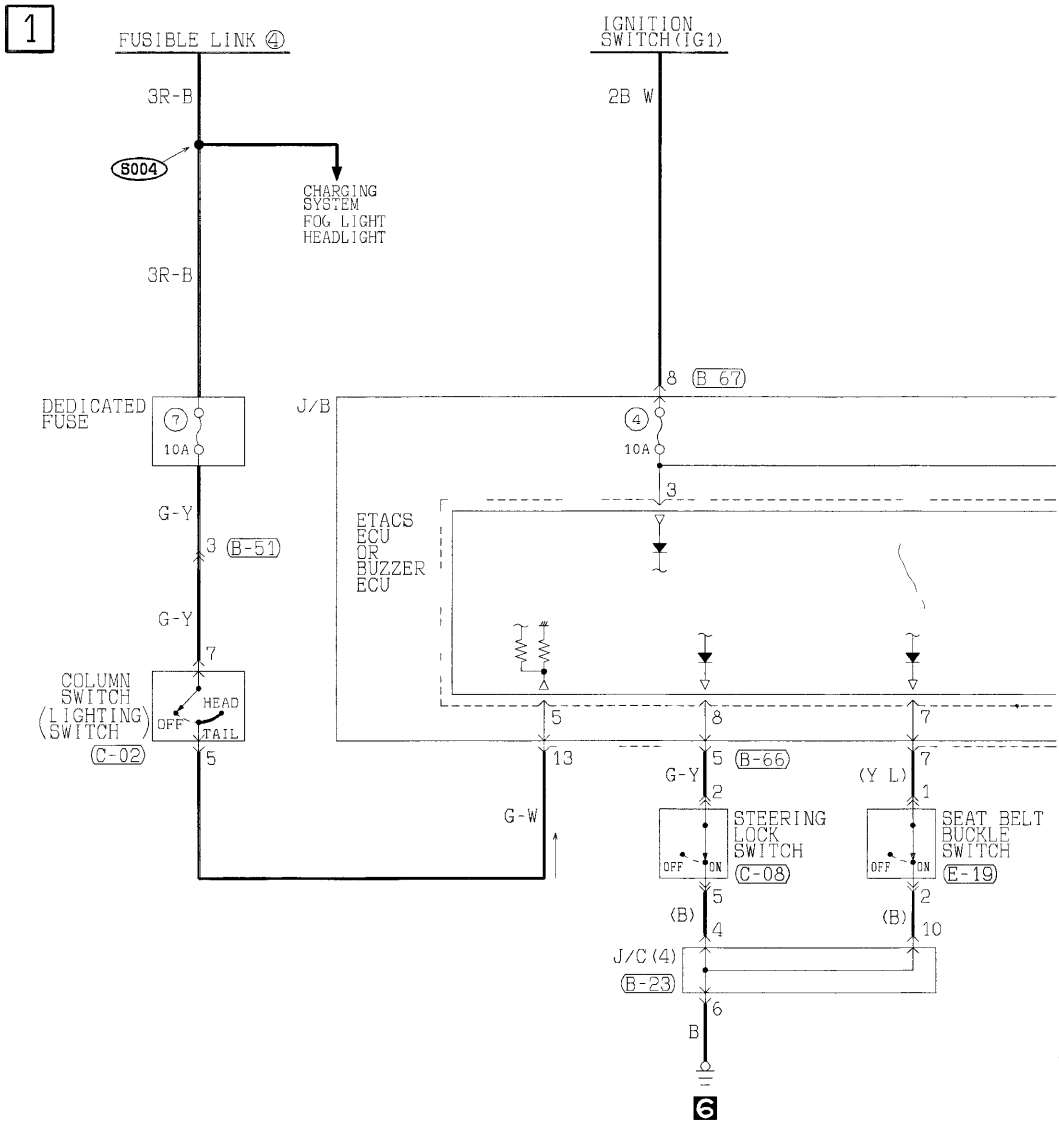
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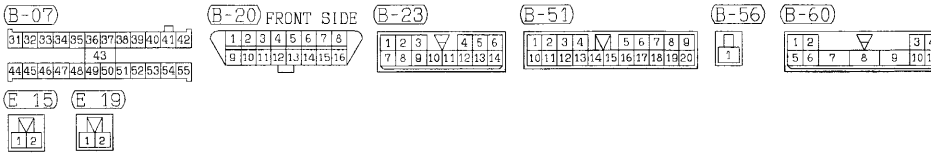
B Black	LG Light green	G Green	L Blue
BR Brown	O Orange	GR Gray	R Red
W White	SB Sky blue	P Pink	Y Yellow
V Violet			

9C15M05AA

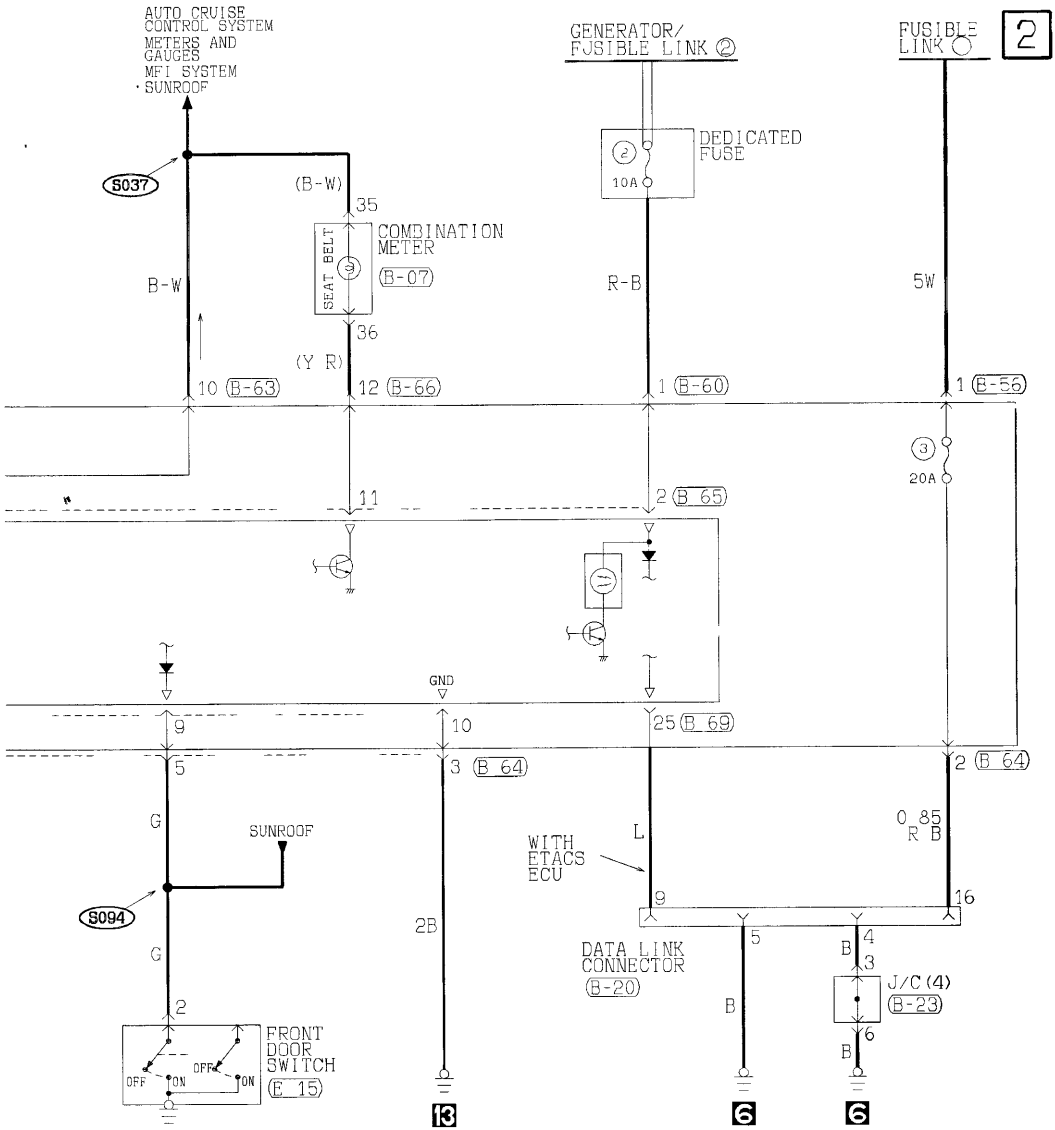
BUZZER

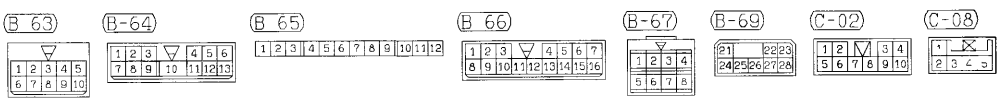
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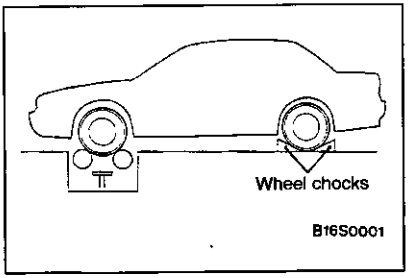
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Wire color code
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BR Brown O Orange GR Gray R Red P Pink V Violet

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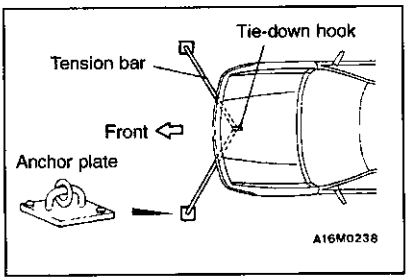


ON-VEHICLE SERVICE

54300090084

SPEEDOMETER CHECK

1. Adjust tire pressure to the specified level. (Refer to GROUP 31 – Service Specifications.)
2. Set the vehicle onto a speedometer tester and use wheel chocks to hold the rear wheels.
3. Make sure the parking brake has been applied.



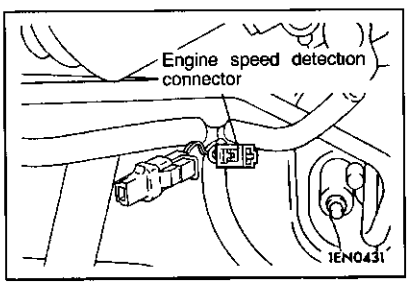
4. To prevent the front wheel from moving from side to side, attach tension bars to the tie-down hook, and secure both ends to anchor plates.
5. To prevent the vehicle from launching, attach a chain or wire to the rear retraction hook, and make sure the end of the chain or wire is secured firmly.
6. Check if the speedometer indicator range is within the standard values.

Caution
Do not operate the clutch suddenly. Do not increase/decrease speed rapidly while testing.

Standard values:

Standard indication mph	Allowable range mph
20	19 - 22
40	38 - 44
60	57 - 66
80	76 - 88
100	94 - 110

7. If not to the standard value, inspect for proper tire size. If not correct, replace tires with original size tires and retest. If correct, replace the speedometer. If still not to standard value, replace vehicle speed sensor.



TACHOMETER CHECK

54300100084

1. Insert a paper clip in the engine speed detection connector from the harness side, and attach an external high quality tachometer.

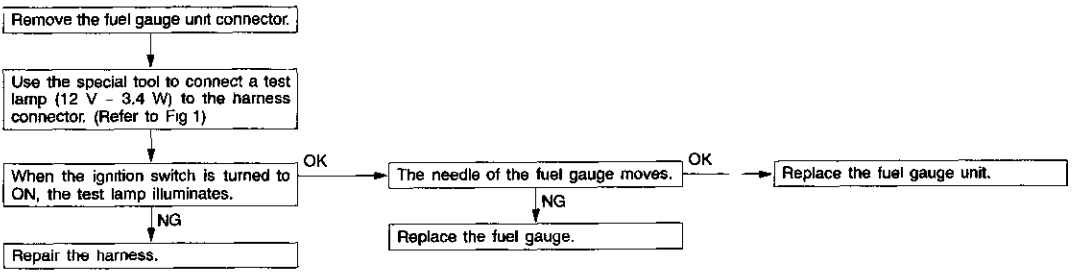
NOTE
For tachometer check, use an external high quality inductive tachometer.

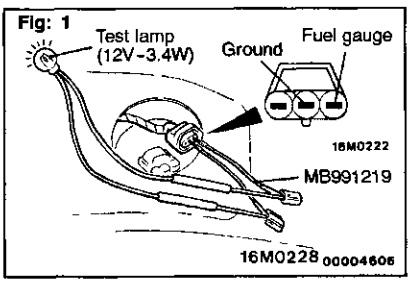
2. Compare the readings of the vehicle tachometer and the external tachometer at every engine speed, and check if the variations are within the standard values.

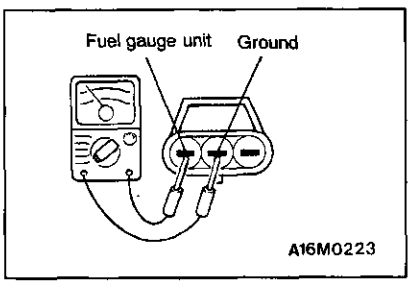
Standard values:
700 r/min : ±100 r/min
3,000 r/min : ±150 r/min
5,000 r/min : ±250 r/min
6,000 r/min : ±300 r/min

FUEL GAUGE SIMPLE CHECK

54300110100







FUEL GAUGE UNIT CHECK

54300120141

Remove the fuel gauge unit from the fuel tank. (Refer to GROUP 13F.)

FUEL GAUGE UNIT RESISTANCE

1. Check that the resistance value between the fuel gauge terminal and ground terminal is at standard value when fuel gauge unit float is at point F (highest) and point E (lowest).

   Standard value:
   Point F: 0.9 - 5.1 Ω
   Point E: 102.3 - 117.7 Ω

2. Check that resistance value changes smoothly when float moves slowly between point F (highest) and point E (lowest).
3. If all checks are correct, proceed to fuel gauge unit float height check. If any check is not correct, replace the fuel gauge unit.

CHASSIS ELECTRICAL

CONTENTS

110003620

AIR CONDITIONING ..... Refer to GROUP 55

AUTO-CRUISE CONTROL SYSTEM ..... Refer to GROUP 13G

AUTOMATIC SEAT BELT ..... Refer to GROUP 52A

BATTERY 3
- SERVICE ADJUSTMENT PROCEDURES 3
  - Battery Charging 3
  - Battery Inspection 3
  - Battery Testing Procedure 4

BUZZER 50
- BUZZER 50
- TROUBLESHOOTING 50

CIGARETTE LIGHTER 58
- CIGARETTE LIGHTER 59
- TROUBLESHOOTING 58

CLOCK 60
- CLOCK 61
- TROUBLESHOOTING 60

COLUMN SWITCH* 46

DOOR GLASS AND REGULATOR (POWER WINDOWS) ..... Refer to GROUP 42

DOOR HANDLE AND LATCH (CENTRAL DOOR LOCKING SYSTEM) ..... Refer to GROUP 42

DOOR MIRROR (ELECTRONIC CONTROL DOOR MIRROR) ..... Refer to GROUP 51

HEADLIGHT 19
- HEADLIGHT 26
- SPECIAL TOOL 19
- SERVICE ADJUSTMENT PROCEDURES 22
  - Headlight Aiming 22
  - Bulb Replacement 25
- SERVICE SPECIFICATIONS 19
- TROUBLESHOOTING 20

HEATER ..... Refer to GROUP 55

HIGH MOUNTED STOP LIGHT 43
- TROUBLESHOOTING 43

HORN 52
- HORN 55
- TROUBLESHOOTING 52

IGNITION SWITCH 5

INTERIOR LIGHT 44
- TROUBLESHOOTING 44

CONTINUED ON NEXT PAGE

WARNINGS REGARDING SERVICING OF SUPPLEMENTAL RESTRAINT SYSTEM (SRS) EQUIPPED VEHICLES

WARNING!

(1) Improper service or maintenance of any component of the SRS, or any SRS-related component, can lead to personal injury or death to service personnel (from inadvertent firing of the air bag) or to the driver and passenger (from rendering the SRS inoperative).

(2) Service or maintenance of any SRS component or SRS-related component must be performed only at an authorized MITSUBISHI dealer.

(3) MITSUBISHI dealer personnel must thoroughly review this manual, and especially its GROUP 52B – Supplemental Restraint System (SRS) and GROUP 00 – Maintenance Service, before beginning any service or maintenance of any component of the SRS or any SRS-related component.

NOTE

The SRS includes the following components: SRS air bag control unit, SRS warning light, air bag module, clock spring and interconnecting wiring. Other SRS-related components (that may have to be removed/installed in connection with SRS service or maintenance) are indicated in the table of contents by an asterisk (*).

METERS AND GAUGES 7
METERS AND GAUGES 16
SEALANTS 11
SERVICE ADJUSTMENT PROCEDURES 12
Engine Coolant Temperature Gauge Simple Inspection 15
Engine Coolant Temperature Gauge Unit Inspection 15
Fuel Gauge Simple Inspection 13
Fuel Gauge Unit Inspection 14
Fuel Sensor 14
Speedometer Inspection 12
Tachometer Inspection 13
SERVICE SPECIFICATIONS 7
TROUBLESHOOTING 11

PARKING AND SIDE-MARKER LIGHT, HAZARD LIGHT 28
PARKING AND SIDE-MARKER LIGHT, HAZARD LIGHT 37
TROUBLESHOOTING 28

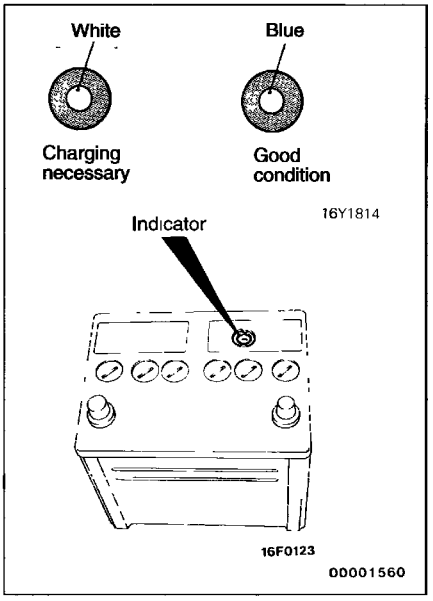
RADIATOR (RADIATOR FAN MOTOR) ..... Refer to GROUP 14

RADIO AND TAPE PLAYER 62
RADIO AND TAPE PLAYER 85
TROUBLESHOOTING 62

REAR COMBINATION LIGHT 39
REAR COMBINATION LIGHT 42
TROUBLESHOOTING 39

REAR WINDOW DEFOGGER 88
REAR WINDOW DEFOGGER 91
SERVICE ADJUSTMENT PROCEDURES 90
Printed-heater Line Check 90
Printed-heater Line Repair 90
TROUBLESHOOTING 88

RHEOSTAT 48



BATTERY

110003621

SERVICE ADJUSTMENT PROCEDURES

BATTERY INSPECTION

BATTERY VISUAL INSPECTION (1)

The battery contains a visual test indicator which gives blue signal when an adequate charge level exists, and white signal when charging is required.

BATTERY VISUAL INSPECTION (2)

Make sure ignition switch is in OFF position and all battery feed accessories are OFF.

1. Disconnect ground cable from battery before disconnecting (+) cable.
2. Remove battery from vehicle.

Caution
Care should be taken in the event battery case is cracked or leaking to protect hands from the electrolyte. A suitable pair of rubber gloves (not the household type) should be worn when removing battery by hand.

3. Inspect battery carrier for damage caused by loss of acid from battery. If acid damage is present, it will be necessary to clean area with a solution of clean warm water and baking soda. Scrub area with a stiff bristle brush and wipe off with a cloth moistened with ammonia or baking soda in water.
4. Clean top of battery with same solutions as described in step 3.
5. Inspect battery case and cover for cracks. If cracks are present, battery must be replaced.
6. Clean the battery post with a suitable battery post cleaning tool.
7. Clean the inside surfaces of the terminal clamps with a suitable battery terminal cleaning tool. Replace damaged or frayed cables and broken terminal clamps.
8. Install the battery in vehicle.
9. Connect (+) and (–) cables to battery in the order of mention.
10. Tighten the clamp nut securely.

BATTERY CHARGING

110003622

Caution
When batteries are being charged, an explosive gas forms beneath the cover of each cell. Do not smoke near batteries on charge or which have recently been charged.
Do not break live circuits at the terminals of the batteries on charge. A spark will occur where the live circuit is broken.
Keep all open flames away from the battery.

Battery electrolyte temperature may temporarily be allowed to rise to 55°C (131°F). Increase of electrolyte temperature above 55°C (131°F) is harmful to the battery, causing deformation of battery cell, decrease in life of battery, etc.

CHARGE RATE

If the test indicator is white, the battery should be charged as outlined below.

When the dot appears or when maximum charge shown below is reached, charging should be stopped.

NOTE
If the indicator does not turn to blue even after the battery is charged, the battery should be replaced; do not overcharge.

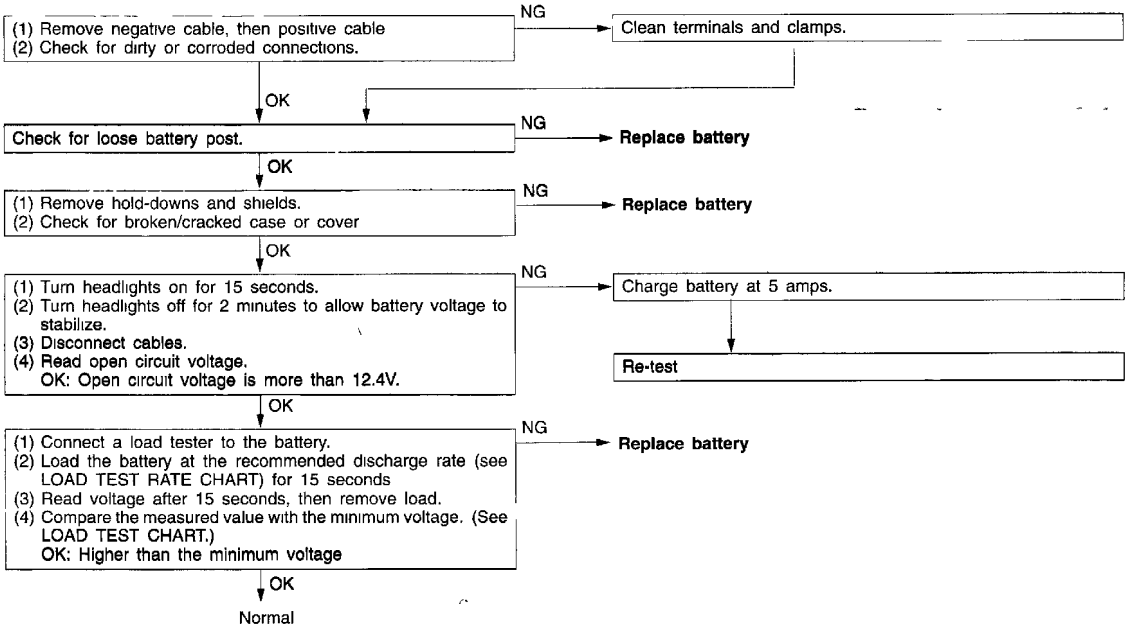
Charge Rate Chart

Battery	55B24R (433 amps)	Battery	55B24R (433 amps)
Slow charging	5 amps 10 hrs.	Fast charging	20 amps 2.5 hrs.
	10 amps 5 hrs.		30 amps 1.5 hrs.

BATTERY TESTING PROCEDURE

110003623

TEST STEP



LOAD TEST CHART

Temperature °C (°F)	21 (70) and above	16 (60)	10 (50)	4 (40)	–1 (30)	–7 (20)	–12 (10)	–18 (0)
Minimum voltage	9.6	9.5	9.4	9.3	9.1	8.9	8.7	8.5

LOAD TEST RATE CHART

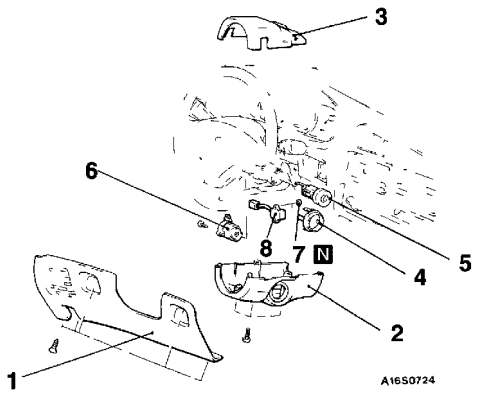
Load test (AMPS)	210 amps
Cranking rating (0°F)	433 amps
Reserve capacity	79 minutes
Application	55B24R

TSB Revision

IGNITION SWITCH

REMOVAL AND INSTALLATION

110003624



Steering lock cylinder removal steps

1. Knee protector
2. Column cover lower
3. Column cover upper
4. Ignition key ring
5. Steering lock cylinder

◀A▶

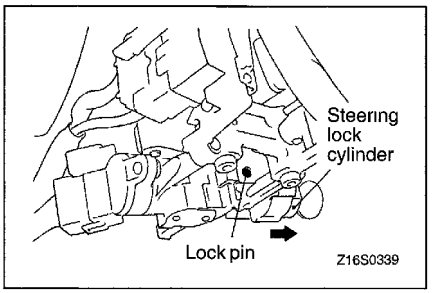
Ignition switch segment removal steps

1. Knee protector
2. Column cover lower
3. Column cover upper
6. Ignition switch

Key reminder switch removal steps

1. Knee protector
2. Column cover lower
3. Column cover upper
7. Push nut
8. Key reminder switch

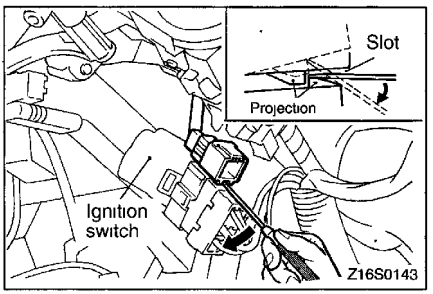
◀B▶



REMOVAL SERVICE POINTS

◀A▶ STEERING LOCK CYLINDER REMOVAL

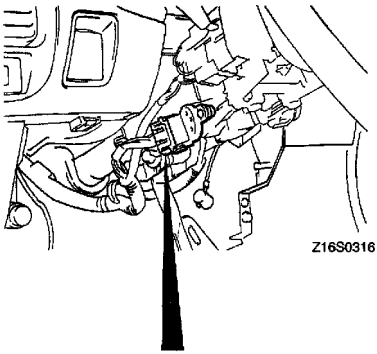
(1) Insert the key in the steering lock cylinder and turn it to the "ACC" position.
(2) Using a cross-tip (+) screwdriver (small) or a similar tool, push the lock pin of the steering lock cylinder inward and then pull the steering lock cylinder toward you.

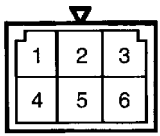


◀B▶ KEY REMINDER SWITCH REMOVAL

Insert a flat-tipped screwdriver or similar tool in the slot and pry out the projection as indicated by an arrow to remove the connector.

TSB Revision





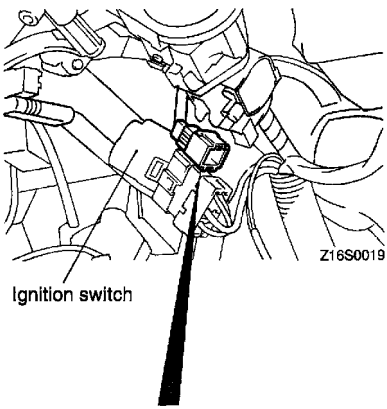
Z16L0300

INSPECTION

IGNITION SWITCH

(1) Remove the knee protector, and the column cover.
(2) Disconnect the wiring connector from the ignition switch, and connect an ohmmeter to the switch side connector.
(3) Operate the switch, and check the continuity between the terminals.

Ignition key position	Terminal No.					
	1	2	3	4	5	6
LOCK						
ACC		○			○	
ON	○	○	○		○	
START		○	○	○		○



KEY REMINDER SWITCH

(1) Remove the knee protector, and the column cover.
(2) Remove the ignition switch mounting screws and pull out the ignition switch.
(3) Disconnect the connector of the key cylinder switch.
(4) Insert the key into and remove it from the steering lock cylinder to check for continuity between the terminals.

Ignition key position	Terminal No.						
	1	2	3	4	5	6	7
Pull out			○			○	
Insert <Up to 1994 models>		○					○

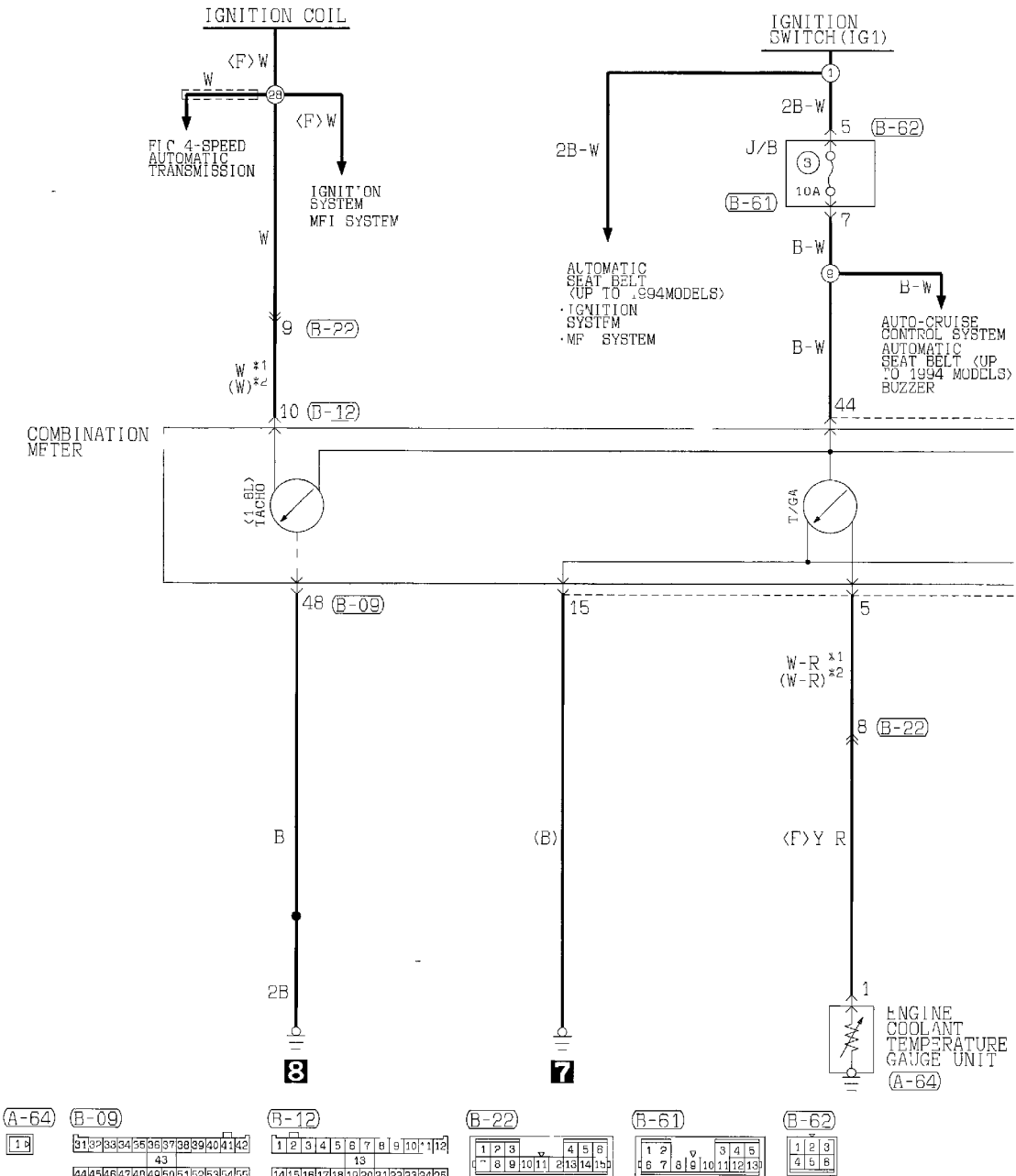
METERS AND GAUGES

SERVICE SPECIFICATIONS

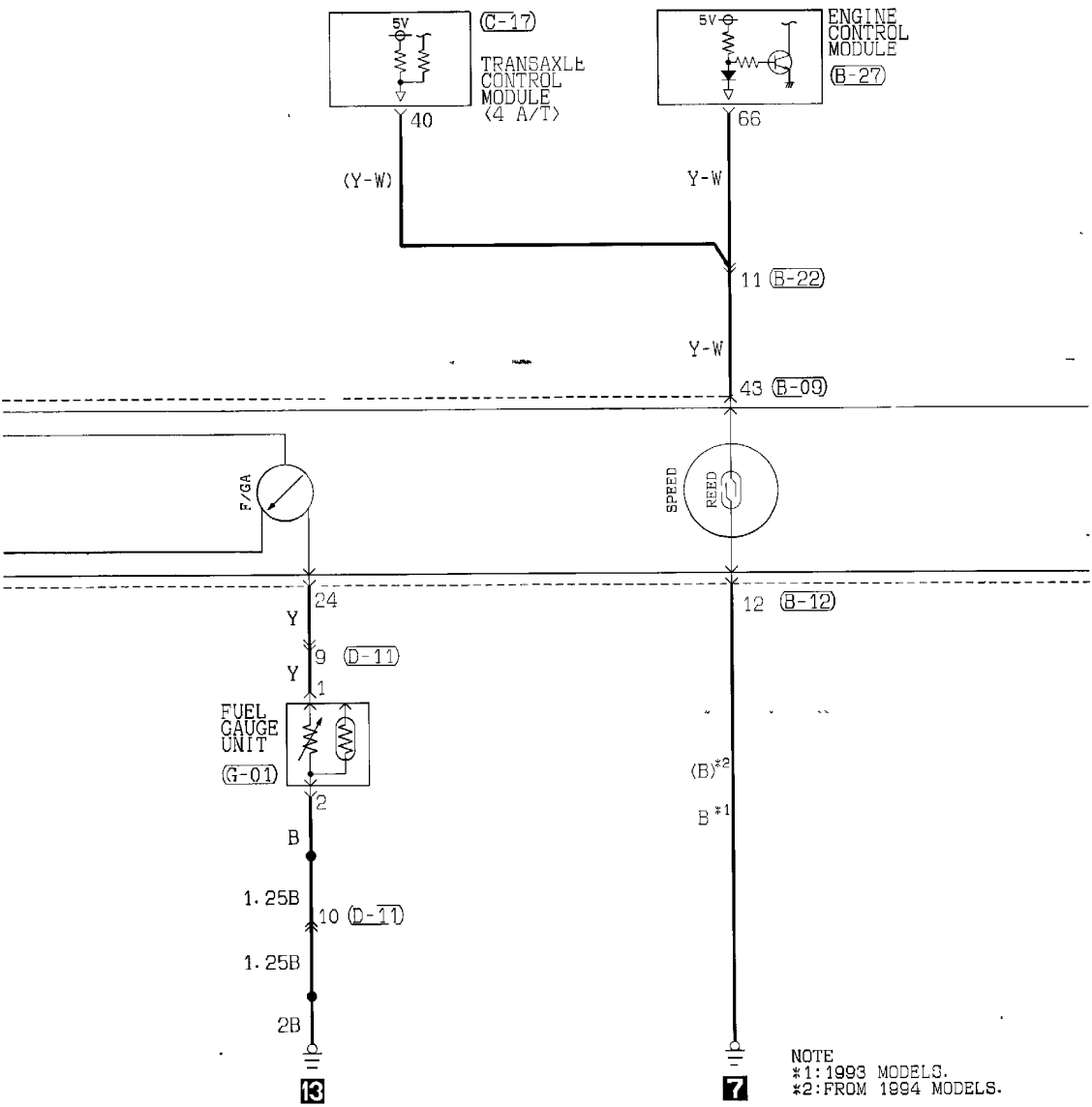
110003625

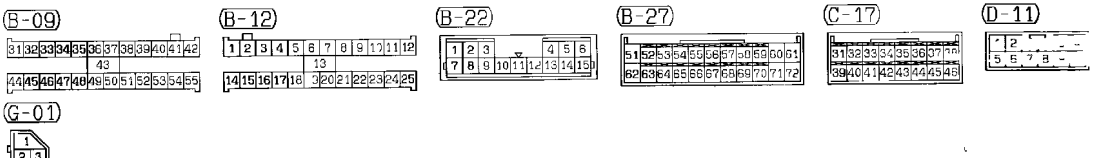
Items		Standard values
Speedometer indication error	20 mph	19–22
	40 mph	38–44
	60 mph	57–66
	80 mph	76–88
	100 mph	94 –110
Tachometer indication error rpm	1,000	±100
	3,000	+100 –200
	5,000	+100 –375
	6,000	+100 –450
Fuel gauge unit resistance Ω	Float point "F"	0.9–5.1
	Float point "E"	102.3–117.7
Fuel gauge unit float height mm (in.)	A (Float point "F")	17.4 (0.69)
	B (Float point "E")	130 2 (5.13)
Fuel gauge resistance Ω <Vehicles without tachometer>	power supply and ground	218.7–267.3
	power supply and fuel gauge	74.3–91.3
	fuel gauge and ground	144.0–176.0
Fuel gauge resistance Ω <Vehicles with tachometer>	power supply and ground	210.6–257.4
	power supply and fuel gauge	78.3–95.7
	fuel gauge and ground	132.3–161.7
Engine coolant temperature gauge resistance Ω <Vehicles without tachometer>	power supply and ground	133.2–162.8
	power supply and engine coolant temperature gauge	71.3–78.8
	engine coolant temperature gauge and ground	200.7–245.3
Engine coolant temperature gauge resistance Ω <Vehicles with tachometer>	power supply and ground	210.6–257.4
	power supply and engine coolant temperature gauge	71.3–78.8
	engine coolant temperature gauge and ground	278.1–340.0

CIRCUIT DIAGRAM



(A-64) (B-09) (B-12) (B-22) (B-61) (B-62)

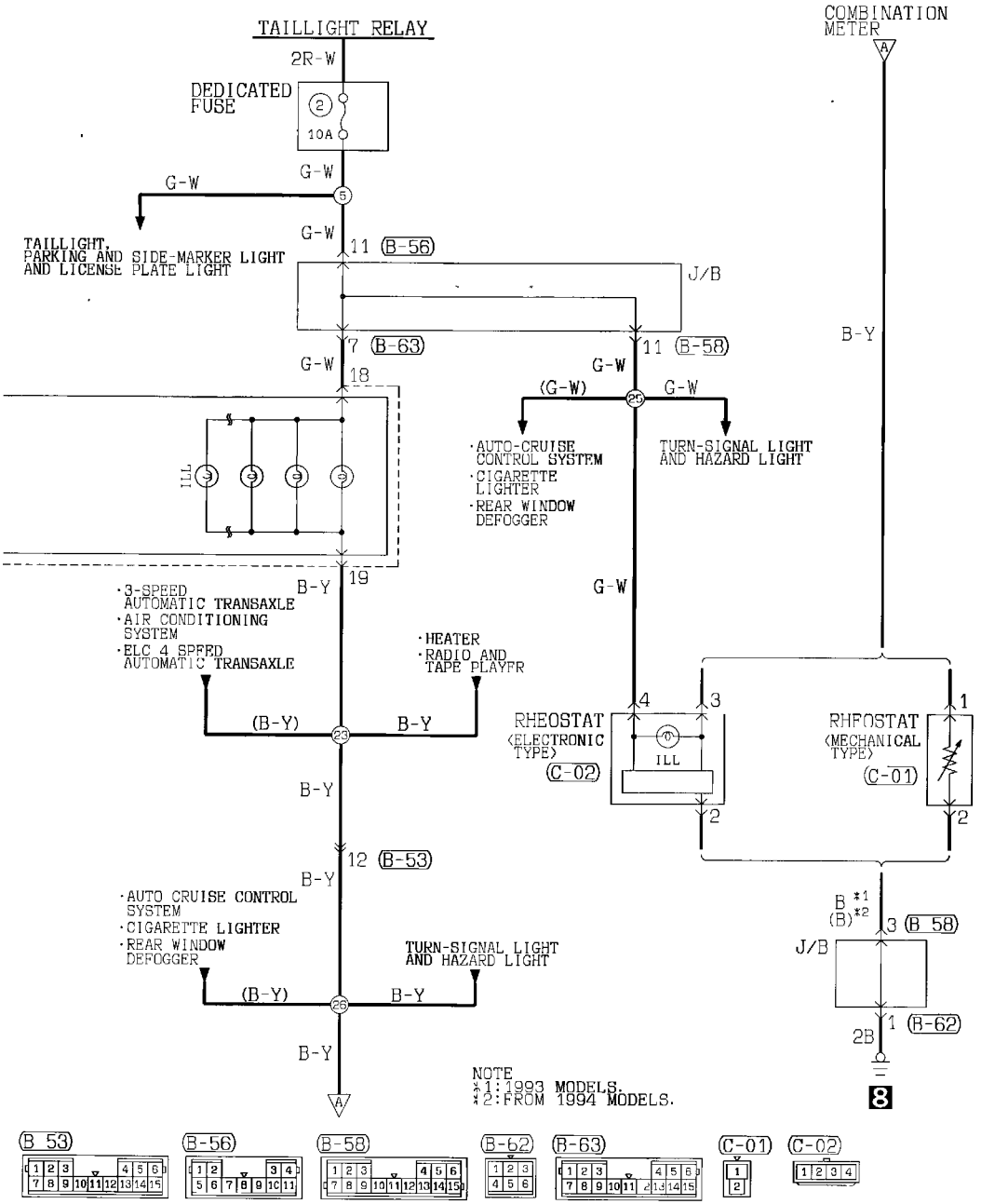




HE10M00AB

TSB Revision

CIRCUIT DIAGRAM (CONTINUED)



SEALANTS

110003626

Items	Specified sealants
Engine coolant temperature gauge unit threaded portion	3M Adhesive nut locking No. 4171 or equivalent

TROUBLESHOOTING

110003627

OPERATION

<Fuel gauge>

- When the ignition key is at the "ON" position, the fuel gauge is activated.
- When there is much fuel, the unit's resistance is small and the current flowing in the circuit is great, so the gauge's indicator indicates in the "F" area.
- When there is little fuel, the unit's resistance is high and the current flowing in the circuit is small, so the gauge's indicator indicates in the "E" area.

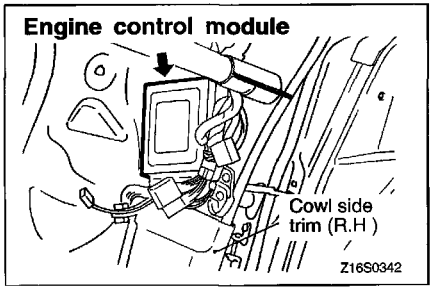
<Engine coolant temperature gauge>

- When the ignition key is at the "ON" position, the engine coolant temperature gauge is activated.
- When the engine coolant temperature is high, the unit's resistance is low and there is a great flow of current in the circuit, so the gauge's indicator indicates in the "H" area.
- When the engine coolant temperature is low, the unit's resistance is high and there is a small flow of current in the circuit, so the gauge's indicator indicates in the "C" area.

<Reed switch>

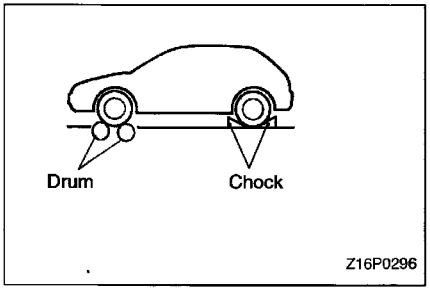
- Pulses are produced in accordance with the vehicle speed, and vehicle-speed signals are input to systems (the transaxle-control system, etc.) that regulate according to the vehicle speed.

COMPONENT LOCATION



TROUBLESHOOTING HINTS

1. The fuel gauge doesn't function, or shows the incorrect indication.
   1) Disconnect the connector of the fuel gauge unit; the "F" side is indicated when terminal 1 is then grounded.
      - Check the fuel gauge.
2. The engine coolant temperature gauge doesn't function, or shows the incorrect indication.
   1) The "H" side is indicated when the connector of the engine coolant temperature gauge unit is disconnected and then grounded.
      - Check the engine coolant temperature gauge unit.
3. Systems dependent upon control according to the vehicle speed do not function correctly.
   - Check the reed switch (located within the speedometer).
4. The meter illumination light does not illuminate.
   1) The tail lights illuminate.
      - Check the rheostat.



SERVICE ADJUSTMENT PROCEDURES

SPEEDOMETER INSPECTION

110003628

Take note of the following before inspection:

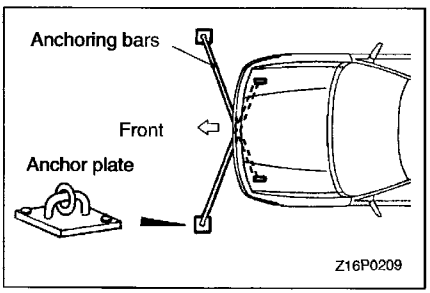
(1) Assure tire pressure at standard value. (Refer to GROUP 31 – Service Specifications.)

(2) When placing the vehicle on a speedometer tester drum, make sure the center line of the vehicle is at right angles to the center line of the drum. Also, make sure the drum is positioned so as to center between the front tires.

Rear wheel safety procedures

(1) Be sure to chock both rear wheels to prevent the vehicle from moving. Secure the stoppers to the floor, or take measures to prevent the stoppers from slipping.

(2) Make sure the parking brake has been set.



Front wheel sway prevention procedure

(1) Attach anchoring bars on the tie-down brackets and secure their ends to the anchor plates.

(2) Make sure the tension on the right and left bars is the same. Also be sure there is enough tension on each bar.

Accident prevention procedures

(1) Attach a chain or wire to the rear towing hook. Make sure the end of the wire or chain is secured firmly.

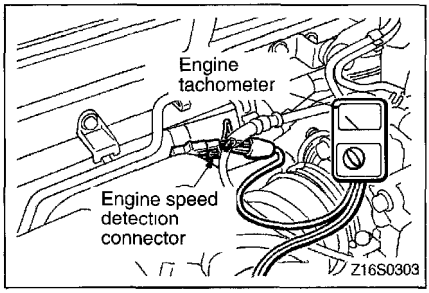
(2) Take all other necessary precautions.

Use a speedometer tester to measure the speedometer's indication error.

Caution
Do not operate the clutch or accelerator abruptly or decelerate during the operations.

Standard values:

Standard indication mph	20	40	60	80	100
Allowable range mph	19–22	38–44	57–66	76–88	94–110



TACHOMETER INSPECTION

110003629

(1) Insert paper clip into the engine revolution speed detection terminal provided in the engine compartment, and connect the engine tachometer to the inserted paper clip.

Caution
As the tachometer is negative grounded, do not connect battery conversely to prevent damaging transistor and diode.

NOTE
For tachometer inspection, use of a fluxmeter-type engine tachometer is recommended. (Because a fluxmeter only needs to be clipped to the high tension cable.)

(2) Connect the engine tachometer and compare the engine tachometer and tachometer readings. Replace tachometer if difference is excessive.

Standard value:

Engine speed r/min	1,000	3,000	5,000	6,000
Indicated variation r/min	±100	+100 −200	+100 −375	+100 −450

FUEL GAUGE SIMPLE INSPECTION

110003630

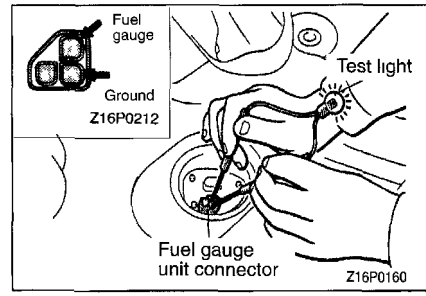
Remove the fuel gauge unit coupling connector.

↓

Connect a test light to the harness connector.

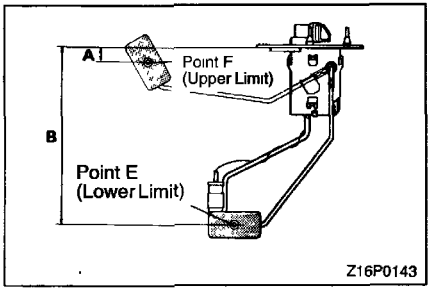
↓

Place the ignition switch in the ON position.



Check the test light and gauge conditions.

1. Test light lights. (Pointer of gauge does not swing.)	→ Replace fuel gauge.
2. Test light lights. (Pointer of gauge swings.)	→ Replace fuel gauge unit.
3. Test light does not light. (Pointer of gauge does not swing.)	→ Correct harness.



FUEL GAUGE UNIT INSPECTION 110003631

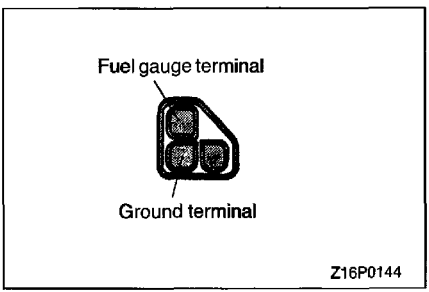
To check, remove fuel gauge unit from fuel tank. (Refer to GROUP 13F – Fuel Tank.)

Float Height of Fuel Gauge Unit

Move float and measure the height at point F (highest) and point E (lowest) with float arm touching stopper.

Standard value: Point F: 17.4 mm (.69 in.)

Point E: 130.2 mm (5.13 in.)



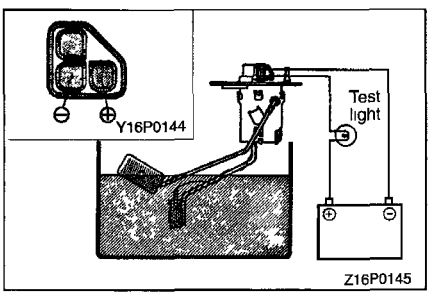
Standard Resistance of Fuel Gauge Unit

(1) Check that resistance value between the fuel gauge terminal and ground terminal is at standard value when fuel gauge unit float is at point F (highest) and point E (lowest).

Standard value: Point F: 9–5.1 Ω

Point E: 102.3–117.7 Ω

(2) Check that resistance value changes smoothly when float moves slowly between point F (highest) and point E (lowest).



FUEL SENSOR

Connect fuel gauge unit to battery via test light (12V–3.4W). Immerse in water. Condition good if light goes off when unit thermistor is in water and lights when unit is removed from water.

Caution

After completing this test, wipe the unit dry and install it in the fuel tank.

ENGINE COOLANT TEMPERATURE GAUGE SIMPLE INSPECTION

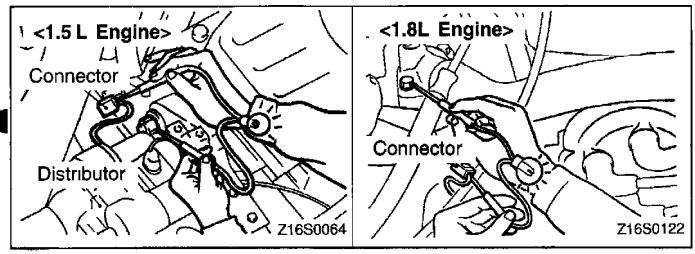
110003632

Remove the engine coolant temperature gauge unit coupling connector.

↓

Connect the harness connector via a test light to the ground.

◀



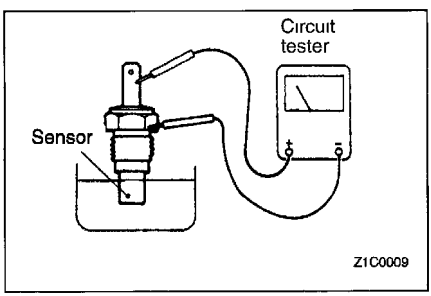
↓

Place the ignition switch in the ON position.

↓

Check the test light and gauge conditions.

1. Test light lights. (Pointer of gauge does not swing)	→ Replace water temperature gauge.
2. Test light lights. (Pointer of gauge swings.)	→ Replace water temperature gauge unit.
3. Test light does not light. (Pointer of gauge does not swing.)	→ Correct harness.



ENGINE COOLANT TEMPERATURE GAUGE UNIT INSPECTION

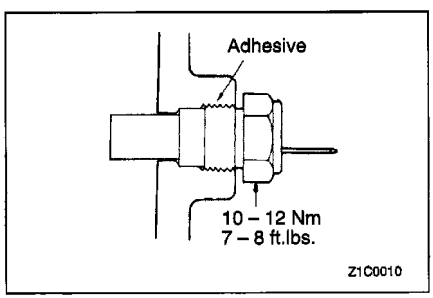
110003633

To check, remove engine coolant temperature gauge unit from intake manifold.

Standard Resistance of Engine Coolant Temperature Gauge Unit

(1) Immerse unit in 70°C (158°F) water to measure resistance.

Standard value: 104±13.5 Ω



(2) After checking, apply the specified adhesive around the thread of engine coolant temperature gauge unit and install on the intake manifold.

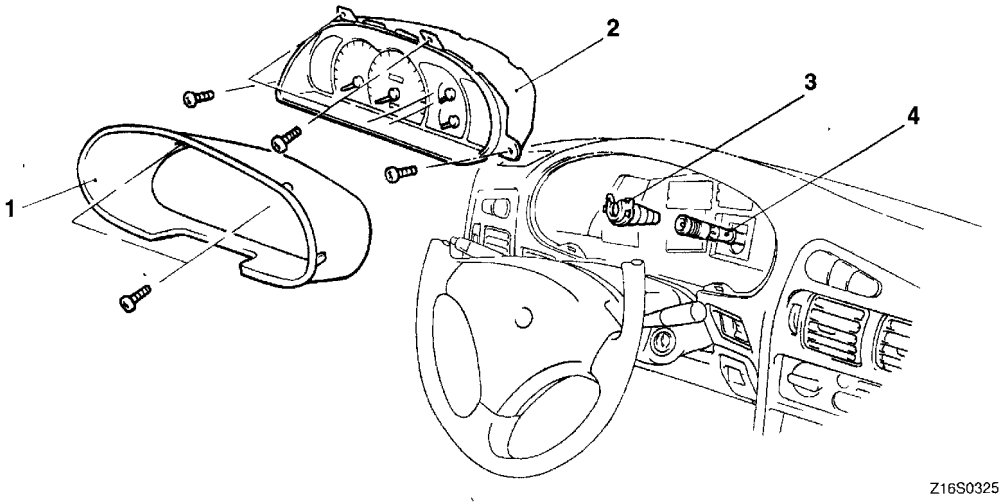
Specified sealant: 3M Adhesive nut locking No. 4171

TSB Revision

METERS AND GAUGES

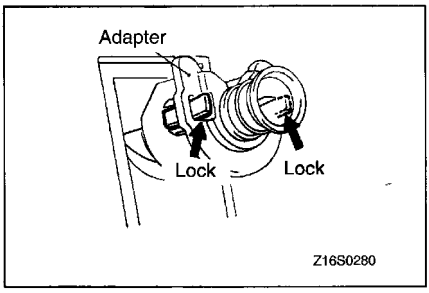
REMOVAL AND INSTALLATION

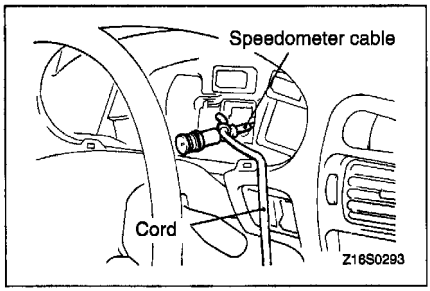
110003634



Removal steps

1. Meter bezel
2. Combination meter
◀A▶ 3. Adapter
◀B▶ 4. Speedometer cable





REMOVAL SERVICE POINTS

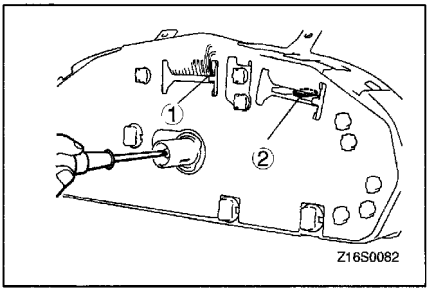
◀A▶ ADAPTER REMOVAL

(1) Remove the adapter lock.
(2) Pull the speedometer cable slightly into the passenger compartment, and remove the rear side of the adapter from the cable.
(3) After turning the adapter so that the notched section is aligned with the tab on the cable side, remove the adapter by sliding it backwards.

◀B▶ SPEEDOMETER REMOVAL

Tie a cord to the end of the speedometer cable that is in the passenger compartment. Then remove the grommet inside the engine compartment, and pull the cable into the engine compartment.

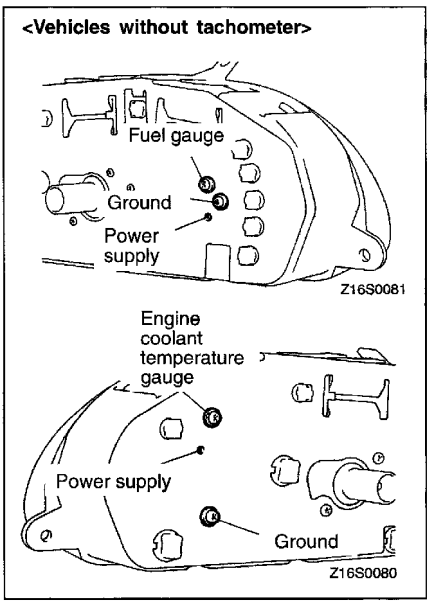
TSB Revision

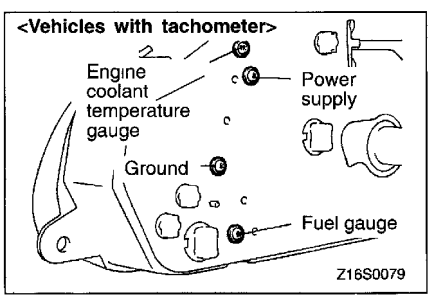


INSPECTION

REED SWITCH

Using an ohmmeter, check that continuity and discontinuity alternates between terminals 1 and 2 four times at every rotation of the shaft of the speedometer cable connection.





FUEL GAUGE RESISTANCE AND ENGINE COOLANT TEMPERATURE GAUGE RESISTANCE

<Vehicles without tachometer>

(1) Remove the power supply tightening screw.
(2) Use an ohmmeter to measure the resistance value between the terminals.

Caution
When inserting the testing probe into the power supply terminal, be careful not to touch the printed board.

Standard value:

Fuel gauge resistance

Power supply–Ground: 218.7–267.3 Ω

Power supply–Fuel gauge: 74.7–91.3 Ω

Fuel gauge–Ground: 144.0–176.0 Ω

Engine coolant temperature gauge resistance

Power supply–Ground: 133.2–162.8 Ω

Power supply–Engine coolant temperature gauge: 71.3–78.8 Ω

Engine coolant temperature gauge–Ground: 200.7–245.3 Ω

<Vehicles with tachometer>

Use an ohmmeter to measure the resistance value between the terminals.

Standard value:

Fuel gauge resistance

Power supply–Ground: 210.6–257.4 Ω

Power supply–Fuel gauge: 78.3–95.7 Ω

Fuel gauge–Ground: 132.3–161.7 Ω

Engine coolant temperature gauge resistance

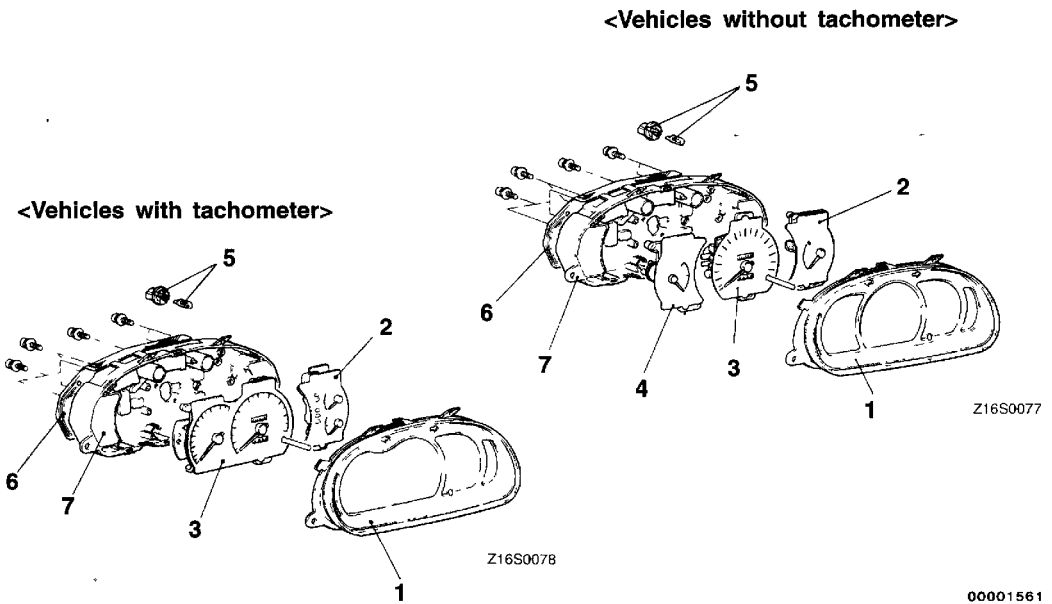
Power supply–Ground: 210.6–257.4 Ω

Power supply –Engine coolant temperature gauge: 71.3–78.8 Ω

Engine coolant temperature gauge–Ground: 278.1–340.0 Ω

DISASSEMBLY AND REASSEMBLY

110003635



Disassembly steps

1. Meter glass, window plate
2. Engine coolant temperature gauge
   <Vehicles without tachometer>
   Fuel gauge, engine coolant temperature gauge
   <Vehicles with tachometer>
3. Speedometer
   <Vehicles without tachometer>
   Speedometer, tachometer
   <Vehicles with tachometer>
4. Fuel gauge
   <Vehicles without tachometer>
5. Bulb, socket
6. Printed-circuit board
7. Meter case

HEADLIGHT

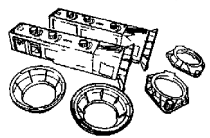
SERVICE SPECIFICATIONS

110003636

Items	Limit
Headlight intensity	20,000 cd or more

SPECIAL TOOL

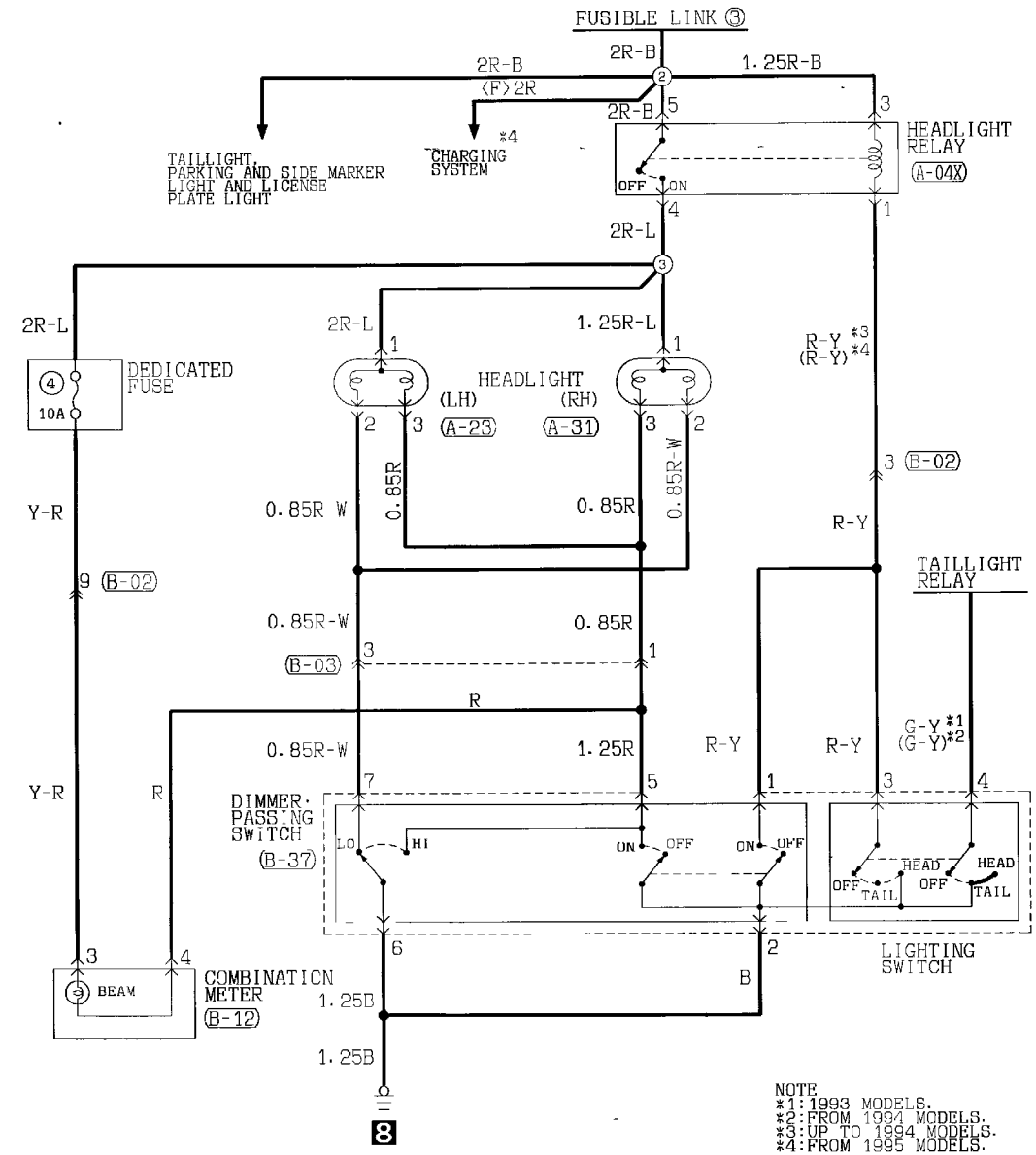
110003637

Tool	Tool number and name	Supersession	Application
	Headlight aimer	General service tool	Headlight aiming

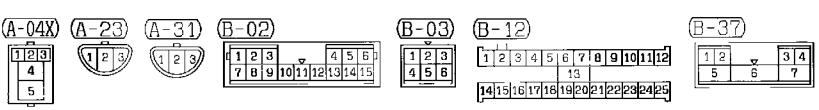
TROUBLESHOOTING

110003638

CIRCUIT DIAGRAM



NOTE
*1: 1993 MODELS.
*2: FROM 1994 MODELS.
*3: UP TO 1994 MODELS.
*4: FROM 1995 MODELS.



OPERATION

Conditions for switch-ON of headlight relay

See the fig.1.

<Low-beam operation>

- The headlight relay is switched ON when the lighting switch is set to the "HEAD" position.
- The low beam of the headlights will illuminate when, in this condition, the dimmer/passing switch is set to the "LO" position.

<Upper-beam operation>

- The headlight relay is switched ON when the lighting switch is set to the "HEAD" position.
- The high beam of the headlights will illuminate when, in this condition, the dimmer/passing switch is set to the "HI" position.

<Upper-beam indicator light>

- This indicator illuminates during use of the high beam of the headlights, and when the passing signal (high beam) is activated, thus indicating that the headlights' high beam is illuminated.

<Passing operation>

- When the dimmer/passing switch is set to the "ON" position, the headlight relay is switched ON and the upper beam of the headlight illuminates.

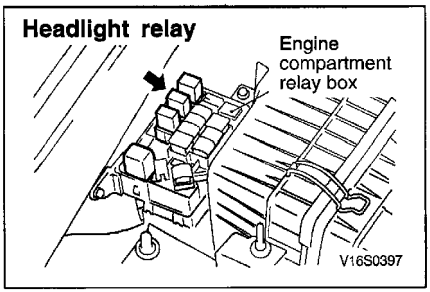
TROUBLESHOOTING HINTS

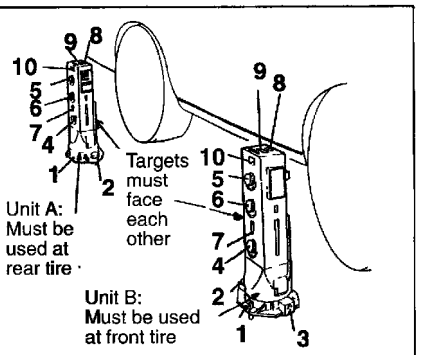
1. Headlights don't come on.
   1) But the tail lights do illuminate.
      - Check the headlight relay.
      - Check the lighting switch.
   2) The tail lights also don't illuminate.
      - Check the fusible link No. 3.
2. The low beam at both sides doesn't illuminate.
   - Check the "LO" contacts of the dimmer switch.
3. The upper beam at both sides doesn't illuminate.
   1) The passing signal functions OK.
      - Check the "HI" contacts of the dimmer switch.
   2) The passing signal doesn't function.
      - Check the dimmer switch.
4. One headlight doesn't illuminate.
   - Check the bulb.
5. Can't switch from low to high beam or vice-versa.
   - Check the dimmer switch.
6. The high beam indicator light doesn't illuminate.
   1) The high beam of the headlights is normal.
      - Check dedicated fuse No. 4.
      - Check the bulb.

<Fig.1>

Lighting switch	Dimmer/passing switch	Headlight relay
"HEAD"	–	ON
–	"PASS"	ON

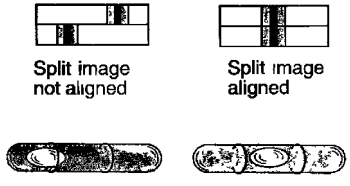
COMPONENT LOCATION





1. Calibration fixture
2. Thumb adjusting screws
3. Level vial
4. Floor level offset dial
5. Horizontal dial knob
6. Vertical dial knob
7. Aimer level vial
8. Level vial bubble
9. Top port hole
10. Viewing port

Z16B0245



Z16B0246

SERVICE ADJUSTMENT PROCEDURES

HEADLIGHTS AIMING

110003639

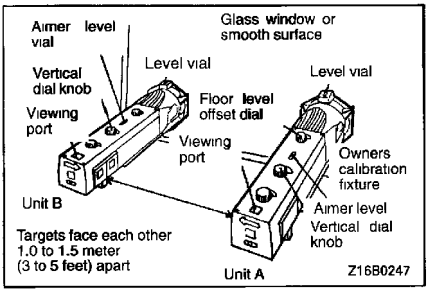
PRE-AIMING INSTRUCTIONS

1. Test dimmer switch operation.
2. Observe operation of high beam light mounted in instrument cluster.
3. Inspect for badly rusted or faulty headlight assemblies. These conditions must be corrected before a satisfactory adjustment can be made.
4. Place vehicle on a level floor.
5. Bounce front suspension through three (3) oscillations by applying body weight to hood or bumper.
6. Inspect tire inflation.
7. Rock vehicle sideways to allow vehicle to assume its normal position.
8. If fuel tank is not full, place a weight in trunk of vehicle to simulate weight of a full tank [3 kg (6.5 lbs.) per gallon].
9. There should be no other load in the vehicle other than driver or substituted weight of approximately 70 kg (150 lbs.) placed in driver's position.
10. Thoroughly clean headlight lenses.

COMPENSATING THE AIMERS FOR FLOOR SLOPE

The floor level offset dial must coincide with the floor slope for accurate aiming. Calibration fixtures are included with the aimers.

1. Attach one calibration fixture to each aimer. Fixtures will easily snap into position on aimer when properly positioned.
2. Place aimers at center line of each wheel on one side of vehicle. Unit A must be placed at rear wheel with target facing forward. Unit B must be placed at front wheel with target facing rearward.
3. Adjust thumb adjusting screw on each calibration fixture by turning either clockwise or counterclockwise until level vial bubble registers in a centered, level position.
4. Look into top port hole of Unit A. Turn horizontal knob until split image is aligned.
5. Transfer plus or minus reading indicated on horizontal dial to floor level offset dial on each aimer. Press floor level dial inward to set reading.
6. Remove calibration fixtures from both units.



Z16B0247

TESTING AIMER CALIBRATION

The aimer calibration may be off due to extended use. Calibration fixtures used in conjunction with aimers can be used to check and adjust aimers.

1. Turn thumb adjusting screw on each calibration fixture until it is approximately the same distance as the supporting posts.
2. Attach calibration fixtures to each unit with level vials on top.

TSB Revision

3. Locate a true vertical plate glass window or smooth surface and secure aimers three to five feet apart so split image targets can be located in viewing ports.
4. Set floor level dial at zero.
5. Rotate thumb adjusting screws on each calibration fixture until level vials on fixtures are centered.
6. With both calibration level vials centered, turn vertical dial knobs on each aimer until aimer level vials are centered. If aimer vertical dial pointers read between 1/2 up and 1/2 down, aimers are within allowable vertical tolerance. Recalibrate units if beyond these limits.

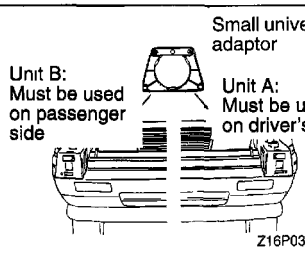
   Vertical dial pointer reading (on each aimer): 1/2 up to 1/2 down

7. Adjust horizontal dial knob on each aimer until split image targets align. If aimer horizontal dial pointers read between 1 left and 1 right, the aimers are within allowable tolerance limits. Recalibrate units if beyond these limits.

   Horizontal dial pointer reading (on each aimer): 1 left to 1 right

MOUNTING AIMERS

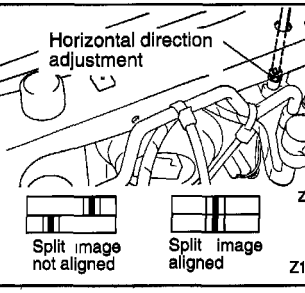
1. If necessary to expose adjusting screws, remove headlight trim rings.
2. Snap proper adaptor into position on each aimer making full contact with aimer mounting flange.



Sight openings (Must face each other)

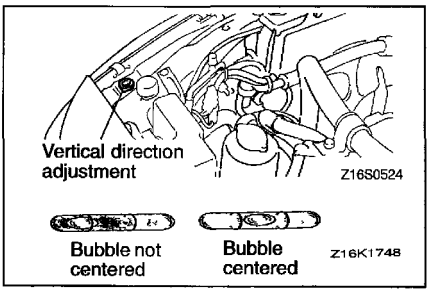
3. Position aimers on headlights by pushing piston handle forward, engaging rubber suction cup. Immediately pull back piston handle until it locks in place.

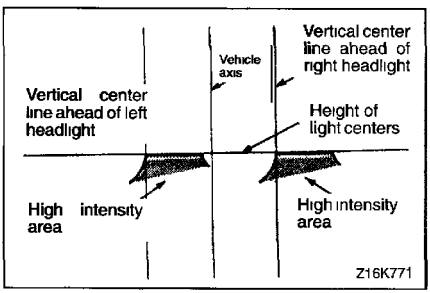
NOTE
Steel inserts are molded into position on the adaptor to insure accuracy. These inserts must be in contact with the three guide points on the lights when the aimers are properly positioned.



HORIZONTAL ADJUSTMENT

1. Set horizontal dial to zero.
2. Check to see that the split image target lines are visible in the viewing port. If necessary, rotate each aimer slightly to locate the target.
3. Turn horizontal screw on side of headlight until split image of target line appears in mirrors as one solid line. To remove "backlash", make final adjustment by turning adjusting screw in a clockwise direction.
4. Repeat the last three steps on opposite headlight.





VERTICAL ADJUSTMENT

1. The vertical dial should be set at zero. (For passenger vehicles an "O" setting is generally required. For special settings, consult local state laws.)
2. Turn vertical adjusting screw until the level bubble is centered between the lines.
3. Repeat the last two steps on the opposite headlight.
4. Re-check target alignment on both aimers and readjust horizontal aim if necessary.
5. Remove aimers by pressing "vacuum release" button located on piston handle.

AIMING WITH SCREEN

HEADLIGHT AIM PREPARATION

Place vehicle on a known level floor 7.6 m (25 feet) from aiming screen or light colored wall. Four lines of adhesive tape or like are required on screen or wall:

1. Position a vertical tape so that it is aligned with the vehicle center line.
2. Position a horizontal tape with reference to center line of headlight.
3. Position a vertical tape on the screen with reference to the center line of each of headlights.

VISUAL HEADLIGHT ADJUSTMENT

1. A properly aimed lower beam will appear on the aiming screen 7.6 m (25 feet) in front of the vehicle. The shaded area as shown in the illustration indicates high intensity zone.
2. Adjust low beam of headlights to match the low beam pattern of the right and left headlights.

Caution

When adjusting one headlight, the other headlight should be turned off if possible. If this is not possible, do not cover the other headlight for more than three minutes while it is turned on. Otherwise, heat from the bulb may warp the headlight lens.

NOTE

Once the headlight low beams have been visually adjusted, high beam adjustment is unnecessary.

LUMINOUS INTENSITY MEASUREMENT

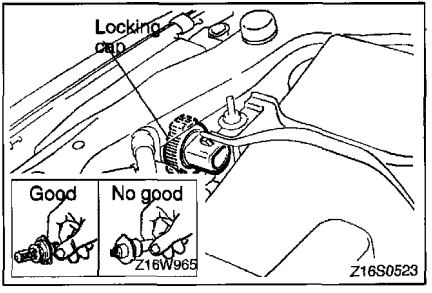
Measure the luminous intensity of headlights with a photometer in accordance with the instruction manual prepared by the manufacturer of the photometer and make sure that the luminous intensity is within the following limit.

Limit: 20,000 cd or more

NOTE

(1) When measuring the luminous intensity of headlight, keep the engine at 2,000 r/min and have the battery changed.

(2) If there are specific regulations for luminous intensity of headlights in the region where the vehicle is operated, make sure that the intensity conforms to the requirements of such regulations.



BULB REPLACEMENT

110003640

1. Disconnect the connector.
2. Turn and remove the locking cap.
3. Pull out the bulb.

Caution
Do not touch the surface of the headlight bulb with hands or dirty gloves. If the surface dies become dirty, clean it with alcohol or thinner, and let it dry thoroughly before installing

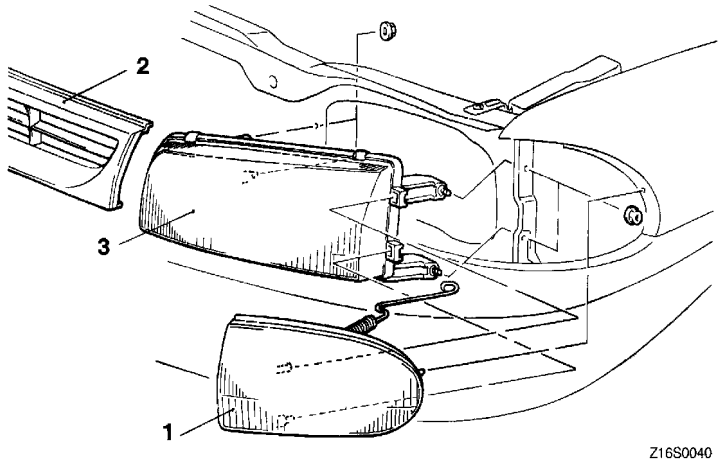
4. Push the locking cap toward the front of the vehicle while it is turned and installed.

NOTE
If the locking cap is not securely installed, the lens will be out of focus, or water will get inside the light unit, so the cap should be securely installed.

HEADLIGHT

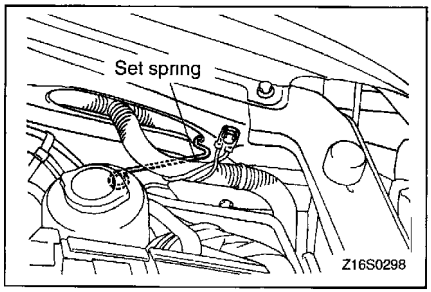
REMOVAL AND INSTALLATION

110003641



Removal steps

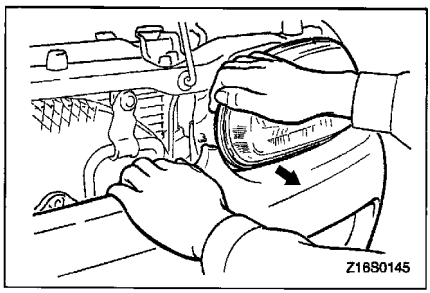
◀A▶ ▶B◀ 1. Front turn-signal light
2. Radiator grille
(Refer to GROUP 51 – Radiator Grille)
◀B▶ ▶A◀ 3. Headlight



REMOVAL SERVICE POINTS

◀A▶ FRONT TURN SIGNAL LIGHT REMOVAL

Remove the set spring, and pull the front turn signal light forward to remove it.

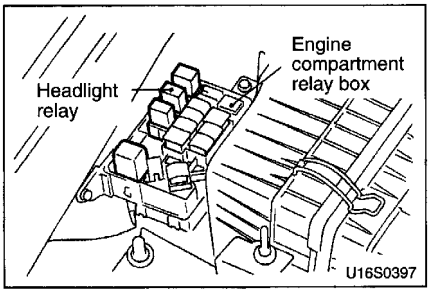


◀B▶ HEADLIGHT REMOVAL

After removing the inside of the headlight while pulling the bumper towards you as shown in the illustration, remove the outside, and then remove the headlight.

NOTE
Remove the reservoir tank before removing the right side headlight (Refer to GROUP 14 – Radiator)

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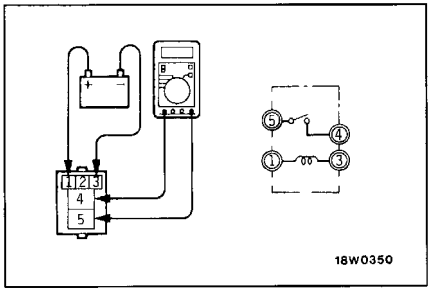


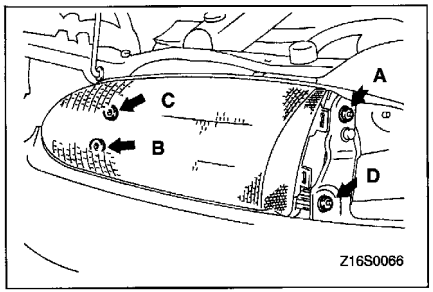
INSPECTION

HEADLIGHT RELAY

(1) Take out the headlight relay from the engine compartment relay box.
(2) Connect battery to terminal 1 and check continuity between terminals with terminal 3 grounded.

Power is supplied	4–5 terminals	Continuity
Power is not supplied	4–5 terminals	No continuity
	1–3 terminals	Continuity

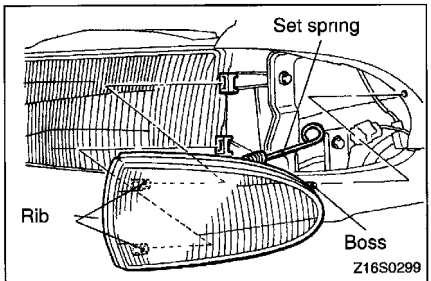




INSTALLATION SERVICE POINTS

▶A◀ HEADLIGHT INSTALLATION

Tighten the mounting nuts in the order A, B, C and D.



▶B◀ FRONT TURN SIGNAL LIGHT INSTALLATION

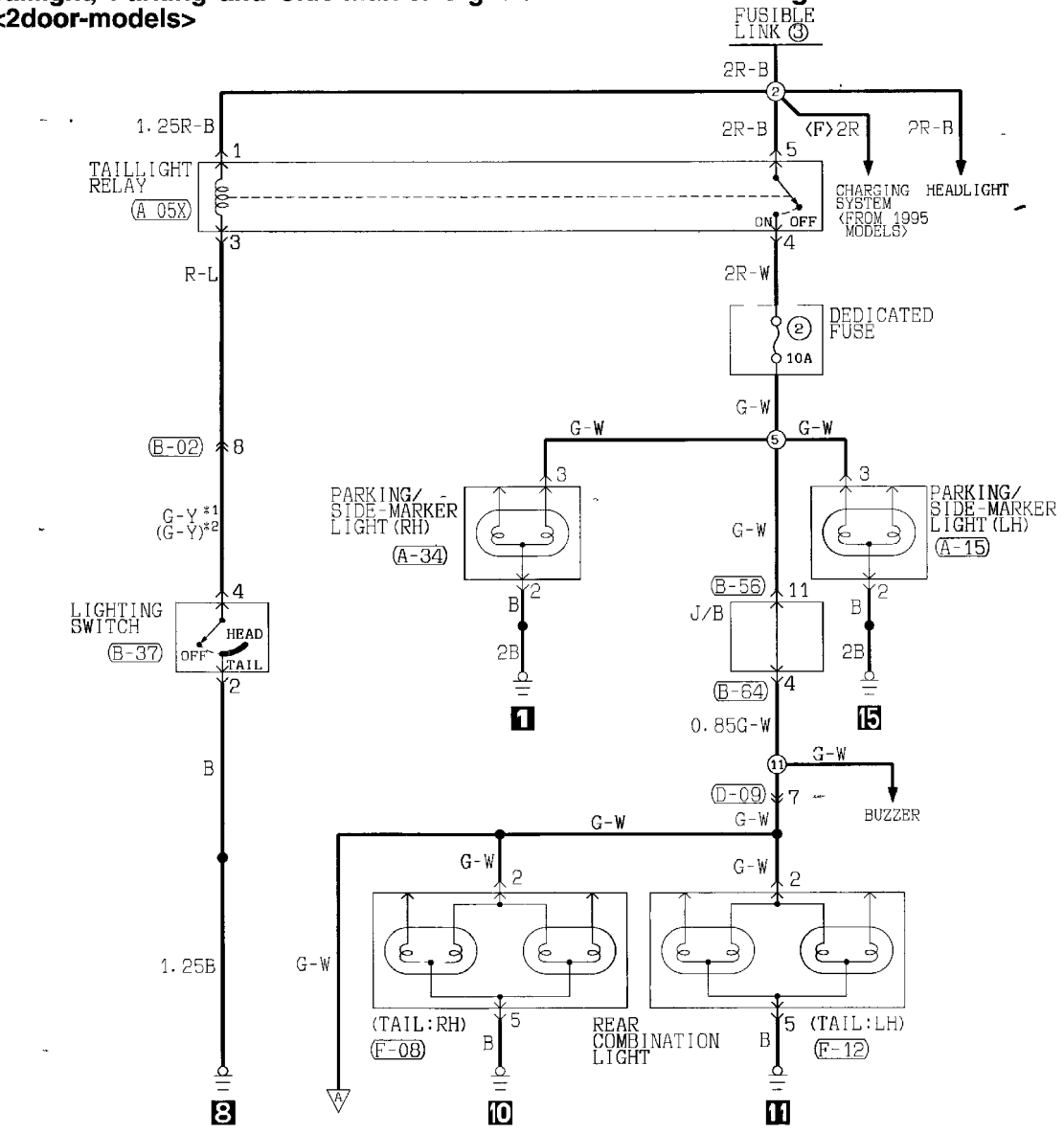
(1) After aligning the positioning boss of the front turn signal light with the fender insertion hole, align the ribs with the headlight insertion holes.
(2) While pressing in the front turn signal light towards the rear of the vehicle, hook the set spring to the fender shield inner to secure the front turn signal light to the vehicle body.

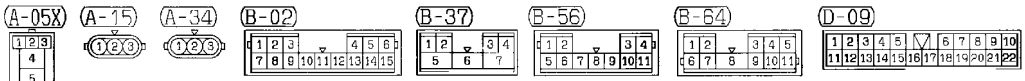
PARKING AND SIDE-MARKER LIGHT, HAZARD LIGHT

110003642

TROUBLESHOOTING

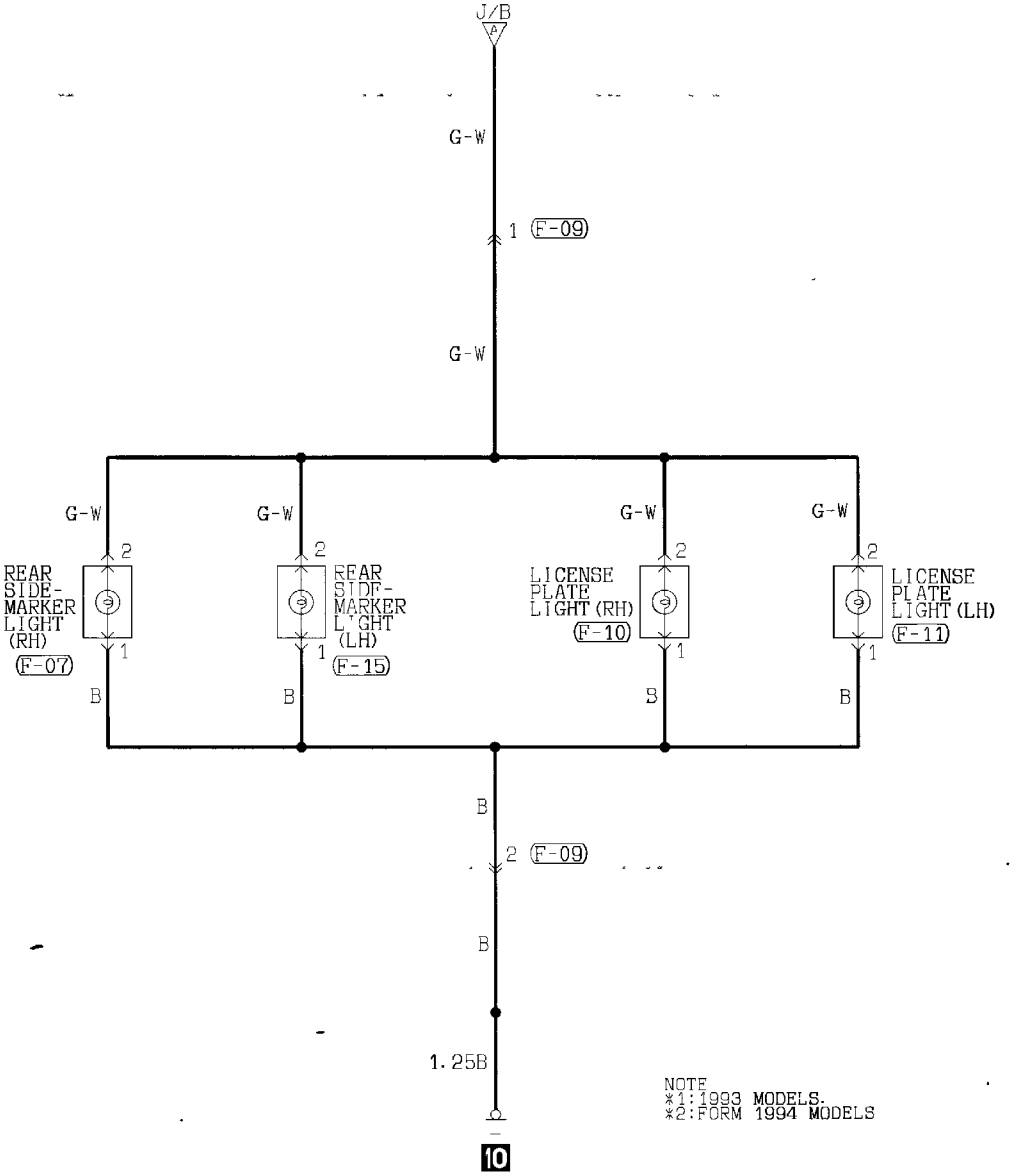
Taillight, Parking and Side-marker Light and License Plate Light Circuit <2door-models>





HE08M03AA

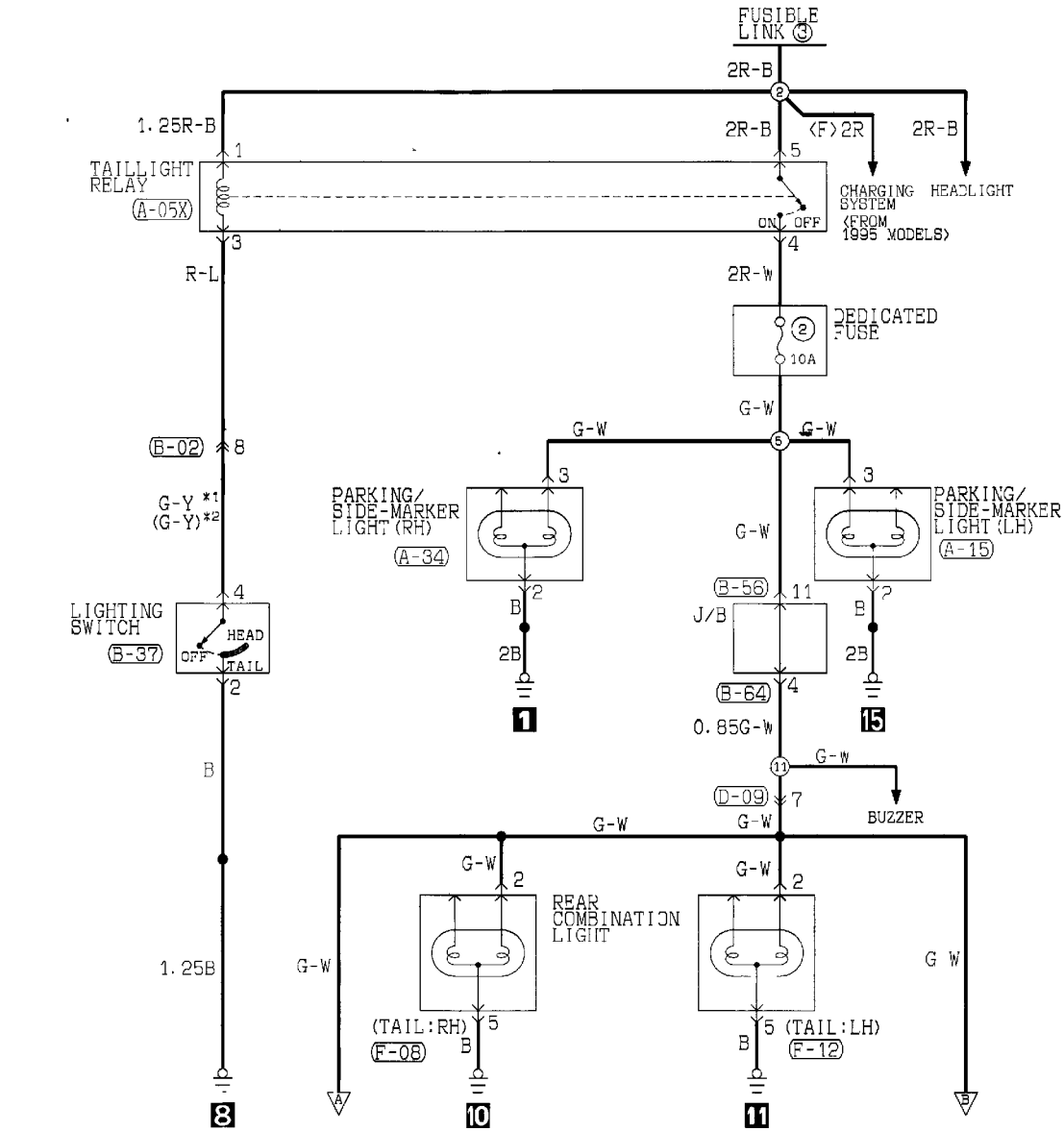
TSB Revision

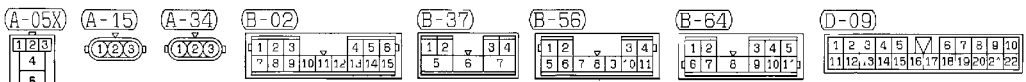


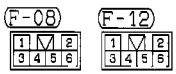
NOTE
*1:1993 MODELS.
*2:FORM 1994 MODELS

F-07 (1 2) F-09 (1 2 3) F-10 (1 2) F-11 (1 2) F-15 (1 2)

<4-door models>

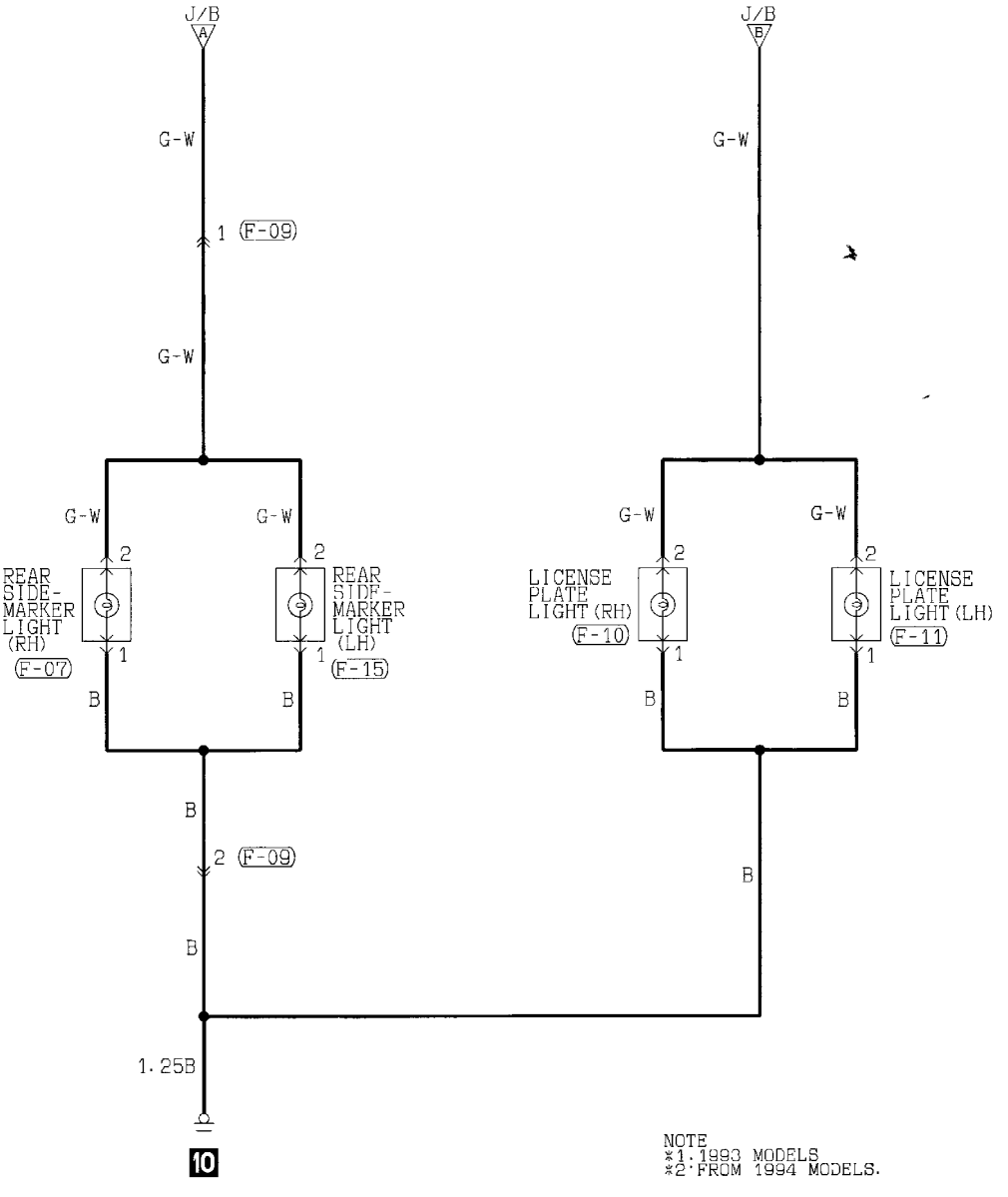






HE08M04A-

TSB Revision



NOTE
*1. 1993 MODELS
*2. FROM 1994 MODELS.

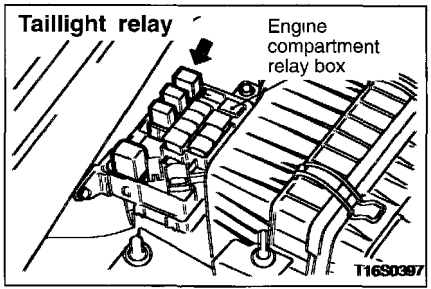
F-07 F-09 F-10 F-11 F-15

OPERATION

<Taillight, Parking / Side-marker light, License plate light operation>

- When the lighting switch is set to the "TAIL" or "HEAD" position, electricity flows via dedicated fuse No. 2 to each light, and each light illuminates.

COMPONENT LOCATION



TROUBLESHOOTING HINTS

1. All lights do not illuminate.
   1) The headlights also do not illuminate.
      - Check fusible link No. 3
   2) The headlights illuminate.
      - Check dedicated fuse No. 2

OPERATION

<Turn-signal light>

1. In normal operating condition

- When the ignition switch is placed in the ON position, battery voltage is applied through the hazard switch to the turn-signal and hazard flasher unit.
- When the turn signal switch is turned to the "LH" or "RH" position, the relay contact turns "ON" and "OFF" repeatedly due to the switching operation of the condenser and transistor inside the flasher unit, and the turn signal light and the "LH" and "RH" of the turn signal indicator light flash.

2. When one bulb is burnt

- When either one of the turn signal lights is burnt, the resistance of the entire light circuit increases, so that the time required for charging and discharging of the condenser is shortened, causing the "ON" "OFF" cycle of the relay to become faster than normal and the number of flashes to increase.

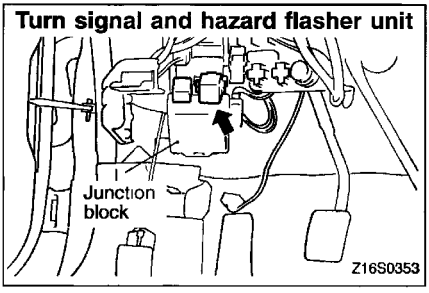
<Hazard-warning lights>

- When the hazard-warning switch is switched to the "ON" position, the relay contact of the flasher unit is switched ON and OFF repeatedly, in the same manner as for the operation of the turn-signal lights, and the left and right turn-signal lights and turn-signal indicator lights simultaneously flash repeatedly.

NOTE
The number of flashes of the hazard-warning lights does not change if there is damaged or disconnected wiring of one light.

COMPONENT LOCATION

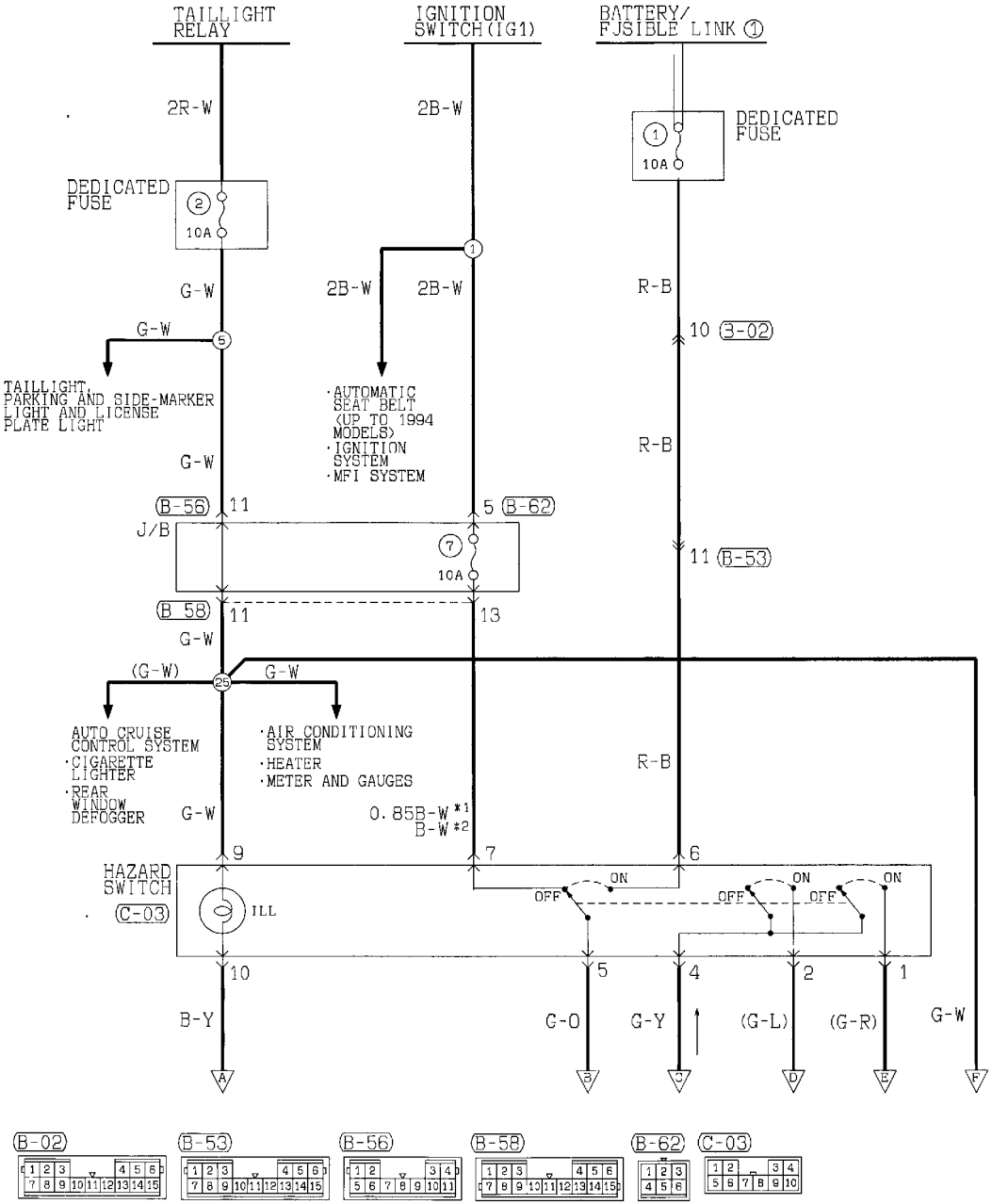
Turn signal and hazard flasher unit

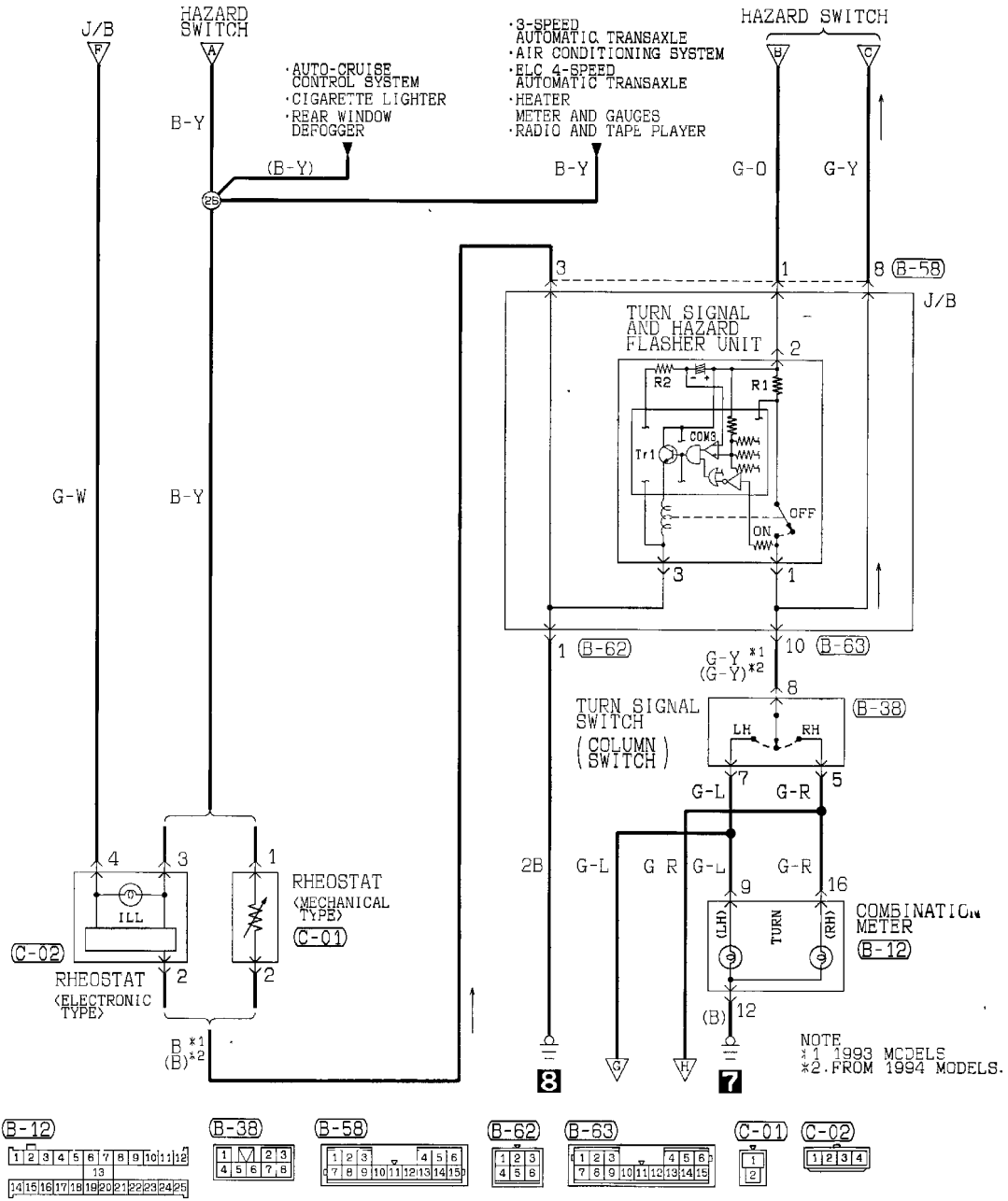


TROUBLESHOOTING HINTS

1. The turn-signal lights and hazard-warning lights do not operate at all.
   - Check the hazard-warning switch contact (power supply side).
   - Check the flasher unit.
2. All turn-signal lights at the left (or right) side do not function.
   1) The hazard-warning lights function normally.
      - Check the hazard-warning switch contact (turn-signal side).
      - Check the turn-signal switch.
3. Turn-signal lights continue to illuminate.
   - Check the bulbs.
4. The hazard-warning lights do not function.
   1) The turn-signal lights function normally.
      - Check the hazard-warning switch contact (hazard-warning light side).

Turn-signal Light and Hazard Light Circuit





B-12

B-38

B-58

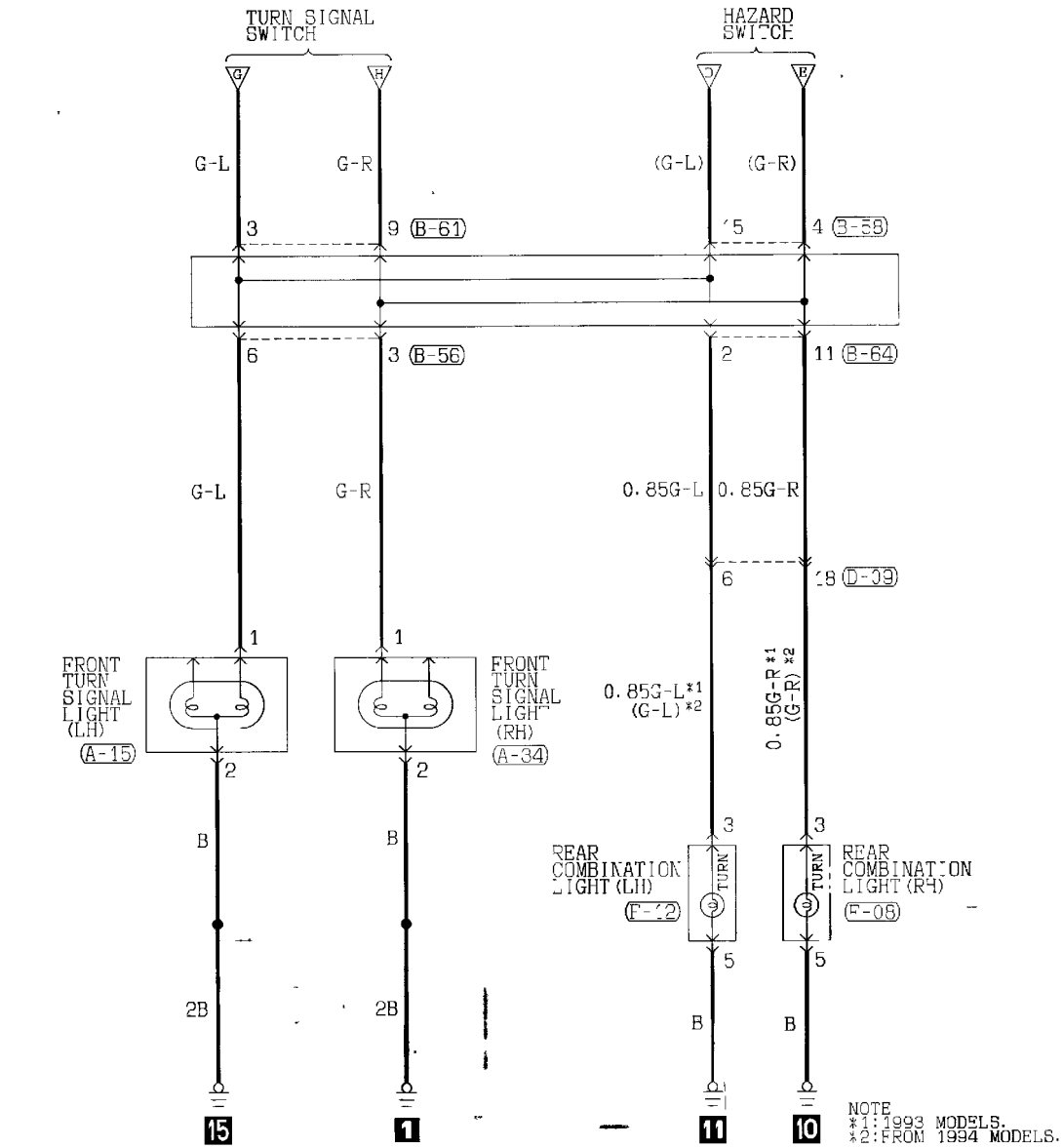
B-62

B-63

C-01

C-02

Turn-signal Light and Hazard Light Circuit (Continued)



(A-15) (A-34) (B-56) (B-58) (B-61) (B-64) (D-09)

(F-08) (F-12)

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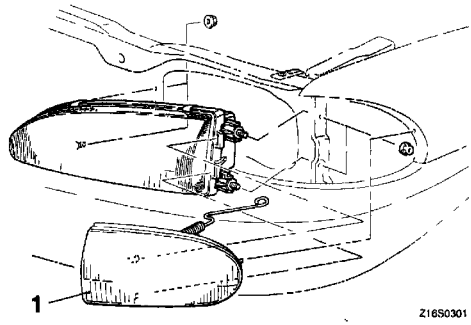
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PARKING AND SIDE-MARKER LIGHT, HAZARD LIGHT

REMOVAL AND INSTALLATION

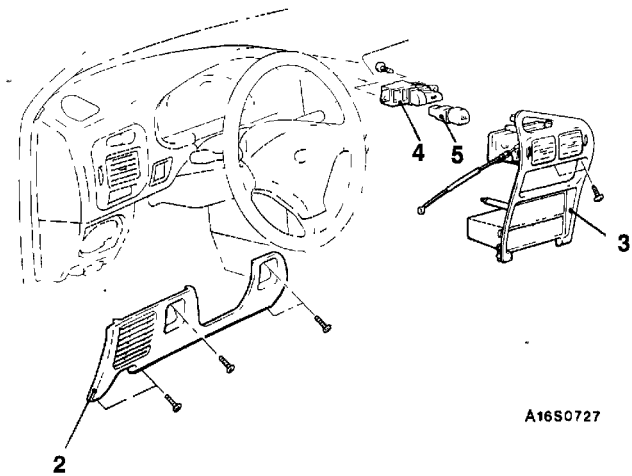
110003643

<Front Turn-signal Light>



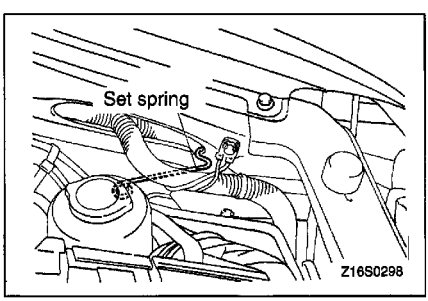
◀A▶ ▶B◀ 1. Front turn-signal light

<Hazard Light Switch>



Removal steps

◀B▶ ▶A◀ 2. Knee protector
3. Air outlet center panel assembly
4. Switch holder
5. Hazard light switch

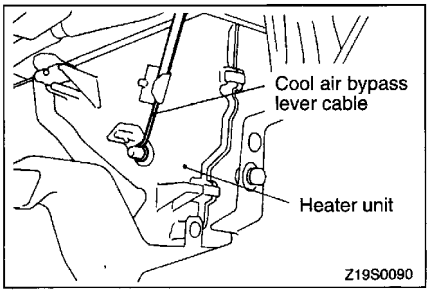


REMOVAL SERVICE POINTS

◀A▶ FRONT TURN SIGNAL LIGHT REMOVAL

Remove the set spring, and pull the front turn signal light forward to remove it.

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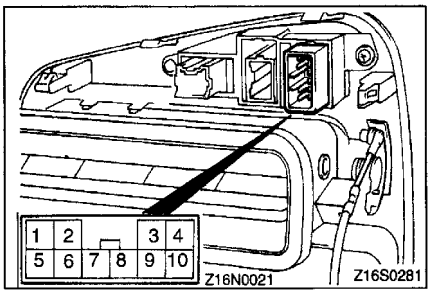
◀B▶ AIR OUTLET CENTER PANEL ASSEMBLY REMOVAL

(1) Remove the cool air bypass lever cable of the air outlet center panel assembly at the heater unit side.
(2) Remove the air outlet center panel assembly mounting screws, and remove the air outlet center panel assembly.

INSPECTION

Hazard Light Switch

Operate the switch and check for continuity between the terminals.

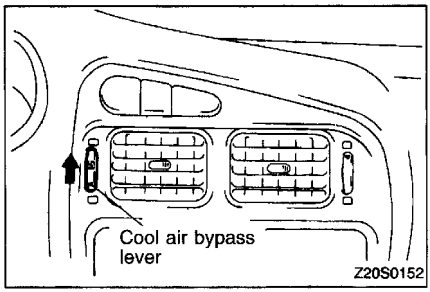


Switch position	Terminal No.									
	1	2	3	4	5	6	7	8	9	10
OFF					○		○	○	○	○
ON	○	○	○	○	○	○			Illumination light	

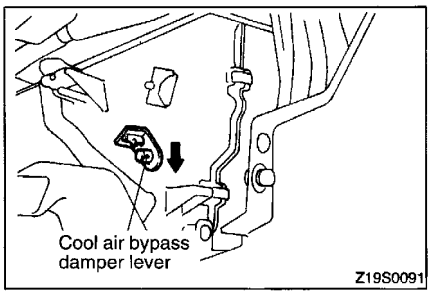
INSTALLATION SERVICE POINTS

▶A◀ AIR OUTLET CENTER PANEL ASSEMBLY INSTALLATION

(1) Install the air outlet center panel assembly to the instrument panel.
(2) Turn the cool air bypass lever of the air outlet center panel assembly fully upward (in the direction of the arrow).

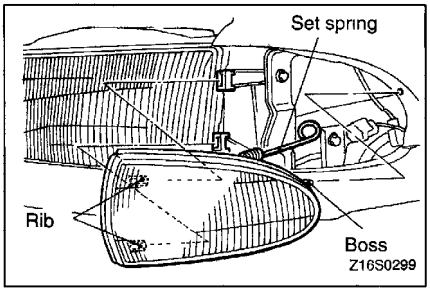


(3) Turn the cool air bypass damper lever at the heater unit side fully downward (in the direction of the arrow), and install the cool air bypass lever cable.



▶B◀ FRONT TURN SIGNAL LIGHT INSTALLATION

(1) After aligning the positioning boss of the front turn signal light with the fender insertion hole, align the ribs with the headlight insertion holes.
(2) While pressing in the front turn signal light towards the rear of the vehicle, hook the set spring to the fender shield inner to secure the front turn signal light to the vehicle body.



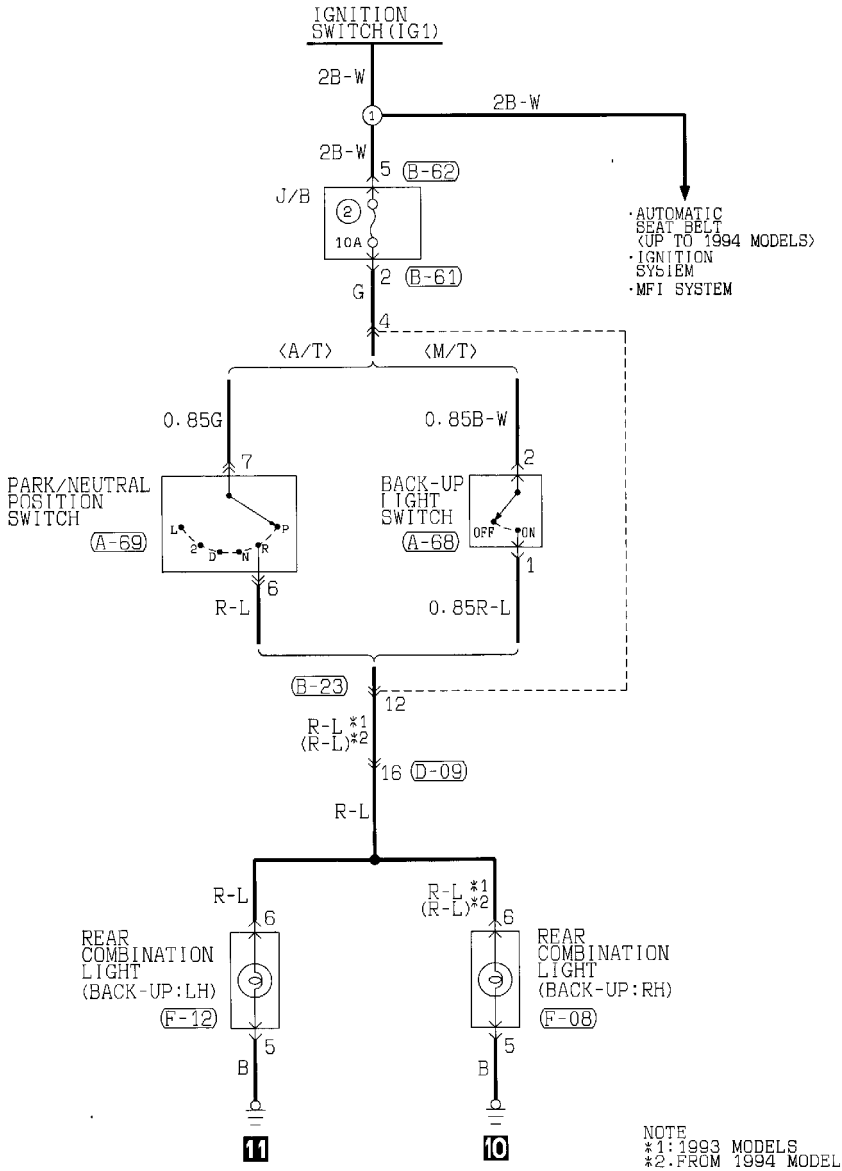
TSB Revision

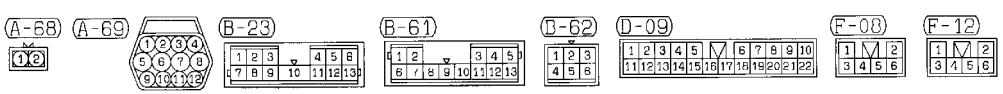
REAR COMBINATION LIGHT

TROUBLESHOOTING

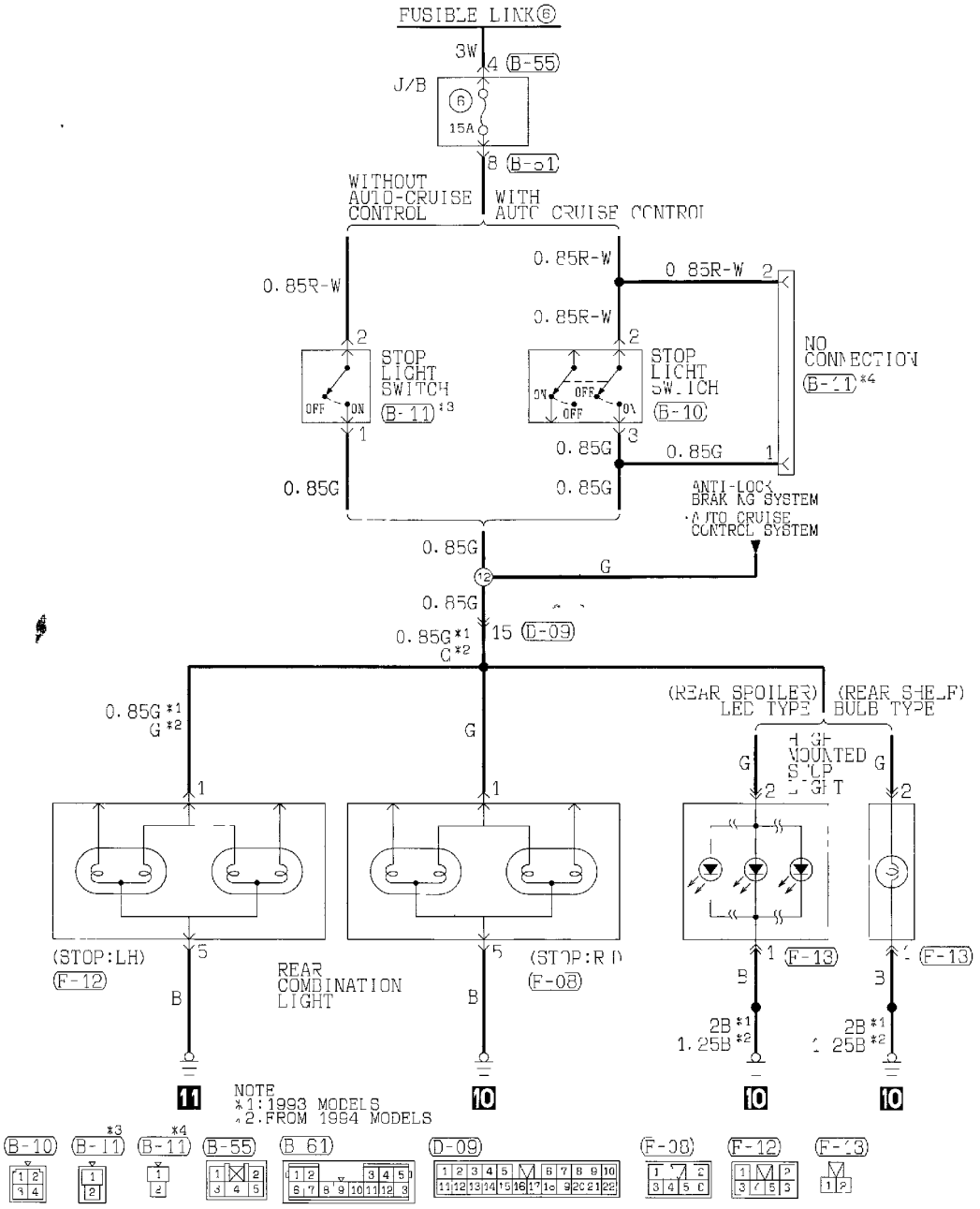
Back-up Light Circuit

110003644

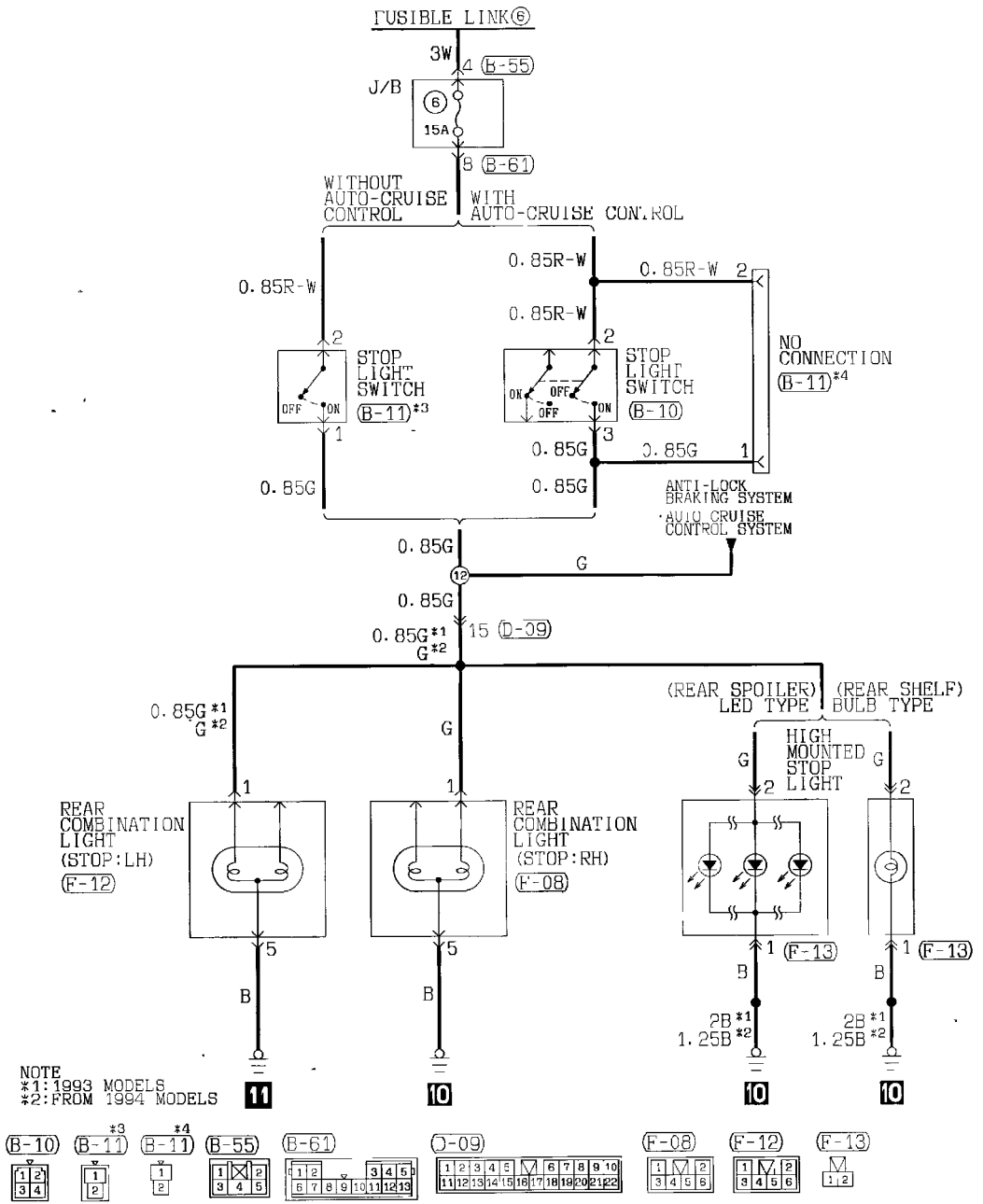




Stop Light Circuit <2-door models>



Stop Light Circuit <4-door models>

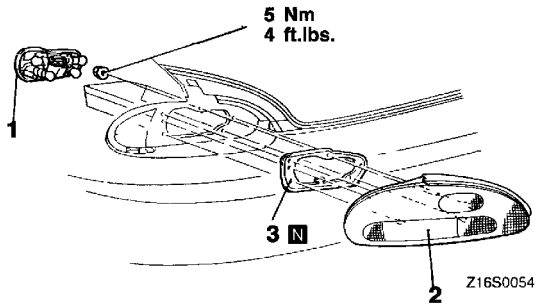


REAR COMBINATION LIGHT

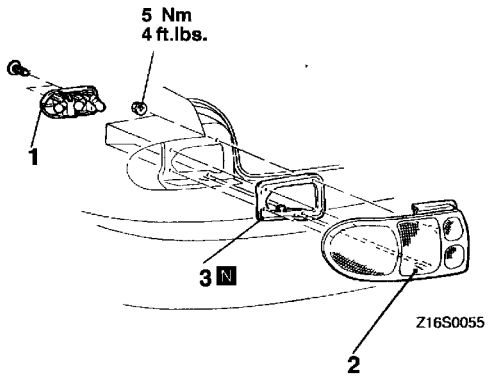
REMOVAL AND INSTALLATION

110003645

<Type 1>



<Type 2>

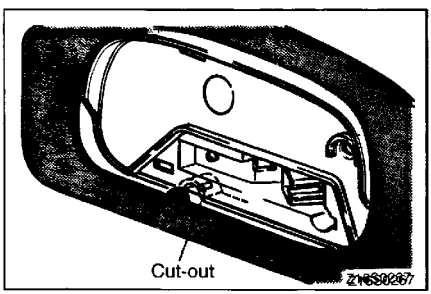


00001563

Removal steps

1. Socket and bulb assembly
2. Rear combination light

▶A◀ 3. Gasket



INSTALLATION SERVICE POINT

▶A◀ GASKET INSTALLATION

Securely insert the gasket onto the lamp unit cut-out.

HIGH MOUNTED STOP LIGHT

TROUBLESHOOTING

110003646

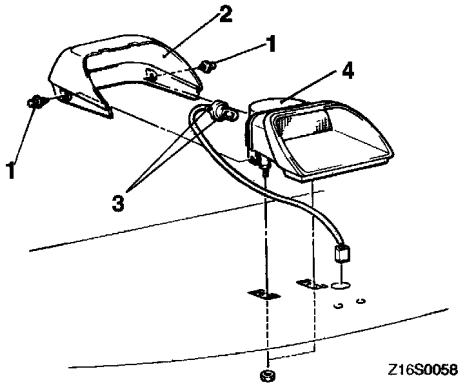
Refer to the paragraph "Rear Combination Light".

HIGH MOUNTED STOP LIGHT

REMOVAL AND INSTALLATION

110003647

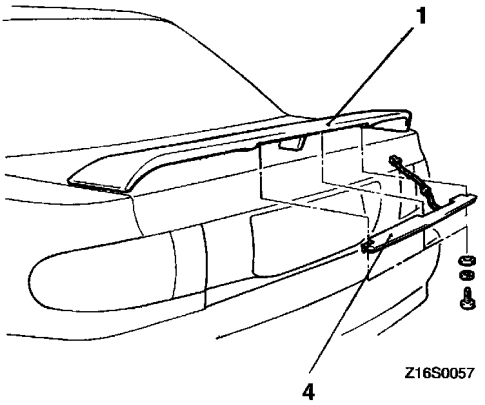
<Vehicles with rear shelf>



Removal steps

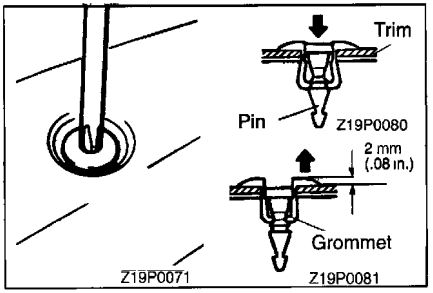
◀A▶ ▶A◀ 1. Clip
2. Cover
3. Socket and bulb assembly
4. High mounted stop light

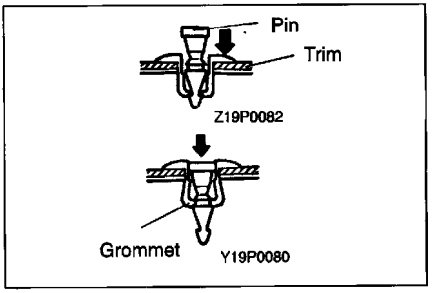
<Vehicles with rear spoiler>



Removal steps

1. Rear spoiler
   (Refer to GROUP 51 – Aero Parts)
4. High mounted stop light





REMOVAL SERVICE POINT

◀A▶ CLIP REMOVAL

(1) Use a cross-tip (+) screwdriver to push inward the pin (at the center of the clip) to a depth of about 2 mm (.08 in.)
(2) Pull the clip outward to remove it.

Caution
Do not push the pin inward more than necessary because it may damage the grommet, or the pin may fall in, if pushed too far.

INSTALLATION SERVICE POINT

▶A◀ CLIP INSTALLATION

(1) With the pin pulled out, insert the clip into the hole in the trim.
(2) Push the pin inward until the pin's head is flush with the grommet.
(3) Check whether the trim is secure.

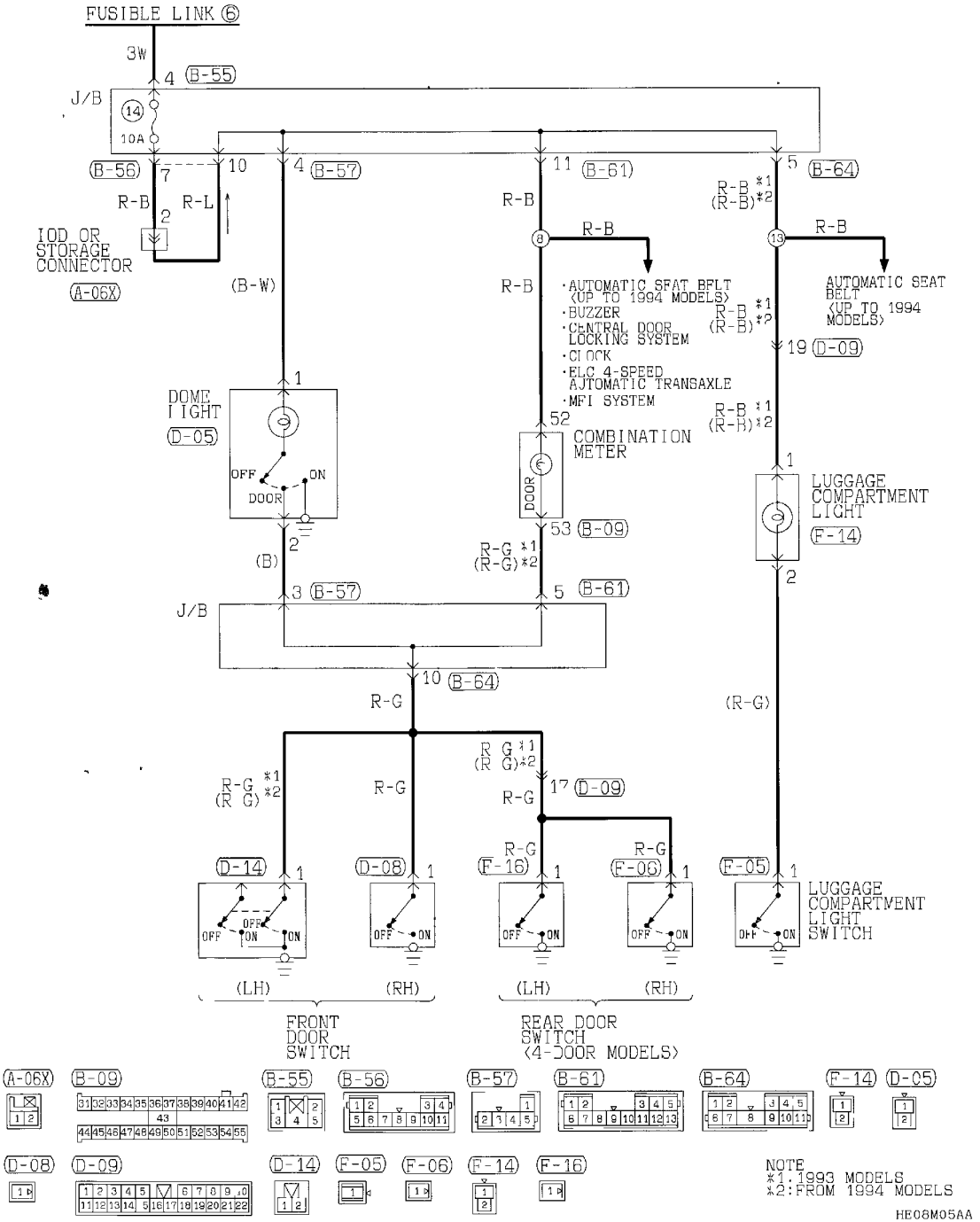
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INTERIOR LIGHT

TROUBLESHOOTING

110003648

Dome Light and Luggage Compartment Light Circuit



NOTE
*1: 1993 MODELS
*2: FROM 1994 MODELS

HE08M05AA

TSB Revision

OPERATION

<Dome light>

- The dome light is always illuminated when the dome light switch is at the "ON" position.
- The dome light illuminates when any door is opened while the dome light switch is at the "DOOR" position.
- The dome light switches OFF when all doors are closed.

<Luggage compartment light>

- Battery voltage is always applied (via fusible link No. 6 and multipurpose fuse No. 14) to the luggage compartment light.
- When the trunk lid is opened, the luggage compartment light switch is switched ON and the luggage compartment light illuminates.

TROUBLESHOOTING HINTS

1. The dome light does not illuminate.
   1) The clock is stopped also.
      - Check multipurpose fuse No. 14.
   2) The dome light does not illuminate when, with the dome light switch at the "DOOR" position, any door is opened.
      - Check the bulb.
      - Check the dome light switch.
   3) The dome light does not illuminate when, with the dome light switch at the "DOOR" position, a certain door or doors is/are opened.
      - Check the door switch [the door switch(es) for the door(s) that does not activate the dome light when opened].
2. The luggage compartment light does not illuminate.
   1) The dome light is normal.
      - Check the bulb.
      - Check the luggage compartment light switch.

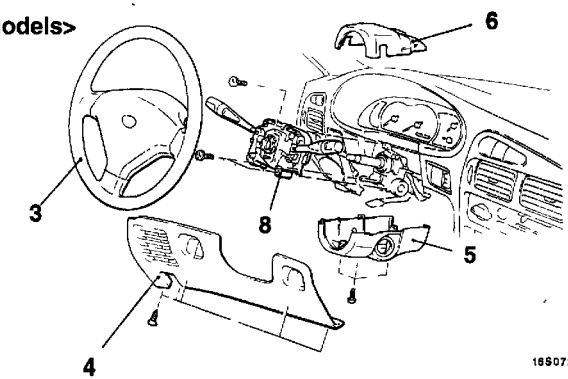
COLUMN SWITCH

REMOVAL AND INSTALLATION

110003649

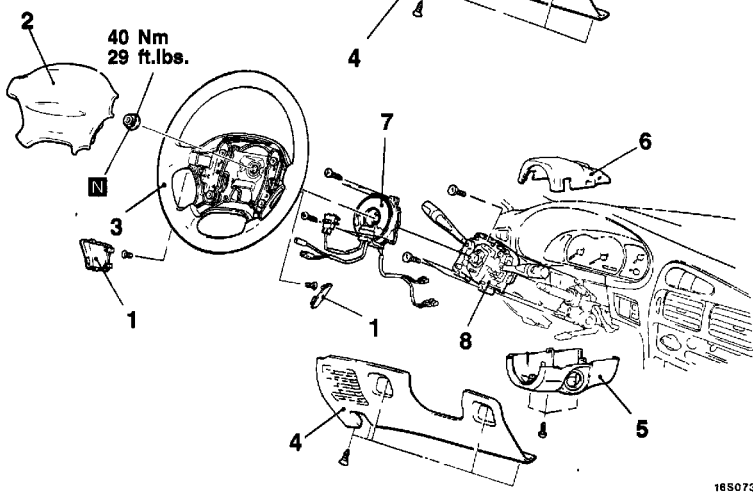
CAUTION: SRS <From 1994 models>
Before removal of air bag module, refer to GROUP 52B – SRS Service Precautions and Air Bag Module and Clock Spring.

<1993 models>



16S0729

<From 1994 models>



16S0730

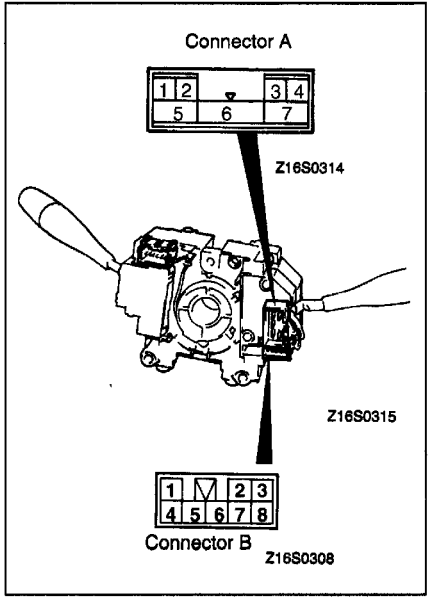
00001564

Removal steps <1993 models>

3. Steering wheel (Refer to GROUP 37A – Steering Wheel)
4. Knee protector
5. Column cover lower
6. Column cover upper
8. Column switch

Removal steps <From 1994 models>

1. Cover
2. Air bag module (Refer to GROUP 52B – Air Bag Module and Clock Spring.)
3. Steering wheel (Refer to GROUP 37A – Steering Wheel)
4. Knee protector
5. Column cover lower
6. Column cover upper
7. Clock spring (Refer to GROUP 52B – Air Bag Module and Clock Spring.)
8. Column switch



INSPECTION

Operate the switch and check for continuity between the terminals.

Switch position		Terminal No.									
		Connector A							Connector B		
		1	2	3	4	5	6	7	5	7	8
LIGHTING	OFF										
	TAIL		○	—	○						
	HEAD		○	○	○						
DIMMER/ PASSING	LOWER						○	○			
	UPPER					○	○				
	PASS-ING	○	○	—	—	○					
TURN SIGNAL	RH								○	—	○
	OFF										
	LH									○	○

WIPER AND WASHER SWITCH

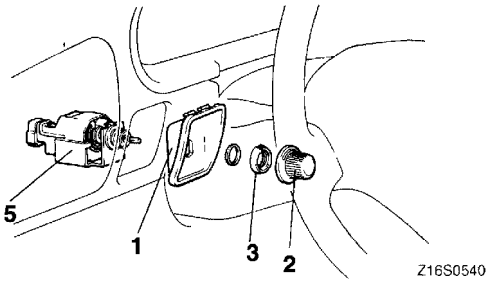
Refer to GROUP 51 – Windshield Wiper and Washer.

RHEOSTAT

REMOVAL AND INSTALLATION

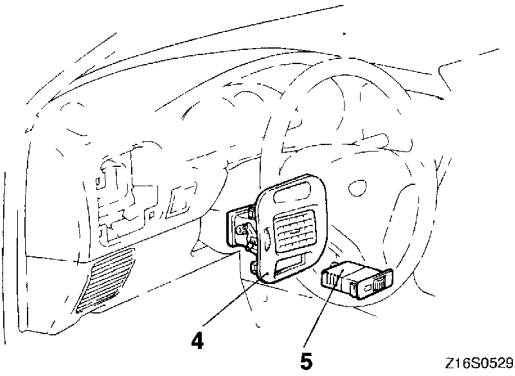
110003650

<Mechanical type>



Z16S0540

<Electronic type>



Z16S0529

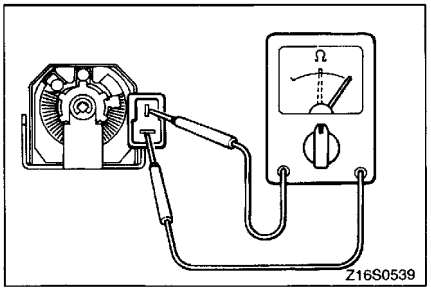
00001565

Removal steps <Mechanical type>

1. Garnish
2. Knob
3. Ring nut
5. Rheostat

Removal steps <Electronic type>

4. Air outlet panel assembly
5. Rheostat

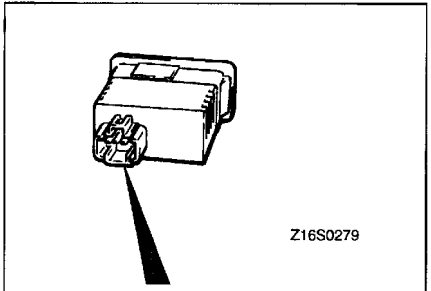


Z16S0539

INSPECTION

<Mechanical type>

(1) With the connector disconnected, measure the continuity between the rheostat terminals with an ohmmeter.
(2) If the resistance value varies smoothly between 0 and 10 ohms throughout the entire operation range, the rheostat is functioning properly.



<Electronic type>

(1) Connect the battery and the test bulb (40W) as shown in the illustration.
(2) Operate the rheostat, and if the brightness changes smoothly without switching off, then the rheostat function is normal.

BUZZER

TROUBLESHOOTING

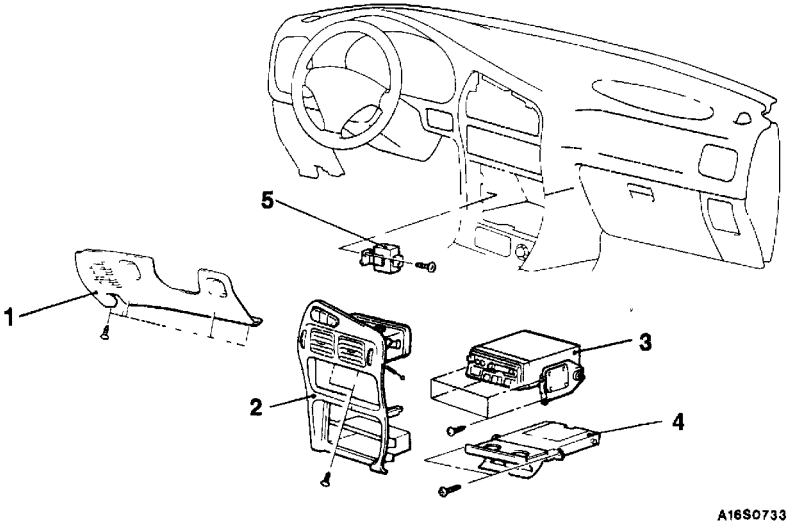
110003651

Refer to the paragraph "Parking and side-marker light, hazard light".

BUZZER

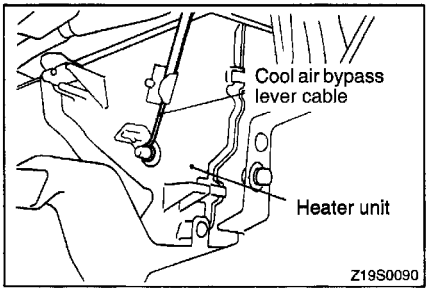
REMOVAL AND INSTALLATION

110003652



Removal steps

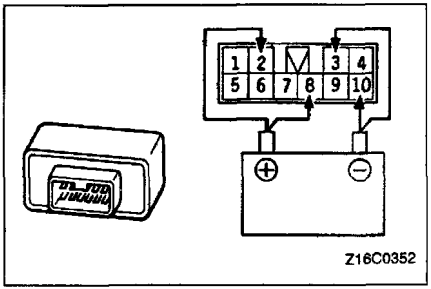
1. Knee protector
◀A▶ ▶A◀ 2. Air outlet center panel assembly
3. Radio and tape player
4. Cup holder
5. Buzzer



REMOVAL SERVICE POINT

◀A▶ AIR OUTLET CENTER PANEL ASSEMBLY REMOVAL

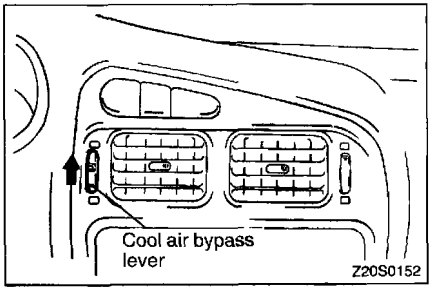
(1) Remove the cool air bypass lever cable of the air outlet center panel assembly at the heater unit side.
(2) Remove the air outlet center panel assembly mounting screws, and remove the air outlet center panel assembly.



INSPECTION

LIGHTING MONITOR BUZZER

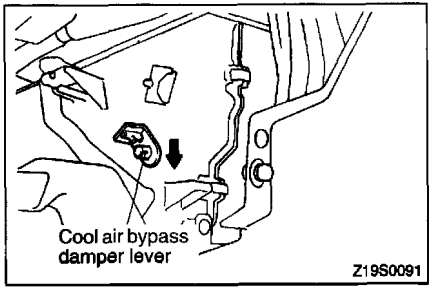
(1) Apply battery voltage between the terminals 2, 8 and 10.
(2) Check to be sure that the buzzer sounds when terminal 3 is grounded.



INSTALLATION SERVICE POINT

▶A◀ AIR OUTLET CENTER PANEL ASSEMBLY INSTALLATION

(1) Install the air outlet center panel assembly to the instrument panel.
(2) Turn the cool air bypass lever of the air outlet center panel assembly fully upward (in the direction of the arrow).



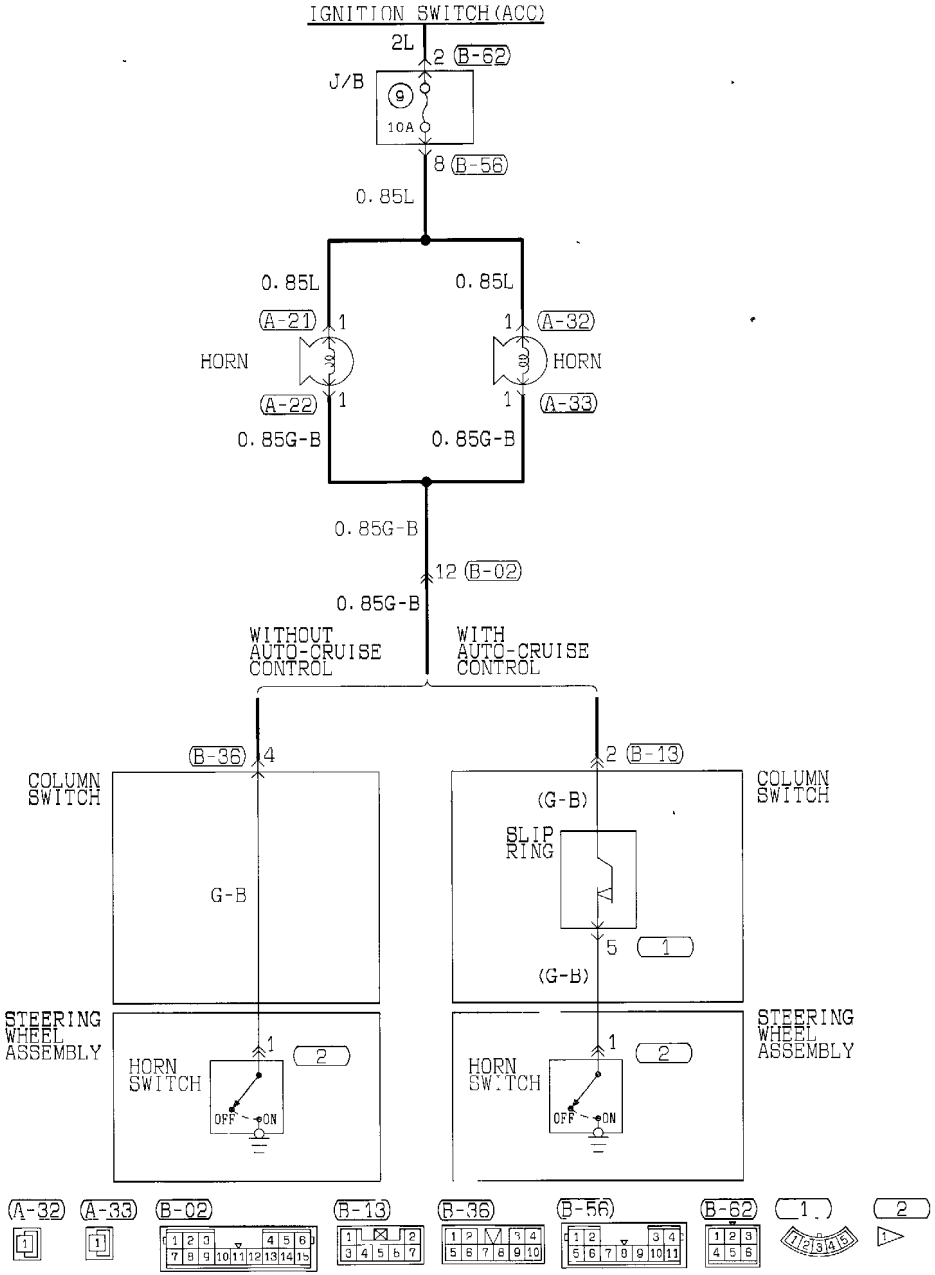
(3) Turn the cool air bypass damper lever at the heater unit side fully downward (in the direction of the arrow), and install the cool air bypass lever cable.

HORN

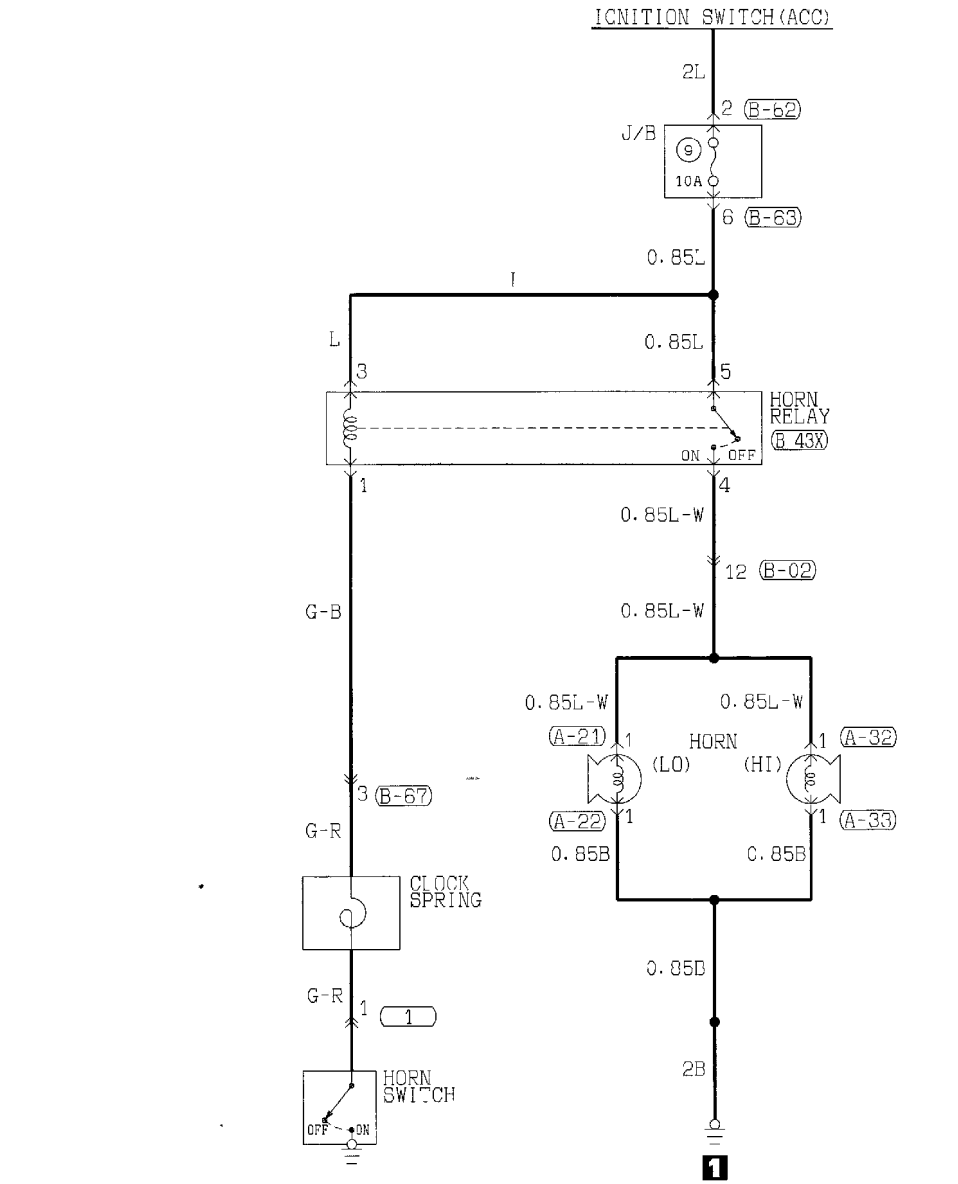
TROUBLESHOOTING

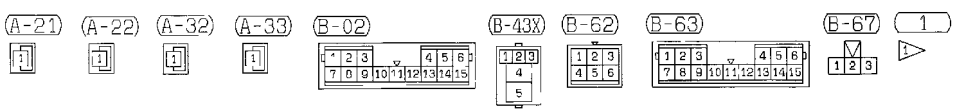
110003653

CIRCUIT DIAGRAM <1993 models>

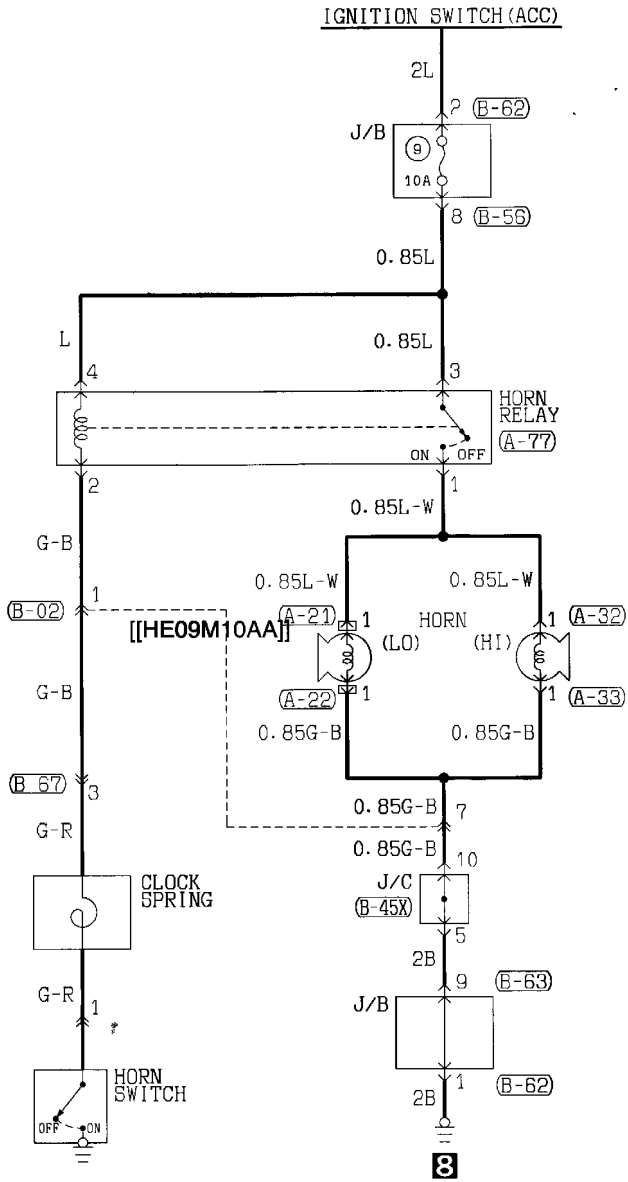


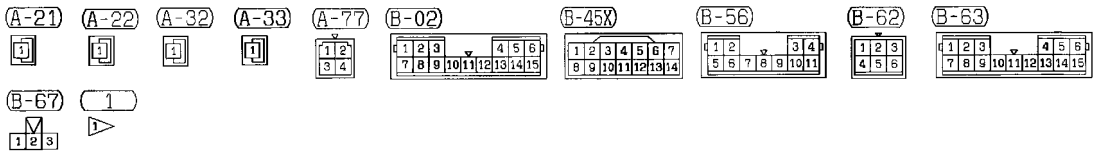
CIRCUIT DIAGRAM <1994 models>





CIRCUIT DIAGRAM <From 1995 models>

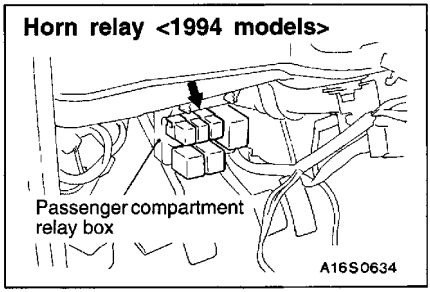


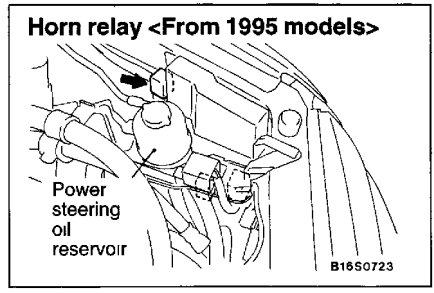


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COMPONENT LOCATION

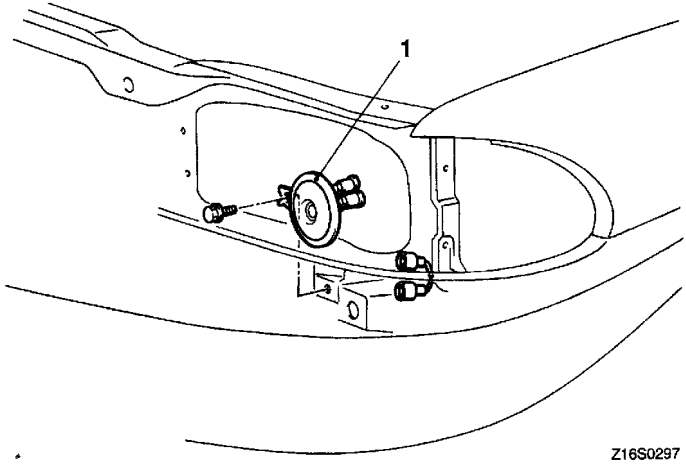




HORN

REMOVAL AND INSTALLATION

110003654



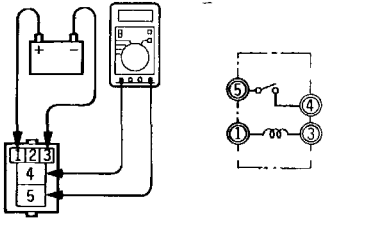
Removal steps

- Headlight (Refer to P.54-26.)

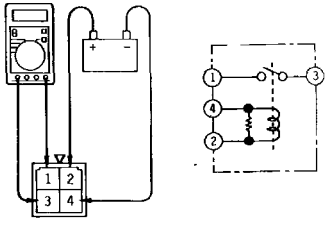
1. Horn

NOTE
Remove the horn at the L.H. side by the same procedure.

<1994 models>



<From 1995 models>



INSPECTION

HORN RELAY

(1) Remove the horn relay.
(2) Check for continuity between the terminals.

<1994 models>

Battery voltage	Terminal No.			
	1	2	3	4
Not applied	○	○		
Applied	⊕	⊖	○	○

<From 1995 models>

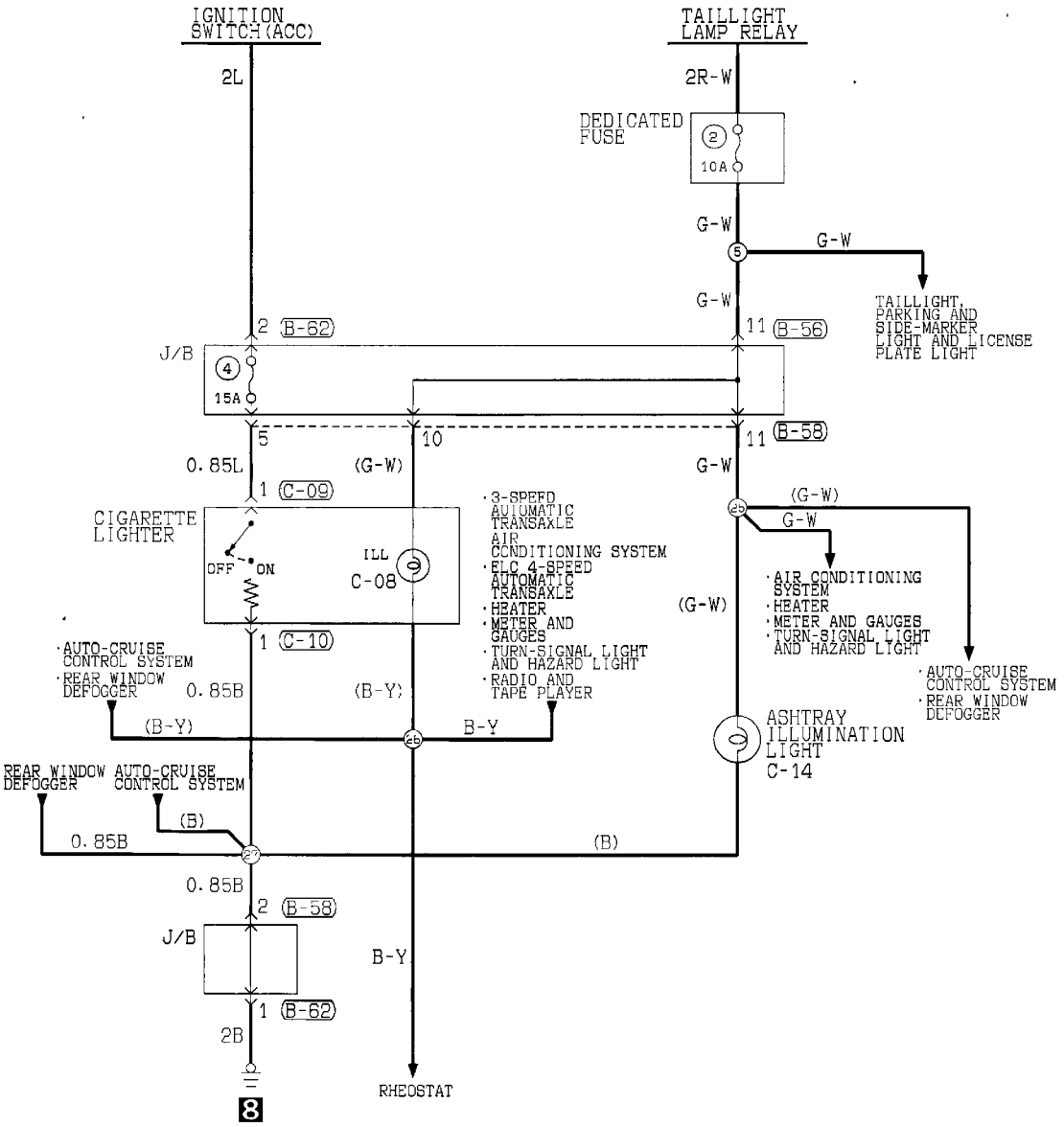
Battery voltage	Terminal No.			
	1	2	3	4
Not applied		○		○
Applied	○	⊕	○	⊖

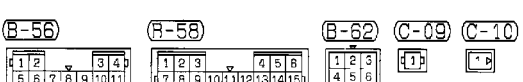
CIGARETTE LIGHTER

TROUBLESHOOTING

110003655

CIRCUIT DIAGRAM

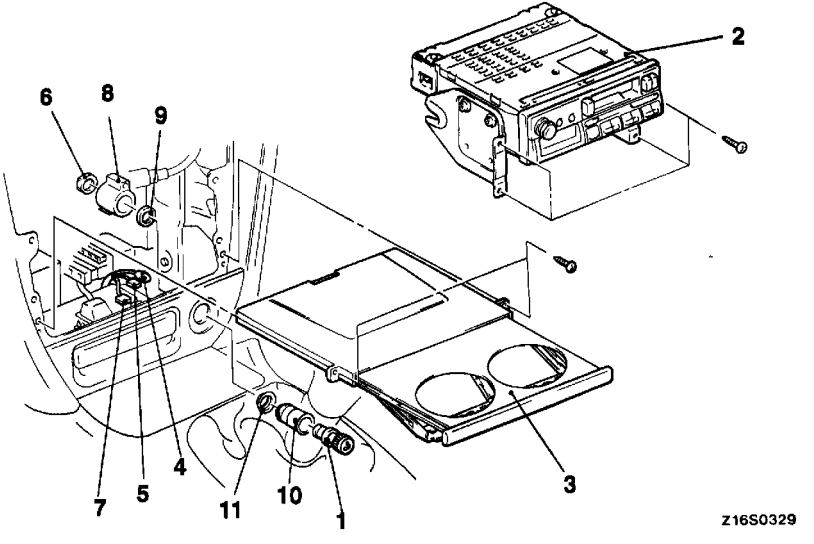




CIGARETTE LIGHTER

REMOVAL AND INSTALLATION

110003656



Removal steps

1. Plug
2. Radio and Tape player
3. Cup holder
4. Cigarette lighter illumination light
5. Cigarette lighter power supply connector
6. Fixing ring
7. Ground connector
8. Socket case
9. Plate
10. Socket
11. Protector

INSPECTION

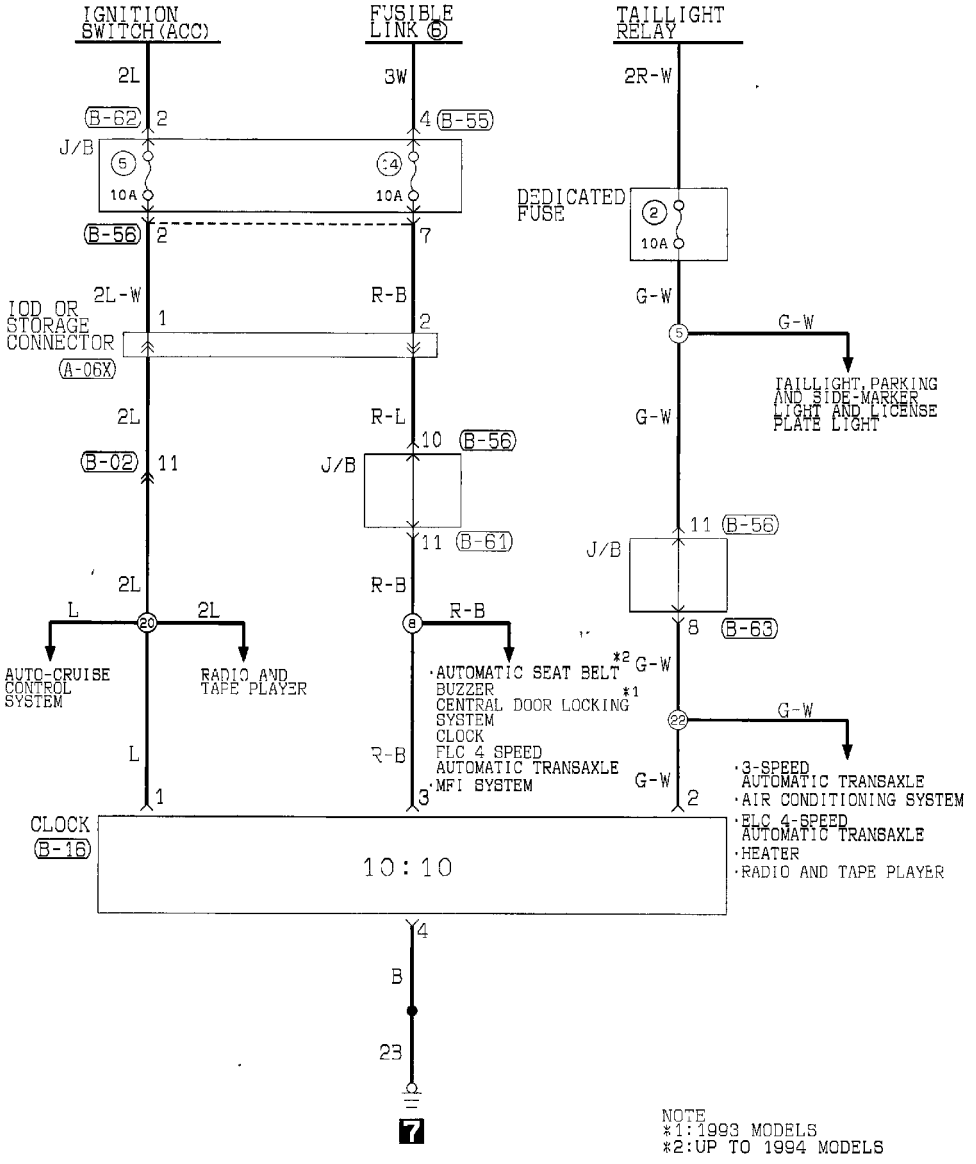
- Take out the plug, and check for a worn edge on the element spot connection, and for shreds of tobacco or other material on the element.
- Using an ohmmeter, check the continuity of the element.

CLOCK

TROUBLESHOOTING

110003657

CIRCUIT DIAGRAM

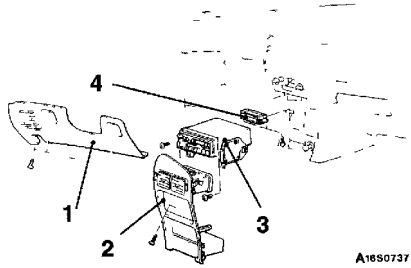


A-06X B-02 B-16 B-55 B-56 B-61 B-62 B-63

CLOCK

REMOVAL AND INSTALLATION

110003658

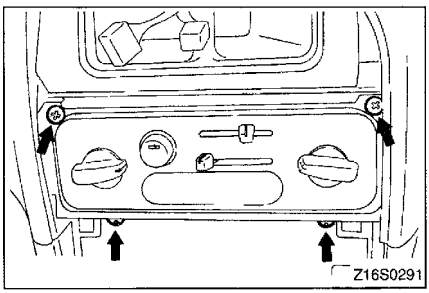


Removal steps

1. Knee protector
2. Air outlet center panel assembly (Refer to P.54-38.)

◀A▶

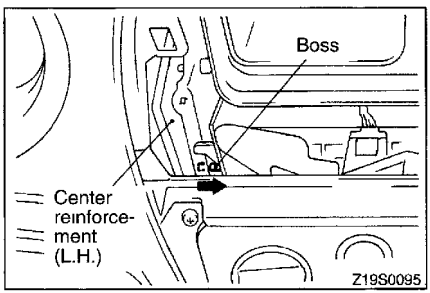
3. Radio and tape player
4. Clock



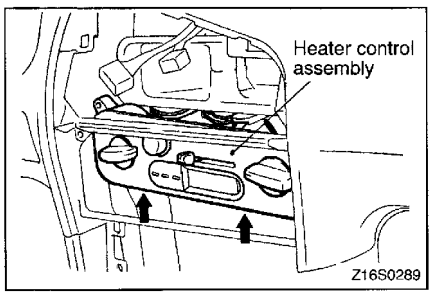
REMOVAL SERVICE POINT

◀A▶ CLOCK REMOVAL

(1) Remove the heater control assembly mounting screws.



(2) Remove the heater control assembly boss from center reinforcement (L.H.).



(3) Push the heater control assembly into the instrument panel, remove the clock mounting screws, and remove the clock.

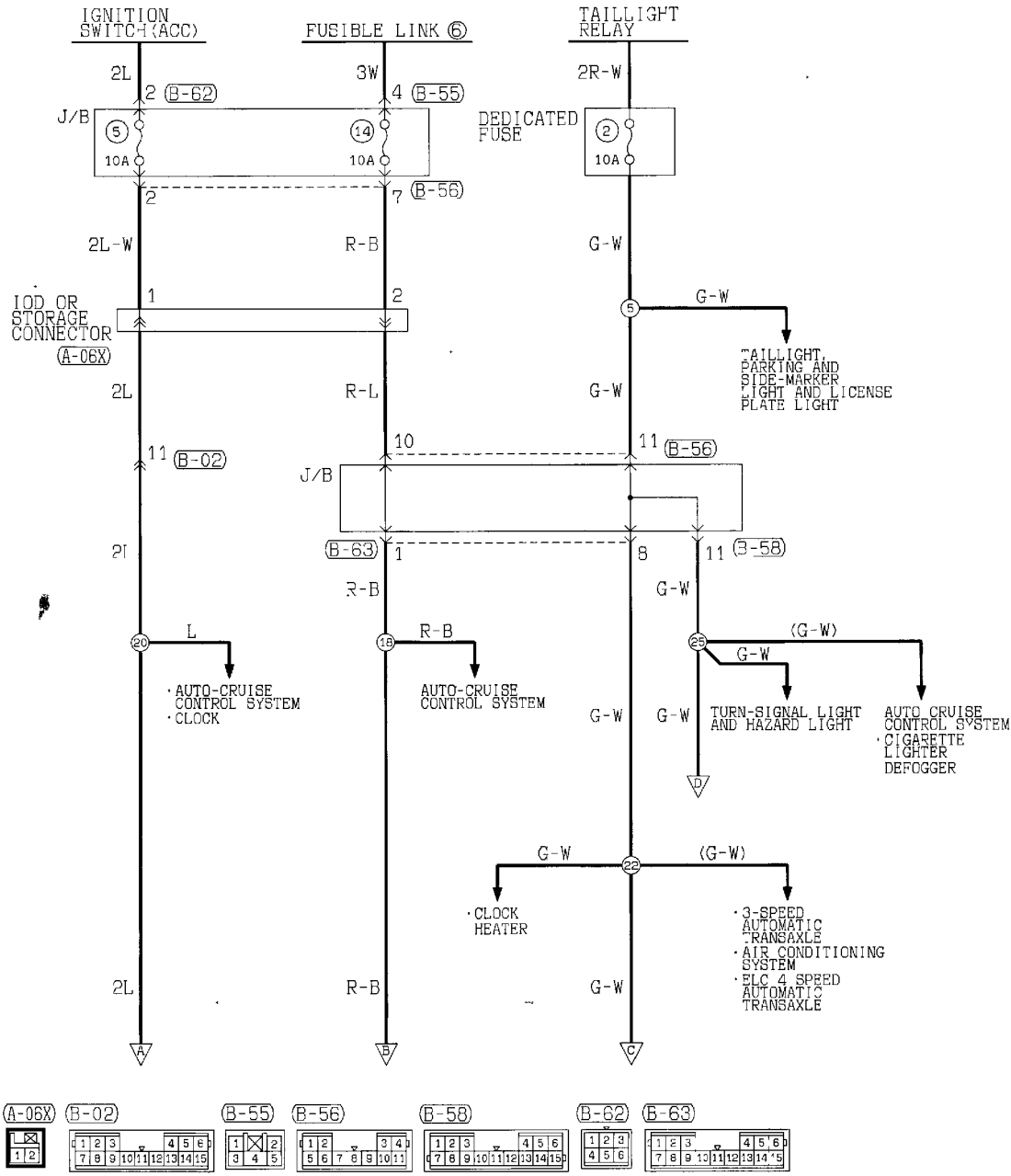
TSB Revision

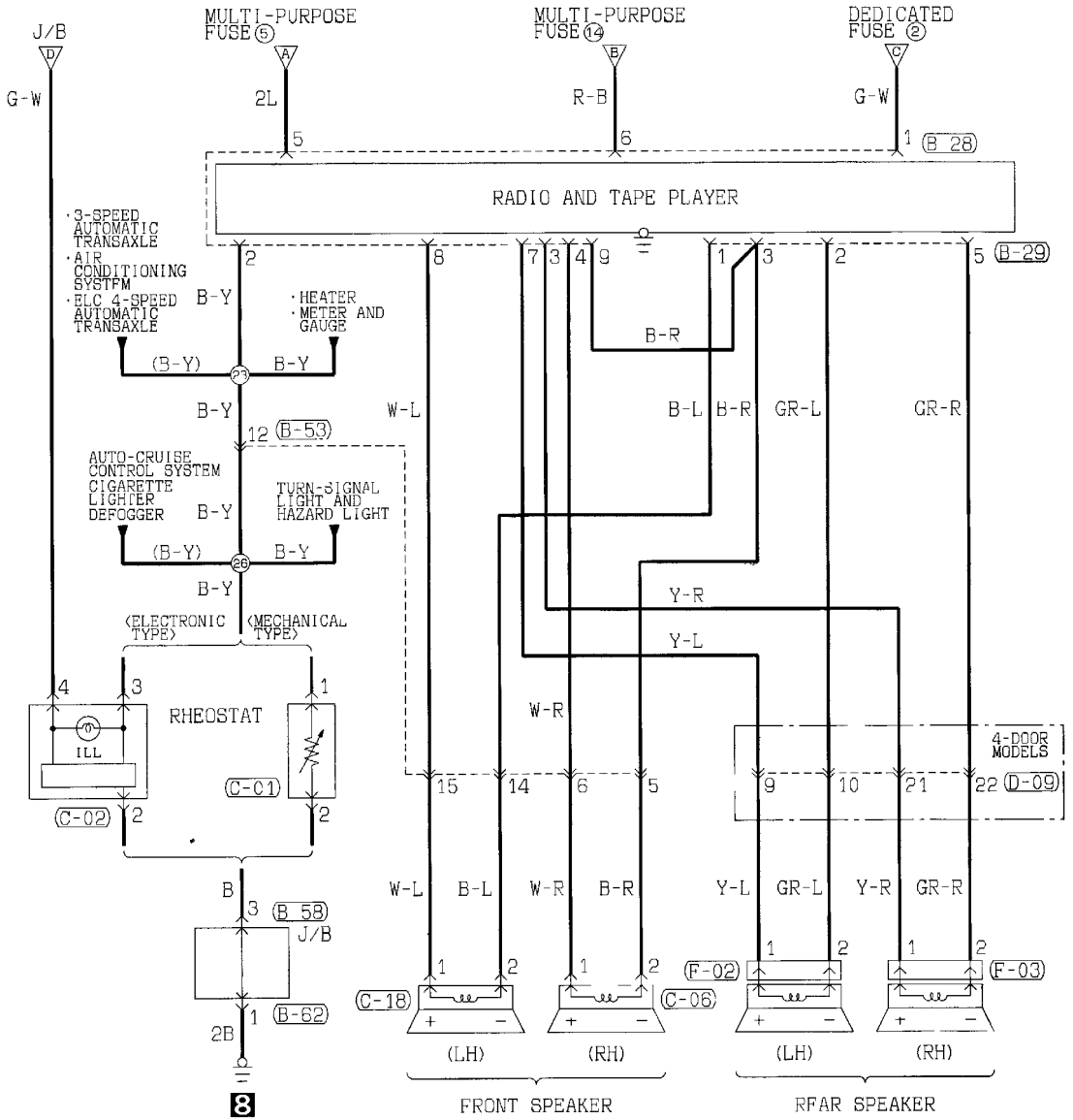
RADIO AND TAPE PLAYER

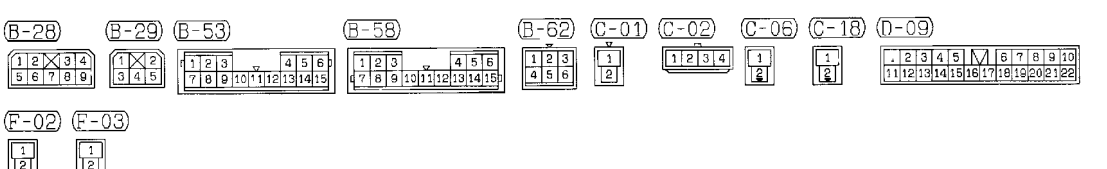
TROUBLESHOOTING

110003659

CIRCUIT DIAGRAM <1993 MODELS>



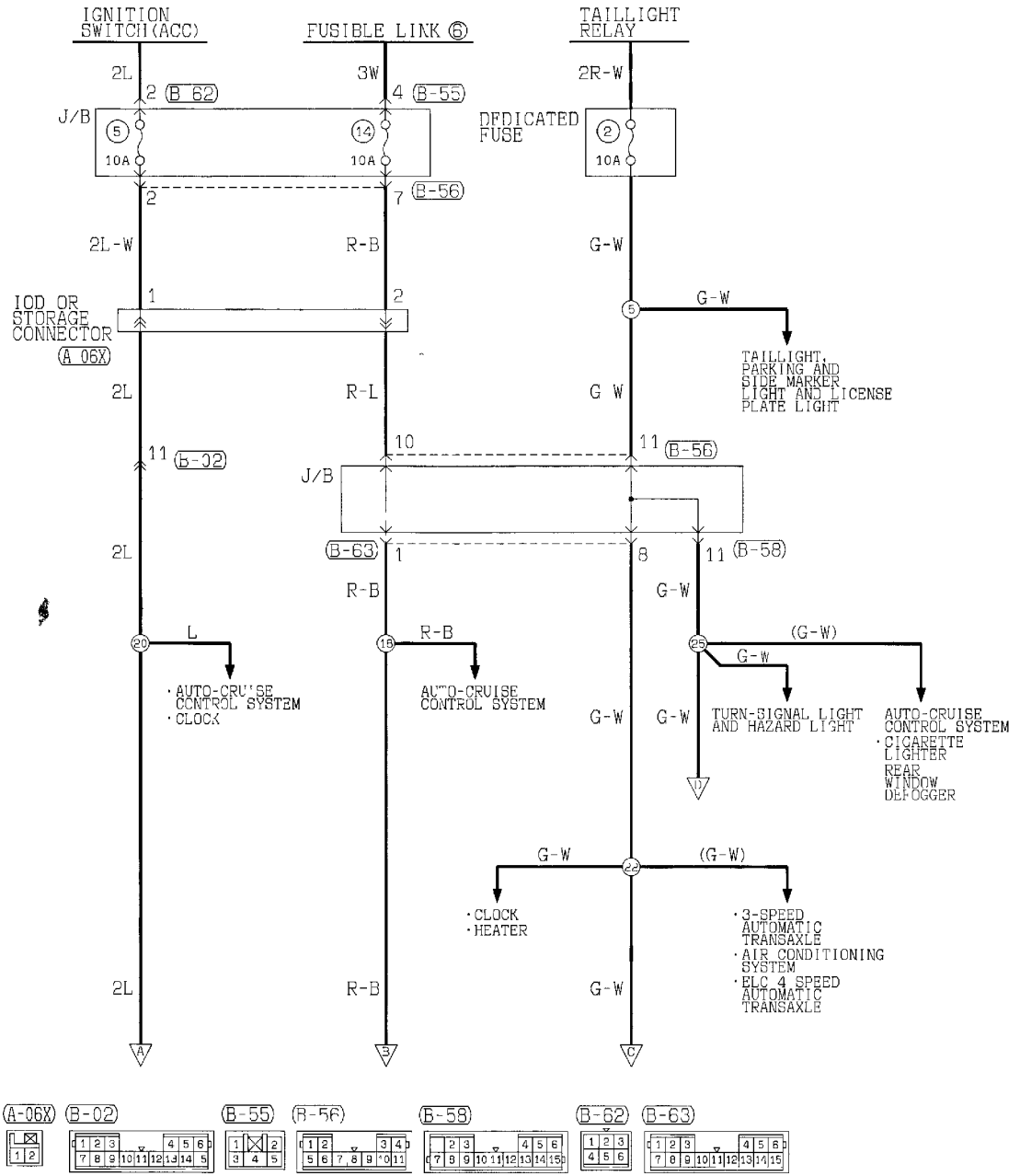


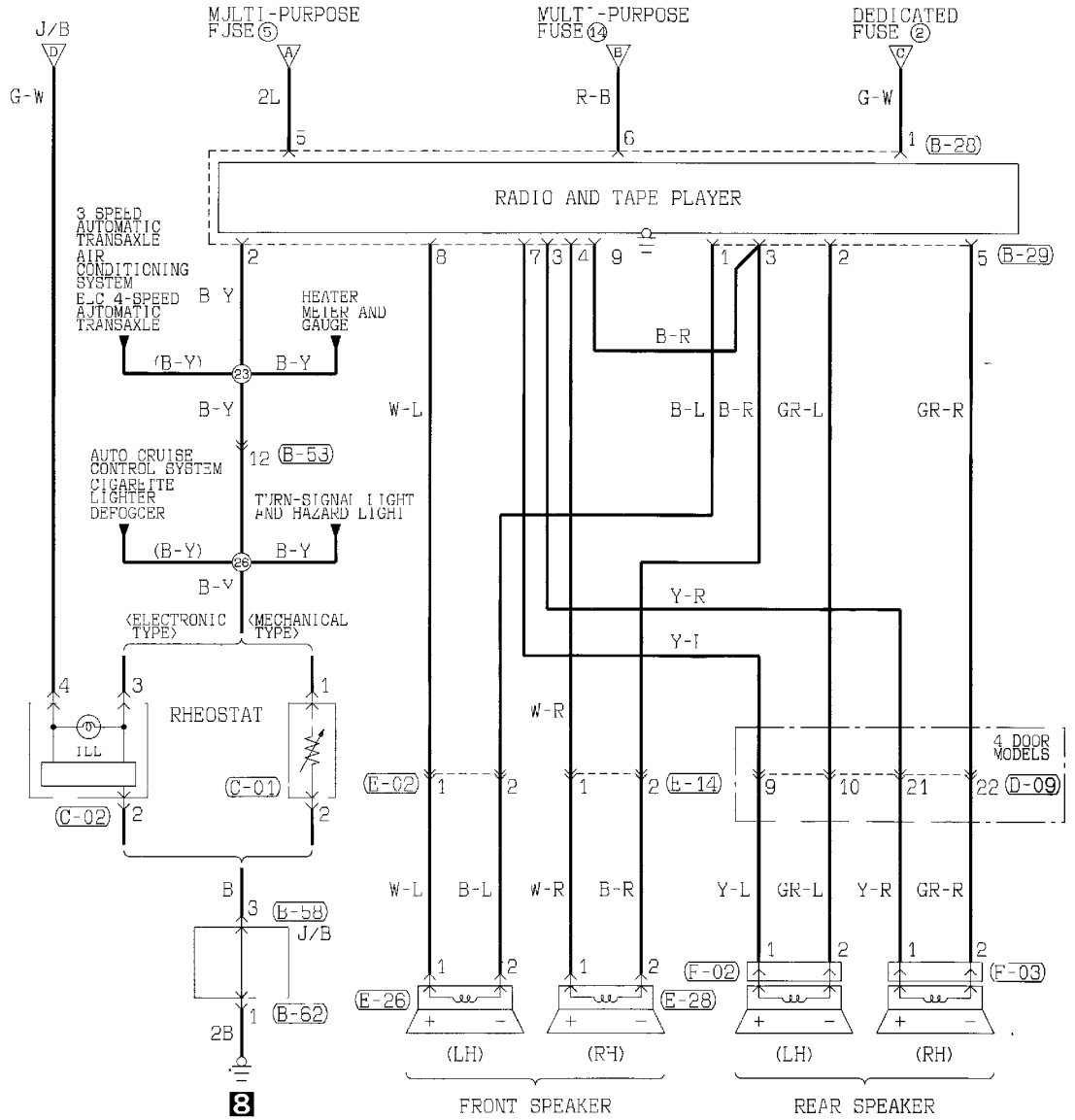


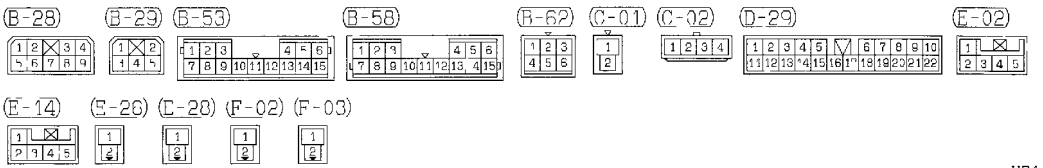
HE14M02AB

TSB Revision

CIRCUIT DIAGRAM <1994 MODELS>



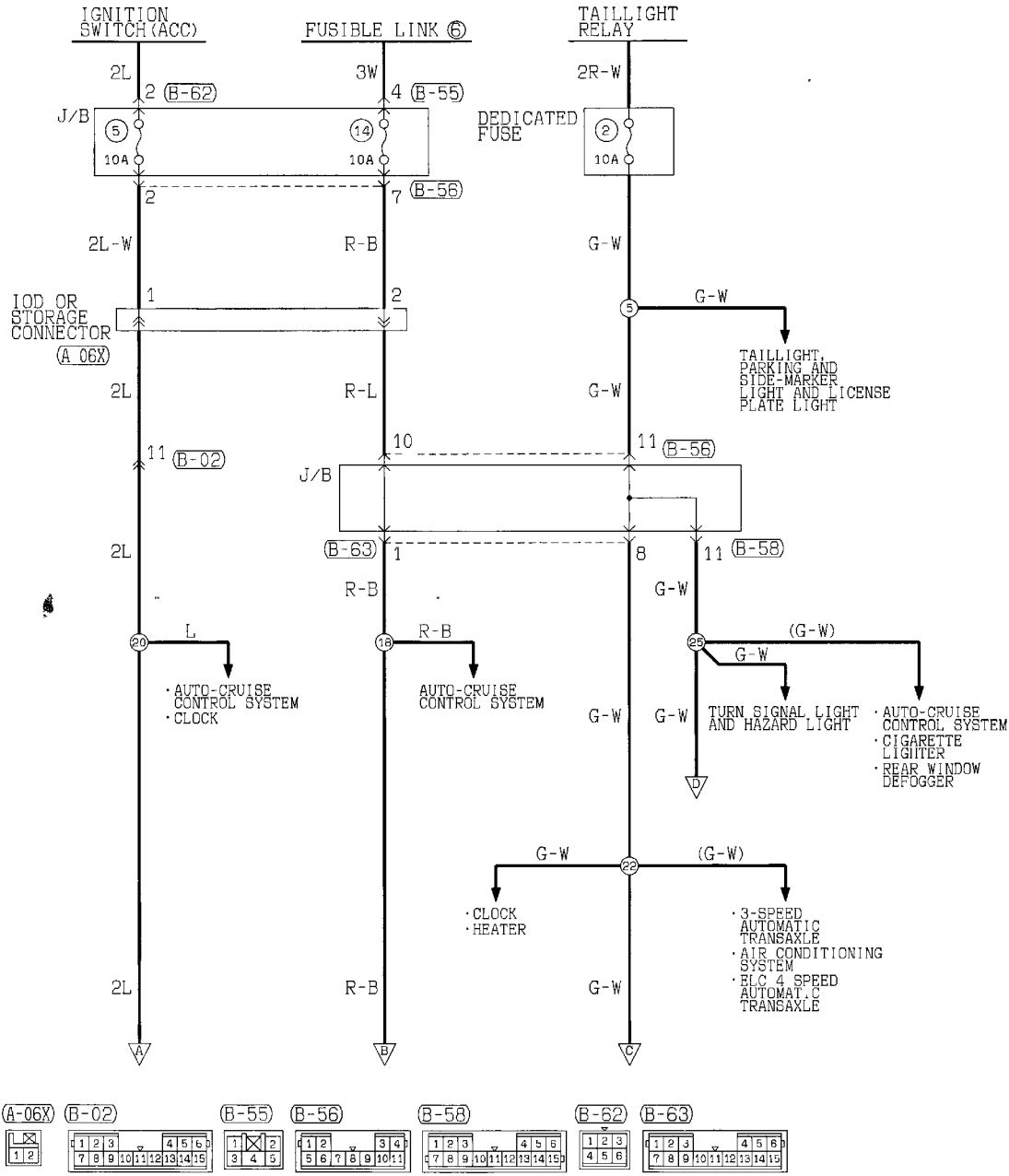


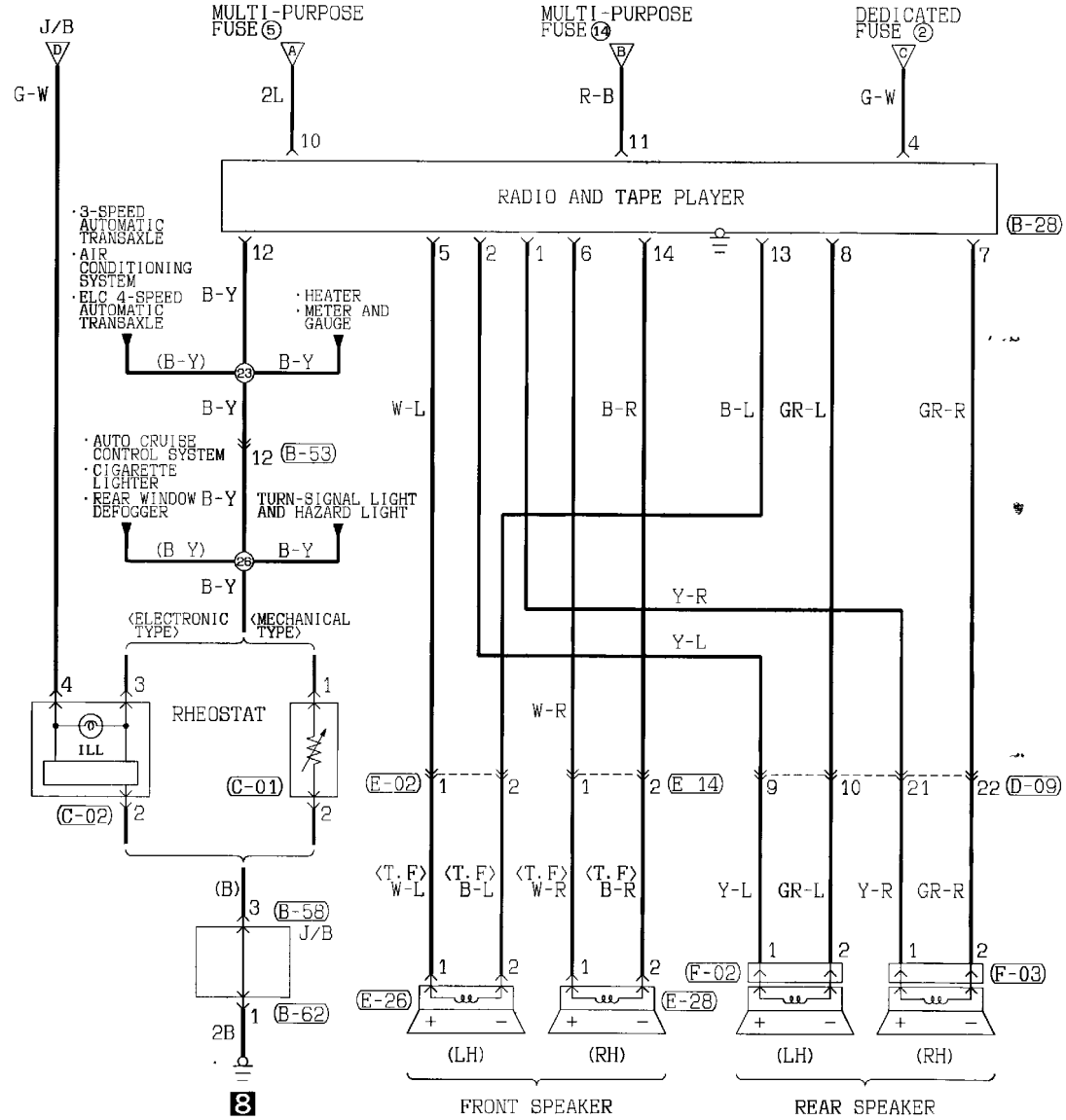


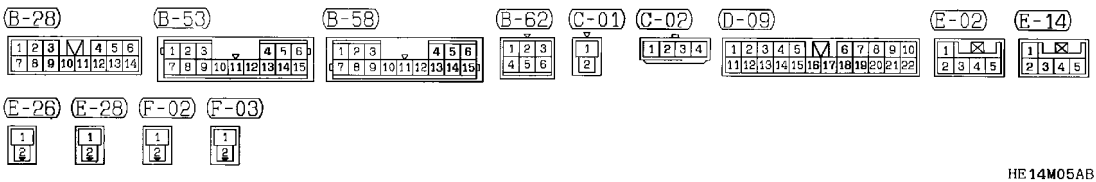
HE14M03AB

TSB Revision

CIRCUIT DIAGRAM <FROM 1995 MODELS>







HE14M05AB

TSB Revision

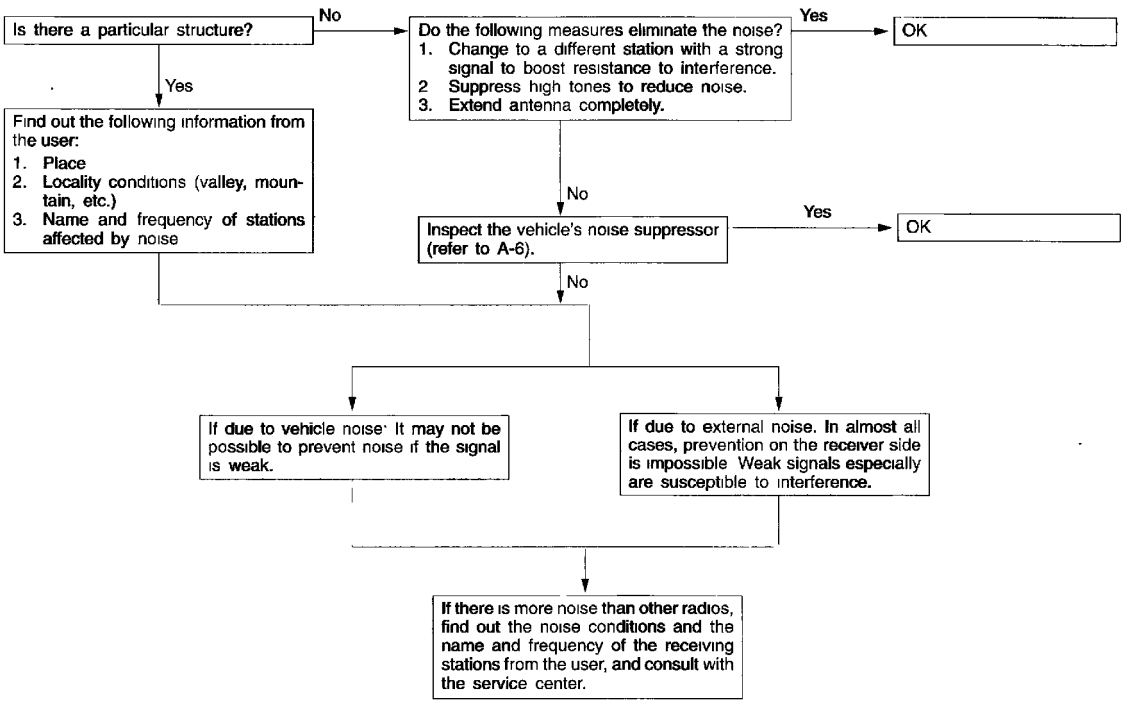
TROUBLESHOOTING CHART

Item	Problem symptom	Relevant chart
A. Noise	1. Noise appears at certain places when traveling (AM).	A-1
	2. Noise appears at certain places when traveling (FM).	A-2
	3. Mixed with noise, only at night (AM).	A-3
	4. Broadcasts can be heard but both AM and FM have a lot of noise.	A-4
	5. There is more noise either on AM or on FM.	A-5
	6. There is noise when starting the engine.	A-6
	7. Some noise appears when there is vibration or shocks during traveling.	A-7
	8. Noise sometimes appears on FM during traveling.	A-8
	9. Ever-present noise.	A-9
B. Radio	1. No sound.	B-1
	2. No sound from one speaker.	B-2
	3. There is noise but no reception for both AM and FM.	B-3
	4. No sound from AM, or no sound from FM.	B-4
	5. Insufficient sensitivity.	B-5
	6. Distortion on AM or on both AM and FM.	B-6
	7. Distortion on FM only.	B-7
	8. Too few automatic select stations.	B-8
	9. Insufficient memory (preset stations are erased).	B-9
C. Cassette player	1. Cassette tape will not insert.	C-1
	2. No sound.	C-2
	3. No sound from one speaker.	C-3
	4. Sound quality is poor, or sound is weak.	C-4
	5. Cassette tape will not eject.	C-5
	6. Uneven revolution. Tape speed is fast or slow.	C-6
	7. Automatic search does not work (only for models with automatic search function).	C-7
	8. Faulty auto reverse.	C-8
	9. Tape gets caught in mechanism.	C-9

CHART

A. NOISE

A-1 Noise appears at certain places when traveling (AM).



A–2 Noise appears at certain places when traveling (FM).

Do the following measures eliminate the noise?
- Change to a different station with a strong signal to boost resistance to interference.
- Suppress high tones to reduce noise.
- Extend antenna completely.

Yes → OK

No

On radios with an FM stereo switch, is noise still present when switched to monaural?

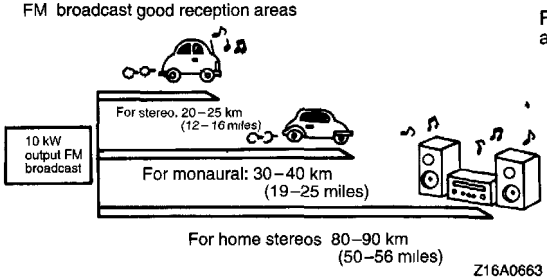
No → OK

Yes

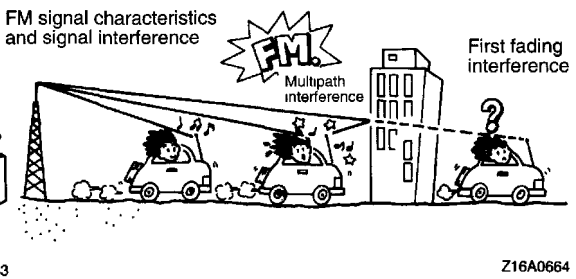
If there is more noise than other radios, find out the noise conditions and the name and frequency of the receiving stations from the user, and consult with the service center.

NOTE
- About FM waves:
  FM waves have the same properties as light, and can be deflected and blocked. Wave reception is not possible in the shadow of obstructions such as buildings or mountains.

1. The signal becomes weak as the distance from the station's transmission antenna increases. Although this may vary according to the signal strength of the transmitting station and intervening geographical formations or buildings, the area of good reception is approx. 20–25 km (12-16 miles) for stereo reception, and 30–40 km (19-25 miles) for monaural reception.
2. The signal becomes weak when an area of shadow from the transmitting antenna (places where there are obstructions such as mountains or buildings between the antenna and the car), and noise will appear. < This is called first fading, and gives a steady buzzing noise>.
3. If a direct signal hits the antenna at the same time as a signal reflected by obstructions such as mountains or buildings, interference of the two signals will generate noise. During traveling, noise will appear each time the vehicle's antenna passes through this kind of obstructed area. The strength and interval of the noise varies according to the signal strength and the conditions of deflection. <This is called multipath noise, and is a repetitious buzzing>.
4. Since FM stereo transmission and reception has a weaker field than monaural, it is often accompanied by a hissing noise.
5. Ordinary vehicles are more susceptible to these types of interference than vehicles equipped with an FM diversity antenna system. If the problem vehicle is identical to a vehicle (radio) of the same type, the variation may be due to different antenna systems. FM diversity antenna system: Two types of antennas (whip or motor antenna and glass antenna) are used. This system allows selection of the antenna that gives the best reception.



Z16A0663

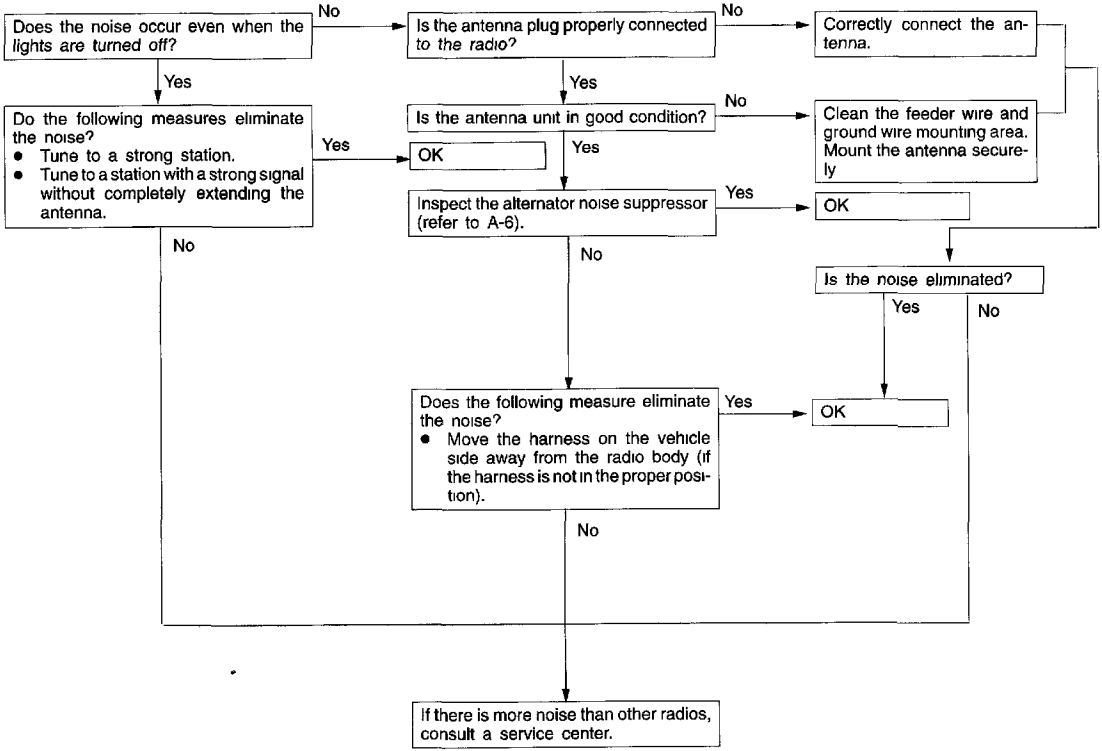


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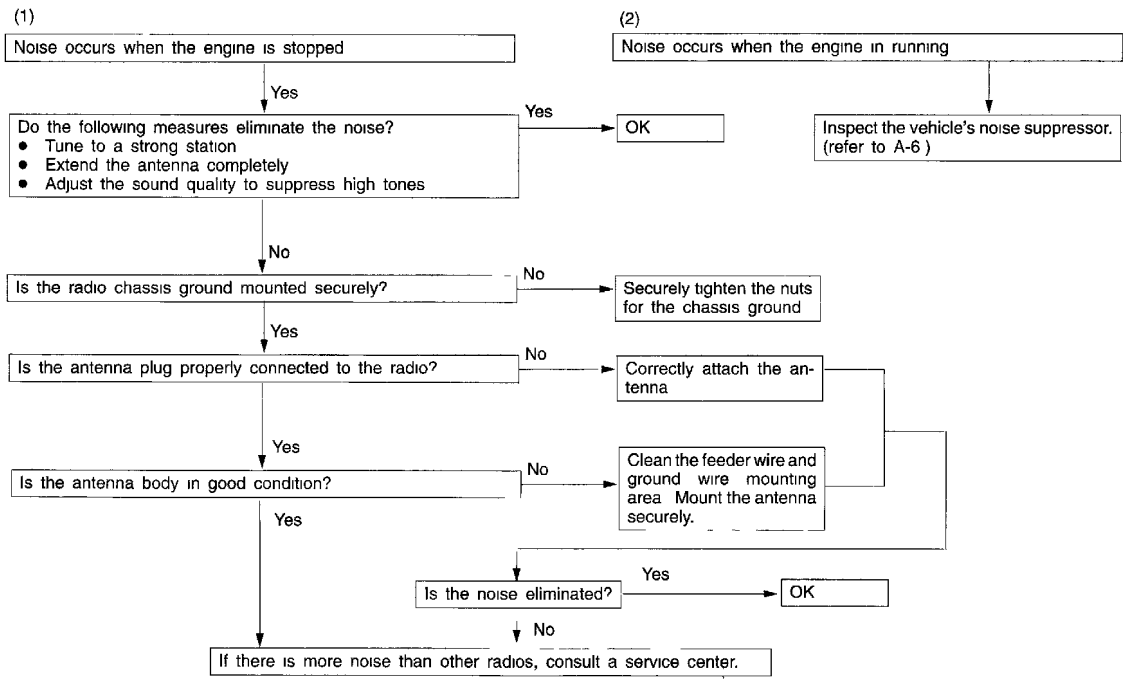
A-3 Mixed with noise, only at night (AM).

The following factors can be considered as possible causes of noise appearing at night.

1. Factors due to signal conditions: Due to the fact that long-distance signals are more easily received at night, even stations that are received without problem during the day may experience interference in a general worsening of reception conditions. The weaker a station is the more susceptible it is to interference, and a change to a different station or the appearance of a beating sound* may occur.
   * Beat sound: Two signals close in frequency interfere with each other, creating a repetitious high-pitched sound. This sound is generated not only by sound signals but by electrical waves as well.
2. Factors due to vehicle noise: Alternator noise may be a cause.

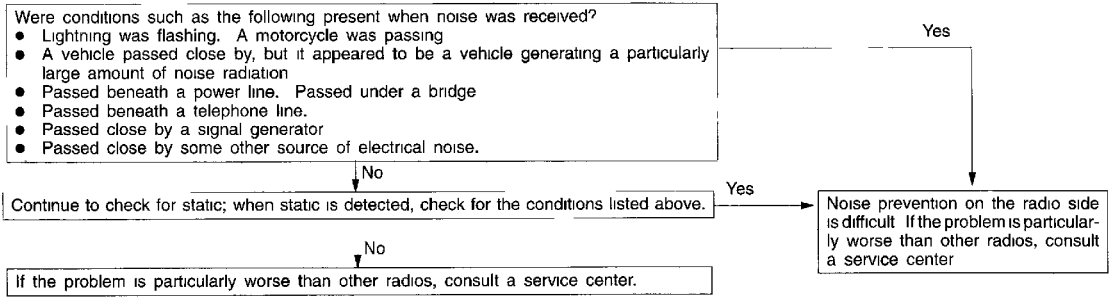


A-4 Broadcasts can be heard but both AM and FM have a lot of noise.



A-5 There is more noise either on AM or on FM.

1. There is much noise only on AM
Due to differences in AM and FM systems, AM is more susceptible to noise interference.



2. There is much noise only on FM

a) Due to differences in FM and AM systems, FM is not as susceptible as AM to interference from engines, power lines, lightning, etc. On the other hand, there are cases due to the characteristics of FM waves of noise or distortion generated by typical noise interference (first fading and multipath). (Refer to A-2) <Noise (hissing) occurs in weak signal areas such as mountainous regions, but this is not due to a problem with the radio.>

b) Ordinary vehicles are more susceptible to these types of interference than vehicles equipped with an FM diversity antenna system. If the problem vehicle is identical to a vehicle (radio) of the same type, the variation may be due to different antenna systems.

A-6 There is noise when starting the engine.

Noise type Sounds are in parentheses ( ).	Conditions	Cause	Response
AM, FM: Ignition noise (Popping Snapping Cracking Buzzing)	• Increasing the engine speed causing the popping sound to speed up, and volume decreases. • Disappears when the ignition switch is turned to ACC.	• Mainly due to the spark plugs. • Due to the engine noise.	• Noise filter • Noise condense • Ground cable
AM, FM: Alternator noise (AM, FM) (Swishing)	• Noise becomes higher as engine speed increase, and in many cases is not present at idle speed.	• Due to ripples* contained in the voltage produced by the alternator. • The amount of fluctuation in voltage during full wave rectification of the three phase A.C. current of the alternator is called a ripple.	• Noise condenser
AM, FM: wiper motor noise (Low-pitched buzzing Electrical buzzing)	• Appears with wiper operation and increases with wiper speed. Disappears when the wipers are stopped.	• Due to the wiper brushes.	• Noise filter
Other electrical components	–	Noise may appear as electrical components become older.	Repair or replace
Static electricity (Crackling Crinkling)	• Disappears when the vehicle is completely stopped. • Severe when the clutch is engaged.	Occurs when parts or wiring move for some reason and contact metal parts of the body.	Return parts or wiring to their proper position.
	• Various noises are produced depending on the body part of the vehicle.	Due to detachment from the body of the front hood, bumpers, exhaust pipe and muffler, suspension, etc.	Ground parts by bonding. Cases where the problem is not eliminated by a single response to one area are common, due to several body parts being imperfectly grounded.

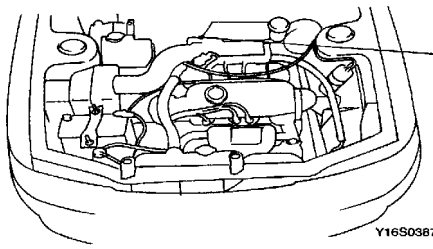
Caution

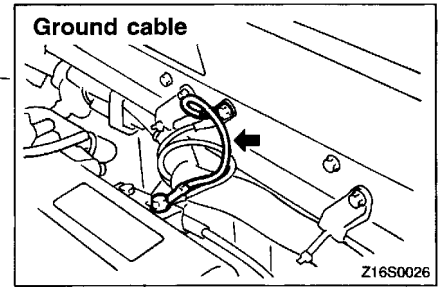
1. **Connecting a high tension cable to the noise filter may destroy the noise filter and should never be done.**
2. **Check that there is no external noise. Since failure due this may result in misdiagnosis due to inability to identify the noise source, this operation must be performed.**
3. **Noise prevention should be performed by suppressing strong sources of noise step by step.**

NOTE

1. Condenser
   The condenser does not pass D.C. current, but as the number of waves increases when it passes A.C. current, impedance (resistance against A.C.) decreases, and current flow is facilitated. A noise suppressing condenser which takes advantage of this property is inserted between the power line for the noise source and the ground. This suppresses noise by grounding the noise component (A.C. or pulse signal) to the body of the vehicle.
2. Coil
   The coil passes D.C. current, but impedance rises as the number of waves increases relative to the A.C. current. A noise suppressing coil which takes advantage of this property is inserted into the power line for the noise source, and works by preventing the noise component from flowing or radiating out of the line.

NOISE SUPPRESSOR MOUNTING LOCATION





A–7 Some noise appears when there is vibration or shocks during traveling.

Are connectors properly connected?
- No → Ensure proper connection
- Yes ↓

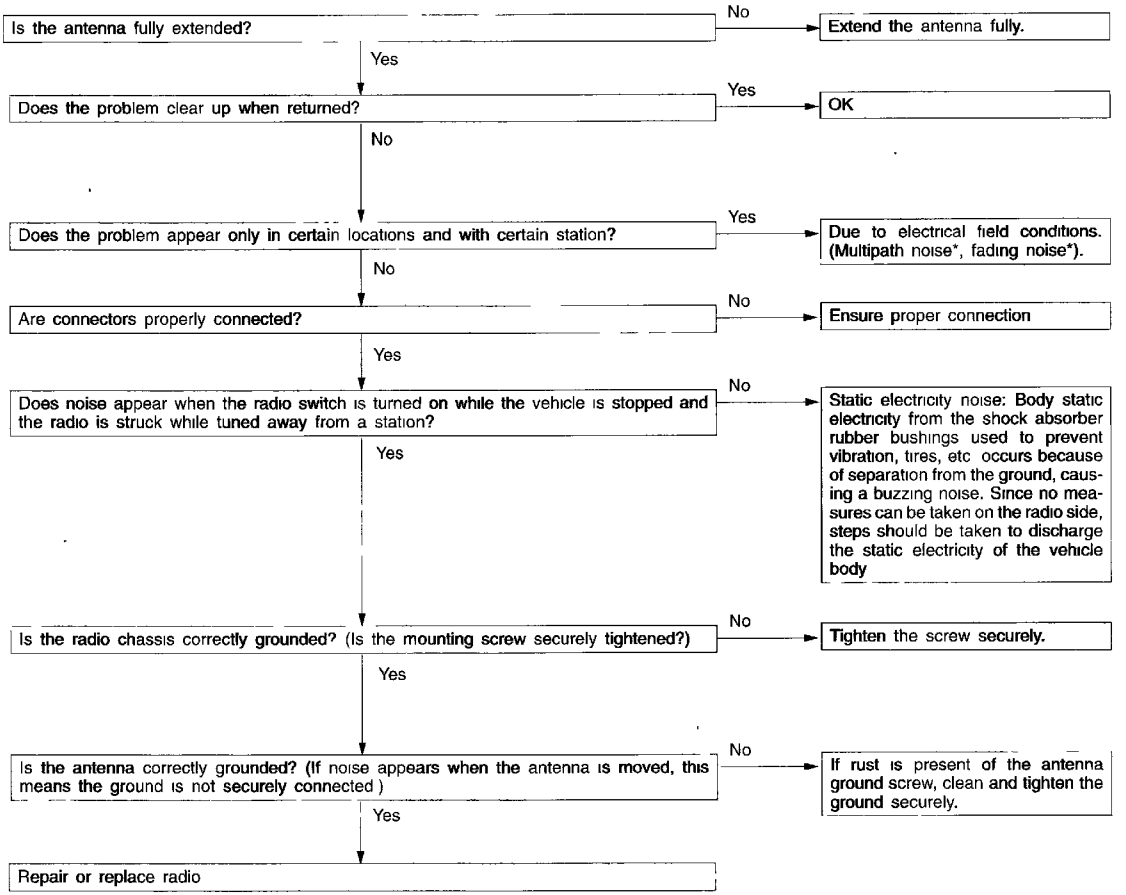
Does noise appear when the radio switch is turned on while the vehicle is stopped and the radio is struck while tuned away from a station?
- No → Static electricity noise Body static electricity from the shock absorber rubber bushings used to prevent vibration, tires, etc. occurs because of separation from the ground, causing a buzzing noise Since no measures can be taken on the radio side, steps should be taken to discharge the static electricity of the vehicle body
- Yes ↓

Is the radio correctly grounded? (Is the mounting screw securely tightened?)
- No → Tighten the screw securely.
- Yes ↓

Is the antenna correctly grounded? (If noise appears when the antenna is moved, this means the ground is not securely connected.)
- No → If rust is present of the antenna ground screw, clean and tighten the ground securely.
- Yes ↓

Repair or replace radio.

A-8 Noise sometimes appears on FM during traveling.



* About multipath noise and fading noise
Because the frequency of FM waves is extremely high, it is highly susceptible to effects from geological formations and buildings. These effects disrupt the broadcast signal and obstruct reception in several ways.

- Multipath noise
  This describes the echo that occurs when the broadcast signal is reflected by a large obstruction and enters the receiver with a slight time delay relative to the direct signal. (repetitious buzzing)
- Fading noise
  This is a buzzing noise that occurs when the broadcast beam is disrupted by obstructing objects and the signal strength fluctuates intricately within a narrow range.

A-9 Noise.

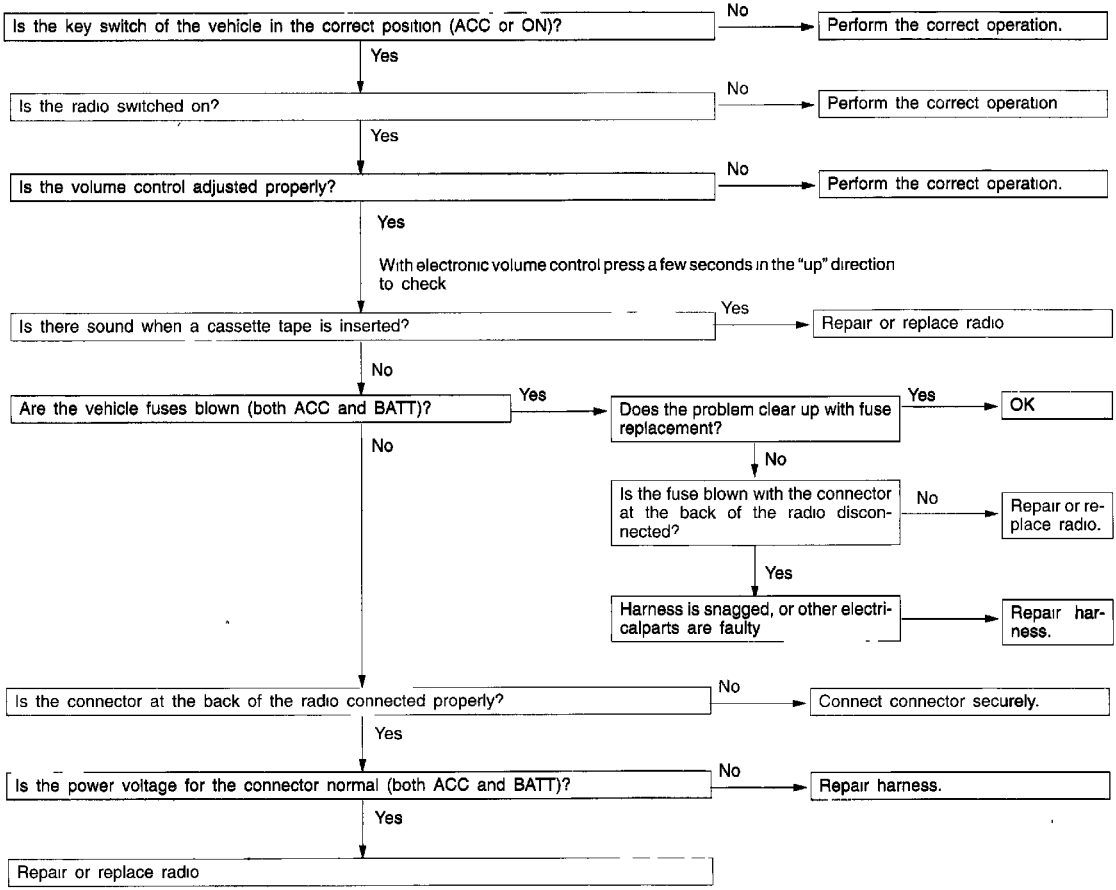
Noise is often created by the following factors, and often the radio is OK when it is checked individually.

- Traveling conditions of the vehicle
- Terrain of area traveled through
- Surrounding buildings
- Signal conditions
- Time period

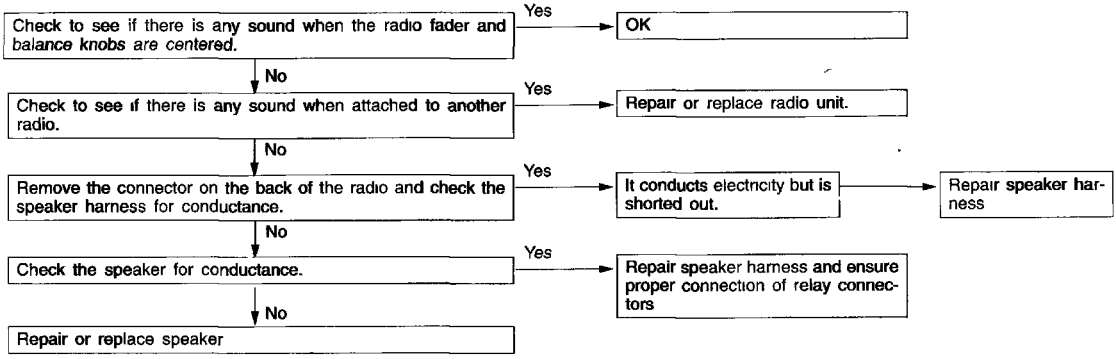
For this reason, if there are still problems with noise even after the measures described in steps A-1 to A-8 have been taken, get information on the factors listed at left as well as determining whether the problem occurs with AM or FM, the station names, frequencies, etc., and contact a service center.

B. RADIO

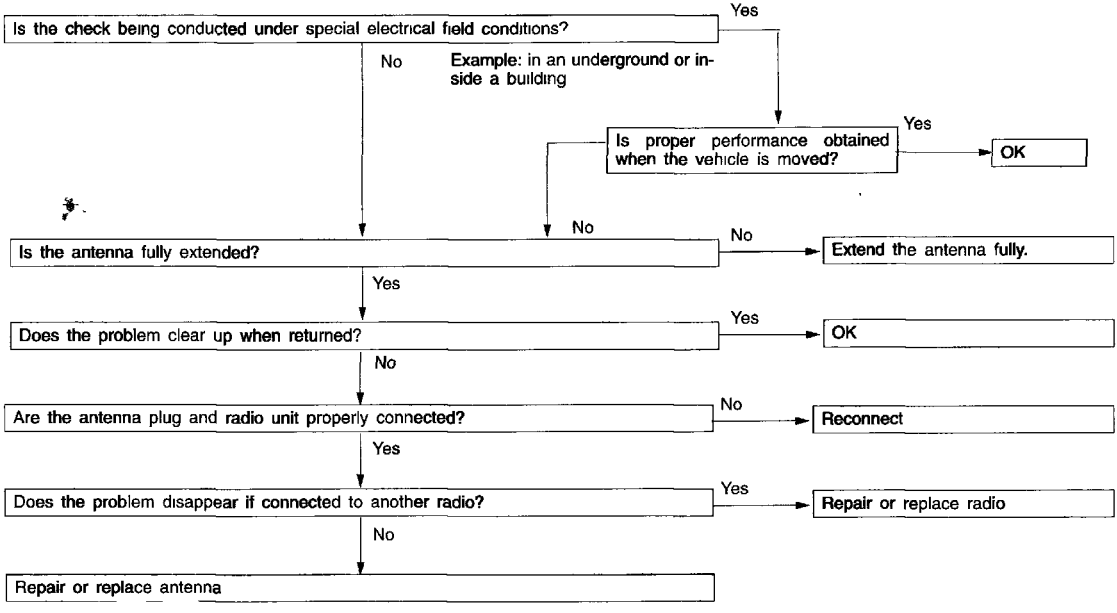
B–1 No sound.



B–2 No sound from one speaker.



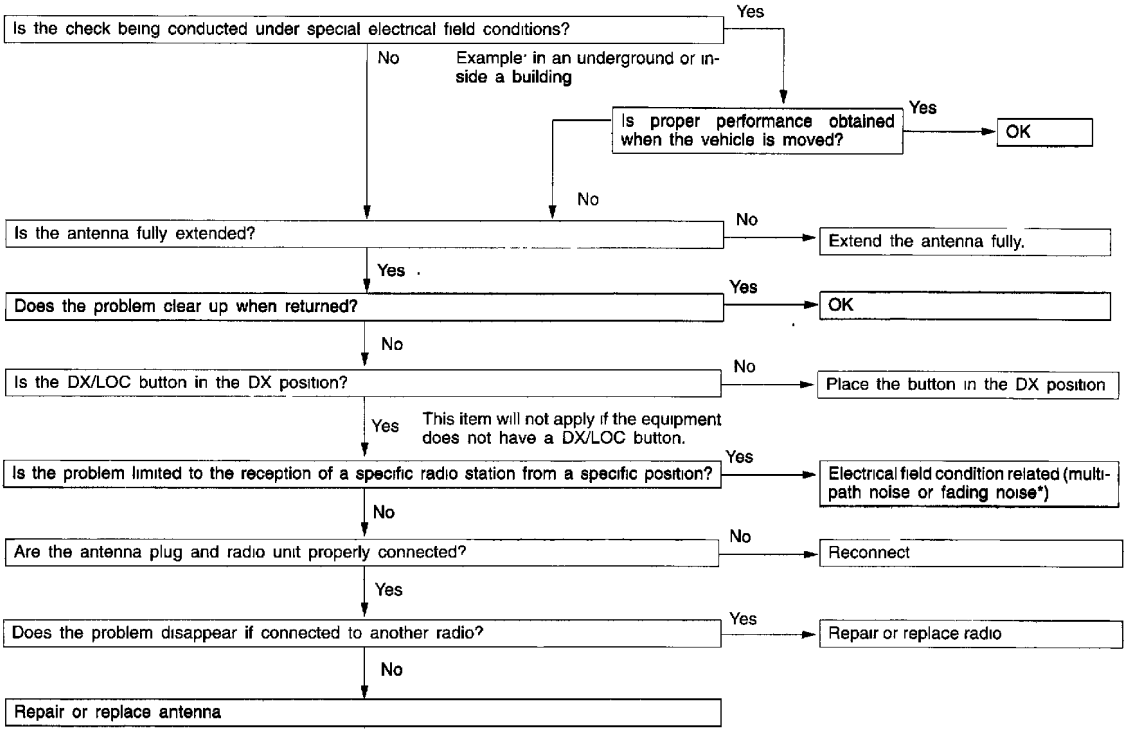
B–3 *There is noise but no reception for both AM and FM.*



B–4 No sound from AM, or no sound from FM.

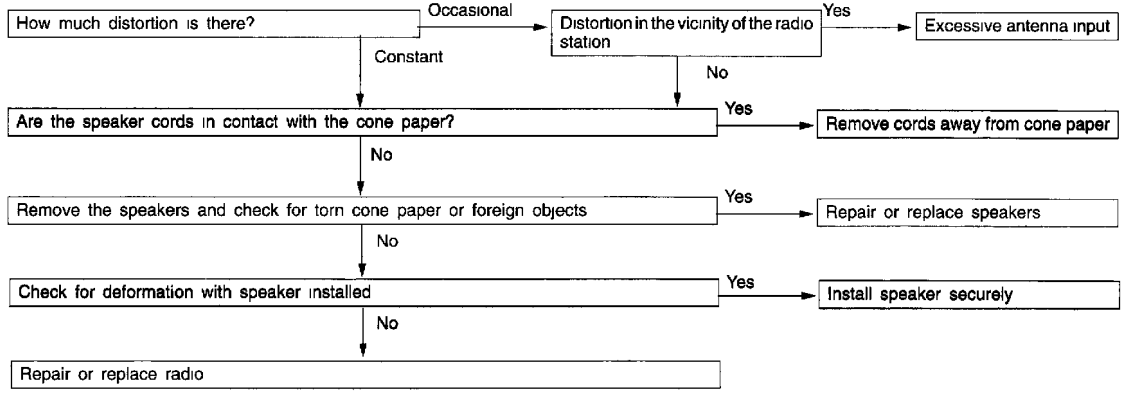
Refer to B-3.

B-5 Insufficient sensitivity

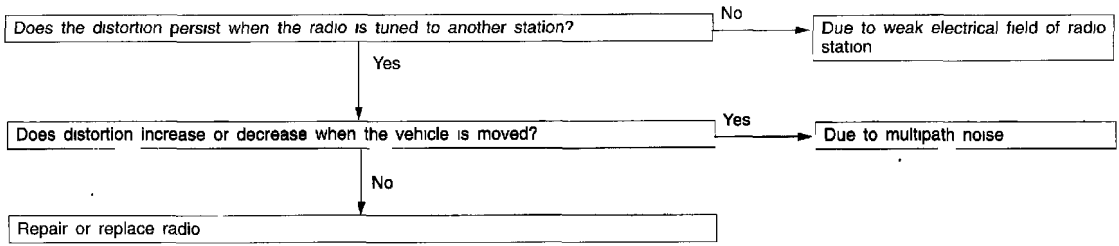


* For multipath noise and fading noise problems, refer to page 54-76.

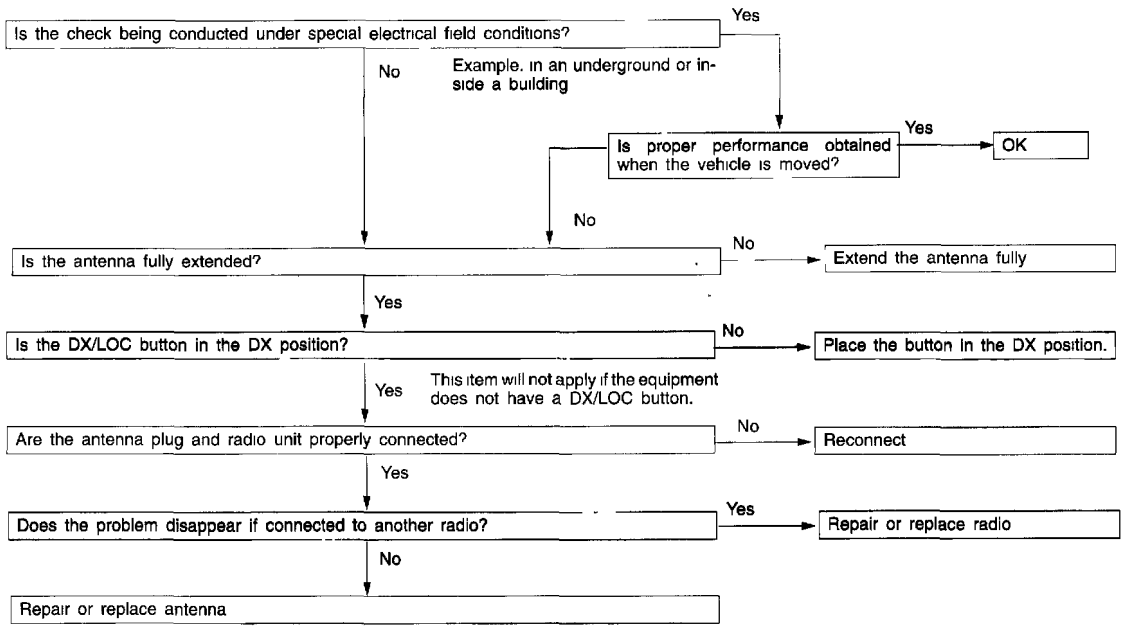
B-6 Distortion on AM or on both AM and FM



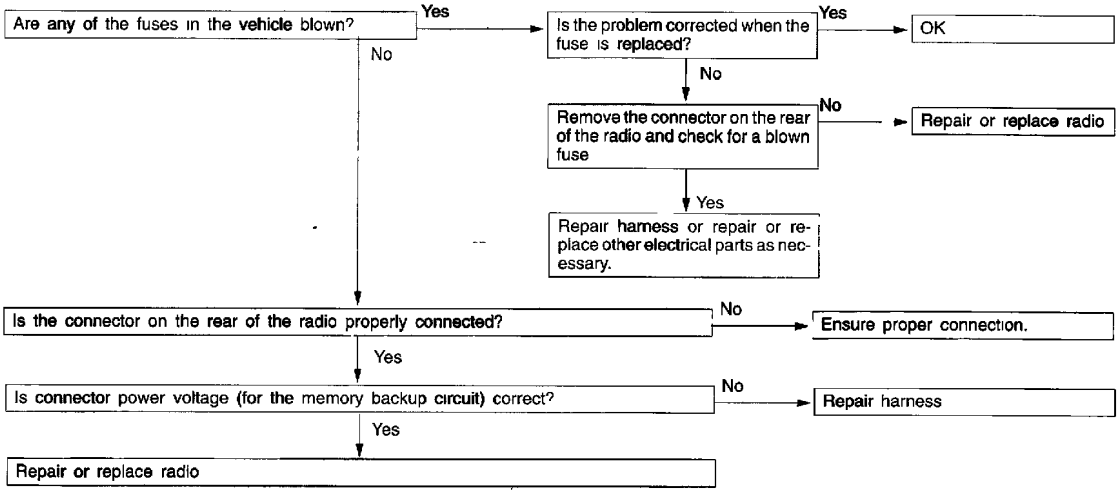
B-7 Distortion on FM only



B-8 Too few automatic select stations.

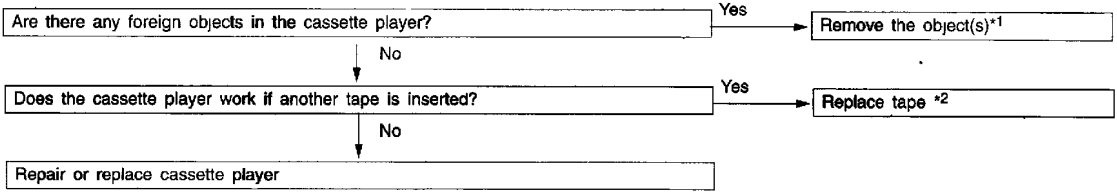


B-9 Insufficient memory (preset stations are erased)



C. CASSETTE PLAYER

C-1 Cassette tape will not insert.



NOTE

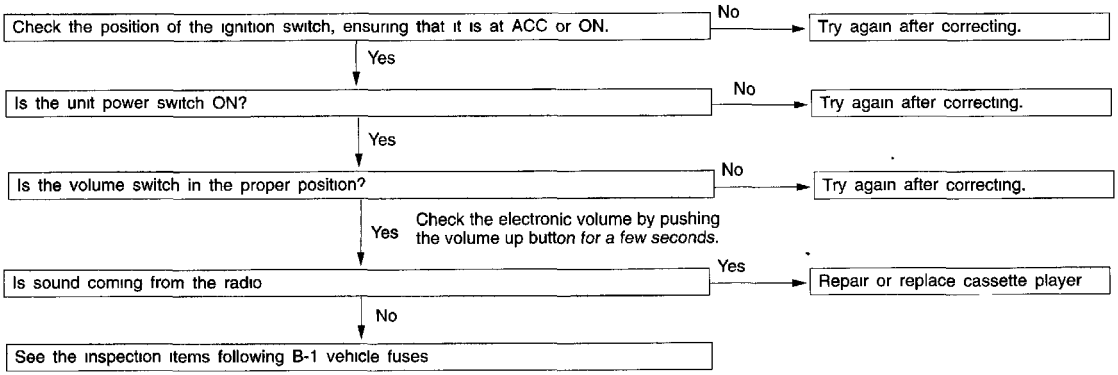
*1

Attempting to force a foreign object (e.g., a coin or clip, etc.) out of the cassette player may damage the mechanism. The player should be taken to a service dealer for repair.

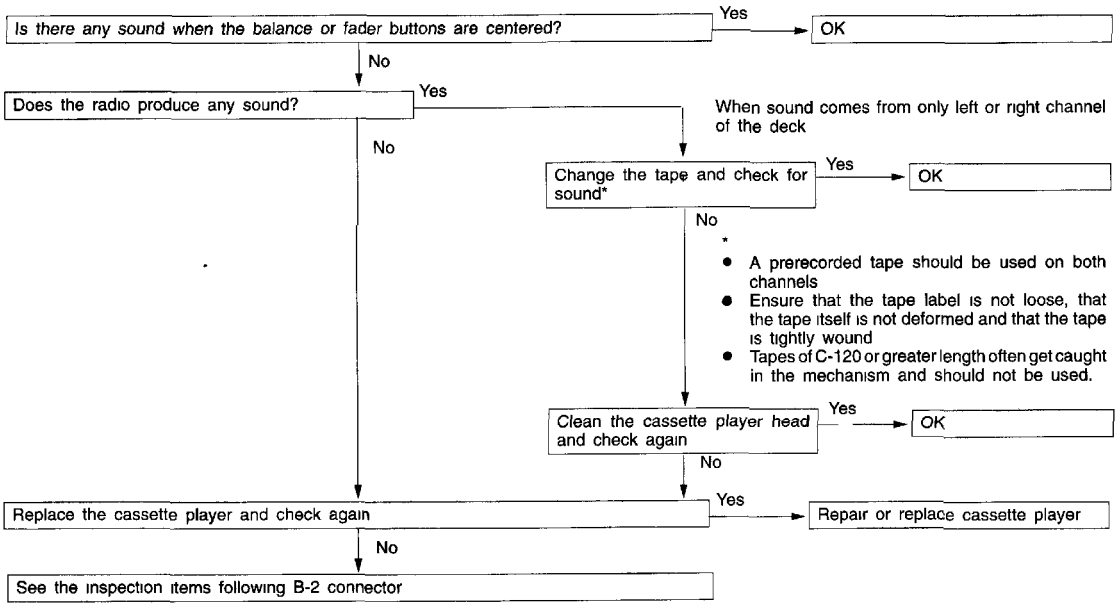
*2

Ensure that the tape label is not loose, that the tape itself is not deformed and that the tape is tightly wound. Also, tapes of C-120 or greater length often get caught in the mechanism and should not be used.

C–2 No sound (even after a tape has been inserted)



C-3 No sound from one speaker



C-4 Sound quality is poor, or sound is weak.

Does the player play properly when another tape* is inserted?
- Yes → OK
- No

*
- Ensure that the tape label is not loose, that the tape itself is not deformed and that the tape is tightly wound.
- Tapes of C-120 or greater length often get caught in the mechanism and should not be used.

Does the player play properly when the tape player head is cleaned?
- Yes → OK
- No

Is proper operation obtained when the cassette player is replaced?
- Yes → Repair or replace cassette player
- No

Repair or replace speaker

C-5 Cassette tape will not eject

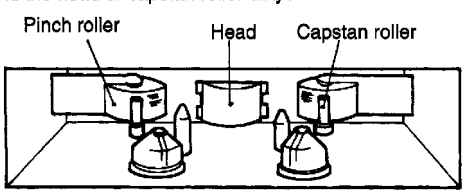
The problems covered here are all the result of the use of a bad tape (deformed or not properly tightened) or of a malfunction of the cassette player itself. Malfunctions involving the tape becoming caught in the mechanism and ruining the case are also possible, and attempting to force the tape out of the player can cause damage to the mechanism. The player should be taken to a service dealer for repair.

C-6 Uneven revolution. Tape speed is fast or slow.

Does the player play OK if the tape is changed?
- Yes → OK
- No

Are there any foreign objects inside the cassette player?
- Yes → Remove foreign object(s)
- No

Is the head or capstan roller dirty?



- Yes → Clean
- No

Cassette player

C–7 Automatic search does not work (only for models with the automatic search function).

Does the MSS (automatic search) button depress properly?
- No → Button improperly operated
- Yes ↓

Does the player play OK if the tape* is changed?
- Yes → Tape used is bad
- No ↓

*
- When the time between songs on a tape is less than three seconds, or when there is a three second period in the middle of a song in which the volume level is extremely low, the automatic search function may not work properly.
- Ensure that the tape label is not loose, that the tape itself is not deformed and that the tape is tightly wound. Also, tapes of C-120 or greater length often get caught in the mechanism and should not be used.

Malfunction of the cassette player unit

C-8 Faulty auto reverse.

Does the player play OK if the tape* is changed?
- Yes → OK
- No ↓

*
- Ensure that the tape label is not loose, that the tape itself is not deformed and that the tape is tightly wound.
- Tapes of C-120 or greater length often get caught in the mechanism and should not be used.

Does the problem only occur while the vehicle is being driven?
- No → Repair or replace cassette player
- Yes ↓

Is the cassette player properly installed to the vehicle?
- No → Ensure cassette player installation
- Yes ↓

Repair or replace cassette player

C–9 Tape gets caught in mechanism*1

*1
When the tape is caught in the mechanism, the case may not eject. When this occurs, do not try to force the tape out as this may damage the tape player mechanism. Take the cassette to a service dealer for repair.

Does the player play OK if the tape*2 is changed?
- No → Tape used is bad
- No ↓

*2
Ensure that the tape label is not loose, that the tape itself is not deformed and that the tape is tightly wound. Also, tapes of C-120 or greater length often get caught in the mechanism and should not be used.

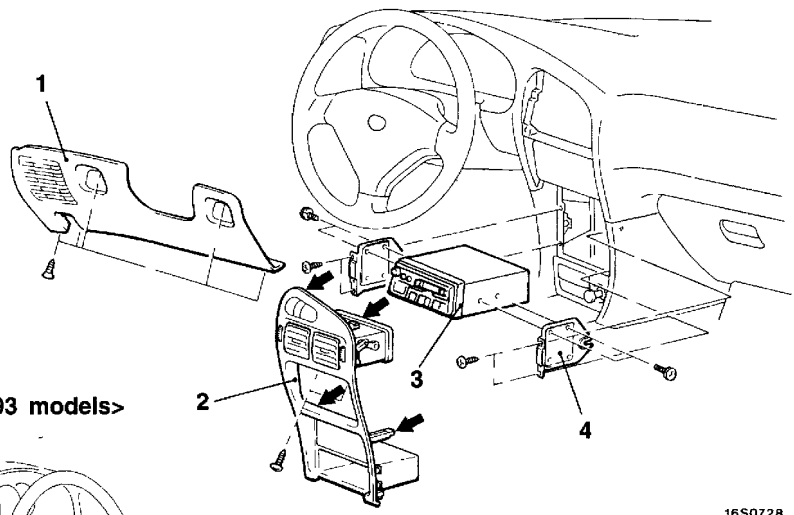
Cassette player unit is bad

RADIO AND TAPE PLAYER

REMOVAL AND INSTALLATION

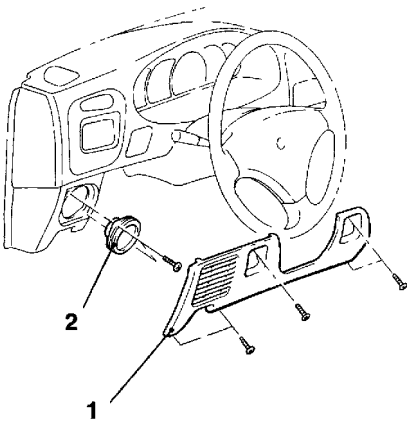
110003660

<Radio and tape player>

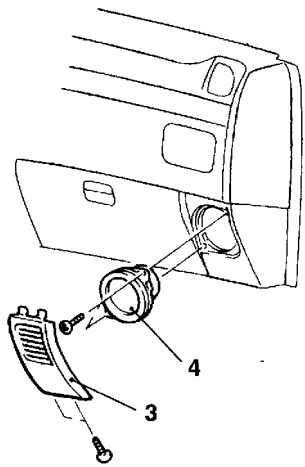


16S0728

<Front speaker, 1993 models>



16S0528



16S0290

00001567

Radio and tape player removal steps

1. Knee protector
2. Air outlet center panel assembly (Refer to P.54-38)
3. Radio and tape player
4. Bracket

Front speaker (driver's side) removal steps <1993 models>

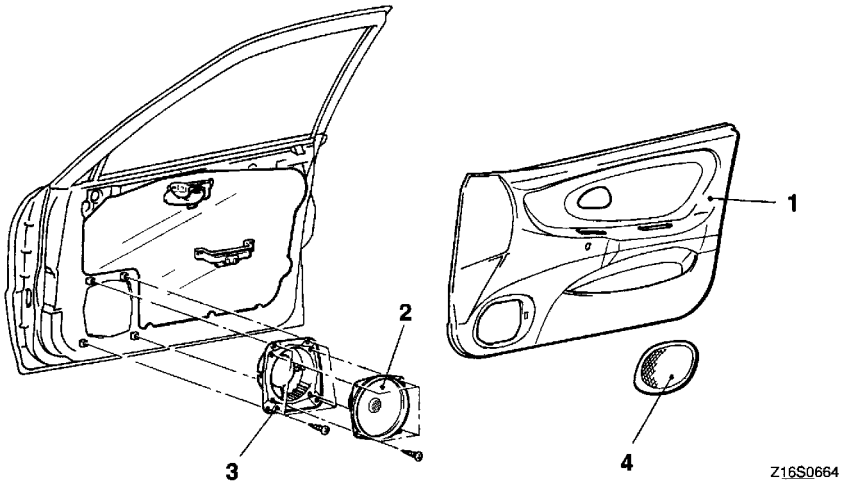
1. Knee protector
2. Front speaker

Front speaker (passenger's side) removal steps <1993 models>

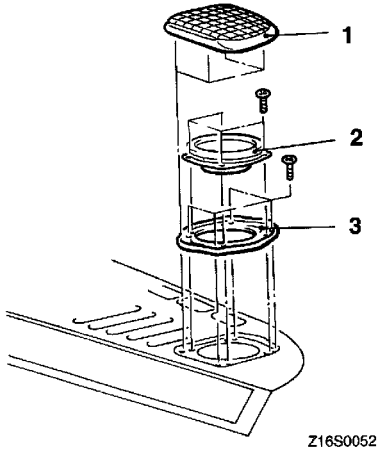
3. Corner panel
4. Front speaker

TSB Revision

<Front speaker, From 1994 models>



<Rear speaker>



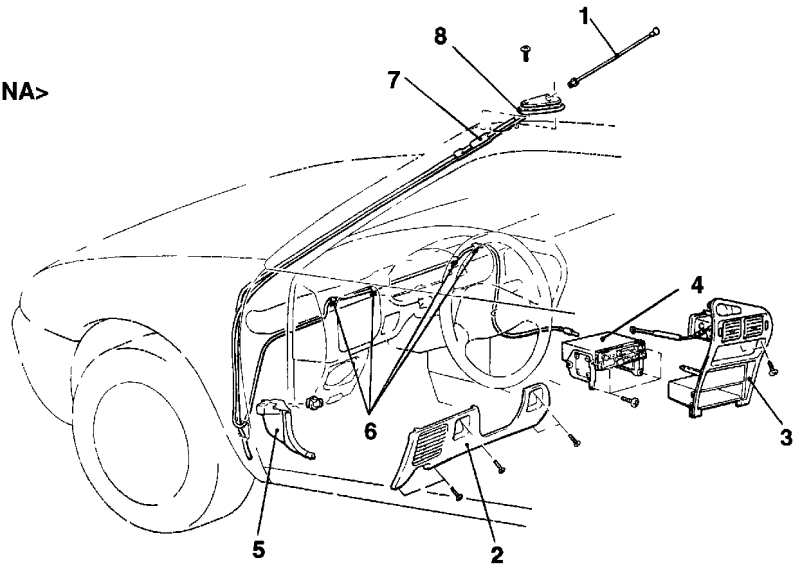
Front speaker removal steps
<From 1994 Models>

▶A◀ 1. Door trim (Refer to GROUP 42 – Door Trim and Waterproof Film.)
2. Front speaker
3. Speaker cover
4. Front speaker garnish <2-door models>

Rear speaker removal steps

1. Rear speaker garnish
▶A◀ 2. Rear speaker
3. Speaker bracket

<ANTENNA>

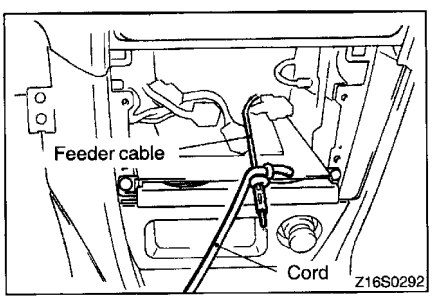


A16S0736

Removal steps

1. Pole
2. Knee protector
3. Air outlet center panel assembly (Refer to P.54-38.)
4. Radio and tape player
5. Cowl side trim (driver's side)
6. Clip
7. Antenna base
8. Base

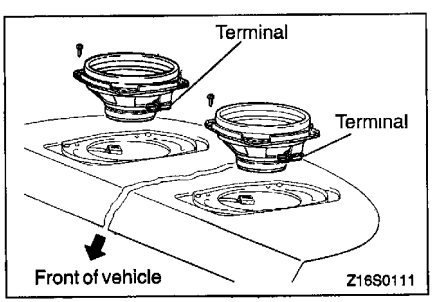
◀A▶



REMOVAL SERVICE POINT

◀A▶ ANTENNA ASSEMBLY REMOVAL

To make wiring easier when installing, tie a cord to the feeder cable terminal, and then pull out the feeder cable to the antenna side.



INSTALLATION SERVICE POINT

▶A◀ SPEAKER INSTALLATION

(1) Install the front speaker on the driver's side with the terminal directed forward and that on the passenger's side with the terminal rearward (Vehicles from 1994 model).
(2) Install both right rear and left rear speakers with their terminals directed towards driver's side.

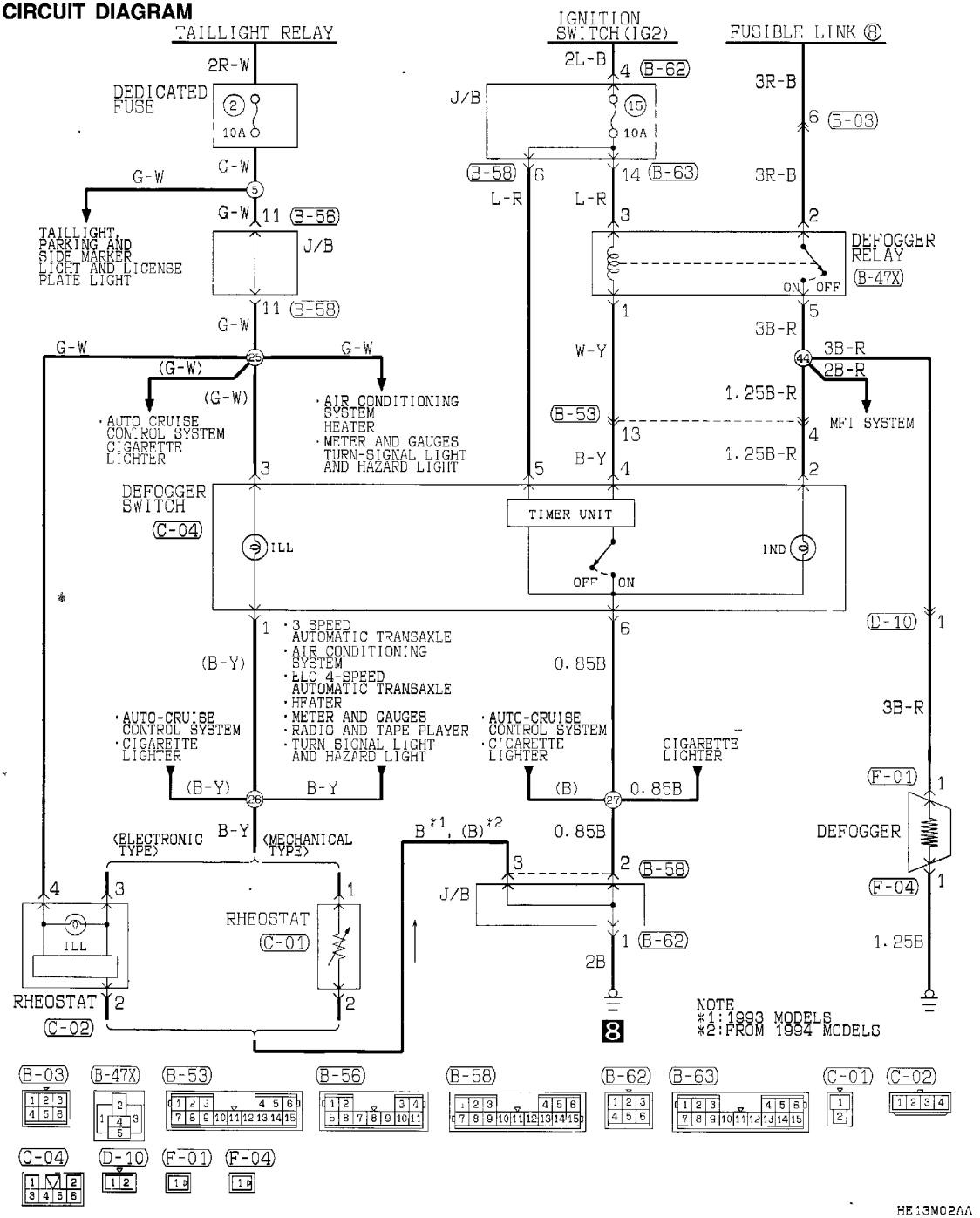
TSB Revision

REAR WINDOW DEFOGGER

TROUBLESHOOTING

110003661

CIRCUIT DIAGRAM

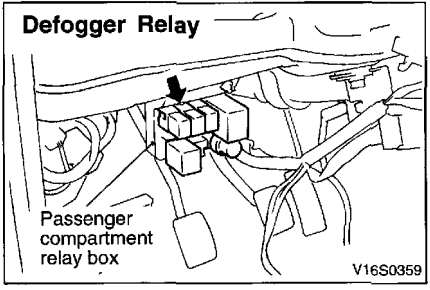


TSB Revision

OPERATION

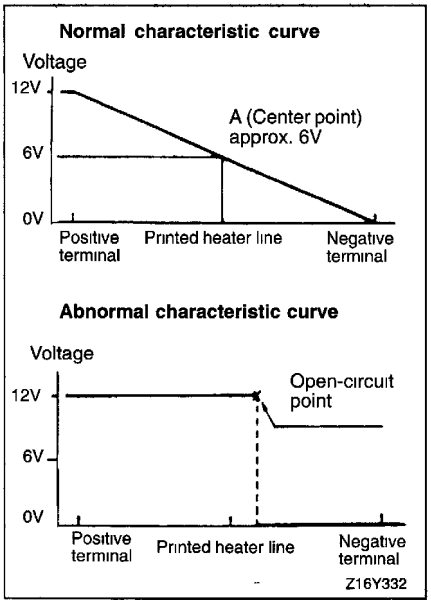
- When the defogger switch is turned ON with the ignition switch in ON position, the defogger relay is energized causing defogger to operate.
- At the same time, the defogger indicator light lights up indicating that the defogger is in operation.

COMPONENT LOCATION



TROUBLESHOOTING HINTS

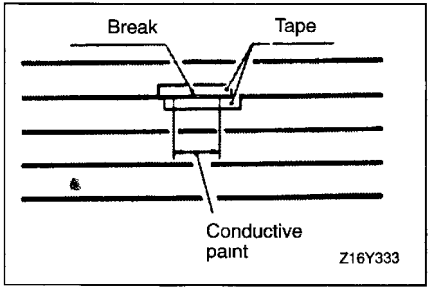
1. Defogger is inoperative.
   1) Indicator does not come on, either.
      - Check multi-purpose fuse No. 15.
      - Check defogger relay.
   2) Indicator comes on.
      - Check defogger.



SERVICE ADJUSTMENT PROCEDURES

PRINTED-HEATER LINE CHECK 110000765

(1) Run engine at 2,000 r/min. Check heater element with battery at full.
(2) Turn ON rear window defogger switch. Measure heater element voltage with circuit tester at rear window glass center A. Condition good if indicating about 6 V.
(3) If 12 V is indicated at A, there is a break in the negative terminals from A. Move test bar slowly to negative terminal to detect where voltage changes suddenly (0 V).
(4) If 0 V is indicated at A, there is a break in the positive terminals from A. Detect where the voltage changes suddenly (12 V) with the same method described.



PRINTED-HEATER LINE REPAIR 110000766

REQUIRED MATERIALS

- Thinner
- Lead-free gasoline
- Tape
- Fine brush
- Conductive paint

(1) Clean disconnected area with lead-free gasoline. Tape along both sides of heater element.
(2) Mix conductive paint thoroughly. Thin the required amount of paint in a separate container with a small amount of thinner and paint break three times at 15 minutes intervals.
(3) Remove tape and leave for a while before use (circuit complete).
(4) When completely dry (after 24 hours) finish exterior with a knife.

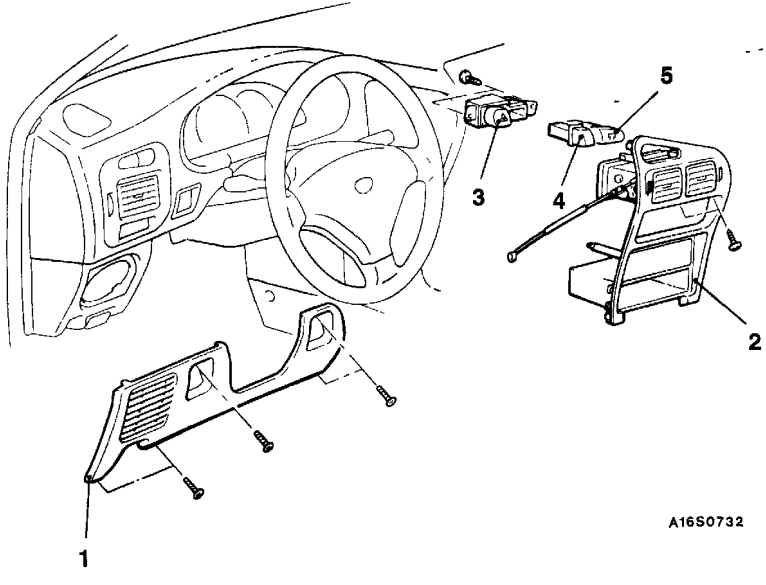
Caution
Clean glass with a soft cloth (dry or damp) along defogger heater element.

REAR WINDOW DEFOGGER

REMOVAL AND INSTALLATION

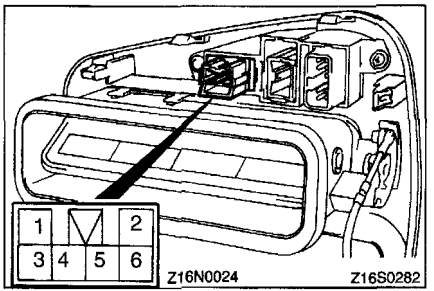
110003662

<Rear Window Defogger Switch>



Removal steps

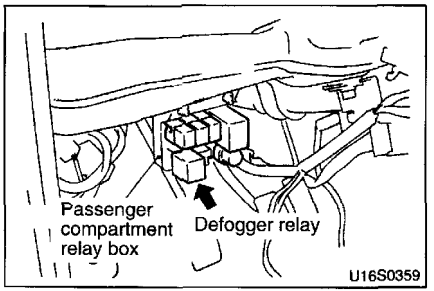
1. Knee protector
2. Air outlet center panel assembly (Refer to P.54-38.)
3. Switch holder
4. Switch plug
5. Defogger switch



INSPECTION

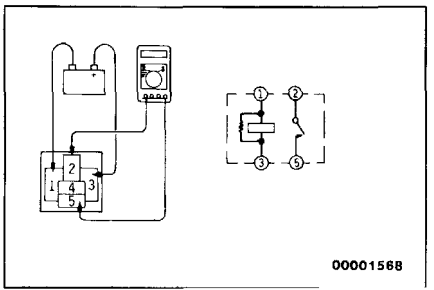
Defogger switch

Switch position	Terminal No.				
	2	4	6	1	3
OFF					
ON		Indicator light		Illumination light	



Defogger relay

(1) Remove the defogger relay from the passenger compartment relay box.



(2) Apply voltage to terminal 3, and check the continuity between the terminals when terminal 1 is grounded.

Power is supplied	2–5 terminals	Continuity
Power is not supplied	2–5 terminals	No continuity
	1–3 terminals	Continuity

ENGINE ELECTRICAL

CONTENTS

11B003663

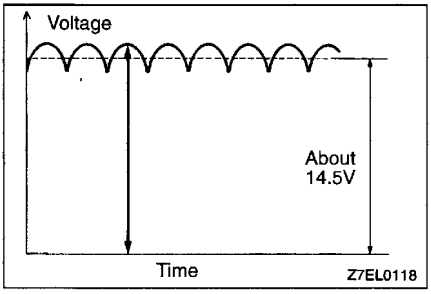
CHARGING SYSTEM 2
GENERAL INFORMATION 2
GENERATOR 19
SERVICE ADJUSTMENT PROCEDURES 12
Generator Output Line Voltage Drop Test 12
Generator Relay Continuity Check 18
Output Current Test 13
Regulated Voltage Test 15
Wave-form Inspection using an Analyzer 16
SERVICE SPECIFICATIONS 3
TROUBLESHOOTING 4
IGNITION SYSTEM 41
DISTRIBUTOR 63
GENERAL INFORMATION 41
IGNITION SYSTEM 59
SERVICE ADJUSTMENT PROCEDURES 52
Camshaft Position Sensor ..... Refer to GROUP13A (ON-VEHICLE INSPECTION OF MFI COMPONENTS)
Crankshaft Position Sensor ..... Refer to GROUP13A (ON-VEHICLE INSPECTION OF MFI COMPONENTS)
Ignition Timing Adjustment . Refer to GROUP11
Spark Plug Cable Test 52
Sparg Plug Test 52
Ignition Secondary Voltage Wave-form Inspection 53
SERVICE SPECIFICATIONS 42
SPECIAL TOOL 42
TROUBLESHOOTING 43
STARTING SYSTEM 28
GENERAL INFORMATION 28
SERVICE ADJUSTMENT PROCEDURES 32
Starter Relay Continuity Check 32
SERVICE SPECIFICATIONS 29
STARTER MOTOR 33
TROUBLESHOOTING 30

CHARGING SYSTEM

GENERAL INFORMATION

110003664

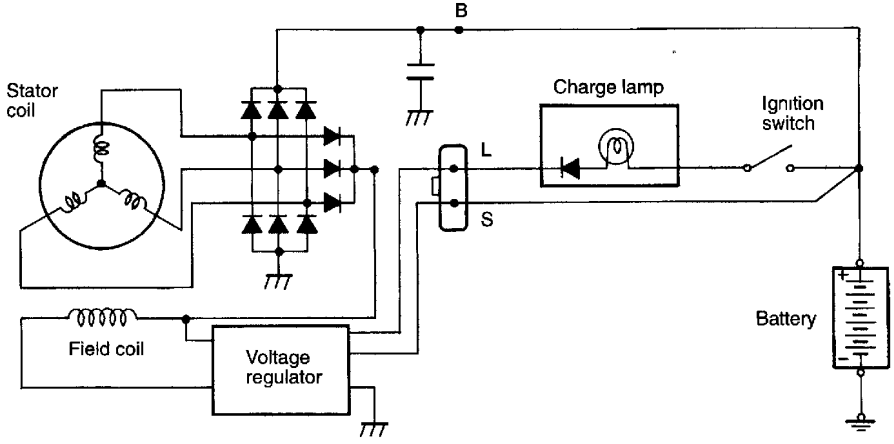
The charging system is a system which charges the battery with the generator output to keep the battery charged at a constant level during varying electrical load.



Operation

Rotation of the excited field coil generates AC voltage in the stator.
This alternating current is rectified through diodes to DC voltage having a waveform shown in the illustration at left.
The average output voltage fluctuates slightly with the generator load condition.

When the ignition switch is turned on, current flows in the field coil and initial excitation of the field coil occurs.
When the stator coil begins to generate power after the engine is started, the field coil is excited by the output current of the stator coil.
The generator output voltage rises as the field current increases and it falls as the field current decreases. When the battery voltage (generator S terminal voltage) reaches a regulated voltage of approx. 14.4V, the field current is cut off. When the battery voltage drops below the regulated voltage, the voltage regulator regulates the output voltage to a constant level by controlling the field current. In addition, when the field current is constant, the generator output voltage rises as the engine speed increases.



GENERATOR SPECIFICATIONS

Items		Specifications
Type		Battery voltage sensing
Rated output V/A	1.5L Engine	12/70
	1.8L Engine	12/75
Voltage regulator		Electronic built-in type

SERVICE SPECIFICATIONS

110003665

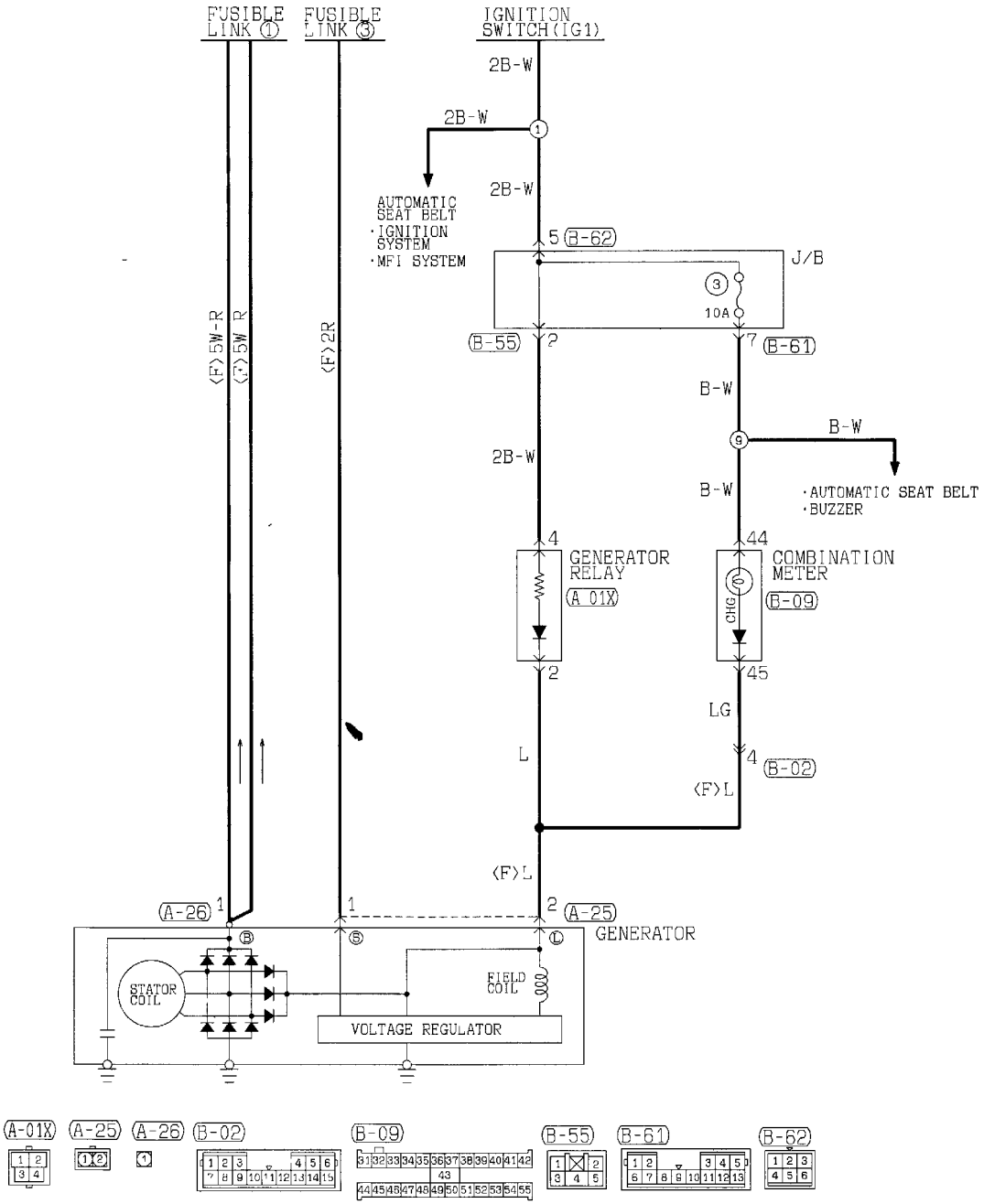
Items		Standard value	Limit
Regulated voltage Ambient temp. at voltage regulator V	–20°C (–4°F)	14.2–15.4	–
	20°C (68°F)	13.9–14.9	–
	60°C (140°F)	13.4–14.6	–
	80°C (176°F)	13.1–14.5	–
Rotor coil resistance Ω		Approx. 3–5	–
Output current		–	70 % of nominal output current

TROUBLESHOOTING

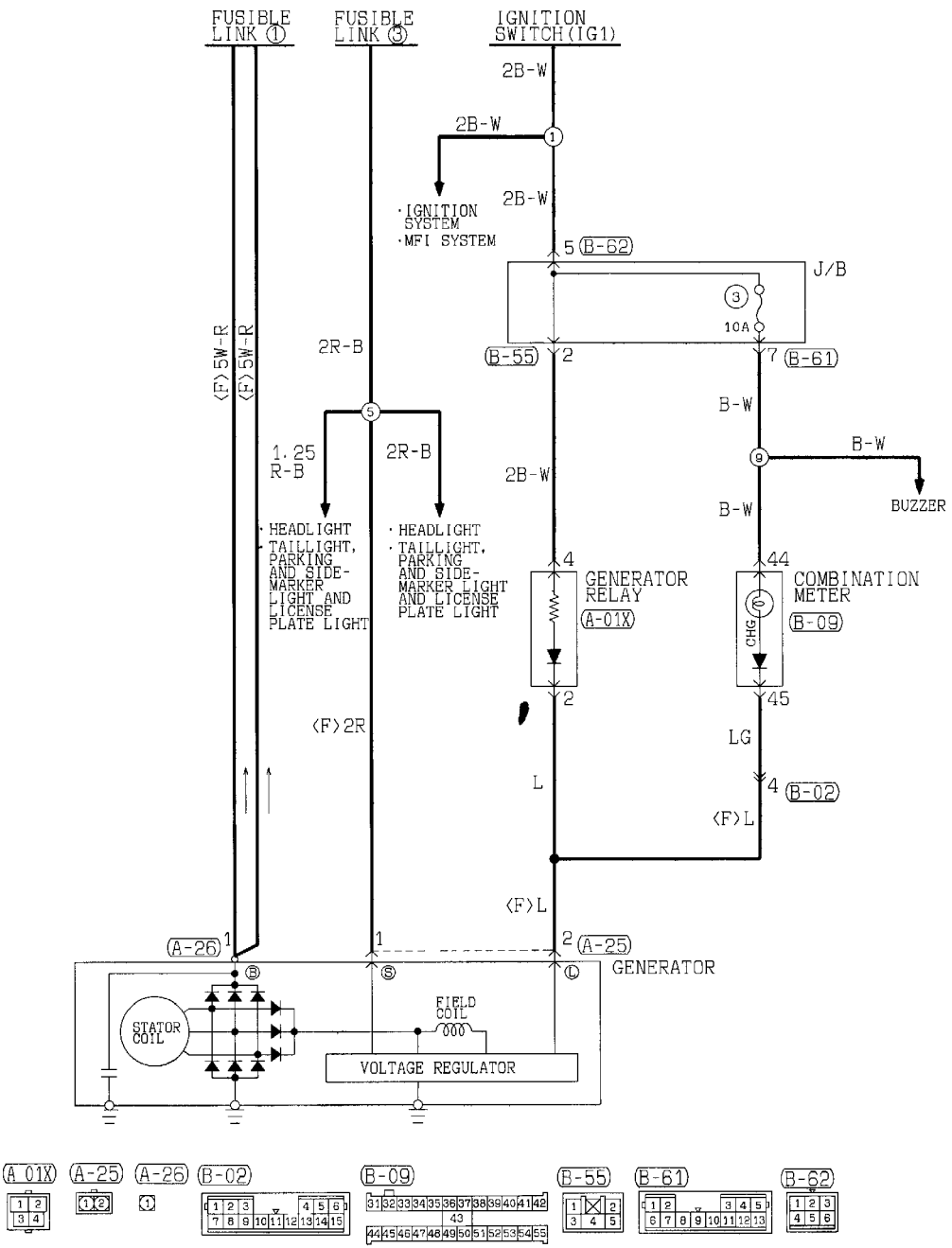
110003666

CIRCUIT DIAGRAM

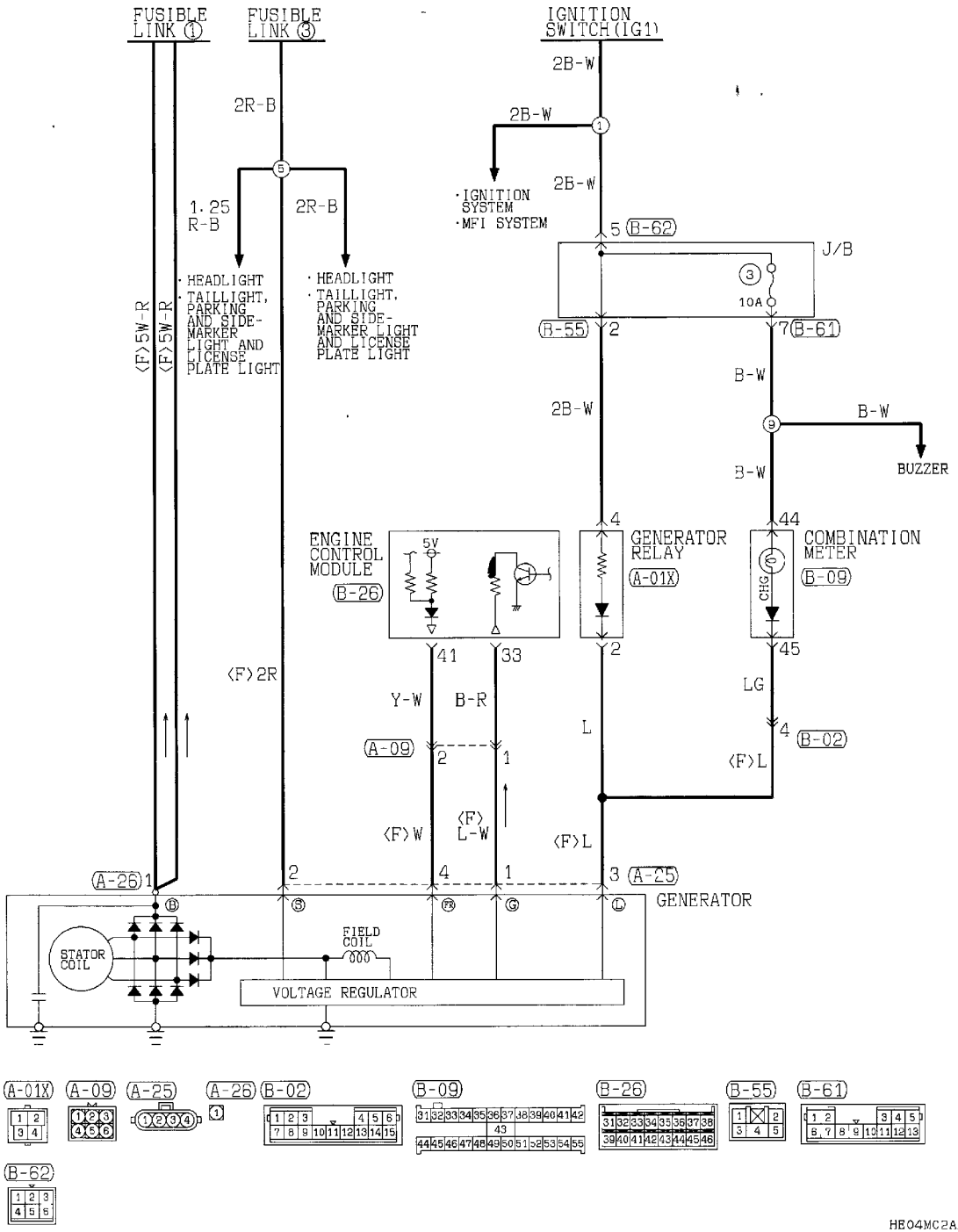
<1.5L ENGINE (UP TO 1994 MODELS)>



<1.5L ENGINE (1995 MODELS FOR FEDERAL)>



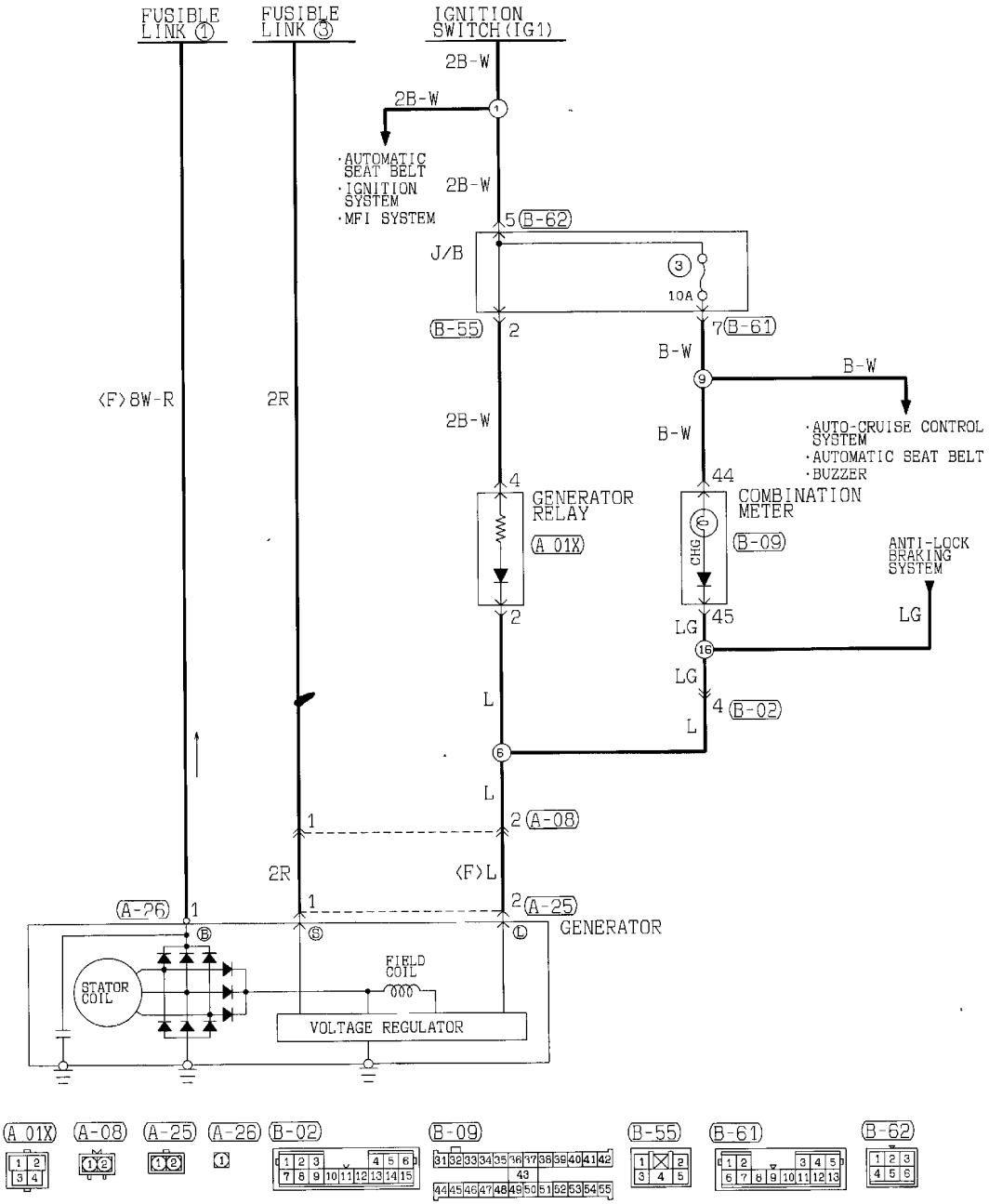
<1.5L ENGINE (1995 MODELS FOR CALIFORNIA AND FROM 1996 MODELS)>



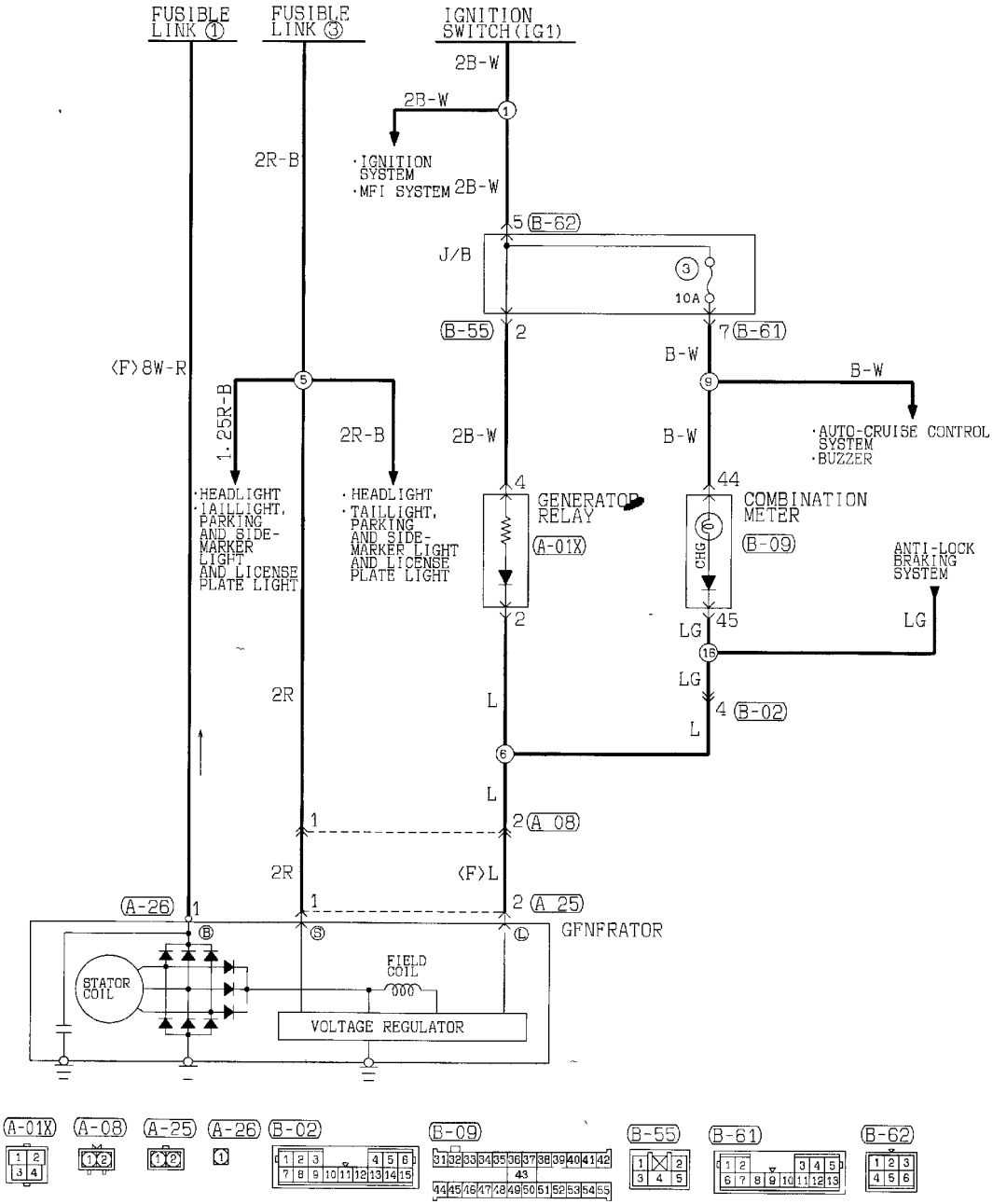
HE04MC2AA

TSB Revision

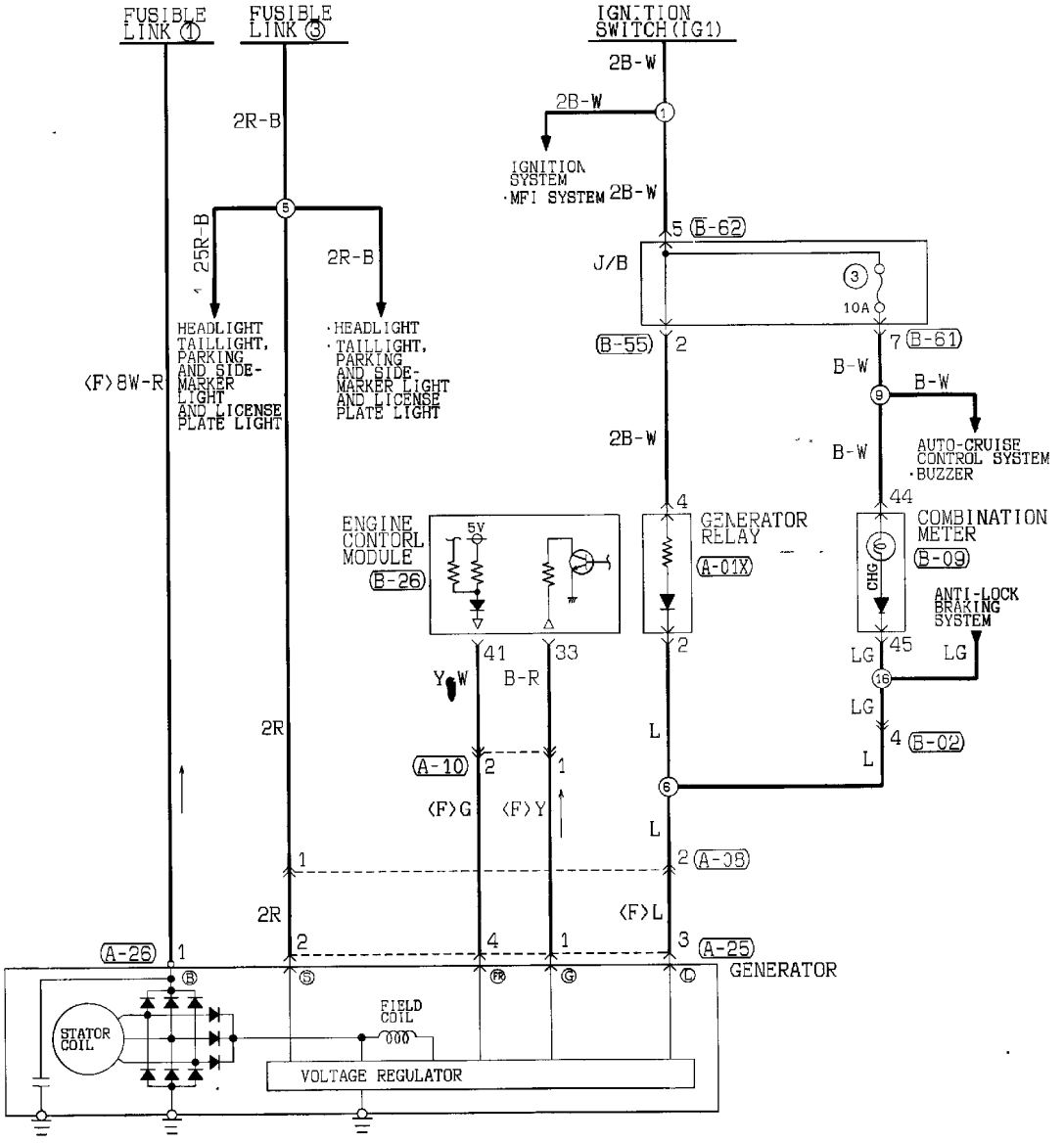
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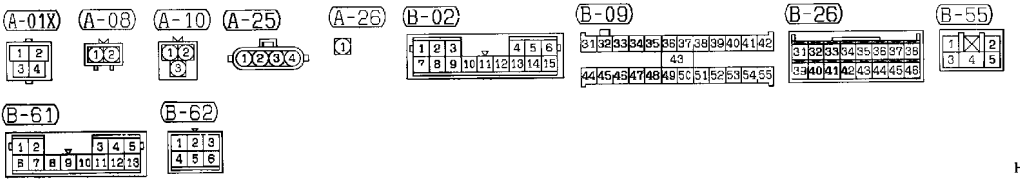


<1.8L ENGINE (1995 MODELS FOR FEDERAL)>



<1.8L ENGINE (1995 MODELS FOR CALIFORNIA AND FROM 1996 MODELS)>





HE04M07AA

TSB Revision

OPERATION

When engine is stopped

When the ignition switch is switched to the "ON" position, electricity flows from the "L" terminal of the generator to the field coil, and at the same time the charging warning light illuminates.

When engine is being started/has started

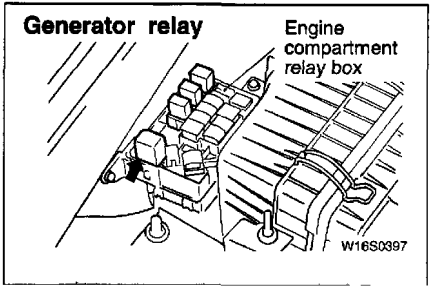
When the engine is started, charging voltage is applied to the "L" terminal of the generator, with the result that the charging warning light is extinguished. In addition, because battery voltage is applied to the "S" terminal of the generator, this battery voltage is monitored at the IC voltage regulator, thus switching ON and OFF the current to the field coil and thereby controlling the amount of generation by the generator.
Power is supplied to each load from the "B" terminal of the generator.

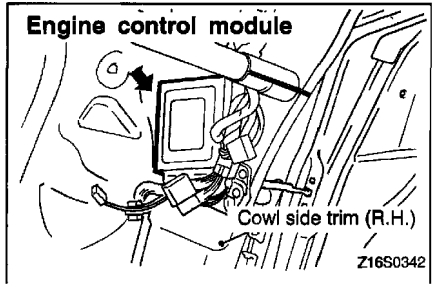
NOTE
The generator relay functions as a back-up for the flow of electricity to the field coil if there is a disconnection or damaged wiring of the charging warning light.

TROUBLESHOOTING HINTS

1. Charging indicator light does not go on when the ignition switch is turned to "ON", before the engine starts.
   - Check the bulb.
2. Charging indicator light fails to go off once the engine starts.
   - Check the IC voltage regulator (located within the generator).
3. Discharged or overcharged battery.
   - Check the IC voltage regulator (located within the generator).
4. The charging warning light illuminates dimly.
   - Check the diode (within the combination meter) for a short-circuit.

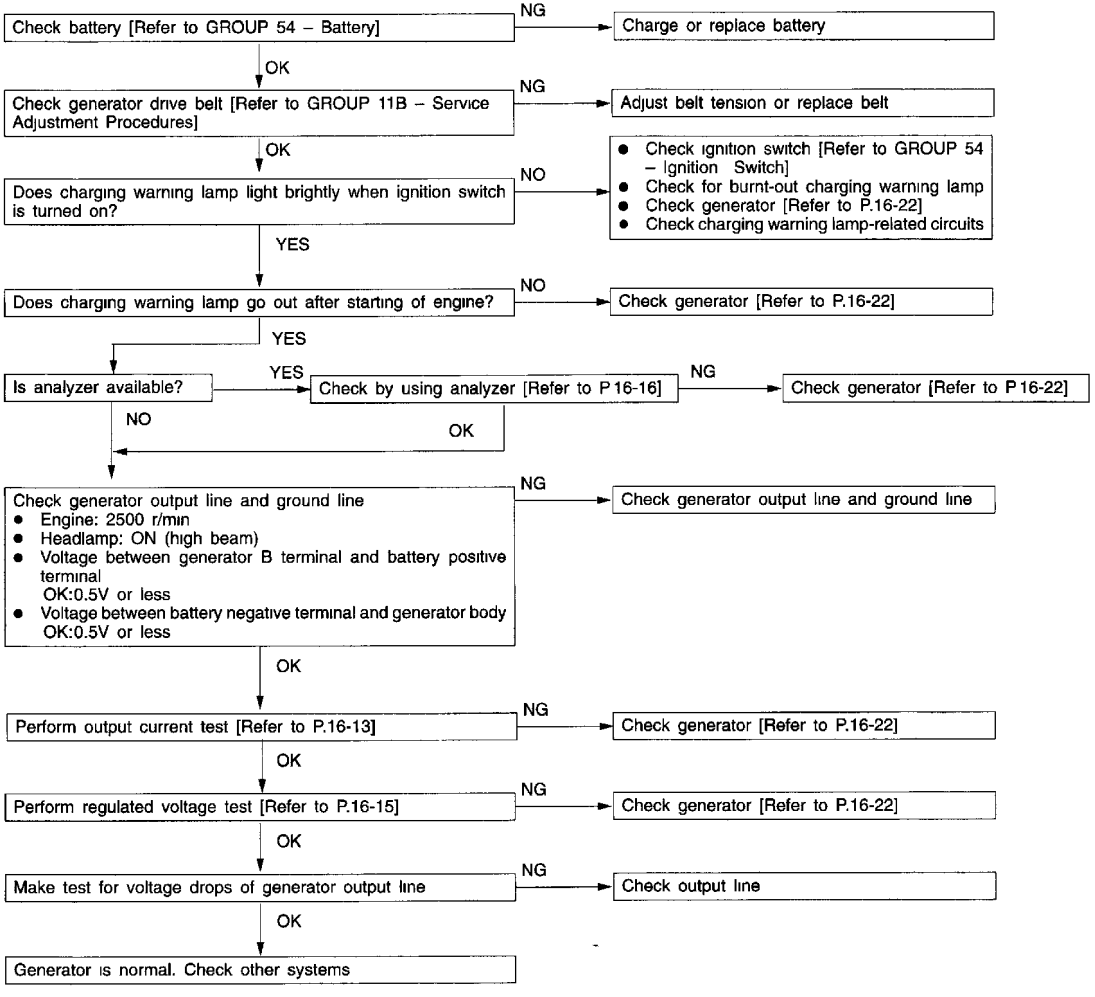
COMPONENT LOCATION





TROUBLESHOOTING GUIDE

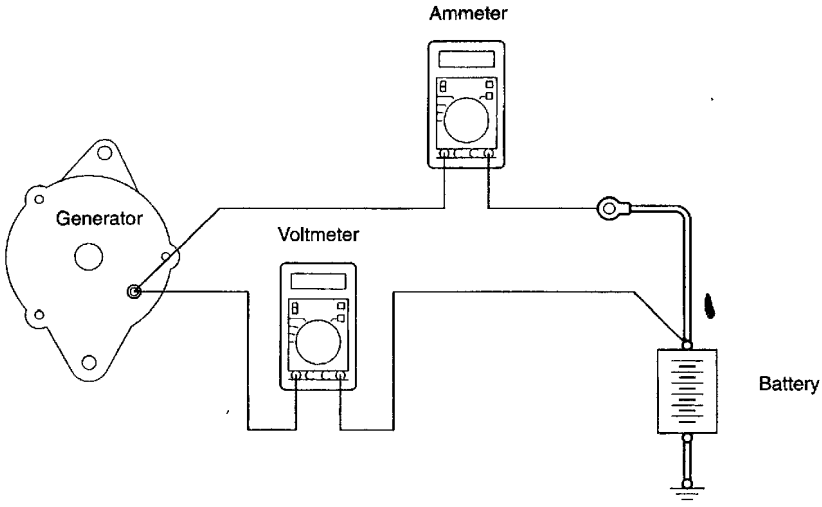
The charging system troubleshooting guide is shown in the following chart.



SERVICE ADJUSTMENT PROCEDURES

GENERATOR OUTPUT LINE VOLTAGE DROP TEST

110003667



6EN0962

This test determines whether the wiring from the generator "B" terminal to the battery (+) terminal (including the fusible link) is in a good condition or not.

(1) Always be sure to check the following before the test.
- Generator installation
- Generator drive belt tension (Refer to GROUP 00 – Maintenance Service.)
- Fusible link
- Abnormal noise from the generator while the engine is running

(2) Turn the ignition switch to the OFF position.
(3) Disconnect the negative battery cable.
(4) Disconnect the generator output wire from the generator "B" terminal and connect a DC test ammeter with a range of 0 – 100 A in series between the "B" terminal and the disconnected output wire. (Connect the (+) lead of the ammeter to the "B" terminal, and then connect the (–) lead of the ammeter to the disconnected output wire.)

NOTE
A clamp-type ammeter which enables measurements to be taken without disconnecting the generator output wire is recommended. The reason for this is if a vehicle in which the voltage may have dropped due to an imperfect connection at the generator "B" terminal is being inspected, and the generator "B" terminal is loosened when the test ammeter is connected, the connection will be completed at this time and the possibility of finding problems will be reduced.

(5) Connect a digital-type voltmeter between the generator "B" terminal and the battery (+) terminal. (Connect the (+) lead of the voltmeter to the "B" terminal, and then connect the (–) lead of the voltmeter to the battery (+) cable.)

(6) Connect a tachometer. (For the procedure for connecting the tachometer, refer to GROUP 11A – Service Adjustment Procedures.)
(7) Reconnect the negative battery cable.
(8) Leave the hood open.
(9) Start the engine.
(10) With the engine running at 2500 r/min., turn the headlights and other lights on and off to adjust the generator load so that the value displayed on the ammeter is slightly above 30A.

Limit value: Max. 0.3 V

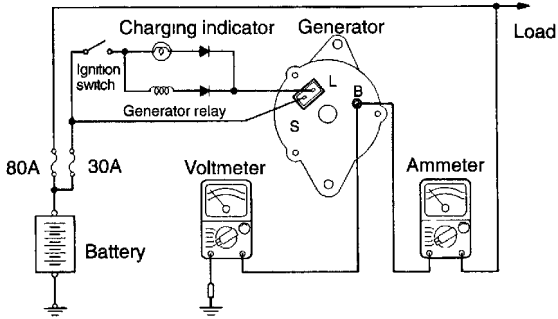
NOTE
When the generator output is high and the value displayed on the ammeter does not decrease to 30A, set the value to 40A. Read the value displayed on the voltmeter at this time.
In this case the limit value becomes max. 0.4V. Adjust the engine speed by gradually decreasing it until the value displayed on the ammeter is 30A. Take a reading of the value displayed on the voltmeter at this time.

(11) If the value displayed on the voltmeter is above the limit value, there is probably a malfunction in the generator output wire, so check the wiring between the generator "B" terminal and the battery (+) terminal (including fusible link).
If a terminal is not sufficiently tight or if the harness has become discolored due to overheating, repair and then test again.
(12) After the test, run the engine at idle.
(13) Turn off all lights and turn the ignition switch to the OFF position.
(14) Disconnect the negative battery cable.
(15) Disconnect the ammeter, voltmeter and tachometer.
(16) Connect the generator output wire to the generator "B" terminal.
(17) Connect the negative battery cable.

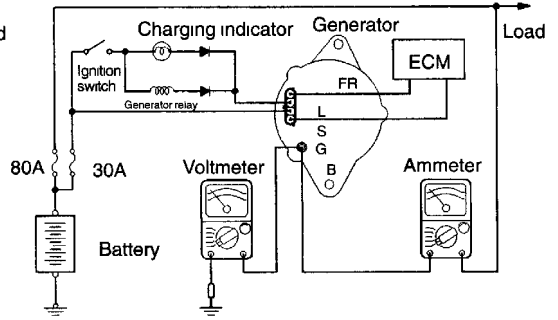
OUTPUT CURRENT TEST

110003668

<Except from 1996 models and 1995 models for California>



<From 1996 models and 1995 models for California>



9EN0434

This test determines whether the generator outputs normal current.

(1) Before the test, always be sure to check the following.
- Generator installation
- Battery (Refer to GROUP 54 – Battery.)

NOTE
The battery to be used should be slightly discharged. The load in a fully-charged battery will be insufficient and the test may not be able to be carried out correctly.
- Generator drive belt tension (Refer to GROUP 11A – Engine Adjustment.)
- Fusible link
- Abnormal noise from the generator while the engine is running

(2) Turn the ignition switch to the OFF position.
(3) Disconnect the negative battery cable.
(4) Disconnect the generator output wire from the generator "B" terminal and connect a DC test ammeter with a range of 0–100A in series between the "B" terminal and the disconnected output wire. (Connect the (+) lead of the ammeter to the "B" terminal, and then connect the (–) lead of the ammeter to the disconnected output wire.)

Caution
Never use clips but tighten bolts and nuts to connect the line. Otherwise loose connections (e.g. using clips) will lead to a serious accident because of high current.

NOTE
A clamp-type ammeter which enables measurements to be taken without disconnecting the generator output wire is recommended.

(5) Connect a voltmeter with a range of 0-20 V between the generator "B" terminal and the ground. (Connect the (+) lead of the voltmeter to the "B" terminal, and then connect the (–) lead of the voltmeter to the ground.)
(6) Connect a tachometer. (For the procedure for connecting the tachometer, refer to GROUP 11A – Service Adjustment Procedures.)
(7) Connect the negative battery cable.
(8) Leave the hood open.
(9) Check to be sure that the reading on the voltmeter is equal to the battery voltage.

NOTE
If the voltage is 0 V, the cause is probably an open circuit in the wire or fusible link between the generator "B" terminal and the battery (+) terminal.

(10) After turning the light switch on and turning on the headlights, start the engine.
(11) Immediately after setting the headlights to high beam and turning the heater blower switch to the high revolution position, increase the engine speed to 2,500 r/min. and read the maximum current output value displayed on the ammeter. Limit value: 70% of nominal current output

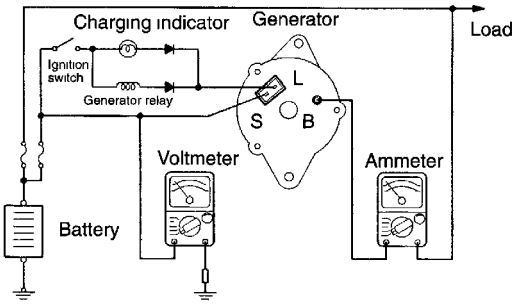
NOTE
- For the nominal current output, refer to the Generator Specifications.
- Because the current from the battery will soon drop after the engine is started, the above step should be carried out as quickly as possible in order to obtain the maximum current output value.
- The current output value will depend on the electrical load and the temperature of the generator body.
- If the electrical load is small while testing, the specified level of current may not be output even though the generator is normal. In such cases, increase the electrical load by leaving the headlights turned on for some time to discharge the battery or by using the lighting system in another vehicle, and then test again.
- The specified level of current also may not be output if the temperature of the generator body or the ambient temperature is too high. In such cases, cool the generator and then test again.

(12) The reading on the ammeter should be above the limit value. If the reading is below the limit value and the generator output wire is normal, remove the generator from the engine and check the generator.
(13) Run the engine at idle speed after the test.
(14) Turn the ignition switch to the OFF position.
(15) Disconnect the negative battery cable.
(16) Disconnect the ammeter, voltmeter and tachometer.
(17) Connect the generator output wire to the generator "B" terminal.
(18) Connect the negative battery cable.

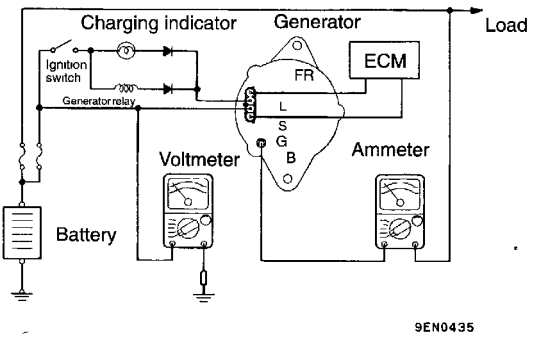
REGULATED VOLTAGE TEST

110003669

<Except from 1996 models and 1995 models for California>



<From 1996 models and 1995 models for California>



This test determines whether the voltage regulator is correctly controlling the generator output voltage.

(1) Always be sure to check the following before the test.
- Generator installation
- Check to be sure that the battery installed in the vehicle is fully charged. (Refer to GROUP 54 – Battery.)
- Generator drive belt tension (Refer to GROUP 00 – Maintenance Service.)
- Fusible link
- Abnormal noise from the generator while the engine is running

(2) Turn the ignition switch to the OFF position.
(3) Disconnect the negative battery cable.
(4) Connect a digital-type voltmeter between the generator "S" terminal and the ground. (Connect the (+) lead of the voltmeter to the "S" terminal, and then connect the (–) lead of the voltmeter to a secure ground or to the battery (–) terminal.)
(5) Disconnect the generator output wire from the generator "B" terminal.
(6) Connect a DC test ammeter with a range of 0–100A in series between the "B" terminal and the disconnected output wire. (Connect the (+) lead of the ammeter to the "B" terminal, and then connect the (–) lead of the ammeter to the disconnected output wire.)
(7) Connect a tachometer. (Refer to GROUP 11A – Service Adjustment Procedures.)
(8) Reconnect the negative battery cable.
(9) Turn the ignition switch to the ON position and check that the reading on the voltmeter is equal to the battery voltage.

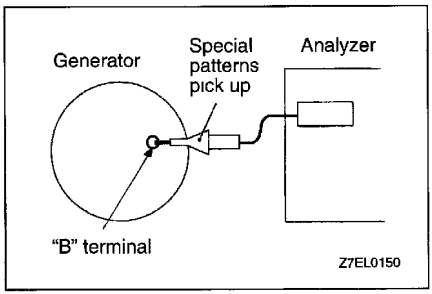
NOTE
If the voltage is 0 V, the cause is probably an open circuit in the wire or fusible link between the generator "S" terminal and the battery (+) terminal.

(10) Check to be sure that all lights and accessories are off.
(11) Start the engine.
(12) Increase the engine speed to 2,500 r/min.
(13) Read the value displayed on the voltmeter when the current output by the generator becomes 10A or less.
(14) If the voltage reading conforms to the value in the voltage regulation table, then the voltage regulator is operating normally.
If the voltage is outside the standard value, there is a malfunction of the voltage regulator or of the generator.
(15) After the test, lower the engine speed to the idle speed.
(16) Turn the ignition switch to the "OFF" position.
(17) Disconnect the negative battery cable.
(18) Disconnect the ammeter, voltmeter and tachometer.
(19) Connect the generator output wire to the generator "B" terminal.
(20) Connect the negative battery cable.

VOLTAGE REGULATION TABLE

Inspection terminal	Voltage regulator ambient temperature (°C [°F])	Standard value (V)	Inspection terminal	Voltage regulator ambient temperature (°C [°F])	Standard value (V)
Terminal "S"	–20 (–4)	14.2–15.4	Terminal "S"	60 (140)	13.4–14.5
	20 (68)	13.9–14.9		80 (176)	13.1–14.5

TSB Revision



WAVE-FORM INSPECTION USING AN ANALYZER

110003670

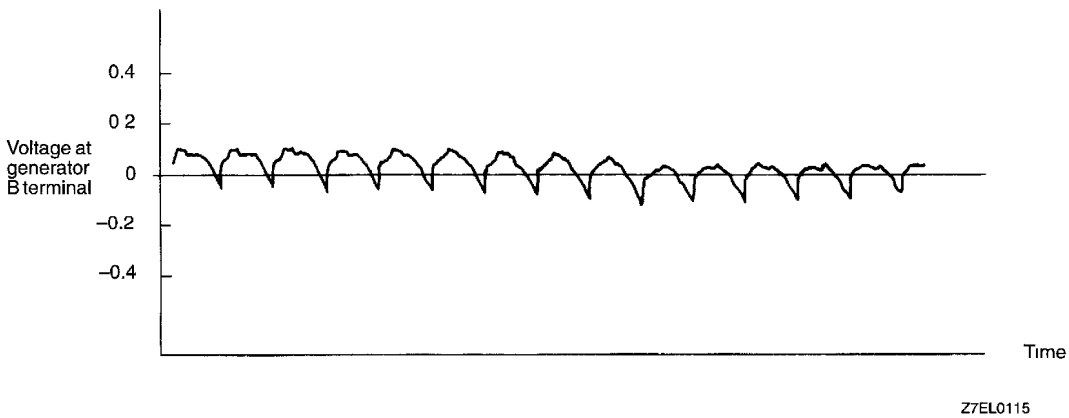
MEASUREMENT METHOD

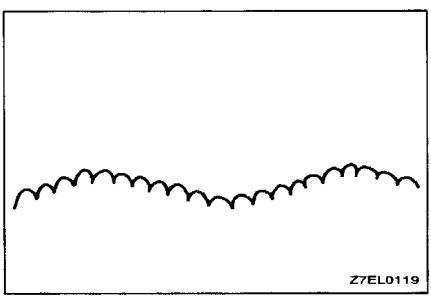
Connect the analyzer special patterns pick-up to the generator B terminal.

STANDARD WAVE-FORM

Observation Conditions

FUNCTION	SPECIAL PATTERNS
PATTERN HEIGHT	VARIABLE
VARIABLE Knob	Adjust while viewing the wave-form
PATTERN SELECTOR	RASTER
Engine speed	Curb idle speed





NOTE

Furthermore, the voltage wave-form of the generator B terminal can undulate as shown at left. This wave-form is produced when the regulator operates according to fluctuations in the generator load (current), and is normal for the generator.

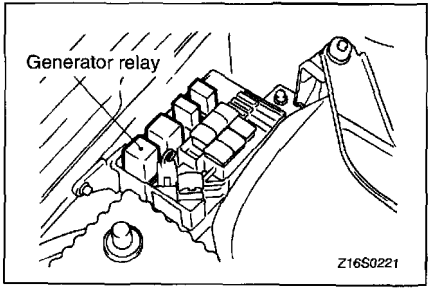
TSB Revision

ABNORMAL WAVE-FORMS EXAMPLES

NOTE
1. The size of the wave-form patterns differs largely depending on the adjustment of the variable knob on the analyzer.
2. Identification of abnormal waveforms is easier when there is a large output current (regulator is not operating). (Wave-forms can be observed when the headlamps are illuminated.)
3. Check the conditions of the charge lamp (illuminated/not illuminated) also, and carry out a total check.

Abnormal wave-forms	Problem cause
Example 1  Z7EL0120	• Open diode
Example 2  Z7EL0121	• Short in diode
Example 3  Z7EL0122	• Broken wire in stator coil
Example 4  Z7EL0123	• Short in stator coil
Example 5  Z7EL0124 At this time, the charge lamp is illuminated.	• Open supplementary diode

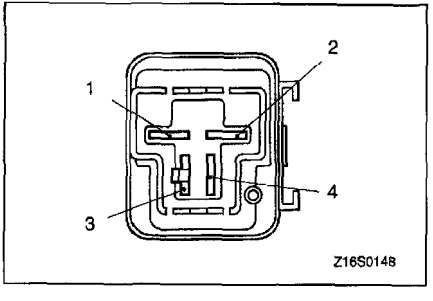
TSB Revision



GENERATOR RELAY CONTINUITY CHECK

110003671

(1) Remove the generator relay from the relay box inside the engine compartment.



(2) Use an ohmmeter to check that there is continuity when the (+) terminal of the tester is connected to terminal 4 of the generator relay and the (–) terminal is connected to terminal 2.
(3) Next, check that there is no continuity when the (+) terminal is connected to terminal 2 and the (–) terminal is connected to terminal 4.
(4) If the continuity checks in steps (2) and (3) show a defect, replace the generator relay.

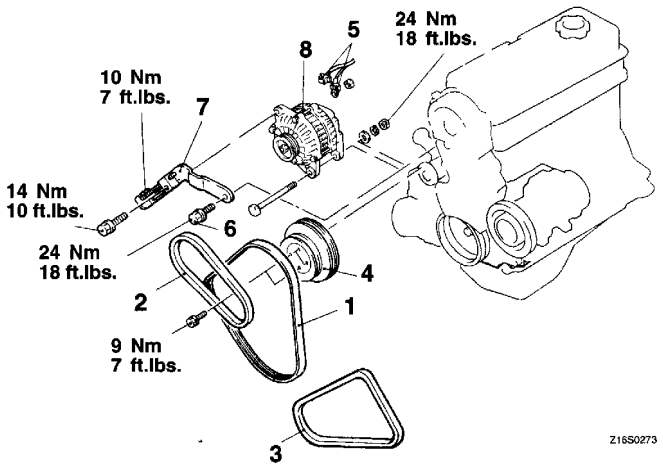
GENERATOR

REMOVAL AND INSTALLATION

110003672

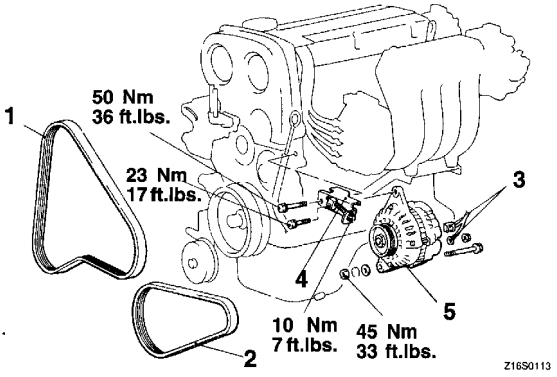
Post-installation Operation
- Drive Belt Tension Adjustment (Refer to GROUP 00 – Maintenance Service.)

<1.5L Engine>



Removal steps
1. Drive belt (Air conditioning)
2. Drive belt (Power steering)
◀A▶ ▶A◀ 3. Drive belt (Generator)
4. Water pump pulley
5. Generator connector
6. Generator brace mounting bolt
▶A◀ 7. Generator brace
▶A◀ 8. Generator

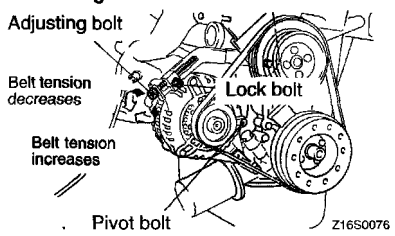
<1.8L Engine>



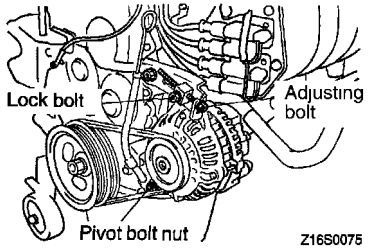
Removal steps
1. Drive belt (Power steering, air conditioning)
◀A▶ ▶B◀ 2. Drive belt (Generator)
3. Generator connector
▶B◀ 4. Generator brace
▶B◀ 5. Generator

TSB Revision

<1.5L Engine>



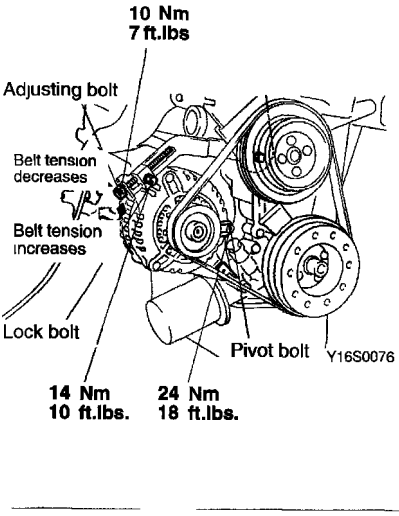
<1.8L Engine>



REMOVAL SERVICE POINT

◀A▶ DRIVE BELT (GENERATOR) REMOVAL

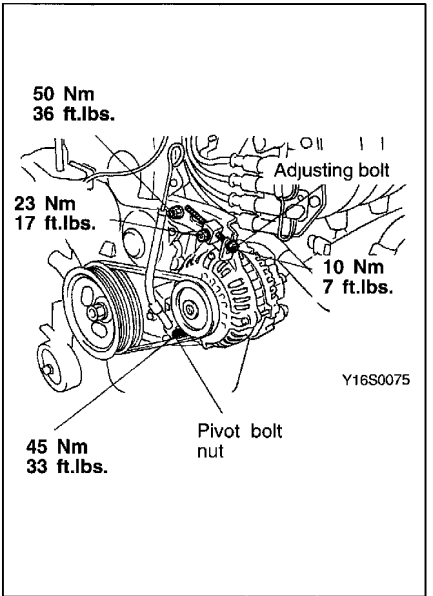
(1) Loosen the pivot bolt nut and the lock bolt as shown in the illustration.
(2) Loosen the adjusting bolt and lift it upwards.
(3) Push the generator towards the engine to remove the drive belt.



INSTALLATION SERVICE POINTS

▶A◀ GENERATOR INSTALLATION / GENERATOR / BRACE / DRIVE BELT (GENERATOR)

(1) Install the generator to the cylinder block and front case mounting boss with the pivot bolt, and provisionally tighten the nut to still allow the generator to move smoothly.
(2) Insert the generator brace between the power steering oil pump bracket and the water pump, and tighten it to the specified torque.
(3) Press the generator body towards the engine, and provisionally tighten the generator and generator brace with the lock bolt.
(4) Install the generator drive belt and adjust the belt tension using the adjusting bolt. (Refer to GROUP 00 – Maintenance Service.)
(5) After adjusting the belt tension, fully tighten the nut of the pivot bolt and the lock bolt to the specified torque, and then tighten the adjusting bolt to the specified torque.

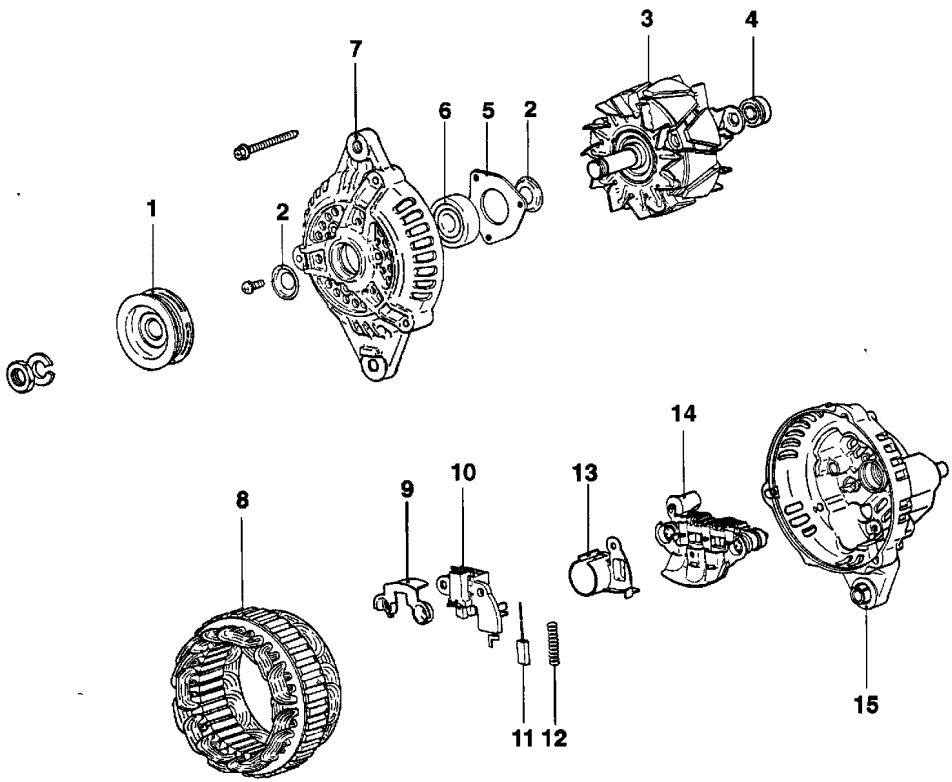


▶B◀ GENERATOR INSTALLATION / GENERATOR / BRACE / DRIVE BELT (GENERATOR)

(1) Install the generator to the front case mounting boss with the pivot bolt, and provisionally tighten the nut to still allow the generator to move smoothly.
(2) Install the generator brace to the water pump, and tighten it to the specified torque.
(3) Press the generator body towards the engine, and provisionally tighten the generator and generator brace with the lock bolt.
(4) Install the generator drive belt and adjust the belt tension using the adjusting bolt. (Refer to GROUP 00 – Maintenance Service.)
(5) After adjusting the belt tension, fully tighten the nut of the pivot bolt and the lock bolt to the specified torque, and then tighten the adjusting bolt to the specified torque.

DISASSEMBLY AND REASSEMBLY <1.5L Engine (Up to 1993 models)>

110003673



Z1EN0349

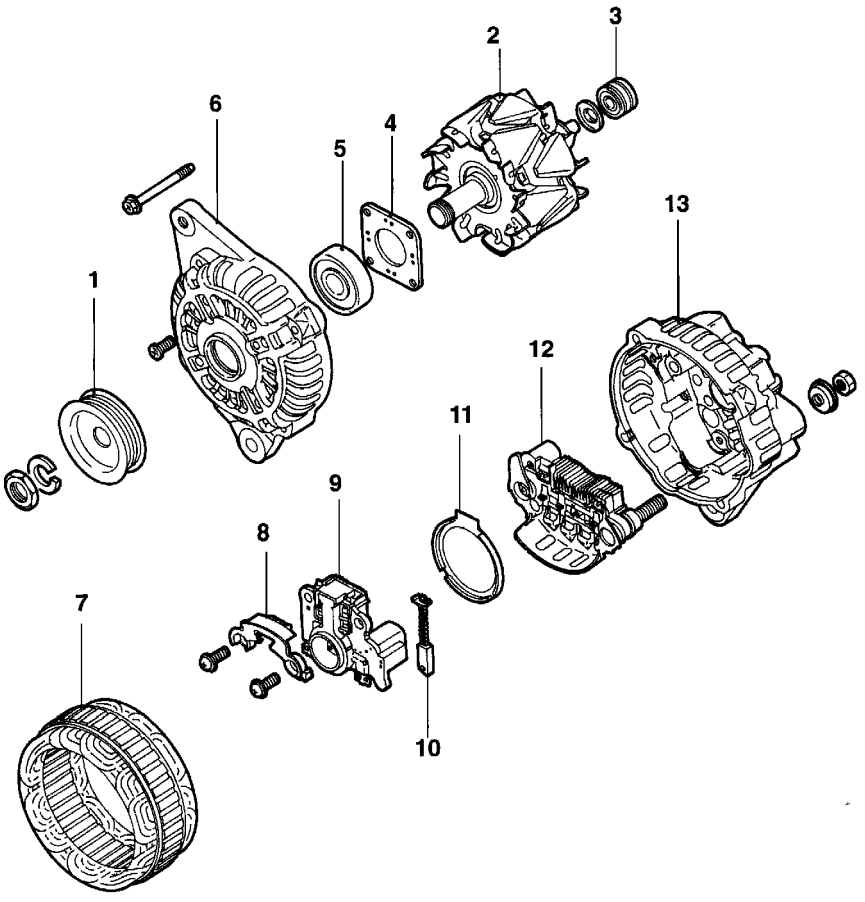
Disassembly steps

◀A▶
1. Generator pulley
2. Seal

▶A◀
3. Rotor assembly
4. Rear bearing
5. Bearing retainer
6. Front bearing
7. Front bracket

◀B▶
8. Stator assembly
9. Plate
10. Regulator and brush holder
11. Brush
12. Brush spring
13. Slinger
14. Rectifier assembly
15. Rear bracket

DISASSEMBLY AND REASSEMBLY <1.5L Engine (From 1994 models), 1.8L Engine>

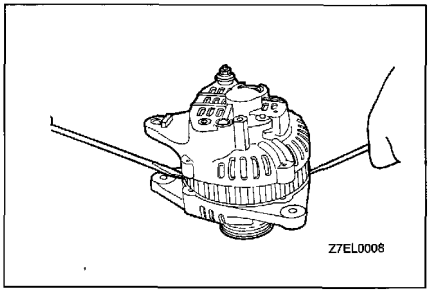


Z9EN0187

Disassembly steps

◀A▶ 1. Generator pulley
▶A◀ 2. Rotor assembly
3. Rear bearing
4. Bearing retainer
5. Front bearing
6. Front bracket

◀B▶ 7. Stator assembly
8. Plate
9. Regulator and brush holder
10. Brush
11. Slinger
12. Rectifier assembly
13. Rear bracket

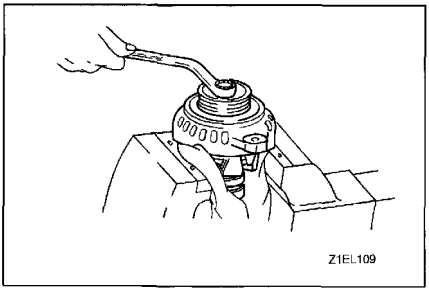


DISASSEMBLY SERVICE POINTS

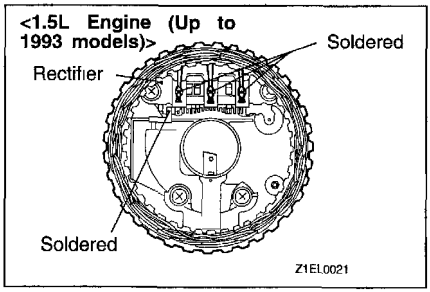
◀A▶ GENERATOR PULLEY REMOVAL

(1) Remove the bolts.
(2) Insert flat tip screwdriver between front bracket and stator core and pry downward.

Caution
Do not insert screwdriver too deep, as there is danger of damage to stator coil.



(3) Clamp the rotor in a vise with soft jaws.
(4) After removing the nut, remove the pulley and front bracket from the rotor.

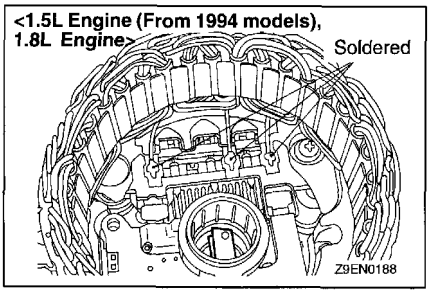


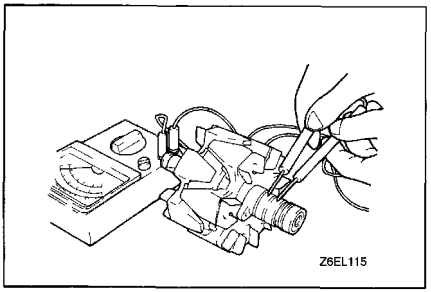
◀B▶ STATOR REMOVAL

(1) When removing stator, unsolder three stator leads soldered to main diodes on rectifier.
(2) When removing rectifier from brush holder, unsolder two soldered points to rectifier.

Caution
(1) When soldering or unsoldering, use care to make sure that heat of soldering iron is not transmitted to diodes for a long period. Finish soldering or unsoldering in as short a time as possible.

(2) Use care that no undue force is exerted to leads of diodes.





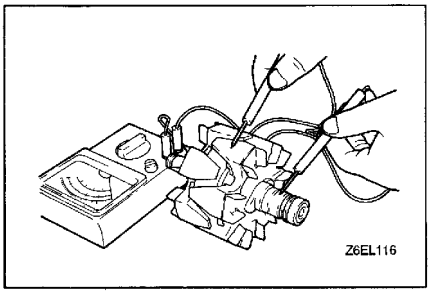
INSPECTION

ROTOR

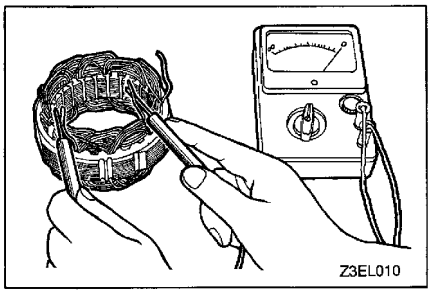
(1) Check field coil for continuity. Check to ensure that there is continuity between slip rings.
If resistance is extremely small, it means that there is a short circuit. If there is no continuity or if there is short circuit, replace rotor assembly.

Resistance value: Approx. 3–5 Ω

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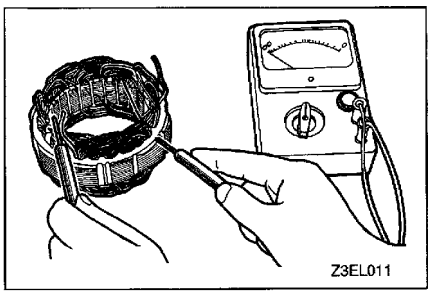


(2) Check field coil for grounding. Check to ensure that there is no continuity between slip ring and core. If there is continuity, replace rotor assembly.

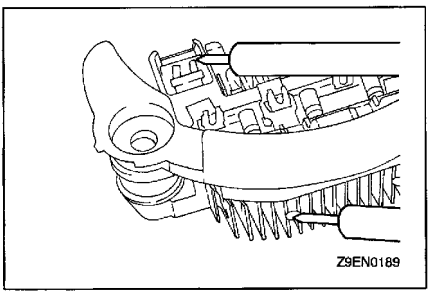


STATOR

(1) Make continuity test on stator coil. Check to ensure that there is continuity between coil leads.
If there is no continuity, replace stator assembly.



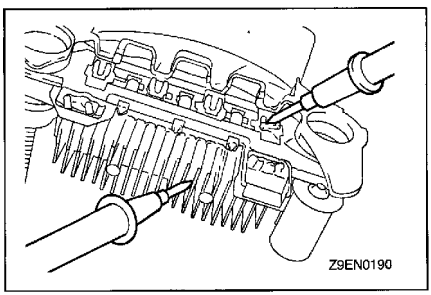
(2) Check coil for grounding. Check to ensure that there is no continuity between coil and core. If there is continuity, replace stator assembly.



RECTIFIERS

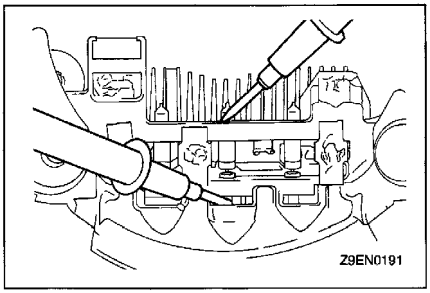
(1) Positive Rectifier Test

Check for continuity between positive rectifier and stator coil lead connection terminal with an ohmmeter. If there is continuity in both directions, diode is shorted.
Replace rectifier assembly.



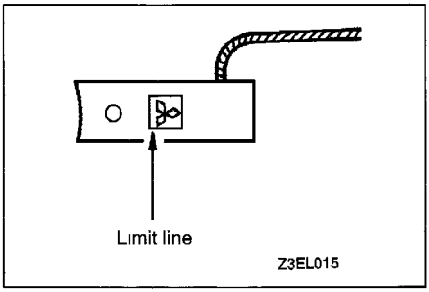
(2) Negative Rectifier Test

Check for continuity between negative rectifier and stator coil lead connection terminal. If there is continuity in both directions, diode is shorted, and rectifier assembly must be replaced.



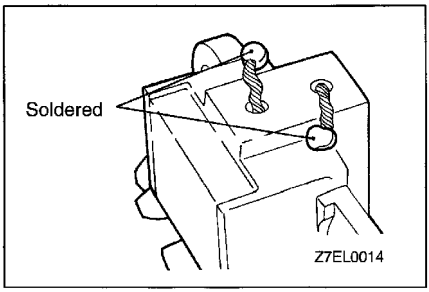
(3) Diode Trio Test

Check three diodes for continuity by connecting an ammeter to both ends of each diode. If there is no continuity in both directions, diode is faulty and heatsink assembly must be replaced.

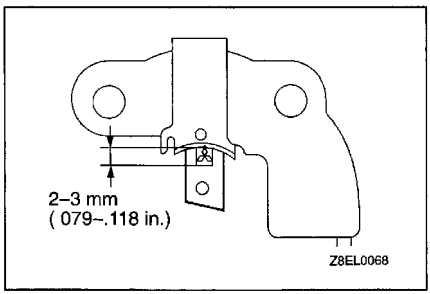


BRUSH REPLACEMENT <1.5L Engine (Up to 1993 models)>

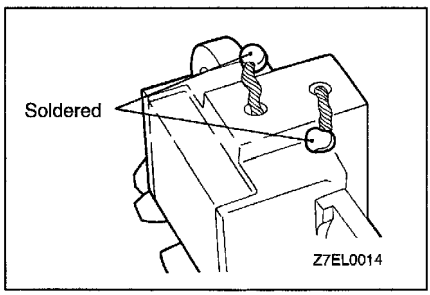
(1) Replace brush by the following procedures if it has been worn to limit line.



(2) Unsolder pigtail and remove old brush and spring.

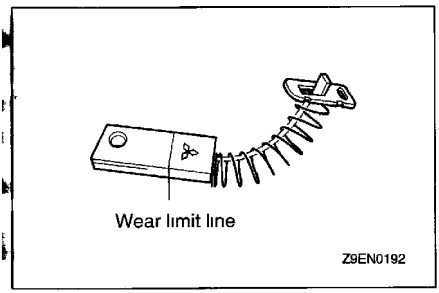


(3) Install brush spring and new brush in brush holder.
(4) Insert the brush to where there is a space 2 to 3 mm (.079 to .118 in.) between the limit line and the end of the brush holder.



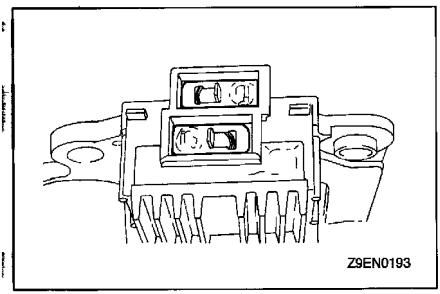
(5) Solder pigtail to brush holder as shown in the illustration.

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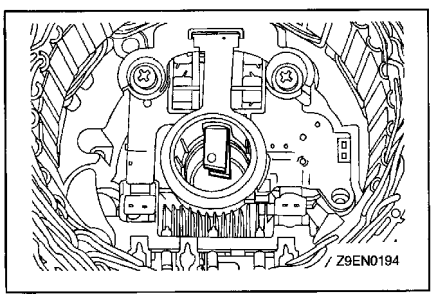


BRUSH REPLACEMENT <1.5L Engine (From 1994 models), 1.8L Engine>

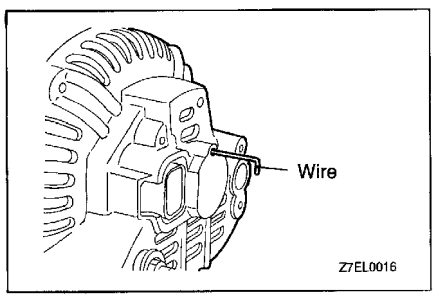
(1) Replace brush by the following procedures if it has been worn to limit line.



(2) Unsolder the lead wire of the brush, and the brush will appear.



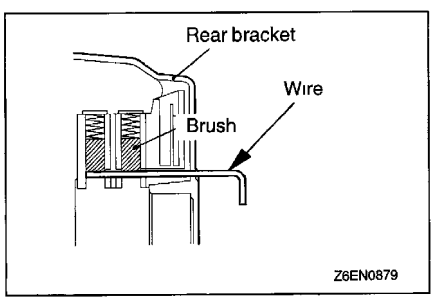
(3) To install a new brush, insert the brush in the holder until it is positioned as illustrated, and solder the lead wire.



REASSEMBLY SERVICE POINT

▶A◀ ROTOR ASSEMBLY INSTALLATION

Before rotor is attached to rear bracket, insert wire through small hole made in rear bracket to lift brush. After rotor has been installed, remove the wire.



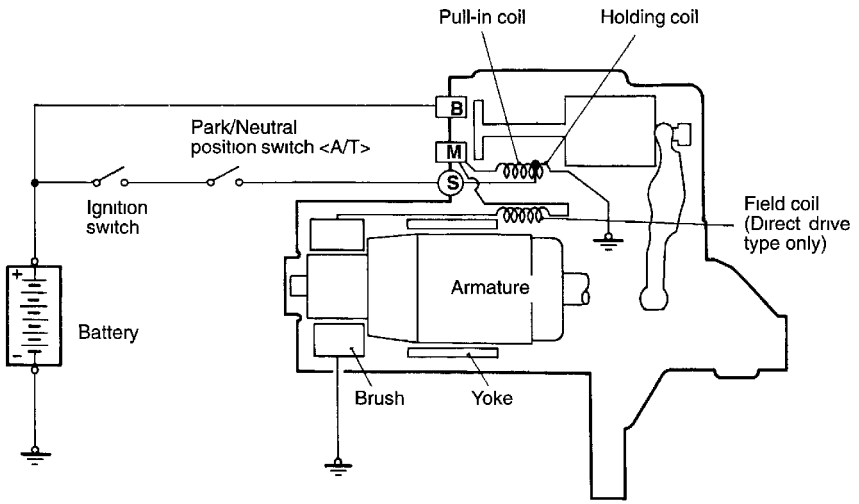
STARTING SYSTEM

GENERAL INFORMATION

110003674

If the ignition switch is turned to the "START" position, current flows in the coil provided inside magnetic switch, attracting the plunger. When the plunger is attracted, the lever connected to the plunger is actuated to engage the starter clutch.
On the other hand, attracting the plunger will turn on the magnetic switch, allowing the B terminal and M terminal to conduct. Thus, current flows to engage the starter motor.

When the ignition switch is returned to the "ON" position after starting the engine, the starter clutch is disengaged from the ring gear.
An overrunning clutch is provided between the pinion and the armature shaft, to prevent damage to the starter.



Z9EN0288

STARTER MOTOR SPECIFICATIONS

Items	1.5L Engine M/T	1.5L Engine A/T
Type	Direct drive	Direct drive
Rated output kW/V	0.7/12	0.9/12
No of pinion teeth	8	8

Items	1.8L Engine M/T	1.8L Engine A/T
Type	Direct drive	Reduction drive
Rated output kW/V	0.9/12	1.0/12
No. of pinion teeth	8	8

SERVICE SPECIFICATIONS

110003675

Direct drive type

Items		Standard value	Limit
Free running characteristics	Terminal voltage V	11.5	–
	Current A	60 or less	–
	Speed r/min.	6,600	–
Pinion gap mm (in.)		0.5–2.0 (.020–.079)	–
Commutator runout mm (in.)		0.05 (.002)	0.1 (.004)
Commutator diameter mm (in.)		32.0 (1.260)	31.0 (1.220)
Undercut depth mm (in.)		0.5 (.020)	–

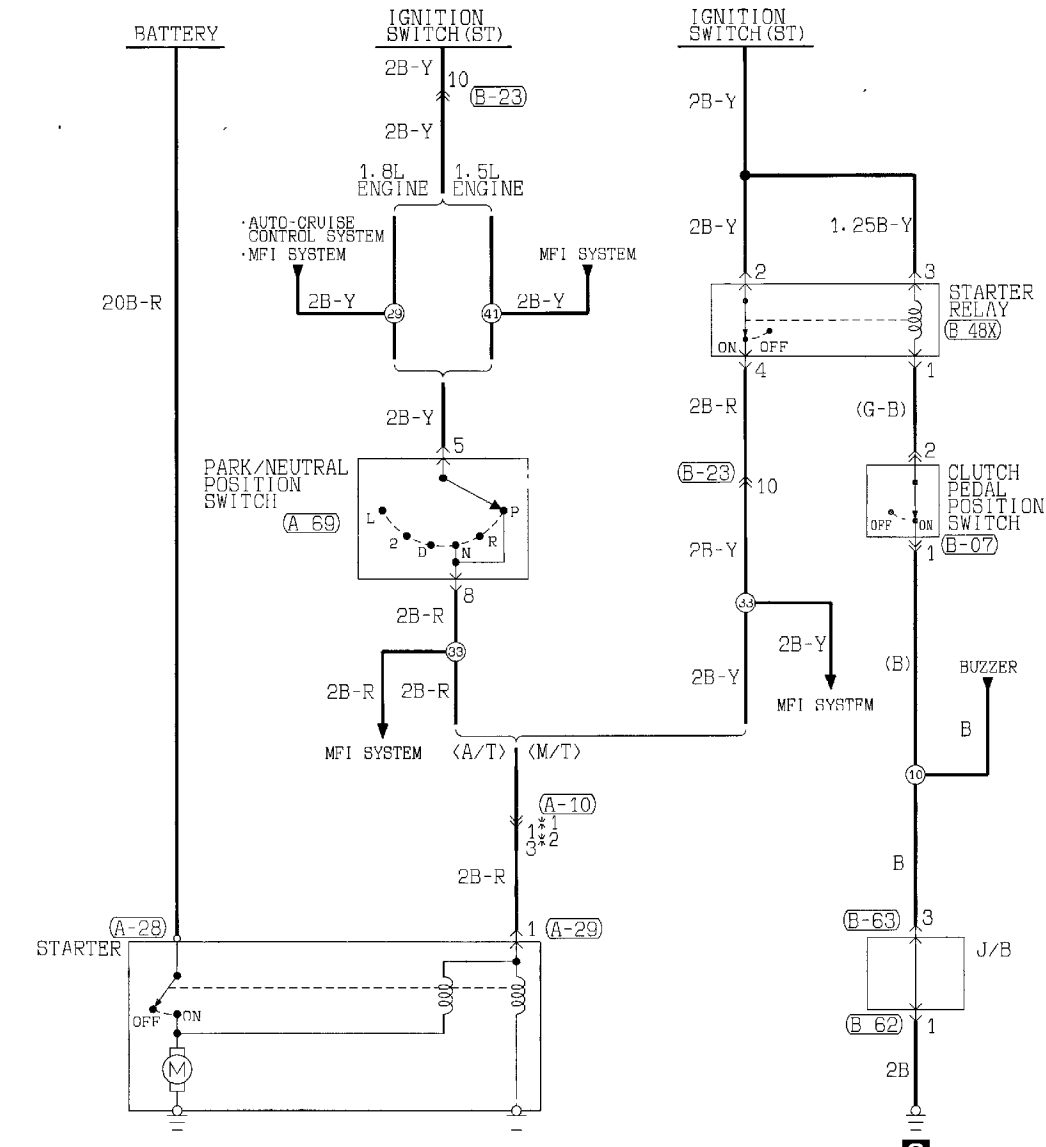
Reduction drive type

Items		Standard value	Limit
Free running characteristics	Terminal voltage V	11	–
	Current A	90 or less	–
	Speed r/min.	3,000	–
Pinion gap mm (in.)		0.5–2.0 (.020–.079)	–
Commutator runout mm (in.)		0 05 (.002)	0.1 (.004)
Commutator diameter mm (in.)		29.4 (1.158)	28.4 (1.118)
Undercut depth mm (in.)		0.5 (.020)	–

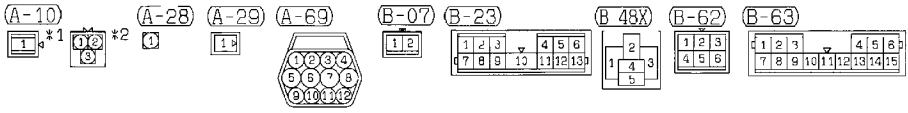
TROUBLESHOOTING

110003676

CIRCUIT DIAGRAM



*1:1.5L ENGINE, 1.8L ENGINE-UP TO 1994 MODELS, 1995 MODELS FOR FEDERAL.
*2:1.8L ENGINE-1995 MODELS FOR CALIFORNIA, FROM 1996 MODELS



HE02M01AA

TSB Revision

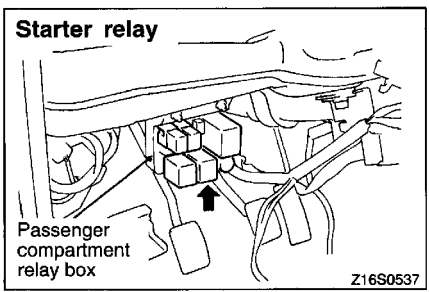
OPERATION

- For models equipped with the M/T, the interlock switch contact is switched OFF when the clutch pedal is depressed; when the ignition switch is then switched to the "ST" position, electricity flows to the starter relay and the starter motor, the contact (magnetic switch) of the starter is switched ON and the starter motor is activated.

  NOTE
  If the ignition switch is switched to the "ST" position without the clutch pedal being depressed, electricity flows to the starter relay (coil), the interlock switch (contacts) and to ground, with the result that the contacts of the starter relay are switched OFF, and, because the power to the starter motor is thereby interrupted, the starter motor is not activated.

- For models equipped with the A/T, when the ignition switch is switched to the "ST" position while the selector lever is at the "P" or "N" position, the contact (magnetic switch) of the starter is switched ON and the starter motor is activated.

COMPONENT LOCATION

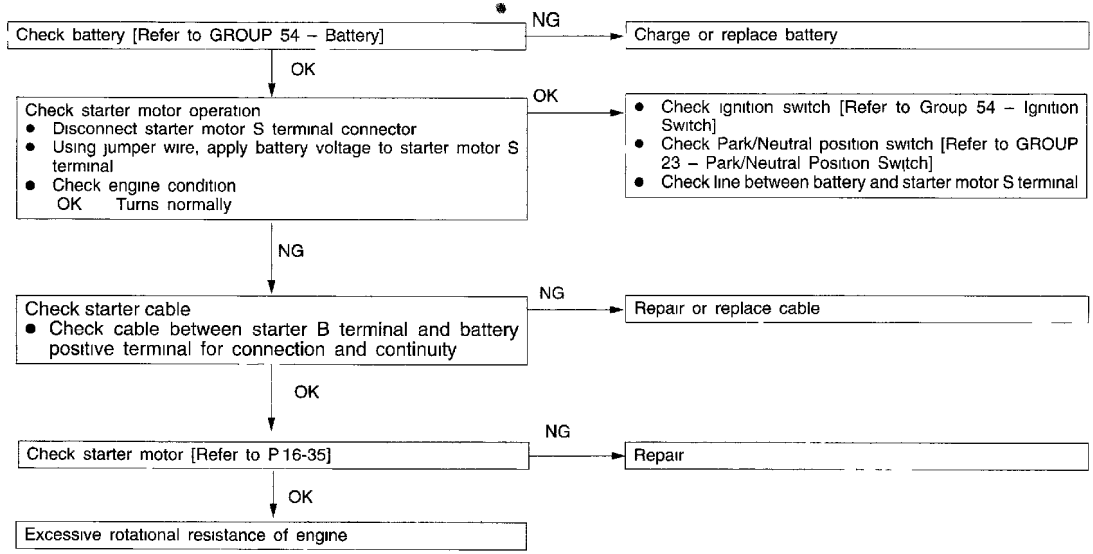


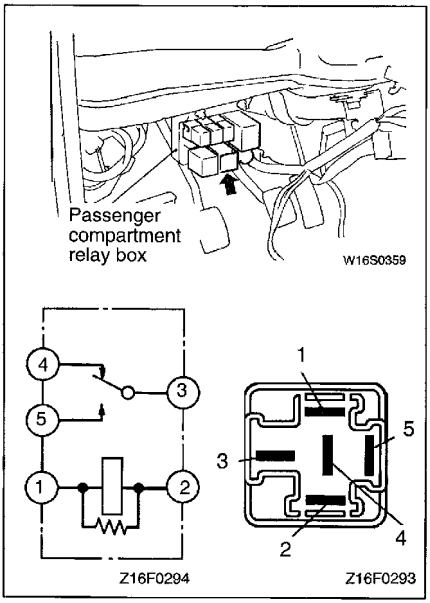
TROUBLESHOOTING HINTS

1. The starter motor does not operate at all.
   - Check the starter (coil).
   - Check for poor contact at the battery terminals.
   - Check the PNP switch <A/T>
   - Check the interlock switch <M/T>
2. The starter motor doesn't stop.
   - Check the starter (magnetic switch).

TROUBLESHOOTING GUIDE

The starting system troubleshooting guide is shown in the following chart.





SERVICE ADJUSTMENT PROCEDURES

STARTER RELAY CONTINUITY CHECK 110003677

(1) Remove the starter relay.
(2) Check the continuity between the relay terminals according to the list below.

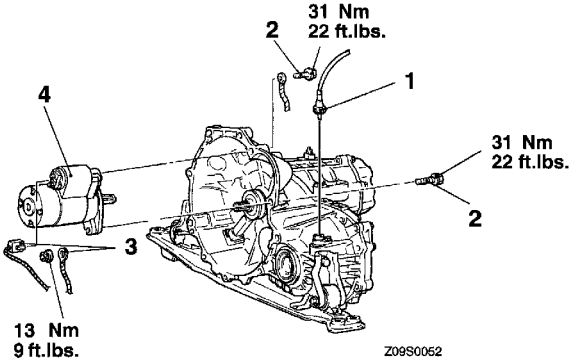
Battery voltage between the terminals 1 and 2 energized	3 – 4 terminals	No continuity
	3 – 5 terminals	Continuity
Battery voltage not energized.	3 – 4 terminals	Continuity
	3 – 5 terminals	No continuity
	1 – 2 terminals	Continuity

TSB Revision

STARTER MOTOR

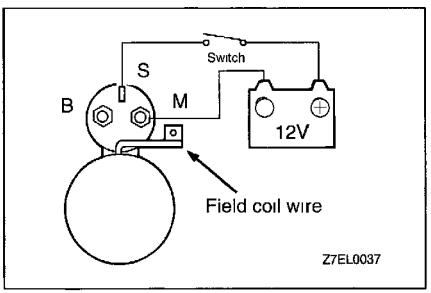
REMOVAL AND INSTALLATION

110003678



Removal steps

1. Speedometer cable connection
2. Starter mounting bolt
3. Starter connector
4. Starter

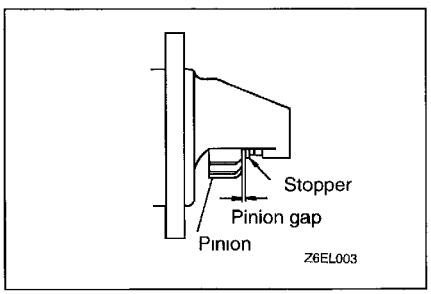


INSPECTION

PINION GAP ADJUSTMENT

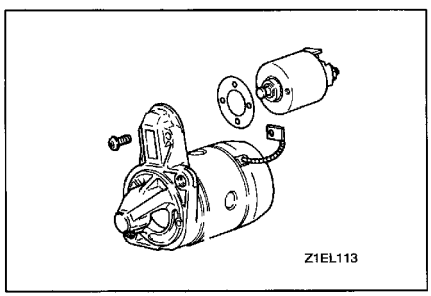
(1) Disconnect field coil wire from M-terminal of magnetic switch.
(2) Connect a 12V battery between S-terminal and M-terminal.
(3) Set switch to "ON", and pinion will move out.

Caution
This test must be performed quickly (in less than 10 seconds) to prevent coil from burning.



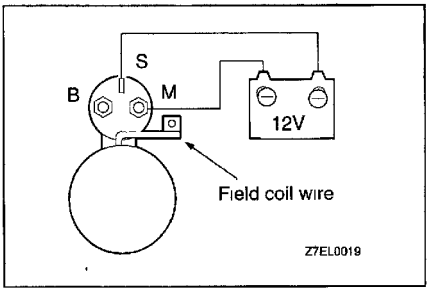
(4) Check pinion to stopper clearance (pinion gap) with a feeler gauge.

Pinion gap: 0.5–2.0 mm (.020–.079 in.)



(5) If pinion gap is out of specification, adjust by adding or removing gaskets between magnetic switch and front bracket.

TSB Revision

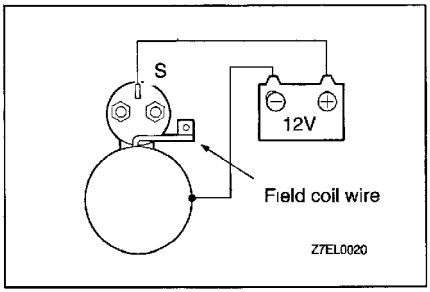


MAGNETIC SWITCH PULL-IN TEST

(1) Disconnect field coil wire from M-terminal of magnetic switch.
(2) Connect a 12V battery between S-terminal and M-terminal.

Caution
This test must be performed quickly (in less than 10 seconds) to prevent coil from burning.

(3) If pinion moves out, then pull-in coil is good. If it doesn't, replace magnetic switch.

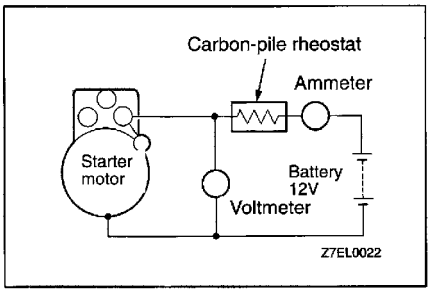


MAGNETIC SWITCH HOLD-IN TEST

(1) Disconnect field coil wire from M-terminal of magnetic switch.
(2) Connect a 12V battery between S-terminal and body.

Caution
This test must be performed quickly (in less than 10 seconds) to prevent coil from burning.

(3) Pull the pinion by hand until it hits against the piston stopper.
(4) If pinion remains out, everything is in order. If pinion moves in, hold-in circuit is open. Replace magnetic switch.



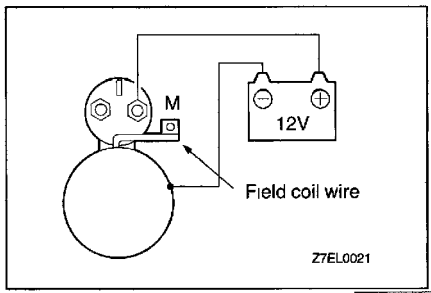
FREE RUNNING TEST

(1) Place starter motor in a vise equipped with soft jaws and connect a fully-charged 12-volt battery to starter motor as follows:
(2) Connect a test ammeter (100-ampere scale) and carbon pile rheostat in series with battery positive post and starter motor terminal.
(3) Connect a voltmeter (15-volt scale) across starter motor.
(4) Rotate carbon pile to full-resistance position.
(5) Connect battery cable from battery negative post to starter motor body.
(6) Adjust the rheostat until the battery voltage shown by the voltmeter is 11.5V (for the direct-drive type) or 11V (for the reduction-drive type).
(7) Confirm that the maximum amperage is within the specifications and that the starter motor turns smoothly and freely.

Current:
max. 60 Amps (Direct drive type)
max. 90 Amps (Reduction drive type)

MAGNETIC SWITCH RETURN TEST

(1) Disconnect field coil wire from M-terminal of magnetic switch.



(2) Connect a 12V battery between M-terminal and body.

Caution
This test must be performed quickly (in less than 10 seconds) to prevent coil from burning.

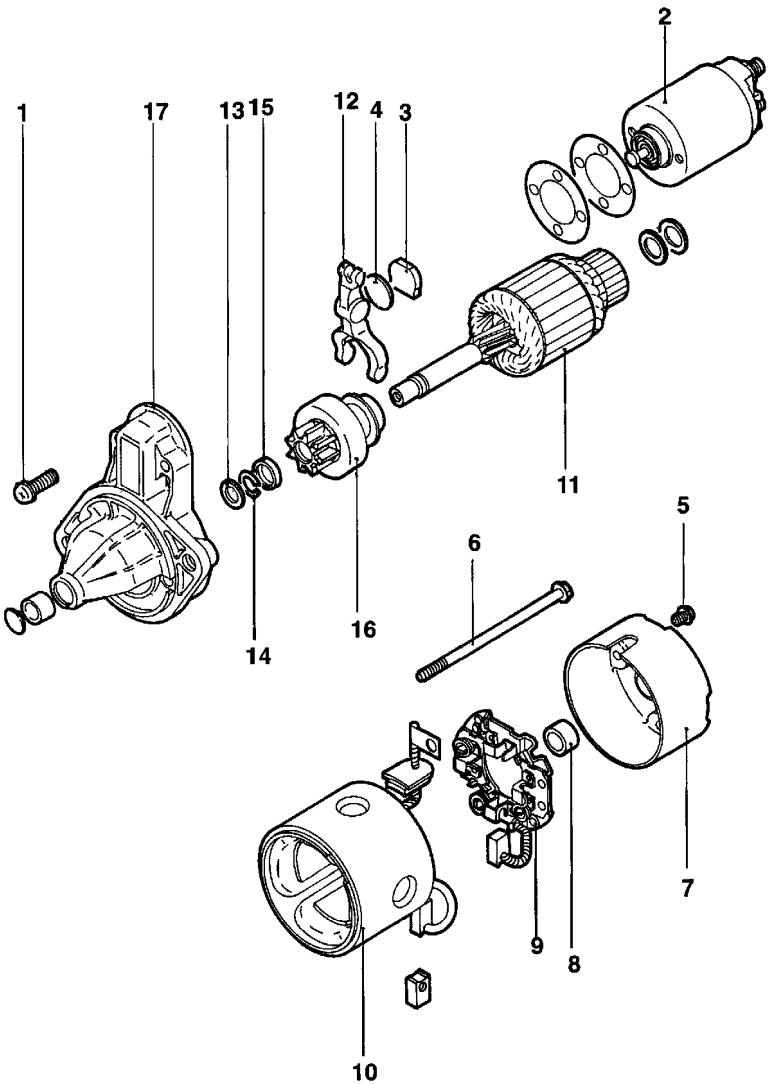
(3) Pull pinion out and release. If pinion quickly returns to its original position, everything is in order. If it doesn't, replace magnetic switch.

Caution
When pulling out the piston, use care not to have your finger pinched.

TSB Revision

DISASSEMBLY AND REASSEMBLY <DIRECT DRIVE TYPE>

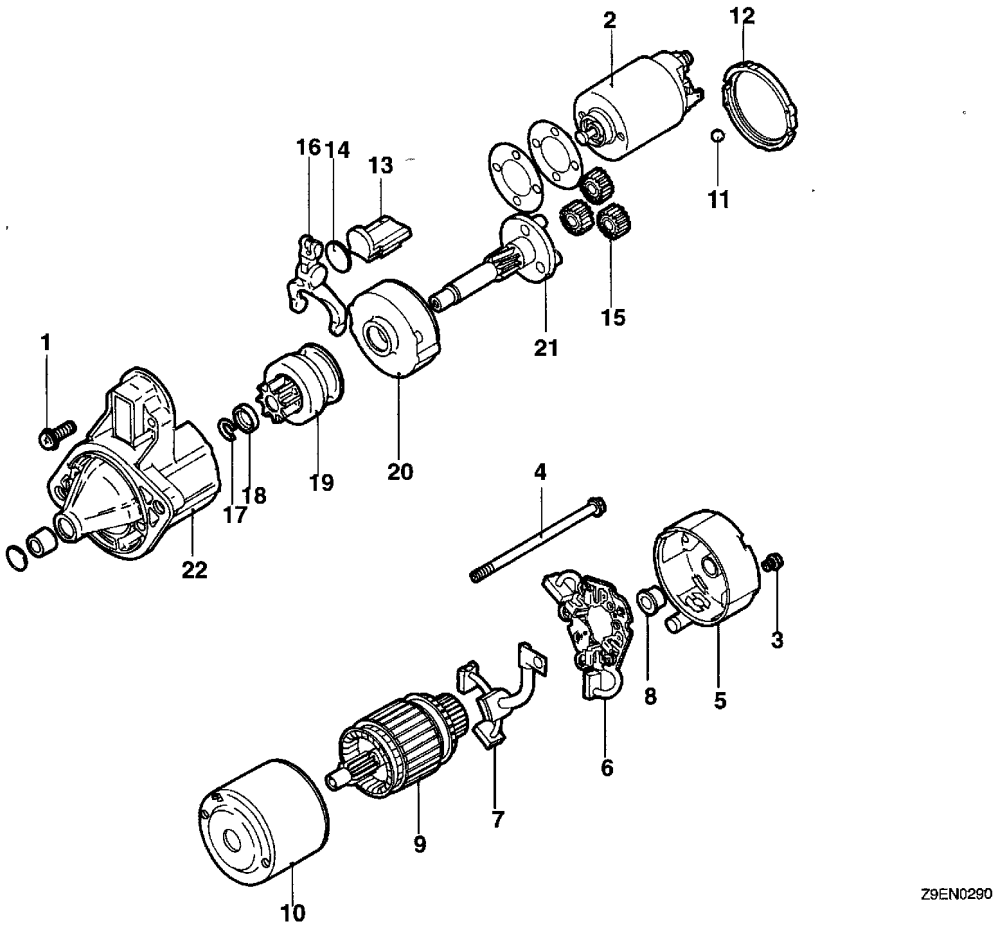
110003679



Disassembly steps

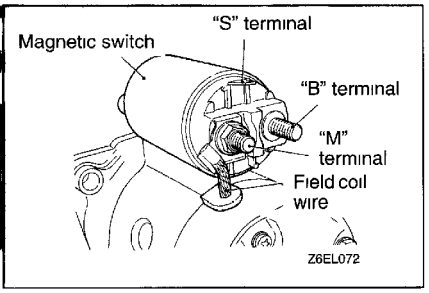
1. Screw
◀A▶ 2. Magnetic switch
3. Packing
4. Plate
5. Screw
6. Through bolt
7. Rear bracket
8. Rear bearing
9. Brush holder assembly
10. Yoke assembly
11. Armature
12. Lever
13. Washer
◀C▶ ▶A◀ 14. Snap ring
◀C▶ ▶A◀ 15. Stop ring
16. Overrunning clutch
17. Front bracket

DISASSEMBLY AND REASSEMBLY <REDUCTION DRIVE TYPE>



Disassembly steps

1. Screw
◀A▶ 2. Magnetic switch
3. Screw
4. Screw
5. Rear bracket
6. Brush holder
7. Brush
8. Rear bearing
◀B▶ 9. Armature
10. Yoke assembly
◀B▶ 11. Ball
12. Packing A
13. Packing B
14. Plate
15. Planetary gear
16. Lever
◀C▶ ▶A◀ 17. Snap ring
◀C▶ ▶A◀ 18. Stop ring
19. Overrunning clutch
20. Internal gear
21. Planetary gear holder
22. Front bracket



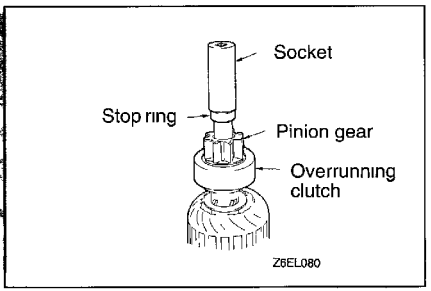
DISASSEMBLY SERVICE POINTS

◀A▶ MAGNETIC SWITCH REMOVAL

Disconnect field coil wire from "M" terminal of magnetic switch.

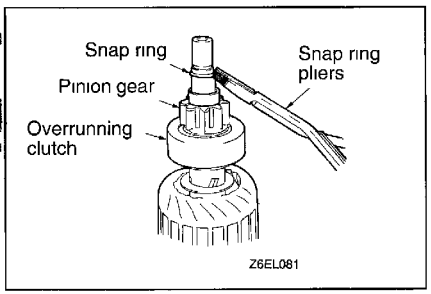
◀B▶ ARMATURE / BALL REMOVAL

Caution
When removing the armature, take care not to lose the ball (which is used as a bearing) in the armature end.



◀C▶ SNAP RING / STOP RING REMOVAL

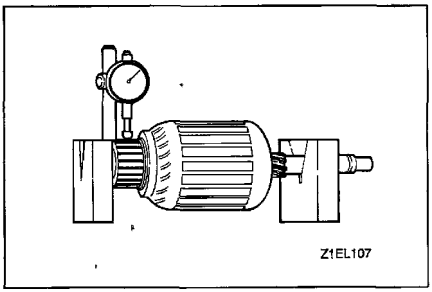
(1) Press stop ring off snap ring with a suitable socket.



(2) Remove snap ring with snap ring pliers and then remove stop ring and overrunning clutch.

STARTER MOTOR PARTS CLEANING

1. Do not immerse parts in cleaning solvent. Immersing the yoke and field coil assembly and/or armature will damage insulation. Wipe these parts with a cloth only.
2. Do not immerse drive unit in cleaning solvent. Overrunning clutch is pre-lubricated at the factory and solvent will wash lubrication from clutch.
3. The drive unit may be cleaned with a brush moistened with cleaning solvent and wiped dry with a cloth.


Z1EL107

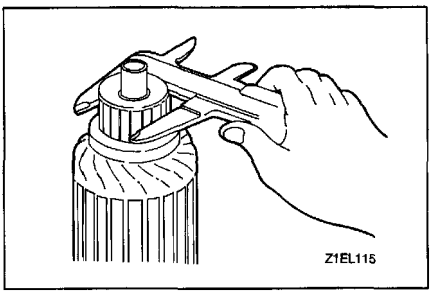
INSPECTION

COMMUTATOR

(1) Place the armature in a pair of "V" blocks and check the runout with a dial indicator.

Standard value: 0.05 mm (.002 in.)

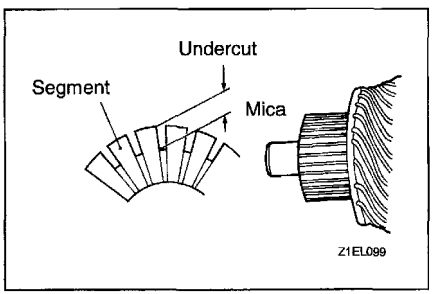
Limit: 0.1 mm (.004 in.)


Z1EL115

(2) Measure the commutator outer diameter.

Standard value: 32.0 mm (1.260 in.)

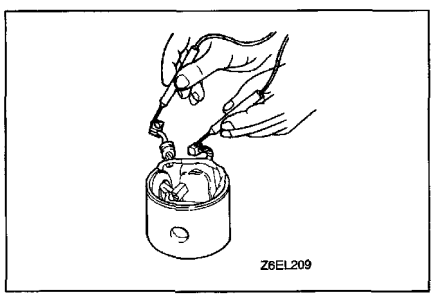
Limit: 31.0 mm (1.220 in.)



Z1EL099

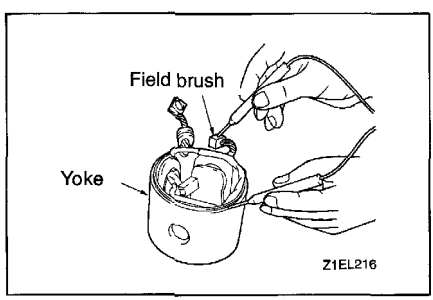
(3) Check the undercut depth between segments.

Standard value: 0.5 mm (.020 in.)


Z6EL209

FIELD COIL OPEN-CIRCUIT TEST (Direct drive type only)

Check the continuity between field brushes. If there is continuity, the field coil is in order.

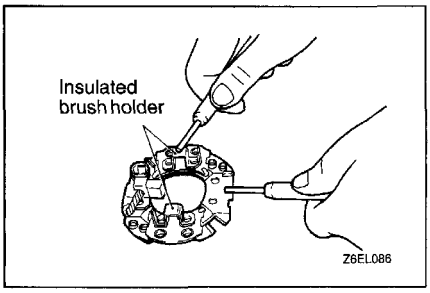


Z1EL216

FIELD COIL GROUND TEST (Direct drive type only)

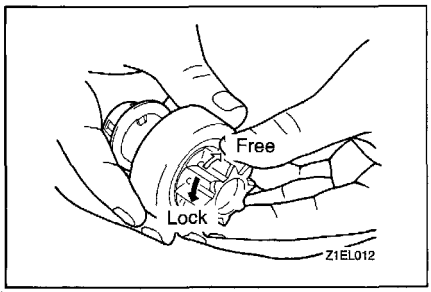
Check the continuity between field coil brush and yoke. If there is no continuity, the field coil is free from grounding.

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BRUSH HOLDER

Check the continuity between brush holder plate and brush holder.
If there is no continuity, the brush holder is in order.

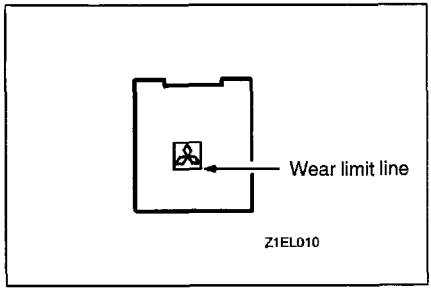


OVERRUNNING CLUTCH

1. While holding clutch housing, rotate the pinion. Drive pinion should rotate smoothly in one direction, but should not rotate in opposite direction. If clutch does not function properly, replace overrunning clutch assembly.
2. Inspect pinion for wear or burrs. If pinion is worn or burred, replace overrunning clutch assembly. If pinion is damaged, also inspect ring gear for wear or burrs.

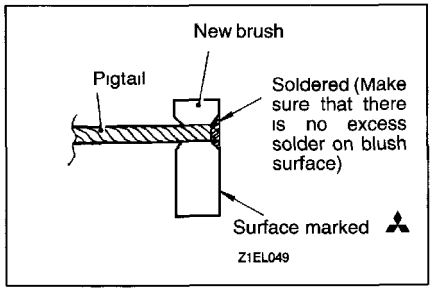
FRONT AND REAR BRACKET BUSHING

Inspect bushing for wear or burrs. If bushing is worn or burred, replace front bracket assembly or rear bracket assembly.



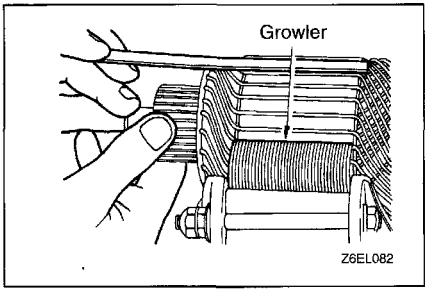
BRUSH AND SPRING REPLACEMENT

1. Brushes that are worn beyond wear limit line, or are oil-soaked, should be replaced.
2. When replacing field coil brushes, crush worn brush with pliers, taking care not to damage pigtail.



3. Sand pigtail end with sandpaper to ensure good soldering.
4. Insert pigtail into hole provided in new brush and solder it.
   Make sure that pigtail and excess solder do not come out onto brush surface.
5. When replacing ground brush, slide the brush from brush holder by prying retaining spring back.

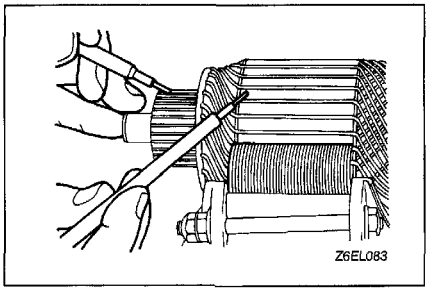
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ARMATURE TEST

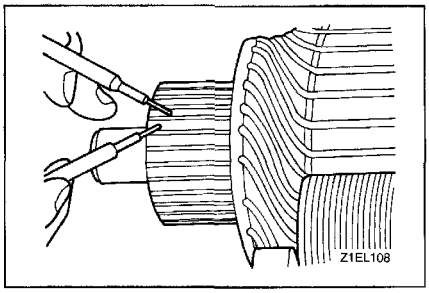
ARMATURE SHORT-CIRCUIT TEST

1. Place armature in a growler.
2. Hold a thin steel blade parallel and just above while rotating armature slowly in growler. A shorted armature will cause blade to vibrate and be attracted to the core. Replace shorted armature.



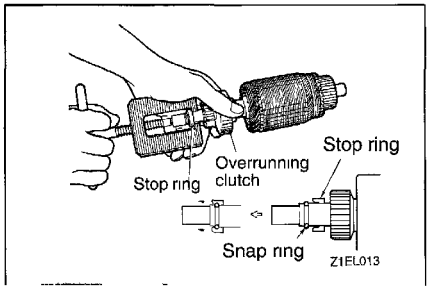
ARMATURE COIL GROUND TEST

Check the insulation between each commutator segment and armature coil core.
If there is no continuity, the insulation is in order.



ARMATURE COIL OPEN-CIRCUIT INSPECTION

Check the continuity between segments. If there is continuity, the coil is in order.



REASSEMBLY SERVICE POINTS

▶A◀ STOP RING / SNAP RING INSTALLATION

Using a suitable pulling tool, pull overrunning clutch stop ring over snap ring.

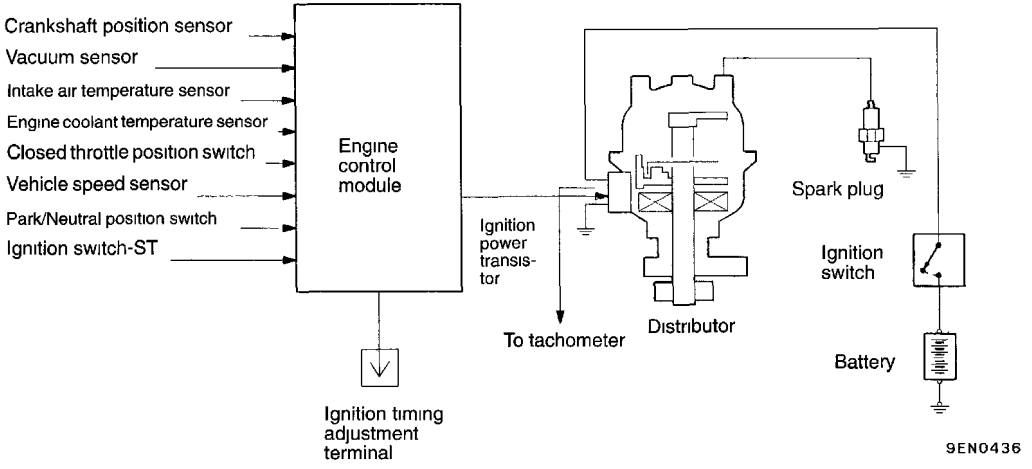
IGNITION SYSTEM

GENERAL INFORMATION

110003680

Interruption of the primary current flowing in the primary side of the ignition coil generates high voltage in the secondary side of the ignition coil. The high voltage thus generated is directed by the distributor to the applicable spark plug. The engine firing order is 1–3–4–2 cylinders.
On application of high voltage, the spark plug generates a spark to ignite the compressed air fuel mixture in the combustion chamber.
The engine control module makes and breaks the primary current of the ignition coil to regulate the ignition timing.

The engine control module detects the crankshaft position by the crankshaft position sensor incorporated in the distributor to provide ignition at the most appropriate timing for the engine operating condition.
When the engine is cold or operated at a high altitude, the ignition timing is slightly advanced to provide optimum performance to the operating condition.



SPECIFICATIONS

DISTRIBUTOR

Items	1.5L Engine (Except from 1996 models and 1995 models for California)	1.5L Engine (From 1996 models and 1995 models for California)
Type	With a built-in crankshaft position sensor and ignition coil	With a built-in ignition coil
Identification No.	T6T57171	T6T58771
Ignition timing control	Controlled by engine control module	Controlled by engine control module
Firing order	1-3-4-2	1-3-4-2

Items	1.8L Engine (Except from 1996 models and 1995 models for California)	1.8L Engine (From 1996 models and 1995 models for California)
Type	With a built-in crankshaft position sensor and ignition coil	With a built-in ignition coil
Identification No.	T6T57671	T6T58571
Ignition timing control	Controlled by engine control module	Controlled by engine control module
Firing order	1-3-4-2	1-3-4-2

IGNITION COIL

Items	1.5L Engine	1.8L Engine
Type	Mold single-coil with a built-in distributor	Mold single-coil with a built-in distributor

SPARK PLUG

Manufacturer	1.5L Engine	1.8L Engine
NGK	BPR5ES-11	BKR5E-11
NIPPON DENSO	W16EPR-11	K20PR-U11
CHAMPION	RN11YC4	–

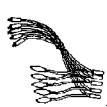
SERVICE SPECIFICATIONS

110003681

Items		Standard value	Limit
Ignition coil	Primary coil resistance at 20°C (68°F) Ω	0.9 – 1.2	–
	Secondary coil resistance at 20°C (68°F) kΩ	20 – 29	–
Spark plug gap mm (in.)		1.0 – 1.1 (.039 – .043)	–
Spark plug cable resistance kΩ		–	Max. 22

SPECIAL TOOL

110003682

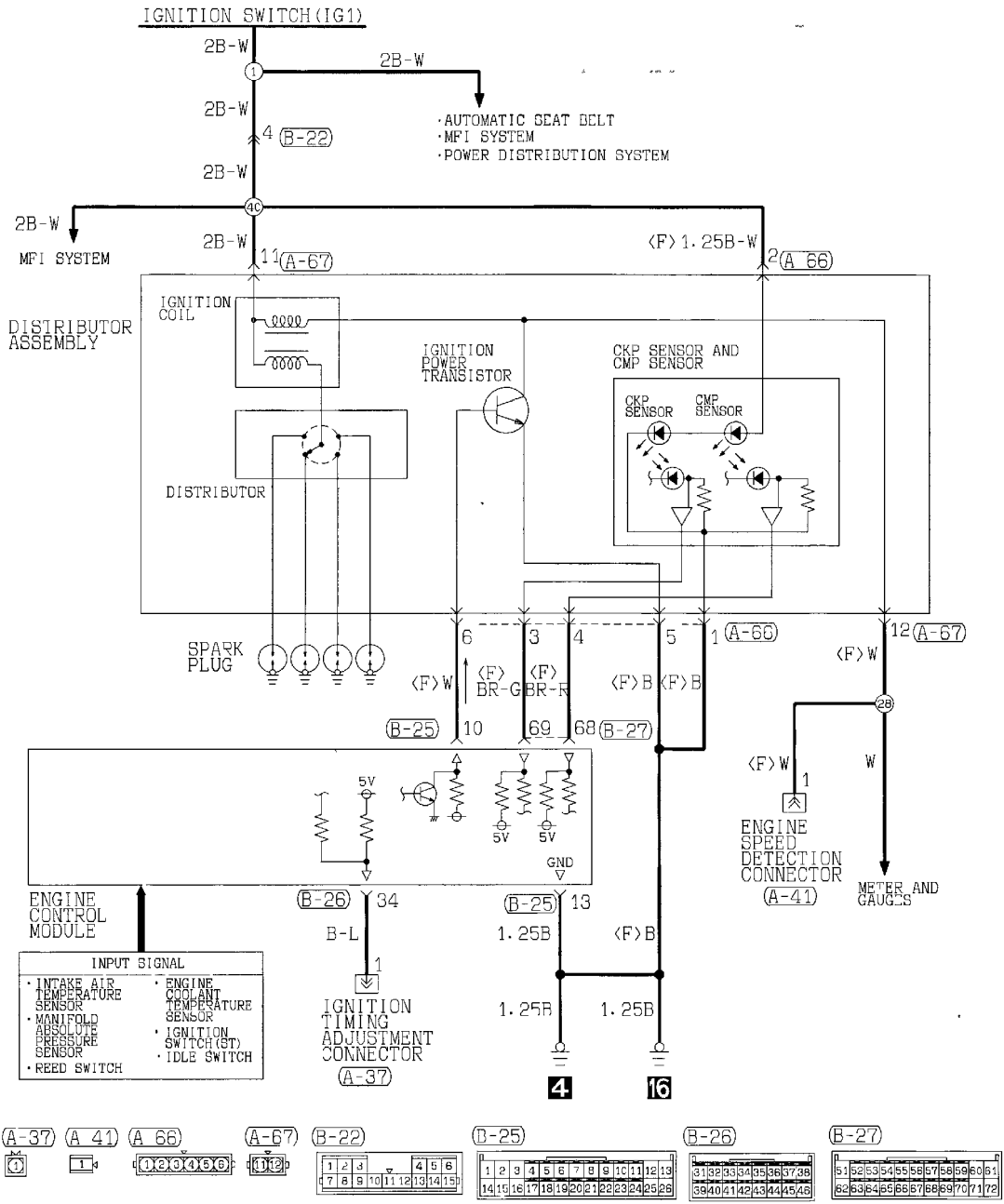
Tool	Tool number and name	Supersession	Application
 ZMB991348	MB991348 Test harness set	Tool not available	Inspection by analyzer

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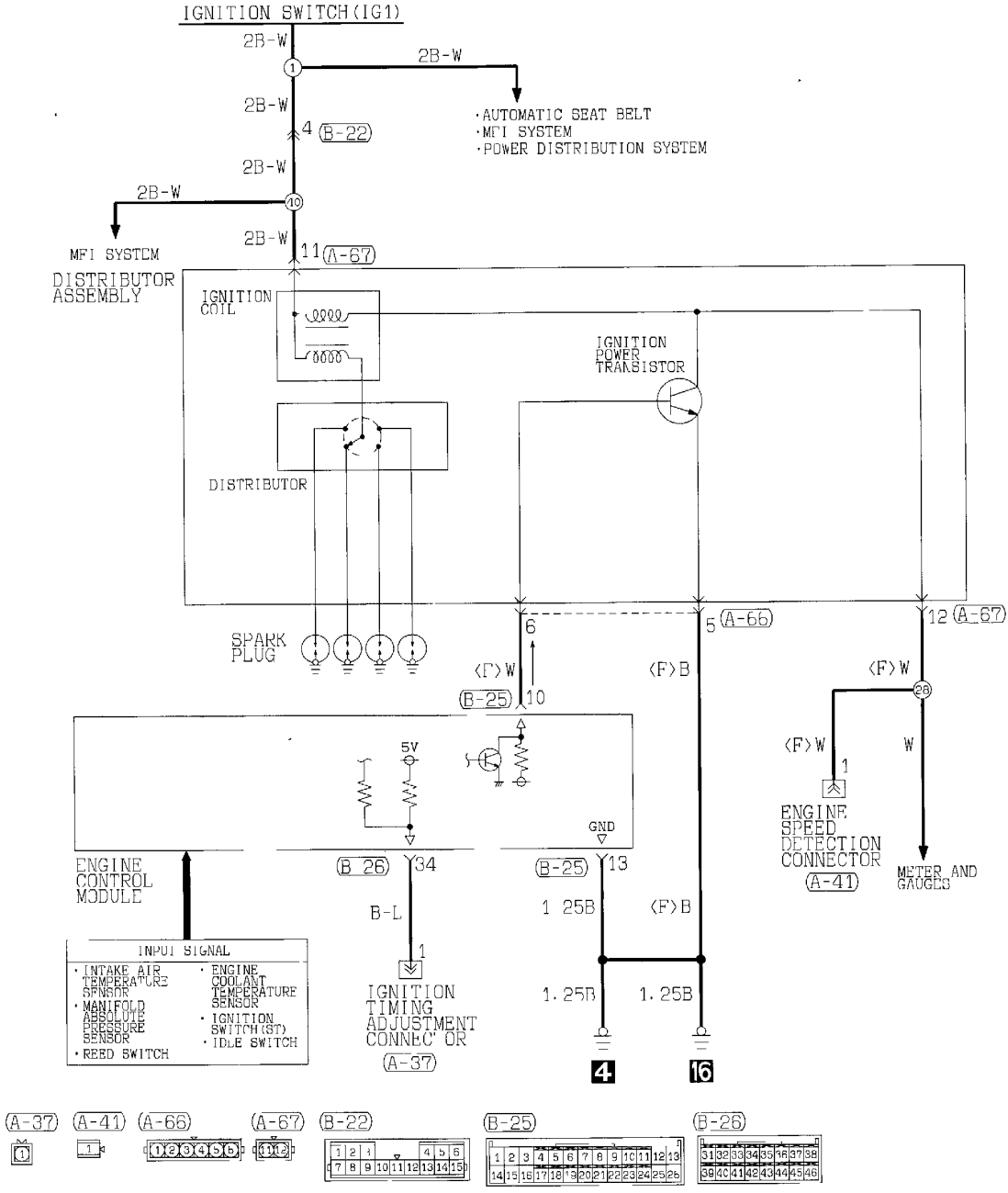
TROUBLESHOOTING

110003683

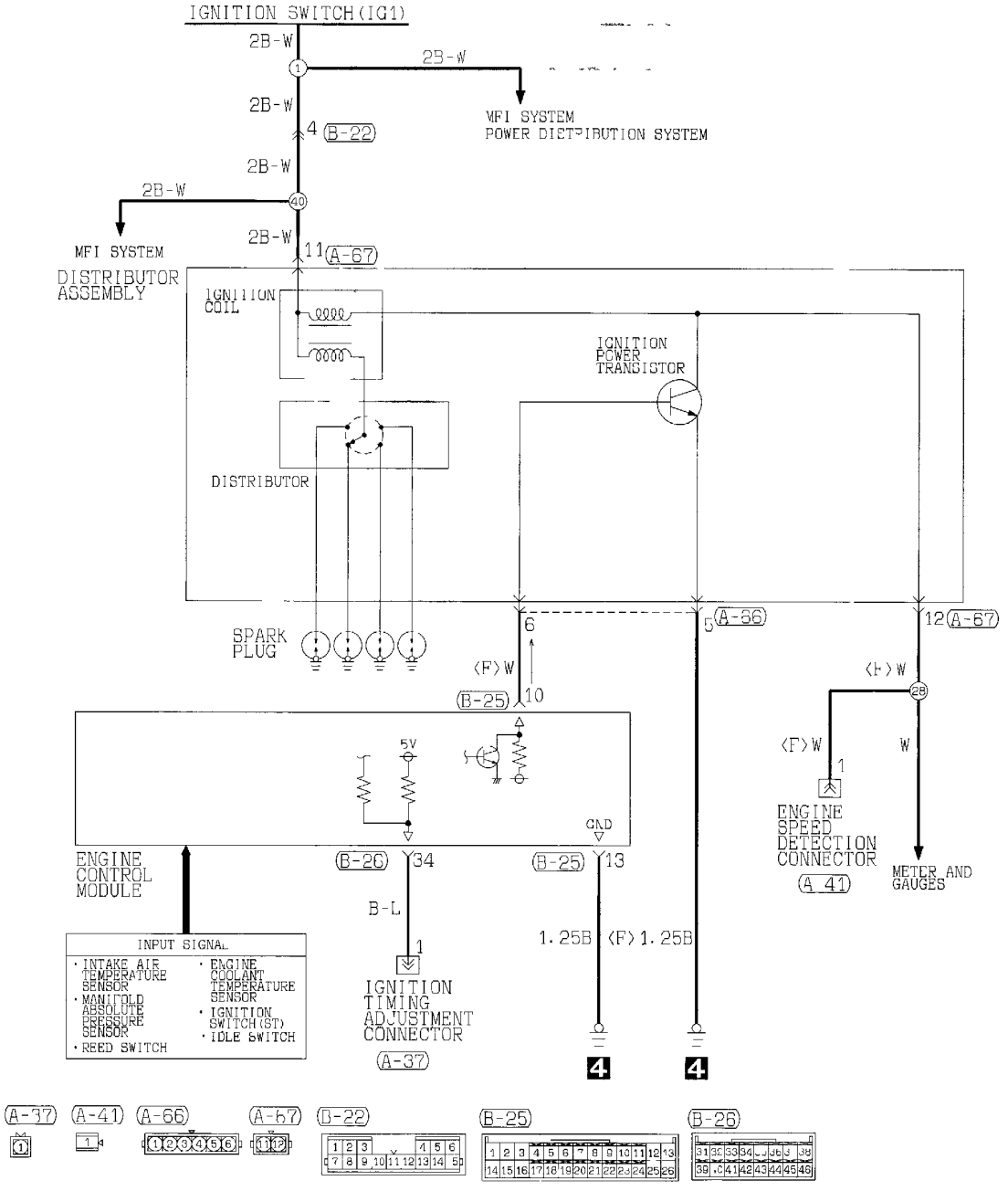
CIRCUIT DIAGRAM <1.5L ENGINE (1993 MODELS)>



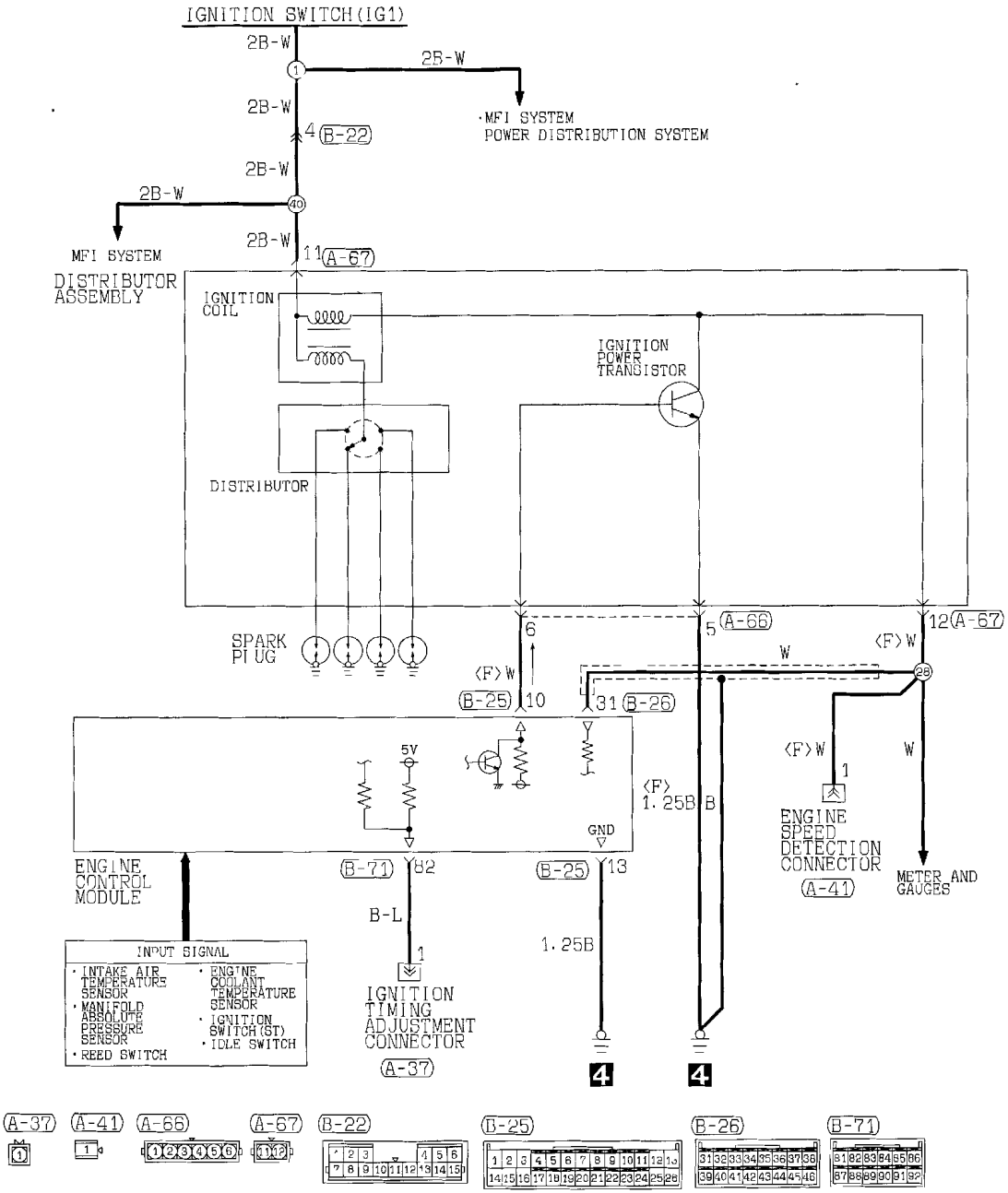
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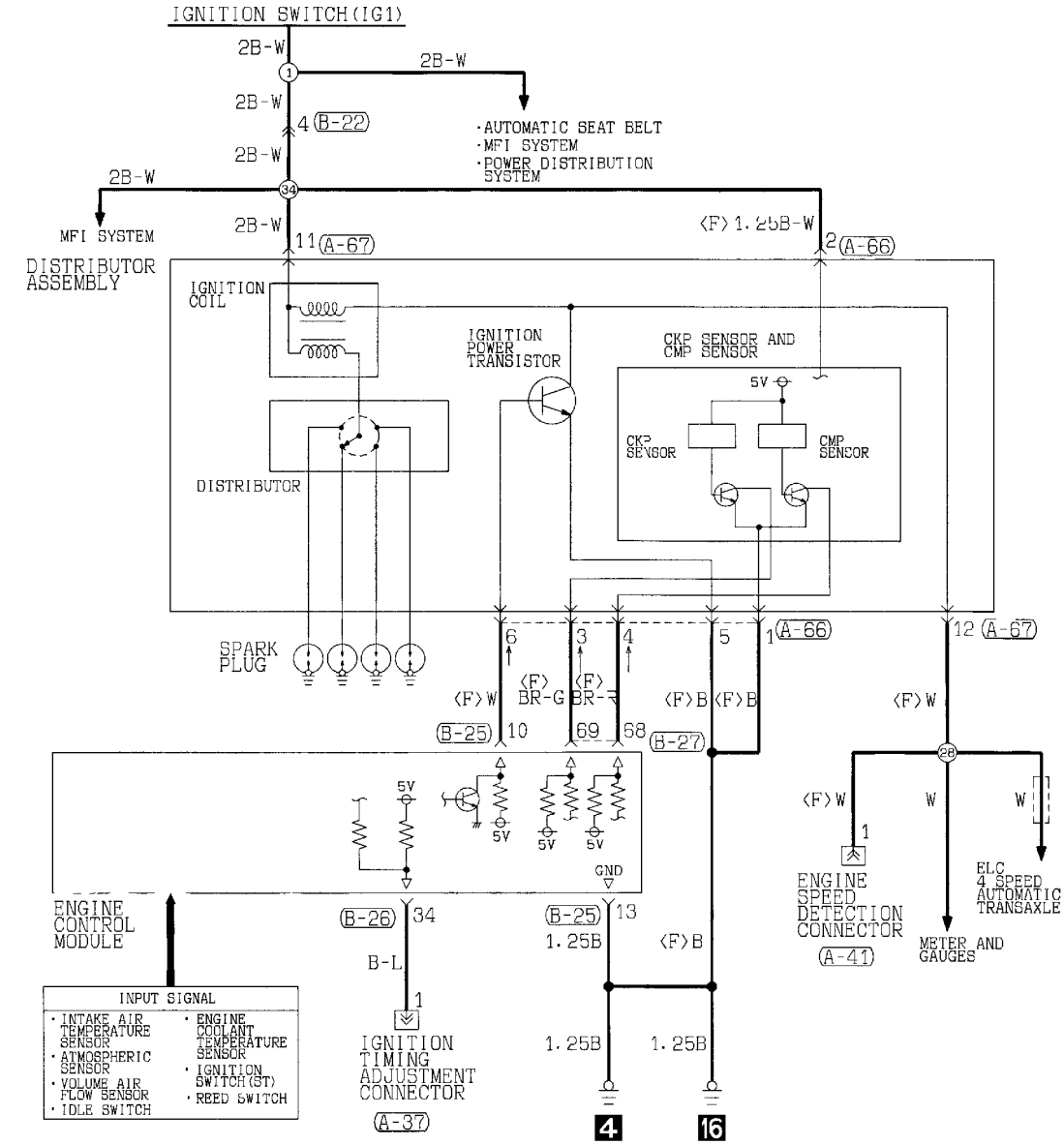
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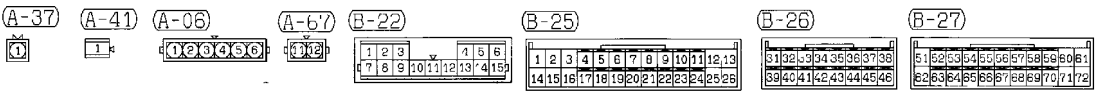


<1.5L ENGINE (1995 MODELS FOR CALIFORNIA AND FROM 1996 MODELS)>

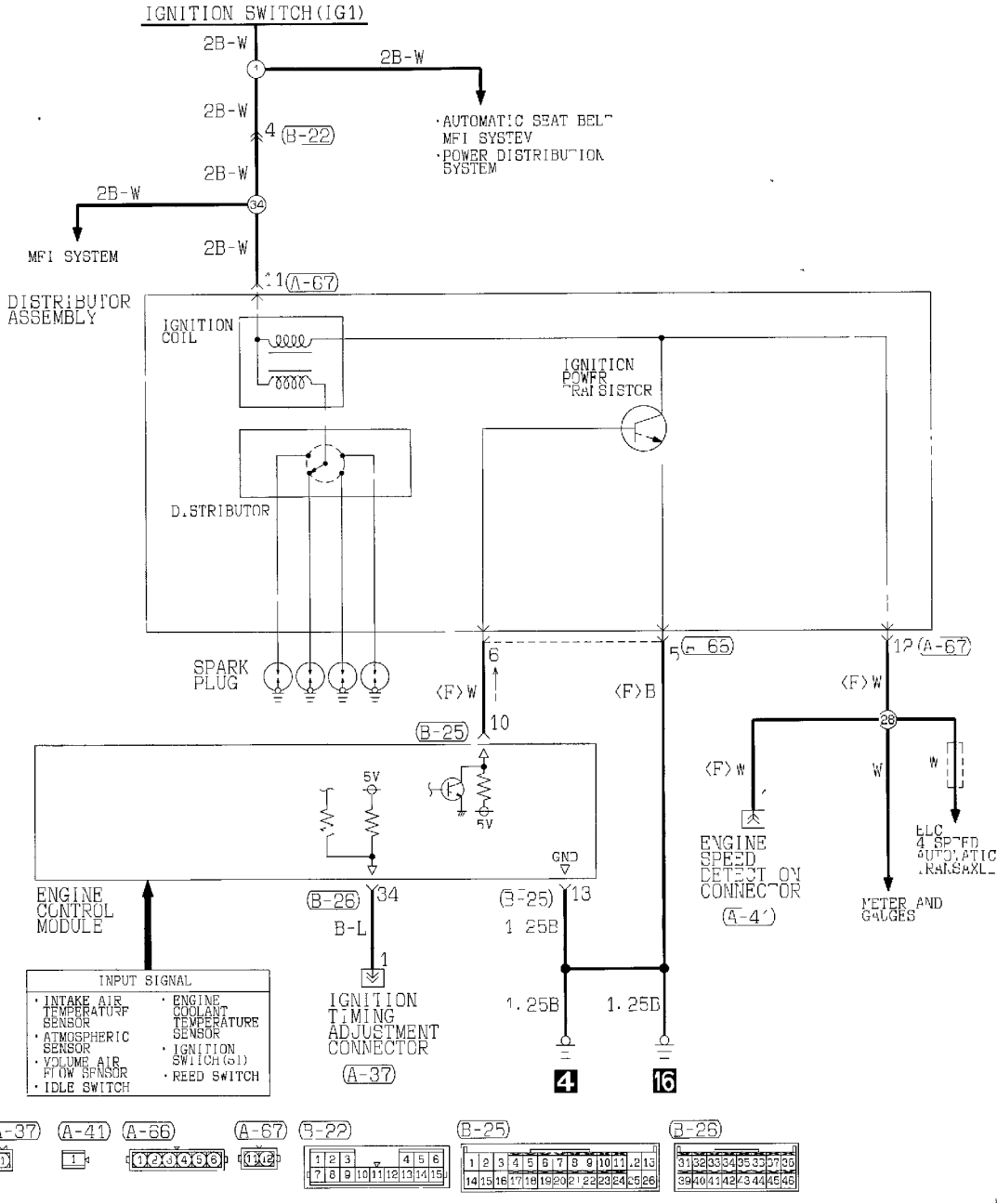


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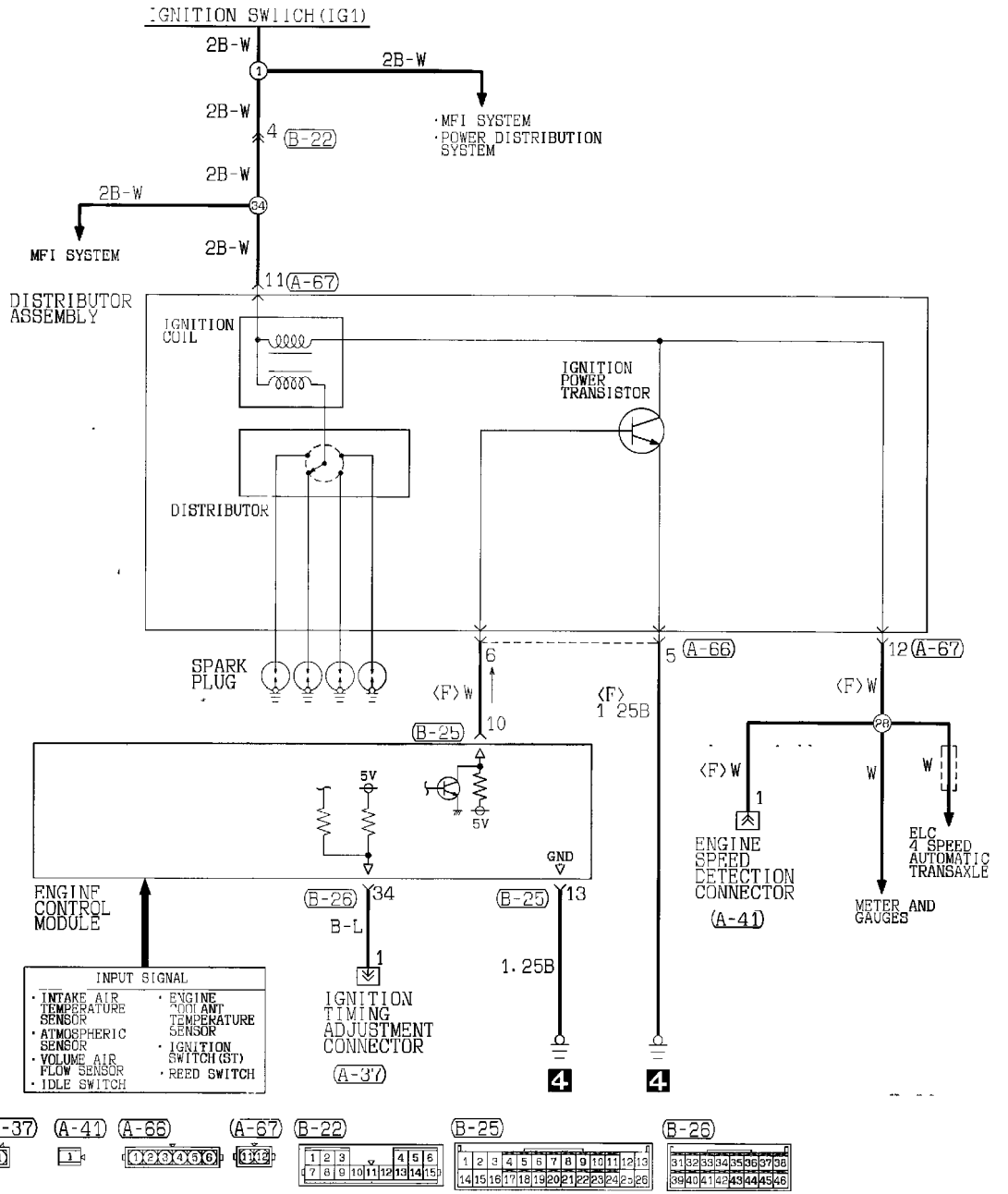




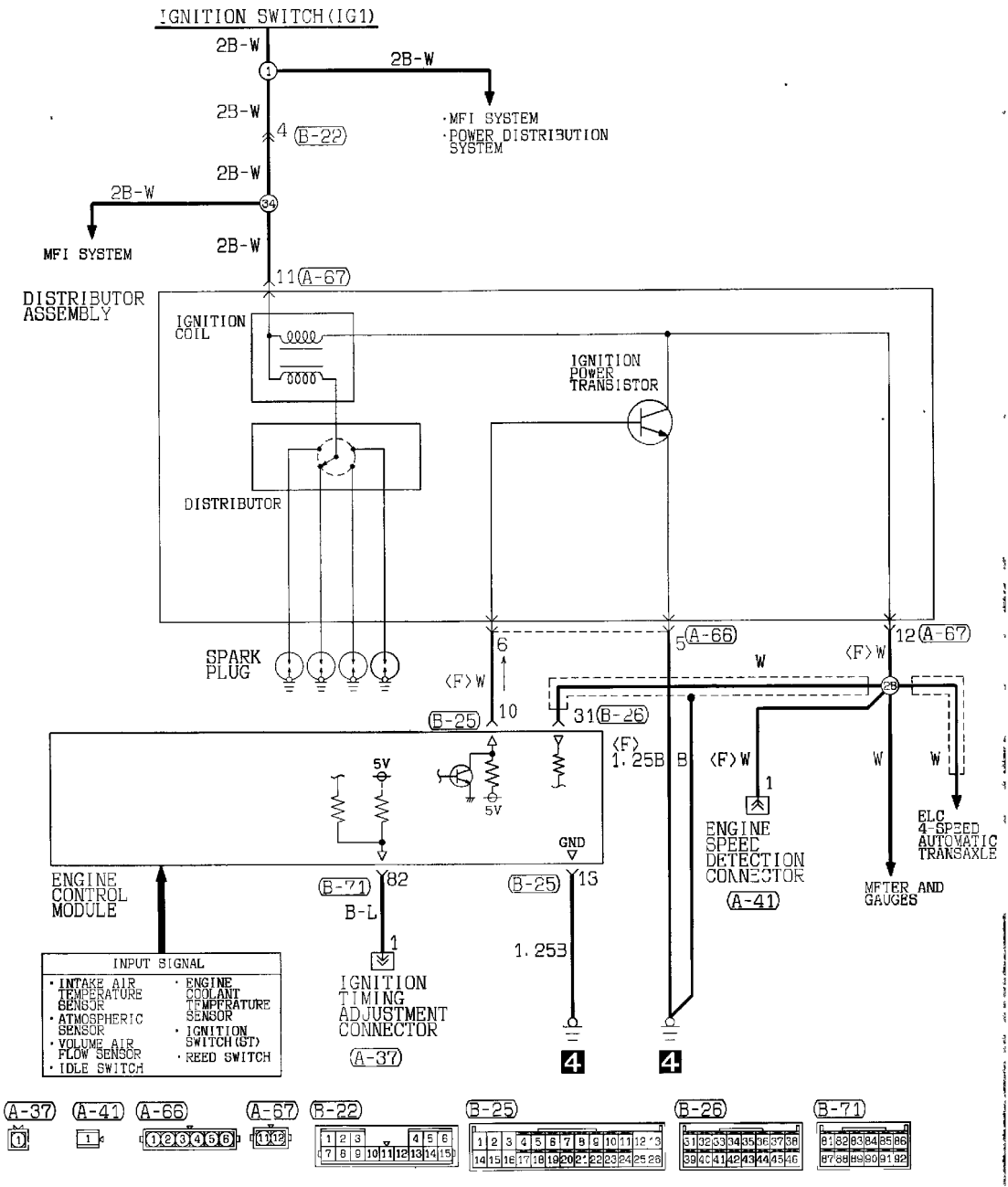
<1.8L ENGINE (1994 MODELS)>



<1.8L ENGINE (1995 MODELS FOR FEDERAL)>



<1.8L ENGINE (1995 MODELS FOR CALIFORNIA AND FROM 1996 MODELS)>



OPERATION

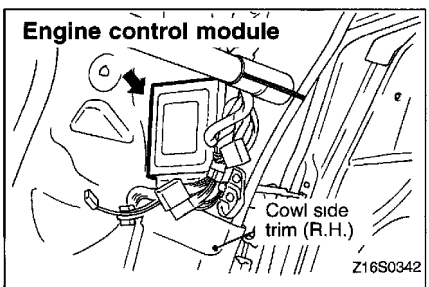
- Turn ignition switch to "ON" position, and battery voltage will be applied to primary winding of ignition coil.
- When crankshaft position sensor signal is input to engine control module, engine control module makes ON-OFF control of ignition power transistors one by one.
- When ignition power transistor is turned on, current flows from ignition coil (primary winding) to ground through ignition power transistor.

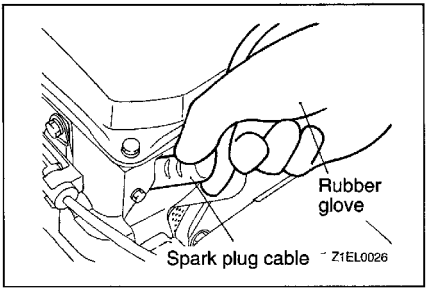
TROUBLESHOOTING HINTS

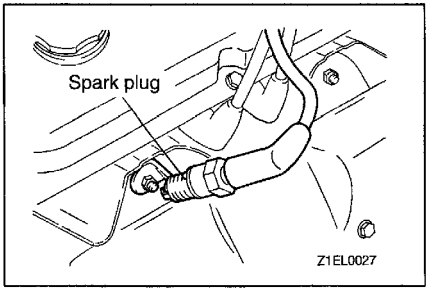
1. Engine cranks, but does not start.
   (1) Spark is insufficient or does not occur at all (on spark plug).
   - Check ignition coil.
   - Check crankshaft position sensor (with a built-in distributor).
   - Check ignition power transistor.
   - Check spark plugs.
   - Check spark plug cable.

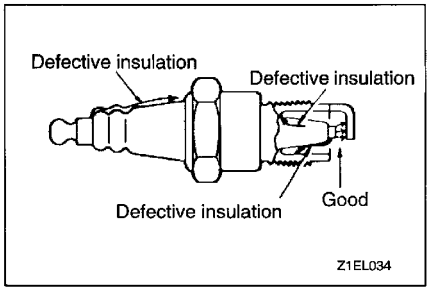
   (2) Spark is good.
   - Check ignition timing.
2. Engine idles roughly or stalls.
   - Check spark plugs.
   - Check ignition timing.
   - Check ignition coil.
   - Check spark plug cable.
3. Poor acceleration
   - Check ignition timing.
   - Check spark plug cable.
   - Check ignition coil.

COMPONENT LOCATION









SERVICE ADJUSTMENT PROCEDURES

SPARK PLUG CABLE TEST 110003684

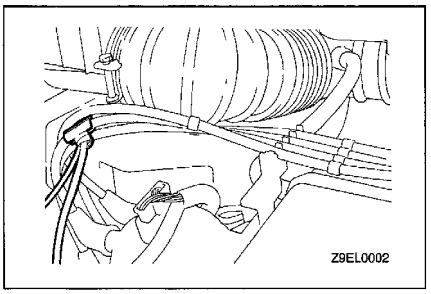
(1) Disconnect, one at a time, each of the spark plug cables while the engine is idling to check whether the engine's running performance changes or not.

Caution
Wear rubber gloves while doing so.

(2) If the engine performance does not change, check the resistance of the spark plug cable, and check the spark plug itself.

SPARK PLUG TEST 110003685

(1) Remove the spark plug and connect to the spark plug cable.
(2) Ground the spark plug outer electrode (body), and crank the engine.
Check to be sure that there is an electrical discharge between the electrodes at this time.

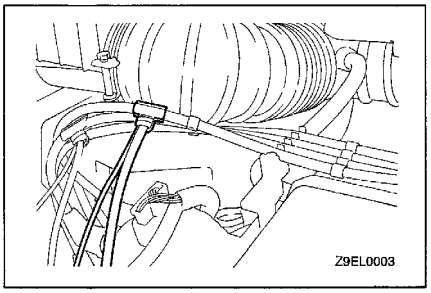


IGNITION SECONDARY VOLTAGE WAVE-FORM INSPECTION

110003686

MEASUREMENT METHOD

(1) Clamp the spark plug cable (No.1, No.2, No.3 or No.4) with the secondary pickup.

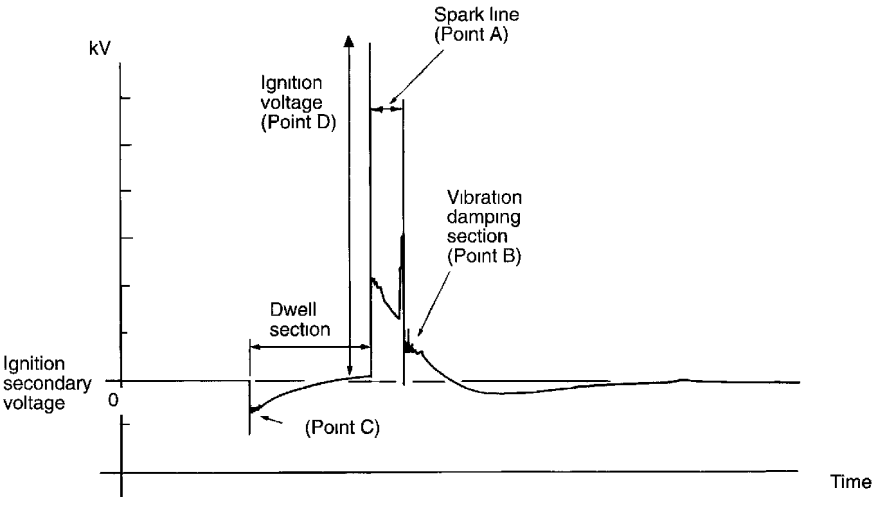


(2) Clamp the No.1 cylinder spark plug cable with the trigger pickup.

STANDARD WAVE-FORM

Observation Conditions

FUNCTION	SECONDARY
PATTERN HEIGHT	HIGH (or LOW)
PATTERN SELECTOR	RASTER
Engine speed	Curb idle speed



Z7EL0128

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WAVE-FORM OBSERVATION POINTS

Point A: The height, length and slope of the spark line (refer to abnormal wave-form examples 1, 2, 3 and 4) show the following trends.

Spark line		Plug gap	Condition of electrode	Compression force	Concentration of air mixture	Ignition timing	Spark plug cable
Length	Long	Small	Normal	Low	Rich	Advanced	Leak
	Short	Large	Large wear	High	Lean	Retarded	High resistance
Height	High	Large	Large wear	High	Lean	Retarded	High resistance
	Low	Small	Normal	Low	Rich	Advanced	Leak
Slope		Large	Plug is fouled	–	–	–	–

Point B: Number of vibrations in reduction vibration section (Refer to abnormal wave-form example 5)

Number of vibrations	Coil and condenser
Three or more	Normal
Except above	Abnormal

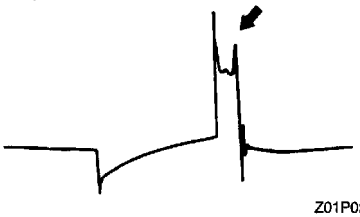
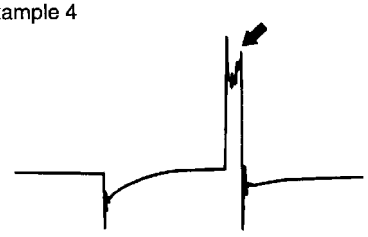
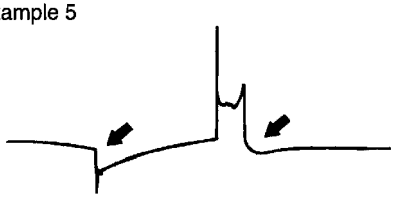
Point C: Number of vibrations at beginning of dwell section (Refer to abnormal wave-form example 5)

Number of vibrations	Coil
5 – 6 or higher	Normal
Except above	Abnormal

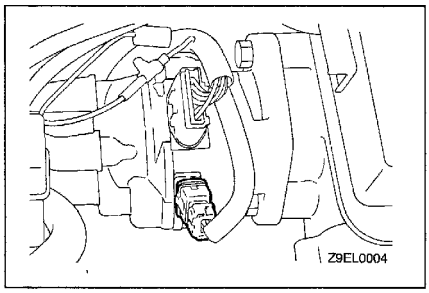
Point D: Ignition voltage height (distribution per each cylinder) shows the following trends.

Ignition voltage	Plug gap	Condition of electrode	Compression force	Concentration of air mixture	Ignition timing	Spark plug cable
High	Large	Large wear	High	Lean	Retarded	High resistance
Low	Small	Normal	Low	Rich	Advanced	Leak

ABNORMAL WAVE-FORMS EXAMPLES

Abnormal wave-form	Wave characteristics	Cause of problem
Example 1  Z01P0215	Spark line is high and short.	Spark plug gap is too large.
Example 2  Z01P0216	Spark line is low and long, and is sloping. Also, the second half of the spark line is distorted. This could be a result of misfiring.	Spark plug gap is too small.
Example 3  Z01P0217	Spark line is low and long, and is sloping. However, there is almost no spark line distortion.	Spark plug gap is fouled.
Example 4  Z01P0218	Spark line is high and short. Difficult to distinguish between this and abnormal wave-form example 1.	Spark plug cable is nearly falling off. (Causing a dual ignition)
Example 5  Z01P0219	No waves in wave damping section.	Rare short in ignition coil.

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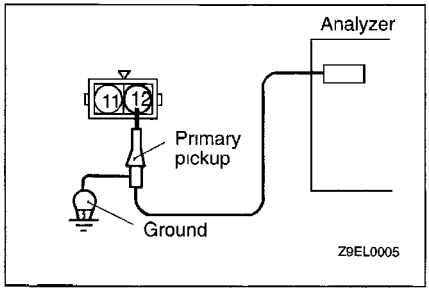


IGNITION PRIMARY VOLTAGE WAVE-FORM CHECK

110003687

MEASUREMENT METHOD

(1) Disconnect the distributor 2 pin connector and connect the special tool (test harness: MB991348) in between. (All of the terminals should be connected.)



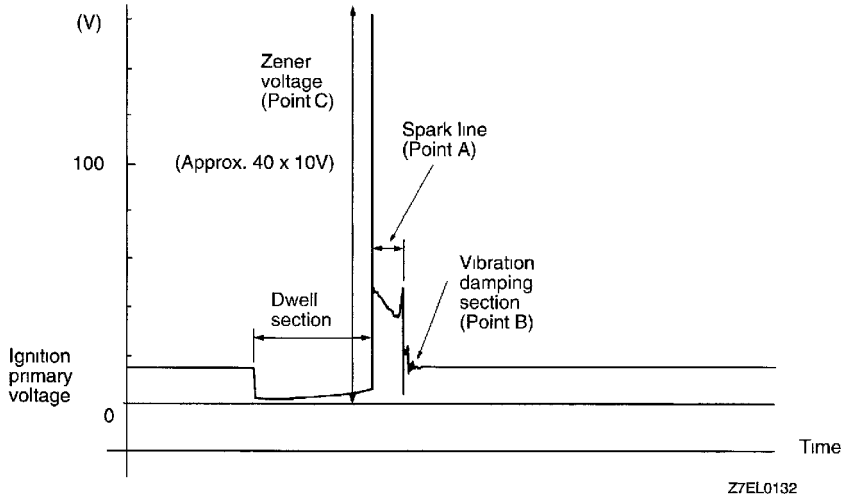
(2) Connect the analyzer primary pickup to the distributor connector terminal 12.
(3) Connect the primary pickup ground terminal.
(4) Clamp the spark plug cable with the trigger pickup.

NOTE
The wave pattern of the cylinder clamped to the trigger pickup will appear at the left edge of the screen.

STANDARD WAVE-FORM

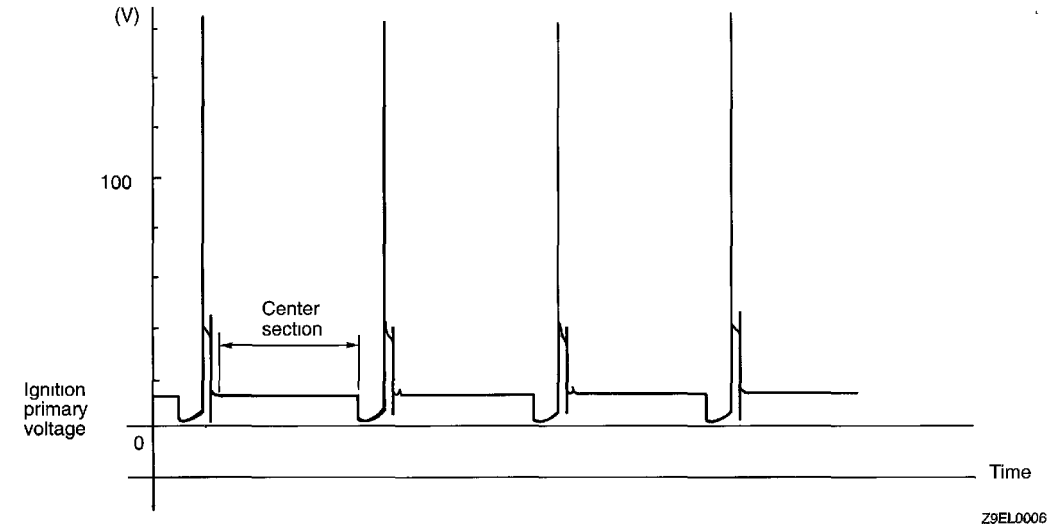
Observation Conditions

FUNCTION	PRIMARY
PATTERN HEIGHT	HIGH (or LOW)
PATTERN SELECTOR	RASTER
Engine speed	Curb idle speed



Observation conditions (Only the pattern selector shown below changes from the previous conditions)

PATTERN SELECTOR	DISPLAY



WAVEFORM OBSERVATION POINTS

Point A: The height, length and slope of the spark line (refer to abnormal wave-form examples 1, 2, 3 and 4) show the following trends.

Spark line		Plug gap	Condition of electrode	Compression force	Concentration of air mixture	Ignition timing	High tension cable
Length	Long	Small	Normal	Low	Rich	Advanced	Leak
	Short	Large	Large wear	High	Lean	Retarded	High resistance
Height	High	Large	Large wear	High	Lean	Retarded	High resistance
	Low	Small	Normal	Low	Rich	Advanced	Leak
Slope		Large	Plug is fouled	–	–	–	–

Point B: Number of vibrations in reduction vibration section (Refer to abnormal wave-form example 5)

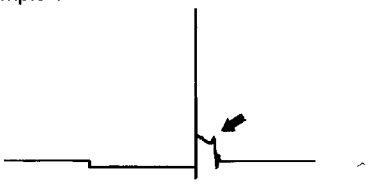
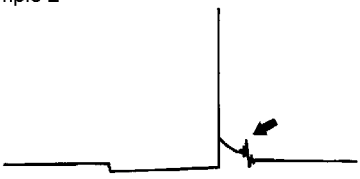
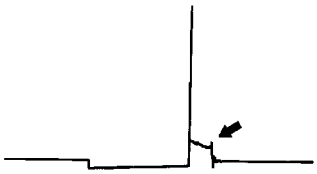
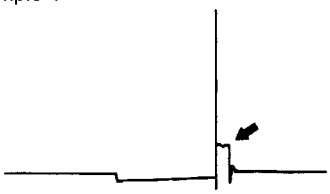
Number of vibrations	Coil and condenser
3 or higher	Normal
Except above	Abnormal

Point C: Height of Zener voltage

Height of Zener voltage	Probable cause
Higher	Problem in Zener diode
Lower	Abnormal resistance in primary coil circuit

TSB Revision

ABNORMAL WAVE-FORMS EXAMPLES

Abnormal wave-form	Wave characteristics	Cause of problem
Example 1  Z01P0210	Spark line is high and short.	Spark plug gap is too large.
Example 2  Z01P0211	Spark line is low and long, and is sloping. Also, the second half of the spark line is distorted. This could be a result of misfiring.	Spark plug gap is too small.
Example 3  Z01P0212	Spark line is low and long, and is sloping. However, there is almost no spark line distortion.	Spark plug gap is fouled.
Example 4  Z01P0213	Spark line is high and short.	Spark plug cable is nearly falling off. (Causing a dual ignition)
Example 5  Z01P0214	No waves in wave damping section.	Rare short in ignition coil.

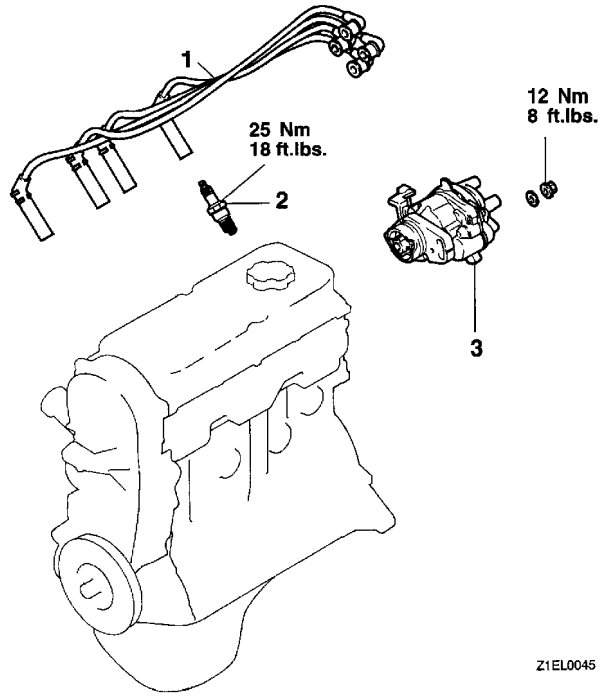
TSB Revision

IGNITION SYSTEM

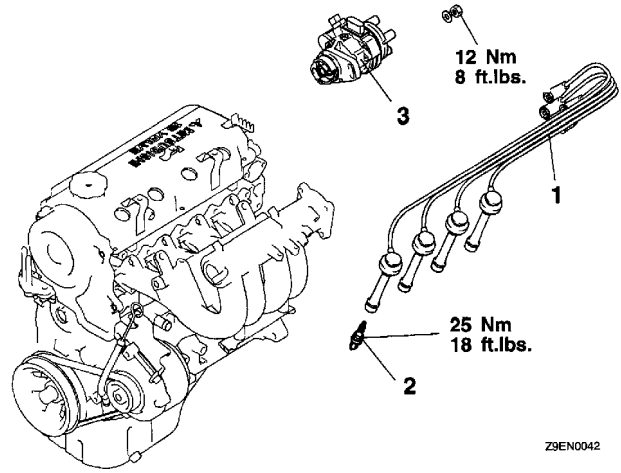
REMOVAL AND INSTALLATION

110003688

<1.5L Engine>



<1.8L Engine>



Removal steps

▶B◀ 1. Spark plug cable
2. Spark plug
▶A◀ 3. Distributor

TSB Revision

INSPECTION

SPARK PLUG

(1) Check the following items to see that electrodes are not burnt, and insulators are not broken, and how porcelain insulator is burnt.
- Broken insulators
- Wearing electrodes
- Deposited carbon
  For cleaning, use a plug cleaner or wire brush. Clean porcelain insulator above shell as well.
- Damaged or broken gasket
- Burnt condition of porcelain insulator at spark gap
  Dark deposit of carbon indicates too rich a fuel mixture or extremely low air intake. Also, misfiring due to excessive spark gap is suspected.
  White burn indicates too lean a fuel mixture or excessively advanced ignition timing. Also insufficient plug tightening is suspected.

(2) Clean with a plug cleaner.
Use an air gun to remove dust deposited on plug threads.

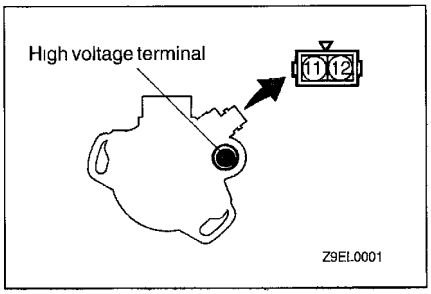
(3) Check plug gap using a plug gap gauge and adjust if it is not as specified.

Standard value: 1.0–1.1 mm (.039–.043 in.)

SPARK PLUG CABLE

(1) Check cap and coating for cracks.
(2) Measure resistance.

Limit: Max. 22 kΩ



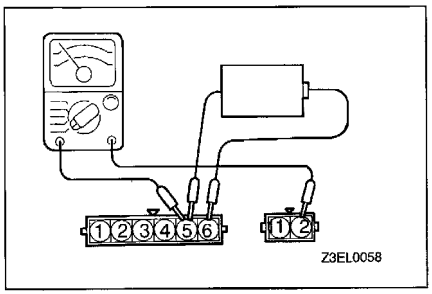
IGNITION COIL

(1) Measurement of the primary coil resistance
Measure the resistance of the positive terminal 11 and negative terminal 12 of the ignition coil.

Standard value: 0.9–1.2 Ω

(2) Measurement of the secondary coil resistance
Measure the resistance of the positive terminal 11 and the high voltage terminal.

Standard value: 20–29 kΩ



IGNITION POWER TRANSISTOR

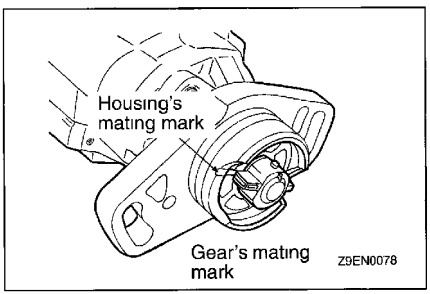
NOTE
An analog-type circuit tester should be used.

(1) Connect the negative (–) terminal of the 1.5V power supply to terminal 5 of the ignition power transistor; then check whether there is continuity between terminal 5 and terminal 12 when terminal 6 and the positive (+) terminal are connected and disconnected.

NOTE
Connect the negative (–) probe of the circuit tester to terminal 12.

Terminal 6 and (+) terminal	Terminal 5 and terminal 12
Connected	Continuity
Unconnected	No continuity

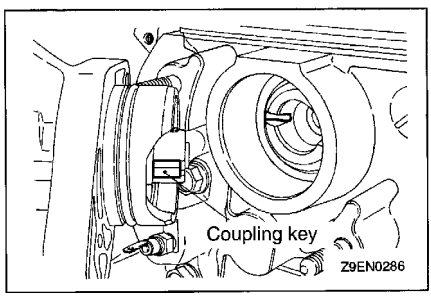
(2) Replace the ignition power transistor if there is a malfunction.



INSTALLATION SERVICE POINTS

▶A◀ DISTRIBUTOR INSTALLATION

(1) Turn the crankshaft so that the No. 1 cylinder is at top dead center.
(2) Align the distributor housing and gear mating marks.



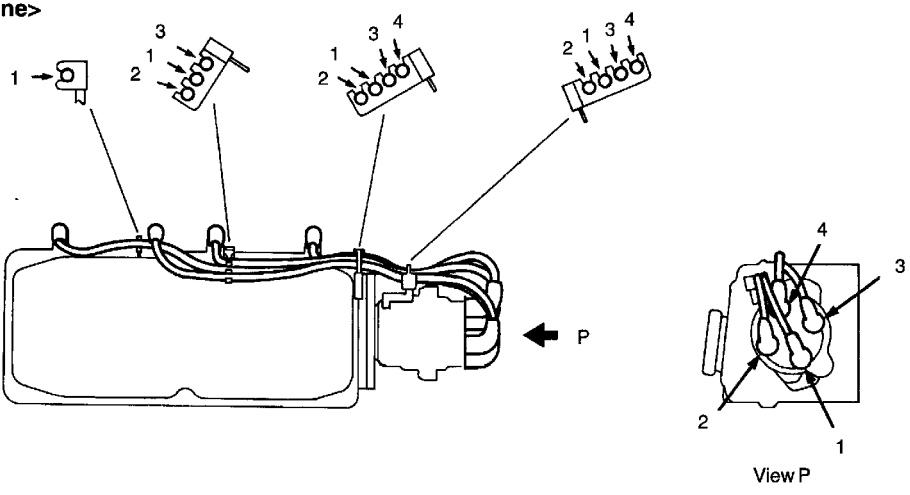
(3) Install the distributor with the coupling key fitted in the keyway provided in the camshaft end.

▶B◀ SPARK PLUG CABLE INSTALLATION

Improper arrangement of spark plug cables will induce voltage between the cables, causing miss firing and developing a surge at acceleration in high-speed operation. Therefore, be careful to arrange the spark plug cables properly by the following procedure.

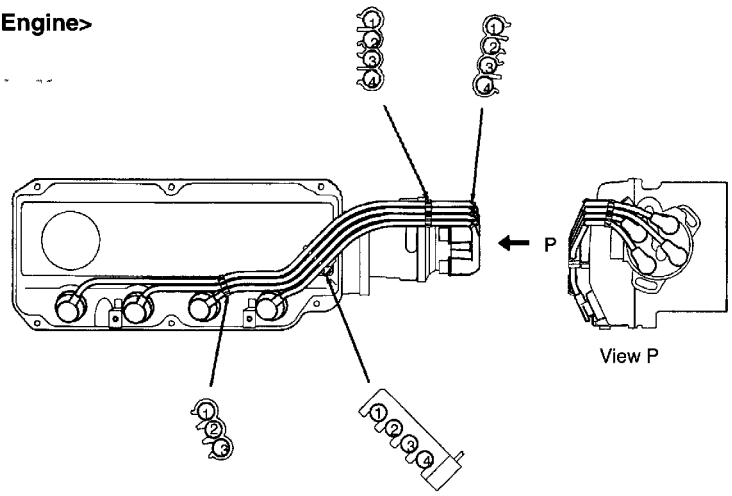
1. Install the spark plug cable clamps as shown in the illustration.
2. The numerals on the support and clamp indicate the spark plug cable No.
3. Pay attention to the following items when the spark plug cables are installed.
   (1) Install the cables securely to avoid possible contact with metal parts.
   (2) Install the cables neatly, ensuring they are not too tight, loose, twisted or kinked.

<1.5L Engine>



Z1EL0050

<1.8L Engine>



Z9EN0266

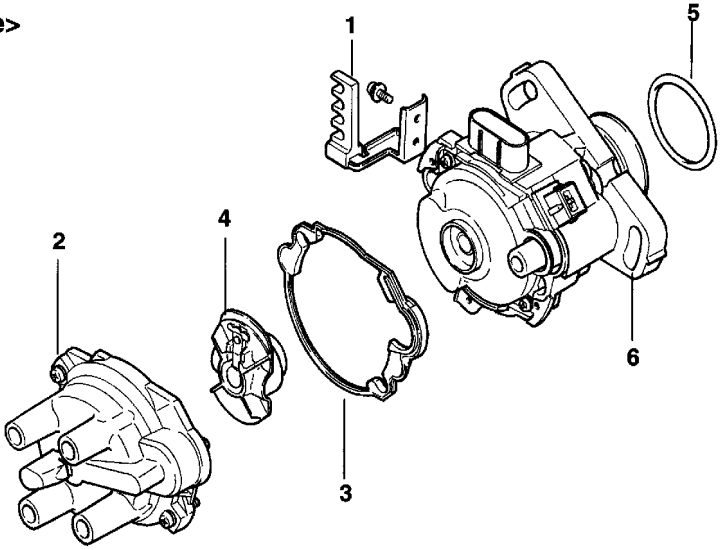
TSB Revision

DISTRIBUTOR

DISASSEMBLY AND REASSEMBLY

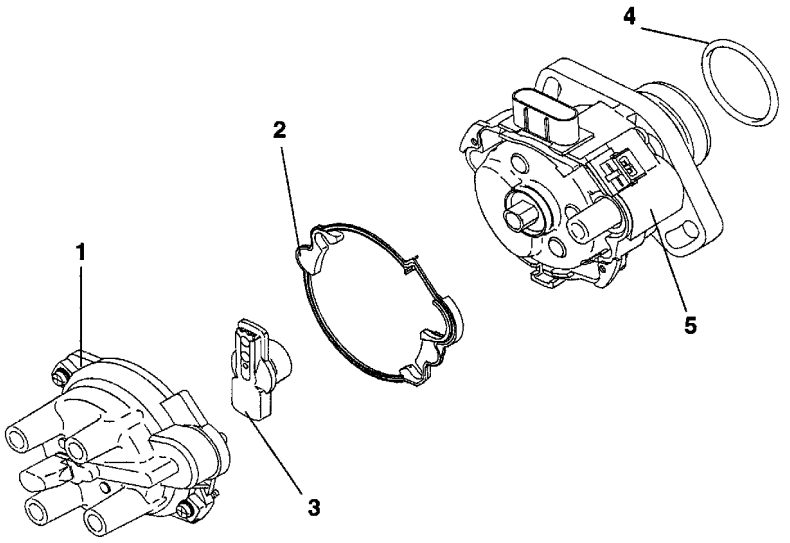
110003689

<1.5L Engine>



Z1EL0055

<1.8L Engine>



Z9EN0120

Disassembly steps
<1.5L ENGINE>
1. Cable clamp
2. Distributor cap
3. Packing
4. Rotor
5. O-ring
6. Distributor housing

<1.8L ENGINE>
1. Distributor cap
2. Packing
3. Rotor
4. O-ring
5. Distributor housing

TSB Revision

INSPECTION

Check the following points; repair or replace if a problem is found.

CAP, ROTOR

(1) There must be no cracking in the cap.
(2) There must be no damage to the cap's electrode or the rotor's electrode.
(3) Clean away any dirt from the cap and rotor.

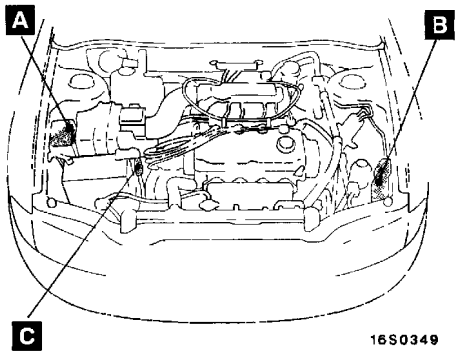
CAMSHAFT POSITION SENSOR, CRANKSHAFT POSITION SENSOR

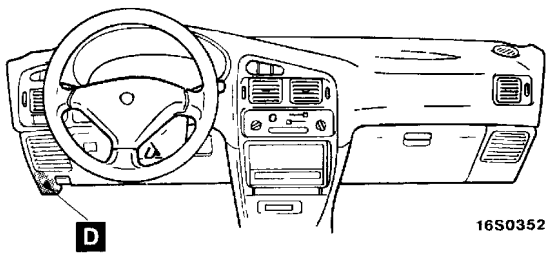
Refer to GROUP13A – On-vehicle Inspection MFI Components

FUSIBLE LINK, FUSE AND IOD OR STORAGE CONNECTOR LOCATION

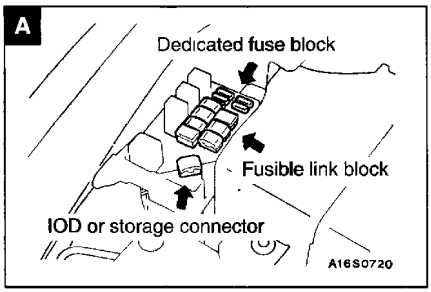
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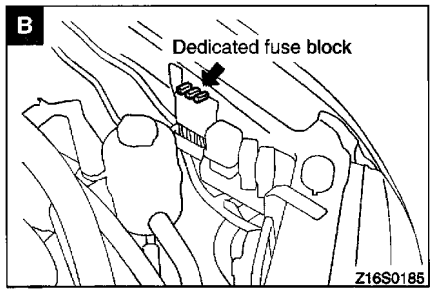
Name	Symbol	Name	Symbol
Dedicated fuse block	A	Fusible link (for ABS circuit)	C
Dedicated fuse block (air conditioning)	B	IOD or storage connector	A
Fusible link block	A	Multi-purpose fuse block	D

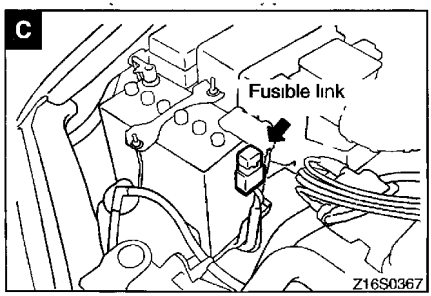


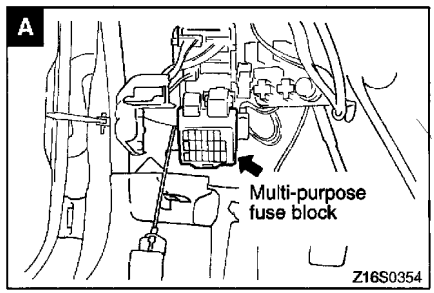


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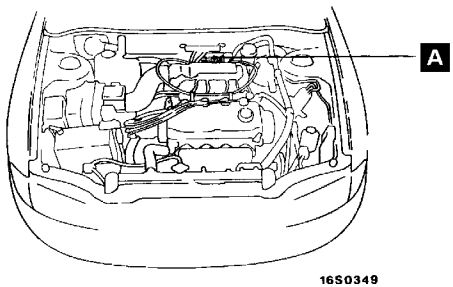


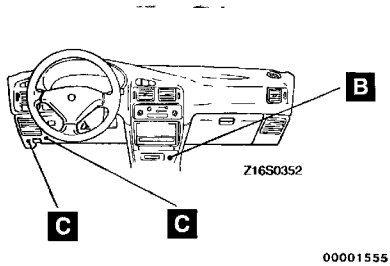


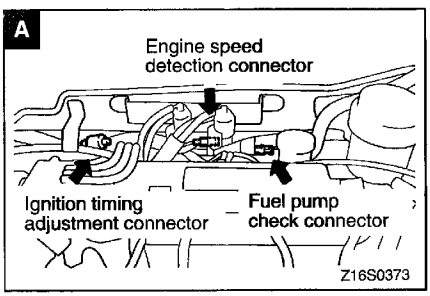
INSPECTION TERMINAL LOCATION

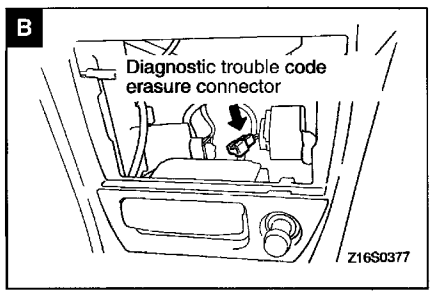
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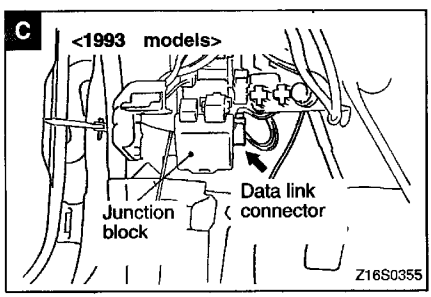
Name	Symbol	Name	Symbol
Data link connector	C	Fuel pump check connector	A
Diagnostic trouble code erasure connector <ABS>	B	Ignition timing adjustment connector	A
Engine speed detection connector	A		

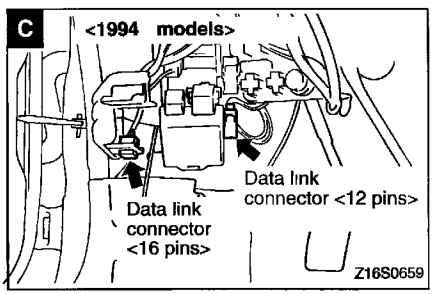


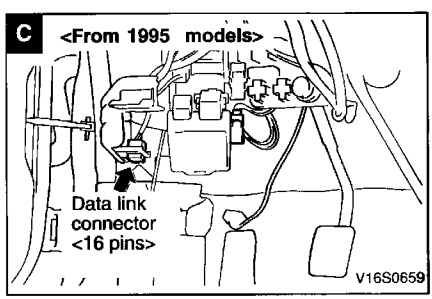






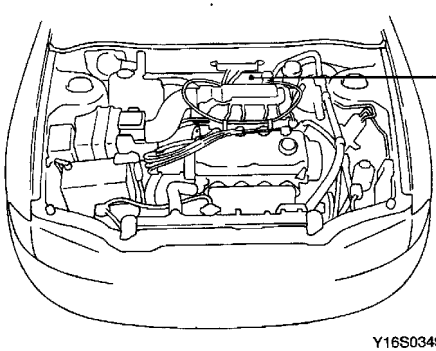




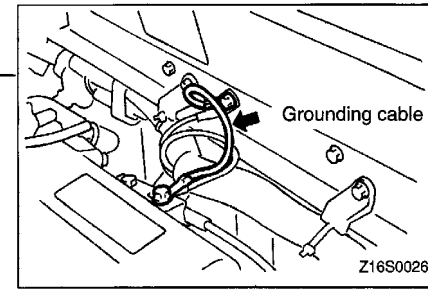


GROUNDING CABLE LOCATION

110003522

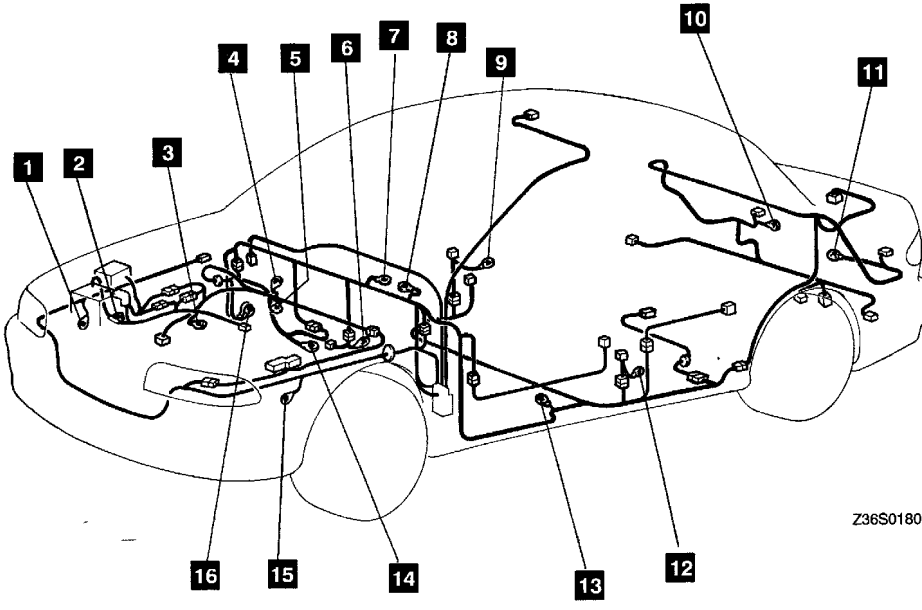


Y16S0349

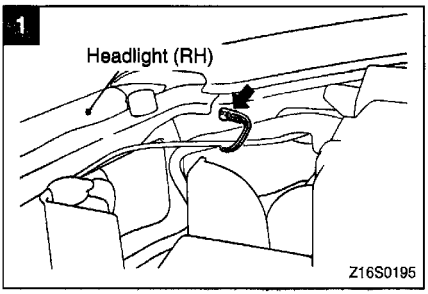


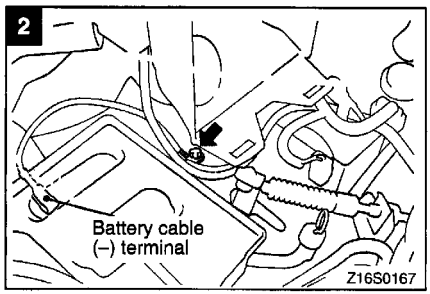
GROUNDING LOCATION

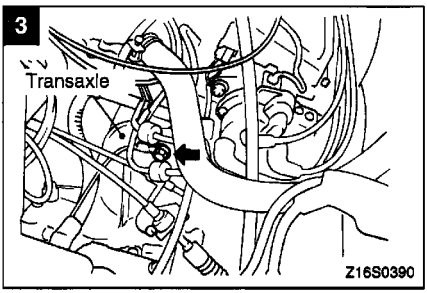
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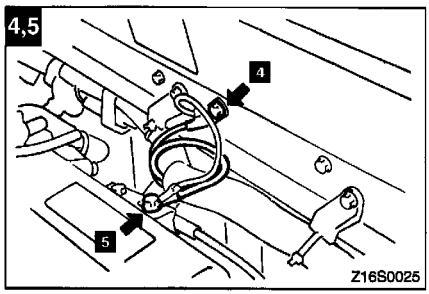


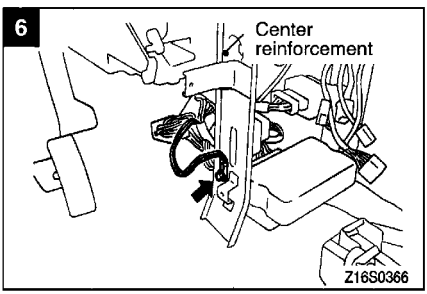
NOTE
Same ground numbers are used in the circuit diagram.

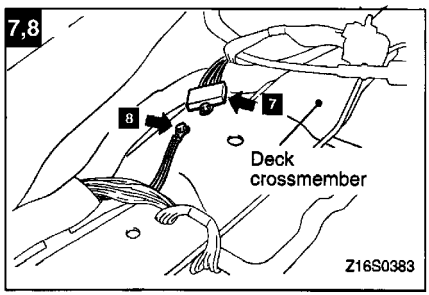
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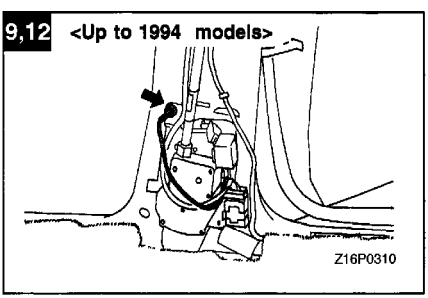
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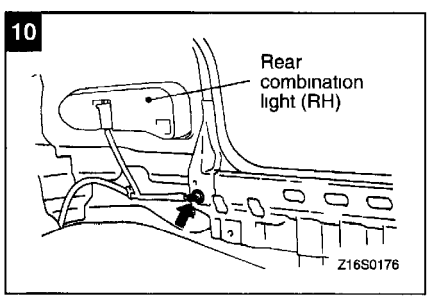
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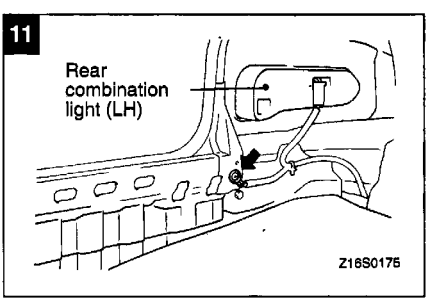
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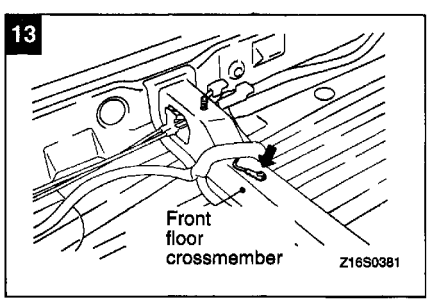
6


7,8


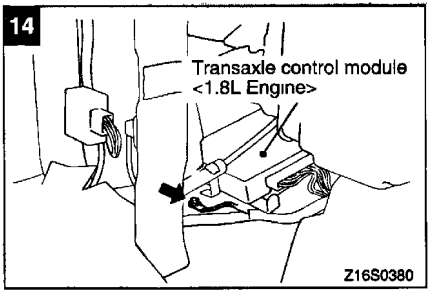
9,12 <Up to 1994 models>


10


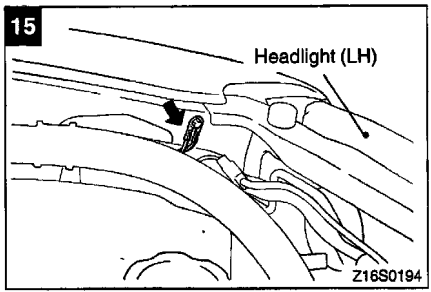
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13


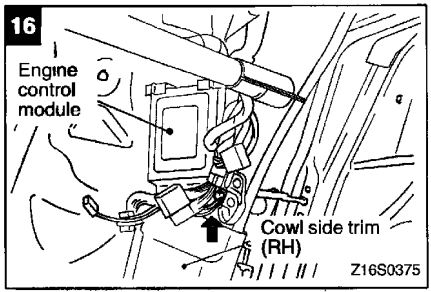
14


Transaxle control module
<1.8L Engine>
Z16S0380

15


Headlight (LH)
Z16S0194

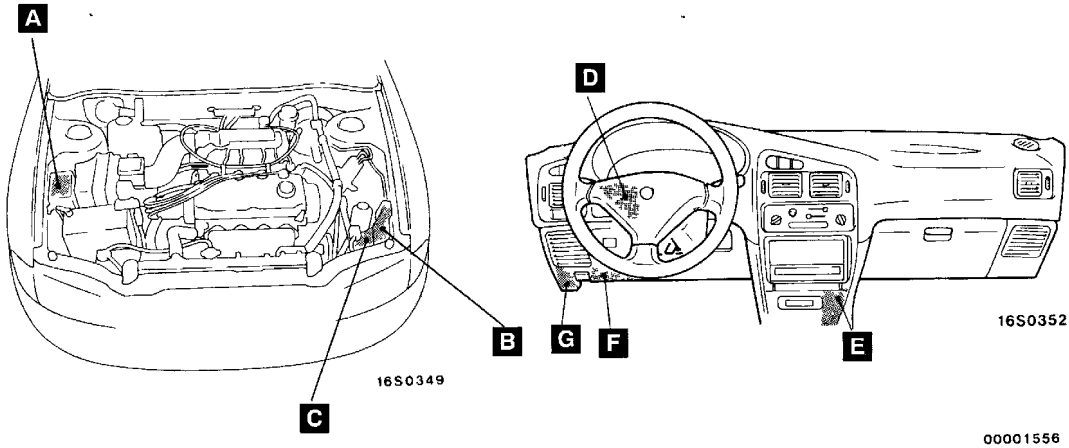
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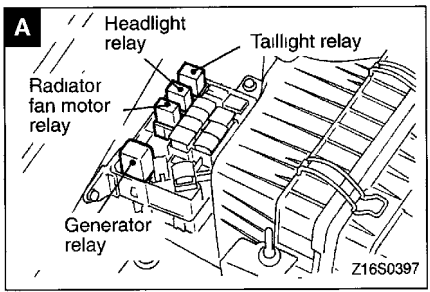

Engine
control
module
Cowl side trim
(RH)
Z16S0375

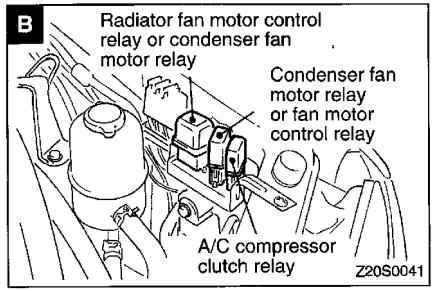
RELAY LOCATION

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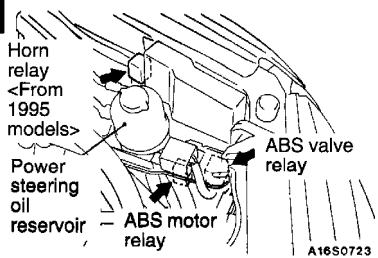
Name	Symbol	Name	Symbol
ABS motor relay	C	Horn relay <1994 models>	F
ABS power relay	F	Horn relay <From 1995 models>	C
ABS valve relay	C	Multiport fuel injection relay	E
A/C compressor clutch relay	B	Power window relay	F
Blower motor relay	G	Radiator fan motor control relay	B
Condenser fan motor relay	B	Radiator fan motor relay	A
Defogger relay	F	Starter relay	F
Door lock control relay <1993 models>	F	Taillight relay	A
Fan motor control relay	B	Turn-signal and hazard flasher unit	G
Generator relay	A	Windshield intermittent wiper relay	D
Headlight relay	A		



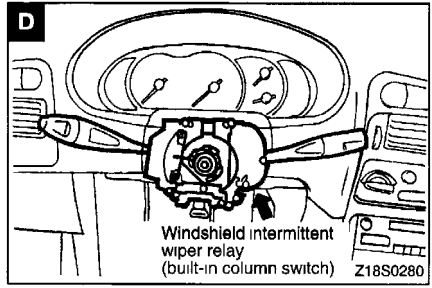




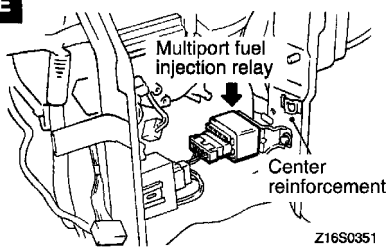
C


Horn relay <From 1995 models>
Power steering oil reservoir
ABS motor relay
ABS valve relay
A16S0723

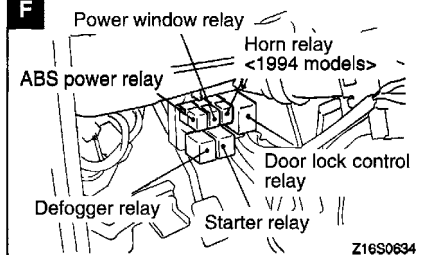
D


Windshield intermittent wiper relay (built-in column switch)
Z18S0280

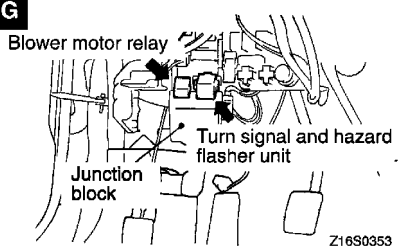
E


Multiport fuel injection relay
Center reinforcement
Z16S0351

F


Power window relay
Horn relay <1994 models>
ABS power relay
Door lock control relay
Defogger relay
Starter relay
Z16S0634

G

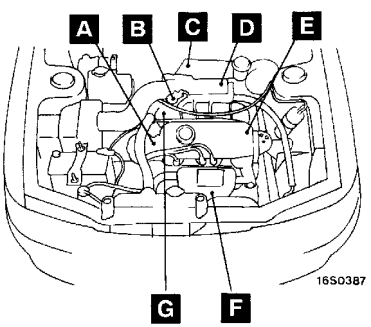

Blower motor relay
Turn signal and hazard flasher unit
Junction block
Z16S0353

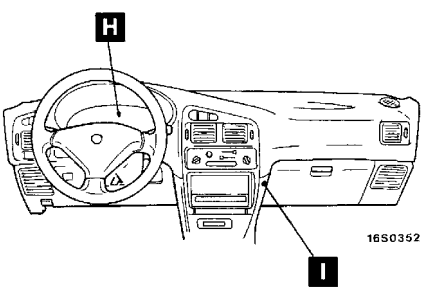
SENSOR LOCATION

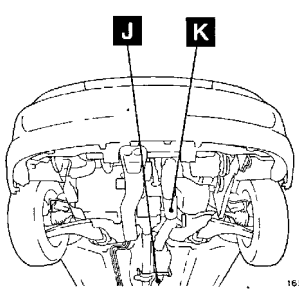
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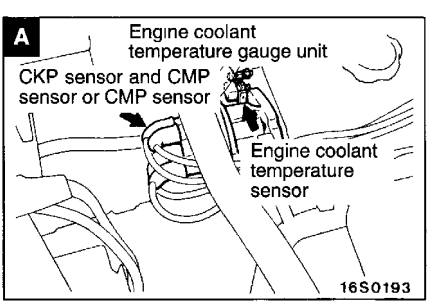
<1.5L ENGINE>

Name	Symbol	Name	Symbol
Air thermo sensor <A/C>	I	Heated oxygen sensor (rear) <Federal–From 1994 models, California–Up to 1994 models>	J
CKP sensor (crankshaft position sensor) <Federal–From 1996 models, California–From 1995 models>	E	Heated oxygen sensor (rear) <California–From 1995 models>	K
CKP sensor and CMP sensor (built-in distributor) <Federal–Up to 1995 models, California–Up to 1994 models>	A	Intake air temperature sensor	D
CMP sensor (built-in distributor) <Federal–From 1996 models, California–From 1995 models>	A	Manifold absolute pressure sensor	C
EGR temperature sensor <Federal–1994, 1995 models, California–Up to 1994 models>	G	Oxygen sensor <Federal–1993 models>	F
Engine coolant temperature sensor	A	Throttle position sensor	B
Heated oxygen sensor (front) <Federal–From 1994 models, California–Up to 1994 models>	K	Vehicle speed sensor (Reed switch)	H
Heated oxygen sensor (front) <California–From 1995 models>	F		



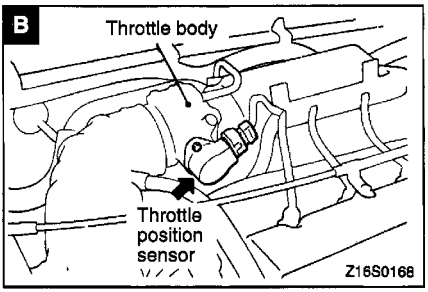




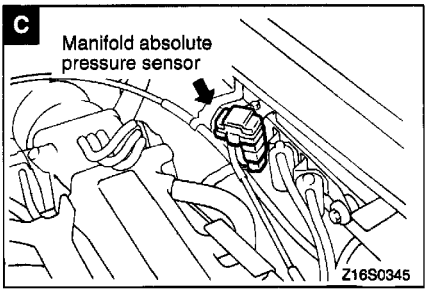


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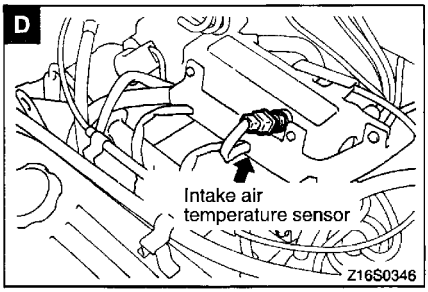
B


Throttle body
Throttle position sensor
Z16S0168

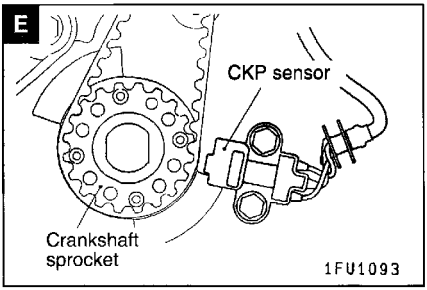
C


Manifold absolute pressure sensor
Z16S0345

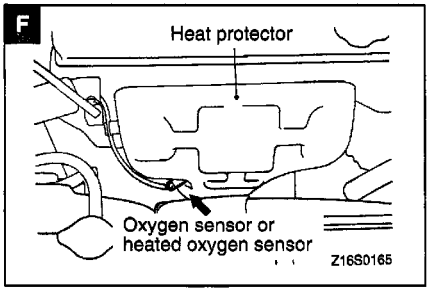
D


Intake air temperature sensor
Z16S0346

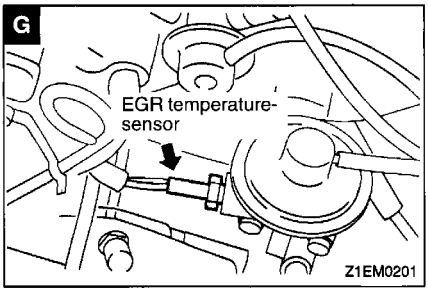
E


CKP sensor
Crankshaft sprocket
1FU1093

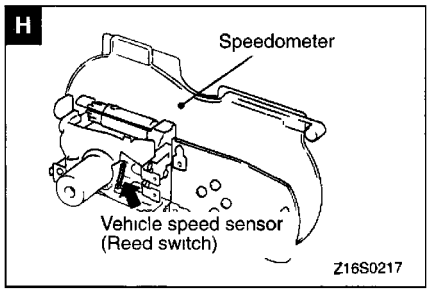
F


Heat protector
Oxygen sensor or heated oxygen sensor
Z16S0165

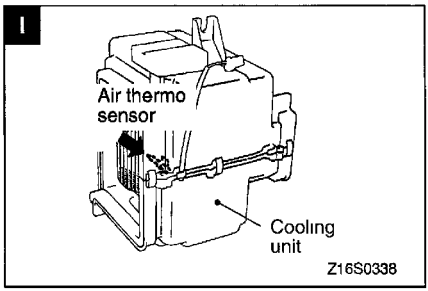
G


EGR temperature-sensor
Z1EM0201

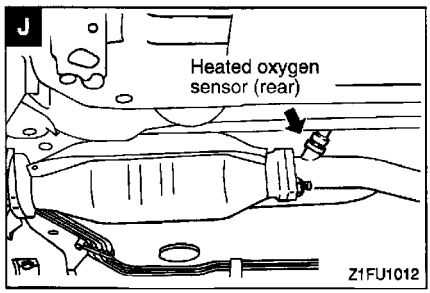
H


Speedometer
Vehicle speed sensor (Reed switch)
Z16S0217

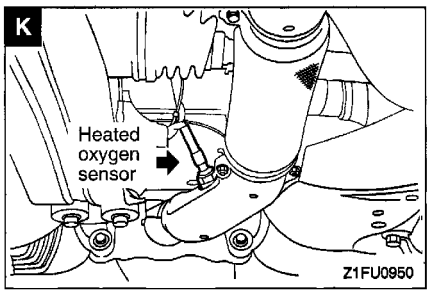
I


Air thermo sensor
Cooling unit
Z16S0338

J

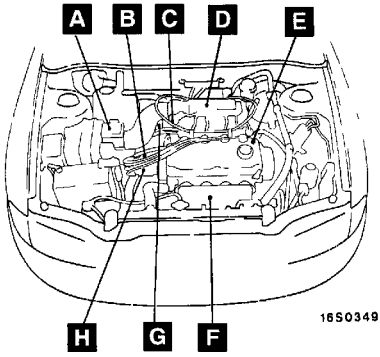

Heated oxygen sensor (rear)
Z1FU1012

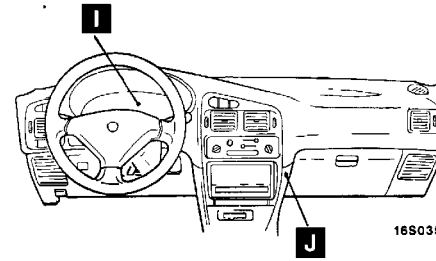
K

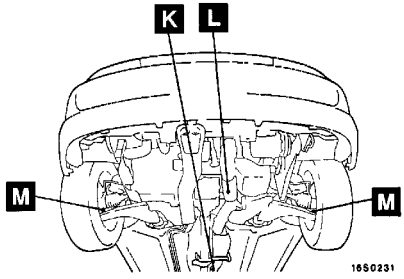

Heated oxygen sensor
Z1FU0950

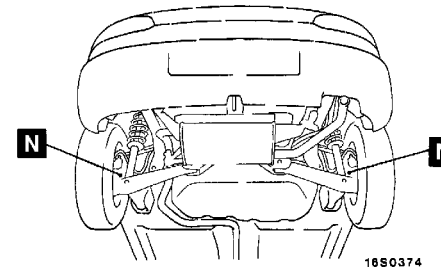
<1.8L ENGINE>

Name	Symbol	Name	Symbol
ABS speed sensor (front)	M	Heated oxygen sensor (front) <California–From 1995 models>	F
ABS speed sensor (rear)	N	Heated oxygen sensor (rear) <Federal–From 1994 models, California–Up to 1995 models>	K
Air thermo sensor <A/C>	J	Heated oxygen sensor (rear) <California–From 1995 models>	L
CKP sensor (crankshaft position sensor) <Federal–From 1996 models, California–From 1995 models>	E	Manifold differential pressure sensor <Federal–From 1996 models, California–From 1995 models>	D
CKP sensor and CMP sensor (built-in distributor) <Federal–Up to 1995 models, California–Up to 1994 models>	H	Oxygen sensor <Federal–1993 models>	F
CMP sensor (built-in distributor) <Federal–From 1996 models, California–From 1995 models>	H	Throttle position sensor	C
EGR temperature sensor <Federal–1994, 1995 models, California–Up to 1995 models>	G	Vehicle speed sensor (Reed switch)	I
Engine coolant temperature sensor	B	Volume air flow sensor (with built-in barometric pressure sensor, intake air temperature sensor)	A
Heated oxygen sensor (front) <Federal–From 1994 models, California–Up to 1995 models>	L		





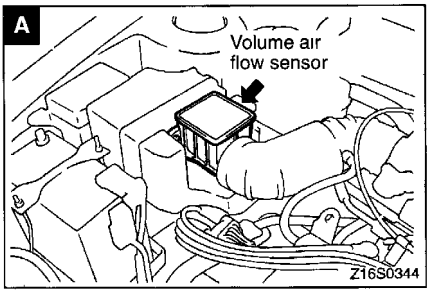




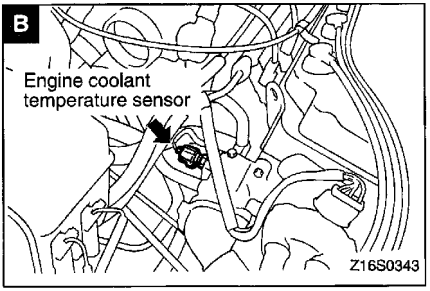
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TSB Revision

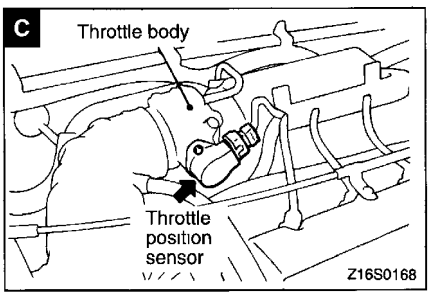
A


Volume air flow sensor
Z16S0344

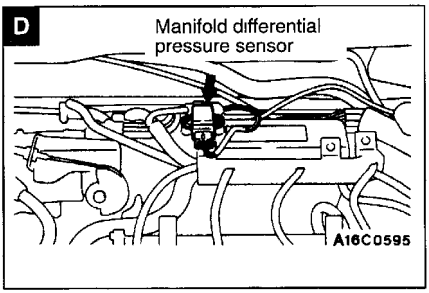
B


Engine coolant temperature sensor
Z16S0343

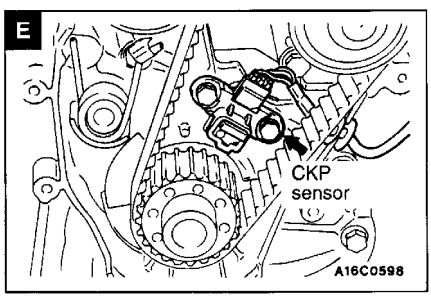
C


Throttle body
Throttle position sensor
Z16S0168

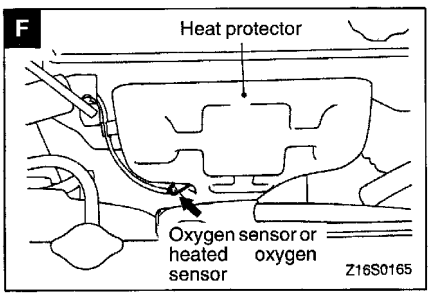
D


Manifold differential pressure sensor
A16C0595

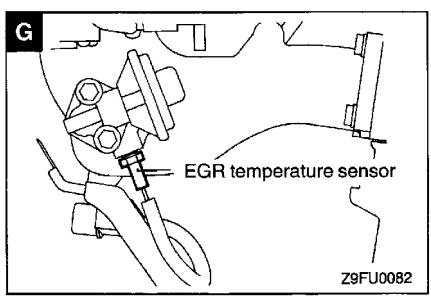
E


CKP sensor
A16C0598

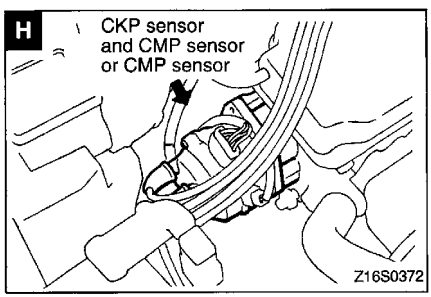
F


Heat protector
Oxygen sensor or heated oxygen sensor
Z16S0165

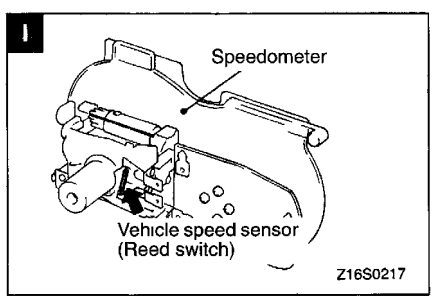
G


EGR temperature sensor
Z9FU0082

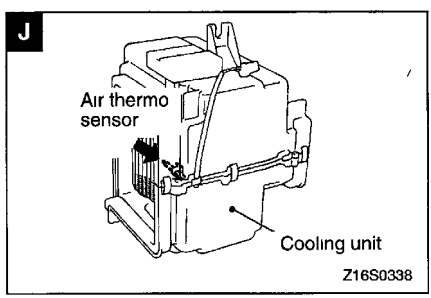
H


CKP sensor and CMP sensor or CMP sensor
Z16S0372

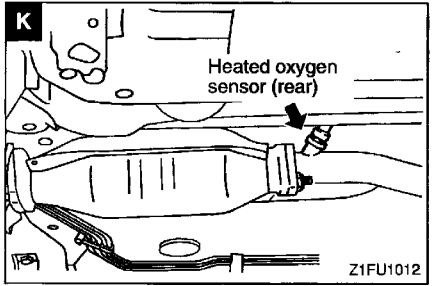
I


Speedometer
Vehicle speed sensor (Reed switch)
Z16S0217

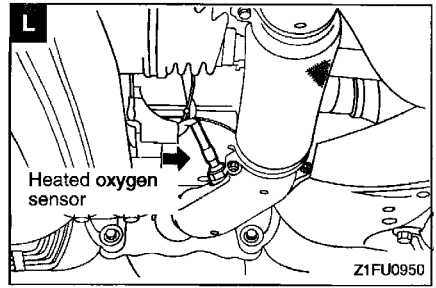
J


Air thermo sensor
Cooling unit
Z16S0338

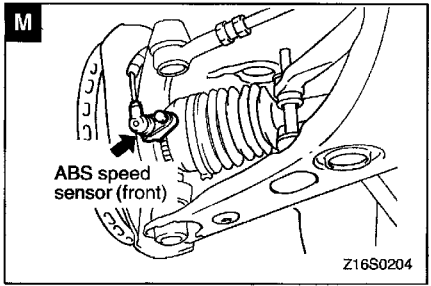
K


Heated oxygen sensor (rear)
Z1FU1012

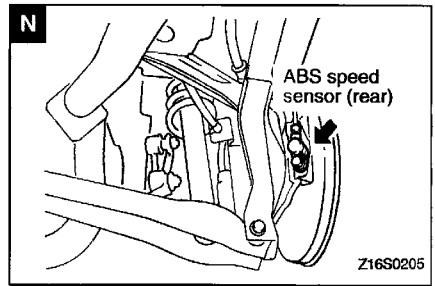
L


Heated oxygen sensor
Z1FU0950

M


ABS speed sensor (front)
Z16S0204

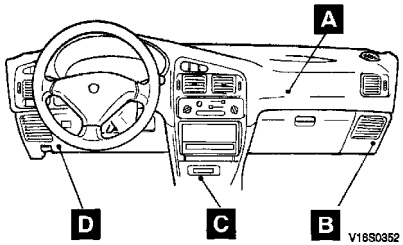
N

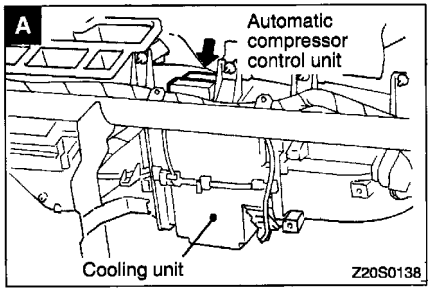

ABS speed sensor (rear)
Z16S0205

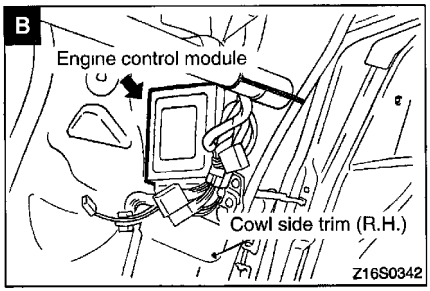
CONTROL UNIT LOCATION

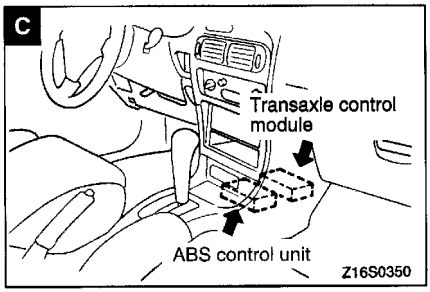
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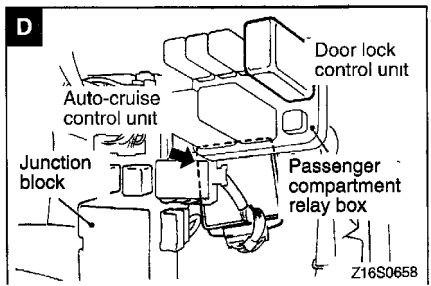
Name	Symbol	Name	Symbol
ABS control unit	C	Door lock control unit <From 1994 models>	D
Automatic compressor control unit	A	Engine control module	B
Automatic seat belt control unit <Up to 1994 models>	E	SRS air bag control unit <From 1994 models>	E
Auto-cruise control unit	D	Transaxle control module <1.8L Engine>	C

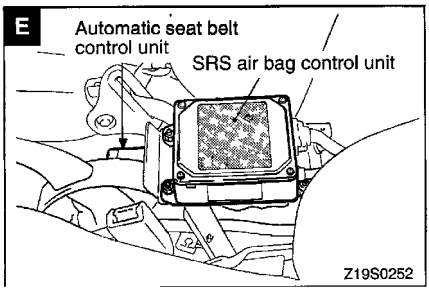








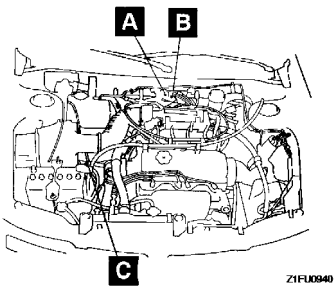


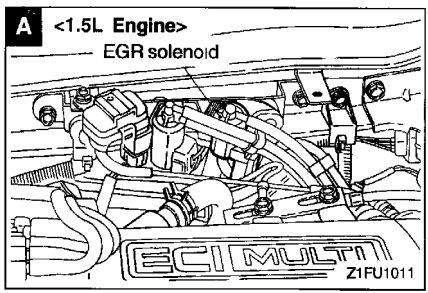


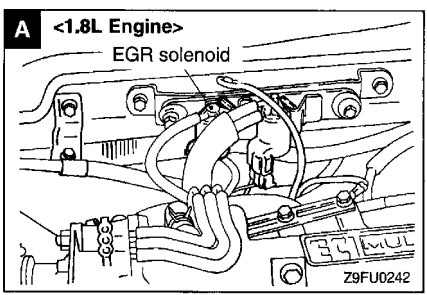
SOLENOID, SOLENOID VALVE LOCATION

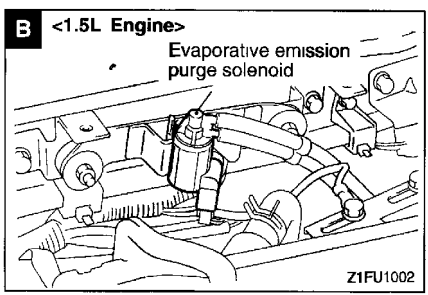
110003527

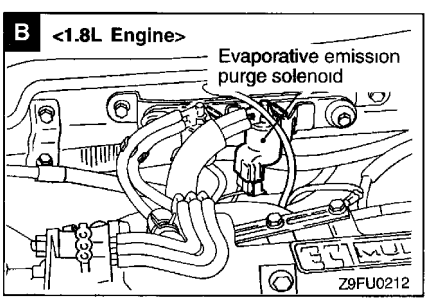
Name	Symbol	Name	Symbol
EGR solenoid	A	4 A/T control solenoid valve	C
Evaporative emission purge solenoid	B		

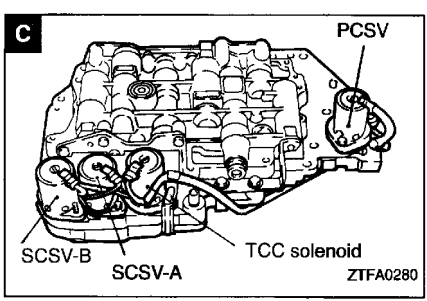








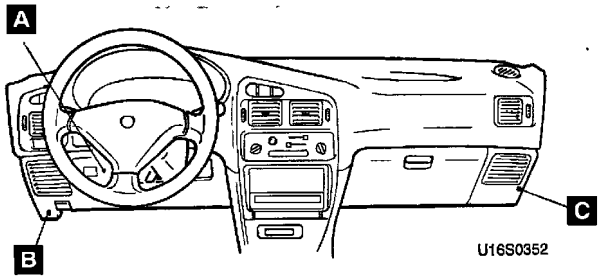


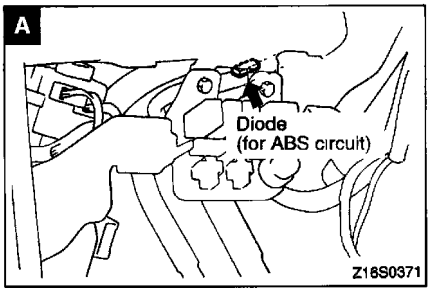


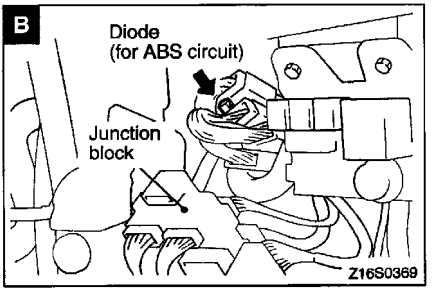
DIODE LOCATION

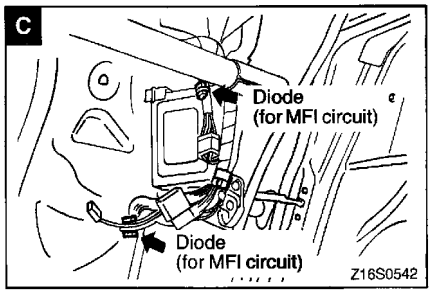
110003528

Name	Symbol	Name	Symbol
Diode (for ABS circuit)	A, B	Diode (for MFI circuit)	C



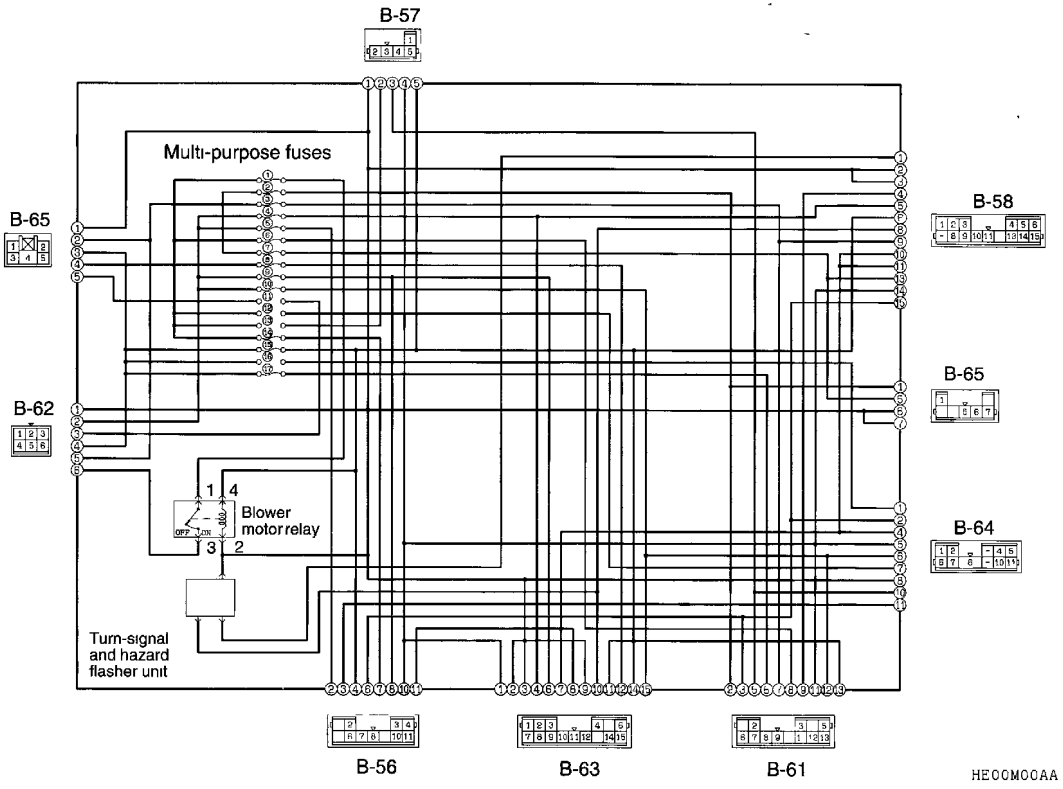




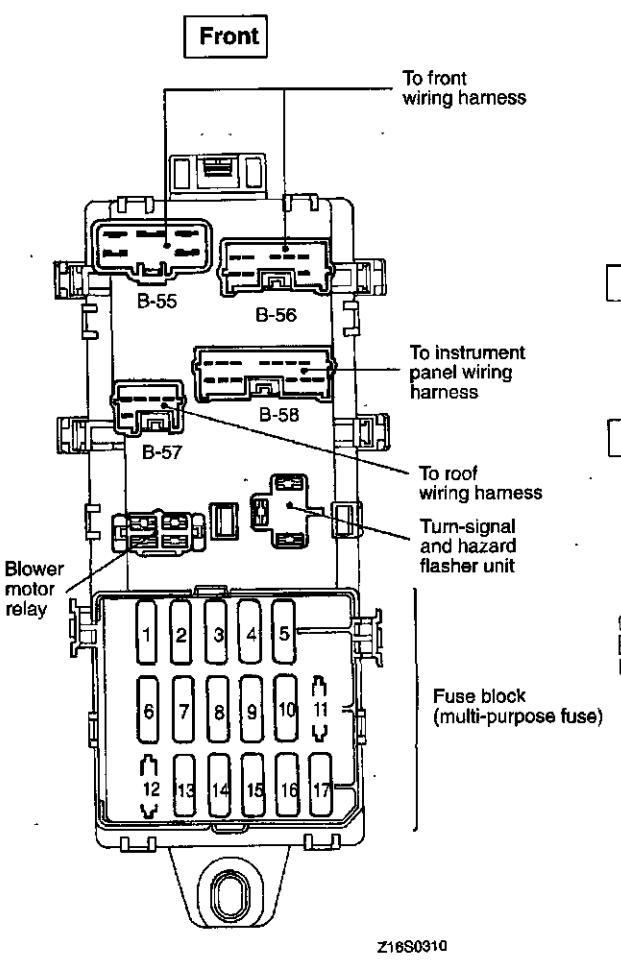


JUNCTION BLOCK

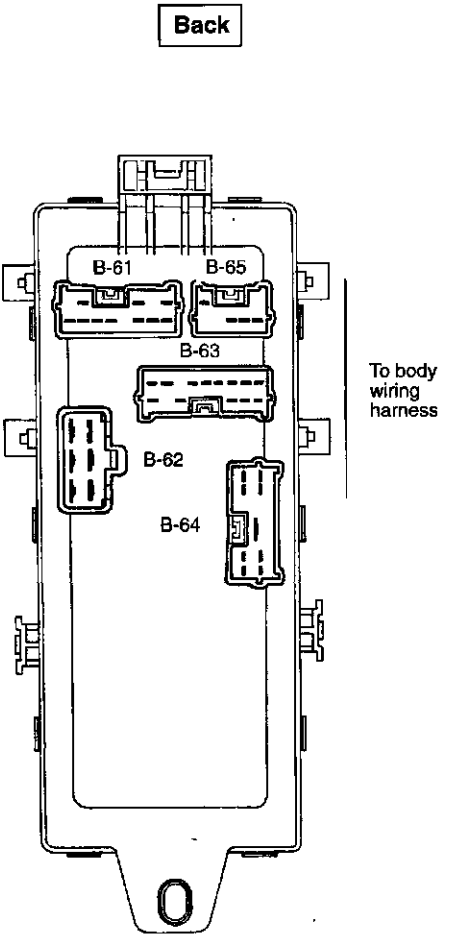
110003529



REMARK
Connector numbers are keyed to the configuration diagram (dashboard panel) and each circuit diagram.



Z16S0310

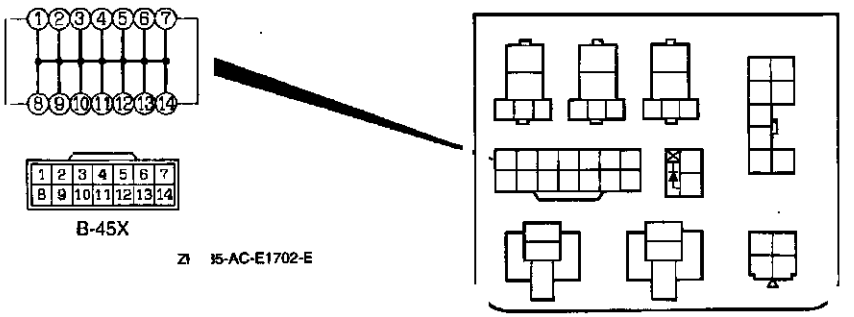


Z16S0311

110003530

JUMPER CONNECTOR

(Relay box in passenger compartment)



ZI I5-AC-E1702-E

Z16S0309

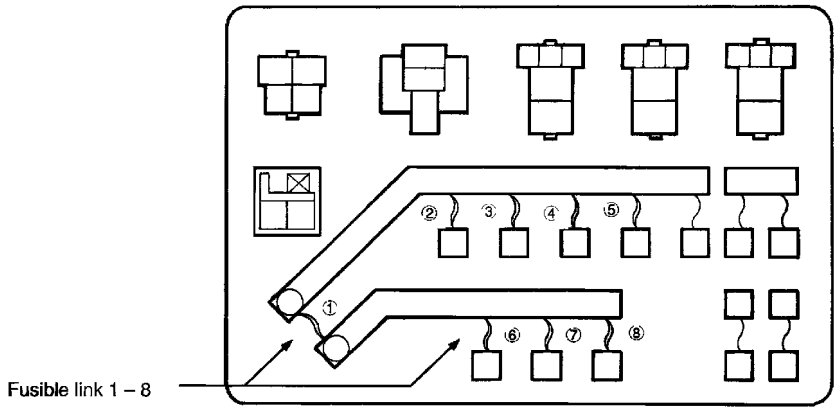
CENTRALIZED JUNCTION

110003531

FUSIBLE LINK

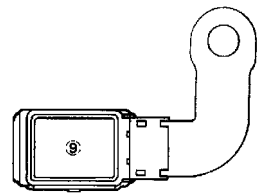
No.	Circuit	Housing color	Rated capacity (A)
1	Fusible link No. 6, 7, 8 <when the engine is stopped> and Fusible link No. 2, 3, 4, 5, 9 dedicated fuse No. 1 <after start of the engine> circuit	Black	80
2	MFI circuit	Blue	20
3	Headlight, taillight and generator circuit	Pink	30
4	Radiator fan motor, condenser fan motor and A/C compressor circuit	Pink	30
5	Ignition switch circuit	Green	40
6	Multi-purpose fuse (in the junction block) No. 1, 6, 8, 13, 14 circuit	Green	40
7	Power window circuit	Pink	30
8	Defogger circuit	Blue	20
9	ABS circuit	Yellow	60

(Relay box in engine compartment)



Z16S0162

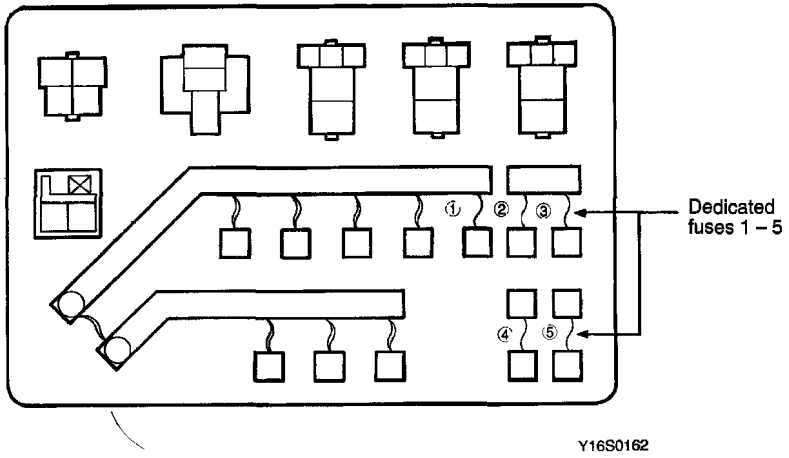
(Connected directly to battery positive terminal)



Z16S0157

DEDICATED FUSE 1–5 (Relay box in engine compartment)

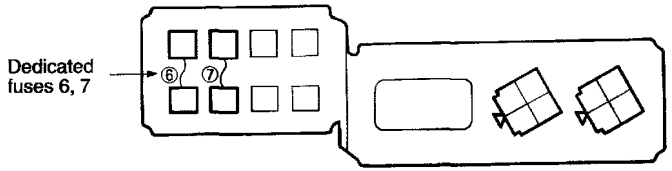
Power supply circuit	No.	Rated capacity (A)	Housing Color	Circuit
Battery	1	10	Red	Hazard light circuit
Taillight relay (Battery)	2	10	Red	Taillight and illumination circuit
	3	–	–	–
Headlight relay (Battery)	4	10	Red	Upper beam indicator circuit
Battery	5	10	Red	ABS circuit



DEDICATED FUSE 6–8 (A/C compressor clutch relay bracket in engine compartment) <1993 models>

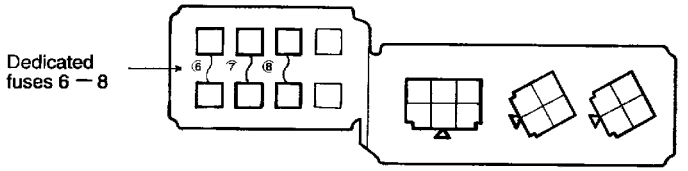
<1.5L ENGINE (M/T)>

Power supply circuit	No.	Rated capacity (A)	Housing Color	Circuit
Battery	6	10	Red	A/C compressor circuit
	7	20	Yellow	Condenser fan motor circuit



<1.5L ENGINE (A/T)>

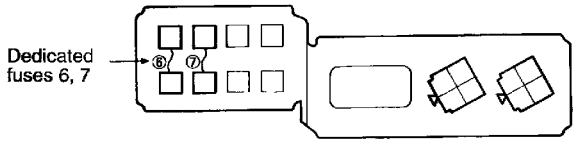
Power supply circuit	No.	Rated capacity (A)	Housing Color	Circuit
Battery	6	10	Red	A/C compressor circuit
Radiator fan motor control relay (Battery)	7	20	Yellow	Radiator fan motor circuit
Condenser fan motor control relay (Battery)	8	20	Yellow	Condenser fan motor circuit



Z16S0158

<1.8L ENGINE>

Power supply circuit	No.	Rated capacity (A)	Housing Color	Circuit
Battery	6	10	Red	A/C compressor circuit
Condenser fan motor relay (Battery)	7	25	Yellow	Condenser fan motor circuit

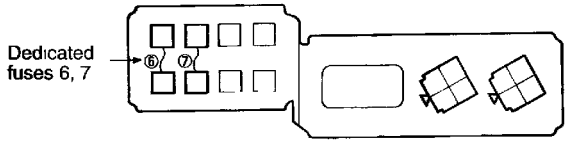


Z16S0160

DEDICATED FUSE 6, 7 (A/C compressor clutch relay bracket in engine compartment) <From 1994 models>

Power supply circuit	No.	Rated capacity (A)	Housing Color	Circuit
Battery	6	10	Red	A/C compressor circuit
Condenser fan motor relay (Battery)	7	20*1, 25*2	Yellow	Condenser fan motor circuit

NOTE
*1: 1.5L engine
*2: 1.8L engine

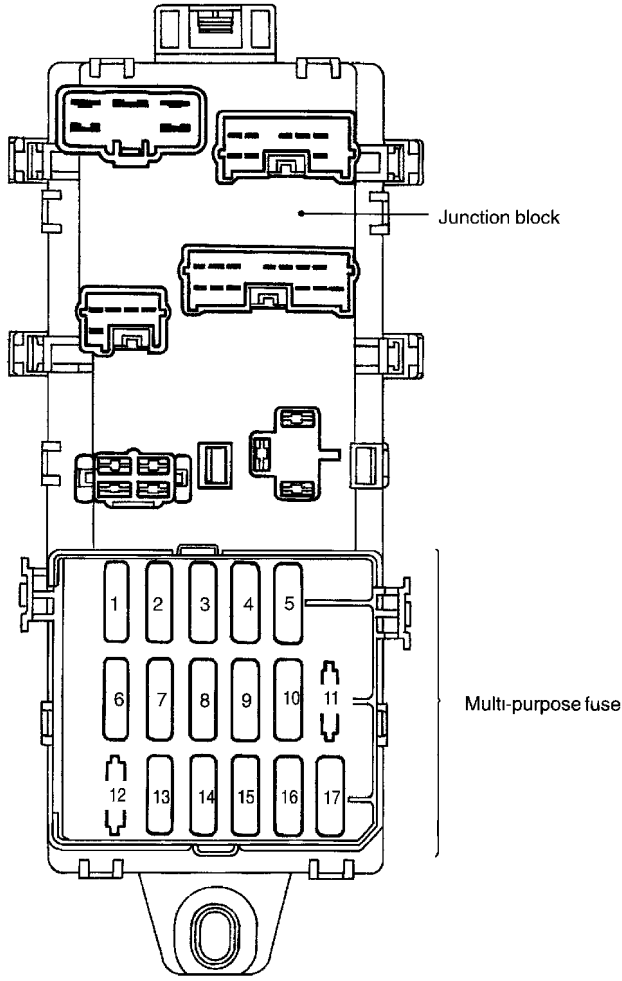


Z16S0160

MULTI-PURPOSE FUSE (In junction block)

Power supply circuit	No.	Rated capacity (A)	Housing Color	Load Circuit
Battery	1	20*1 25*2	Yellow	Blower motor
Ignition switch <IG1>	2	10	Red	Back-up light, buzzer assembly and combination meter <3A/T>, SRS air bag control unit*2
	3	10	Red	Combination meter, buzzer assembly and auto-cruise control main switch
Ignition switch <ACC>	4	15	Blue	Cigarette lighter and remote controlled mirror
	5	10	Red	Clock, radio and tape player and auto-cruise control unit
Battery	6	15	Blue	Stop light
Ignition switch <IG1>	7	10	Red	Turn signal and hazard flasher unit, SRS air bag control unit*2
Battery	8	15*1 20*2	Blue	Door lock control relay*1, door lock control unit*2
Ignition switch <ACC>	9	10	Red	Horn
	10	15*1 20*2	Blue	Wiper and washer motor
–	11	–	–	–
Battery	12	–	–	–
	13	–	–	–
	14	10	Red	Dome light, luggage compartment light, clock, radio and tape player, combination meter, door lock control relay*1, engine control module, transaxle control module
Ignition switch <IG2>	15	10	Red	Blower motor relay, defogger relay, power window relay, automatic compressor control unit, ABS power relay, ABS valve relay, buzzer assembly, auto-cruise control unit and automatic seat belt control unit*3
	16	–	–	–
	17	10	Red	Combination meter <4A/T> and transaxle control module

NOTE
*1: 1993 models
*2: From 1994 models
*3: Up to 1994 models

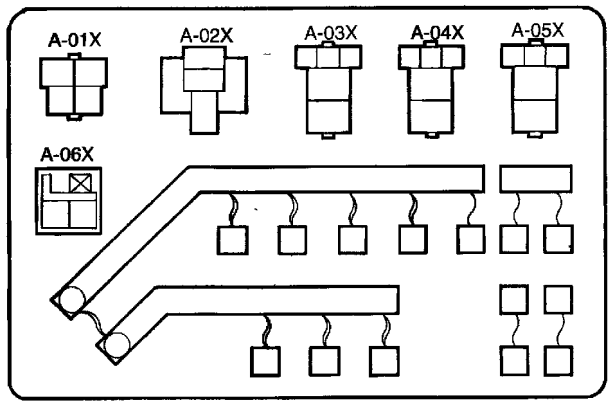

Junction block
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
Multi-purpose fuse

Y16S0310

CENTRALIZED RELAY

(Relay box in engine compartment)

Connector No.	Name	Connector No.	Name
A-01X	Generator relay	A-04X	Headlight relay
A-02X		A-05X	Taillight relay
A-03X	Radiator fan motor relay	A-06X	IOD or storage connector



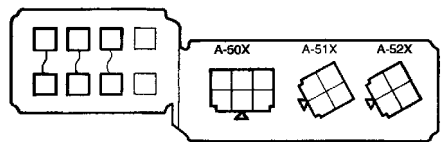
X16S0162

(A/C compressor clutch relay bracket in engine compartment)

Connector No.	Name	Connector No.	Name
A-50X	Radiator fan motor control relay*1 Condenser fan motor relay*2	A-51X	Condenser fan motor relay Fan motor control relay*2
		A-52X	A/C compressor clutch relay

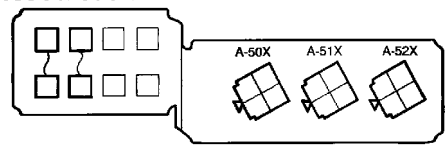
NOTE
*1: 1.5L engine <A/T>–1993 models and 1.5L engine–From 1994 models
*2: 1.8L engine

<1.5L engine–1993 models>



Y16S0158

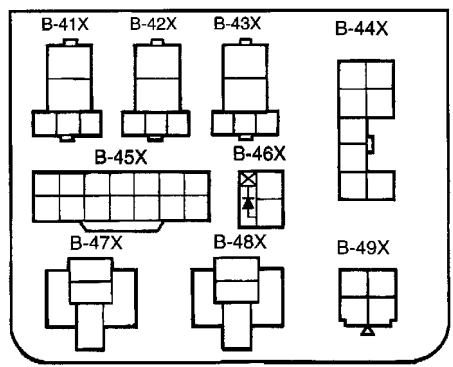
<1.8L engine and 1.5L engine –From 1994 models>



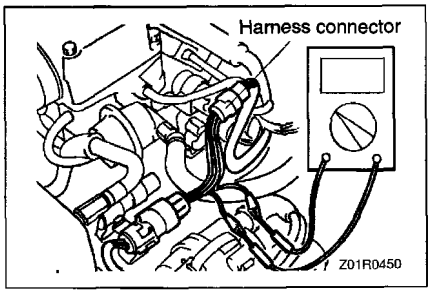
Y16S0541

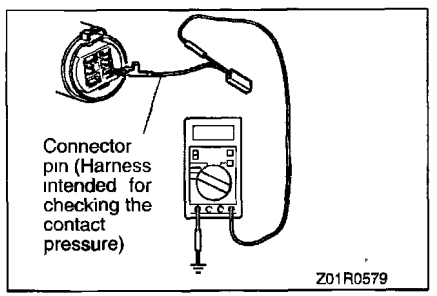
(Relay box in passenger compartment)

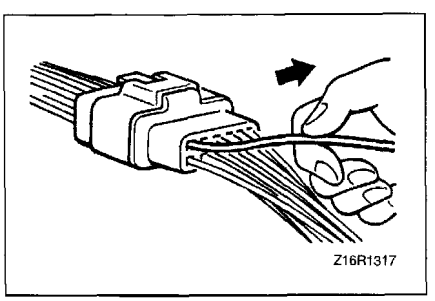
Connector No.	Name	Connector No.	Name
B-41X	ABS power relay	B-46X	–
B-42X	Power window relay	B-47X	Defogger relay
B-43X	Horn relay <1994 models>	B-48X	Starter relay
B-44X	Door lock control relay <1993 models> Door lock control unit <From 1994 models>	B-49X	–
B-45X	J/C (for earth circuit)		



Y16S0309







HARNESS CONNECTOR INSPECTION

110000779

CONNECTOR CONTINUITY AND VOLTAGE TEST

Follow the steps below to avoid causing poor connector contact and/or reduced waterproof performance of waterproof connectors when checking continuity and/or voltage at connectors.

(1) If checking is performed with the circuit in the state of continuity, be sure to use the special tool (harness connector).
Never insert a test bar from the harness side, because to do so will reduce the waterproof performance and result in corrosion.

(2) If the connectors are disconnected to check the female pin, use the harness intended for checking the contact pressure of the connector pin.
Never force the insertion of a test bar, because to do so will cause poor or improper contact.

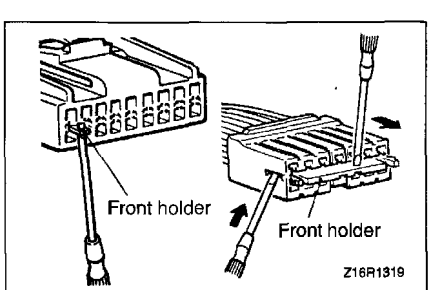
(3) When checking the male pin, contact the test bar directly to the pins.
Care must be taken not to short-circuit the connector pins.

TERMINAL ENGAGEMENT CHECK

When the terminal stopper of connector is out of order, engagement of male and female terminals becomes improper even when the connector itself is engaged perfectly and the terminal sometimes slips out to the rear side of connector. Ascertain, therefore, that each terminal does not come off the connector by pulling each harness wire.

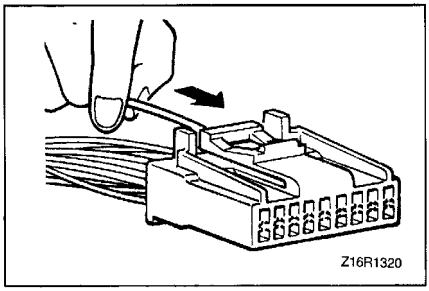
CONNECTOR TERMINAL ENGAGEMENT AND DISENGAGEMENT

Connectors which are loose shall be rectified by removing the female terminal from connector housing and raising its lance to establish a more secure engagement. Removal of connector terminal used for MFI and 4 A/T control circuit shall be done in the following manner.

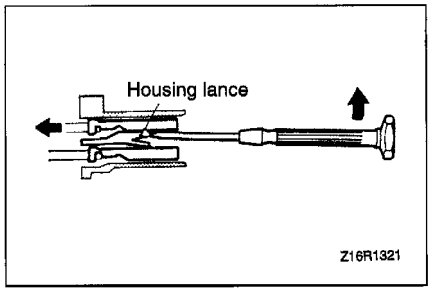


COMPUTER CONNECTOR

(1) Insert screwdriver [1.4 mm (.06 in.) width] as shown in the figure, disengage front holder and remove it.

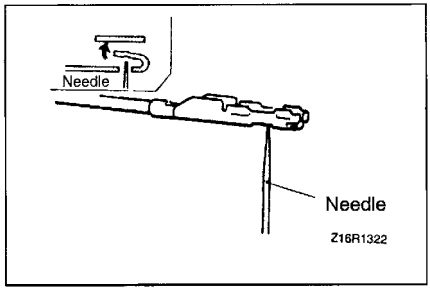


(2) Insert harness of terminal to be rectified deep into connector from harness side and hold it there.



(3) Insert tip of screwdriver [1.4 mm (.06 in.) width] into connector in a manner as shown in the figure, raise housing lance slightly with it and pull out harness.

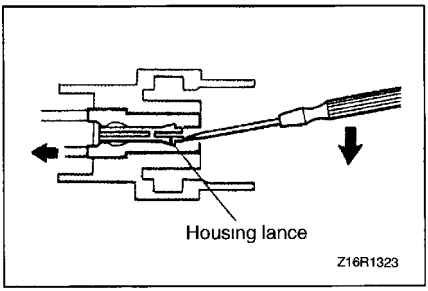
Caution
Tool No. 753787-1 supplied by AMP can be used instead of screwdriver.

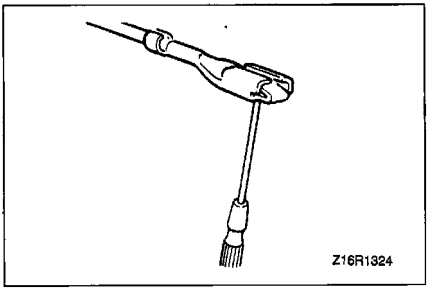


(4) Insert needle through a hole provided on terminal and raise contact point of male terminal.

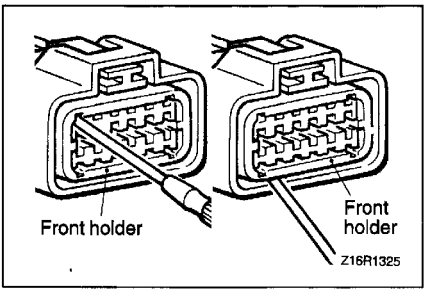
ROUND WATERPROOF CONNECTOR

(1) Remove waterproof cap by using a screwdriver.
(2) Insert tip of screwdriver [1.4 mm (.06 in.) or 2.0 mm (.08 in.) width] into connector in a manner as shown in the figure, raise housing lance slightly with it and pull out harness.



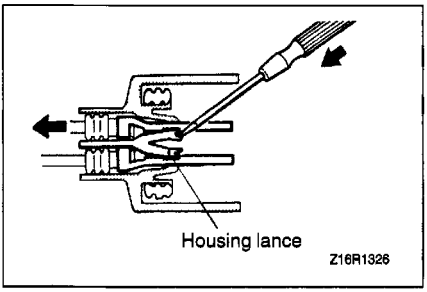


(3) Insert screwdriver through a hole provided on terminal and raise contact point of male terminal.

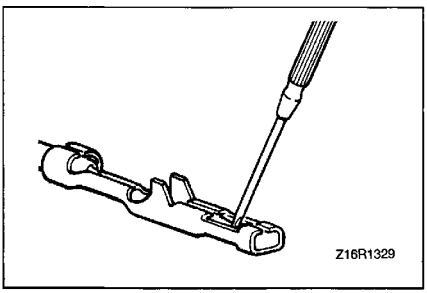


RECTANGULAR WATERPROOF CONNECTOR

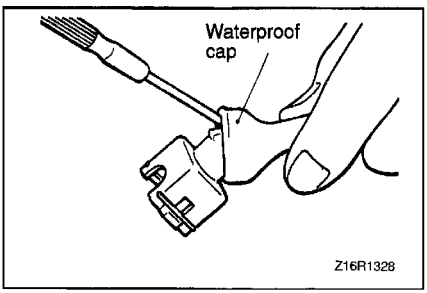
(1) Disengage front holder by using a screwdriver and remove it.



(2) Insert tip of screwdriver [*0.8 mm (.03 in.) width] into connector in a manner as shown in the figure, push it lightly to raise housing lancer and pull out harness.
*If right size screwdriver is not available, convert a conventional drive to suit the size.

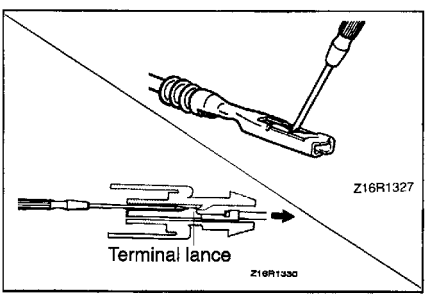


(3) Press contact point of male terminal down by holding a screwdriver [1.4 mm (.06 in.) width] in a manner as shown in the figure.



INJECTOR CONNECTOR

(1) Remove waterproof cap.



(2) Insert tip of screwdriver [1.4 mm (.06 in.) width] into connector in a manner as shown in the figure, press in terminal lance and pull out harness.
(3) Press contact point of male terminal down by holding a screwdriver [1.4 mm (.06 in.) width] in a manner as shown in the figure.

Caution
Ensure that lance is in proper condition before terminal is inserted into connector.

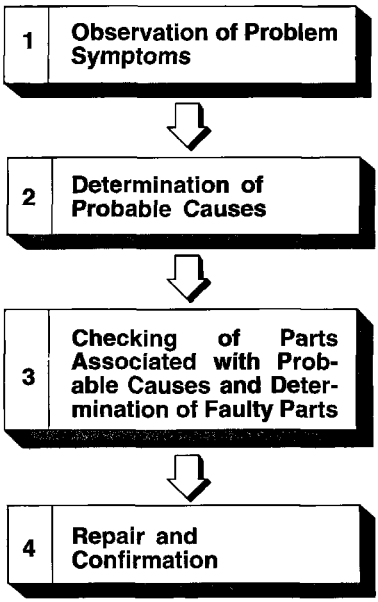
HOW TO DIAGNOSE

110000780

The most important point in troubleshooting is to determine "Probable Causes". Once the probable causes are determined, parts to be checked can be limited to those associated with such probable causes. Therefore, unnecessary checks can be eliminated. The determination of the probable causes must be based on a theory and be supported by facts and must not be based on intuition only.

TROUBLESHOOTING STEPS

If an attempt is made to solve a problem without going through correct steps for troubleshooting, the problem symptoms could become more complicated, resulting in failure to determine the causes correctly and making incorrect repairs. The four steps below should be followed in troubleshooting.



Observe the symptom carefully.
Check if there are also other problems.

In determining the probable causes, it is necessary to check the wiring diagram to understand the circuit as a system. Knowledge of switches, relays and other parts is necessary for accurate determination. The causes of similar problems in the past must be taken into account.

Troubleshooting is carried out by making step by step checks until the true cause is found. Always go through the procedures considering what check is to be made where for the best results.

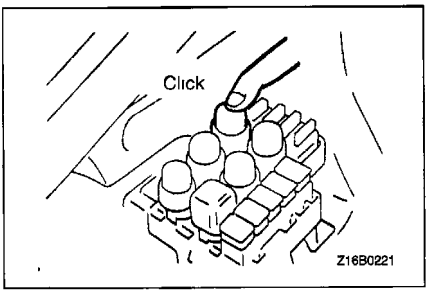
After the problems are corrected, be sure to check that the system operates correctly. Also, check that new problems have not been caused by the repair.

INFORMATION FOR DIAGNOSIS

This manual contains the cable diagrams as well as the individual circuit drawings, operational explanations, and troubleshooting hints for each component required to facilitate the task of troubleshooting. The information is compiled in the following manner:

(1) Cable diagrams show the connector positions, etc., on the actual vehicle as well as the harness path.
(2) Circuit drawings show the configuration of the circuit with all switches in their normal positions.
(3) Operational explanations include circuit drawings of voltage flow when the switch is operated and how the component operates in reaction.
(4) Troubleshooting hints include numerous examples of problems which might occur, traced backward in a common-sense manner to the origin of the trouble.
Problems whose origins may not be found in this manner are pursued through the various system circuits.

NOTE
Components of MFI, ETACS, ECS, etc. with electronic control unit do not include 3 and 4 above. For this information, refer to a manual which includes details of these components.

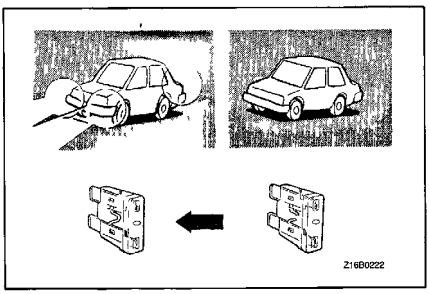


INSPECTION

110000781

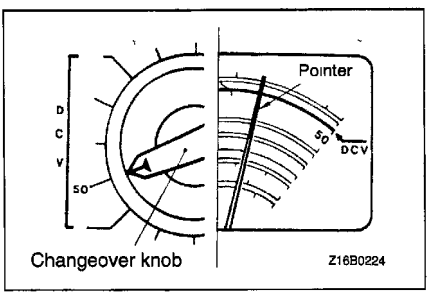
1. Visual and aural checks

Check relay operation, blower motor rotation, light illumination, etc. visually or aurally. The flow of current is invisible but can be checked by the operation of the parts.



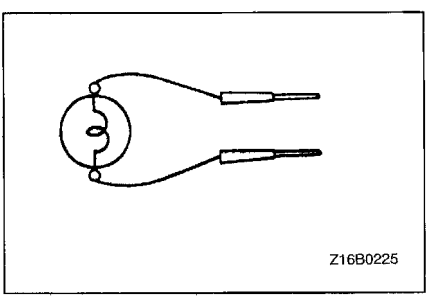
2. Simple checks

For example, if a headlight does not come on and a faulty fuse or poor grounding is suspected, replace the fuse with a new one or ground the light to the body by a jumper wire to determine which part is responsible for the problem.



3. Checking with Instruments

Use an appropriate instrument in an adequate range and read the indication correctly. You must have sufficient knowledge and experience to handle instruments correctly.



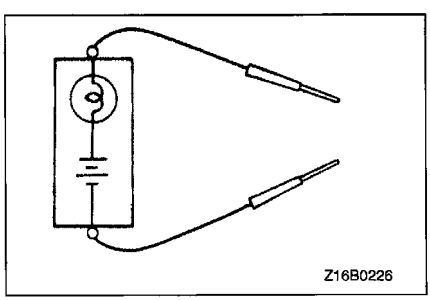
INSPECTION INSTRUMENTS

110000782

In inspection, make use of the following instruments.

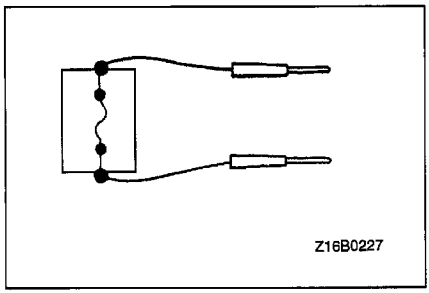
1. Test lights

A test light consists of a 12V bulb and lead wires. It is used to check voltages or short-circuits.



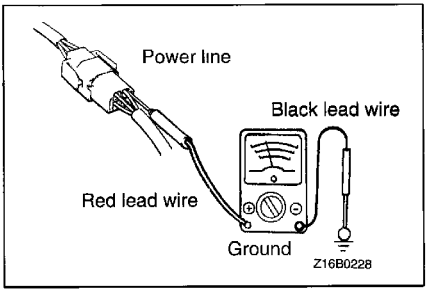
2. Self-power test light

A self-power test light consists of a bulb, battery and lead wires connected in series. It is used to check continuity or grounding.



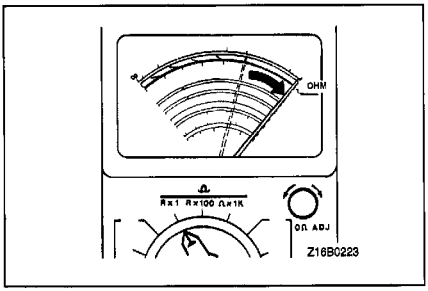
3. Jumper wire

A jumper wire is used to close an open circuit. Never use one to connect a power supply directly to a load.



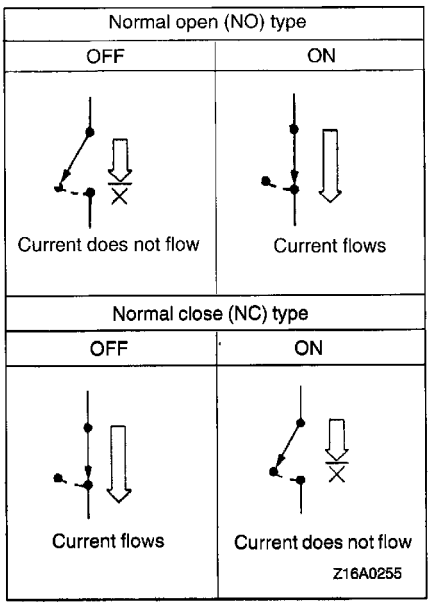
4. Voltmeter

A voltmeter is used to measure the circuit voltage. Normally, the positive (red lead) probe is applied to the point of voltage measurement and the negative (black lead) probe to the body ground.



5. Ohmmeter

An ohmmeter is used to check continuity or measure resistance of a switch or coil. If the measuring range has been changed, the zero point must be adjusted before measurement.



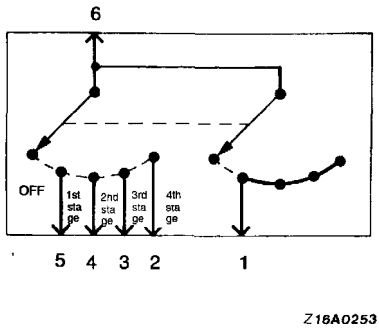
CHECKING SWITCHES

110000783

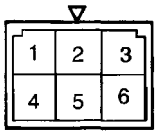
In a circuit diagram, a switch is represented by a symbol and in the idle state.

1. Normal open or normal close switch

Switches are classified into those which make the circuit open and those which make the circuit closed when off.



Z16A0253

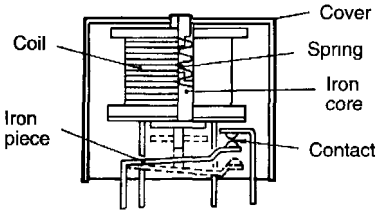


Z16W898

2. SWITCH CONNECTION

This figure illustrates a complex switch. The continuity between terminals at each position is as indicated in the table below.

Position	Terminal No.					
	1	2	3	4	5	6
OFF						
1st stage	○				○	○
2nd stage	○			○		○
3rd stage	○		○			○
4th stage	○	○				○

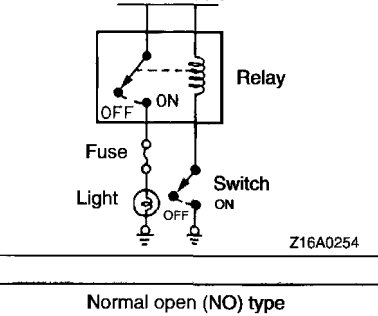


Z16B0231

CHECKING RELAYS

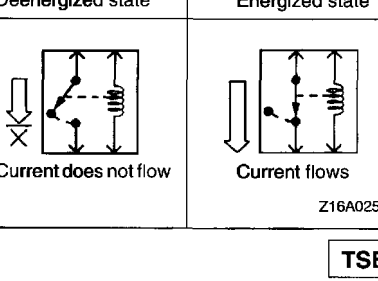
110000784

1. When current flows through the coil of a relay, its core is magnetized to attract the iron piece, closing (ON) the contact at the tip of the iron piece. When the coil current is turned off, the iron piece is made to return to its original position by a spring, opening the contact (OFF).



Z16A0254

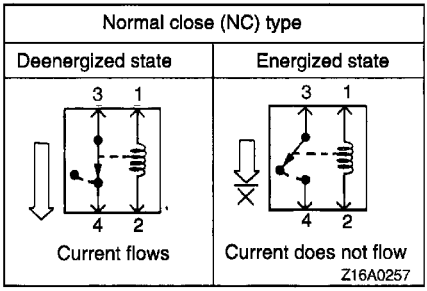
2. By using a relay, a heavy current can be turned on and off by a switch of small capacity. For example, in the circuit shown here, when the switch is turned on (closed), current flows to the coil of the relay. Then, its contact is turned on (closed) and the light comes on. The current flowing at this time to the switch is the relay coil current only and is very small.



Z16A0256

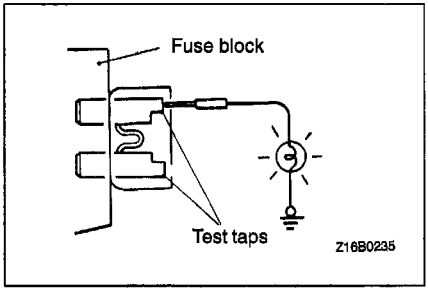
3. The relays may be classified into the normal open type and the normal close type by their contact construction.

NOTE
The deenergized state means that no current is flowing through the coil and the energized state means that current is flowing through the coil.

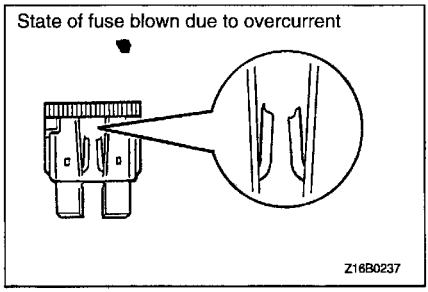


When a normal close type relay as illustrated here is checked, there should be continuity between terminals (1) and (2) and between terminals 3 and 4 when the relay is deenergized, and the continuity should be lost between terminals 3 and 4 when the battery voltage is applied to the terminals 1 and 2. A relay can be checked in this manner and it cannot be determined if a relay is okay or faulty by checking its state only when it is deenergized (or energized).

CHECKING FUSES 110000785



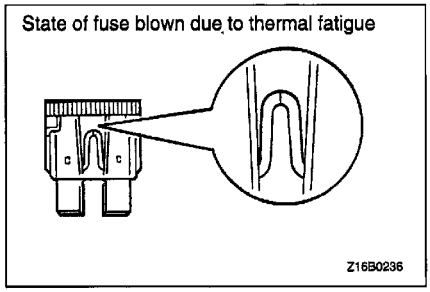
A blade type fuse has test taps provided to allow checking of the fuse itself without removing it from the fuse block. The fuse is okay if the test light comes on when its one lead is connected to the test taps (one at a time) and the other lead is grounded. (Change the ignition switch position adequately so that the fuse circuit becomes live.)



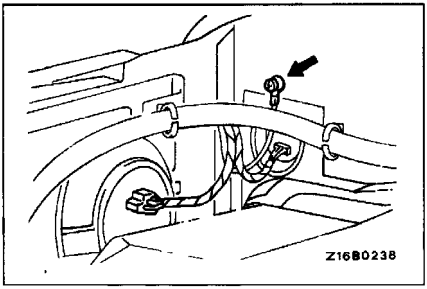
CAUTIONS IN EVENT OF BLOWN FUSE

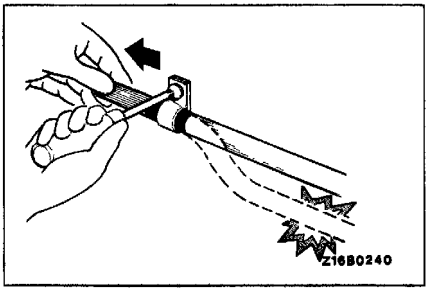
When a fuse is blown, there are two probable causes as follows: One is that it is blown due to flow of current exceeding its rating.
The other is that it is blown due to repeated on/off current flowing through it. Which of the two causes is responsible can be easily determined by visual check as described below.

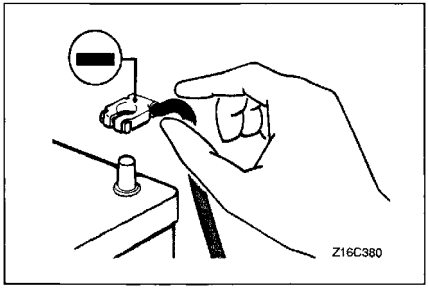
(1) Fuse blown due to current exceeding rating
The illustration shows the state of a fuse blown due to this cause. In this case, do not replace the fuse with a new one hastily since a current heavy enough to blow the fuse has flowed through it. First, check the circuit for shorting and check for abnormal electric parts. Only after the correction of such shorting or parts, fuse of the same capacity should be used as a replacement. Never use a fuse of larger capacity than the one that has blown. If such a fuse is used, electric parts or wirings could be damaged before the fuse blows in the event an overcurrent occurs again.



(2) Fuse blown due to repeated current on/off
The illustration shows the state of a fuse blown due to repeated current on/off. Normally, this type of problem occurs after fairly long period of use and hence is less frequent than the above type. In this case, you may simply replace with a new fuse of the same capacity.







CHECKING CABLES AND WIRES 110000786

1. Check connections for looseness, rust and stains.
2. Check terminals and wires for corrosion by battery electrolyte, etc.
3. Check terminals and wires for open circuit or impending open circuit.
4. Check wire insulation and coating for damage, cracks and degrading.
5. Check conductive parts of terminals for contact with other metallic parts (vehicle body and other parts).
6. Check grounding parts to verify that there is complete continuity between attaching bolt(s) and vehicle body.
7. Check for incorrect wiring.
8. Check that wirings are so clamped as to prevent contact with sharp corners of the vehicle body, etc. or hot parts (exhaust manifold, pipe, etc.).
9. Check that wirings are clamped firmly to secure enough clearance from the fan pulley, fan belt and other rotating or moving parts.
10. Check that the wirings between the fixed parts such as the vehicle body and the vibrating parts such as the engine are made with adequate allowance for vibrations.

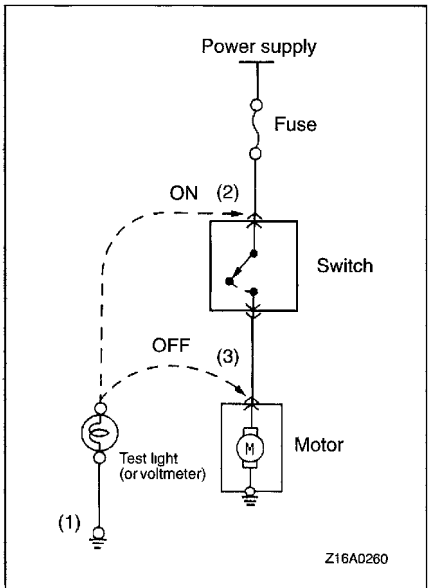
BATTERY HANDLING 110003532

When checking or servicing does not require power from the vehicle battery, be sure to disconnect the cable from the battery (–) terminal. This is to prevent problems that could be caused by a short circuit. Disconnect the (–) terminal first and reconnect it last.

Caution

1. **Before connecting or disconnecting the negative cable, be sure to turn off the ignition switch and the lighting switch. (If this is not done, there is the possibility of semiconductor parts being damaged.)**
2. **After completion of the work steps [when the battery's negative (–) terminal is connected], warm up the engine and allow it to idle for approximately ten minutes under the conditions described below, in order to stabilize the engine control conditions, and then check to be sure that the idling is satisfactory.**

   Engine coolant temperature: 85–95°C (185–203°F)
   Lights, electric fans, accessories: OFF
   Transaxle: Neutral position
   (A/T models: "N"or "P")
   Steering wheel: Neutral (center) position



GENERAL ELECTRICAL SYSTEM CHECKS

110000788

A circuit consists of the power supply, switch, relay, load, ground, etc. There are various methods to check a circuit including an overall check, voltage check, short-circuit check and continuity check. Each of these methods is briefly described in the following.

1. VOLTAGE CHECK

(1) Ground one lead wire of the test light. If a voltmeter is used instead of the test light, ground the grounding side lead wire.

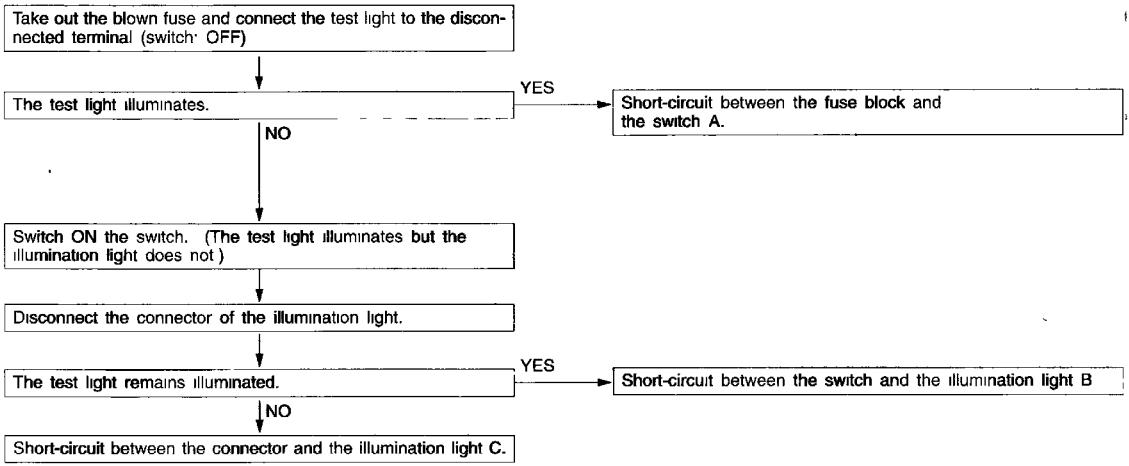
(2) Connect the other lead wire of the test light to the power side terminal of the switch connector. The test light should come on or the voltmeter should indicate a voltage.

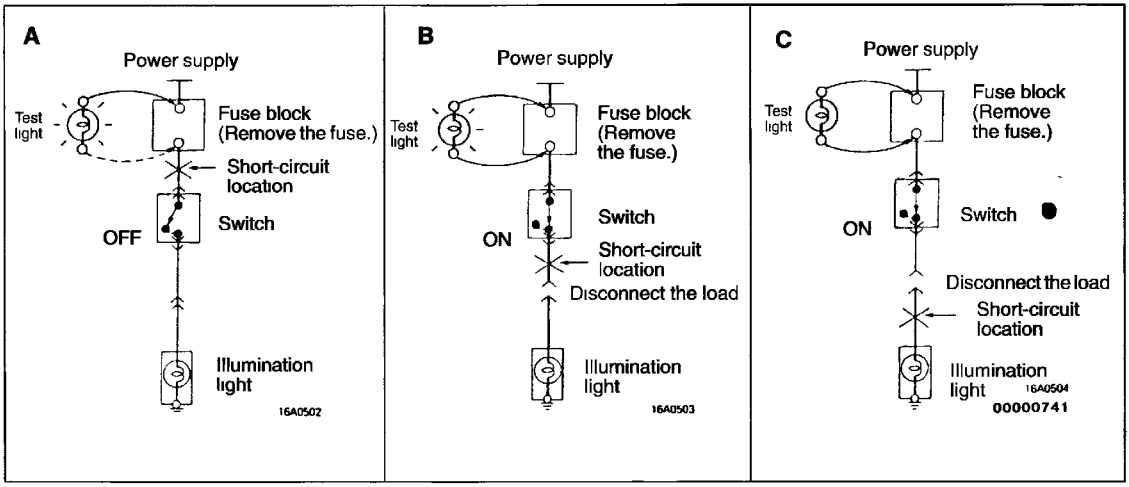
(3) Then, connect the test light or voltmeter to the motor connector. The test light should not come on, or the voltmeter should indicate no voltage. When the switch is turned on in this state, the test light should come on, or the voltmeter should indicate a voltage, with motor starting to run.

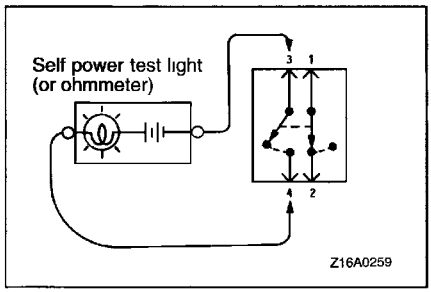
(4) The circuit illustrated here is normal but if there is any problem such as the motor failing to run, check voltages beginning at the connector nearest to the motor until the faulty part is identified.

2. SHORT-CIRCUITS CHECK

Because the fuse has blown, it is probable that there is a short-circuited circuit.
Follow the procedures below to narrow down the short-circuit location.







3. CONTINUITY CHECK

(1) When the switch is in the OFF position, the self power test light should come on or the ohmmeter should read 0 ohm only when the terminals 1 and 2 are interconnected.
(2) When the switch is the ON position, the self power test light should come on or the ohmmeter should read 0 ohm only when the terminals 3 and 4 are interconnected.

TSB Revision

CONFIGURATION DIAGRAMS

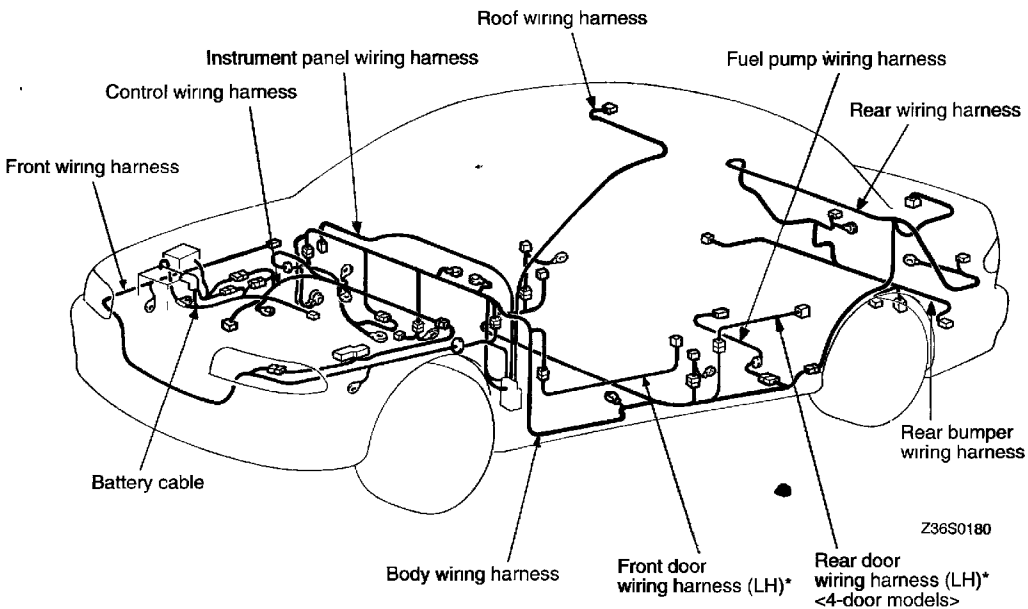
CONTENTS

110003533

Dash Panel 64
Door 73
Engine Compartment 40
How to Read Configuration Diagrams 39
Instrument Panel 70
Interior 72
Luggage Compartment 77
Overall Configuration Diagram 38
Under Rear Floor 78

OVERALL CONFIGURATION DIAGRAM

110003534



NOTE
(1) This illustration shows only the major wiring harnesses.
(2) * Indicates also equipped at the right side.

HOW TO READ CONFIGURATION DIAGRAMS

110003535

The wiring harness diagrams clearly show the connector locations and harness routings at each site on actual vehicles.

Denotes connector No
The same connector No is used throughout the circuit diagrams to facilitate connector location searches
The first alphabetical symbol indicates the location site of the connector and a number that follows is the unique number Numbers are assigned to parts in clockwise order on the diagram.
In addition, the number of connector wires and the connector color (except milk white)* are shown for ease of retrieval

Example: A-12 (2-Black)

- Connector color (milk white if no color is indicated)
- Number of connector wires
- Number specific to connector (serial number)
- Connector location site symbol
  - A Engine compartment
  - B Dash panel
  - C Instrument panel
  - D Interior
  - E Door
  - F Luggage compartment
  - G. Under rear floor

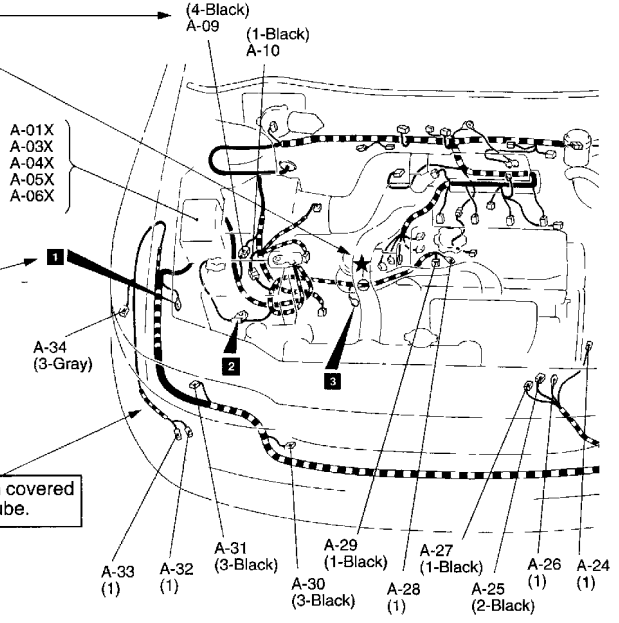
*:Typical connector colors. Black, white, red, blue, yellow, green, brown, etc

The mark ★ shows the standard mounting position of wiring harness

Denotes ground point.
Same ground number is used throughout circuit diagrams to facilitate search of ground point. Refer to P.5 for details of ground points.

Denotes a section covered by a corrugated tube.

Indicates the device to which the connector is to be connected "–" means that the connector with code-number is not used.



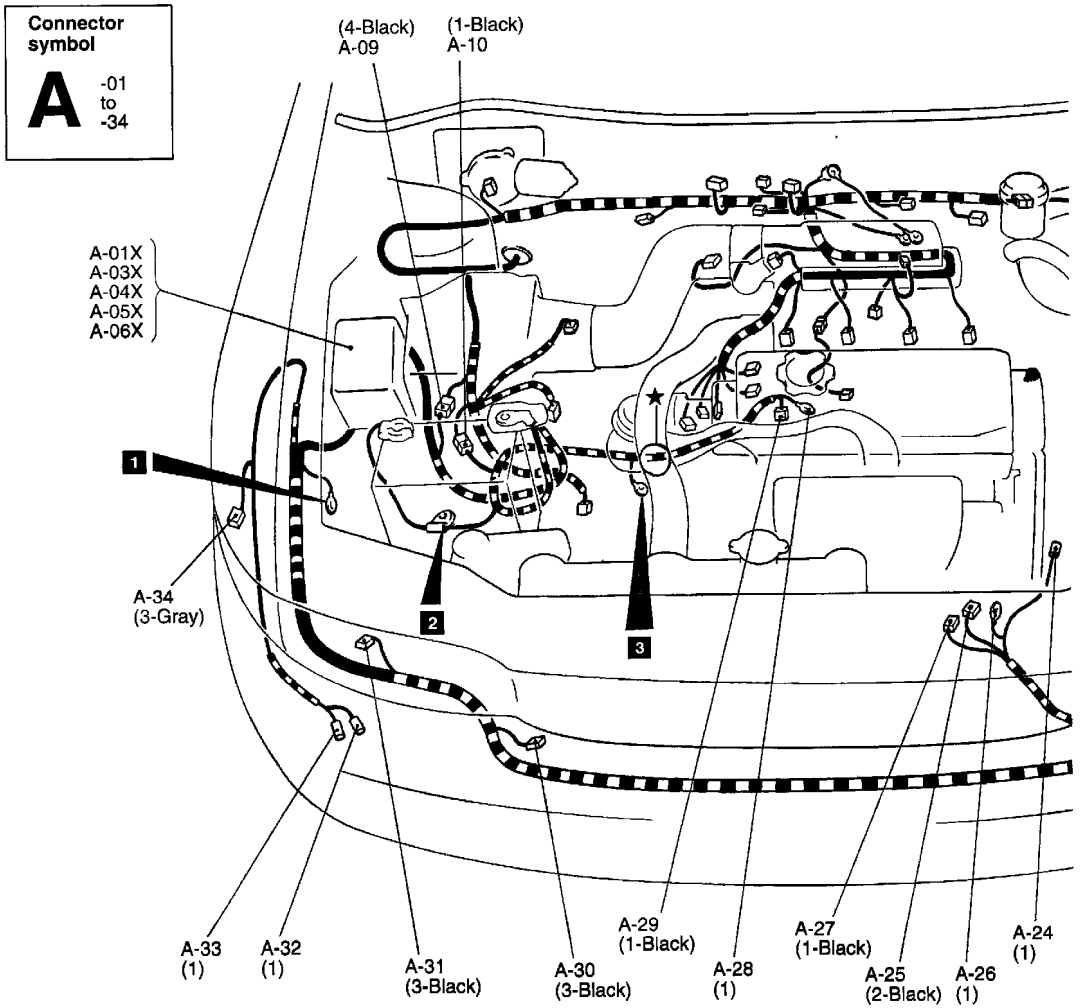
A-01X Generator relay*
A-02X –
A-03X Radiator fan motor relay*
A-04X Headlight relay*

A-11 –
A-12 –
A-13 –
A-14 –
A-15 Front turn signal light (LH)

ENGINE COMPARTMENT

110003536

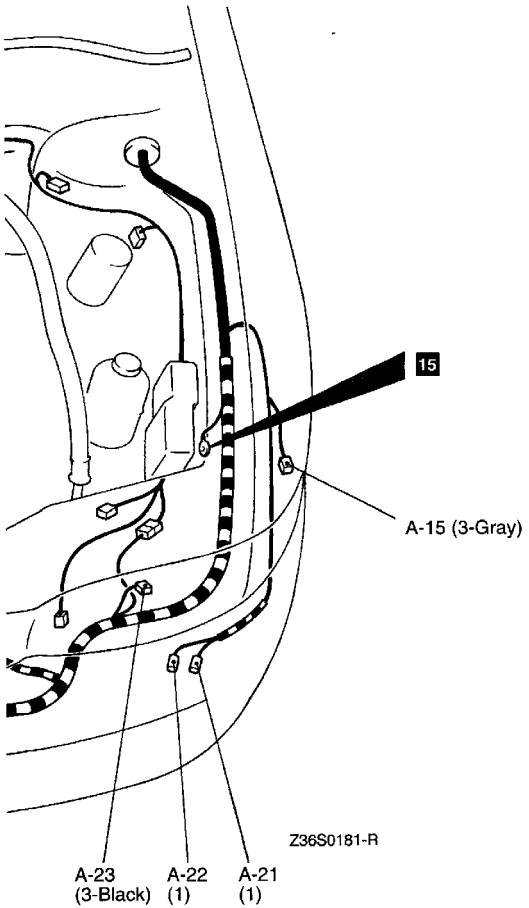
1.5L ENGINE <Up to 1994 models>



Z36S0181-L

A-01X	Generator relay*
A-02X	–
A-03X	Radiator fan motor relay*
A-04X	Headlight relay*
A-05X	Taillight relay*
A-06X	IOD or storage connector*
A-07	–
A-08	–
A-09	Front wiring harness and control wiring harness combination
A-10	Control wiring harness and battery cable assembly combination
A-11	–
A-12	–
A-13	–
A-14	–
A-15	Front turn signal light (LH)
A-16	–
A-17	–
A-18	–
A-19	–
A-20	–
A-21	Horn (LH)
A-22	Horn (LH)
A-23	Headlight (LH)
A-24	Power steering pressure switch

TSB Revision

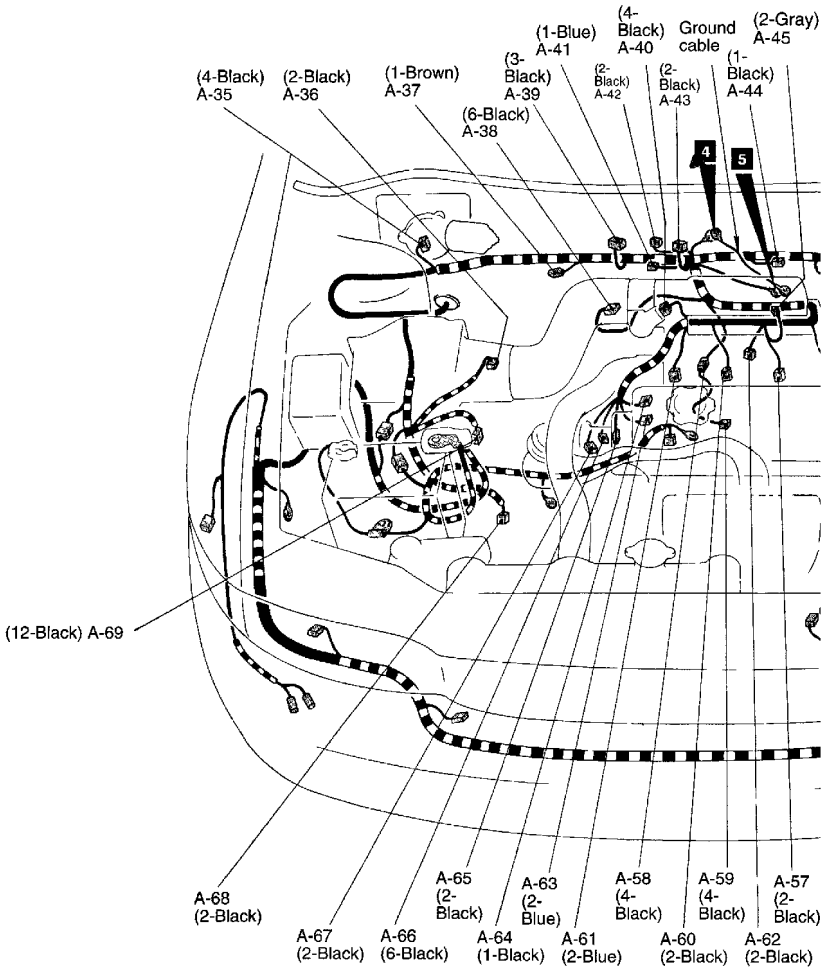


A-25 Generator
A-26 Generator
A-27 Oil pressure switch
A-28 Starter
A-29 Starter
A-30 Radiator fan assembly
A-31 Headlight (RH)
A-32 Horn (RH)
A-33 Horn (RH)
A-34 Front turn signal light (RH)

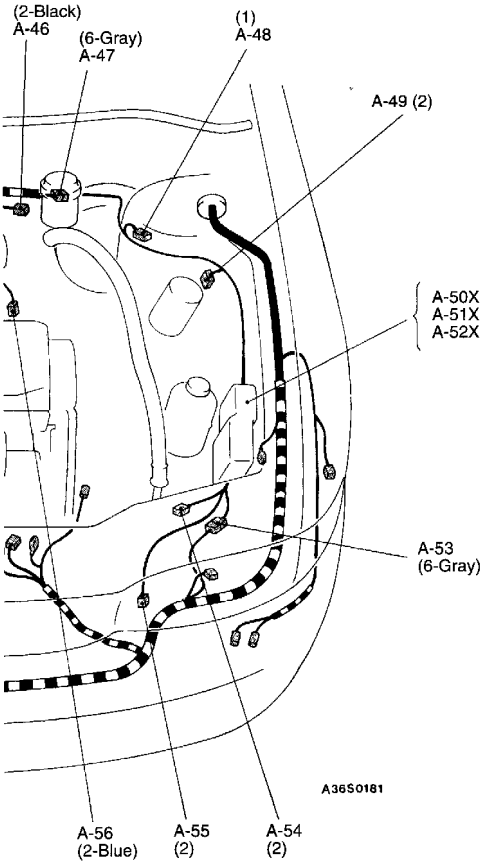
NOTE
*: Refer to CENTRALIZED JUNCTION

Connector symbol

A -35 to -69



A-35 Windshield wiper motor
A-36 Windshield washer motor
A-37 Ignition timing adjustment connector
A-38 Idle air control motor
A-39 Manifold absolute pressure sensor
A-40 Throttle position sensor
A-41 Engine speed detection connector
A-42 EGR solenoid
A-43 Evaporative emission purge solenoid
A-44 Fuel pump check connector
A-45 Intake air temperature sensor
A-46 Brake fluid level switch
A-47 Control wiring harness and A/C wiring harness combination
A-48 Magnetic clutch and refrigerant temperature switch <A/C>
A-49 Dual pressure switch* <A/C>
A-50X Radiator fan motor control relay* <A/T (A/C), M/T (A/C)–1994 models>
A-51X Condenser fan motor relay* <A/C>
A-52X A/C compressor clutch relay* <A/C>



A-53 Front wiring harness and A/C wiring harness combination <A/C>
A-54 No connection <M/T, A/T–1994 models>
A-55 Condenser fan motor
A-56 Injector No. 1
A-57 Injector No. 2
A-58 Control wiring harness and heated oxygen sensor wiring harness combination <California, Federal–1994 models>
A-59 Heated oxygen sensor (front) <California, Federal–1994 models>
A-60 Injector No. 3
A-61 Injector No. 4
A-62 EGR temperature sensor
A-63 Engine coolant temperature sensor
A-64 Engine coolant temperature gauge unit
A-65 Oxygen sensor <1993 models>
A-66 Distributor assembly
A-67 Distributor assembly
A-68 Back-up light switch <M/T>
A-69 Park / neutral position switch <A/T>

NOTE
*: Refer to CENTRALIZED JUNCTION

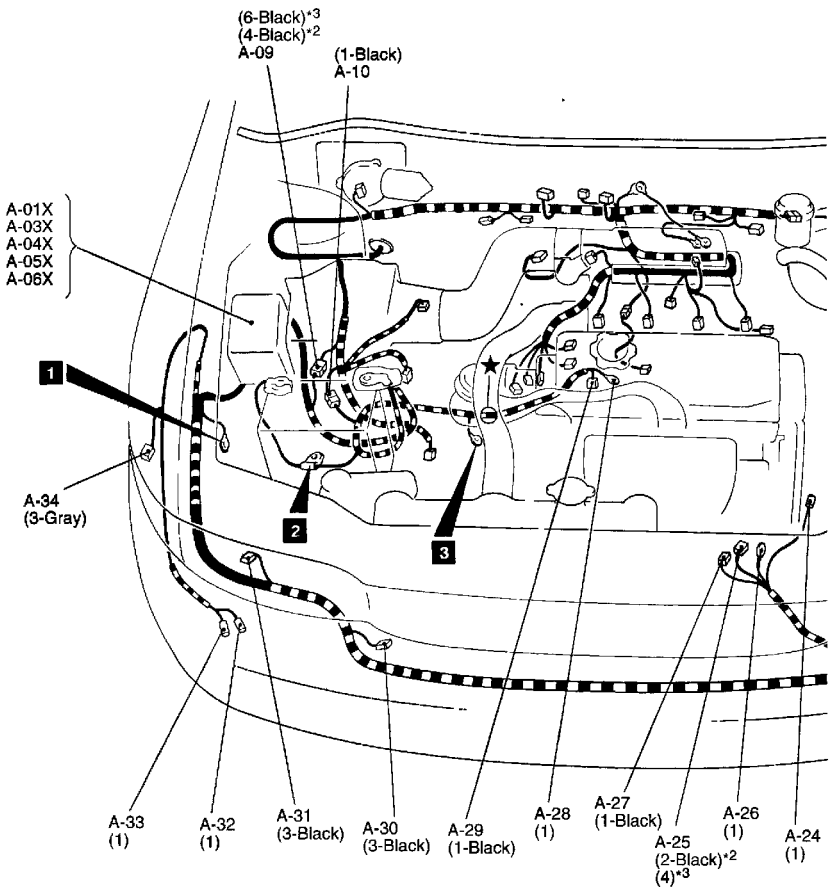
ENGINE COMPARTMENT

110003537

1.5L ENGINE <1995 models>

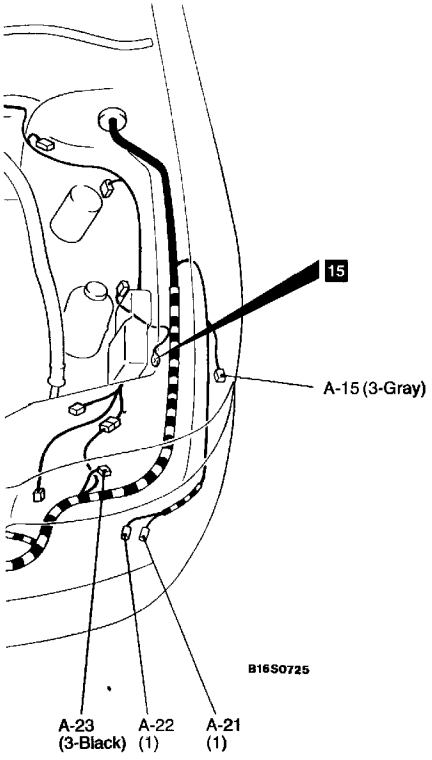
Connector symbol

A -01 to -34



A-01X	Generator relay*1
A-02X	–
A-03X	Radiator fan motor relay*1
A-04X	Headlight relay*1
A-05X	Taillight relay*1
A-06X	IOD or storage connector*1
A-07	–
A-08	–
A-09	Front wiring harness and control wiring harness combination
A-10	Control wiring harness and battery cable assembly combination
A-11	–
A-12	–
A-13	–
A-14	–
A-15	Front turn signal light (LH)
A-16	–
A-17	–
A-18	–
A-19	–
A-20	–
A-21	Horn (LH)
A-22	Horn (LH)
A-23	Headlight (LH)
A-24	Power steering pressure switch

TSB Revision

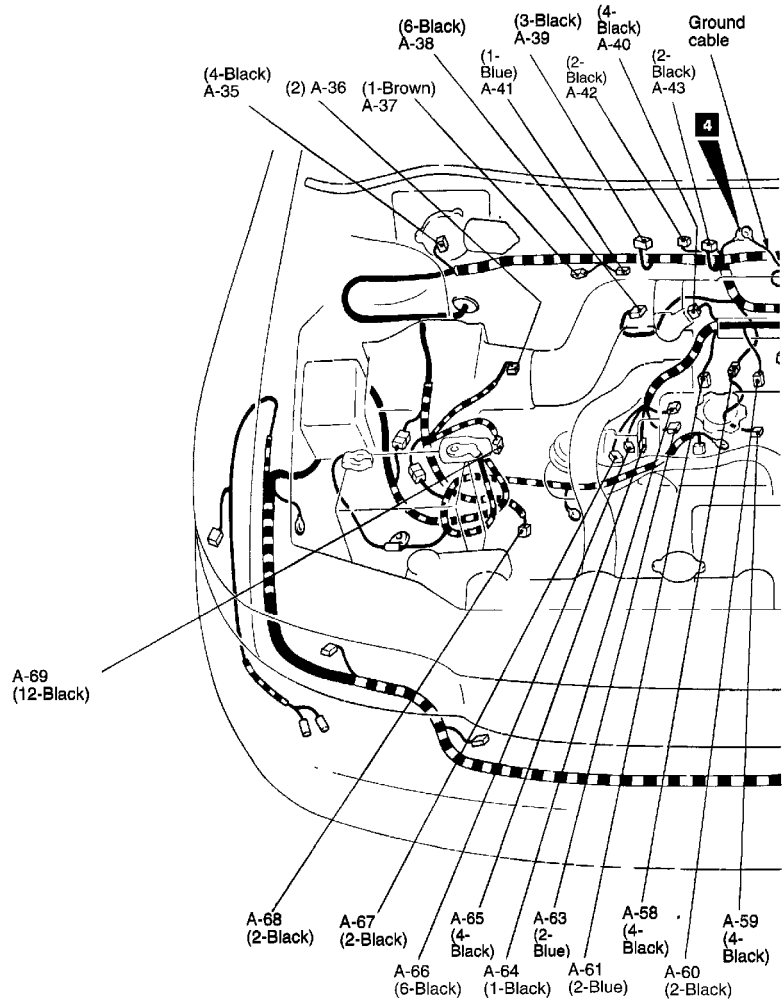


A-25 Generator
A-26 Generator
A-27 Oil pressure switch
A-28 Starter
A-29 Starter
A-30 Radiator fan assembly
A-31 Headlight (RH)
A-32 Horn (RH)
A-33 Horn (RH)
A-34 Front turn signal light (RH)

NOTE
*1: Refer to CENTRALIZED JUNCTION
*2: Vehicles for Federal
*3: Vehicles for California

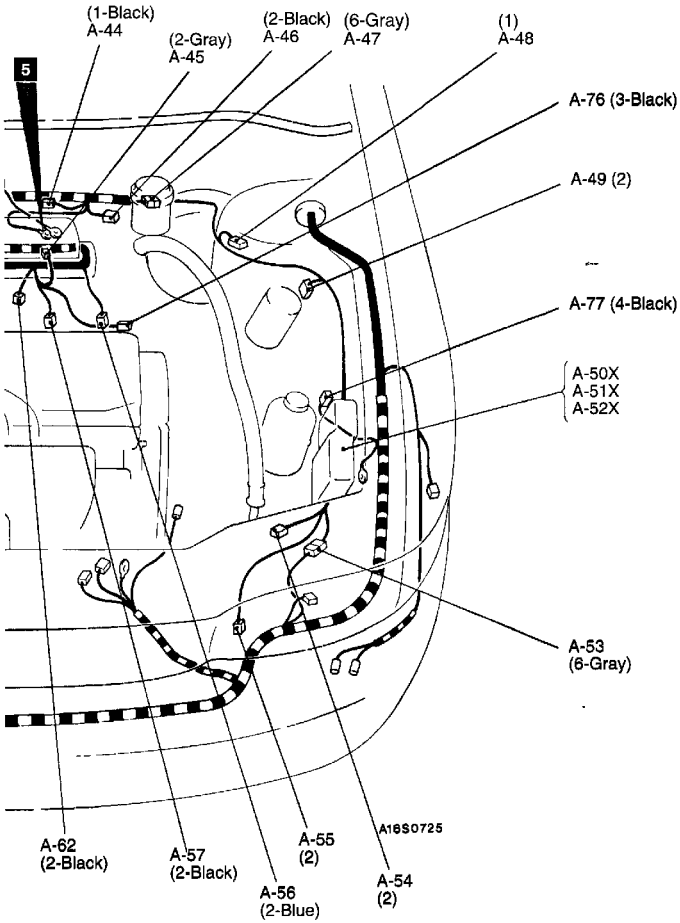
Connector symbol

A -35 to -77



A-35 Windshield wiper motor
A-36 Windshield washer motor
A-37 Ignition timing adjustment connector
A-38 Idle air control motor
A-39 Manifold absolute pressure sensor
A-40 Throttle position sensor
A-41 Engine speed detection connector
A-42 EGR solenoid
A-43 Evaporative emission purge solenoid
A-44 Fuel pump check connector
A-45 Intake air temperature sensor
A-46 Brake fluid level switch
A-47 Control wiring harness and A/C wiring harness combination
A-48 Magnetic clutch and refrigerant temperature switch <A/C>
A-49 Dual pressure switch <A/C>
A-50X Radiator fan motor control relay* <A/C>
A-51X Condenser fan motor relay* <A/C>
A-52X A/C compressor clutch relay* <A/C>

TSB Revision

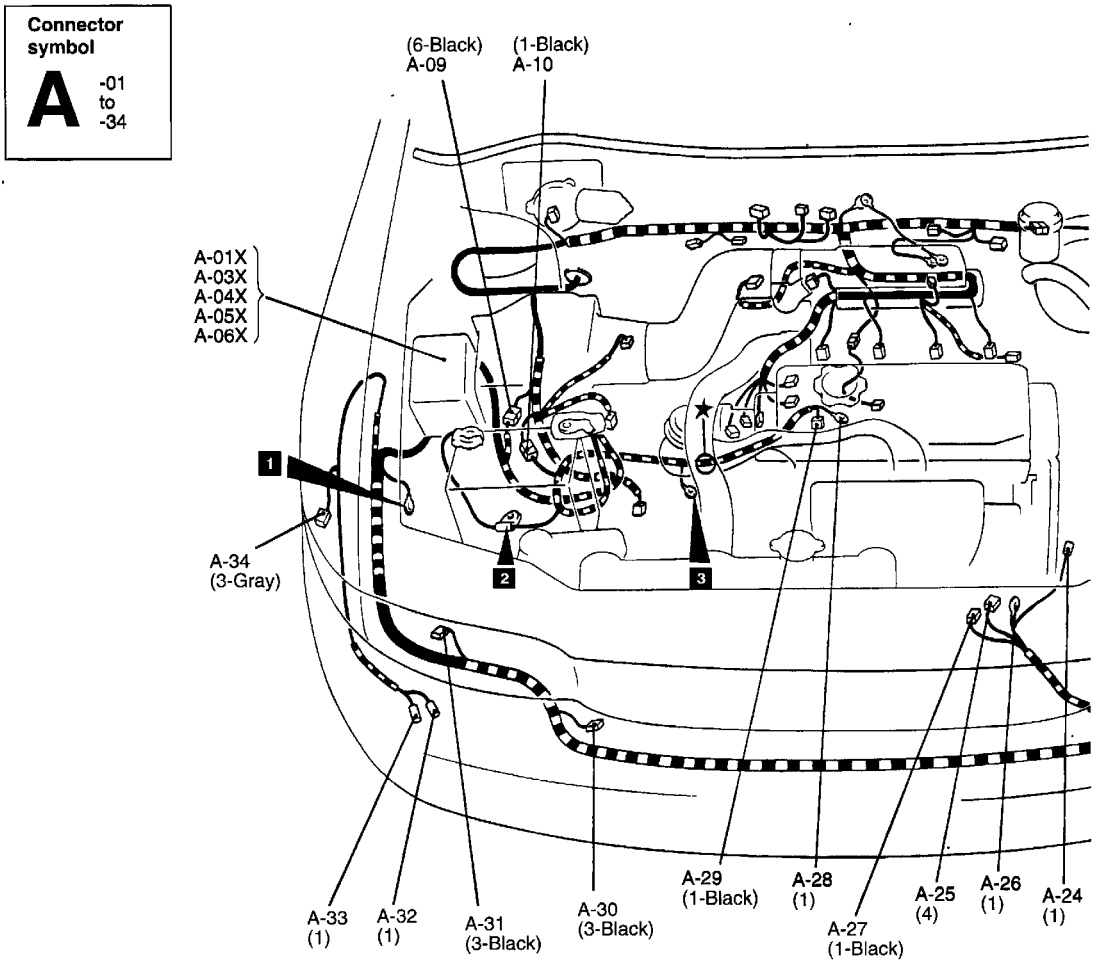


A-53	Front wiring harness and A/C wiring harness combination <A/C>	A-65	Heated oxygen sensor (front) <California>
A-54	No connection	A-66	Distributor assembly
A-55	Condenser fan motor	A-67	Distributor assembly
A-56	Injector No. 1	A-68	Back-up light switch <M/T>
A-57	Injector No. 2	A-69	Park / neutral position switch <A/T>
A-58	Control wiring harness and heated oxygen sensor wiring harness combination	A-70	–
A-59	Heated oxygen sensor (front) <Federal> Heated oxygen sensor (rear) <California>	A-71	–
		A-72	–
		A-73	–
		A-74	–
A-60	Injector No. 3	A-75	–
A-61	Injector No. 4	A-76	Crankshaft position sensor <California>
A-62	EGR temperature sensor <Federal>	A-77	Horn relay
A-63	Engine coolant temperature sensor	NOTE	
A-64	Engine coolant temperature gauge unit	*: Refer to CENTRALIZED JUNCTION	

ENGINE COMPARTMENT

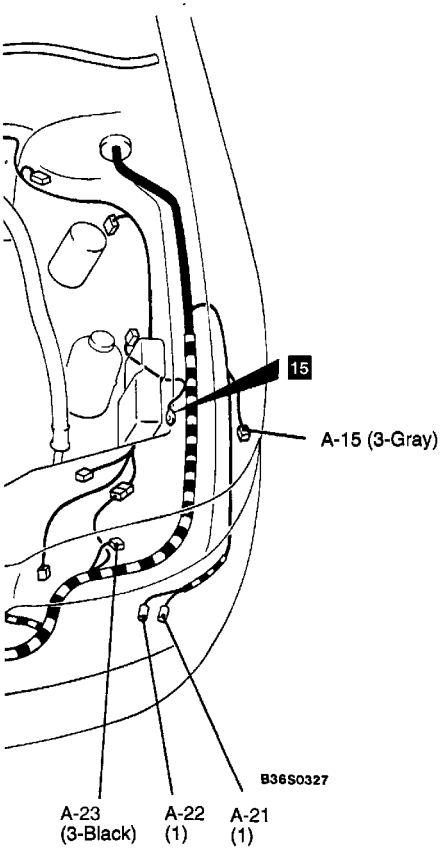
110003537

1.5L ENGINE <From 1996 models>



A-01X	Generator relay*
A-02X	–
A-03X	Radiator fan motor relay*
A-04X	Headlight relay*
A-05X	Taillight relay*
A-06X	IOD or storage connector*
A-07	–
A-08	–
A-09	Front wiring harness and control wiring harness combination
A-10	Control wiring harness and battery cable assembly combination
A-11	–
A-12	–
A-13	–
A-14	–
A-15	Front turn signal light (LH)
A-16	–
A-17	–
A-18	–
A-19	–
A-20	–
A-21	Horn (LH)
A-22	Horn (LH)
A-23	Headlight (LH)
A-24	Power steering pressure switch

TSB Revision

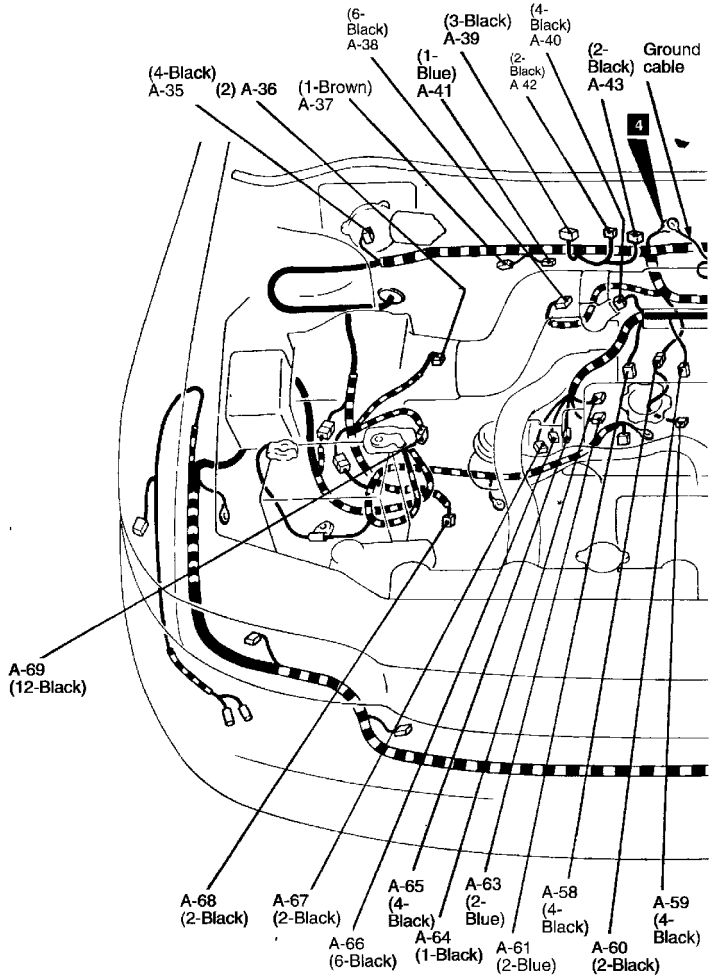


A-25 Generator
A-26 Generator
A-27 Oil pressure switch
A-28 Starter
A-29 Starter
A-30 Radiator fan assembly
A-31 Headlight (RH)
A-32 Horn (RH)
A-33 Horn (RH)
A-34 Front turn signal light (RH)

NOTE
*: Refer to CENTRALIZED JUNCTION

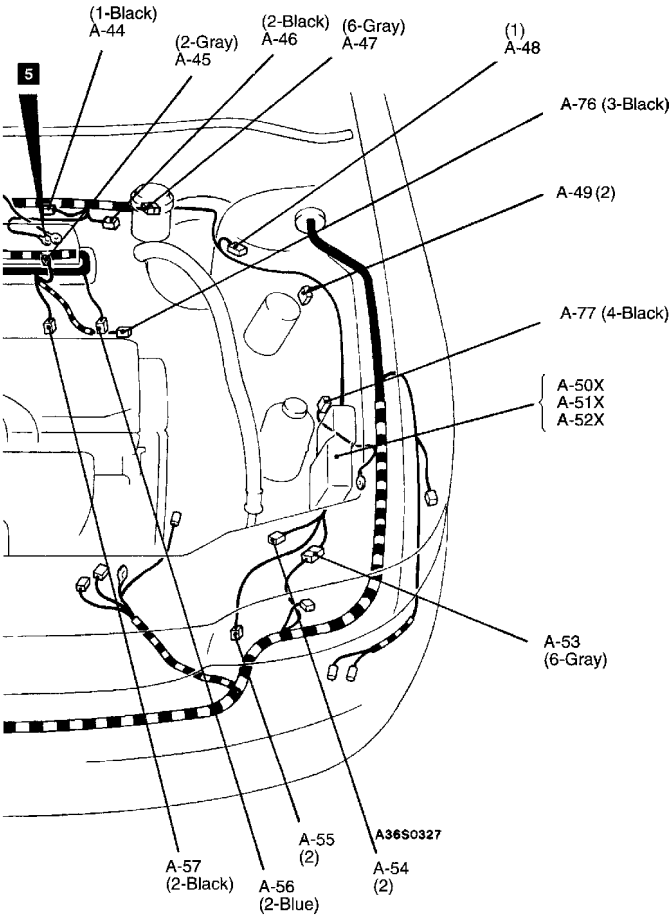
Connector symbol

A -35 to -77



A-35 Windshield wiper motor
A-36 Windshield washer motor
A-37 Ignition timing adjustment connector
A-38 Idle air control motor
A-39 Manifold absolute pressure sensor
A-40 Throttle position sensor
A-41 Engine speed detection connector
A-42 EGR solenoid
A-43 Evaporative emission purge solenoid
A-44 Fuel pump check connector
A-45 Intake air temperature sensor
A-46 Brake fluid level switch
A-47 Control wiring harness and A/C wiring harness combination
A-48 Magnetic clutch and refrigerant temperature switch <A/C>
A-49 Dual pressure switch <A/C>
A-50X Radiator fan motor control relay* <A/C>
A-51X Condenser fan motor relay* <A/C>
A-52X A/C compressor clutch relay* <A/C>

TSB Revision



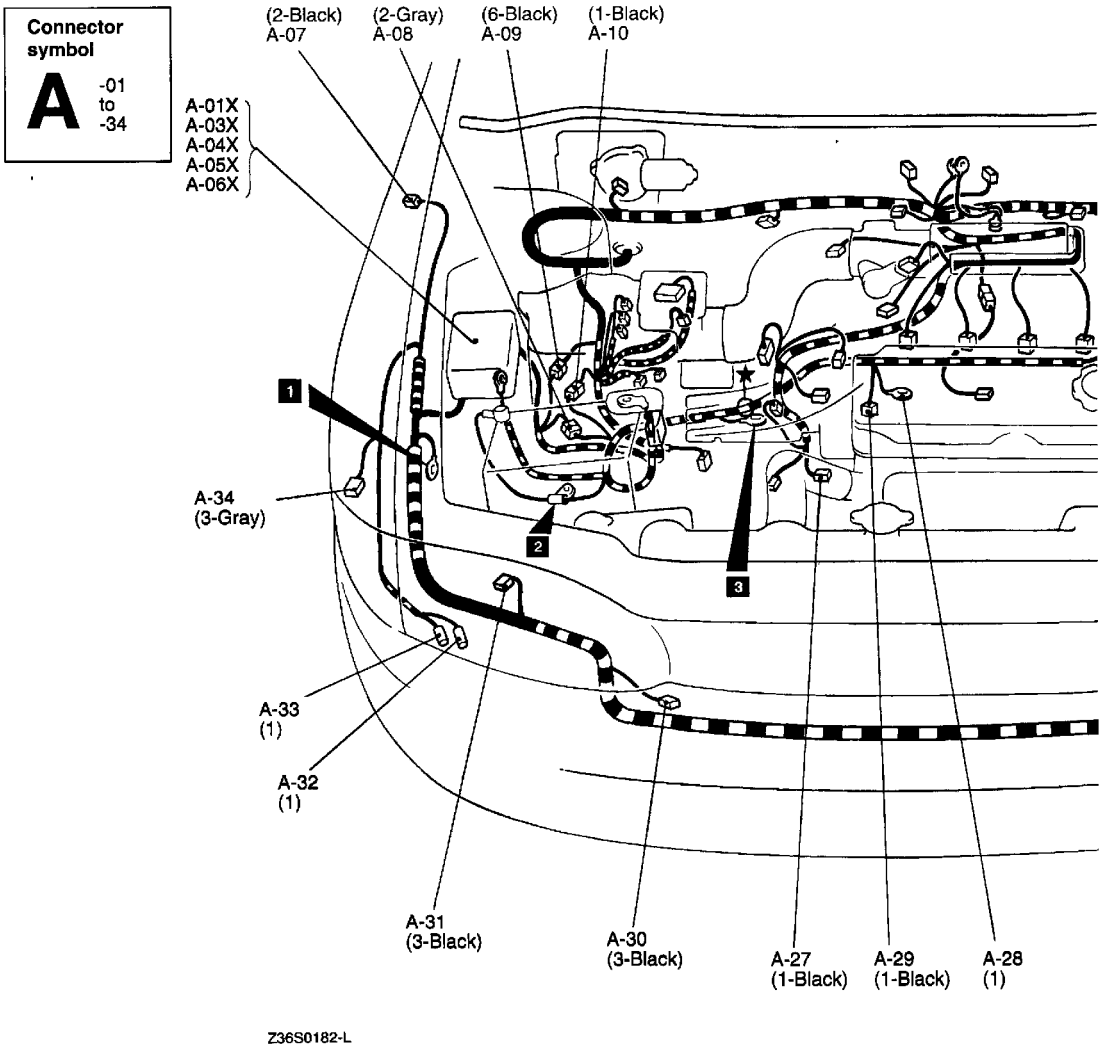
A-53	Front wiring harness and A/C wiring harness combination <A/C>
A-54	No connection
A-55	Condenser fan motor
A-56	Injector No. 1
A-57	Injector No. 2
A-58	Control wiring harness and heated oxygen sensor wiring harness combination
A-59	Heated oxygen sensor (front) <Federal> Heated oxygen sensor (rear) <California>
A-60	Injector No. 3
A-61	Injector No. 4
A-62	–
A-63	Engine coolant temperature sensor
A-64	Engine coolant temperature gauge unit
A-65	Heated oxygen sensor (front) <California>
A-66	Distributor assembly
A-67	Distributor assembly
A-68	Back-up light switch <M/T>
A-69	Park / neutral position switch <A/T>
A-70	–
A-71	–
A-72	–
A-73	–
A-74	–
A-75	–
A-76	Crankshaft position sensor
A-77	Horn relay

NOTE
*: Refer to CENTRALIZED JUNCTION

ENGINE COMPARTMENT

110003538

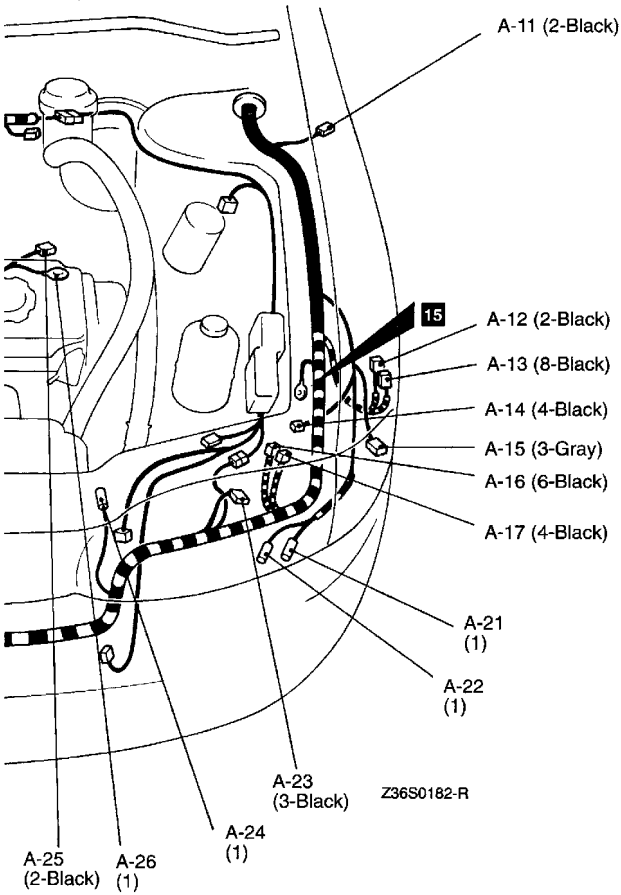
1.8L ENGINE <Up to 1994 models>



Z36S0182-L

A-01X	Generator relay*
A-02X	–
A-03X	Radiator fan motor relay*
A-04X	Headlight relay*
A-05X	Taillight relay*
A-06X	IOD or storage connector*
A-07	ABS speed sensor (Front: RH)
A-08	Front wiring harness and battery cable assembly combination
A-09	Front wiring harness and control wiring harness combination
A-10	Control wiring harness and battery cable assembly combination
A-11	ABS speed sensor (Front: LH)
A-12	ABS hydraulic unit
A-13	ABS hydraulic unit
A-14	Auto-cruise control actuator
A-15	Front turn signal light (LH)
A-16	ABS valve relay
A-17	ABS motor relay
A-18	–
A-19	–
A-20	–
A-21	Horn (LH)
A-22	Horn (LH)

TSB Revision

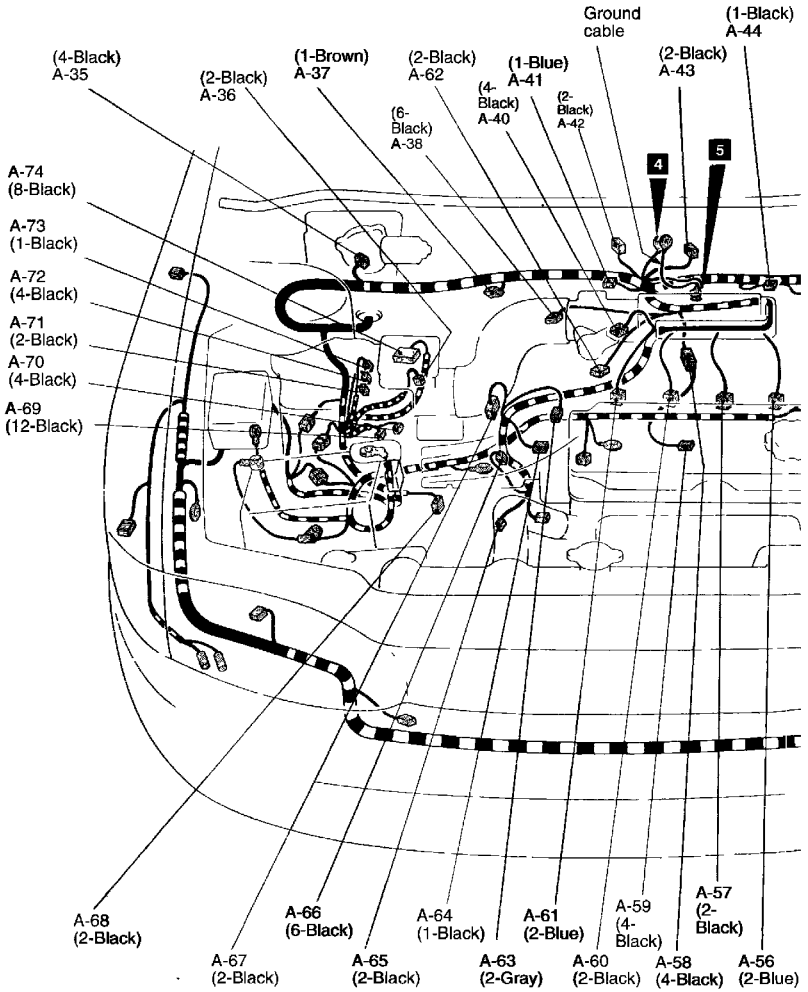


A-23 Headlight (LH)
A-24 Power steering pressure switch
A-25 Generator
A-26 Generator
A-27 Oil pressure switch
A-28 Starter
A-29 Starter
A-30 Radiator fan assembly
A-31 Headlight (RH)
A-32 Horn (RH)
A-33 Horn (RH)
A-34 Front turn signal light (RH)

NOTE
*: Refer to CENTRALIZED JUNCTION

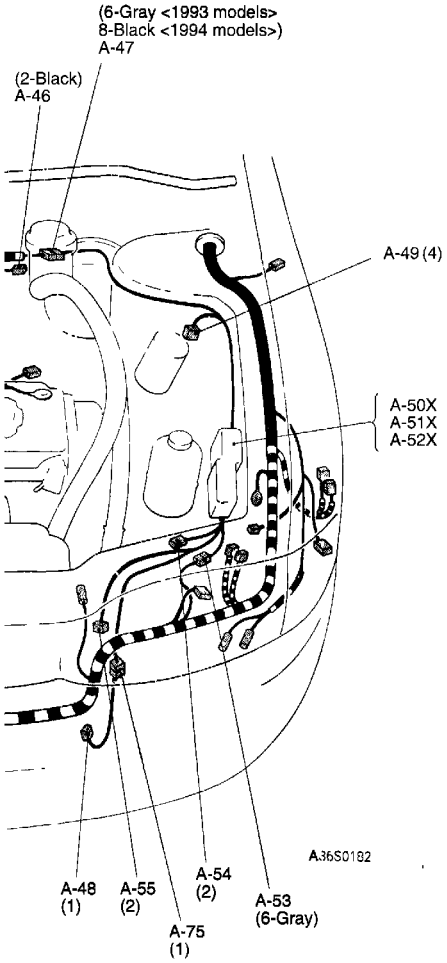
Connector symbol

A -35 to -75



A-35 Windshield wiper motor
A-36 Windshield washer motor
A-37 Ignition timing adjustment connector
A-38 Idle air control motor
A-39 –
A-40 Throttle position sensor
A-41 Engine speed detection connector
A-42 EGR solenoid
A-43 Evaporative emission purge solenoid
A-44 Fuel pump check connector
A-45 –
A-46 Brake fluid level switch
A-47 Control wiring harness and A/C wiring harness combination
A-48 Magnetic clutch and refrigerant temperature switch <A/C>
A-49 Triple pressure switch <A/C>
A-50X Condenser fan motor relay* <A/C>
A-51X Fan motor control relay* <A/C>
A-52X A/C compressor clutch relay* <A/C>

TSB Revision



A-53	Front wiring harness and A/C wiring harness combination <A/C>
A-54	Resistor
A-55	Condenser fan motor
A-56	Injector No. 1
A-57	Injector No. 2
A-58	Control wiring harness and heated oxygen sensor wiring harness combination <California, Federal–1994 models>
A-59	Heated oxygen sensor (front) <California, Federal–1994 models>
A-60	Injector No. 3
A-61	Injector No. 4
A-62	EGR temperature sensor
A-63	Engine coolant temperature sensor
A-64	Engine coolant temperature gauge unit
A-65	Oxygen sensor (front) <1993 models>
A-66	Distributor assembly
A-67	Distributor assembly
A-68	Back-up light switch <M/T>
A-69	Park / neutral position switch <A/T>
A-70	4A/T control solenoid valve
A-71	A/T fluid temperature sensor <A/T>
A-72	Pulse generator <A/T>
A-73	Kickdown servo switch
A-74	Volume air flow sensor
A-75	A/C wiring harness and A/C joint harness combination <1994 models>

NOTE
*: Refer to CENTRALIZED JUNCTION

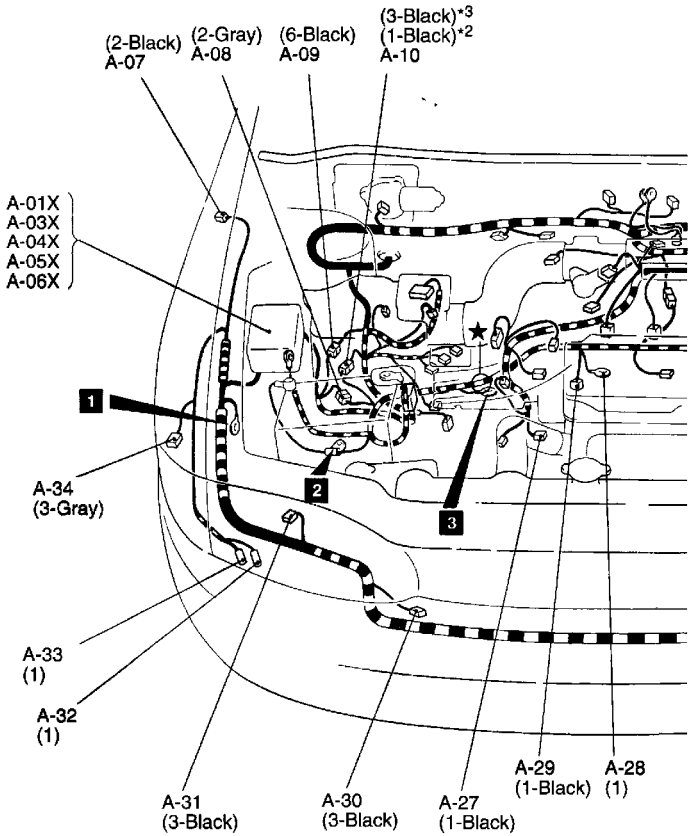
ENGINE COMPARTMENT

110003539

1.8L ENGINE <1995 models>

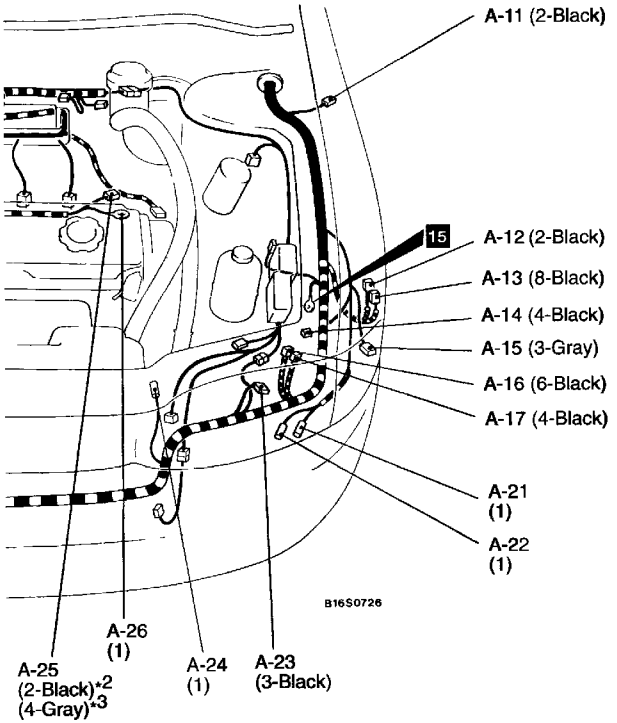
Connector symbol

A -01 to -34



A-01X	Generator relay*1
A-02X	–
A-03X	Radiator fan motor relay*1
A-04X	Headlight relay*1
A-05X	Taillight relay*1
A-06X	IOD or storage connector*1
A-07	ABS speed sensor (Front: RH)
A-08	Front wiring harness and battery cable assembly combination
A-09	Front wiring harness and control wiring harness combination
A-10	Control wiring harness and battery cable assembly combination
A-11	ABS speed sensor (Front: LH)
A-12	ABS hydraulic unit
A-13	ABS hydraulic unit
A-14	Auto-cruise control actuator
A-15	Front turn signal light (LH)
A-16	ABS valve relay
A-17	ABS motor relay
A-18	–
A-19	–
A-20	–
A-21	Horn (LH)
A-22	Horn (LH)

TSB Revision

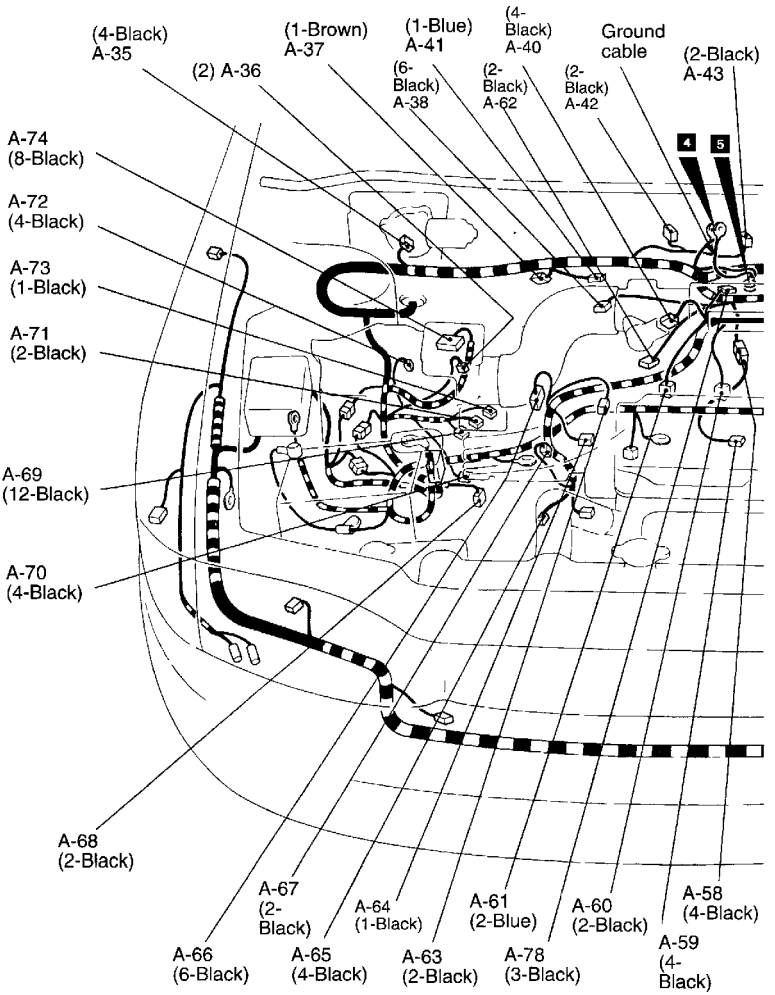


A-23 Headlight (LH)
A-24 Power steering pressure switch
A-25 Generator
A-26 Generator
A-27 Oil pressure switch
A-28 Starter
A-29 Starter
A-30 Radiator fan assembly
A-31 Headlight (RH)
A-32 Horn (RH)
A-33 Horn (RH)
A-34 Front turn signal light (RH)

NOTE
*1: Refer to CENTRALIZED JUNCTION
*2: Vehicles for Federal
*3: Vehicles for California

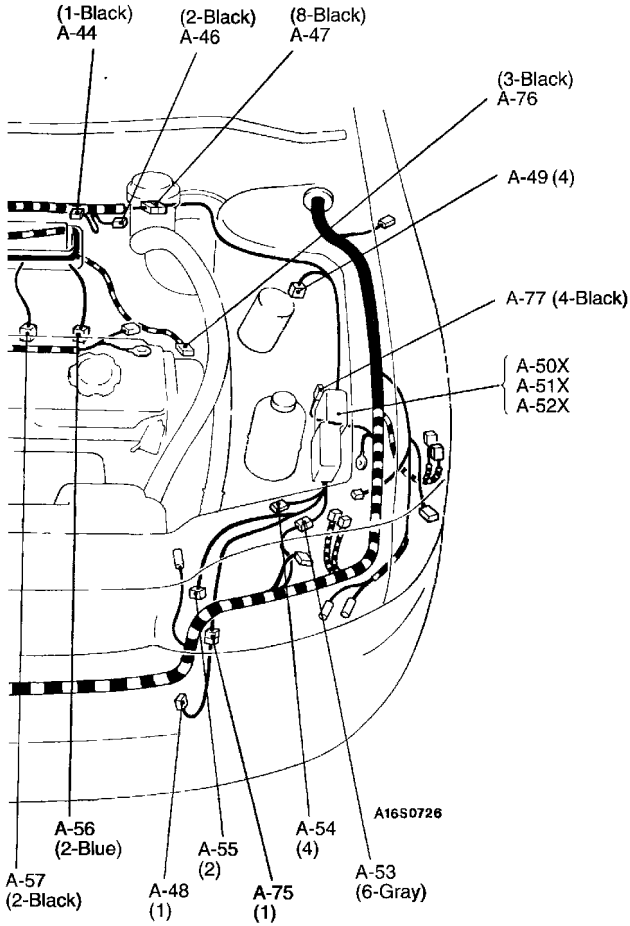
Connector symbol

A -35 to -78



A-35	Windshield wiper motor
A-36	Windshield washer motor
A-37	Ignition timing adjustment connector
A-38	Idle air control motor
A-39	–
A-40	Throttle position sensor
A-41	Engine speed detection connector
A-42	EGR solenoid
A-43	Evaporative emission purge solenoid
A-44	Fuel pump check connector
A-45	–
A-46	Brake fluid level switch
A-47	Control wiring harness and A/C wiring harness combination
A-48	Magnetic clutch and refrigerant temperature switch <A/C>
A-49	Triple pressure switch* <A/C>
A-50X	Condenser fan motor relay* <A/C>
A-51X	Fan motor control relay* <A/C>
A-52X	A/C compressor clutch relay* <A/C>

TSB Revision



A-53 Front wiring harness and A/C wiring harness combination <A/C>
A-54 Resistor
A-55 Condenser fan motor
A-56 Injector No. 1
A-57 Injector No. 2
A-58 Control wiring harness and heated oxygen sensor wiring harness combination
A-59 Heated oxygen sensor (front) <Federal>
Heated oxygen sensor (rear) <California>
A-60 Injector No. 3
A-61 Injector No. 4
A-62 EGR temperature sensor <Federal>
A-63 Engine coolant temperature sensor
A-64 Engine coolant temperature gauge unit
A-65 Heated oxygen sensor (front) <California>
A-66 Distributor assembly
A-67 Distributor assembly
A-68 Back-up light switch <M/T>
A-69 Park / neutral position switch <A/T>
A-70 4A/T control solenoid valve
A-71 A/T fluid temperature sensor <A/T>
A-72 Pulse generator <A/T>
A-73 Kickdown servo switch
A-74 Volume air flow sensor
A-75 A/C wiring harness and A/C joint harness combination
A-76 Crankshaft position sensor <California>
A-77 Horn relay
A-78 Manifold differential pressure sensor <California>

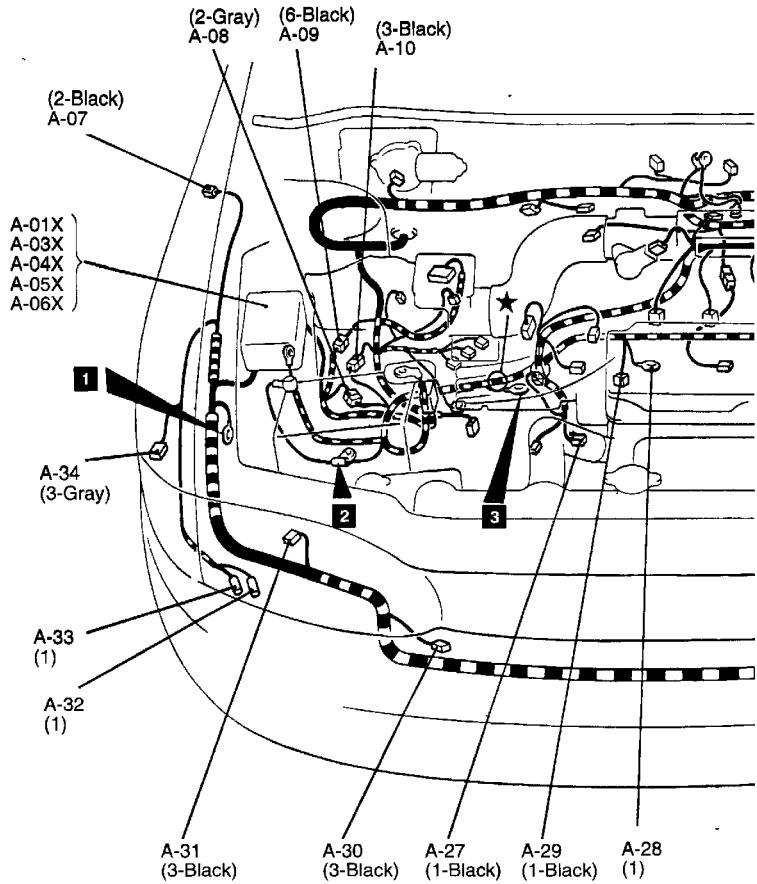
NOTE
*: Refer to CENTRALIZED JUNCTION

ENGINE COMPARTMENT

110003539

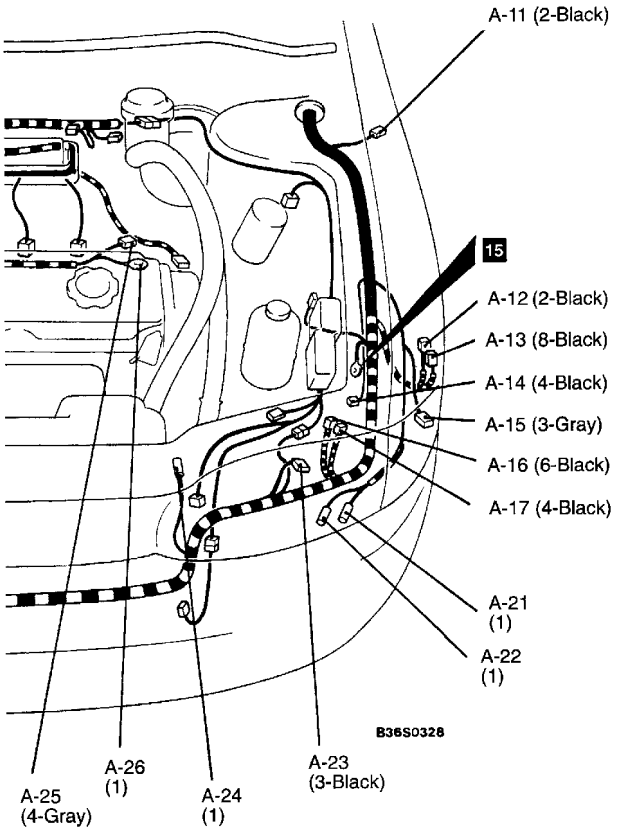
1.8L ENGINE <From 1996 models>

Connector symbol	
A	-01 to -34



A-01X	Generator relay*
A-02X	–
A-03X	Radiator fan motor relay*
A-04X	Headlight relay*
A-05X	Taillight relay*
A-06X	IOD or storage connector*
A-07	ABS speed sensor (Front: RH)
A-08	Front wiring harness and battery cable assembly combination
A-09	Front wiring harness and control wiring harness combination
A-10	Control wiring harness and battery cable assembly combination
A-11	ABS speed sensor (Front: LH)
A-12	ABS hydraulic unit
A-13	ABS hydraulic unit
A-14	Auto-cruise control actuator
A-15	Front turn signal light (LH)
A-16	ABS valve relay
A-17	ABS motor relay
A-18	–
A-19	–
A-20	–
A-21	Horn (LH)
A-22	Horn (LH)

TSB Revision



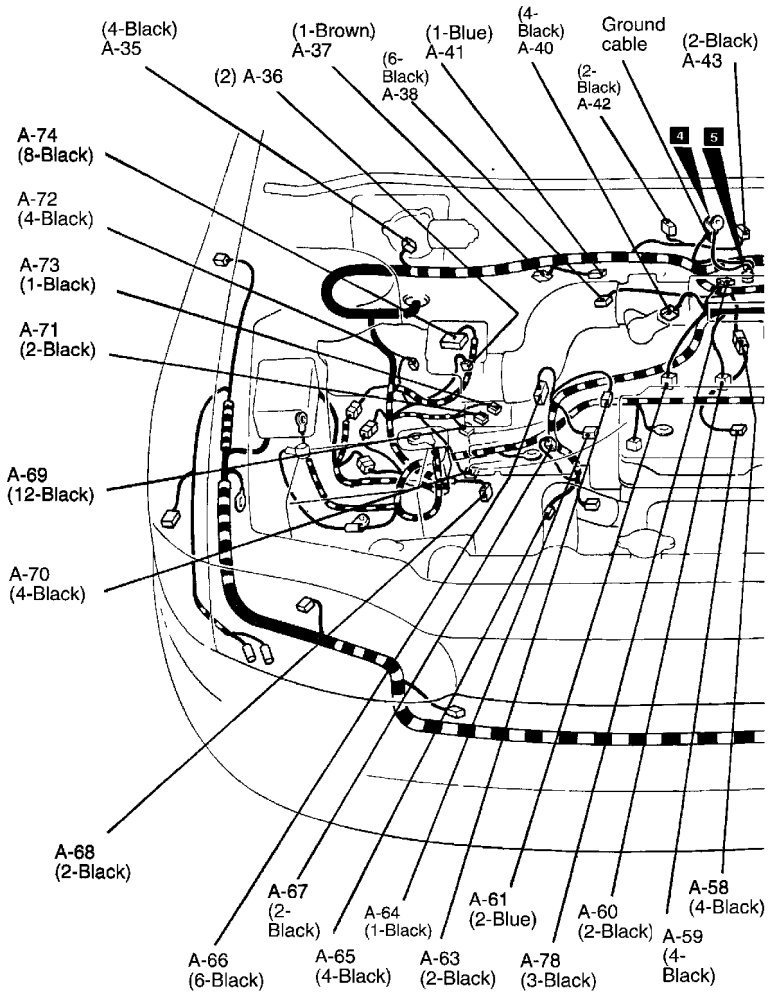
A-23	Headlight (LH)
A-24	Power steering pressure switch
A-25	Generator
A-26	Generator
A-27	Oil pressure switch
A-28	Starter
A-29	Starter
A-30	Radiator fan assembly
A-31	Headlight (RH)
A-32	Horn (RH)
A-33	Horn (RH)
A-34	Front turn signal light (RH)

NOTE
*: Refer to CENTRALIZED JUNCTION

TSB Revision

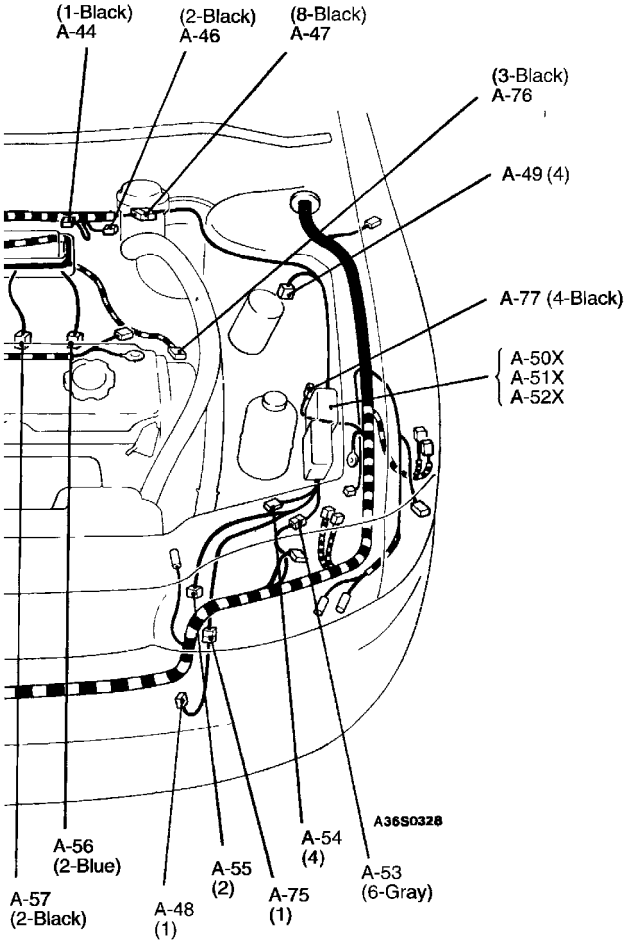
Connector symbol

A -35 to -78



A-35 Windshield wiper motor
A-36 Windshield washer motor
A-37 Ignition timing adjustment connector
A-38 Idle air control motor
A-39 –
A-40 Throttle position sensor
A-41 Engine speed detection connector
A-42 EGR solenoid
A-43 Evaporative emission purge solenoid
A-44 Fuel pump check connector
A-45 –
A-46 Brake fluid level switch
A-47 Control wiring harness and A/C wiring harness combination
A-48 Magnetic clutch and refrigerant temperature switch <A/C>
A-49 Triple pressure switch* <A/C>
A-50X Condenser fan motor relay* <A/C>
A-51X Fan motor control relay* <A/C>
A-52X A/C compressor clutch relay* <A/C>

TSB Revision

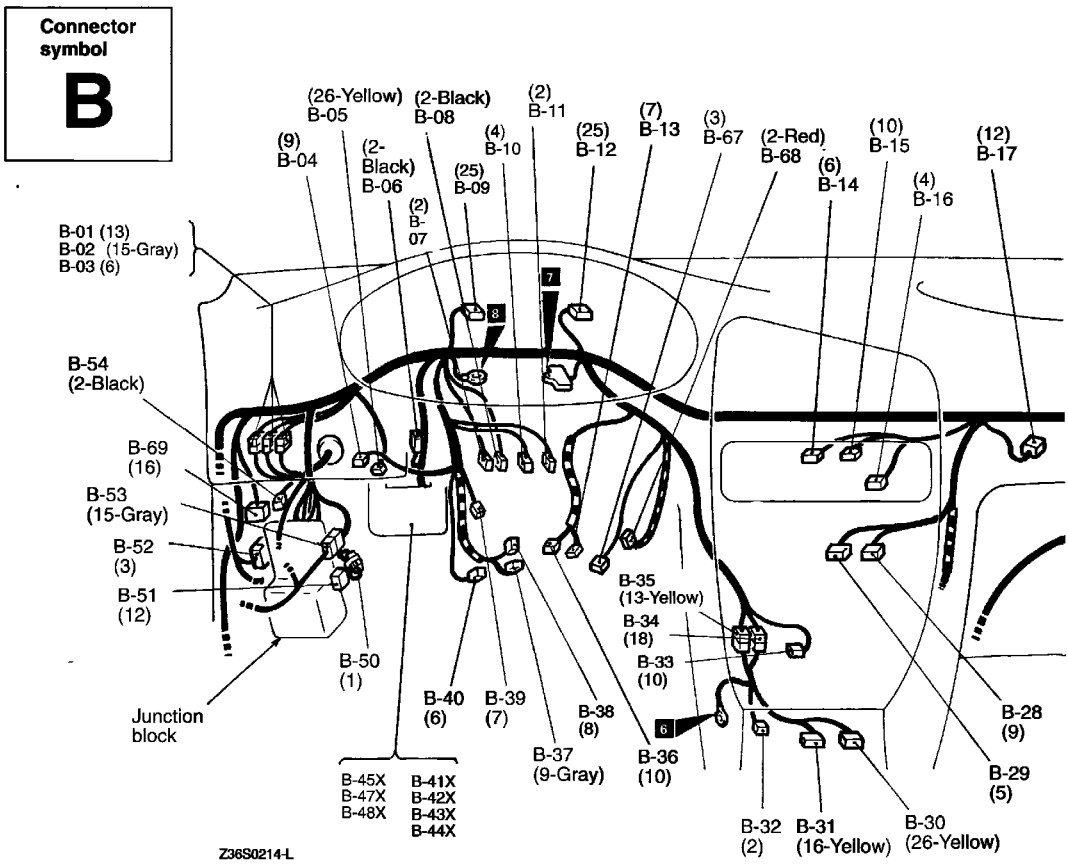


A-53	Front wiring harness and A/C wiring harness combination <A/C>	A-66	Distributor assembly
A-54	Resistor	A-67	Distributor assembly
A-55	Condenser fan motor	A-68	Back-up light switch <M/T>
A-56	Injector No. 1	A-69	Park / neutral position switch <A/T>
A-57	Injector No. 2	A-70	4A/T control solenoid valve
A-58	Control wiring harness and heated oxygen sensor wiring harness combination	A-71	A/T fluid temperature sensor <A/T>
A-59	Heated oxygen sensor (front) <Federal> Heated oxygen sensor (rear) <California>	A-72	Pulse generator <A/T>
A-60	Injector No. 3	A-73	Kickdown servo switch
A-61	Injector No. 4	A-74	Volume air flow sensor
A-62	–	A-75	A/C wiring harness and A/C joint harness combination
A-63	Engine coolant temperature sensor	A-76	Crankshaft position sensor
A-64	Engine coolant temperature gauge unit	A-77	Horn relay
A-65	Heated oxygen sensor (front) <California>	A-78	Manifold differential pressure sensor

NOTE
*: Refer to CENTRALIZED JUNCTION

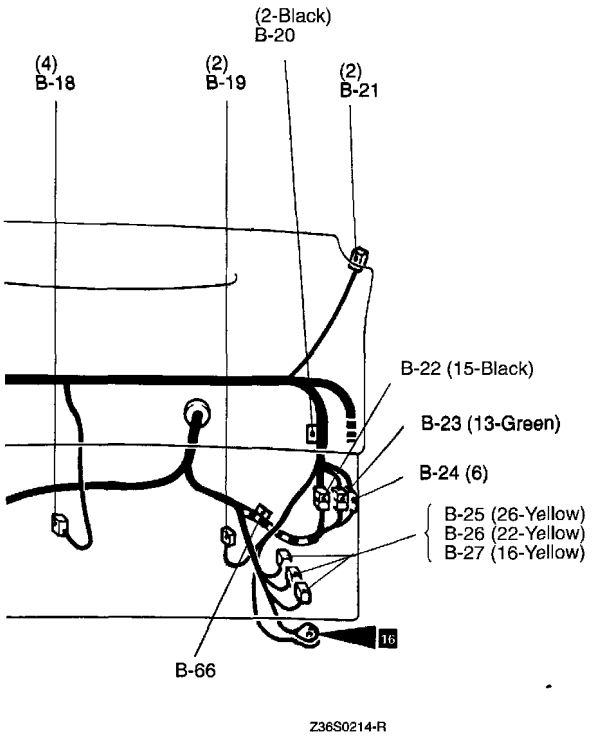
DASH PANEL <Up to 1994 models>

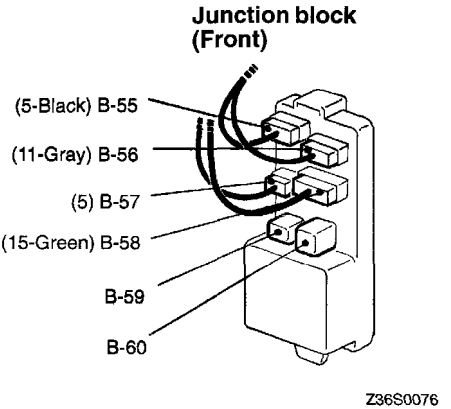
110003540

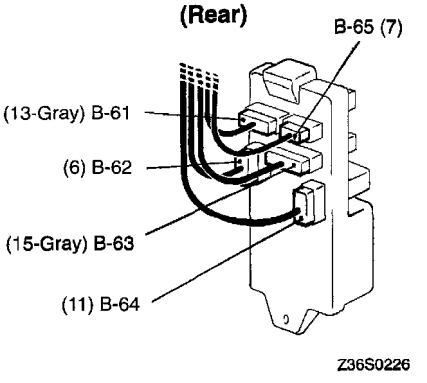


B-01	Body wiring harness and front wiring harness combination
B-02	Body wiring harness and front wiring harness combination
B-03	Body wiring harness and front wiring harness combination
B-04	Remote controlled mirror switch
B-05	Auto-cruise control unit
B-06	Diode (for ABS circuit)
B-07	Clutch pedal position switch <M/T>
B-08	Clutch pedal position switch <Vehicles with auto-cruise control>
B-09	Combination meter
B-10	Stop light switch <Vehicles with auto-cruise control>
B-11	Stop light switch
B-12	Combination meter
B-13	Slip ring <Vehicles with auto-cruise control> (1993 models)
B-14	A/C switch
B-15	Blower switch
B-16	Clock
B-17	Automatic compressor control unit
B-18	Resistor
B-19	Blower motor
B-20	Diode (for MFI system circuit)
B-21	Release switch (RH) <For automatic seat belt>
B-22	Body wiring harness and control wiring harness combination
B-23	Body wiring harness and control wiring harness combination
B-24	Body wiring harness and control wiring harness combination
B-25	Engine control module
B-26	Engine control module
B-27	Engine control module
B-28	Radio and tape player
B-29	Radio and tape player
B-30	ABS control unit
B-31	ABS control unit
B-32	Diagnostic trouble code erasure connector
B-33	Buzzer assembly
B-34	Body wiring harness and ABS wiring harness combination
B-35	Body wiring harness and ABS wiring harness combination

TSB Revision





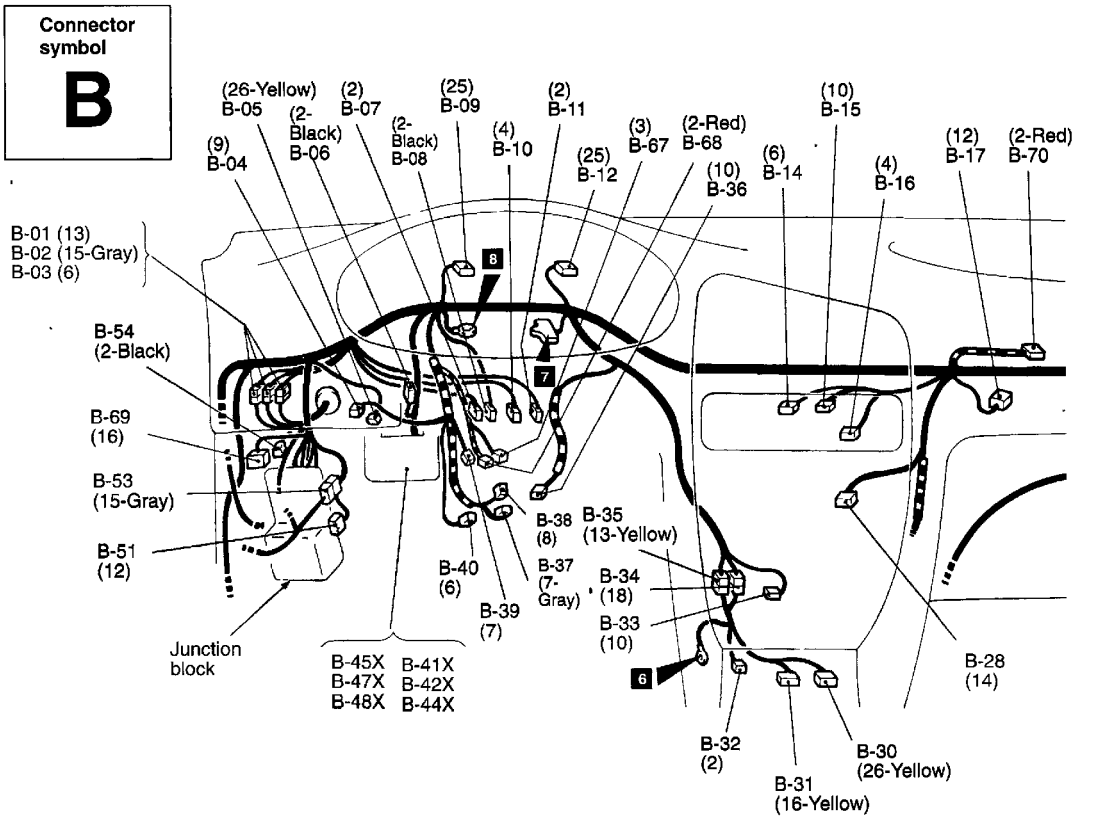


B-36 Column switch
B-37 Column switch
B-38 Column switch
B-39 Steering lock switch
B-40 Ignition switch
B-41X ABS power relay*
B-42X Power window relay*
B-43X Horn relay* <1994 models>
B-44X Door lock control relay* <1993 models> or door lock control unit* <1994 models>
B-45X Jumper connector*
B-46X –
B-47X Defogger relay*.
B-48X Starter relay*
B-49X –
B-50 Automatic seat belt motor connector (used to cut off the motor power supply for servicing)
B-51 Data link connector
B-52 Body wiring harness and roof wiring harness combination <1993 models>
B-53 Body wiring harness and instrument panel wiring harness combination
B-54 Diode (for ABS circuit)
B-55 Front wiring harness and junction block combination
B-56 Front wiring harness and junction block combination
B-57 Roof wiring harness and junction block combination
B-58 Instrument panel wiring harness and junction block combination
B-59 Blower motor relay
B-60 Turn-signal and hazard flasher unit
B-61 Body wiring harness and junction block combination
B-62 Body wiring harness and junction block combination
B-63 Body wiring harness and junction block combination
B-64 Body wiring harness and junction block combination
B-65 Body wiring harness and junction block combination
B-66 Diode (for MFI system circuit)
B-67 Clock spring <1994 models>
B-68 Clock spring <1994 models>
B-69 Data link connector

NOTE
*: Refer to CENTRALIZED JUNCTION

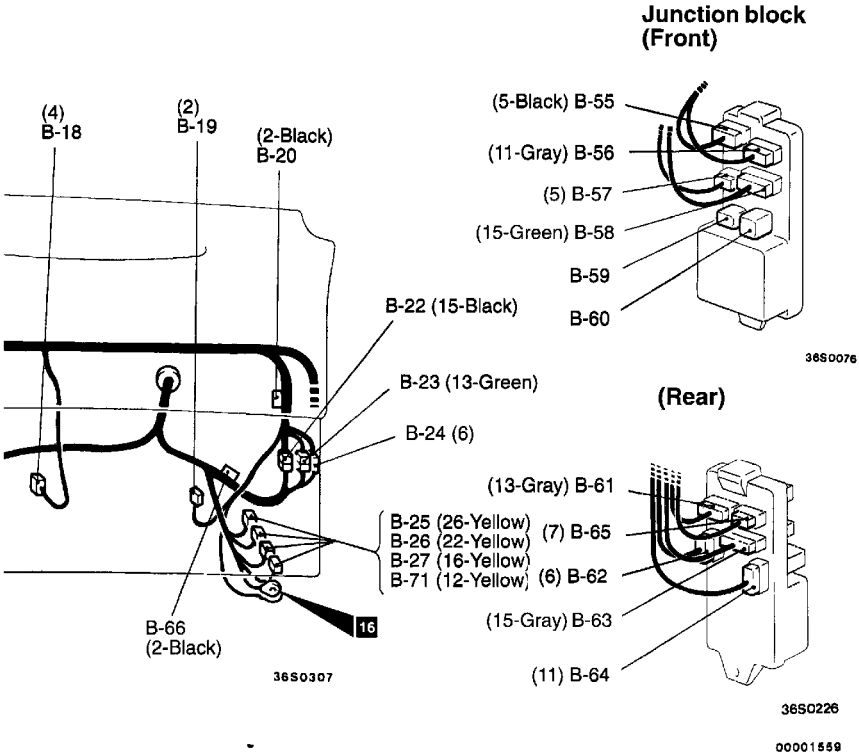
DASH PANEL <1995 models>

110003541



B-01	Body wiring harness and front wiring harness combination
B-02	Body wiring harness and front wiring harness combination
B-03	Body wiring harness and front wiring harness combination
B-04	Remote controlled mirror switch
B-05	Auto-cruise control unit
B-06	Diode (for ABS circuit)
B-07	Clutch pedal position switch <M/T>
B-08	Clutch pedal position switch <Vehicles with auto-cruise control>
B-09	Combination meter
B-10	Stop light switch <Vehicles with auto-cruise control>
B-11	Stop light switch
B-12	Combination meter
B-13	–
B-14	A/C switch
B-15	Blower switch
B-16	Clock
B-17	Automatic compressor control unit
B-18	Resistor
B-19	Blower motor
B-20	Diode (for MFI system circuit)
B-21	–
B-22	Body wiring harness and control wiring harness combination
B-23	Body wiring harness and control wiring harness combination
B-24	Body wiring harness and control wiring harness combination
B-25	Engine control module
B-26	Engine control module
B-27	Engine control module
B-28	Radio and tape player
B-29	–
B-30	ABS control unit
B-31	ABS control unit
B-32	Diagnostic trouble code erasure connector
B-33	Buzzer assembly
B-34	Body wiring harness and ABS wiring harness combination
B-35	Body wiring harness and ABS wiring harness combination

TSB Revision

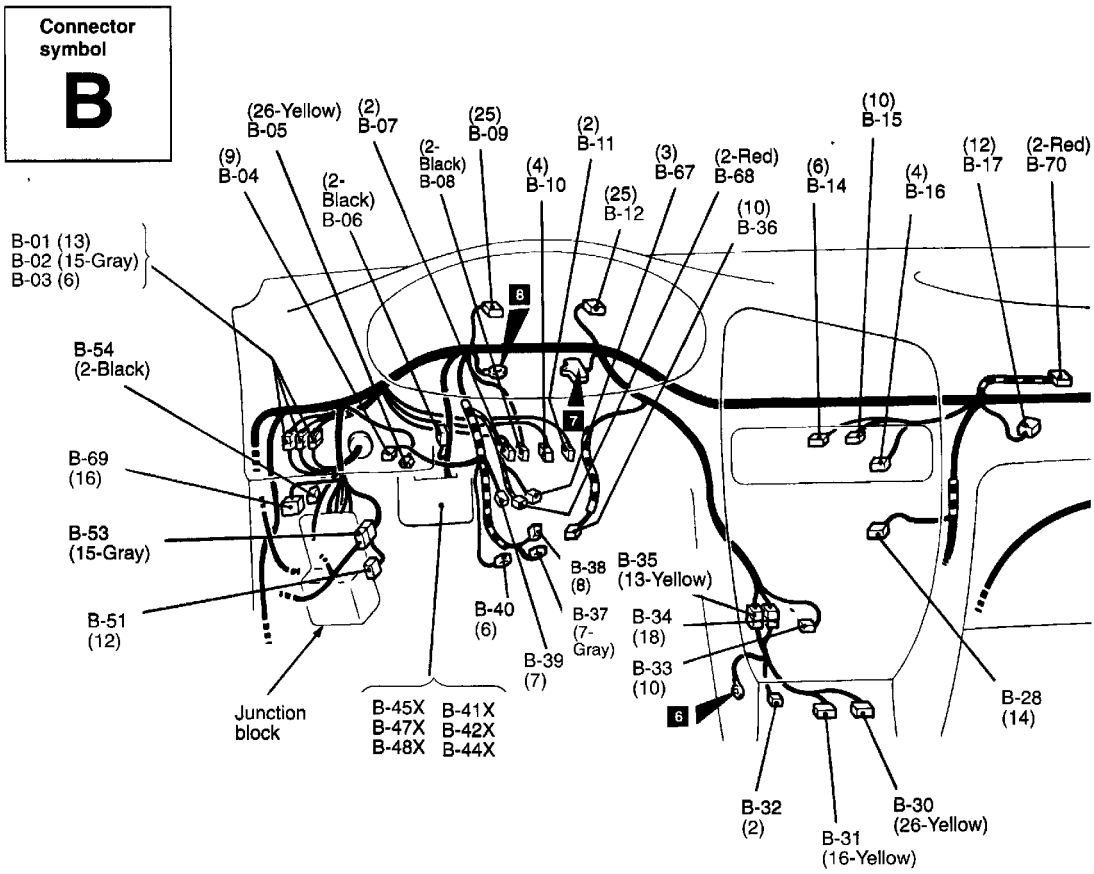


B-36	Column switch
B-37	Column switch
B-38	Column switch
B-39	Steering lock switch
B-40	Ignition switch
B-41X	ABS power relay*
B-42X	Power window relay*
B-43X	–
B-44X	Door lock control unit*
B-45X	Jumper connector*
B-46X	–
B-47X	Defogger relay*
B-48X	Starter relay*
B-49X	–
B-50X	–
B-51	No connection
B-52	–
B-53	Body wiring harness and instrument panel wiring harness combination
B-54	Diode (for ABS circuit)
B-55	Front wiring harness and junction block combination
B-56	Front wiring harness and junction block combination
B-57	Roof wiring harness and junction block combination
B-58	Instrument panel wiring harness and junction block combination
B-59	Blower motor relay
B-60	Turn-signal and hazard flasher unit
B-61	Body wiring harness and junction block combination
B-62	Body wiring harness and junction block combination
B-63	Body wiring harness and junction block combination
B-64	Body wiring harness and junction block combination
B-65	Body wiring harness and junction block combination
B-66	Diode (for MFI system circuit)
B-67	Clock spring
B-68	Clock spring
B-69	Data link connector
B-70	Air bag module (squib)
B-71	Engine control module <California>

NOTE
*: Refer to CENTRALIZED JUNCTION

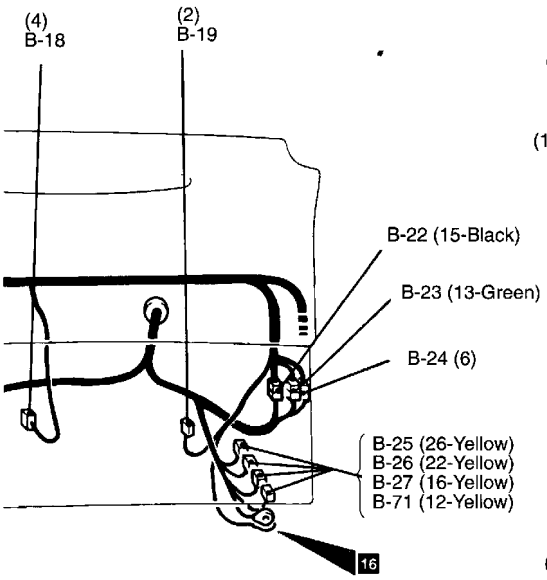
DASH PANEL <From 1996 models>

110003541



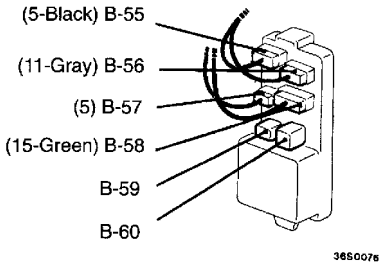
B-01	Body wiring harness and front wiring harness combination
B-02	Body wiring harness and front wiring harness combination
B-03	Body wiring harness and front wiring harness combination
B-04	Remote controlled mirror switch
B-05	Auto-cruise control unit
B-06	Diode (for ABS circuit)
B-07	Clutch pedal position switch <M/T>
B-08	Clutch pedal position switch <Vehicles with auto-cruise control>
B-09	Combination meter
B-10	Stop light switch <Vehicles with auto-cruise control>
B-11	Stop light switch
B-12	Combination meter
B-13	–
B-14	A/C switch
B-15	Blower switch
B-16	Clock
B-17	Automatic compressor control unit
B-18	Resistor
B-19	Blower motor
B-20	–
B-21	–
B-22	Body wiring harness and control wiring harness combination
B-23	Body wiring harness and control wiring harness combination
B-24	Body wiring harness and control wiring harness combination
B-25	Engine control module
B-26	Engine control module
B-27	Engine control module
B-28	Radio and tape player
B-29	–
B-30	ABS control unit
B-31	ABS control unit
B-32	Diagnostic trouble code erasure connector
B-33	Buzzer assembly
B-34	Body wiring harness and ABS wiring harness combination
B-35	Body wiring harness and ABS wiring harness combination

TSB Revision



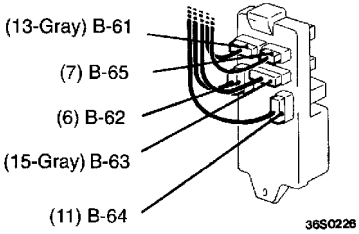
36S0329

Junction block (Front)



36S0075

(Rear)



36S0226

00003700

B-36	Column switch
B-37	Column switch
B-38	Column switch
B-39	Steering lock switch
B-40	Ignition switch
B-41X	ABS power relay*
B-42X	Power window relay*
B-43X	–
B-44X	Door lock control unit*
B-45X	Jumper connector*
B-46X	–
B-47X	Defogger relay*
B-48X	Starter relay*
B-49X	–
B-50X	–
B-51	No connection
B-52	–
B-53	Body wiring harness and instrument panel wiring harness combination
B-54	Diode (for ABS circuit)
B-55	Front wiring harness and junction block combination
B-56	Front wiring harness and junction block combination
B-57	Roof wiring harness and junction block combination
B-58	Instrument panel wiring harness and junction block combination
B-59	Blower motor relay
B-60	Turn-signal and hazard flasher unit
B-61	Body wiring harness and junction block combination
B-62	Body wiring harness and junction block combination
B-63	Body wiring harness and junction block combination
B-64	Body wiring harness and junction block combination
B-65	Body wiring harness and junction block combination
B-66	–
B-67	Clock spring
B-68	Clock spring
B-69	Data link connector
B-70	Air bag module (squib)
B-71	Engine control module

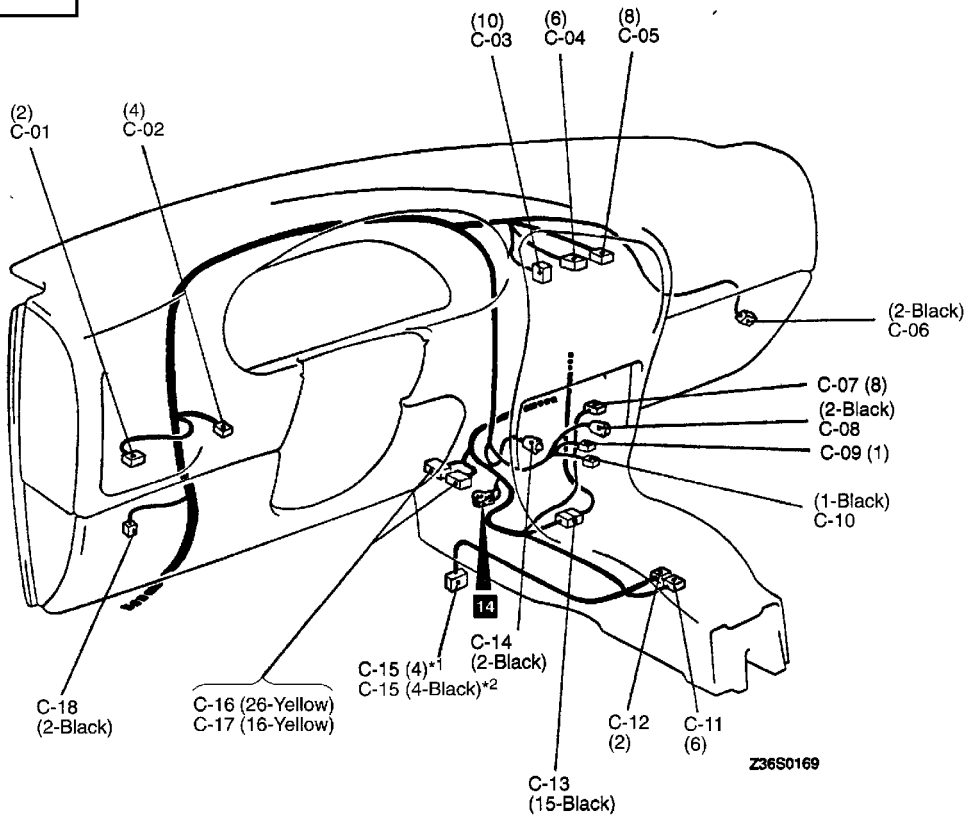
NOTE
*: Refer to CENTRALIZED JUNCTION

INSTRUMENT PANEL <Up to 1995 models>

110003542

Connector symbol

C



C-01 Rheostat <Mechanical type>
C-02 Rheostat <Electronic type>
C-03 Hazard switch
C-04 Defogger switch
C-05 Auto-cruise control main switch
C-06 Front speaker (RH) <1993 models>
C-07 Multiport fuel injection relay
C-08 Cigarette lighter illumination light
C-09 Cigarette lighter
C-10 Cigarette lighter
C-11 Overdrive switch <4A/T>
C-12 A/T selector lever position illumination light <3A/T>
C-13 Control wiring harness and body wiring harness combination <A/T>
C-14 Ashtray illumination light
C-15 Heated oxygen sensor (rear) <California–Up to 1994 models, Federal–From 1994 models>
C-16 Transaxle control module
C-17 Transaxle control module
C-18 Front speaker (LH) <1993 models>

NOTE
*1: 1.5L engine. 1.8L engine–1995 models
*2: 1.8L engine–Up to 1994 models

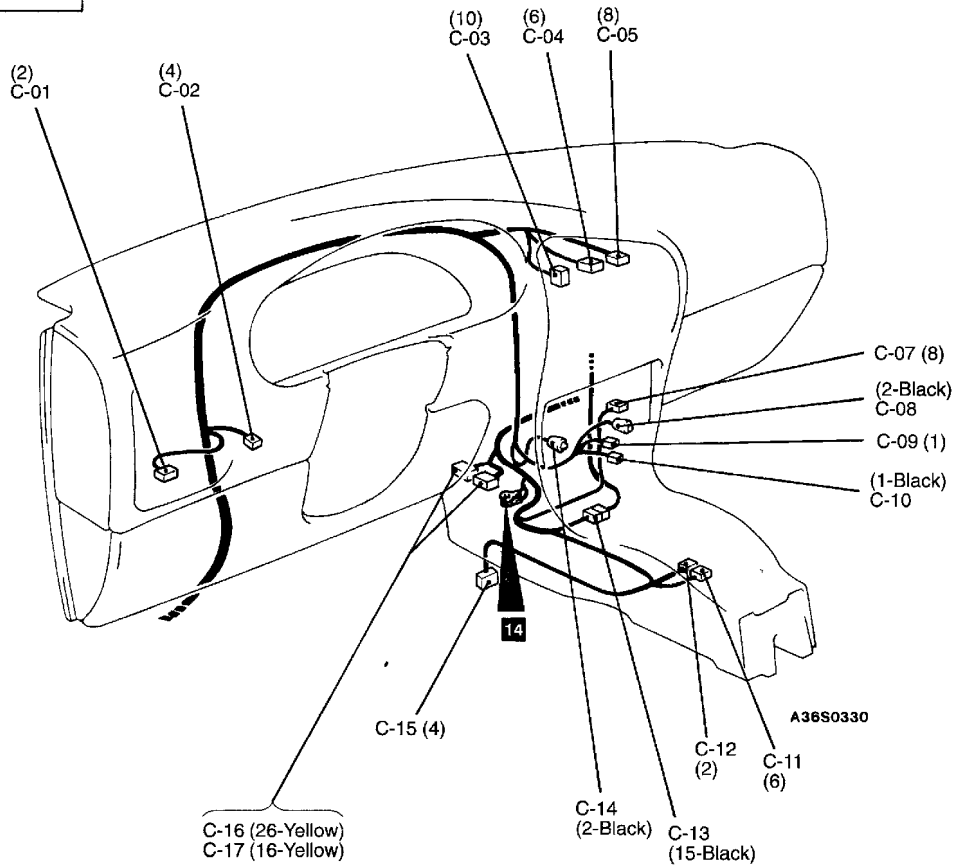
TSB Revision

INSTRUMENT PANEL <From 1996 models>

110003542

Connector symbol

C



C-01	Rheostat <Mechanical type>
C-02	Rheostat <Electronic type>
C-03	Hazard switch
C-04	Defogger switch
C-05	Auto-cruise control main switch
C-06	–
C-07	Multiport fuel injection relay
C-08	Cigarette lighter illumination light
C-09	Cigarette lighter
C-10	Cigarette lighter
C-11	Overdrive switch <4A/T>
C-12	A/T selector lever position illumination light <3A/T>
C-13	Control wiring harness and body wiring harness combination <A/T>
C-14	Ashtray illumination light
C-15	Heated oxygen sensor (rear) <Federal>
C-16	Transaxle control module
C-17	Transaxle control module

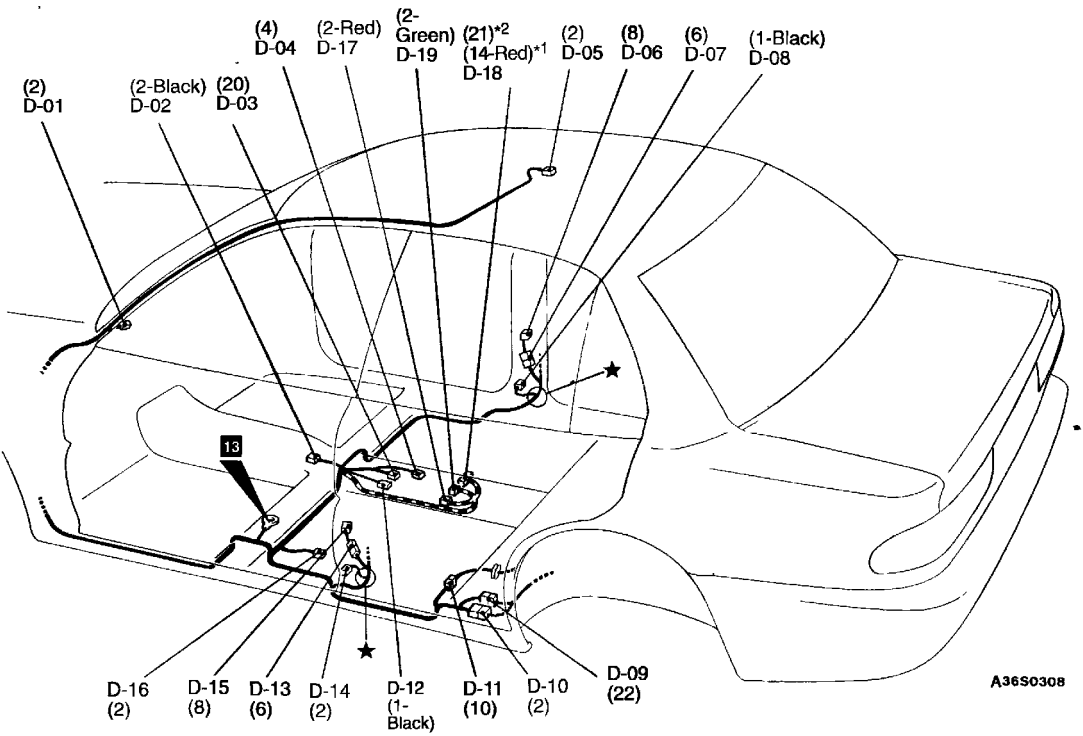
TSB Revision

INTERIOR

110003543

Connector symbol

D



D-01 Release switch (LH) <For automatic seat belt> <1993 models>
D-02 No connection
D-03 Automatic seat belt control unit <Up to 1994 models>
D-04 Outer switch <Up to 1994 models>
D-05 Dome light
D-06 Automatic seat belt motor assembly (RH) <Up to 1994 models>
D-07 Automatic seat belt motor relay (RH) <Up to 1994 models>
D-08 Front door switch (RH)
D-09 Body wiring harness and rear wiring harness combination
D-10 Body wiring harness and rear wiring harness combination
D-11 Body wiring harness and fuel pump wiring harness combination
D-12 Parking brake switch
D-13 Automatic seat belt motor assembly (LH) <1993 models>
D-14 Front door switch (LH)
D-15 Automatic seat belt motor relay (LH) <1993 models>
D-16 Seat belt buckle switch
D-17 SRS air bag control unit <1994, 1995 models>
D-18 SRS air bag control unit <From 1994 models>
D-19 SRS air bag control unit <1995 models>

NOTE
*1: 1994, 1995 models
*2: From 1996 models

TSB Revision

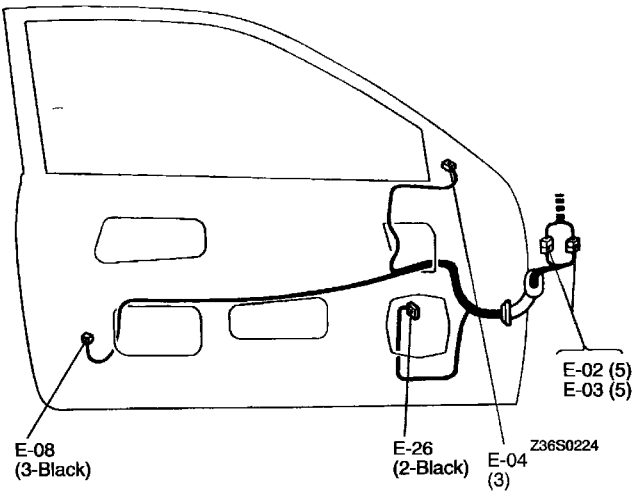
DOOR (2-DOOR MODELS) <Up to 1995 models>

110003544

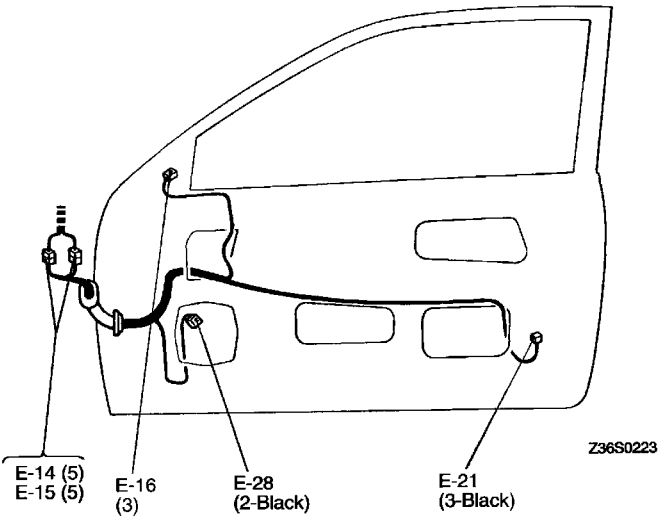
Connector symbol

E

<Driver's side door>



<Passenger's side door>



E-01 –
E-02 Body wiring harness and door wiring harness (LH) combination
E-03 Body wiring harness and door wiring harness (LH) combination <1993 models>
E-04 Remote controlled mirror (LH)
E-05 –
E-06 –
E-07 –
E-08 Door latch switch (LH) <1993 models>
E-09 –
E-10 –
E-11 –
E-12 –
E-13 –
E-14 Body wiring harness and door wiring harness (RH) combination
E-15 Body wiring harness and door wiring harness (RH) combination
E-16 Remote controlled mirror (RH)
E-17 –
E-18 –
E-19 –
E-20 –
E-21 Door latch switch (RH) <Up to 1994 models>
E-22 –
E-23 –
E-24 –
E-25 –
E-26 Front speaker (LH) <From 1994 models>
E-27 –
E-28 Front speaker (RH) <From 1994 models>

TSB Revision

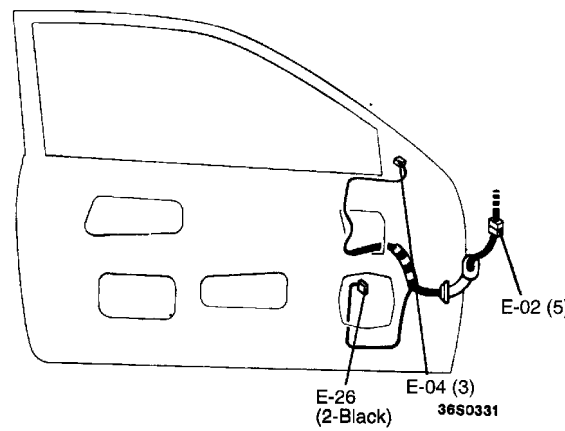
DOOR (2-DOOR MODELS) <From 1996 models>

110003544

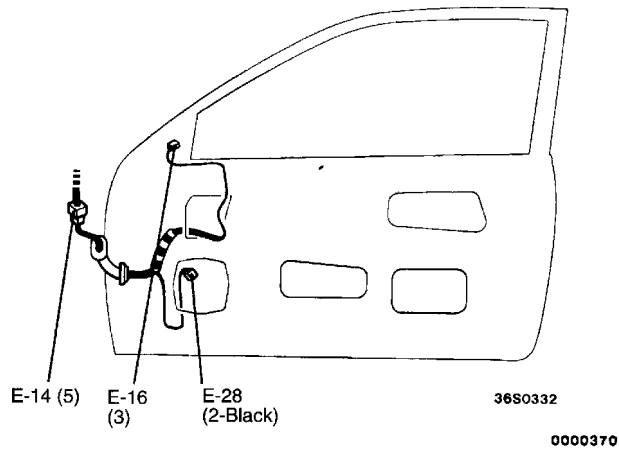
Connector symbol

E

<Driver's side door>



<Passenger's side door>



E-01	–	E-15	–
E-02	Body wiring harness and door wiring harness (LH) combination	E-16	Remote controlled mirror (RH)
E-03	–	E-17	–
E-04	Remote controlled mirror (LH)	E-18	–
E-05	–	E-19	–
E-06	–	E-20	–
E-07	–	E-21	–
E-08	–	E-22	–
E-09	–	E-23	–
E-10	–	E-24	–
E-11	–	E-25	–
E-12	–	E-26	Front speaker (LH)
E-13	–	E-27	–
E-14	Body wiring harness and door wiring harness (RH) combination	E-28	Front speaker (RH)

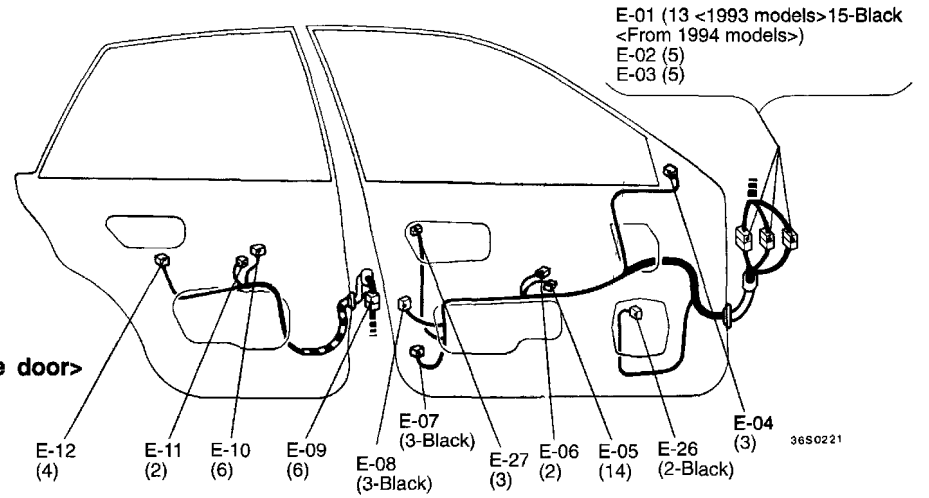
TSB Revision

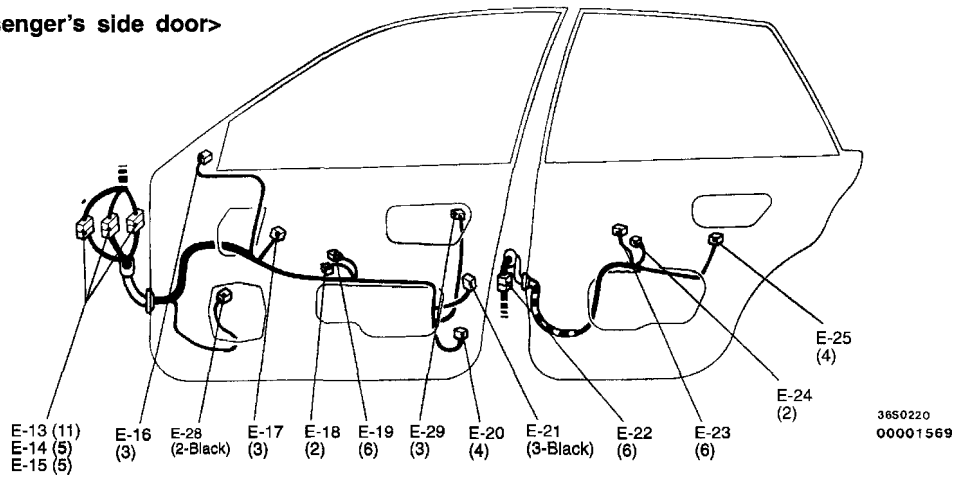
DOOR (4-DOOR MODELS) <Up to 1995 models>

110003545

Connector symbol

E





E-01 Body wiring harness and front door wiring harness (LH) combination
E-02 Body wiring harness and front door wiring harness (LH) combination
E-03 Body wiring harness and front door wiring harness (LH) combination <1993 models>
E-04 Remote controlled mirror (LH)
E-05 Power window main switch
E-06 Front power window motor (LH)
E-07 Front door lock actuator (LH)
E-08 Front door latch switch (LH) <1993 models>
E-09 Body wiring harness and rear door wiring harness (LH) combination
E-10 Rear power window sub switch (LH)
E-11 Rear power window motor (LH)
E-12 Rear door lock actuator (LH)
E-13 Body wiring harness and front door wiring harness (RH) combination
E-14 Body wiring harness and front door wiring harness (RH) combination
E-15 Body wiring harness and front door wiring harness (RH) combination <Up to 1994 models>
E-16 Remote controlled mirror (RH)
E-17 Door lock switch (RH)
E-18 Front power window motor (RH)
E-19 Front power window sub switch
E-20 Front door lock actuator (RH)
E-21 Door latch switch (RH) <Up to 1994 models>
E-22 Body wiring harness and rear door wiring harness (RH) combination
E-23 Rear power window sub switch (RH)
E-24 Rear power window motor (RH)
E-25 Rear door lock actuator (RH)
E-26 Front speaker (LH) <From 1994 models>
E-27 Door lock key cylinder switch (LH) <From 1994 models>
E-28 Front speaker (RH) <From 1994 models>
E-29 Door lock key cylinder switch (RH) <From 1994 models>

TSB Revision

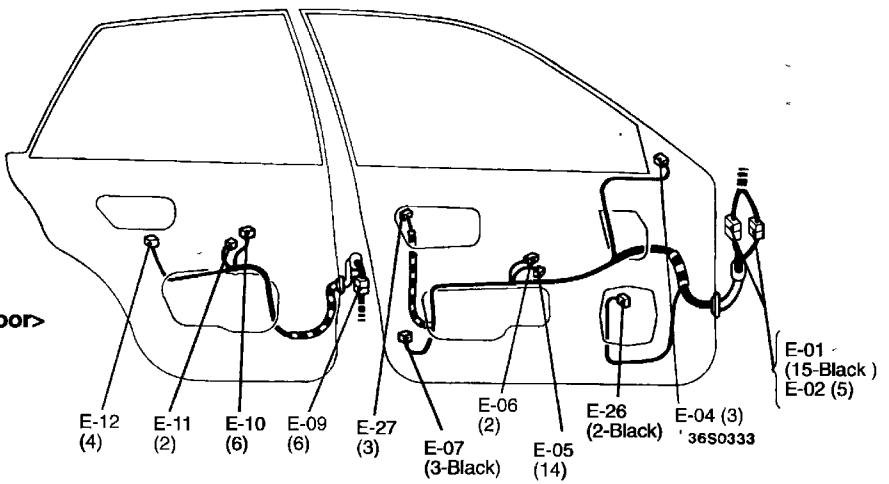
DOOR (4-DOOR MODELS) <From 1996 models>

110003545

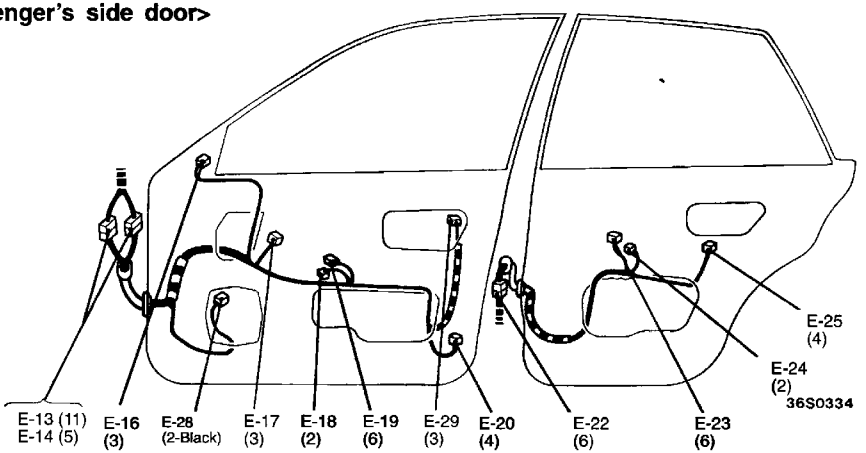
Connector symbol

E

<Driver's side door>



<Passenger's side door>



00003702

E-01 Body wiring harness and front door wiring harness (LH) combination
E-02 Body wiring harness and front door wiring harness (LH) combination
E-03 –
E-04 Remote controlled mirror (LH)
E-05 Power window main switch
E-06 Front power window motor (LH)
E-07 Front door lock actuator (LH)
E-08 –
E-09 Body wiring harness and rear door wiring harness (LH) combination
E-10 Rear power window sub switch (LH)
E-11 Rear power window motor (LH)
E-12 Rear door lock actuator (LH)
E-13 Body wiring harness and front door wiring harness (RH) combination
E-14 Body wiring harness and front door wiring harness (RH) combination
E-15 –
E-16 Remote controlled mirror (RH)
E-17 Door lock switch (RH)
E-18 Front power window motor (RH)
E-19 Front power window sub switch
E-20 Front door lock actuator (RH)
E-21 –
E-22 Body wiring harness and rear door wiring harness (RH) combination
E-23 Rear power window sub switch (RH)
E-24 Rear power window motor (RH)
E-25 Rear door lock actuator (RH)
E-26 Front speaker (LH)
E-27 Door lock key cylinder switch (LH)
E-28 Front speaker (RH)
E-29 Door lock key cylinder switch (RH)

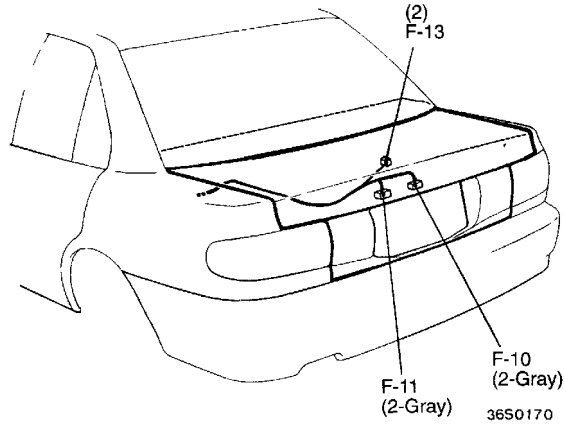
TSB Revision

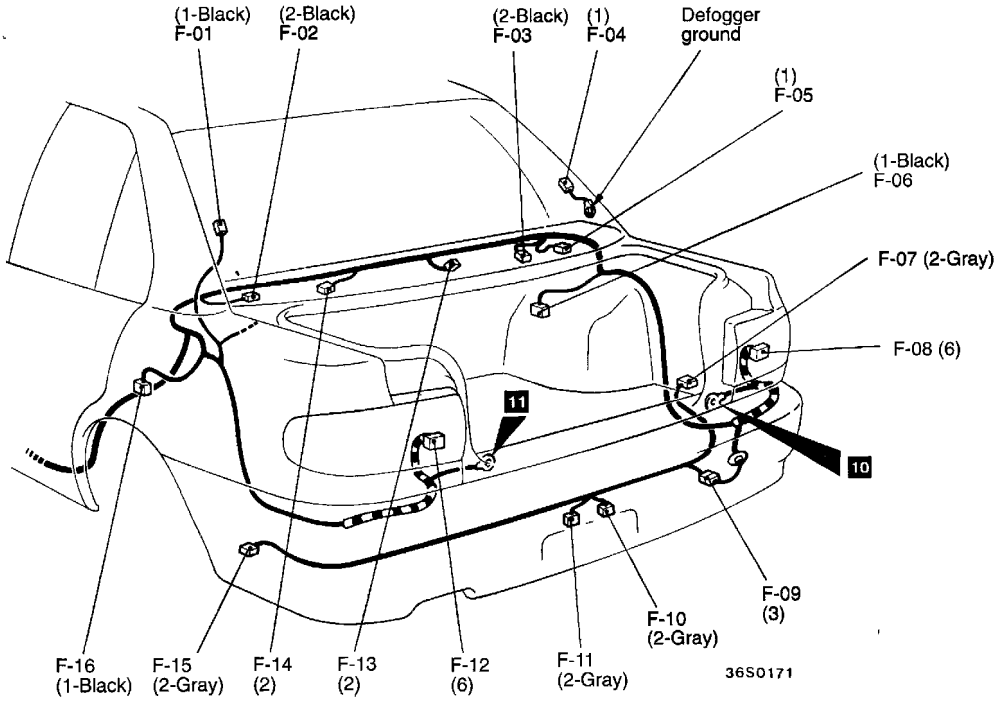
LUGGAGE COMPARTMENT

110003548

Connector symbol

F





00001570

F-01	Defogger (+)
F-02	Rear speaker (LH)
F-03	Rear speaker (RH)
F-04	Defogger (–)
F-05	Luggage compartment light switch
F-06	Rear door switch (RH)
F-07	Rear side-marker light (RH)
F-08	Rear combination light (RH)
F-09	Rear wiring harness and rear bumper wiring harness combination
F-10	License plate light (RH)
F-11	License plate light (LH)
F-12	Rear combination light (LH)
F-13	High-mounted stop light
F-14	Luggage compartment light
F-15	Rear side-marker light (LH)
F-16	Rear door switch (LH)

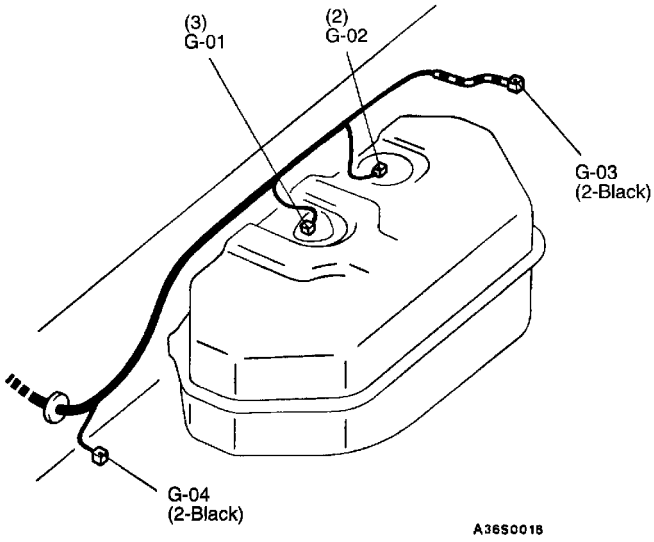
TSB Revision

UNDER REAR FLOOR

110003547

Connector symbol

G



G-01	Fuel gauge unit	G-03	ABS speed sensor (Rear: RH)
G-02	Fuel pump	G-04	ABS speed sensor (Rear: LH)

CIRCUIT DIAGRAMS

CONTENTS

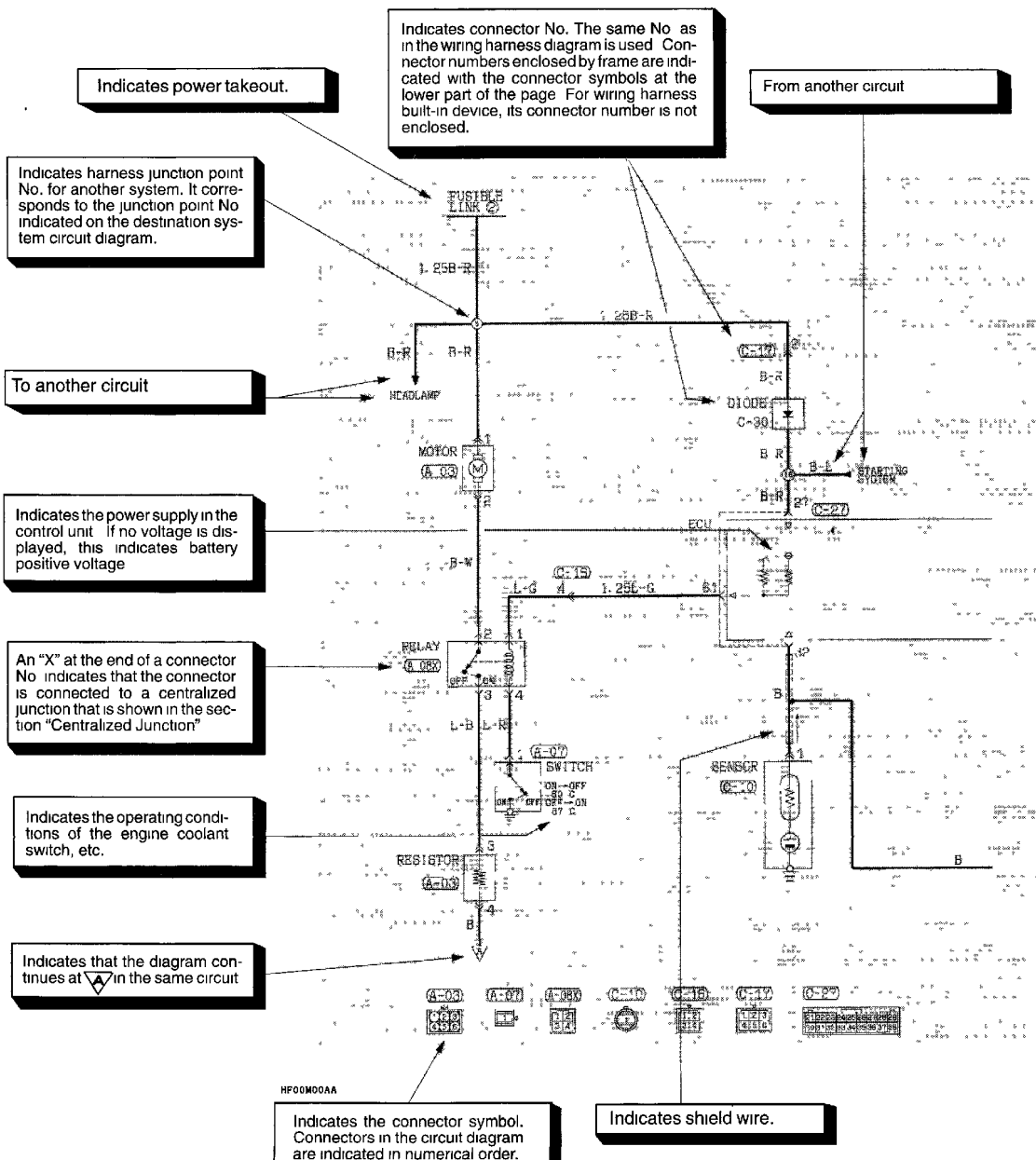
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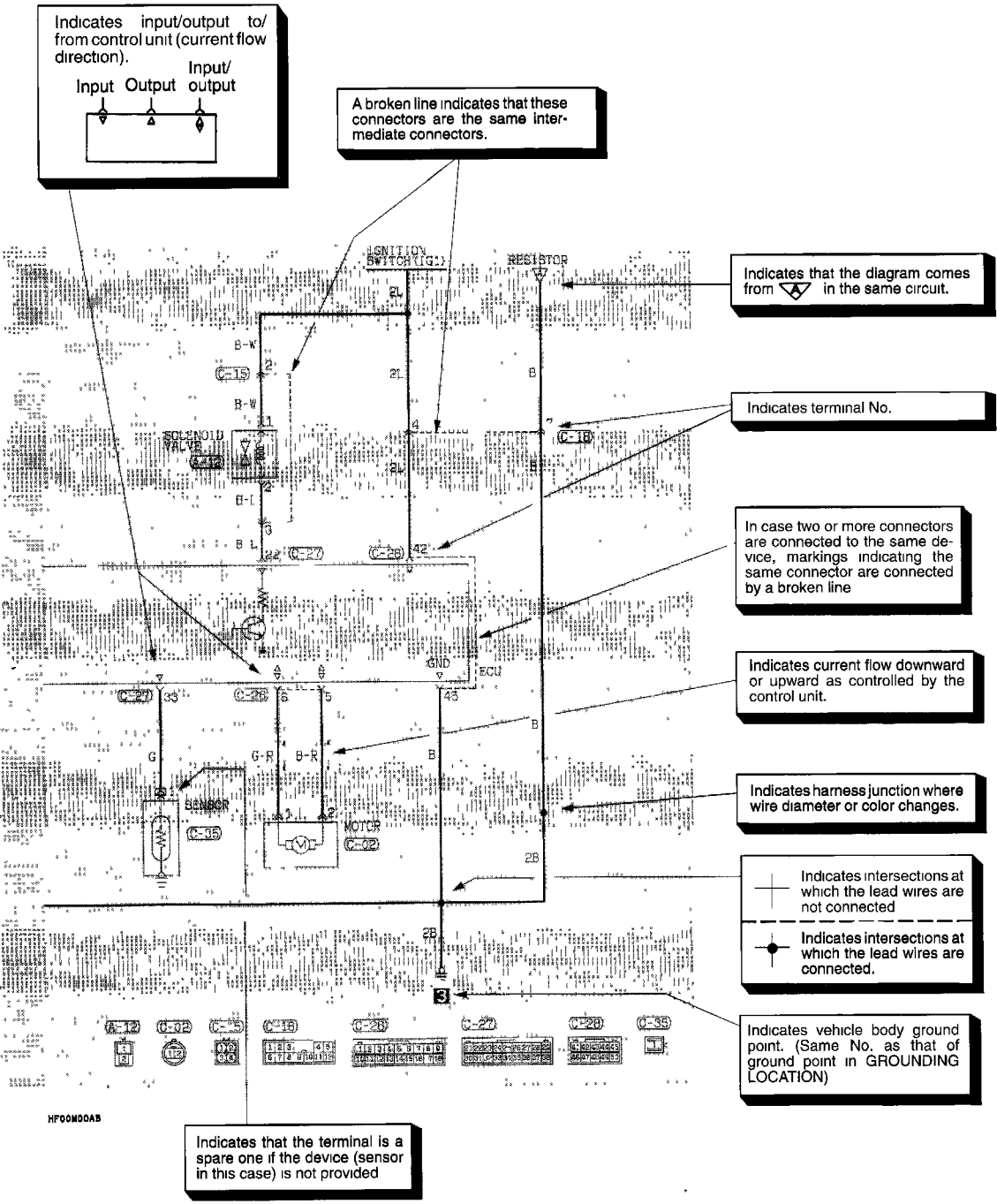
3-speed Automatic Transaxle 192
Air Conditioning System 224
Anti-lock Braking System 278
Auto-cruise Control System 258
Automatic Seat Belt 290
Back-up Light 54-39
Buzzer 186
Central Door Locking System 216
Charging System 16-4
Cigarette Lighter 54-58
Clock 54-60
Cooling System 172
Dome Light and Luggage Compartment Light 54-44
ELC 4-speed Automatic Transaxle 194
Fuel Warning Light, Brake Warning Light and Oil Pressure Warning Light 210
Headlight 54-20
Heater 221
Horn 54-52
How to Read Circuit Diagrams 80
Ignition System 16-43
Meters and Gauges 54-8
MFI System 96
Power Distribution System 86
Power Windows 213
Radio and Tape Player 54-62
Rear Window Defogger 54-88
Remote Controlled Mirror 253
Starting System 16-30
Stop Light 54-40
Supplemental Restraint System (SRS) 299
Taillight, Parking and Side-marker Light and License Plate Light 54-28
Turn-signal Light and Hazard Light 54-34
Windshield Wiper and Washer 254

HOW TO READ CIRCUIT DIAGRAMS

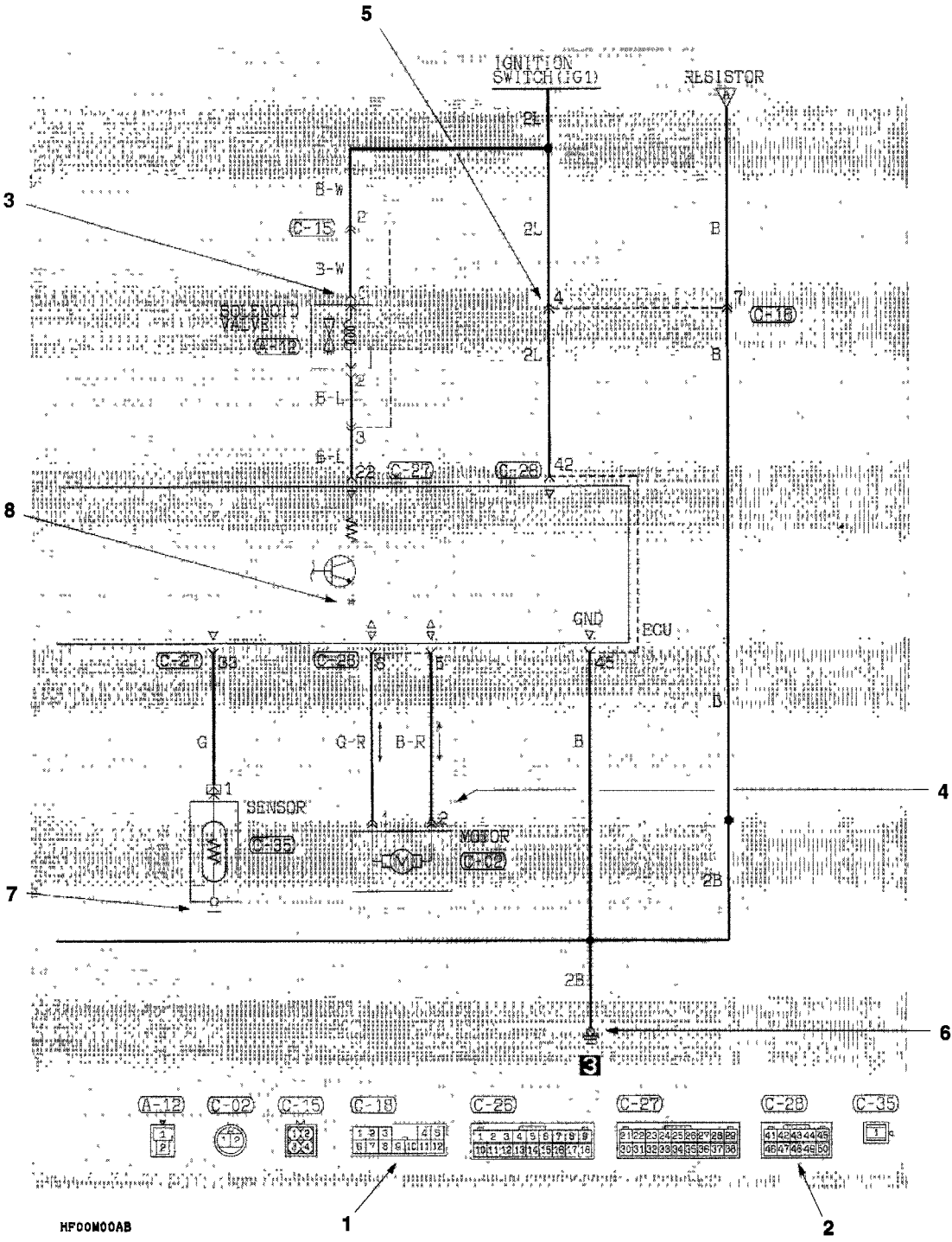
110001449

The circuit of each system from the fuse (or fusible link) to ground is shown. The power supply is shown at the top and the ground at the bottom to facilitate understanding of how the current flows.

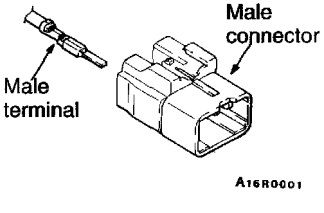
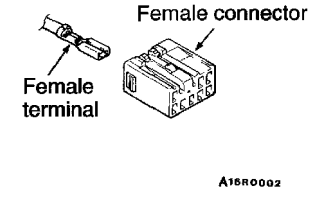
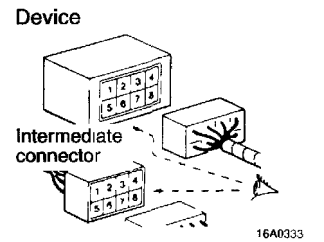
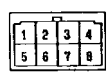
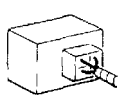
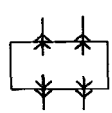
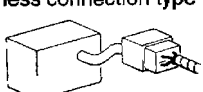
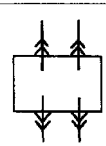
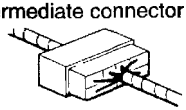


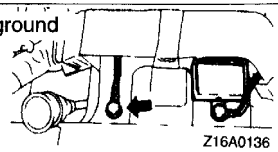
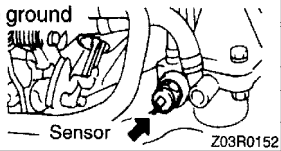
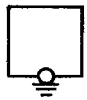
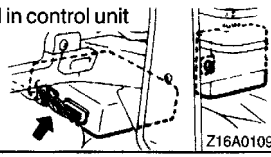

Indicates input/output to/from control unit (current flow direction).
Input/output
Input Output
A broken line indicates that these connectors are the same intermediate connectors.
IGNITION SWITCH (IG1)
RESISTOR
Indicates that the diagram comes from A in the same circuit.
Indicates terminal No.
SOLENOID VALVE
In case two or more connectors are connected to the same device, markings indicating the same connector are connected by a broken line
GND
ECU
Indicates current flow downward or upward as controlled by the control unit.
SENSOR
MOTOR
Indicates harness junction where wire diameter or color changes.
Indicates intersections at which the lead wires are not connected
Indicates intersections at which the lead wires are connected.
Indicates vehicle body ground point. (Same No. as that of ground point in GROUNDING LOCATION)
HF00M00AB
Indicates that the terminal is a spare one if the device (sensor in this case) is not provided

CONNECTOR / GROUNDING INDICATIONS



TSB Revision

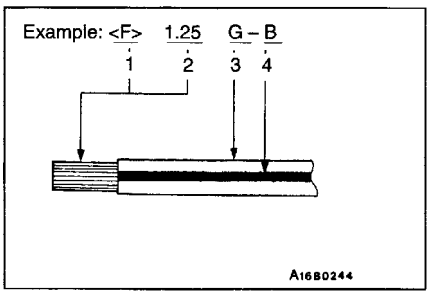
Item	No.	Connector / Grounding	Symbol	Contents
Connector and terminal marking	1		Male terminal  Male connector 	The male and female terminals are indicated as shown. The connector with male terminal(s) is called as male connector and indicated by double connector contour lines, while the connector with female terminal(s) is called as female connector and indicated by single connector contour line.
	–		Female terminal  Female connector 	
Connector symbol marking	2	Device 		The symbol indicates the connector as viewed from the illustrated direction. At the connection with a device, the connector symbol on the device side is shown, and for an intermediate connector, the male connector symbol is shown. For an open connector (like connector not used, connector for inspection, etc.), harness side connector symbol is shown.
Connector connection marking	3	Direct connection type 		A connection between a device and connector on the harness side is either by direct insertion in the device (direct connection type) or by connection with a harness connector furnished on the device side (harness connection type). The two types are indicated as illustrated.
	4	Harness connection type 		
	5	Intermediate connector 		

Item	No.	Connector / Grounding	Symbol	Contents
Grounding markings	6	Body ground  Z16A0136		Grounding is either by body ground, device ground or control unit interior ground. These are indicated as illustrated.
	7	Device ground  Sensor Z03R0152		
	8	Ground in control unit  Z16A0109		

WIRE COLOR CODES

Wire colors are identified by the following color codes.

Code	Wire color	Code	Wire color
B	Black	P	Pink
BR	Brown	R	Red
G	Green	SB	Sky blue
GR	Gray	V	Violet
L	Blue	W	White
LG	Light green	Y	Yellow
O	Orange		



If a cable has two colors, the first of the two color code characters indicates the basic color (color of the cable coating) and the second indicates the marking color.

No.	Meaning
1	<F>: Flexible wire
	<T>: Twisted wire
2	Wire size (mm^2)
3	Basic color (color of the cable coating)
4	Marking color

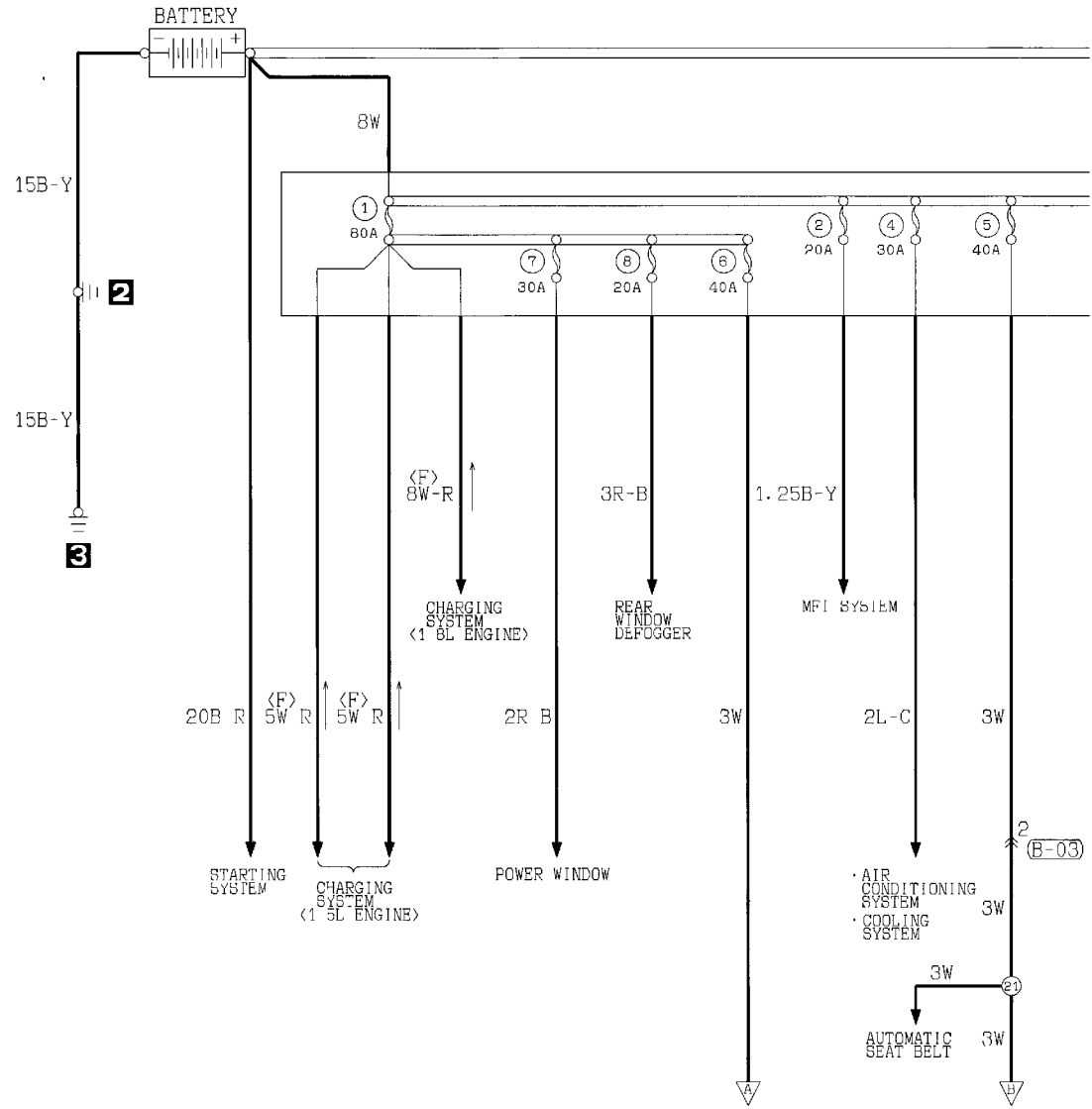
NOTE

*: No code indicates 0.5 mm^2 (.0008 $in.^2$)
Cable color code in parentheses indicates 0.3 mm^2 (.0005 $in.^2$).

POWER DISTRIBUTION SYSTEM

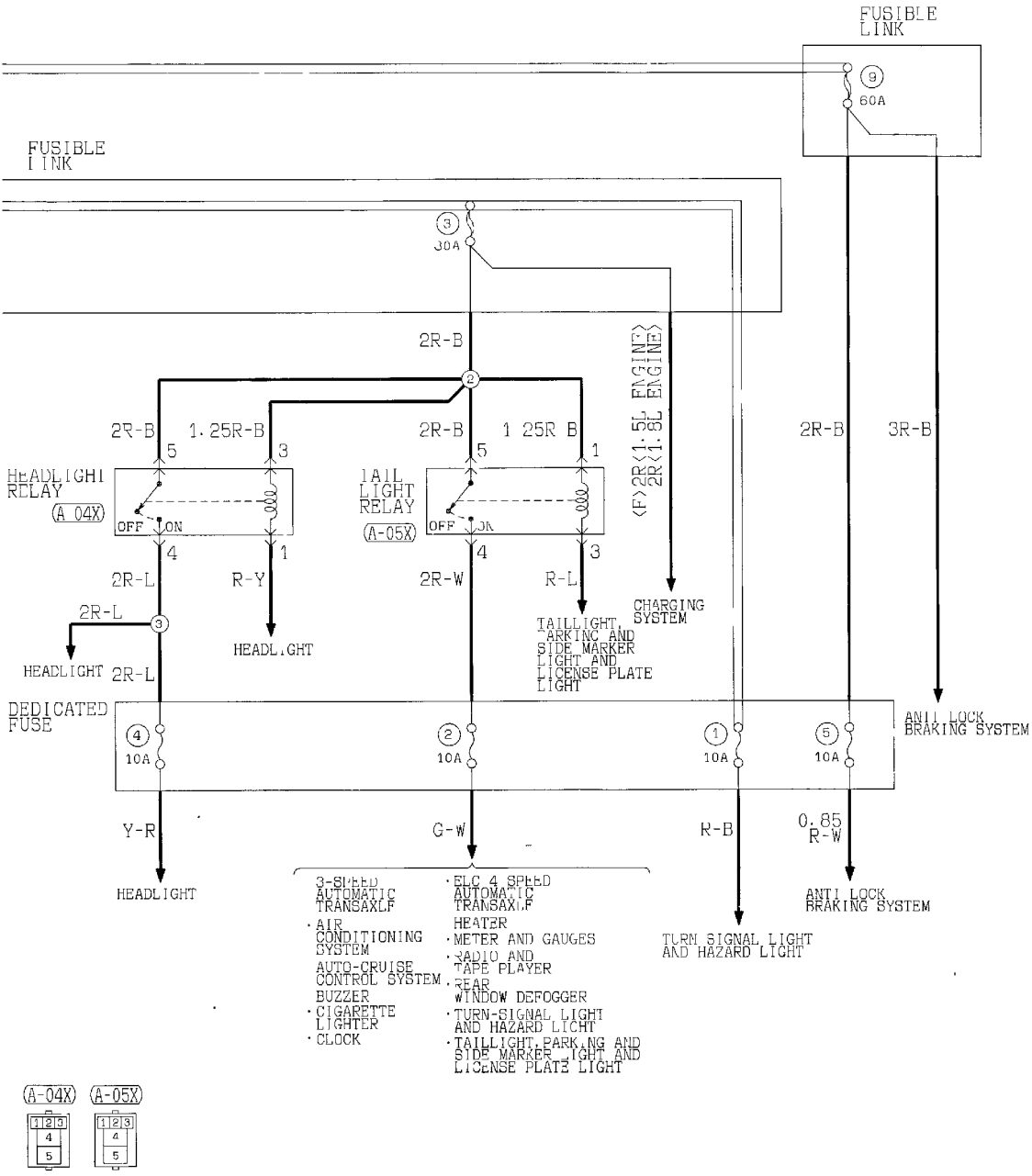
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<UP TO 1994 MODELS>

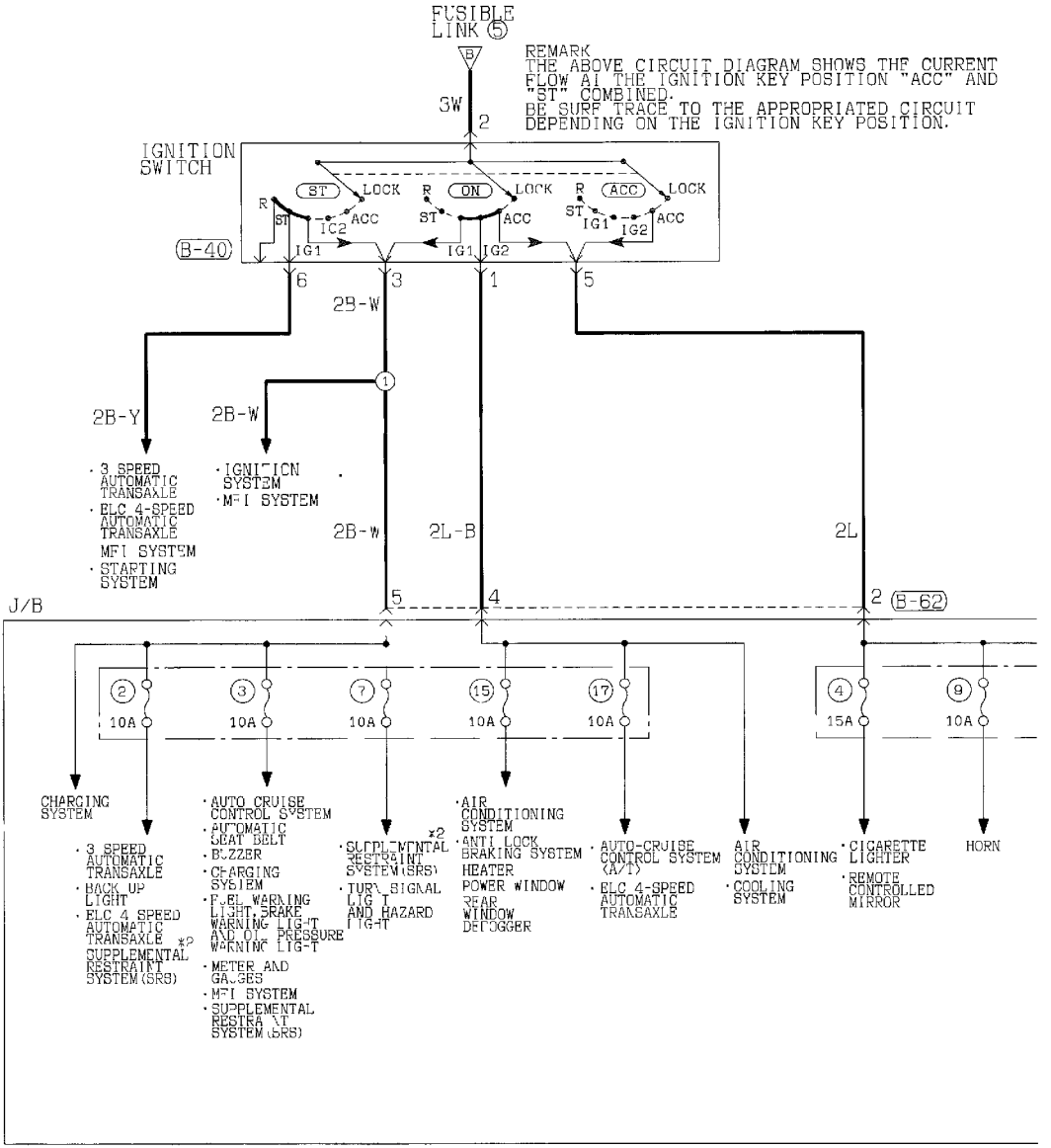


B-03




FUSIBLE LINK
9
60A
FUSIBLE LINK
3
30A
2R-B
2
2R-B
1.25R-B
5
3
2R-B
1.25R-B
5
1
2R-B
3R-B
HEADLIGHT RELAY
(A-04X)
OFF
ON
TAIL LIGHT RELAY
(A-05X)
OFF
ON
4
1
4
3
2R-L
R-Y
2R-W
R-L
2R-L
3
HEADLIGHT
2R-L
HEADLIGHT
TAILLIGHT, PARKING AND SIDE MARKER LIGHT AND LICENSE PLATE LIGHT
CHARGING SYSTEM
<F>2R<1.5L ENGINE>
2R<1.8L ENGINE>
DEDICATED FUSE
4
10A
2
10A
1
10A
5
10A
ANTI LOCK BRAKING SYSTEM
Y-R
G-W
R-B
0.85
R-W
HEADLIGHT
3-SPEED AUTOMATIC TRANSAXLE
· AIR CONDITIONING SYSTEM
AUTO-CRUISE CONTROL SYSTEM
BUZZER
· CIGARETTE LIGHTER
· CLOCK
· ELC 4 SPEED AUTOMATIC TRANSAXLE
HEATER
· METER AND GAUGES
· RADIO AND TAPE PLAYER
· REAR WINDOW DEFOGGER
· TURN-SIGNAL LIGHT AND HAZARD LIGHT
· TAILLIGHT, PARKING AND SIDE MARKER LIGHT AND LICENSE PLATE LIGHT
TURN SIGNAL LIGHT AND HAZARD LIGHT
ANTI LOCK BRAKING SYSTEM
(A-04X)
(A-05X)
1 2 3
4
5
1 2 3
4
5

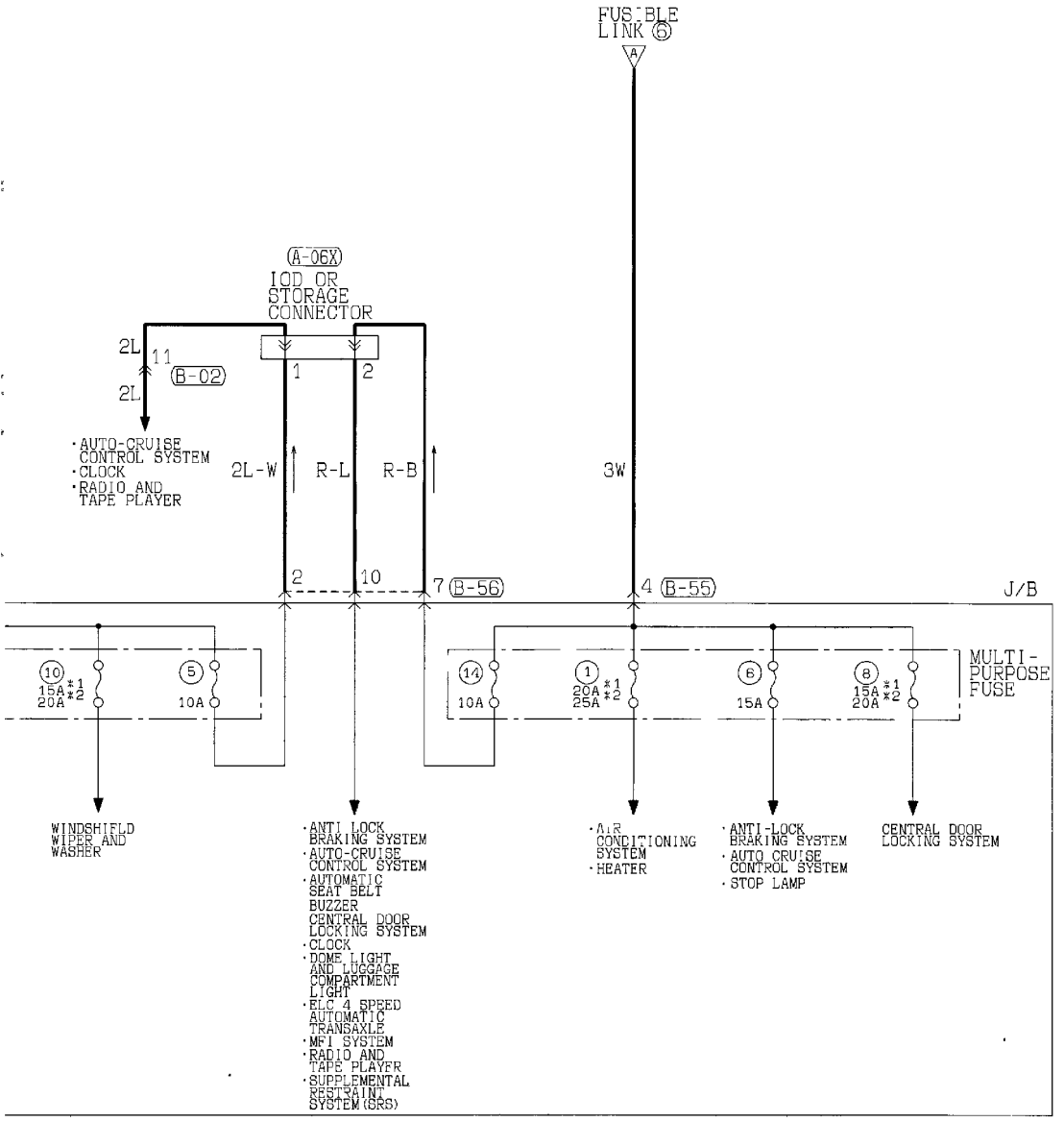
POWER DISTRIBUTION SYSTEM <UP TO 1994 MODELS> (CONTINUED)



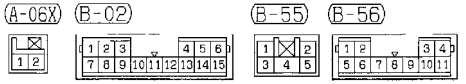
B-40 B-62

1	2	3
4	5	6

1	2	3
4	5	6



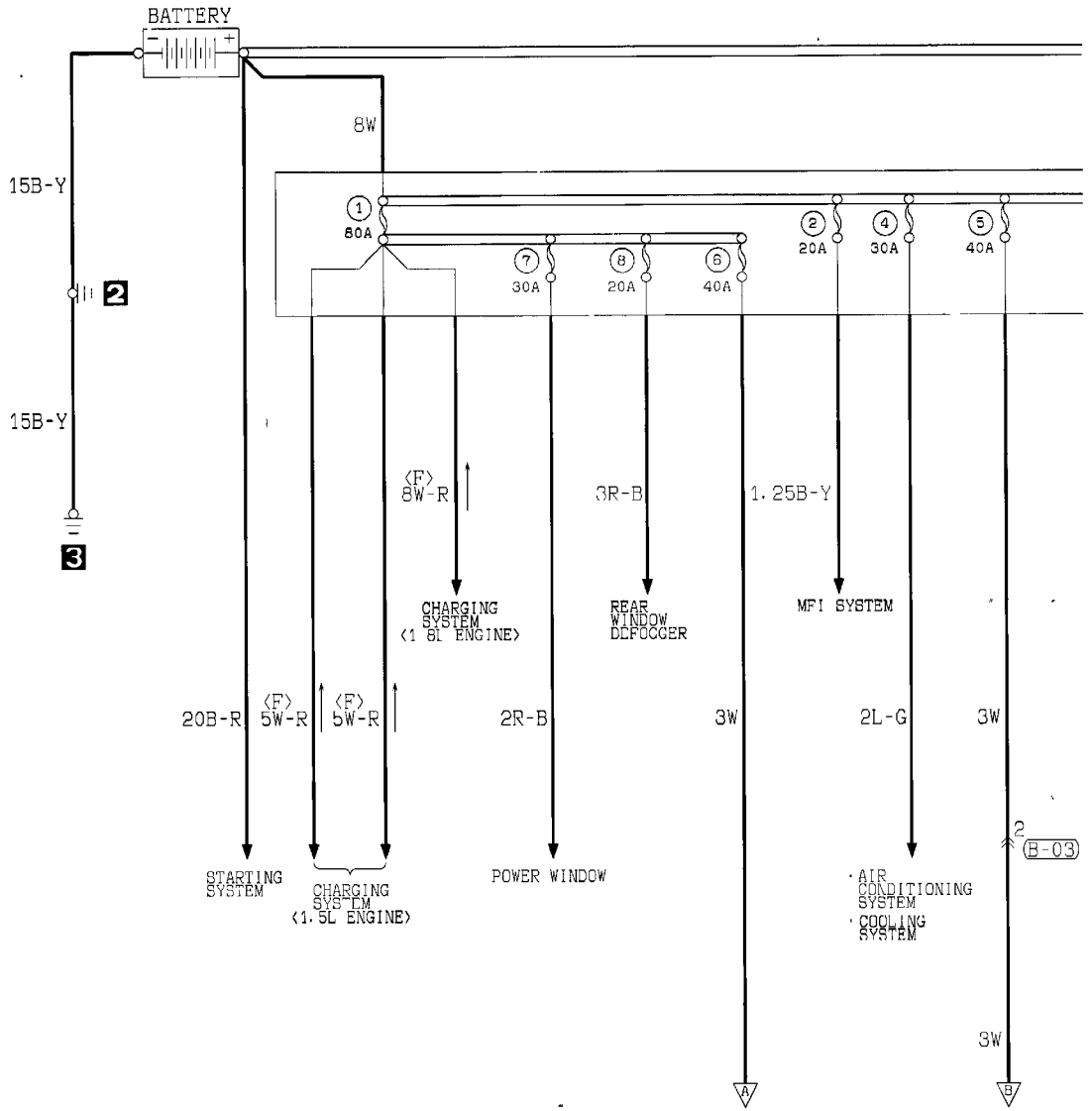
*1: 1993 MODELS
*2 1994 MODELS



POWER DISTRIBUTION SYSTEM

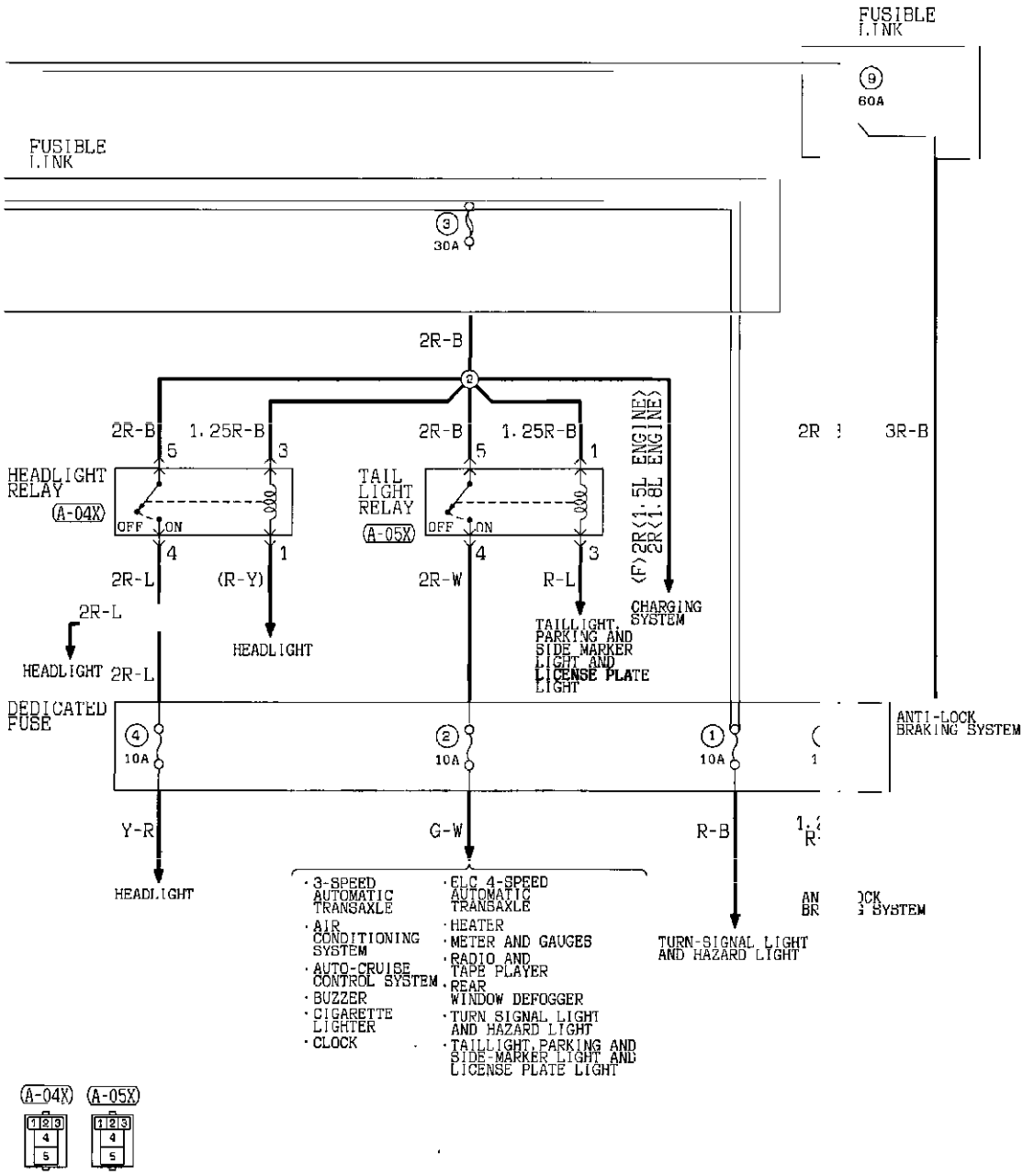
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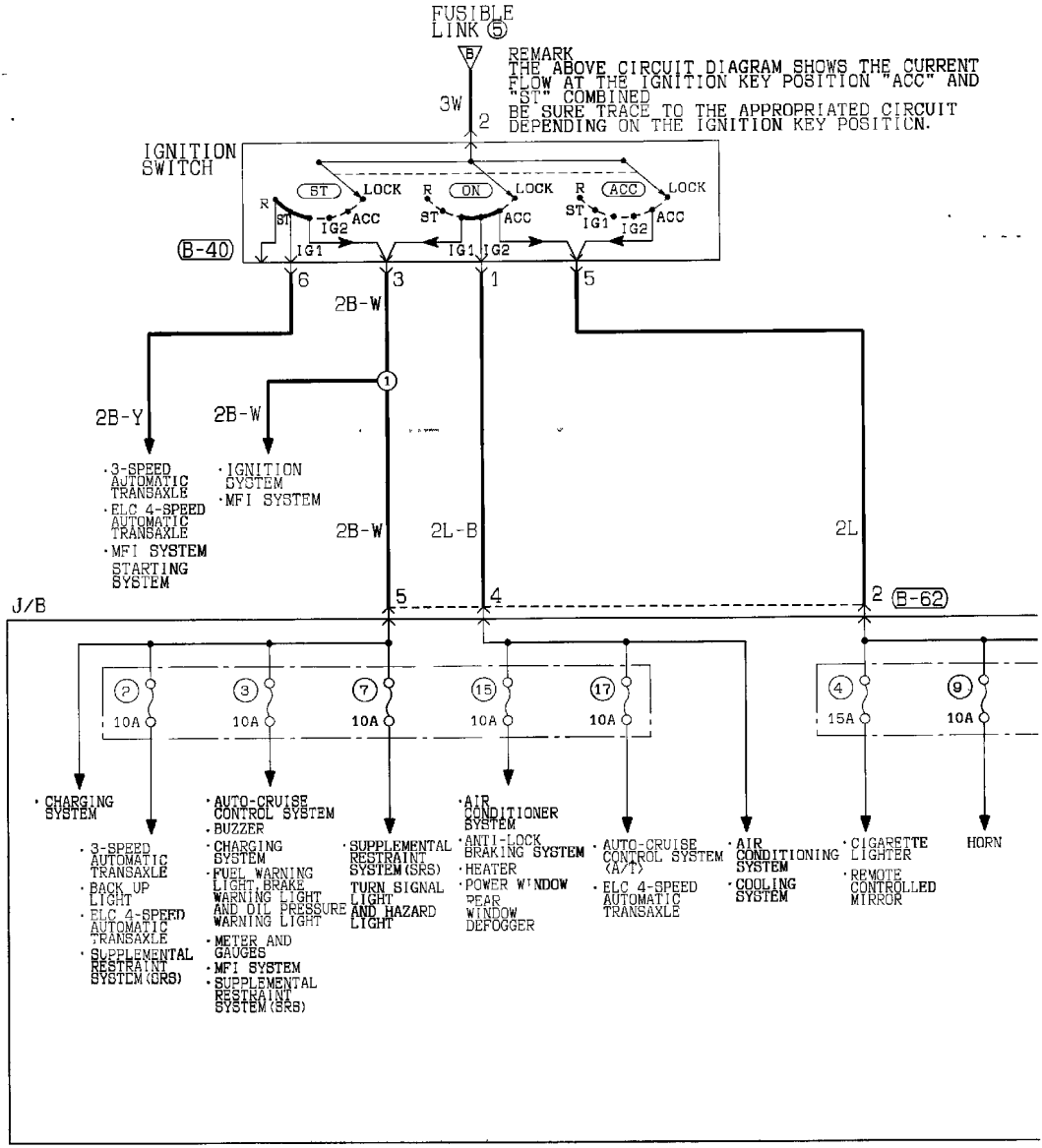


B-03

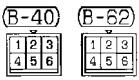


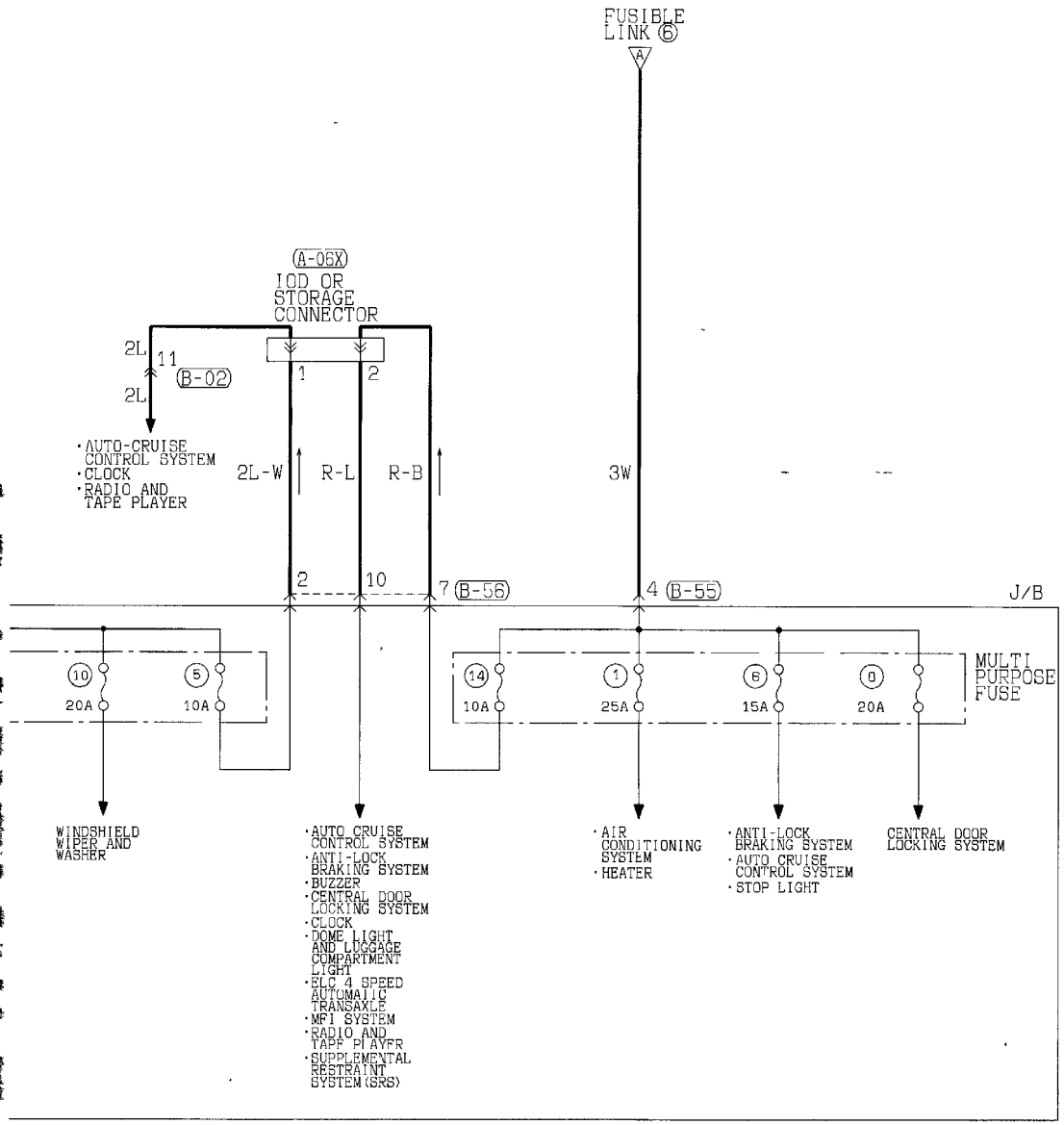

FUSIBLE LINK
9
60A
FUSIBLE LINK
3
30A
2R-B
2
2R-B
1.25R-B
5
3
HEADLIGHT RELAY
A-04X
OFF
ON
4
1
2R-L
(R-Y)
2R-L
HEADLIGHT
HEADLIGHT
2R-L
DEDICATED FUSE
4
10A
Y-R
HEADLIGHT
2R-B
1.25R-B
5
1
TAIL LIGHT RELAY
A-05X
OFF
ON
4
3
2R-W
R-L
TAILLIGHT, PARKING AND SIDE MARKER LIGHT AND LICENSE PLATE LIGHT
(F)2R(1.5L ENGINE) 2R(1.8L ENGINE)
CHARGING SYSTEM
2
10A
G-W
· 3-SPEED AUTOMATIC TRANSAXLE
· AIR CONDITIONING SYSTEM
· AUTO-CRUISE CONTROL SYSTEM
· BUZZER
· CIGARETTE LIGHTER
· CLOCK
· ELC 4-SPEED AUTOMATIC TRANSAXLE
· HEATER
· METER AND GAUGES
· RADIO AND TAPE PLAYER
· REAR WINDOW DEFOGGER
· TURN SIGNAL LIGHT AND HAZARD LIGHT
· TAILLIGHT, PARKING AND SIDE MARKER LIGHT AND LICENSE PLATE LIGHT
1
10A
R-B
TURN-SIGNAL LIGHT AND HAZARD LIGHT
2R
3R-B
ANTI-LOCK BRAKING SYSTEM
A-04X
A-05X
1 2 3
4
5

POWER DISTRIBUTION SYSTEM <FROM 1995 MODELS> (CONTINUED)



B-40 B-62





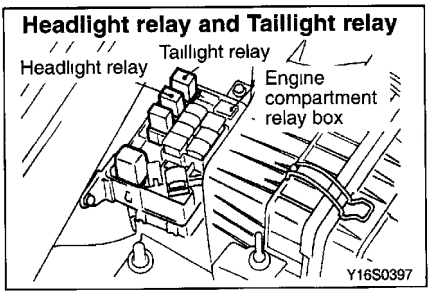
(A-06X) (B-02) (B-55) (B-56)



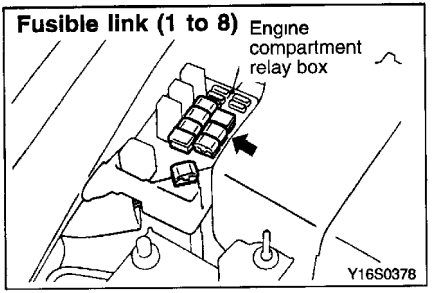
COMPONENT LOCATION

110003551

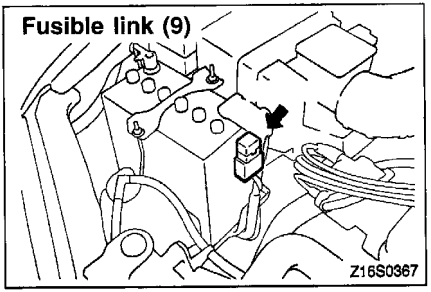
Headlight relay and Taillight relay



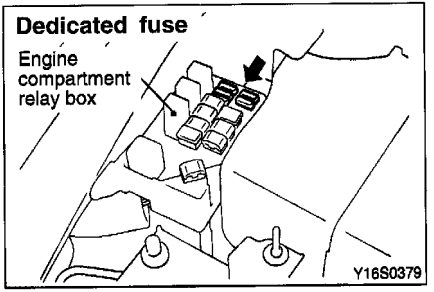
Fusible link (1 to 8)



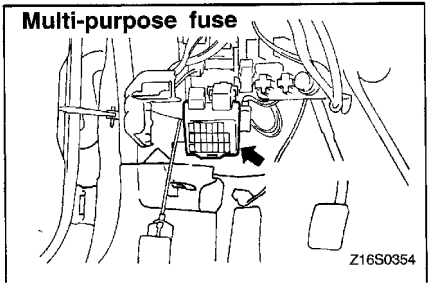
Fusible link (9)



Dedicated fuse



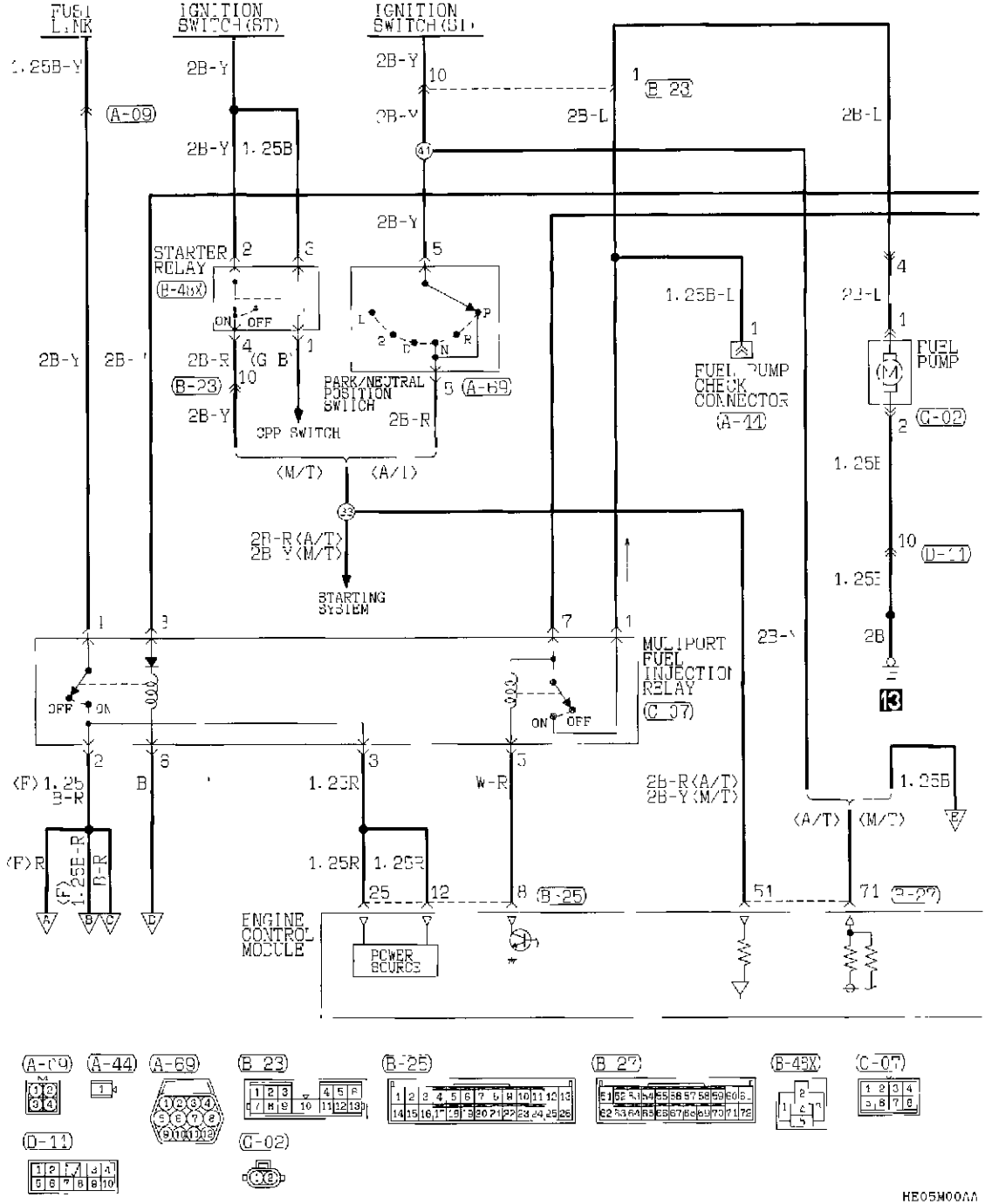
Multi-purpose fuse



MFI SYSTEM

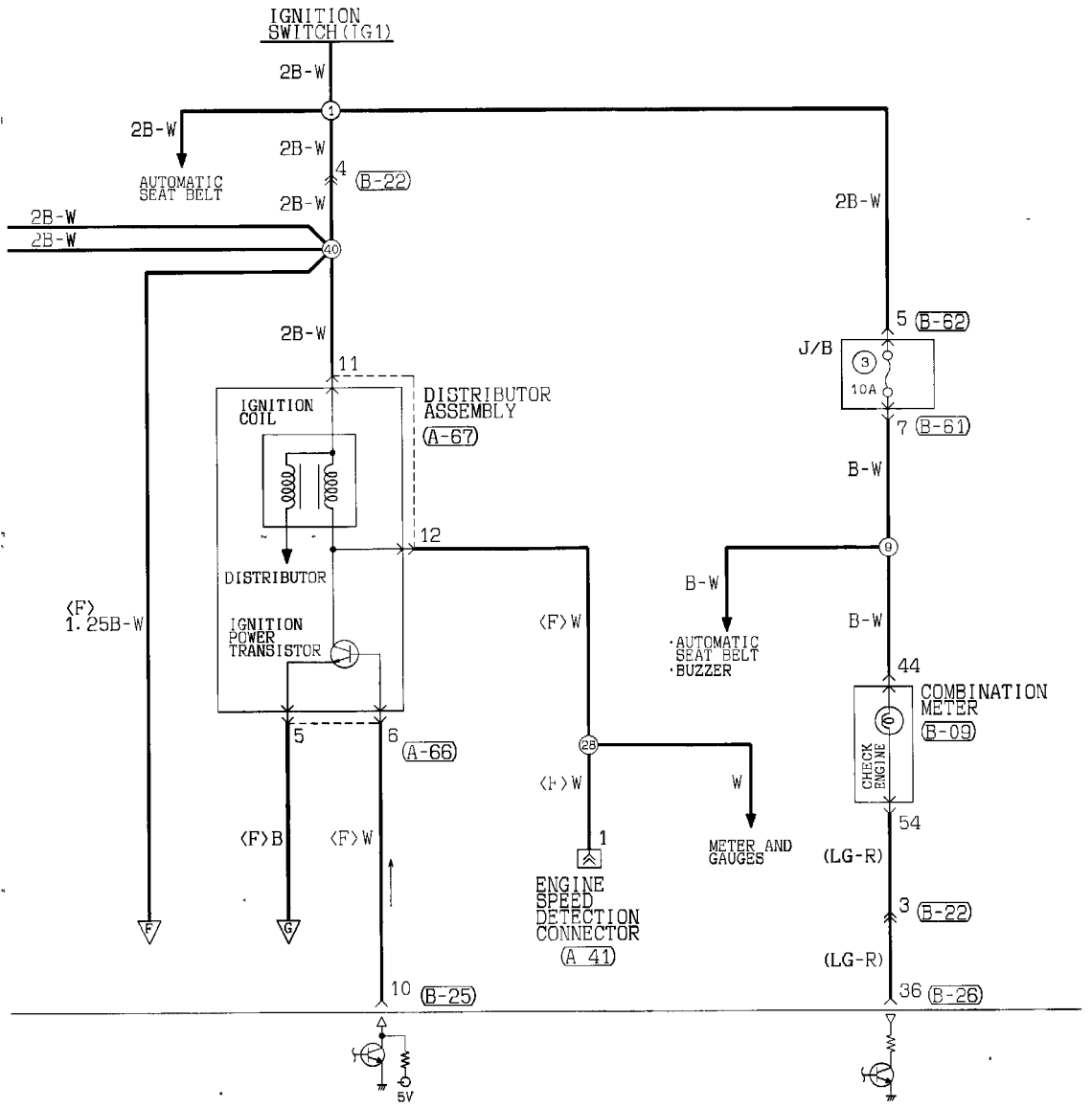
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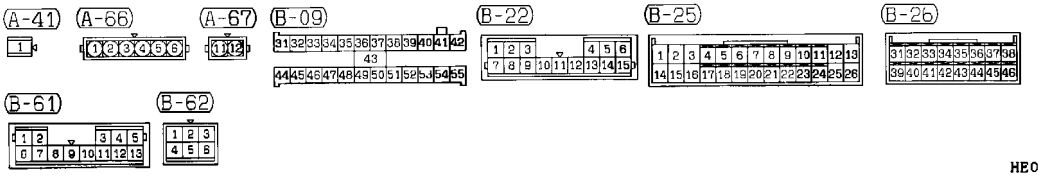
<1.5L ENGINE (1993 MODELS)>



HE05M00AA

TSB Revision

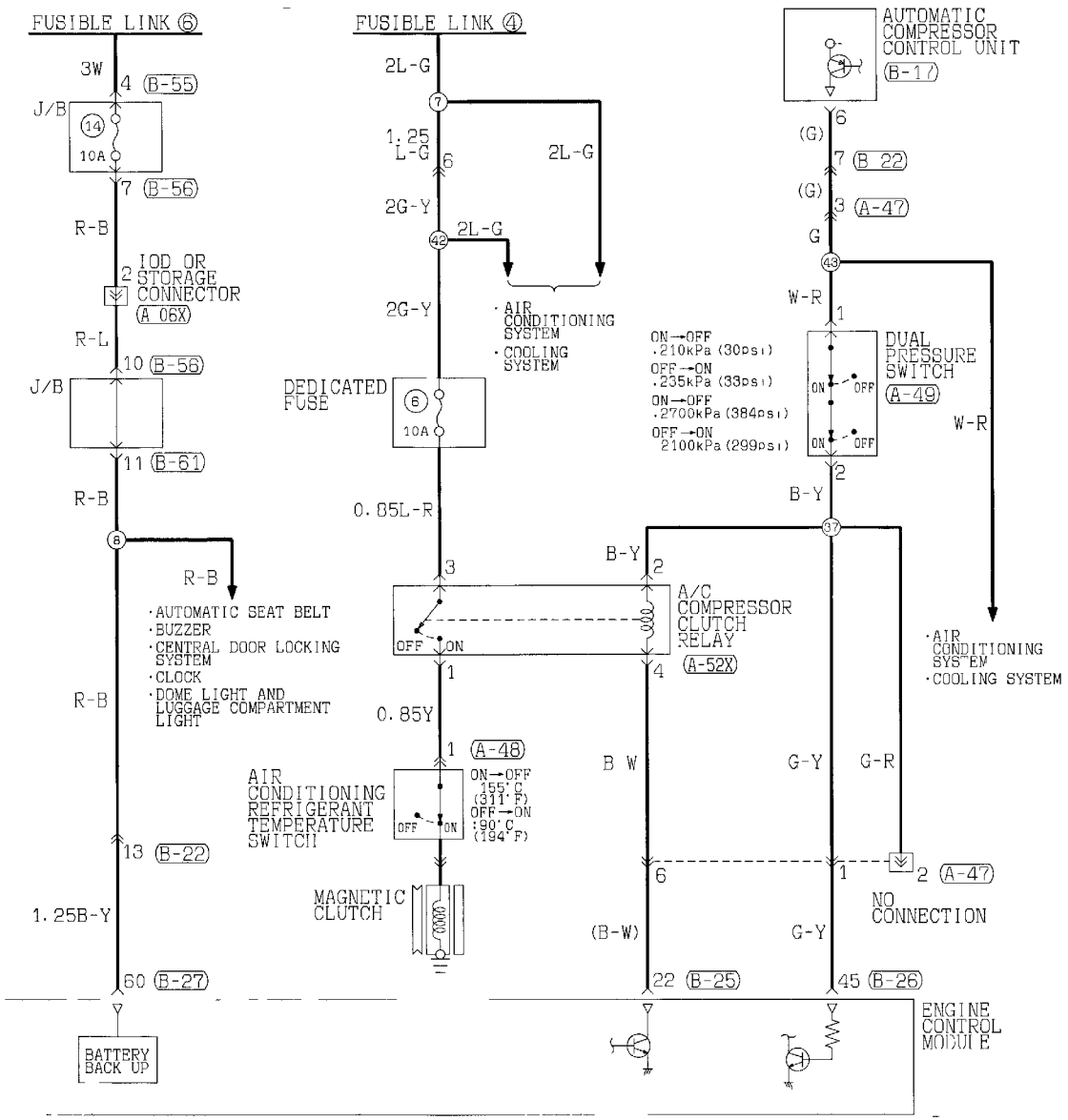




HE05M00AB

TSB Revision

MFI SYSTEM <1.5L ENGINE (1993 MODELS)> (CONTINUED)

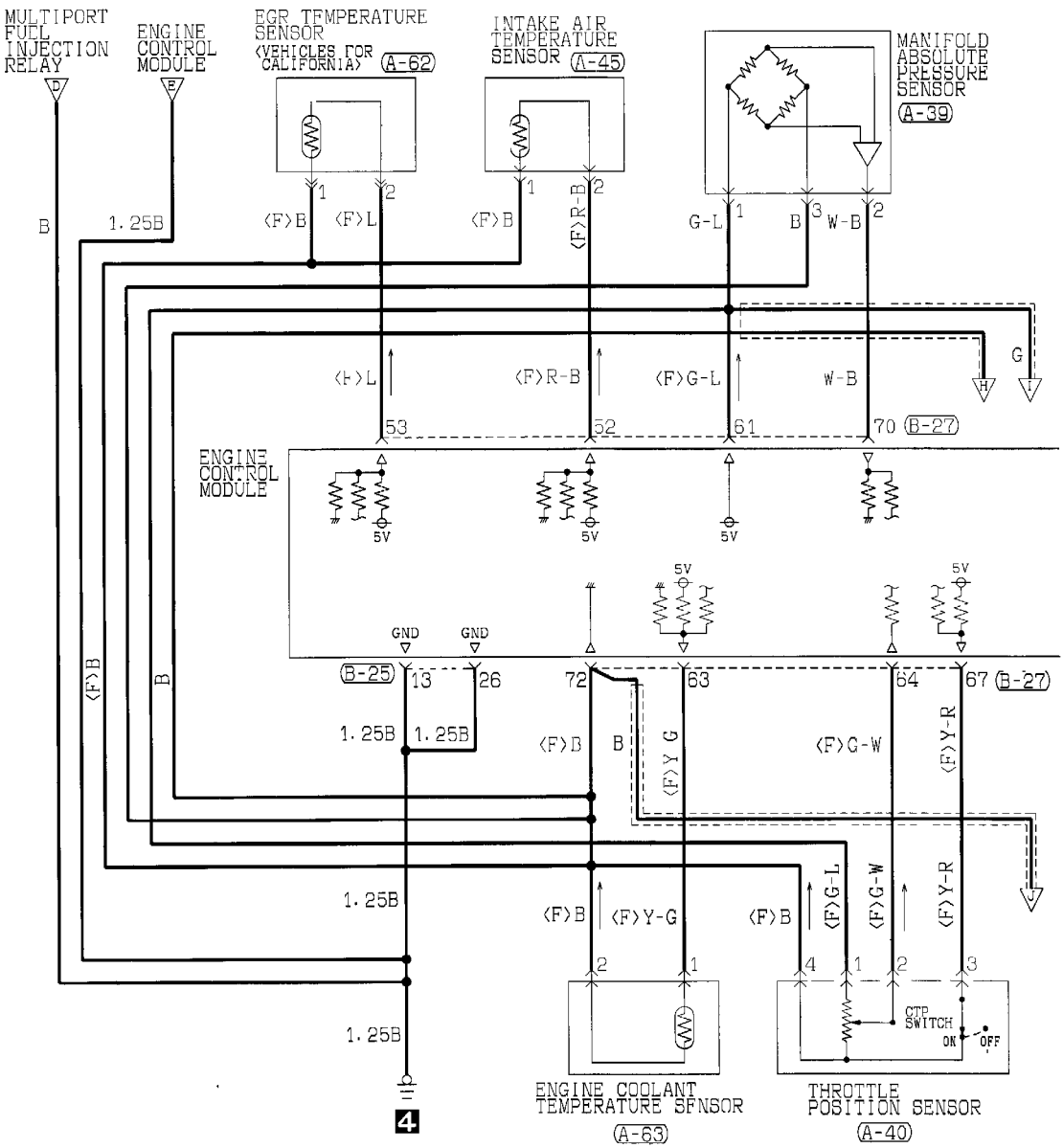


(A-06X) (A-47) (A-48) (A-49) (A-52X) (A-53) (B-17) (B-22) (B-25)

(B-26) (B-27) (B-55) (B-56) (B-61)

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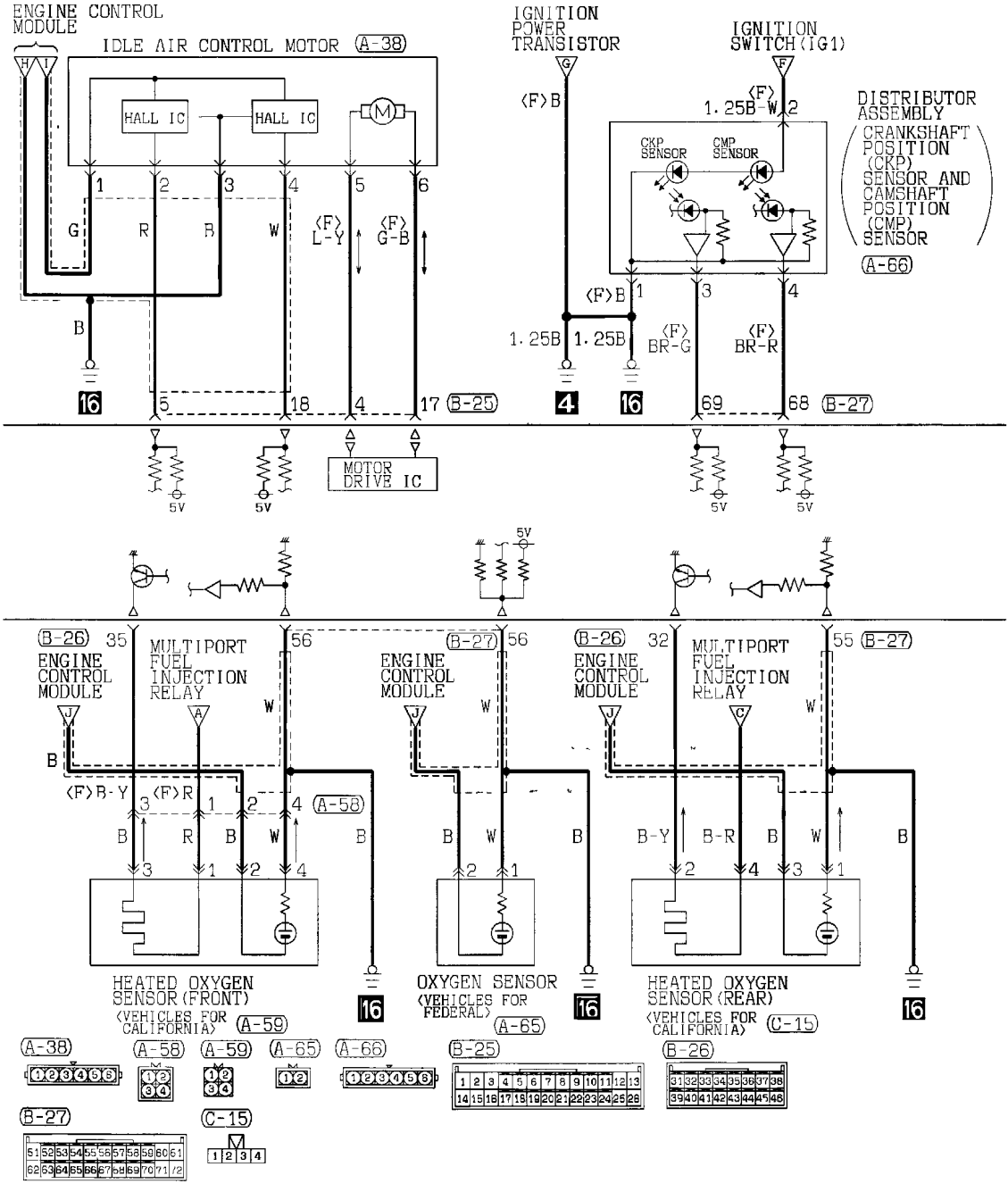
TSB Revision

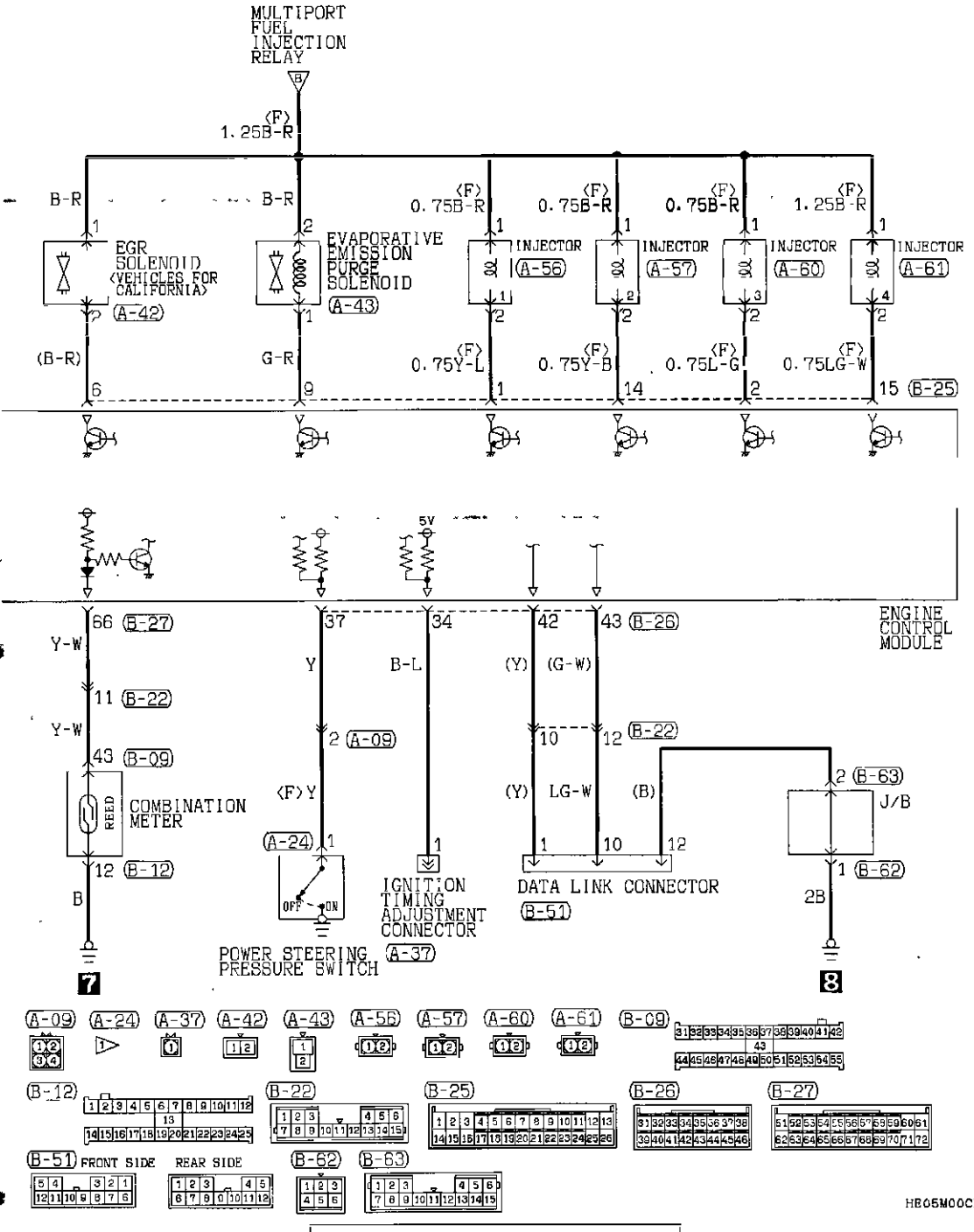


HE05M008B

TSB Revision

MFI SYSTEM <1.5L ENGINE (1993 MODELS)> (CONTINUED)





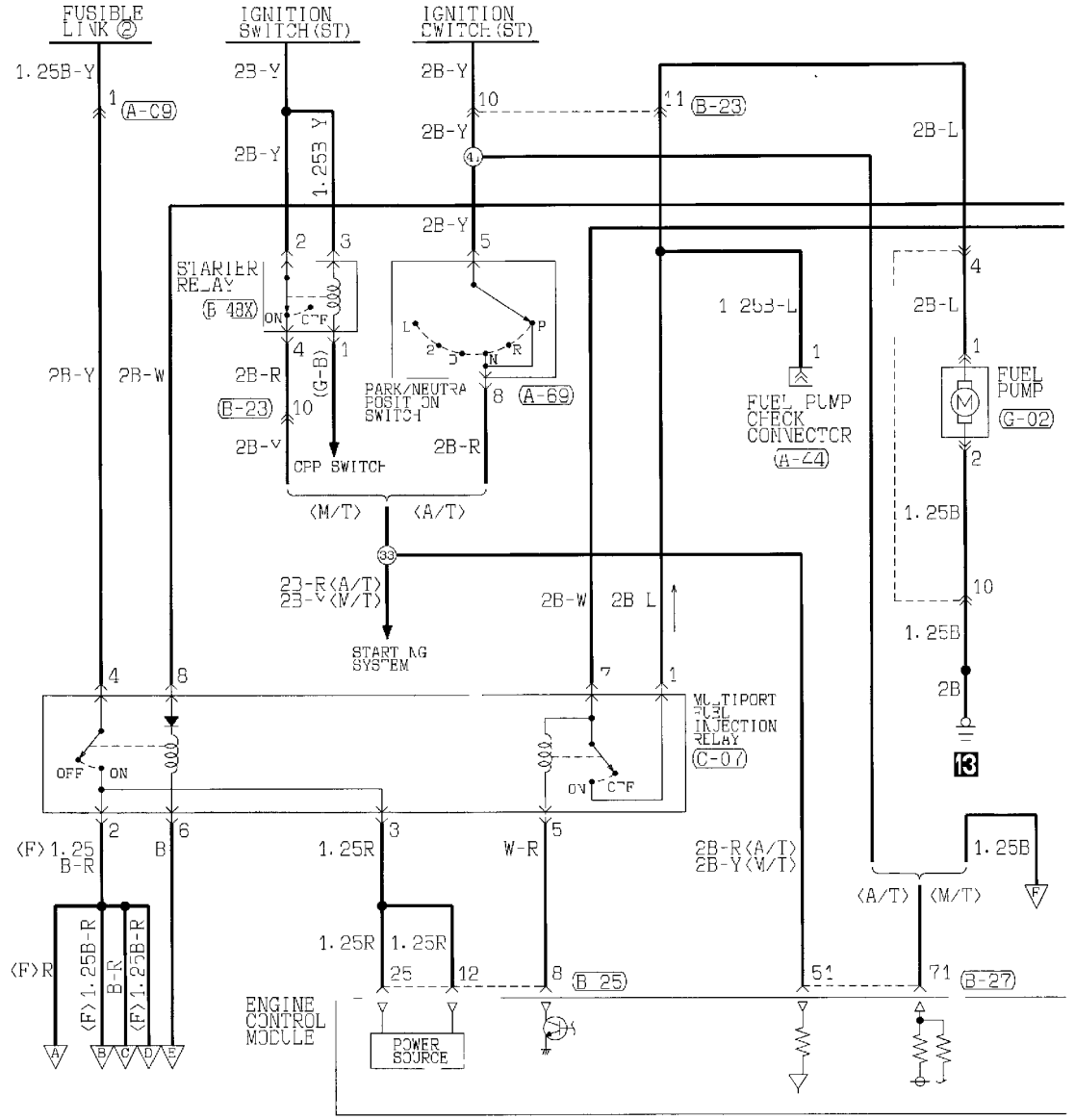
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TSB Revision

MFI SYSTEM

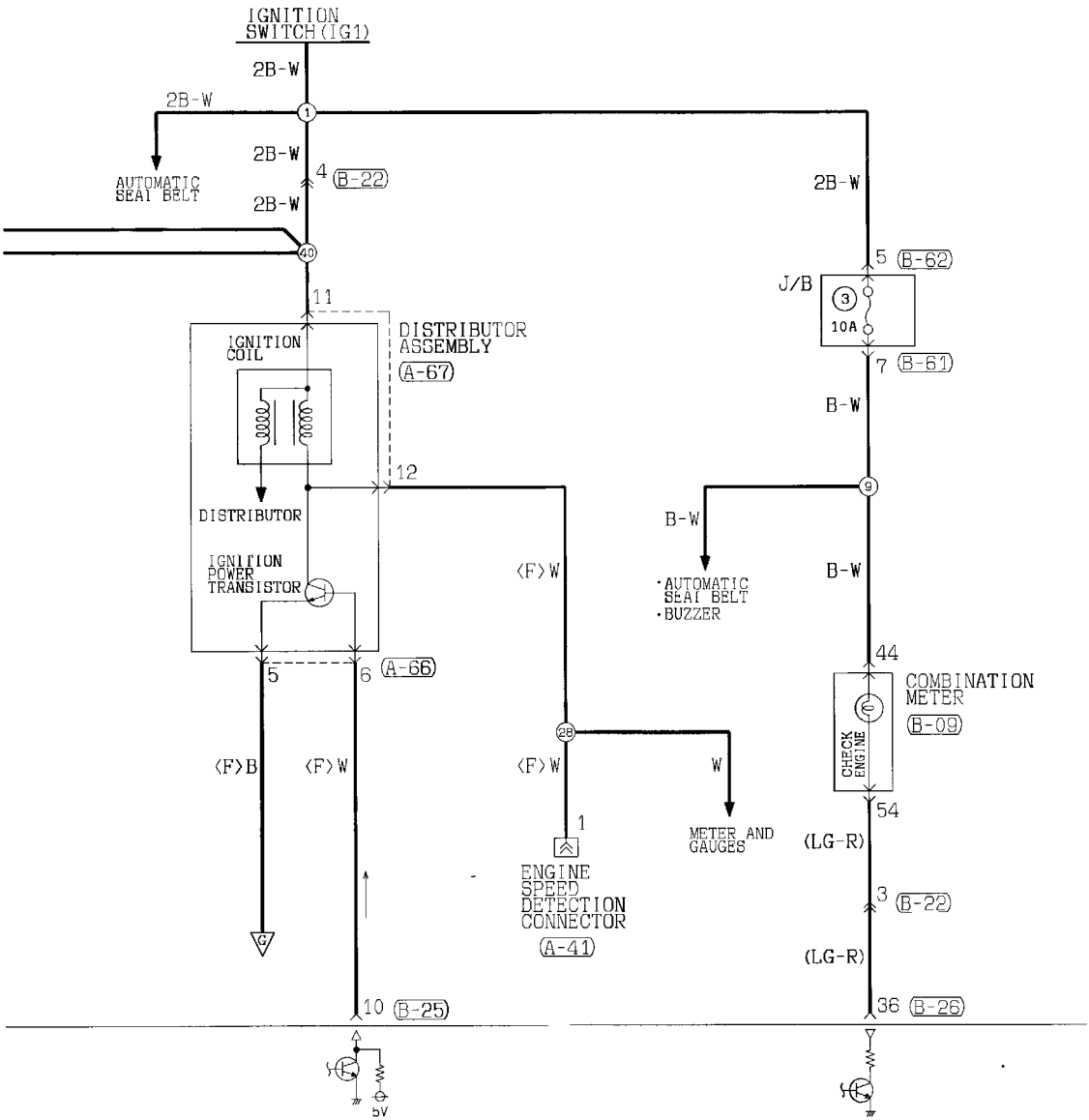
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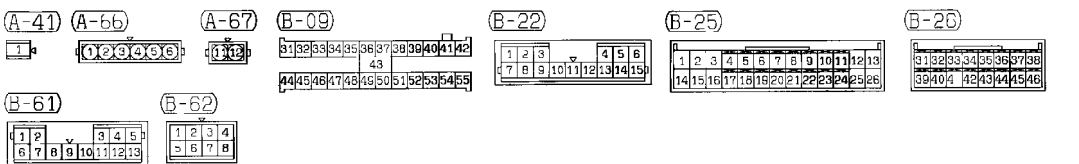
<1.5L ENGINE (1994 MODELS)>



HP05M01AA

TSB Revision

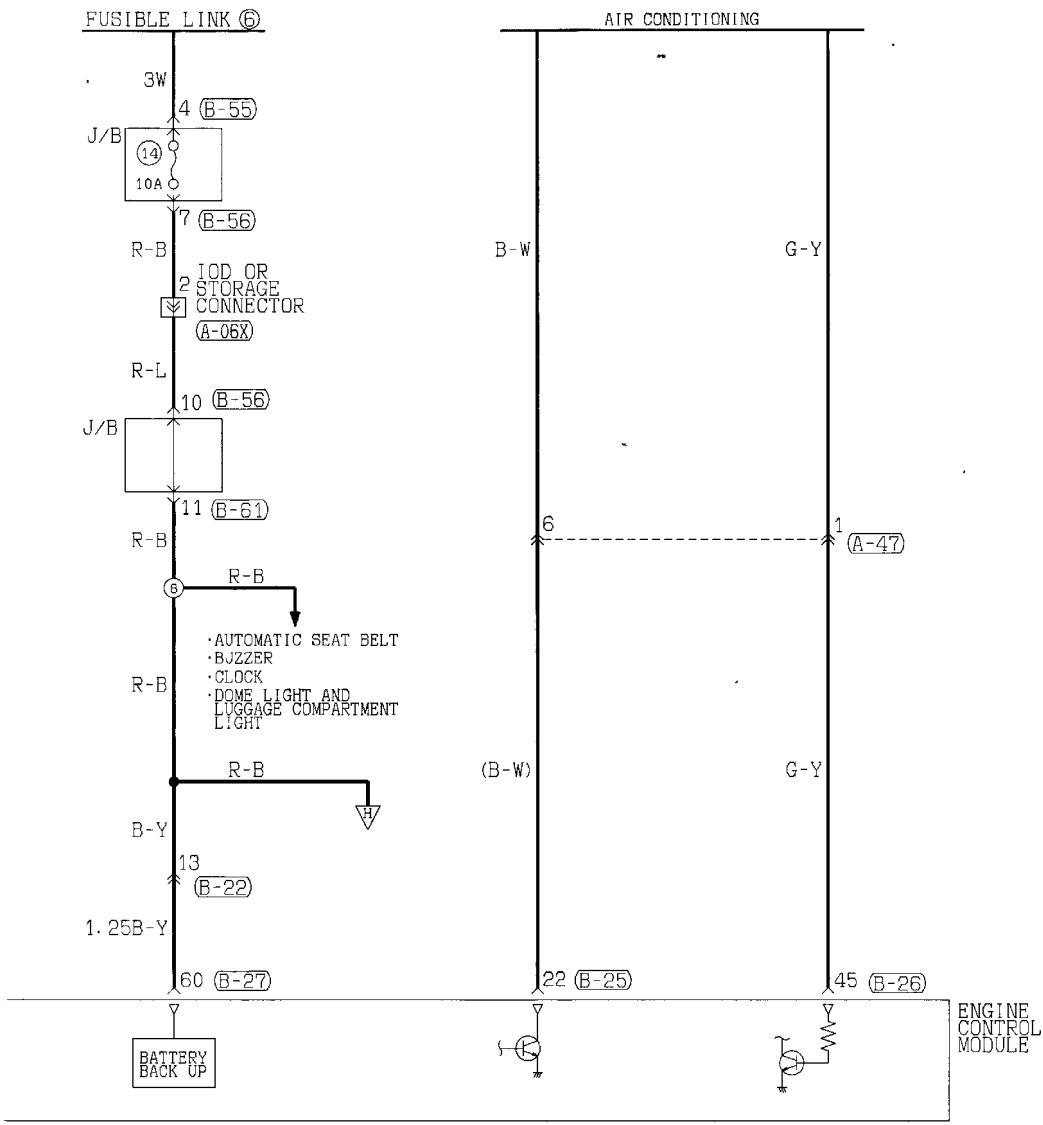


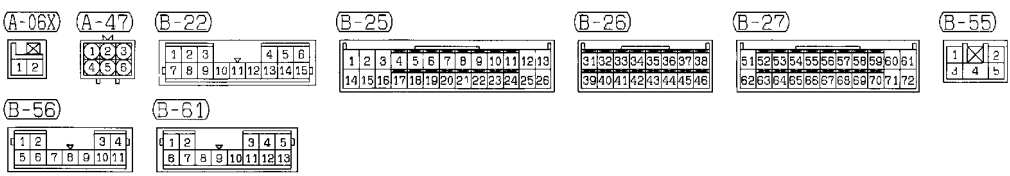


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TSB Revision

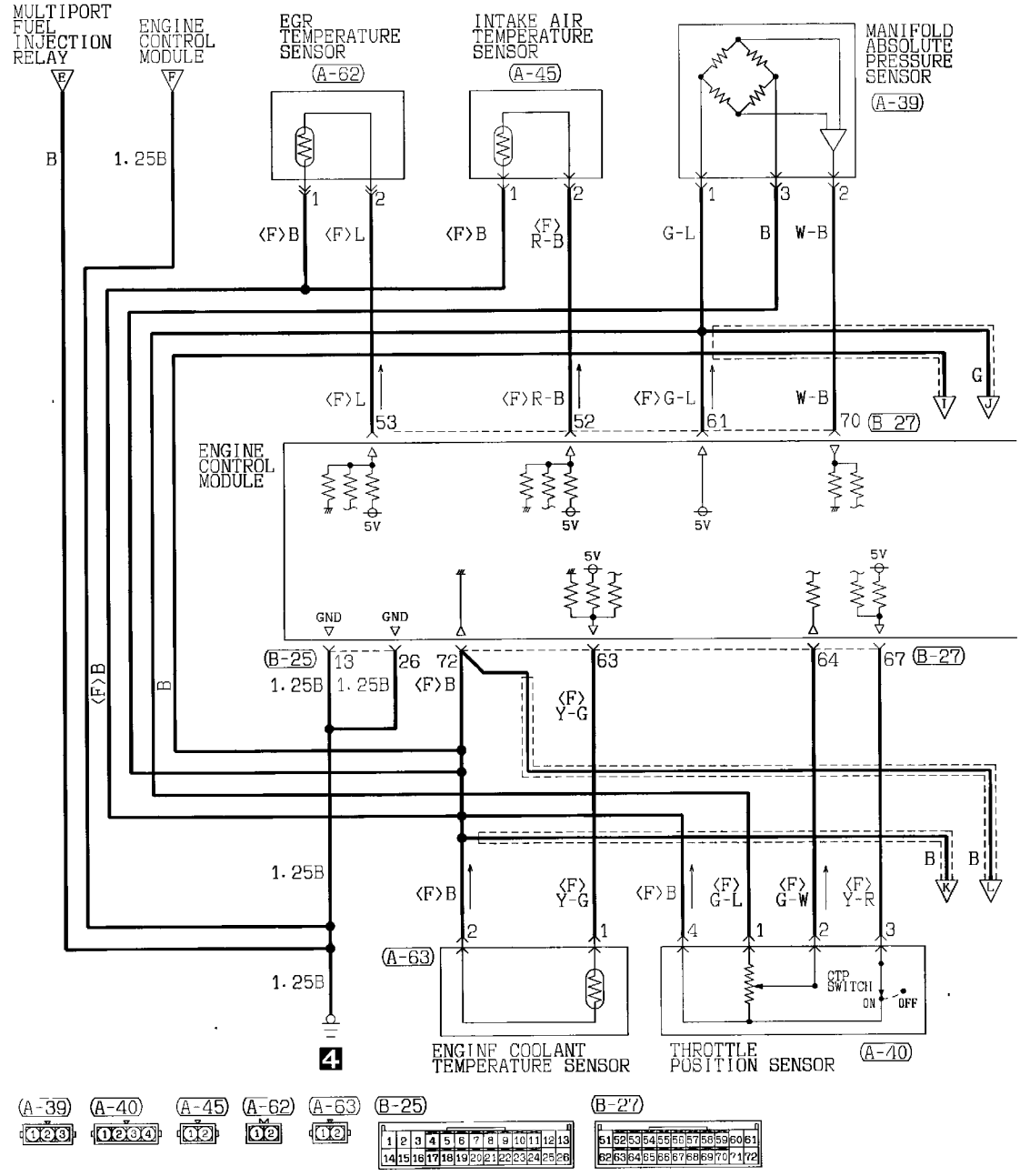
MFI SYSTEM <1.5L ENGINE (1994 MODELS)> (CONTINUED)





HE05M01BA

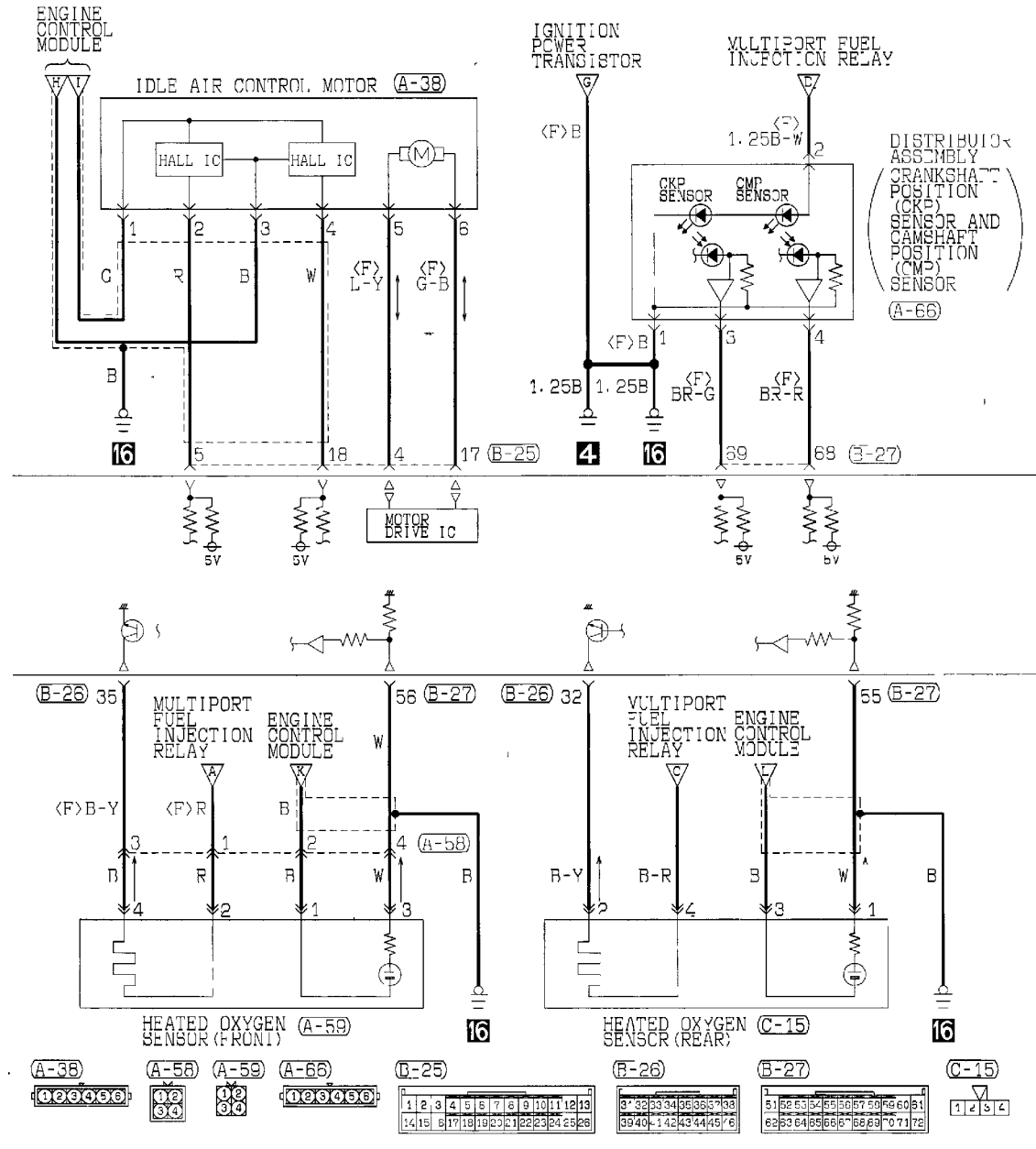
TSB Revision



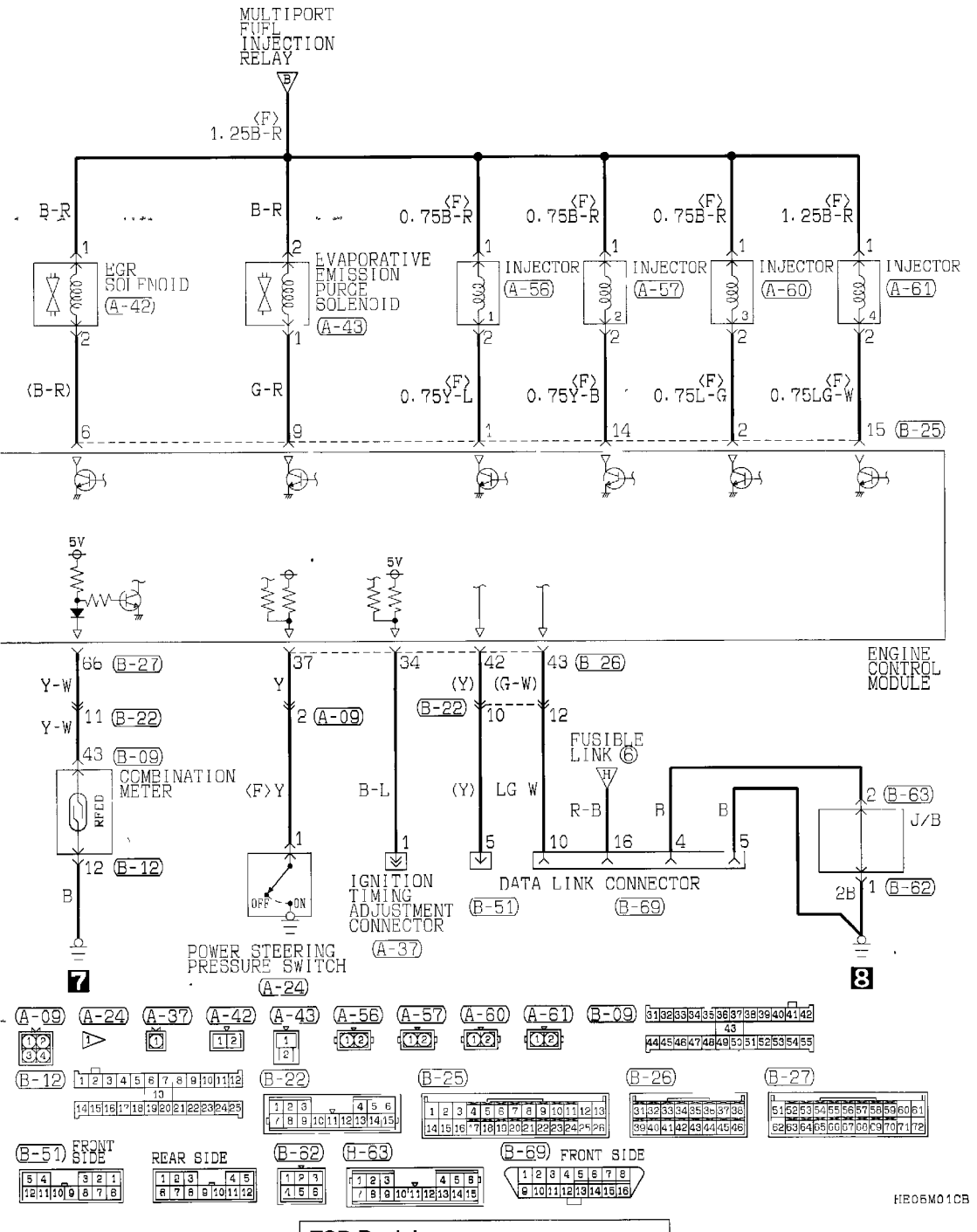
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TSB Revision

MFI SYSTEM <1.5L ENGINE (1994 MODELS)> (CONTINUED)



(A-38) (A-58) (A-59) (A-66) (B-25) (B-26) (B-27) (C-15)



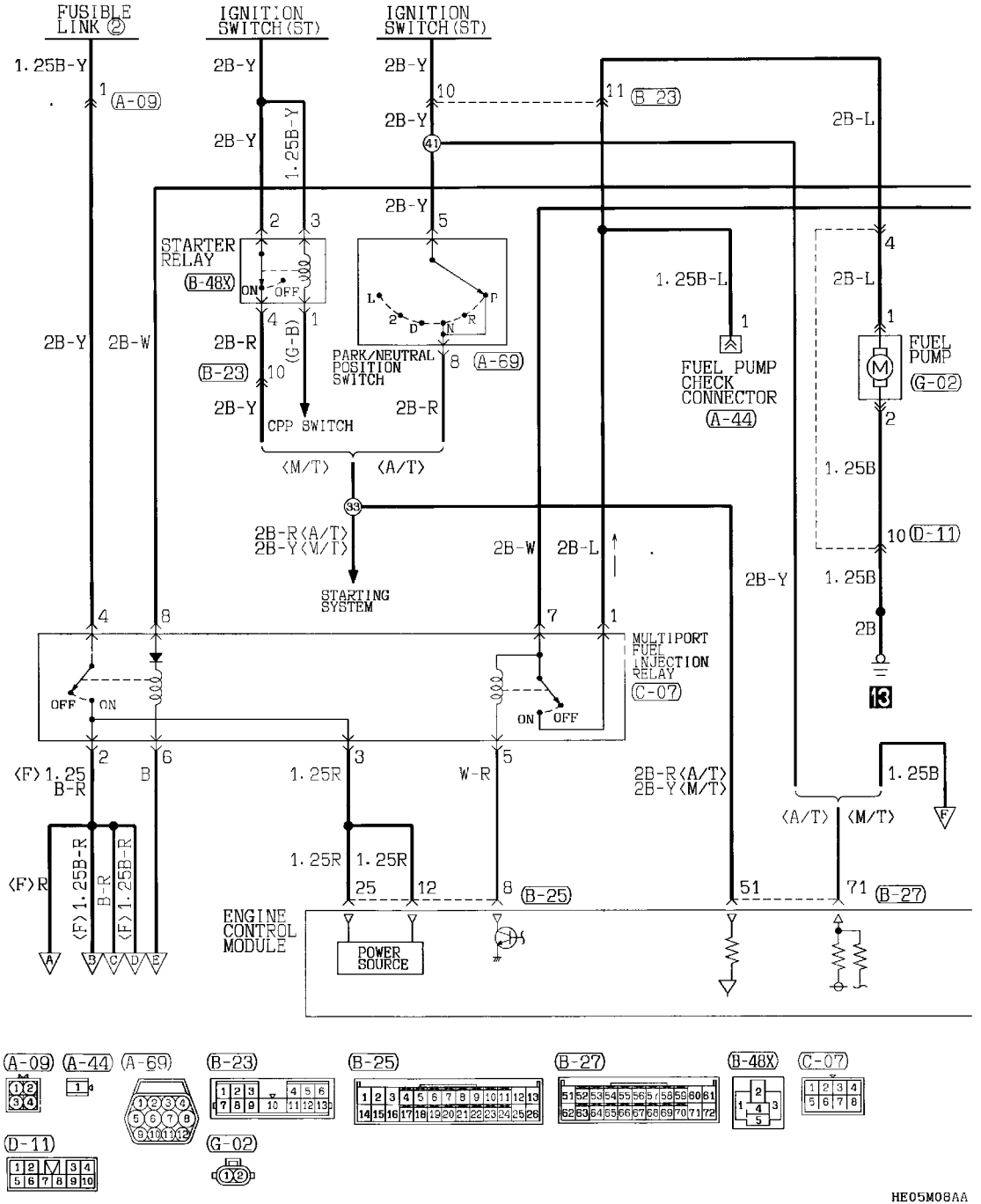
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TSB Revision

MFI SYSTEM

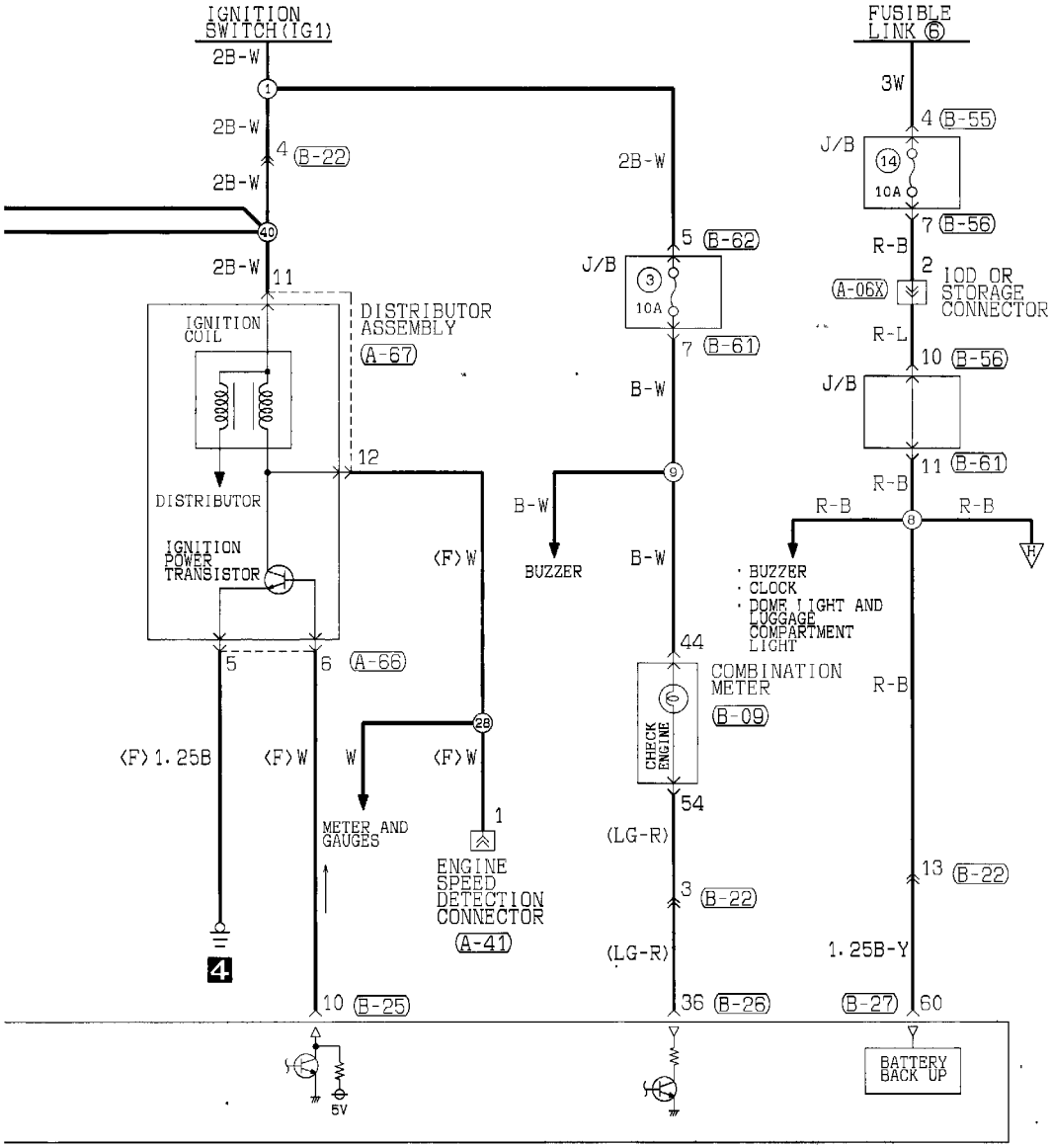
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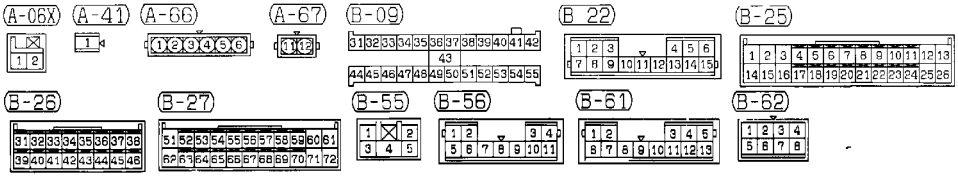
<1.5L ENGINE (1995 MODELS FOR FEDERAL)>



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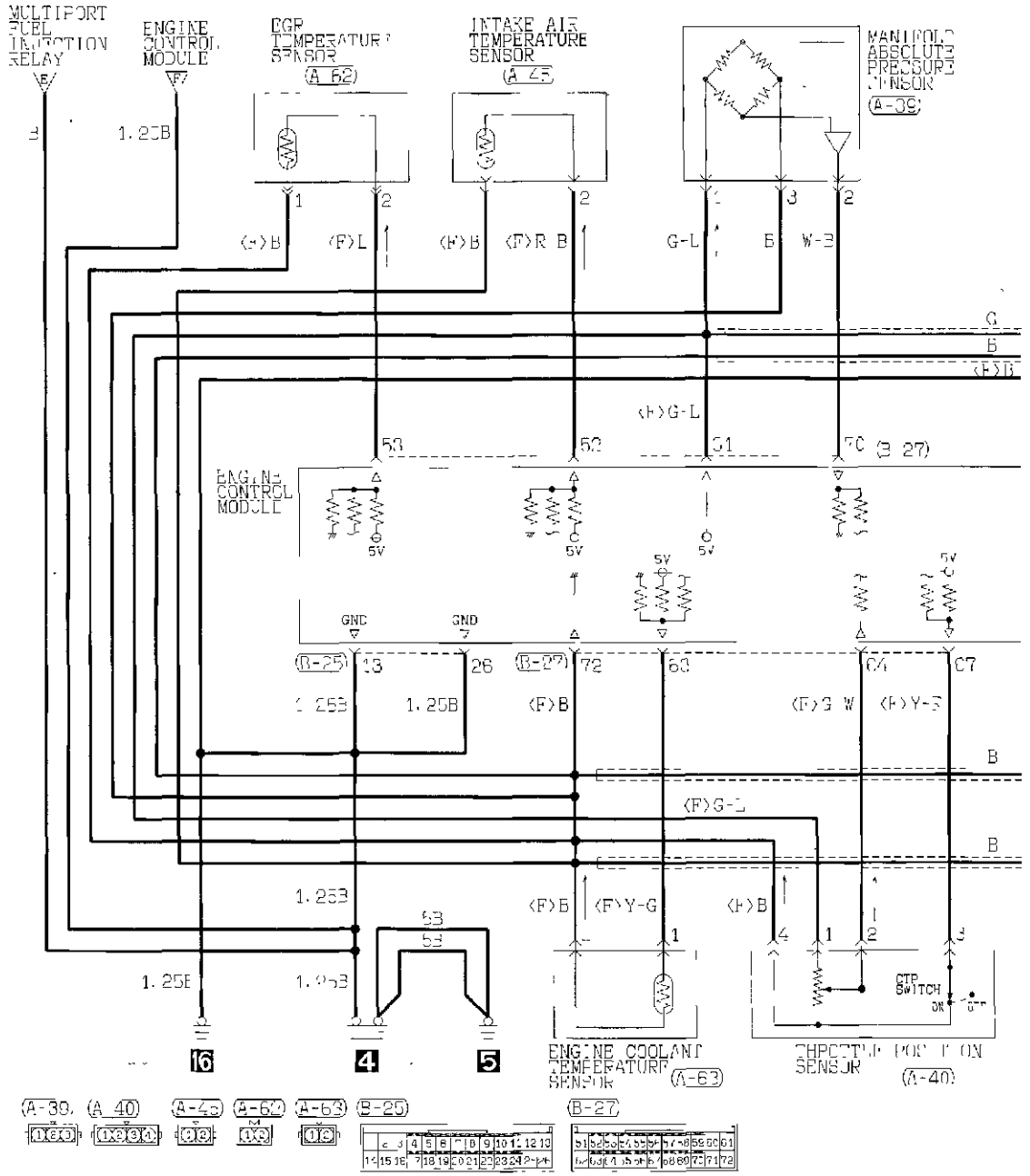


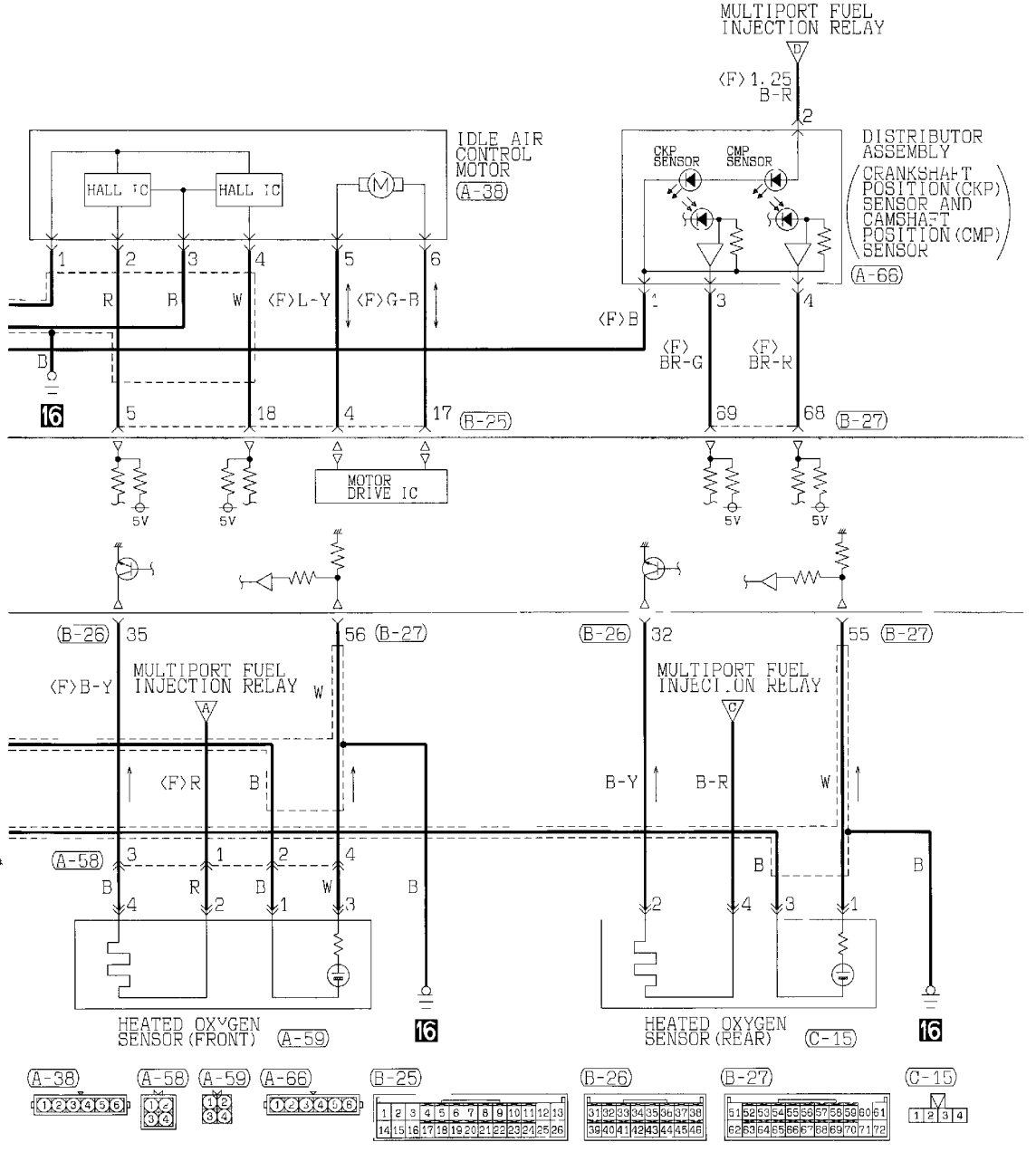


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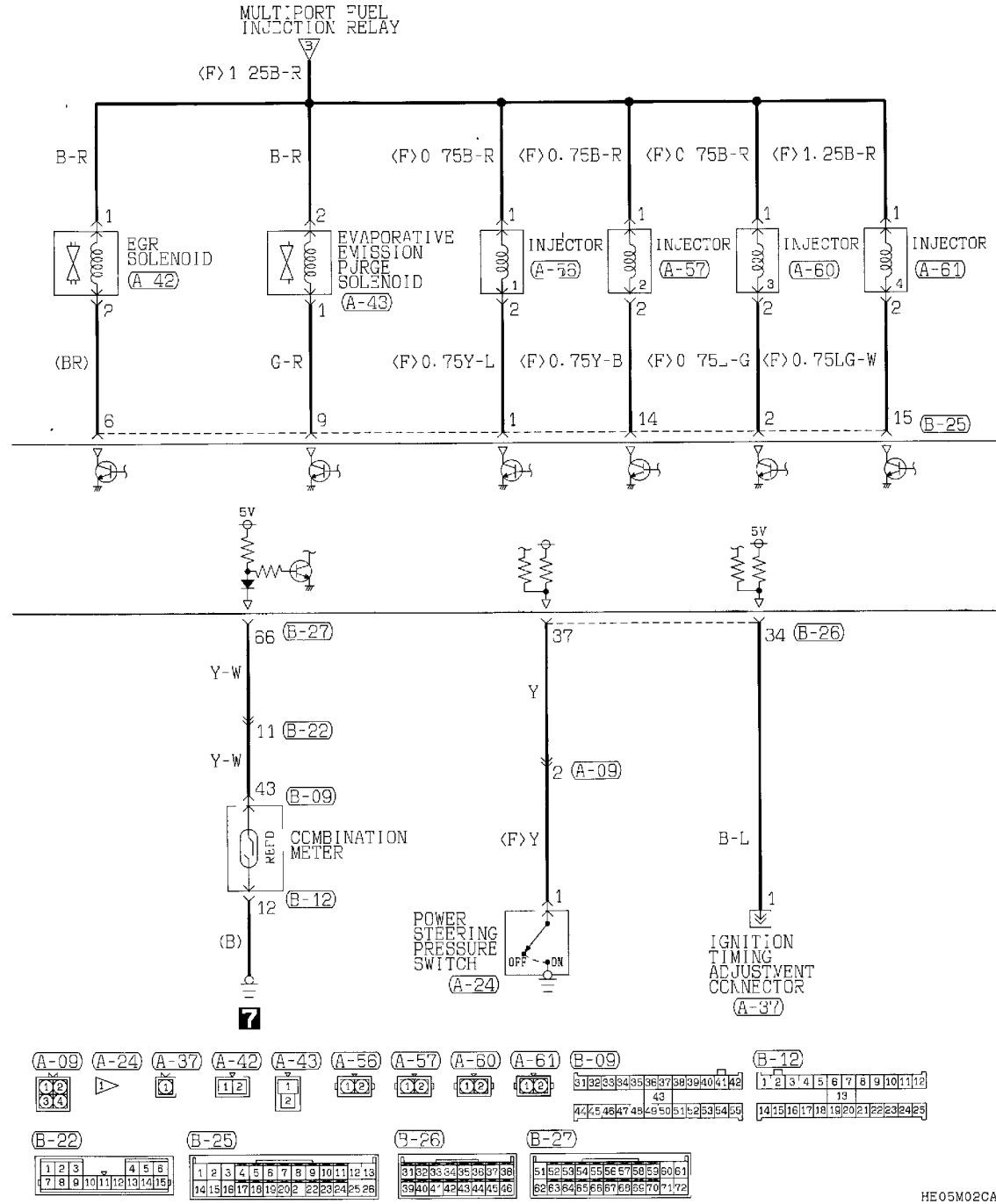
TSB Revision

MFI SYSTEM <1.5L ENGINE (1995 MODELS FOR FEDERAL)> (CONTINUED)



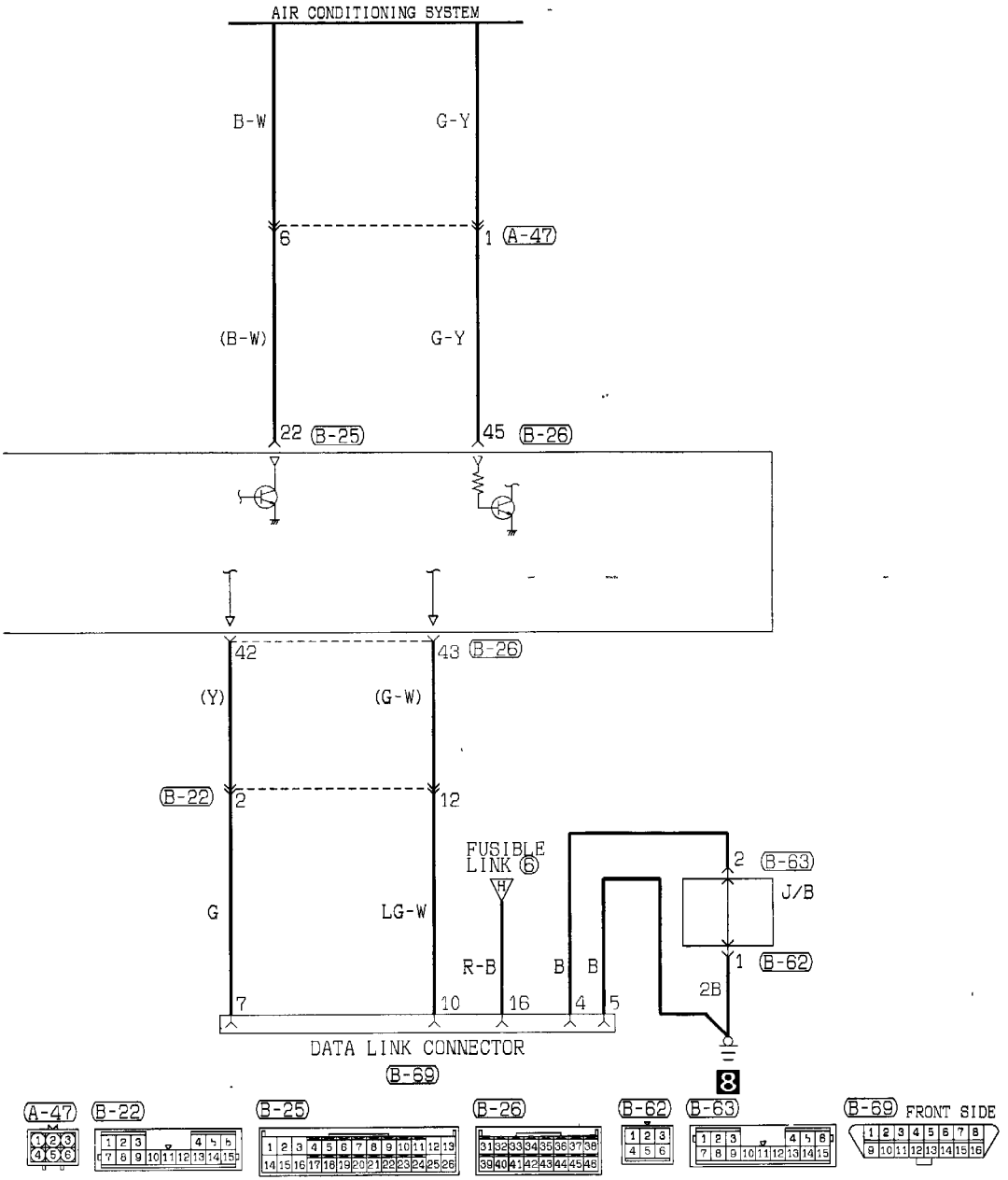

MULTIPORT FUEL INJECTION RELAY
D
(F)1.25 B-R
2
IDLE AIR CONTROL MOTOR
A-38
HALL IC
HALL IC
M
1 2 3 4 5 6
R B W (F)L-Y (F)G-B
B
16
5 18 4 17 B-25
CKP SENSOR
CMP SENSOR
DISTRIBUTOR ASSEMBLY
CRANKSHAFT POSITION(CKP) SENSOR AND CAMSHAFT POSITION(CMP) SENSOR
A-66
(F)B
1 3 4
(F) BR-G
(F) BR-R
69 68 B-27
MOTOR DRIVE IC
5V
B-26 35
56 B-27
MULTIPORT FUEL INJECTION RELAY
A
(F)B-Y
W
(F)R
B
A-58
3 1 2 4
B R B W B
4 2 1 3
HEATED OXYGEN SENSOR(FRONT) A-59
B-26 32
55 B-27
MULTIPORT FUEL INJECTION RELAY
C
B-Y
B-R
W
B
2 4 3 1
HEATED OXYGEN SENSOR(REAR) C-15
A-38
A-58
A-59
A-66
B-25
B-26
B-27
C-15

MFI SYSTEM <1.5L ENGINE (1995 MODELS FOR FEDERAL)> (CONTINUED)



HE05M02CA

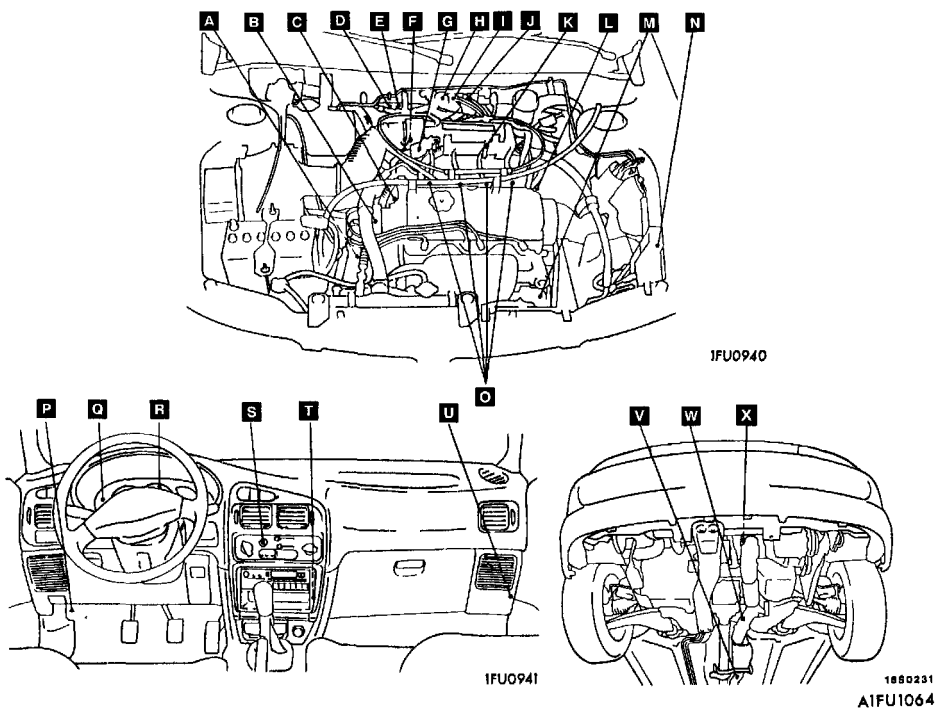
TSB Revision


AIR CONDITIONING SYSTEM
B-W
G-Y
6
1 A-47
(B-W)
G-Y
22 B-25
45 B-26
42
43 B-26
(Y)
(G-W)
B-22
2
12
G
LG-W
FUSIBLE LINK 6
R-B
B
B
7
10
16
4
5
2 B-63
J/B
1 B-62
2B
8
DATA LINK CONNECTOR
B-69
A-47
B-22
B-25
B-26
B-62
B-63
B-69
FRONT SIDE

COMPONENT LOCATION <1.5L ENGINE (Up to 1995 models for Federal, Up to 1994 models for California)>

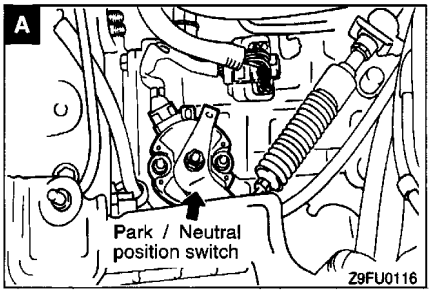
110007462

Name	Symbol	Name	Symbol
Air conditioning compressor clutch relay	N	Heated oxygen sensor (Rear) <Federal–From 1994 models, California>	V
Air conditioning switch	S	Idle air control motor	F
Check engine / Malfunction indicator lamp	Q	Ignition timing adjustment connector	D
Data link connector	P	Injectors	O
Distributor (with built-in camshaft position sensor, crankshaft position sensor, ignition coil and ignition power transistor)	B	*Intake air temperature sensor*	K
EGR solenoid <Federal–From 1994 models, California>	J	Manifold absolute pressure sensor	H
EGR temperature sensor <Federal–From 1994 models, California>	L	Multiport fuel injection (MFI) relay	T
Engine control module	U	Oxygen sensor <Federal–1993 models>	X
Engine coolant temperature sensor	C	Park / Neutral position switch	A
Evaporative emission purge solenoid	I	Power steering pressure switch	M
Fuel pump check terminal	E	Throttle position sensor (with built-in closed throttle position switch)	G
Heated oxygen sensor (Front) <Federal–From 1994 models, California>	W	Vehicle speed sensor (reed switch)	R

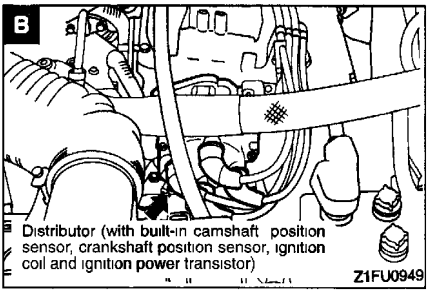


TSB Revision

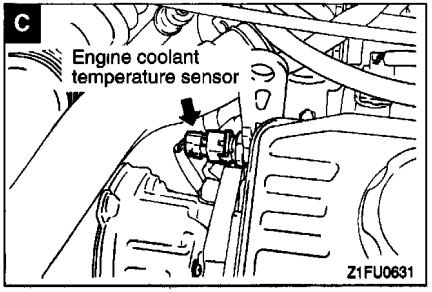
A



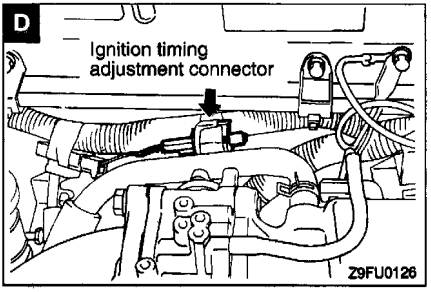
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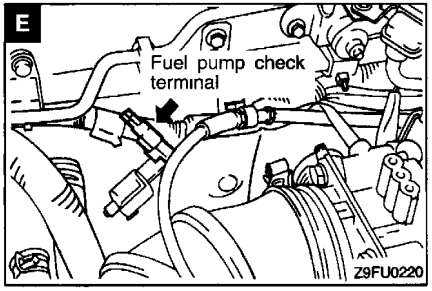
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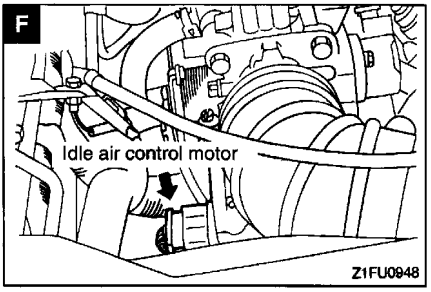
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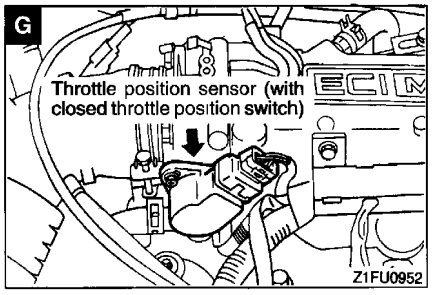
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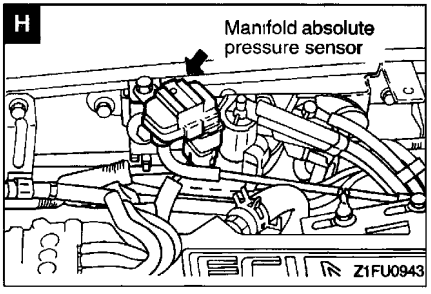
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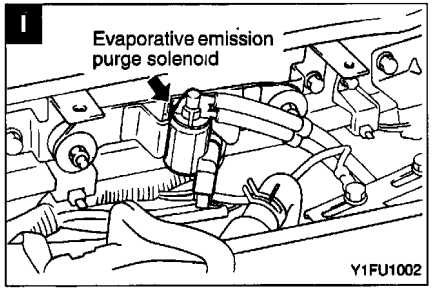
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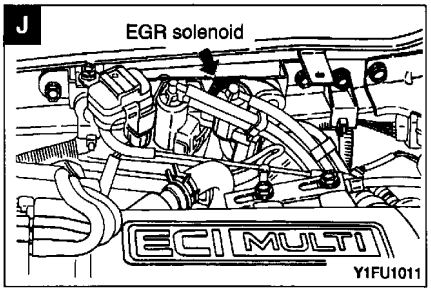
H



I

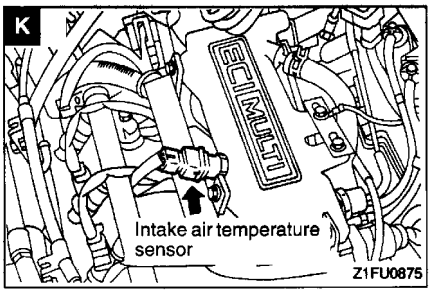


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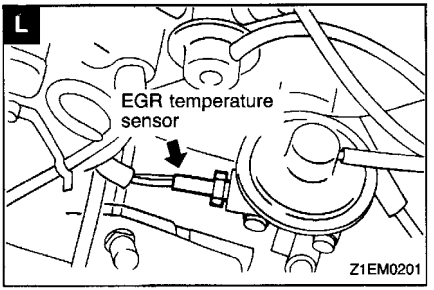


TSB Revision

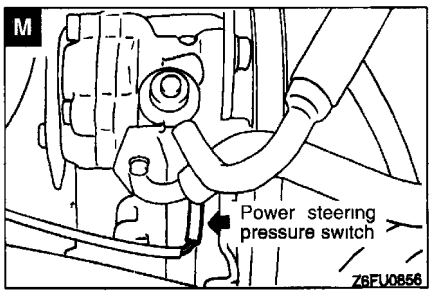
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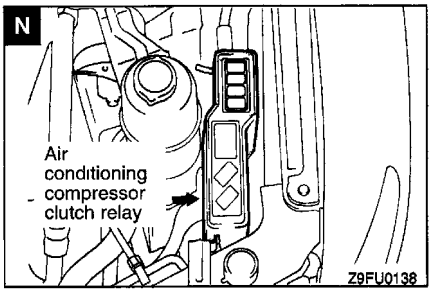
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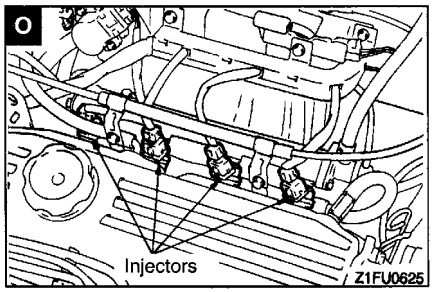
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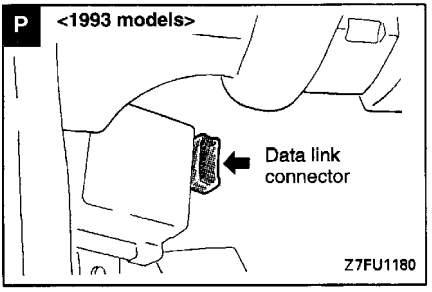
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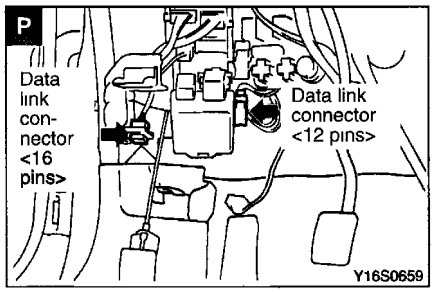
O



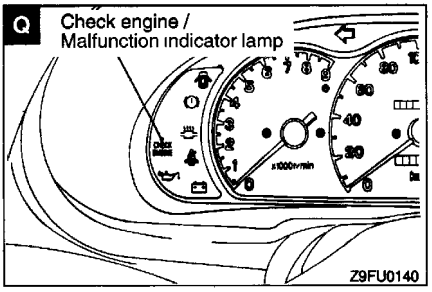
P <1993 models>



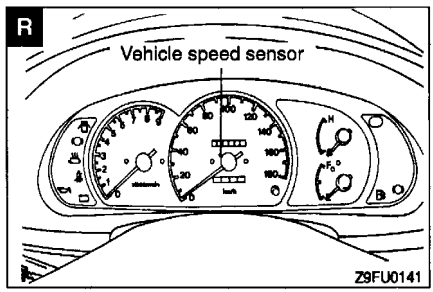
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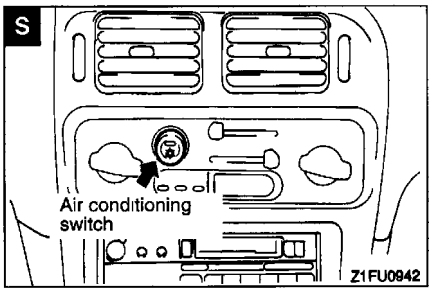
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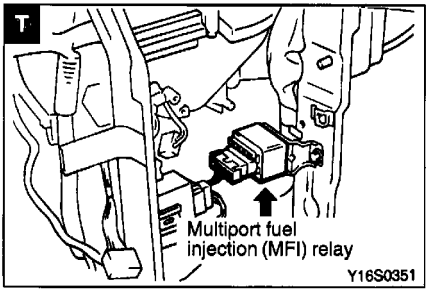
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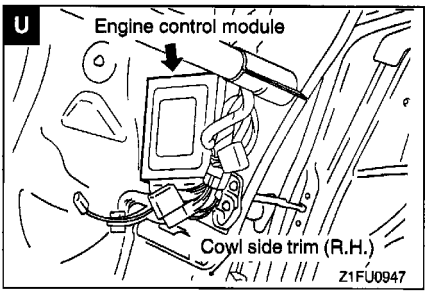
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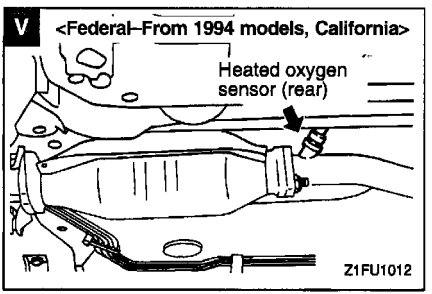
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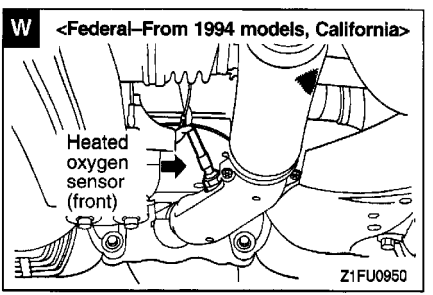
U



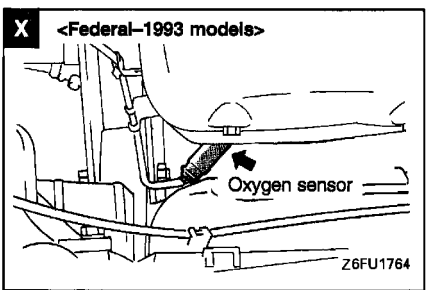
V <Federal–From 1994 models, California>



W <Federal–From 1994 models, California>



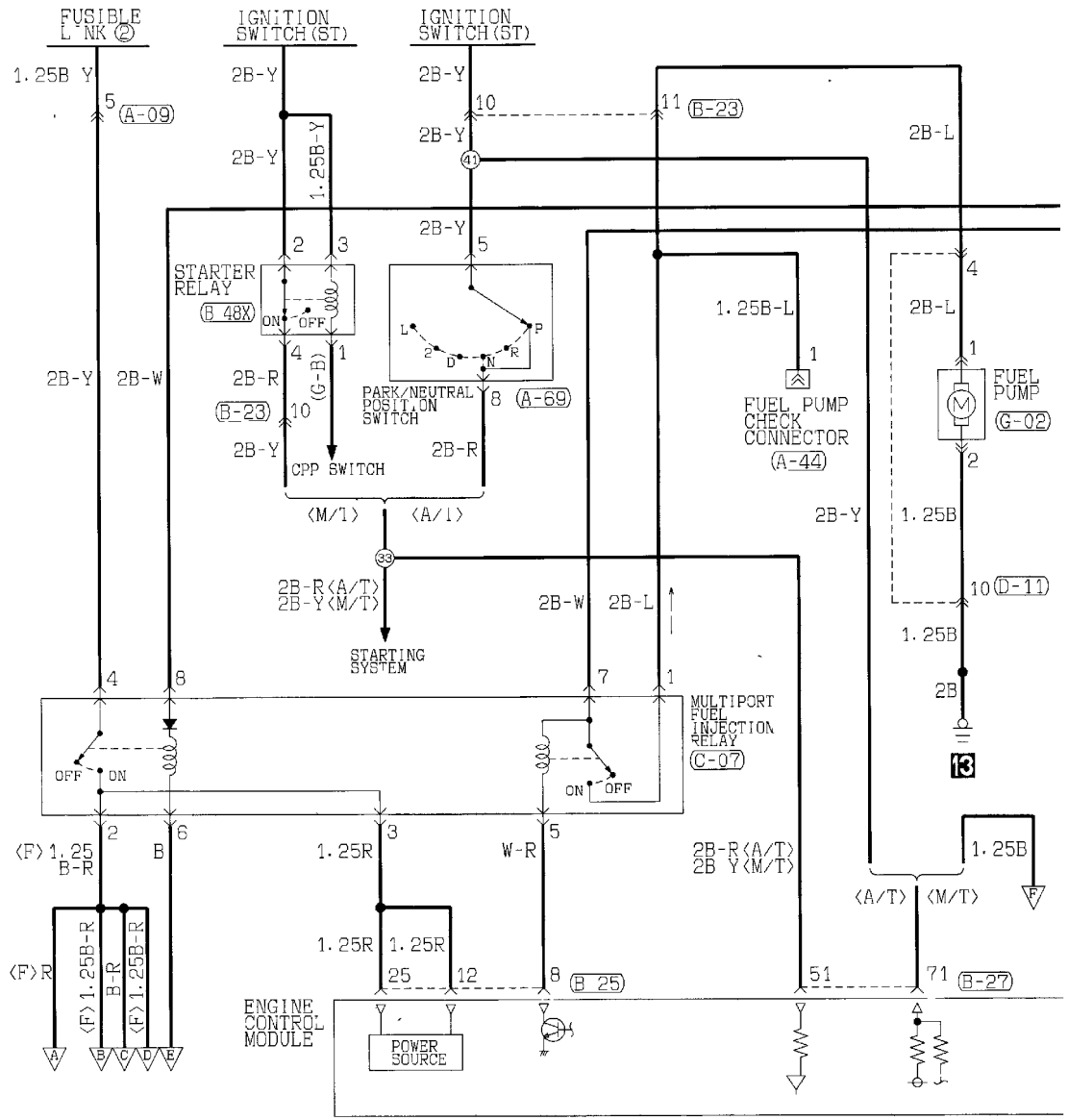
X <Federal–1993 models>

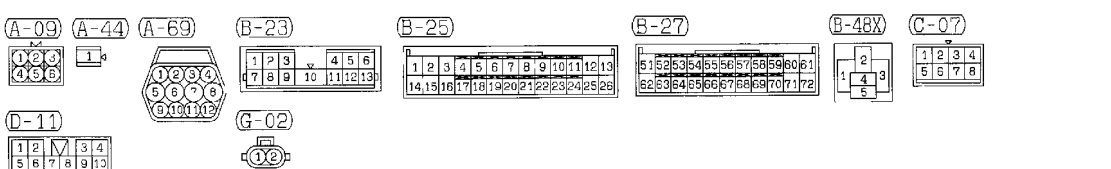


MFI SYSTEM

110003555

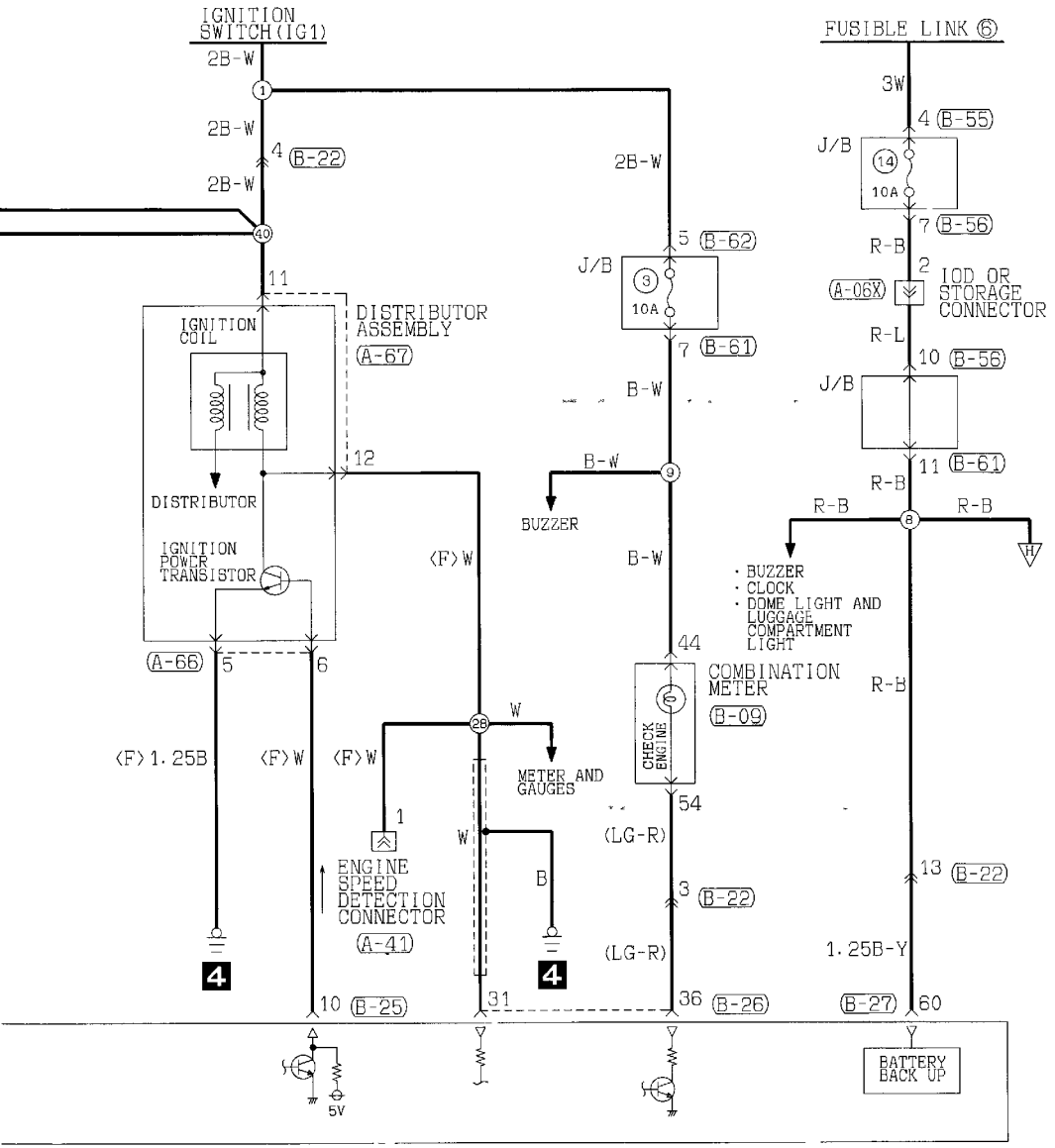
<1.5L ENGINE (FROM 1996 MODEL FOR FEDERAL)>

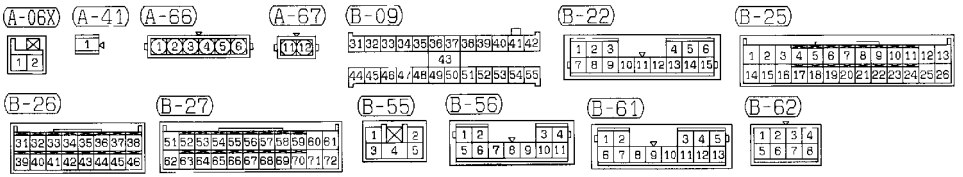




HE05M09AA

TSB Revision

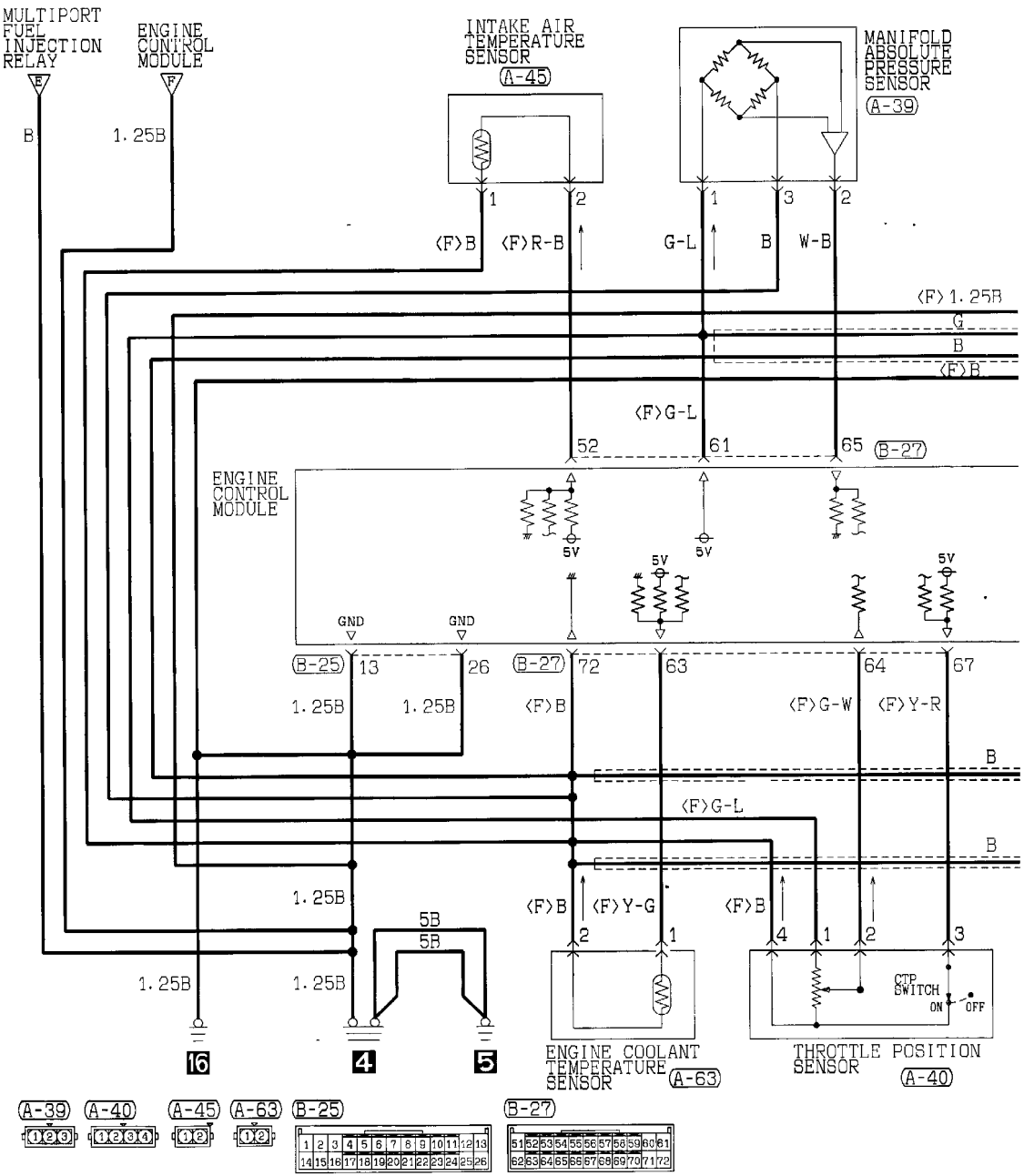


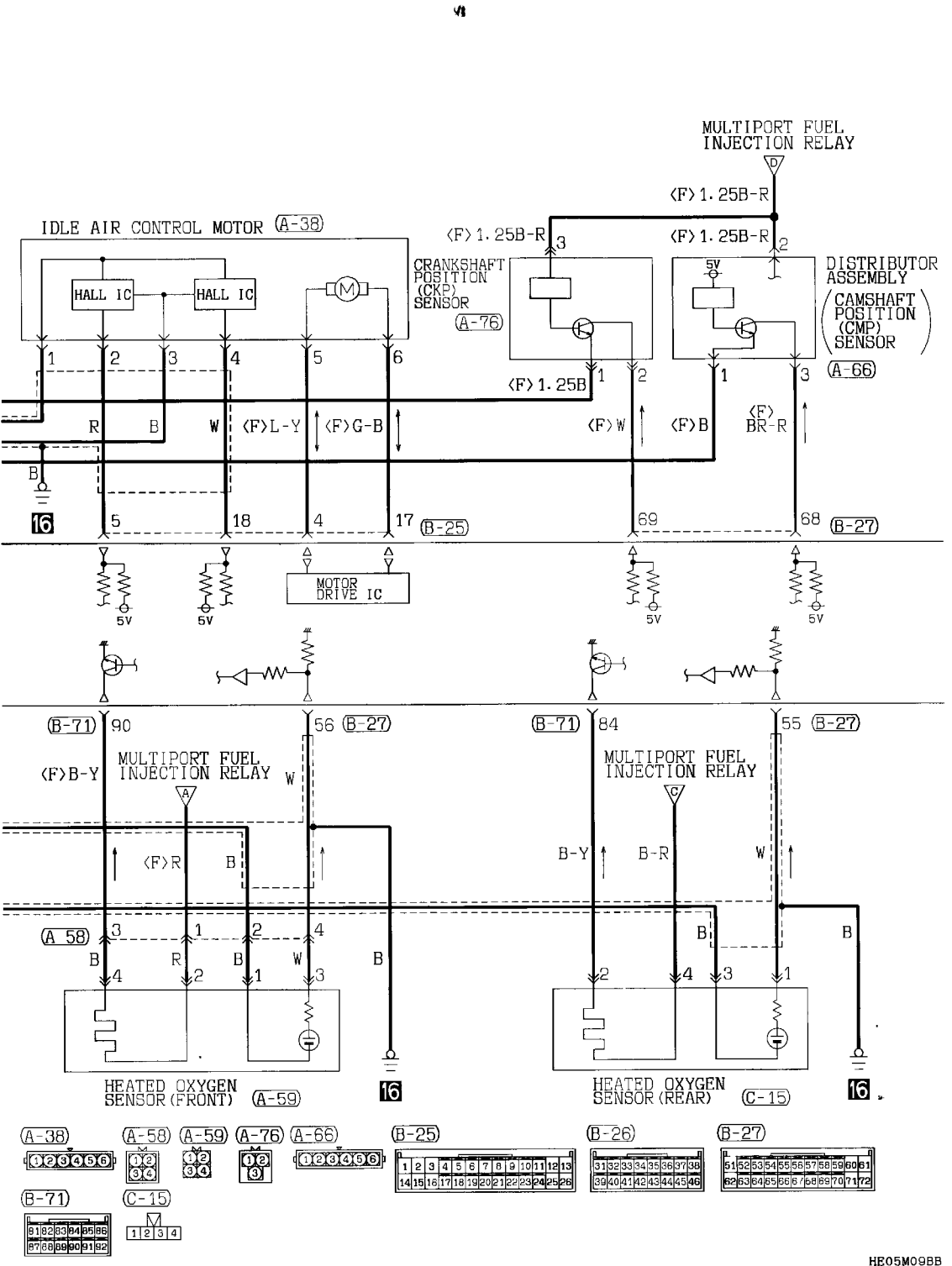


HE05M09AB

TSB Revision

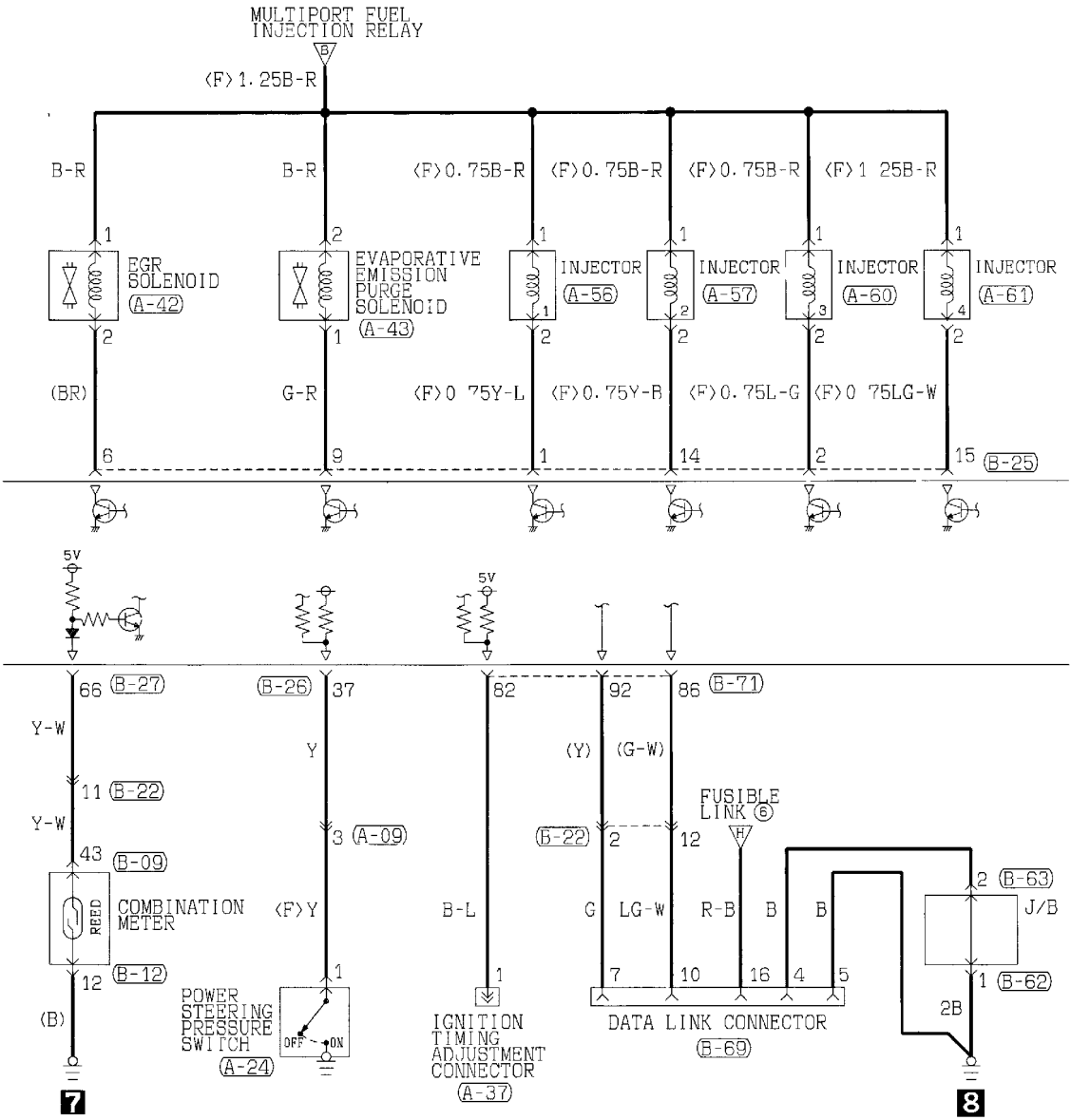
MFI SYSTEM <1.5L ENGINE (FROM 1996 MODELS FOR FEDERAL)> (CONTINUED)

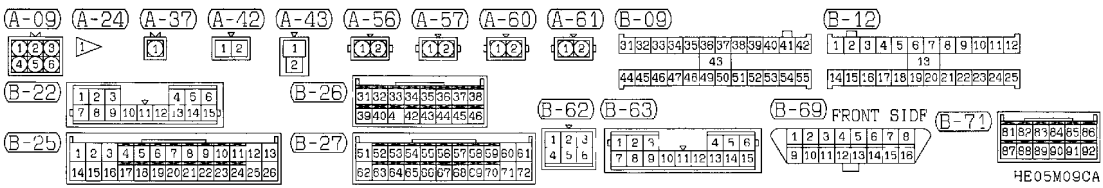



MULTIPORT FUEL INJECTION RELAY
D
⟨F⟩1.25B-R
IDLE AIR CONTROL MOTOR (A-38)
HALL IC
HALL IC
CRANKSHAFT POSITION (CKP) SENSOR (A-76)
DISTRIBUTOR ASSEMBLY
CAMSHAFT POSITION (CMP) SENSOR (A-66)
5V
⟨F⟩1.25B
R
B
W
⟨F⟩L-Y
⟨F⟩G-B
⟨F⟩W
⟨F⟩B
⟨F⟩BR-R
16
5
18
4
17 (B-25)
69
68 (B-27)
MOTOR DRIVE IC
(B-71) 90
56 (B-27)
MULTIPORT FUEL INJECTION RELAY
A
⟨F⟩B-Y
⟨F⟩R
(A 58)
HEATED OXYGEN SENSOR (FRONT) (A-59)
(B-71) 84
55 (B-27)
C
B-Y
B-R
HEATED OXYGEN SENSOR (REAR) (C-15)
(A-38)
(A-58)
(A-59)
(A-76)
(A-66)
(B-25)
(B-26)
(B-27)
(B-71)
(C-15)

HE05M09BB

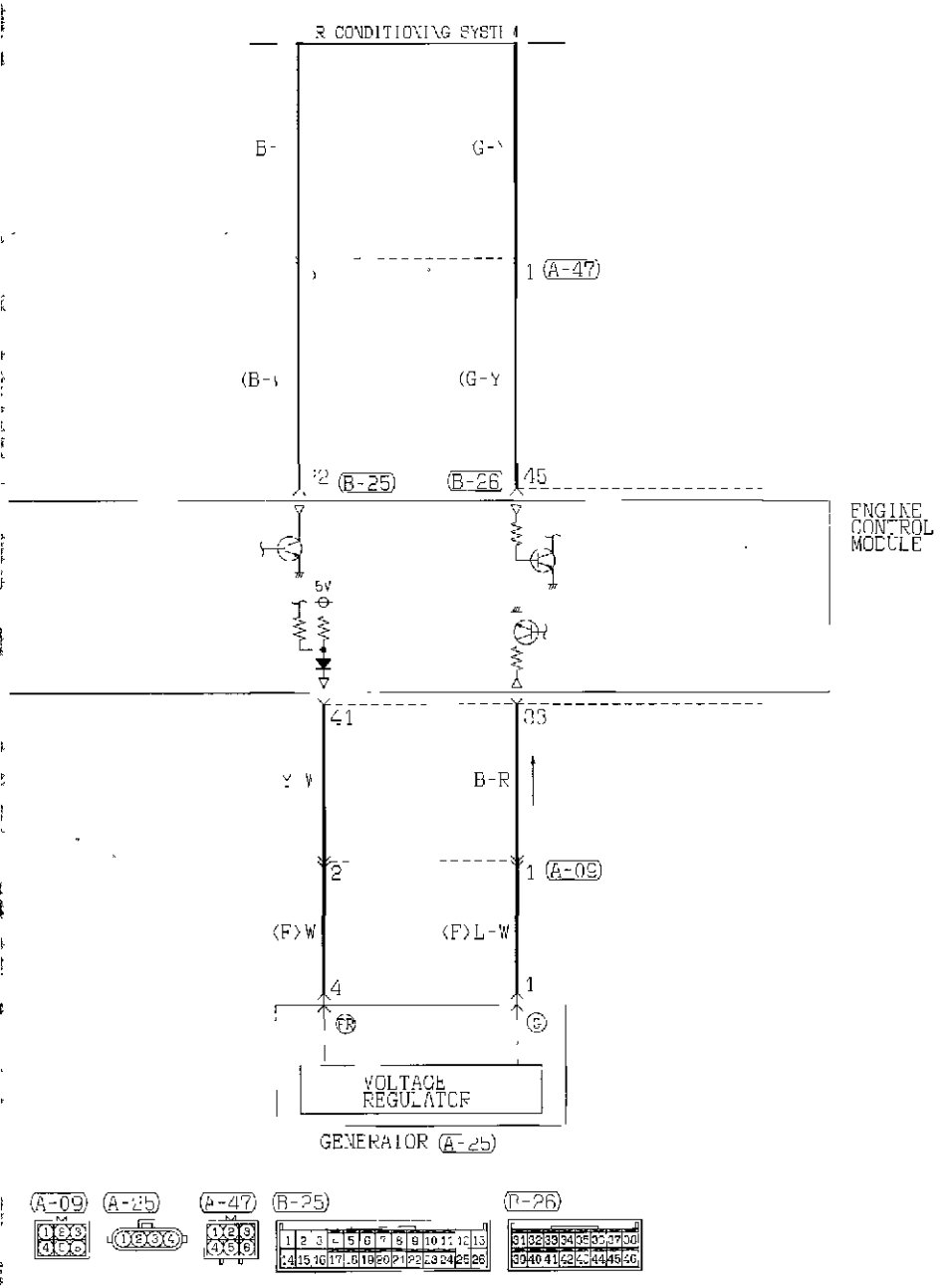
MFI SYSTEM <1.5L ENGINE (FROM 1996 MODELS FOR FEDERAL)> (CONTINUED)





HE05M09CA

TSB Revision

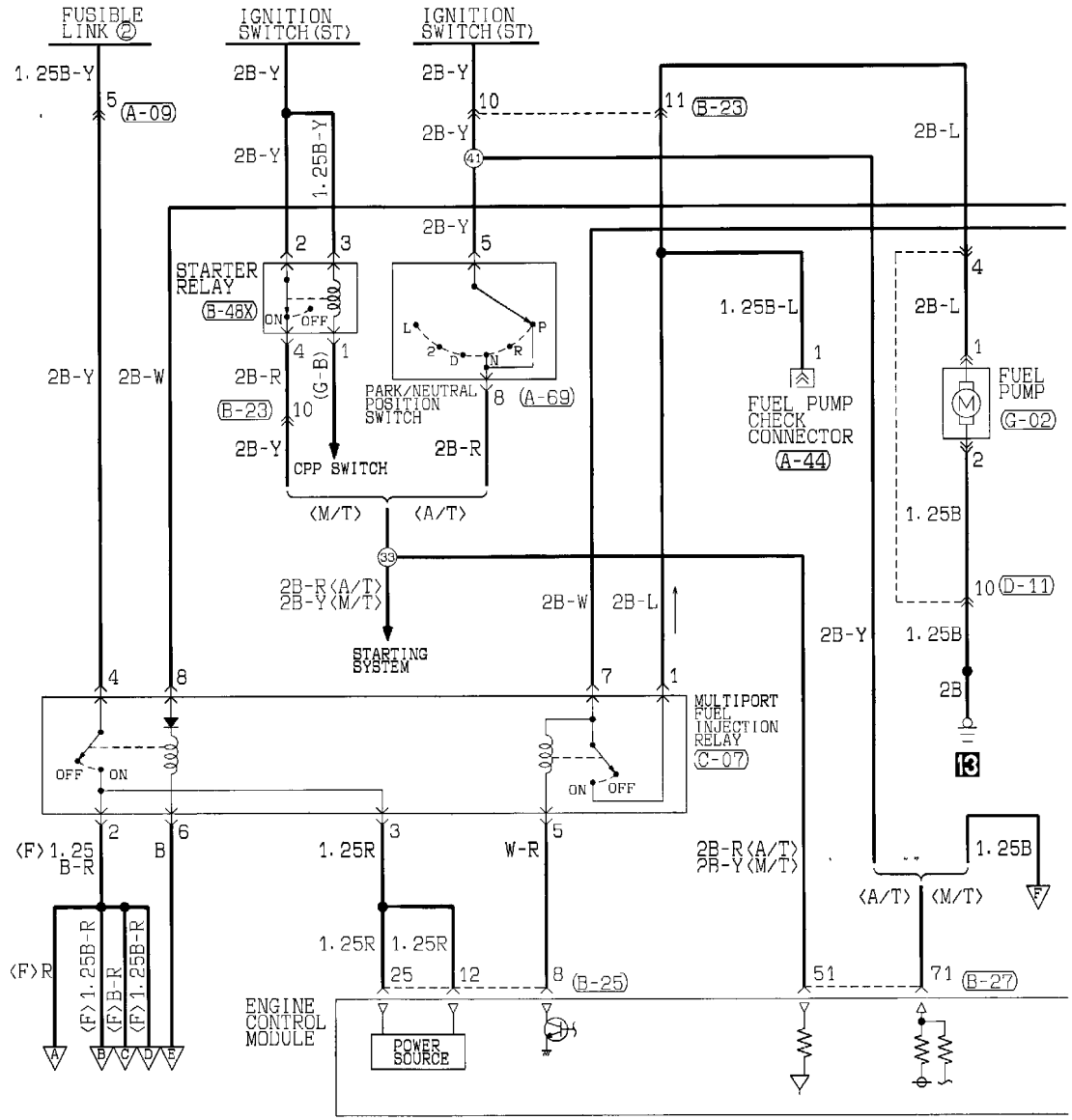


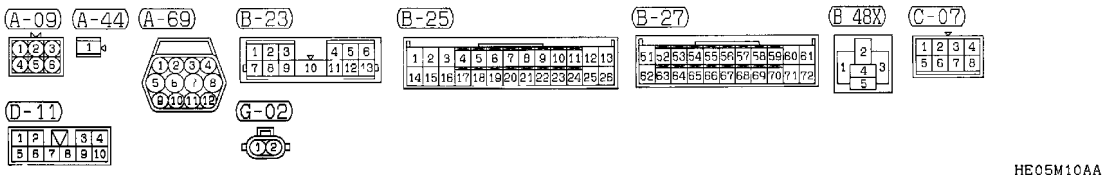
A-09 A-25 A-47 B-25 B-26

MFI SYSTEM

110003555

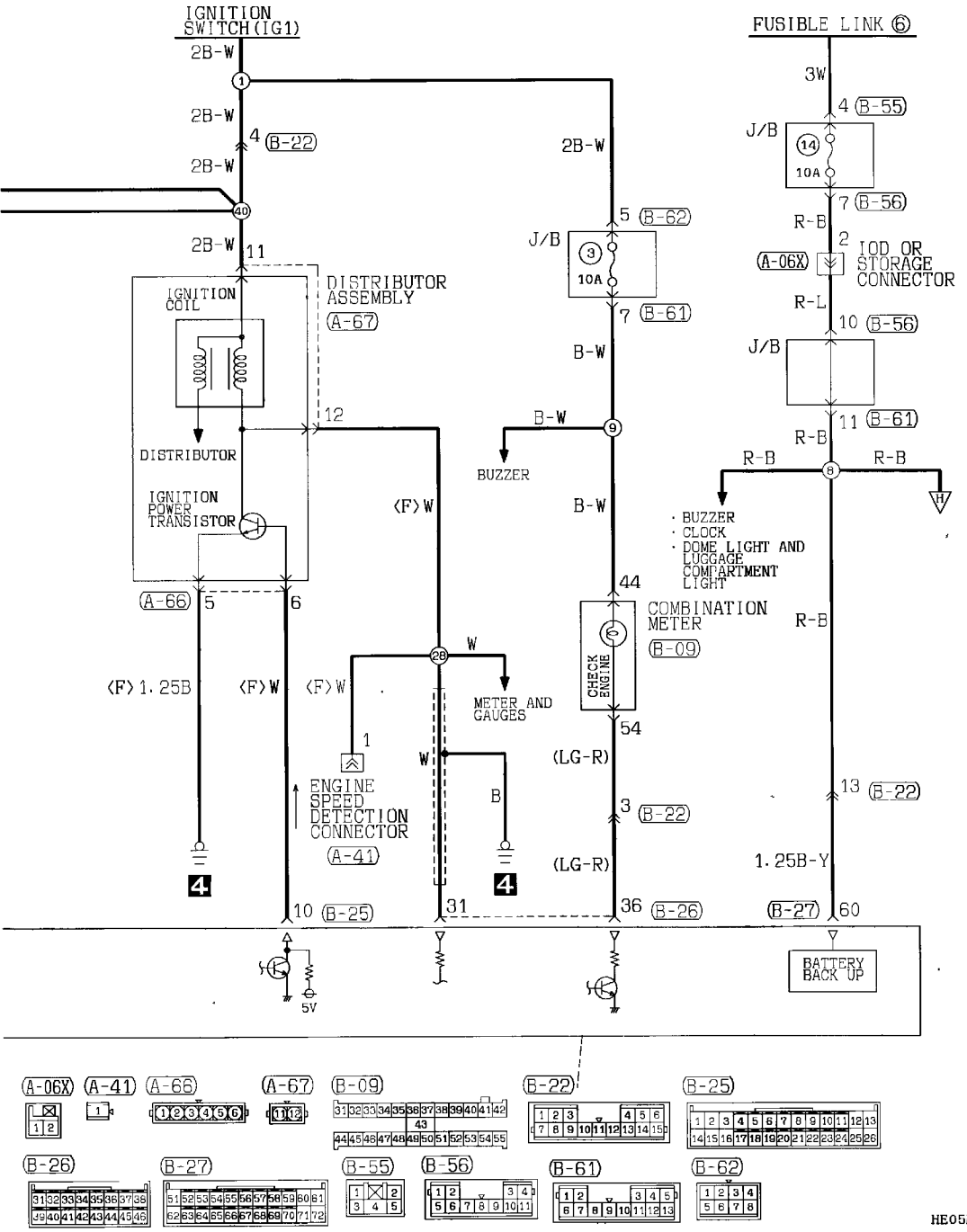
<1.5L ENGINE (FROM 1995 MODEL FOR CALIFORNIA)>





HE05M10AA

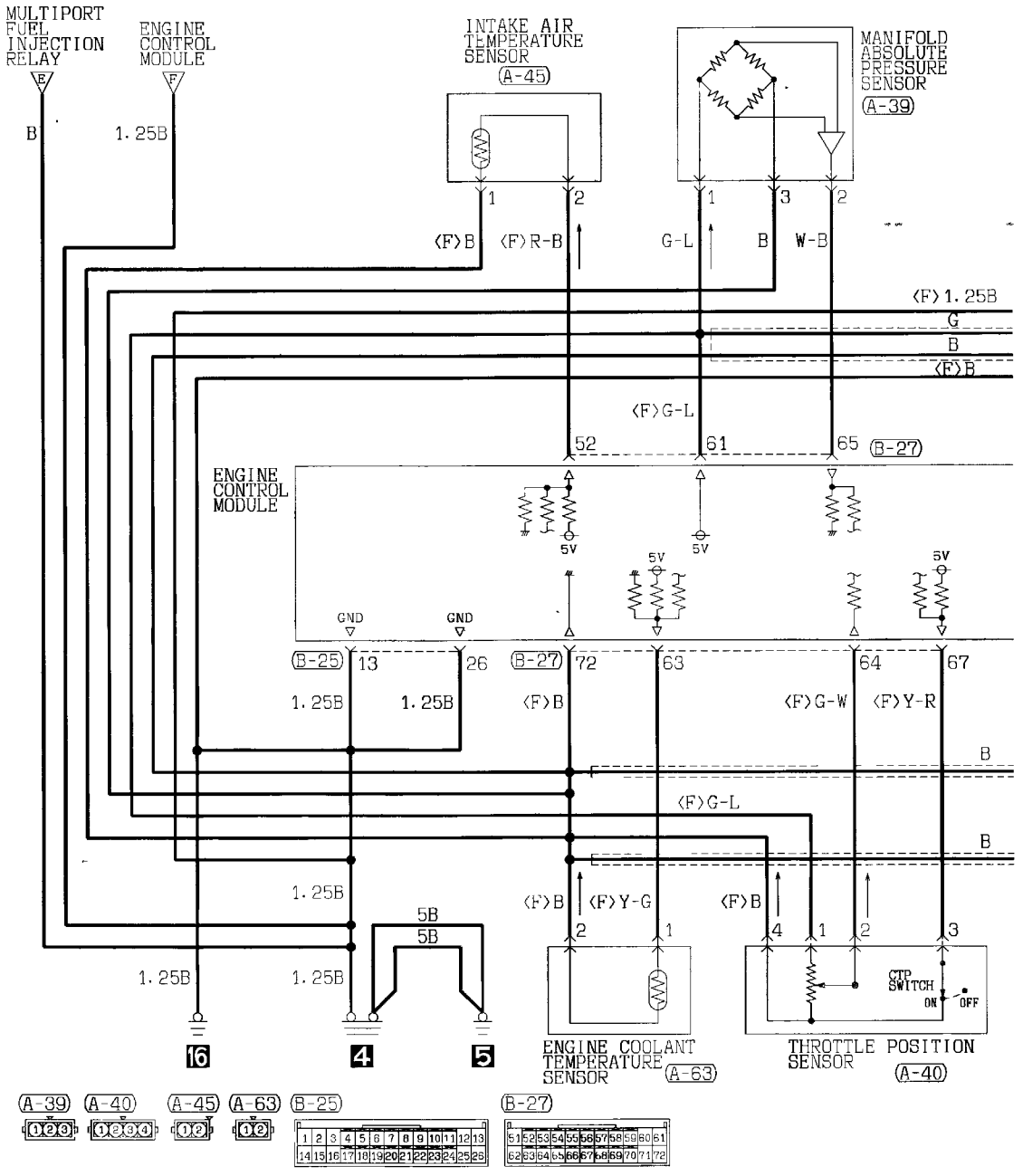
TSB Revision

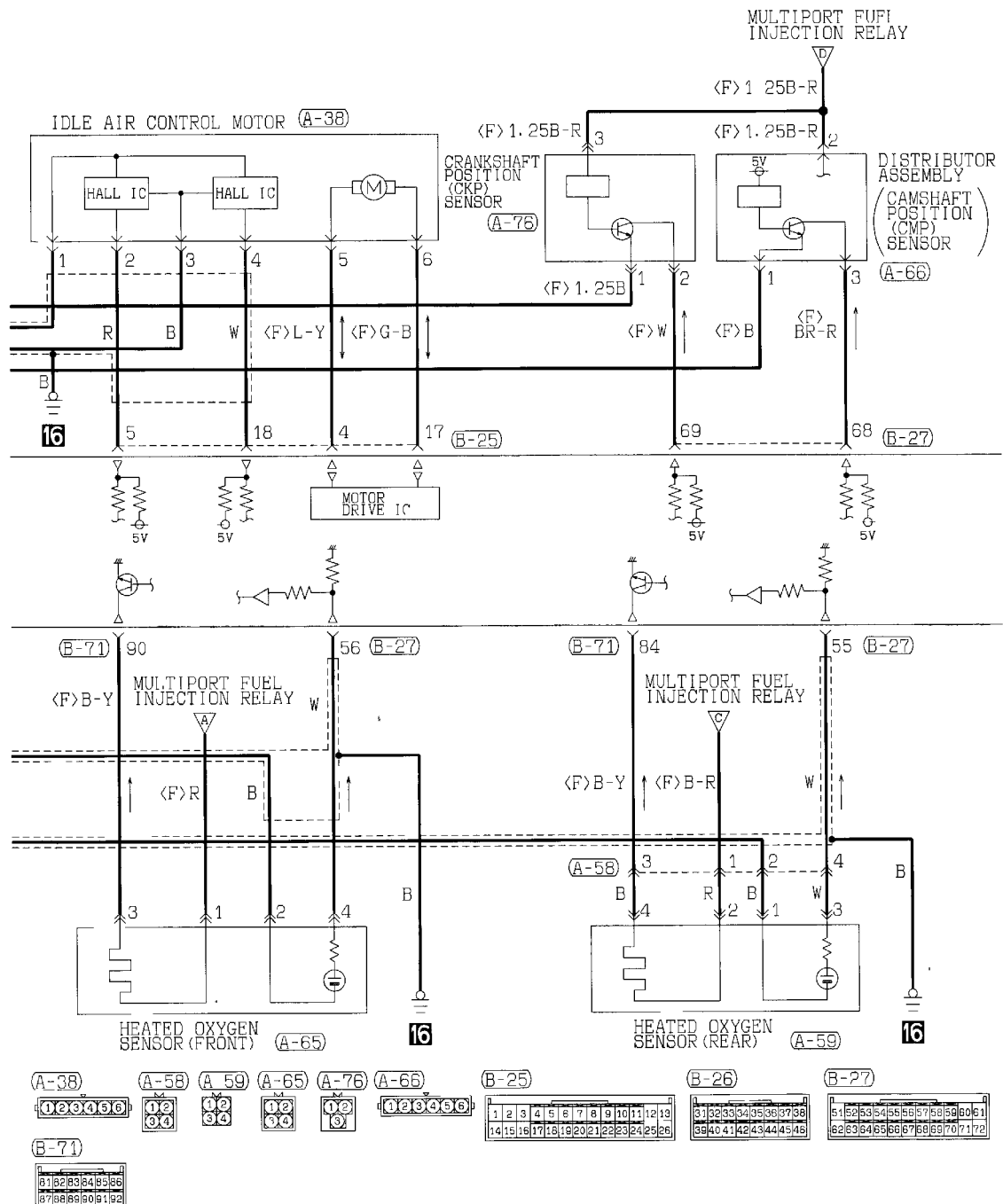


HE05M10AB

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MFI SYSTEM <1.5L ENGINE (FROM 1995 MODELS FOR CALIFORNIA)> (CONTINUED)

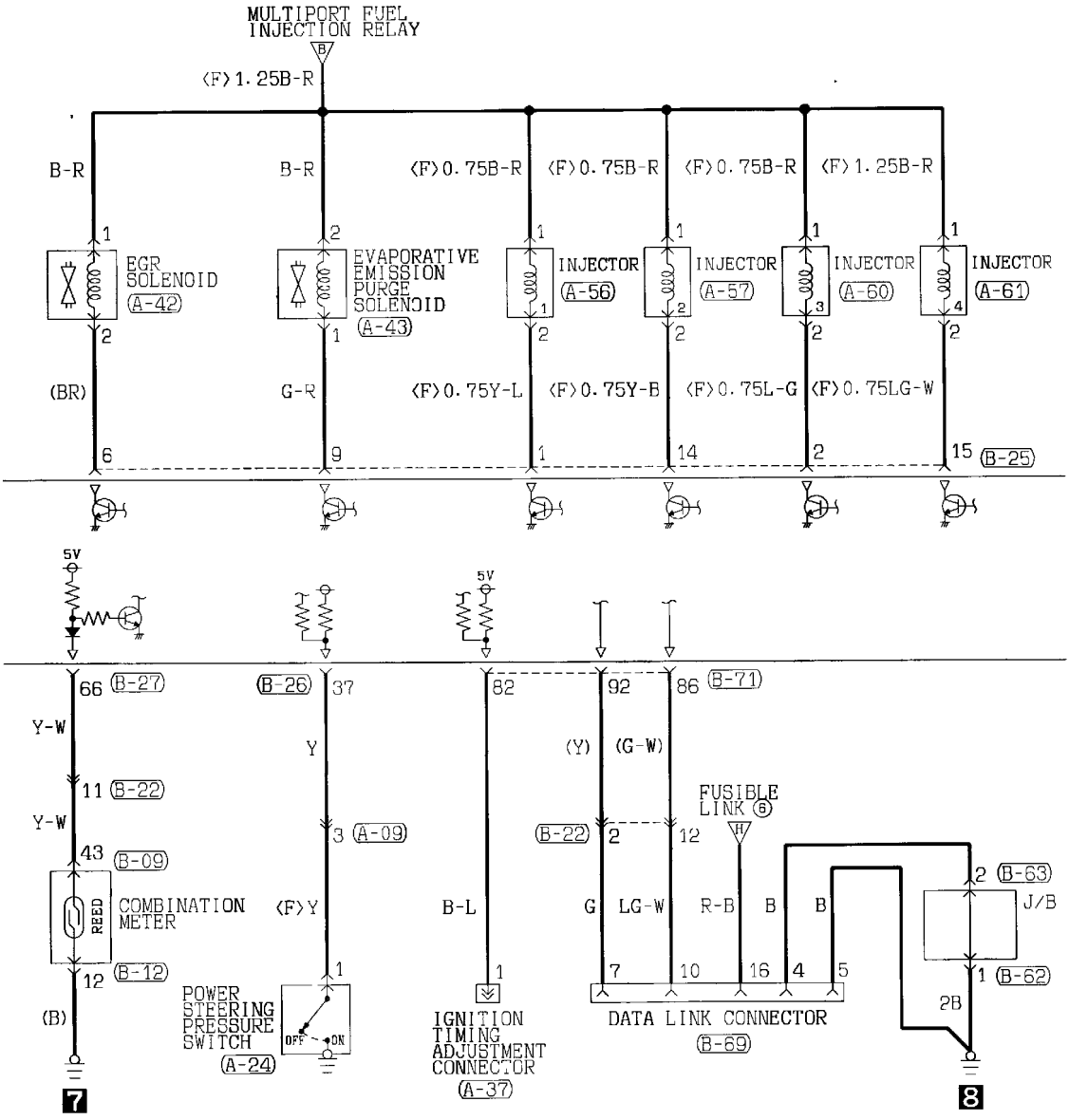




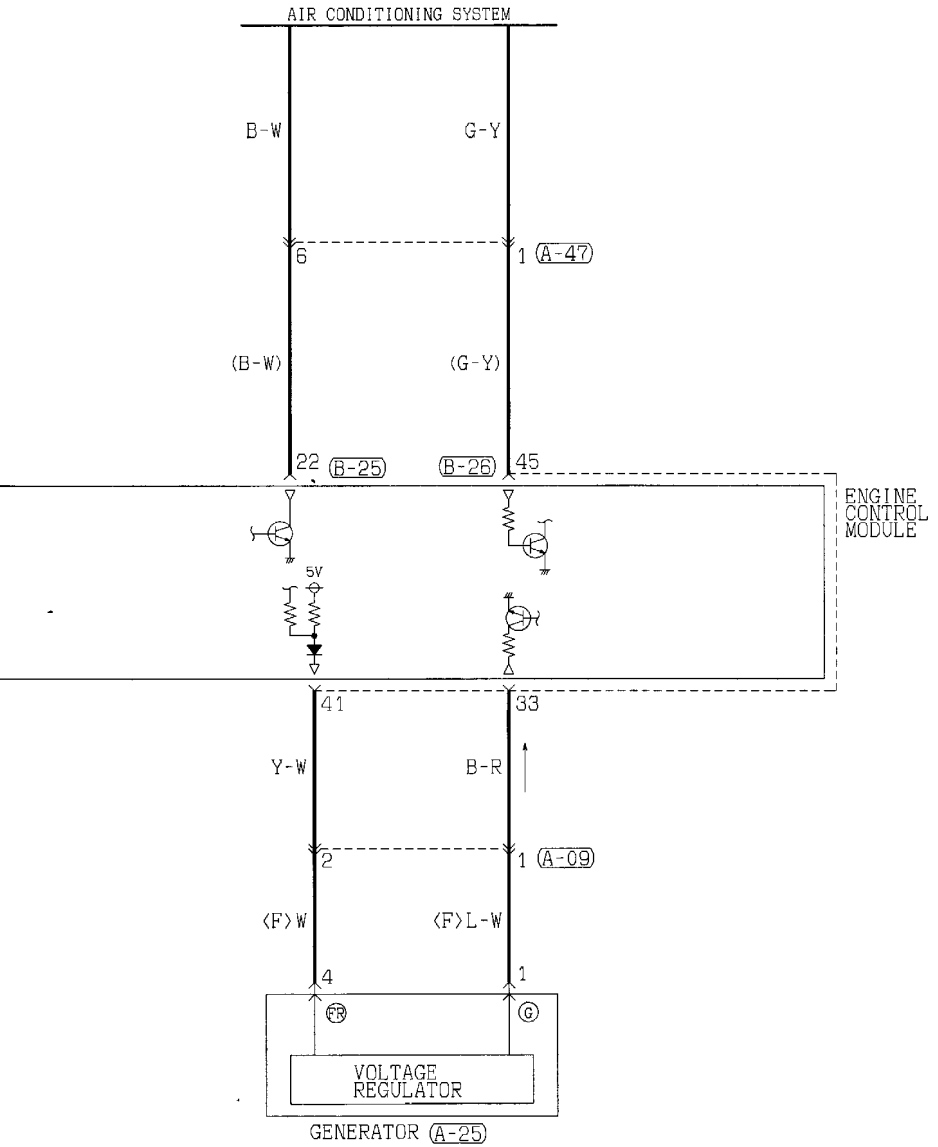
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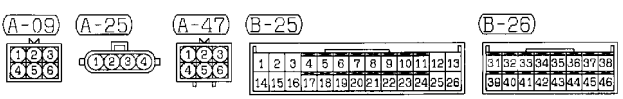
TSB Revision

MFI SYSTEM <1.5L ENGINE (FROM 1995 MODELS FOR CALIFORNIA)> (CONTINUED)



TSB Revision

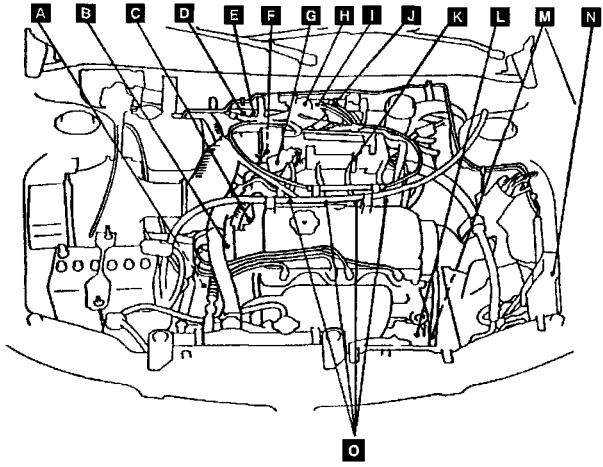

AIR CONDITIONING SYSTEM
B-W
G-Y
6
1 A-47
(B-W)
(G-Y)
22 B-25
B-26 45
ENGINE CONTROL MODULE
5V
41
33
Y-W
B-R
2
1 A-09
⟨F⟩W
⟨F⟩L-W
4
1
FR
G
VOLTAGE REGULATOR
GENERATOR A-25

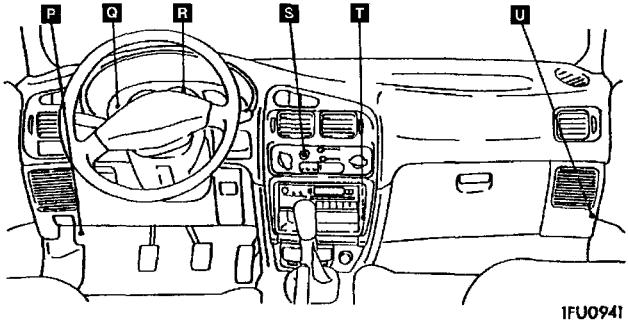

A-09
A-25
A-47
B-25
B-26

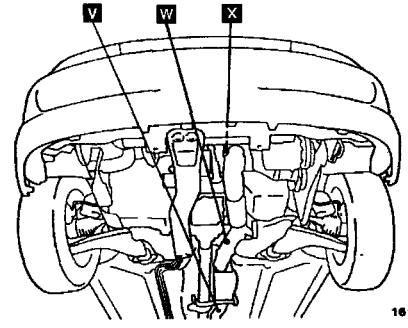
COMPONENT LOCATION <1.5L ENGINE (1995 models for California and From 1996 models)>

110003556

Name	Symbol	Name	Symbol
Air conditioning compressor clutch relay	N	Heated oxygen sensor (Rear) <California>	W
Air conditioning switch	S	Heated oxygen sensor (Rear) <Federal>	V
Check engine / Malfunction indicator lamp	Q	Idle air control motor	F
Crankshaft position sensor	M	Ignition timing adjustment connector	D
Data link connector	P	Injectors	O
Distributor (with built-in camshaft position sensor, ignition coil and ignition power transistor)	B	Intake air temperature sensor	K
EGR solenoid	J	Manifold absolute pressure sensor	H
Engine control module	U	Multiport fuel injection (MFI) relay	T
Engine coolant temperature sensor	C	Park / Neutral position switch	A
Evaporative emission purge solenoid	I	Power steering pressure switch	L
Fuel pump check terminal	E	Throttle position sensor (with built-in closed throttle position switch)	G
Heated oxygen sensor (Front) <California>	X	Vehicle speed sensor (reed switch)	R
Heated oxygen sensor (Front) <Federal>	W		

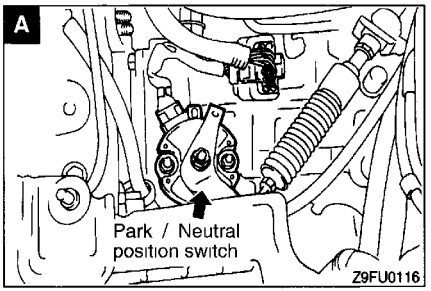




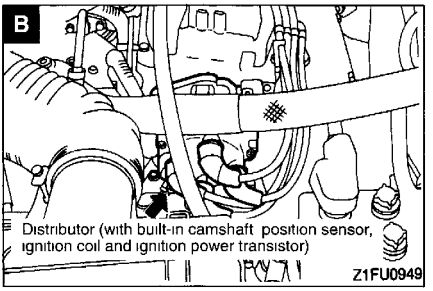


TSB Revision

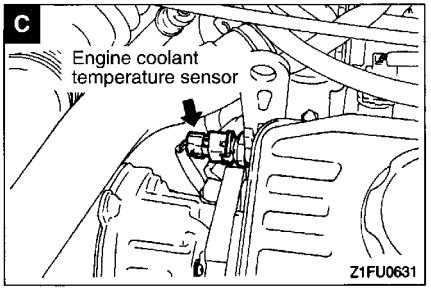
A



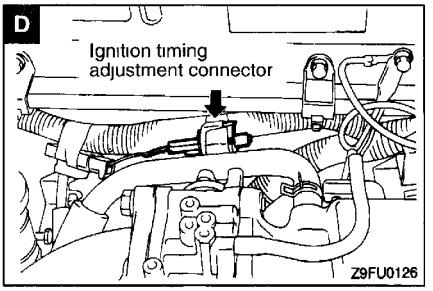
B



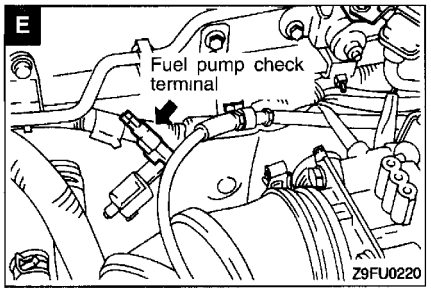
C



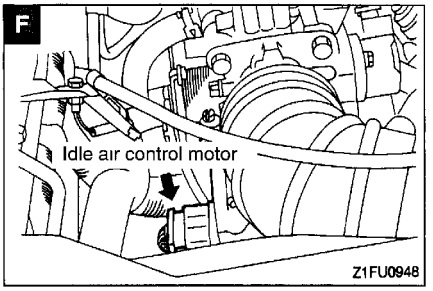
D



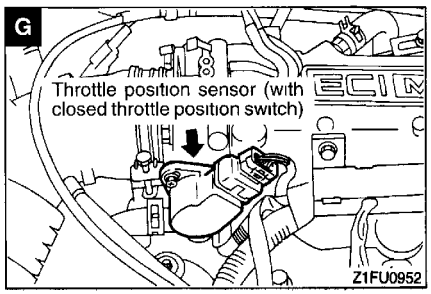
E



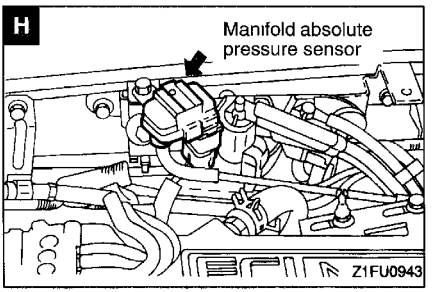
F



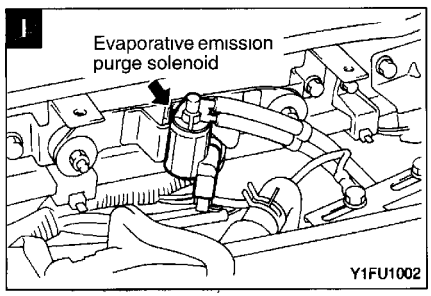
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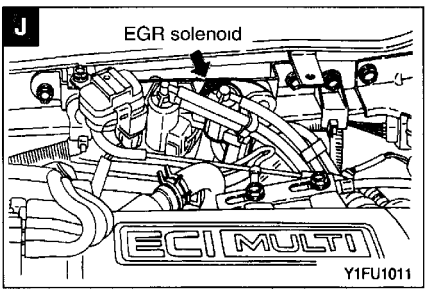
H



I

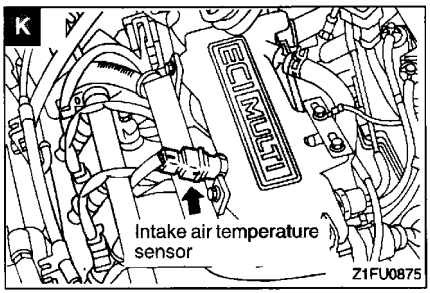


J

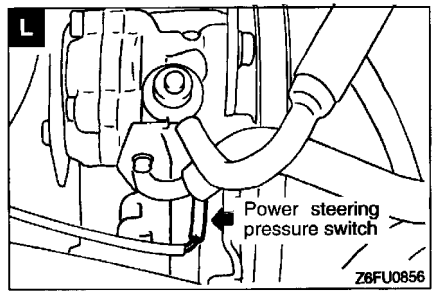


TSB Revision

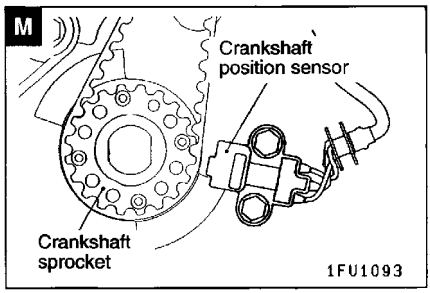
K


ECI MULTI
Intake air temperature sensor
Z1FU0875

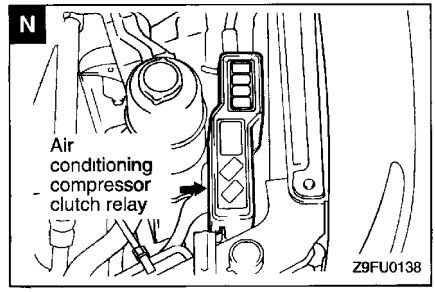
L


Power steering pressure switch
Z8FU0856

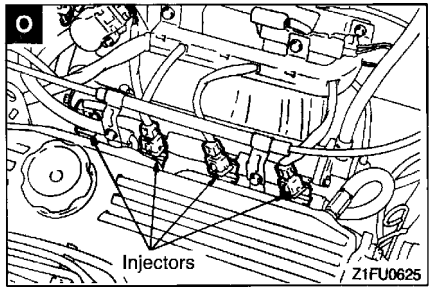
M


Crankshaft position sensor
Crankshaft sprocket
1FU1093

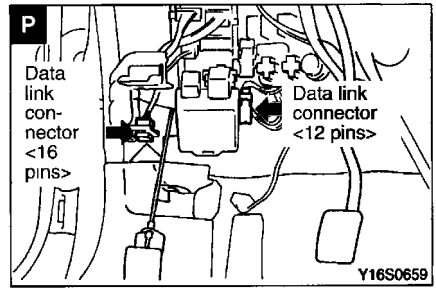
N


Air conditioning compressor clutch relay
Z9FU0138

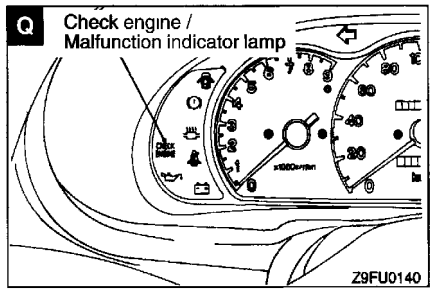
O


Injectors
Z1FU0625

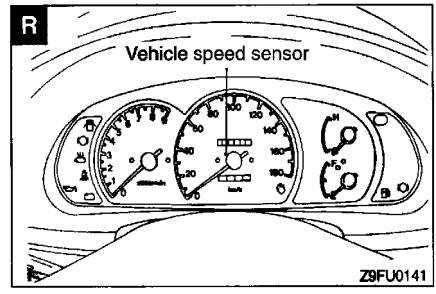
P


Data link connector <16 pins>
Data link connector <12 pins>
Y16S0659

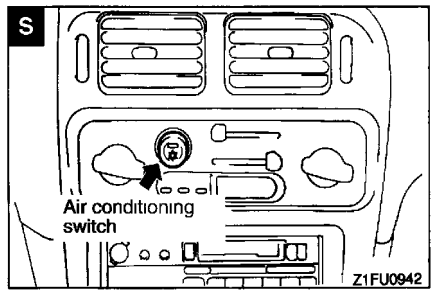
Q


Check engine / Malfunction indicator lamp
Z9FU0140

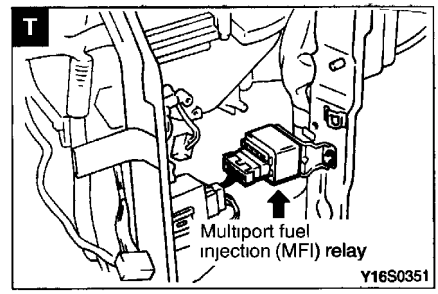
R


Vehicle speed sensor
Z9FU0141

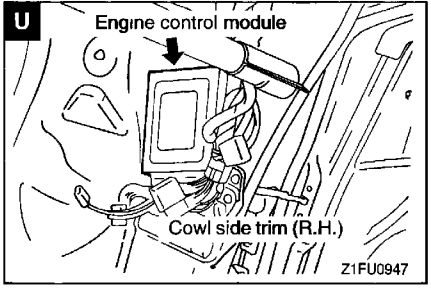
S


Air conditioning switch
Z1FU0942

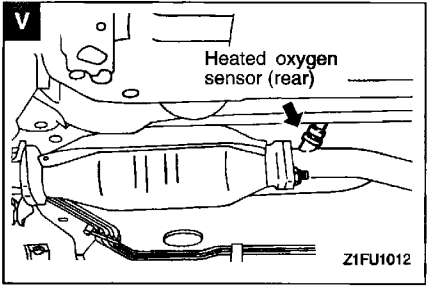
T


Multiport fuel injection (MFI) relay
Y16S0351

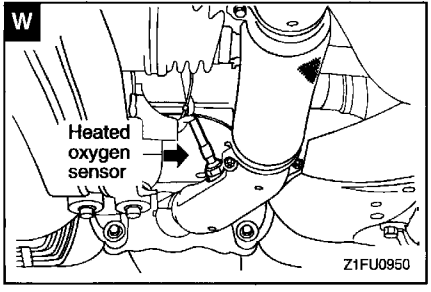
U


Engine control module
Cowl side trim (R.H.)
Z1FU0947

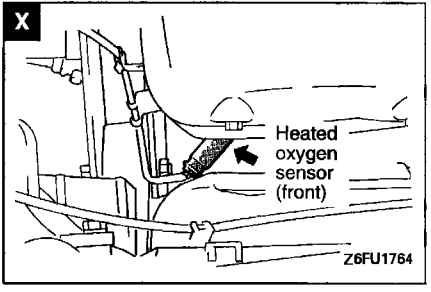
V


Heated oxygen sensor (rear)
Z1FU1012

W


Heated oxygen sensor
Z1FU0950

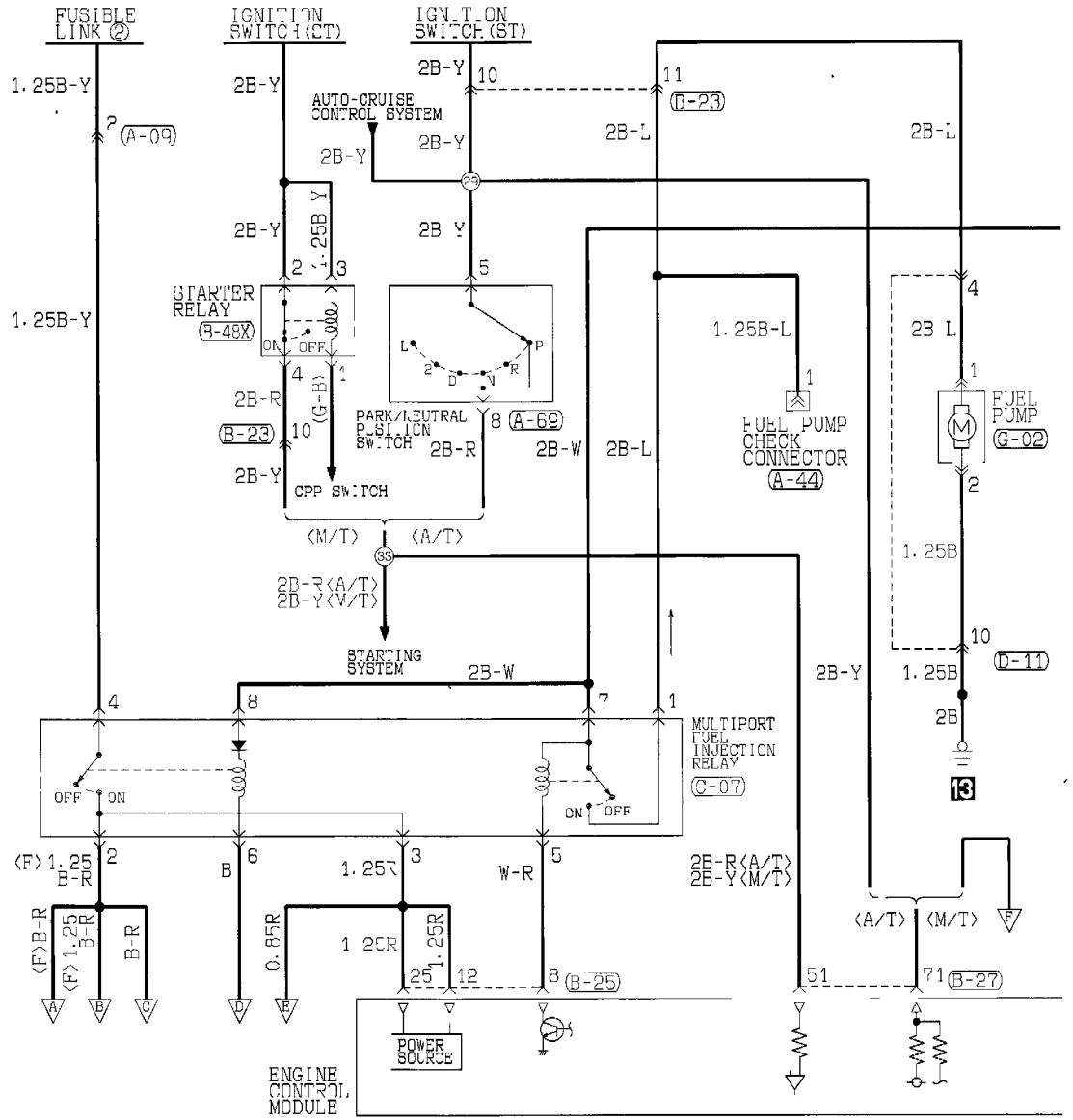
X

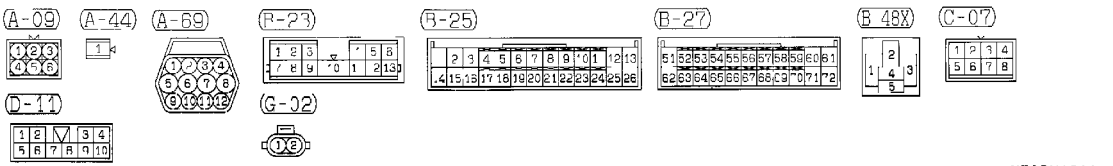

Heated oxygen sensor (front)
Z6FU1764

MFI SYSTEM

110003557

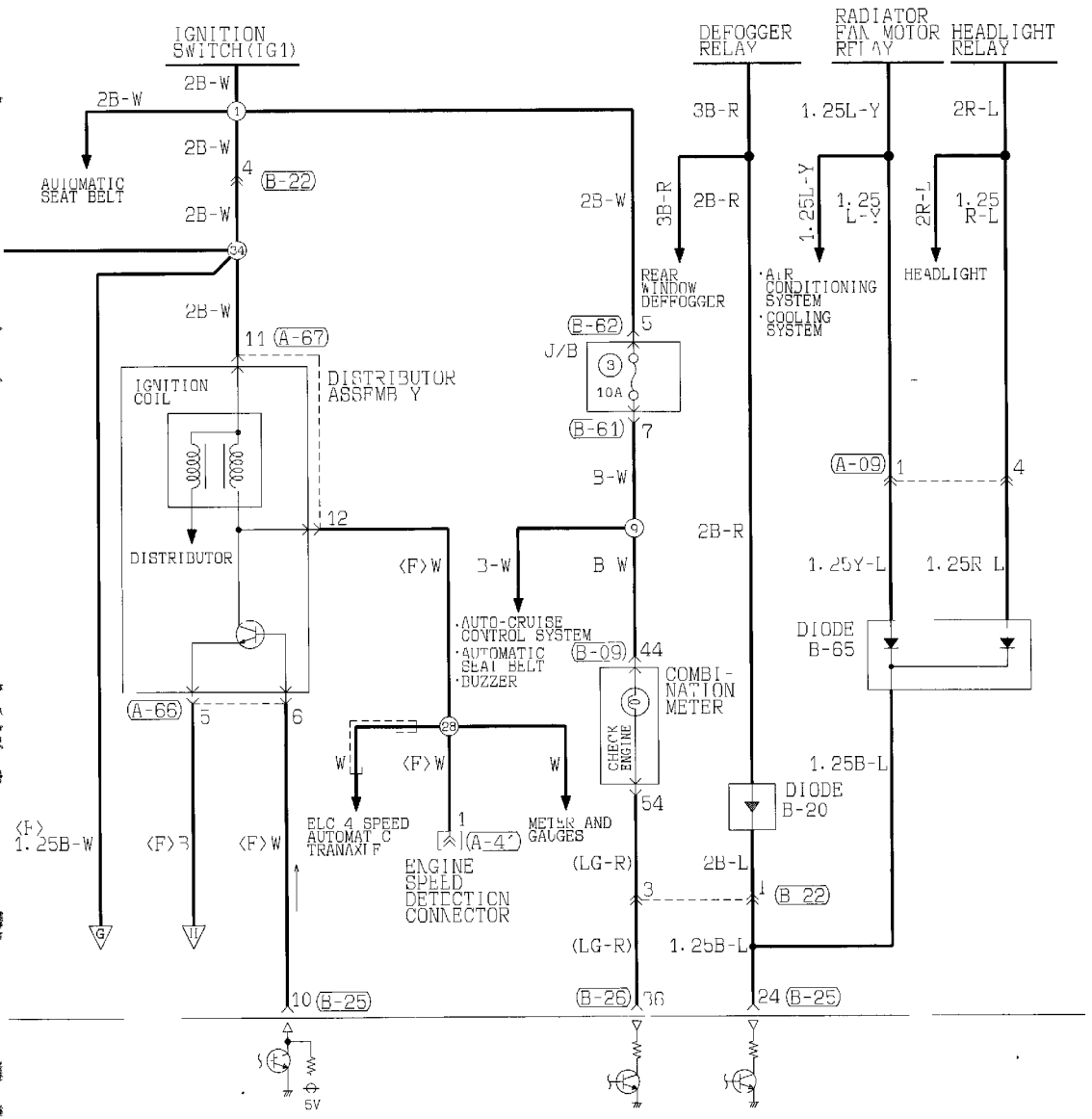
<1.8L ENGINE (1993 MODELS)>





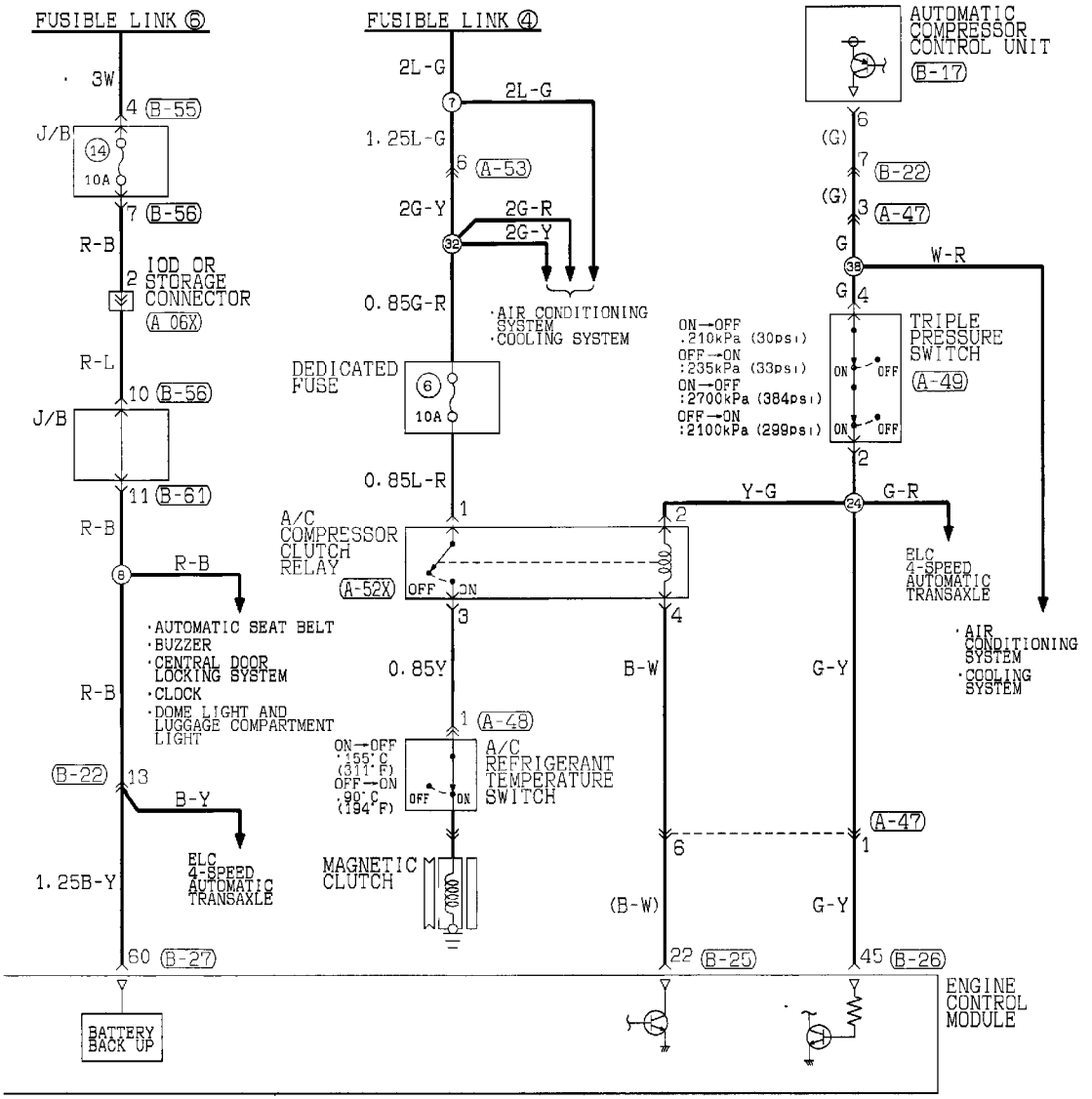
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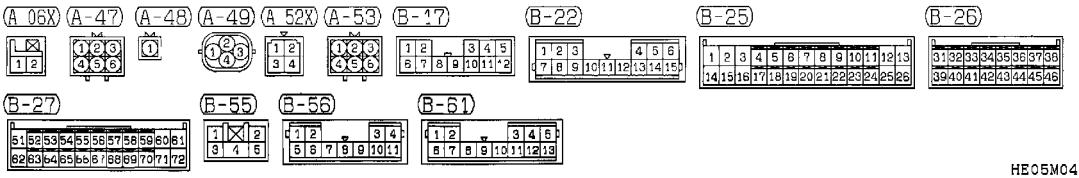
TSB Revision



TSB Revision

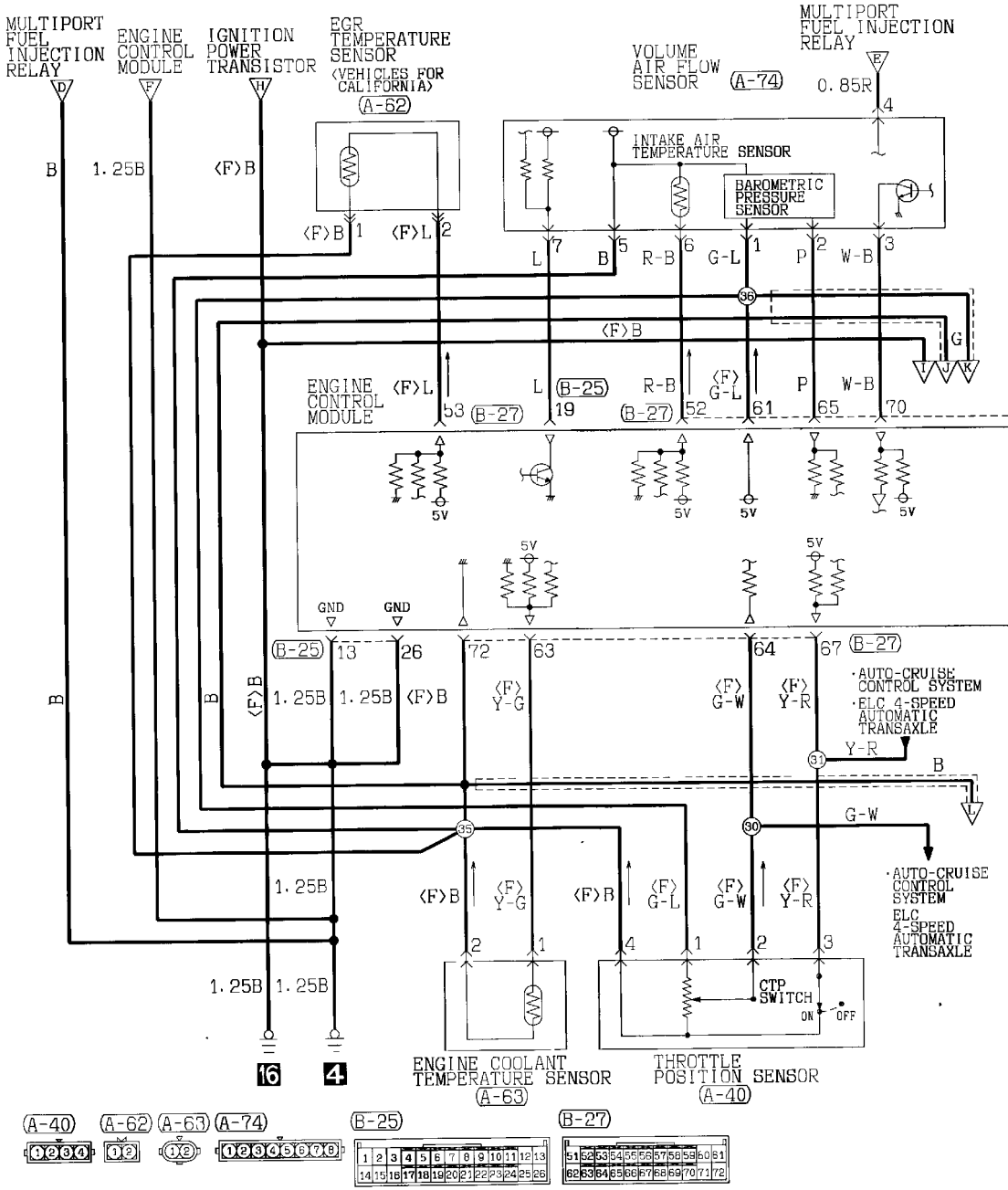
MFI SYSTEM <1.8L ENGINE (1993 MODELS)> (CONTINUED)



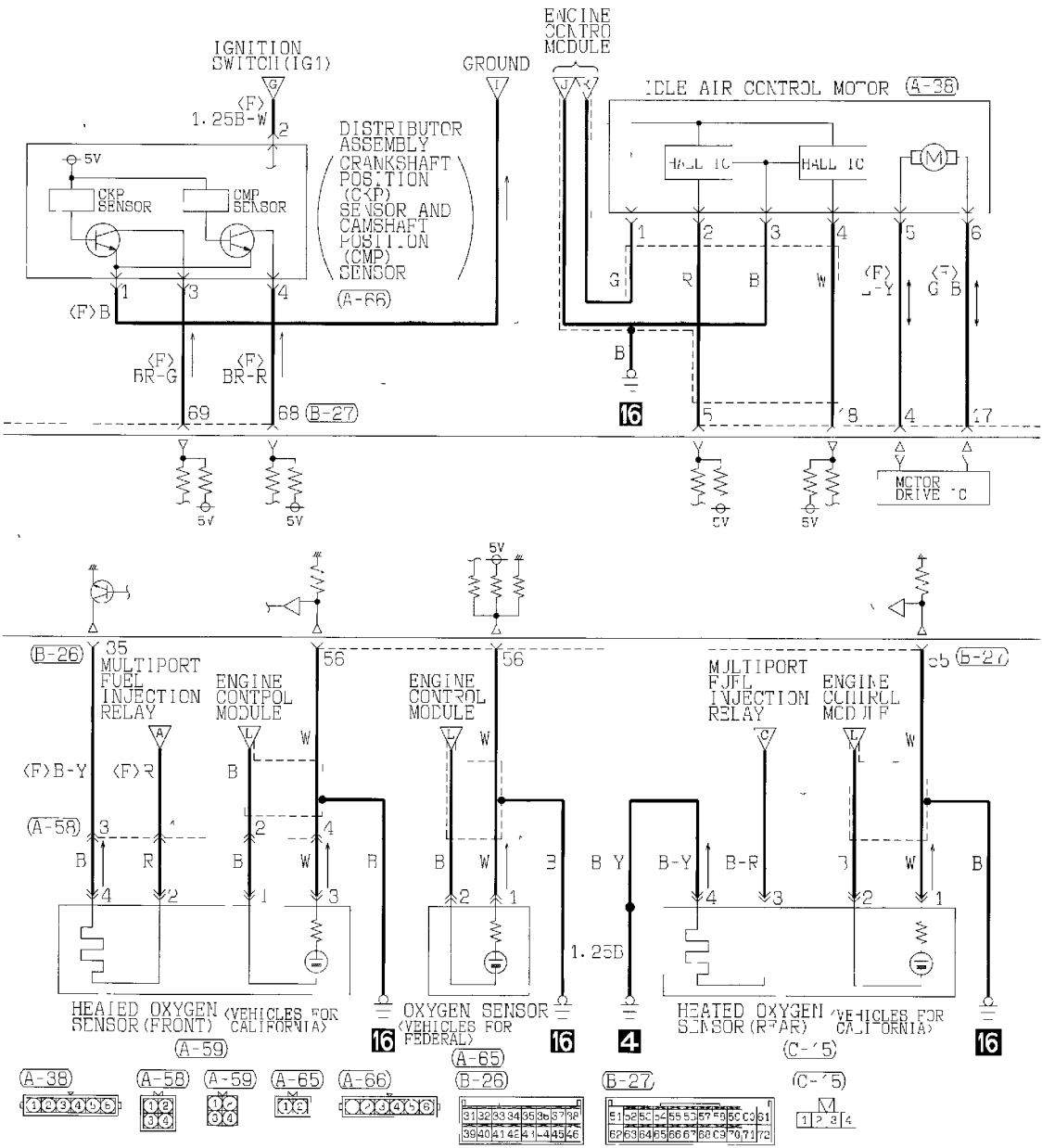


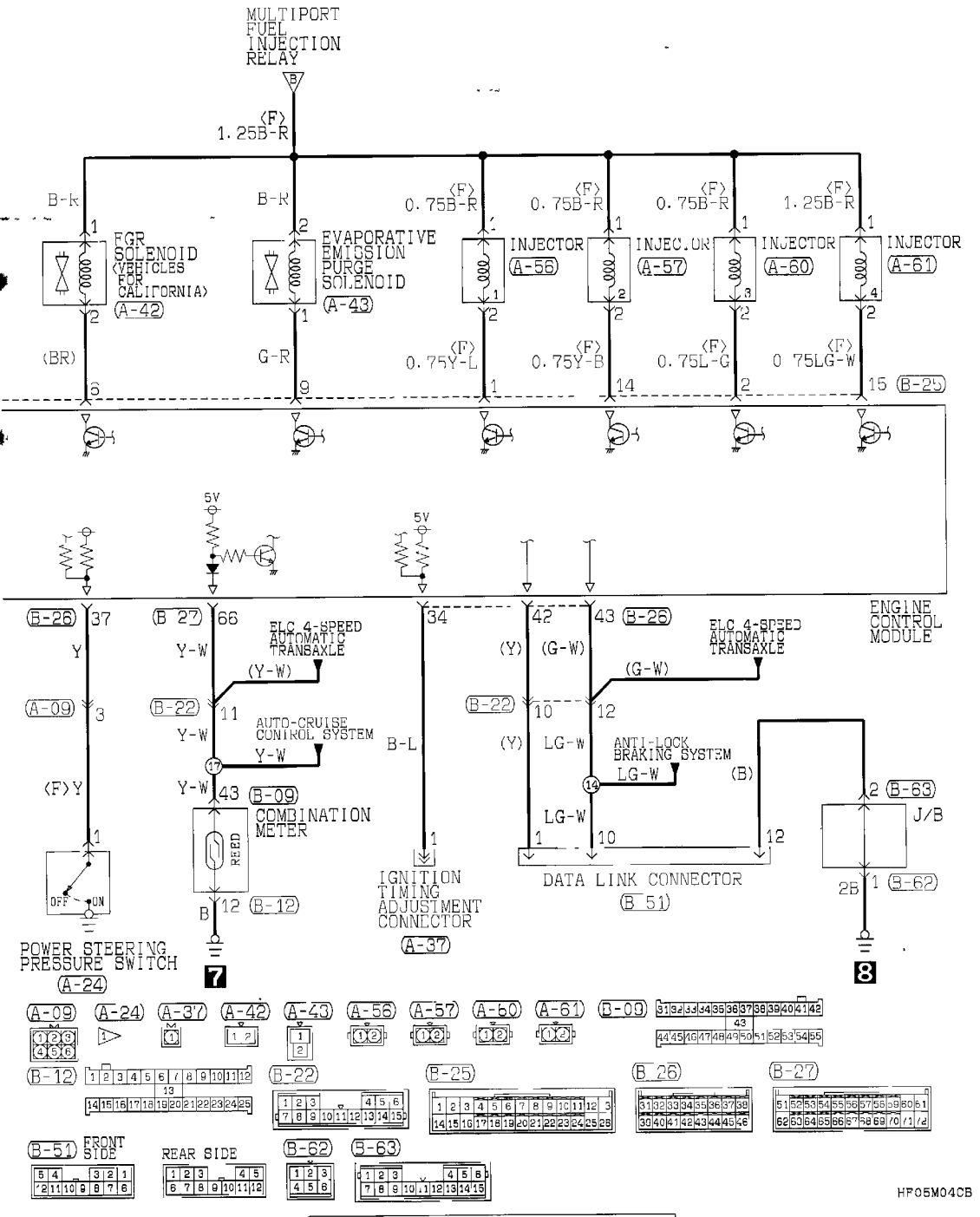
HE05M04BA

TSB Revision


MULTIPORT FUEL INJECTION RELAY
ENGINE CONTROL MODULE
IGNITION POWER TRANSISTOR
EGR TEMPERATURE SENSOR
<VEHICLES FOR CALIFORNIA>
A-62
VOLUME AIR FLOW SENSOR
A-74
MULTIPORT FUEL INJECTION RELAY
0.85R
INTAKE AIR TEMPERATURE SENSOR
BAROMETRIC PRESSURE SENSOR
ENGINE CONTROL MODULE
B-25
B-27
5V
GND
·AUTO-CRUISE CONTROL SYSTEM
·ELC 4-SPEED AUTOMATIC TRANSAXLE
CTP SWITCH
ON
OFF
ENGINE COOLANT TEMPERATURE SENSOR
A-63
THROTTLE POSITION SENSOR
A-40
A-40
A-62
A-63
A-74
B-25
B-27

MFI SYSTEM <1.8L ENGINE (1993 MODELS)> (CONTINUED)



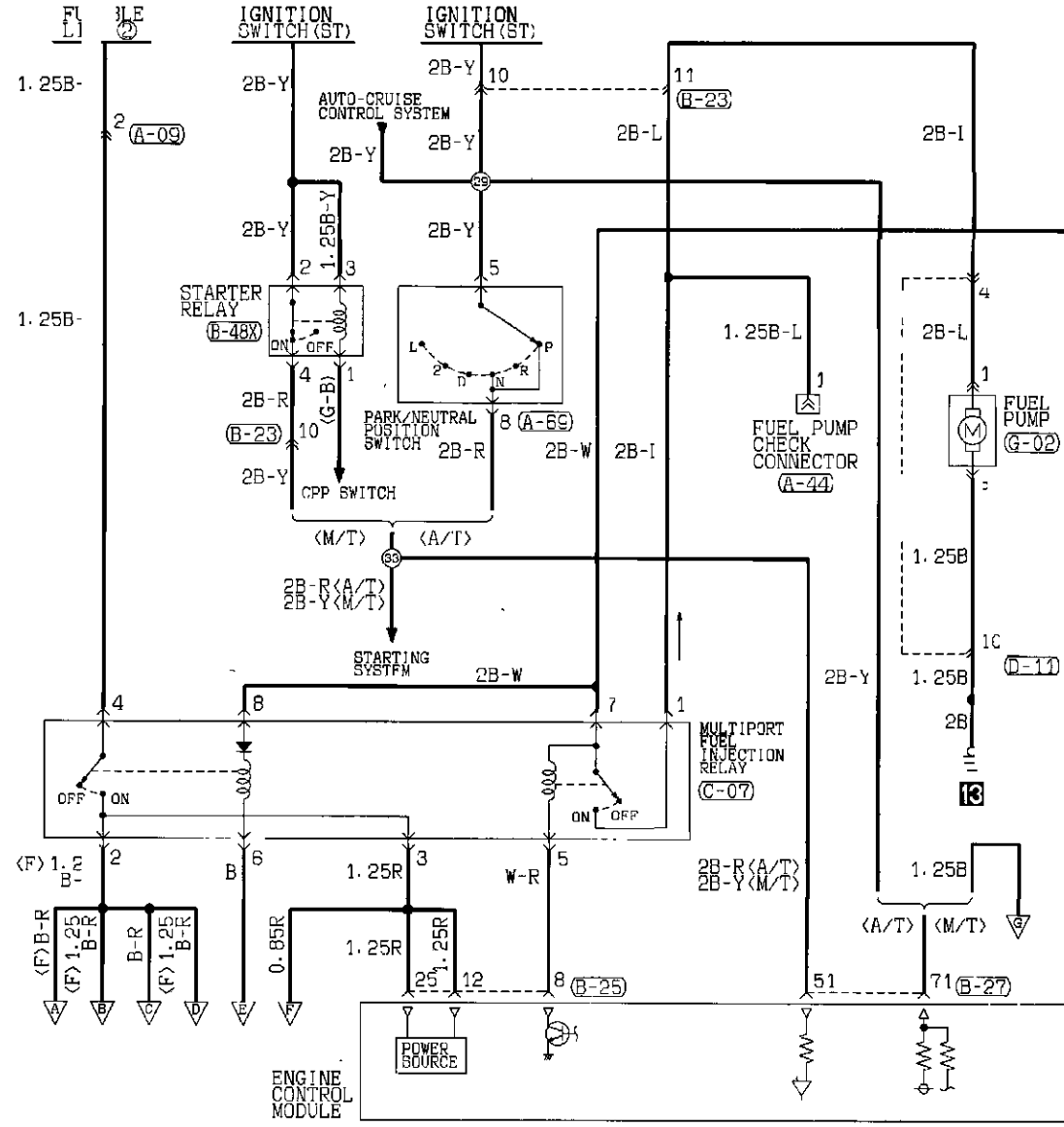


TSB Revision

MFI SYSTEM

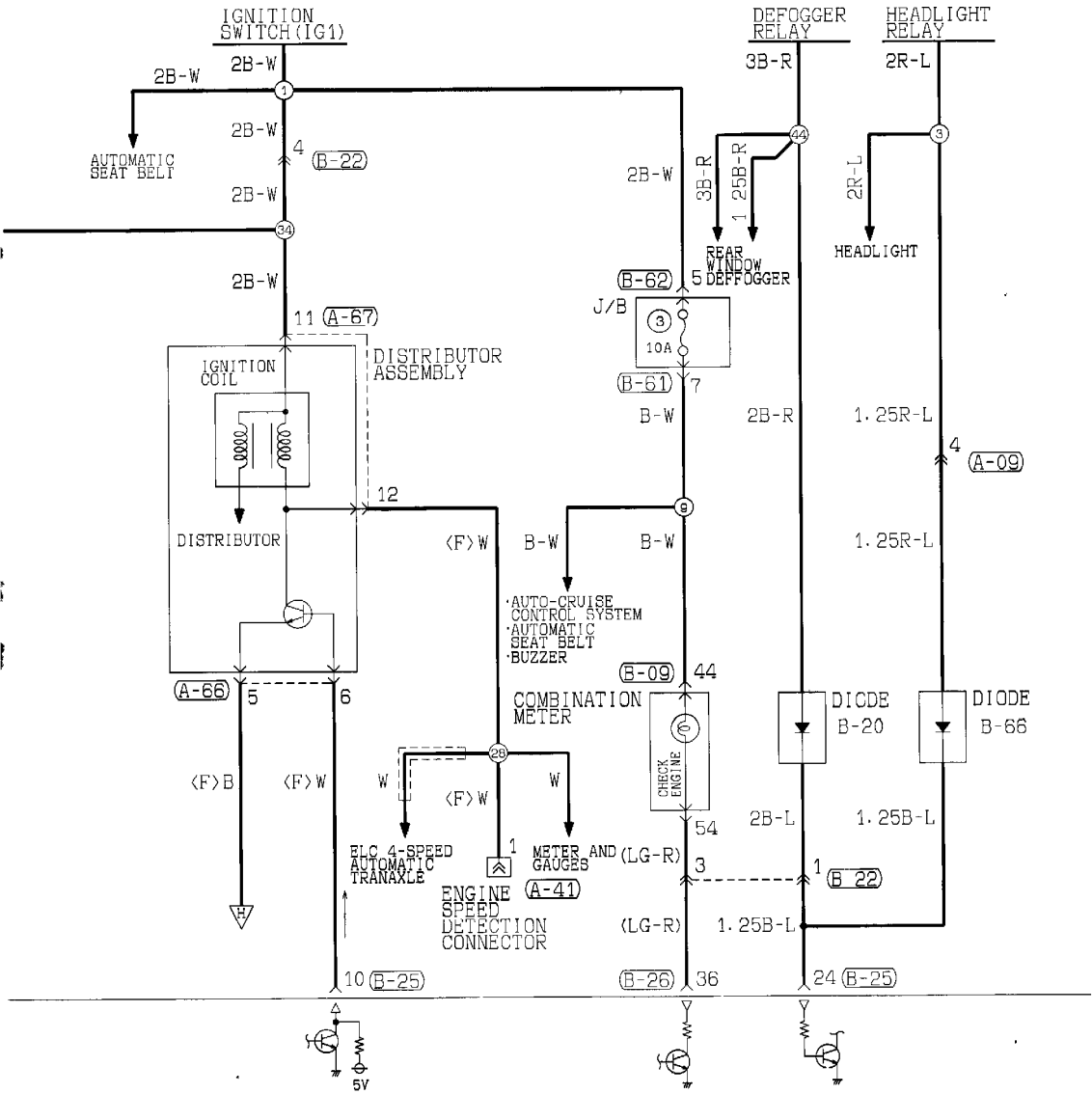
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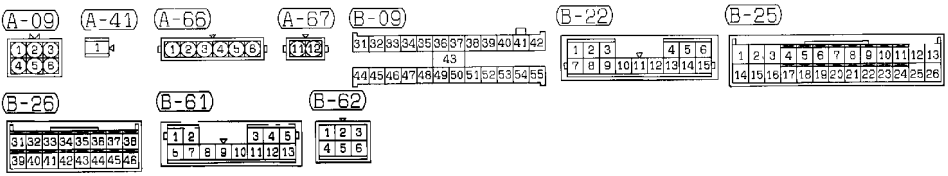
<1.8L ENGINE (1994 MODELS)>



HE05M11AA

TSB Revision

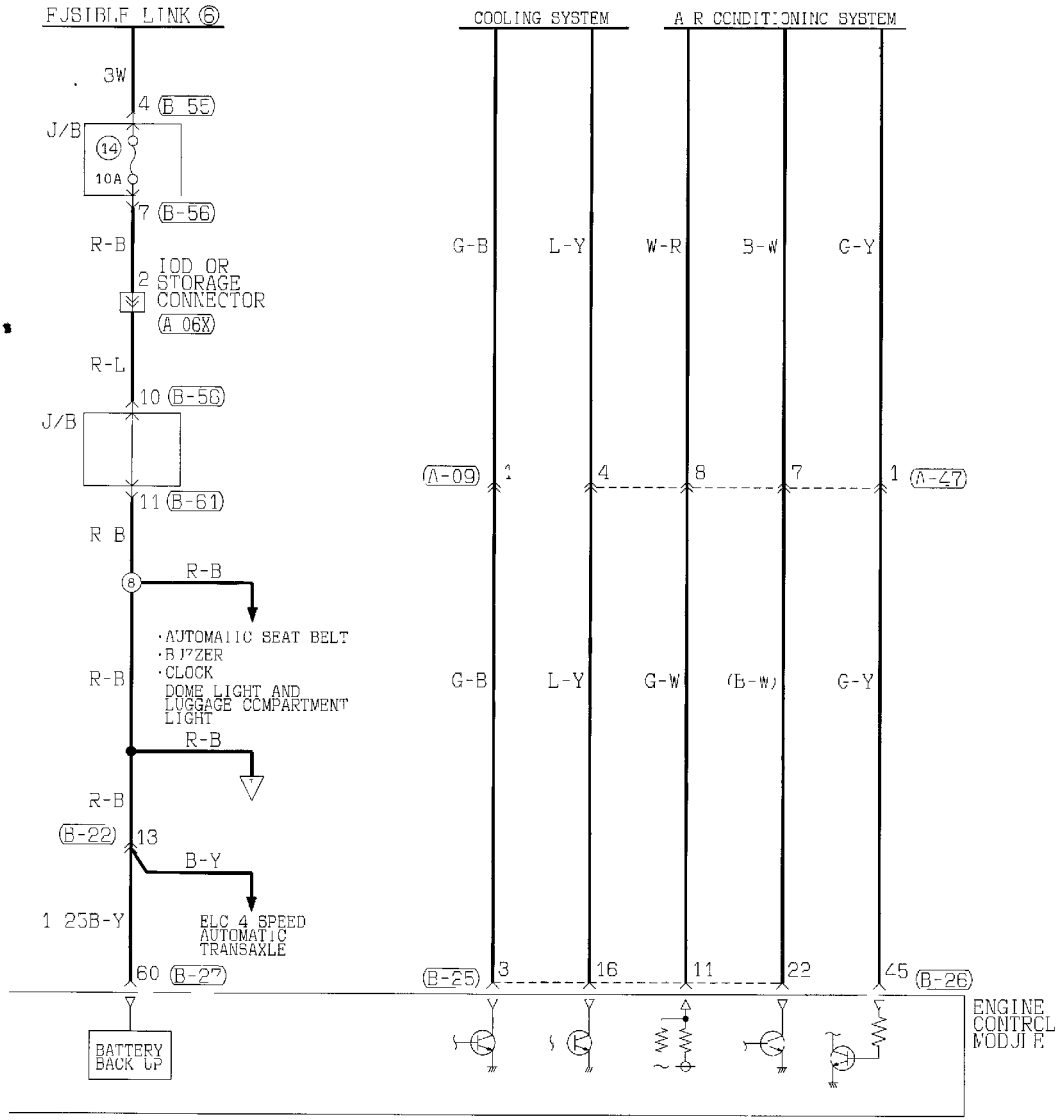


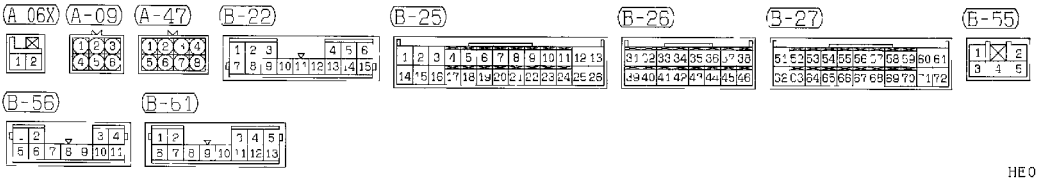


HE05M11AB

TSB Revision

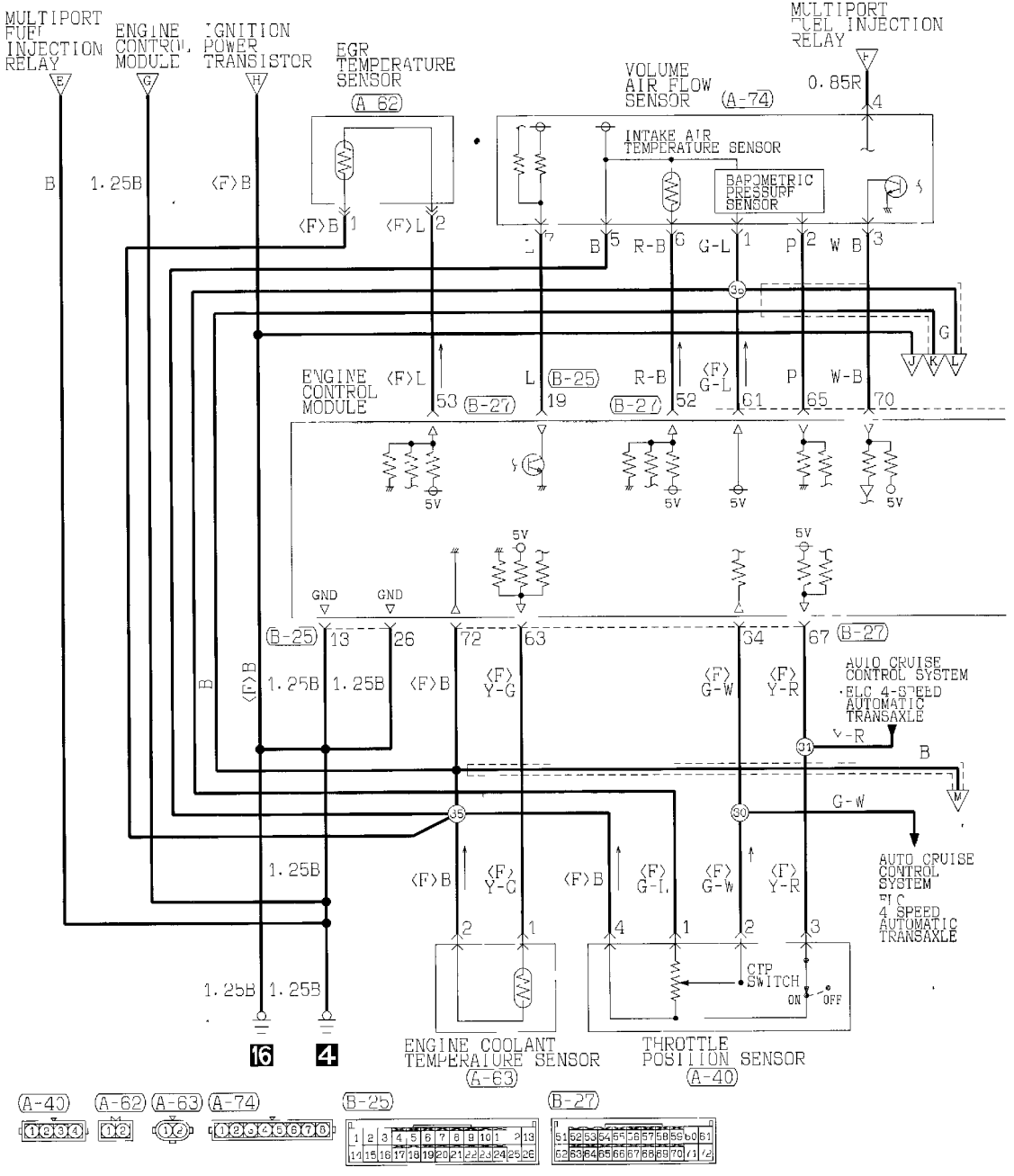
MFI SYSTEM <1.8L ENGINE (1994 MODELS)> (CONTINUED)



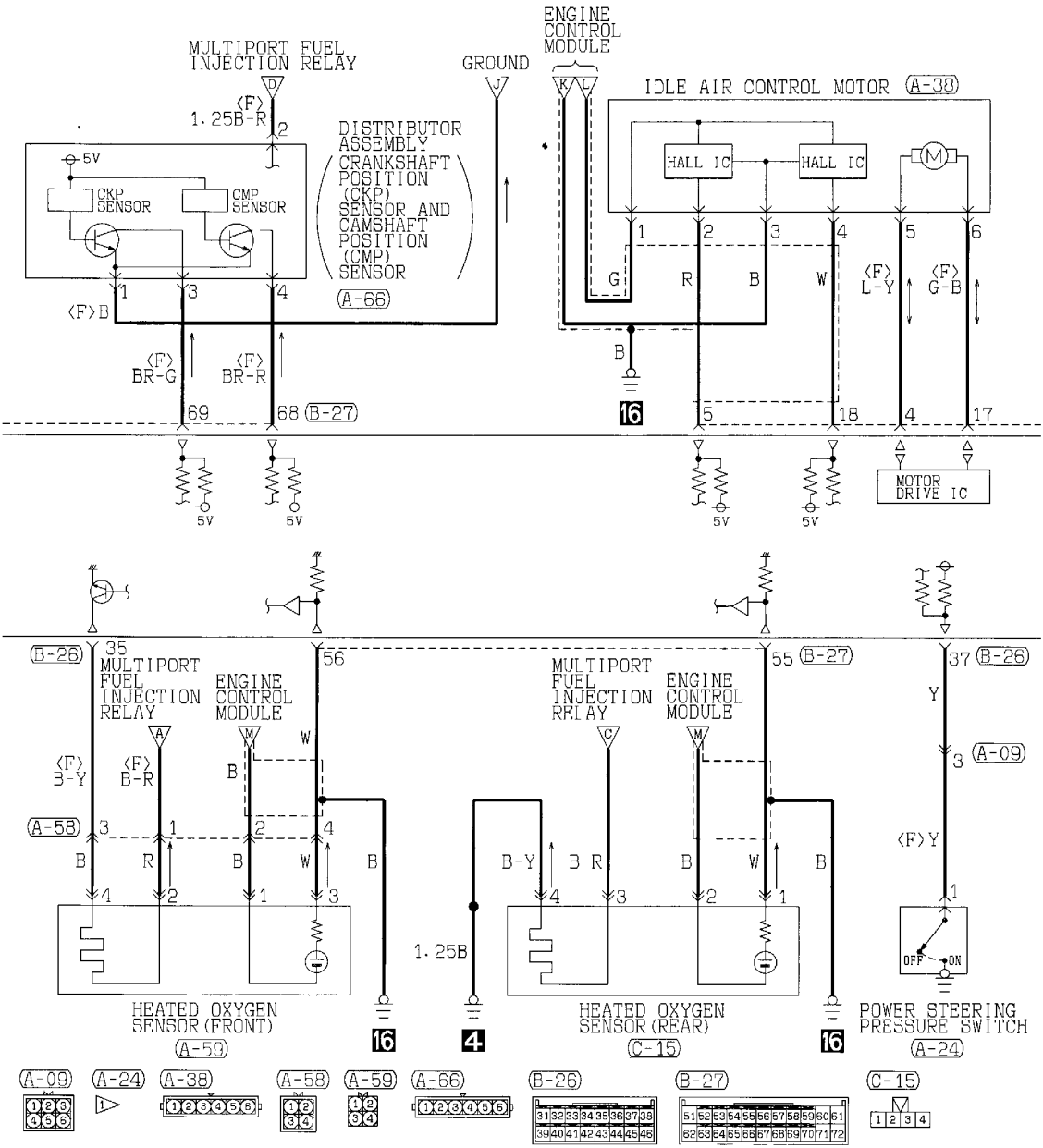


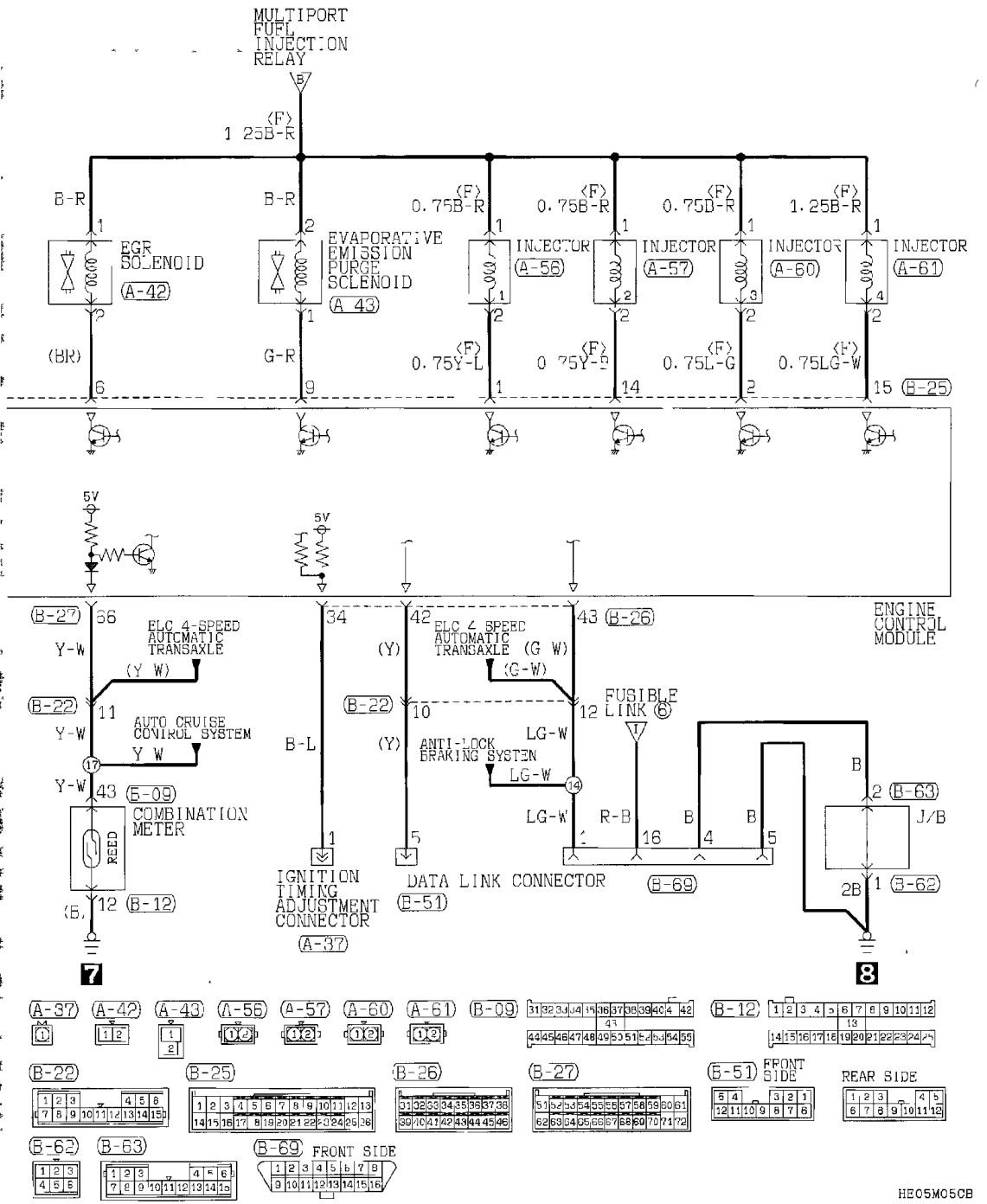
HE05M053A

TSB Revision


MULTIPORT FUEL INJECTION RELAY
ENGINE CONTROL MODULE
IGNITION POWER TRANSISTOR
EGR TEMPERATURE SENSOR
A-62
VOLUME AIR FLOW SENSOR
A-74
MULTIPORT FUEL INJECTION RELAY
0.85R
INTAKE AIR TEMPERATURE SENSOR
BAROMETRIC PRESSURE SENSOR
ENGINE CONTROL MODULE
B-25
B-27
AUTO CRUISE CONTROL SYSTEM
E.L.C. 4-SPEED AUTOMATIC TRANSAXLE
ENGINE COOLANT TEMPERATURE SENSOR
A-63
THROTTLE POSITION SENSOR
A-40
CTP SWITCH
ON
OFF
GND
5V
16
4

MFI SYSTEM <1.8L ENGINE (1994 MODELS)> (CONTINUED)




MULTIPORT FUEL INJECTION RELAY
(F) 1.25B-R
B-R
B-R
(F) 0.75B-R
(F) 0.75B-R
(F) 0.75D-R
(F) 1.25B-R
EGR SOLENOID (A-42)
EVAPORATIVE EMISSION PURGE SOLENOID (A-43)
INJECTOR (A-56)
INJECTOR (A-57)
INJECTOR (A-60)
INJECTOR (A-61)
(BR)
G-R
(F) 0.75Y-L
(F) 0.75Y-B
(F) 0.75L-G
(F) 0.75LG-W
15 (B-25)
5V
5V
(B-27) 36
ELC 4-SPEED AUTOMATIC TRANSAXLE
Y-W
(Y-W)
(B-22) 11
AUTO CRUISE CONTROL SYSTEM
Y-W
Y-W
43 (B-09)
COMBINATION METER
REED
12 (B-12)
34
B-L
IGNITION TIMING ADJUSTMENT CONNECTOR (A-37)
42
43 (B-26)
ELC 4 SPEED AUTOMATIC TRANSAXLE (G-W)
(Y)
(G-W)
(B-22) 10
12
FUSIBLE LINK (6)
ANTI-LOCK BRAKING SYSTEM
(Y)
LG-W
LG-W
LG-W
R-B
16
DATA LINK CONNECTOR (B-69)
(B-51)
B
4
B
5
B
2 (B-63)
J/B
2B
1 (B-62)
ENGINE CONTROL MODULE
7
8

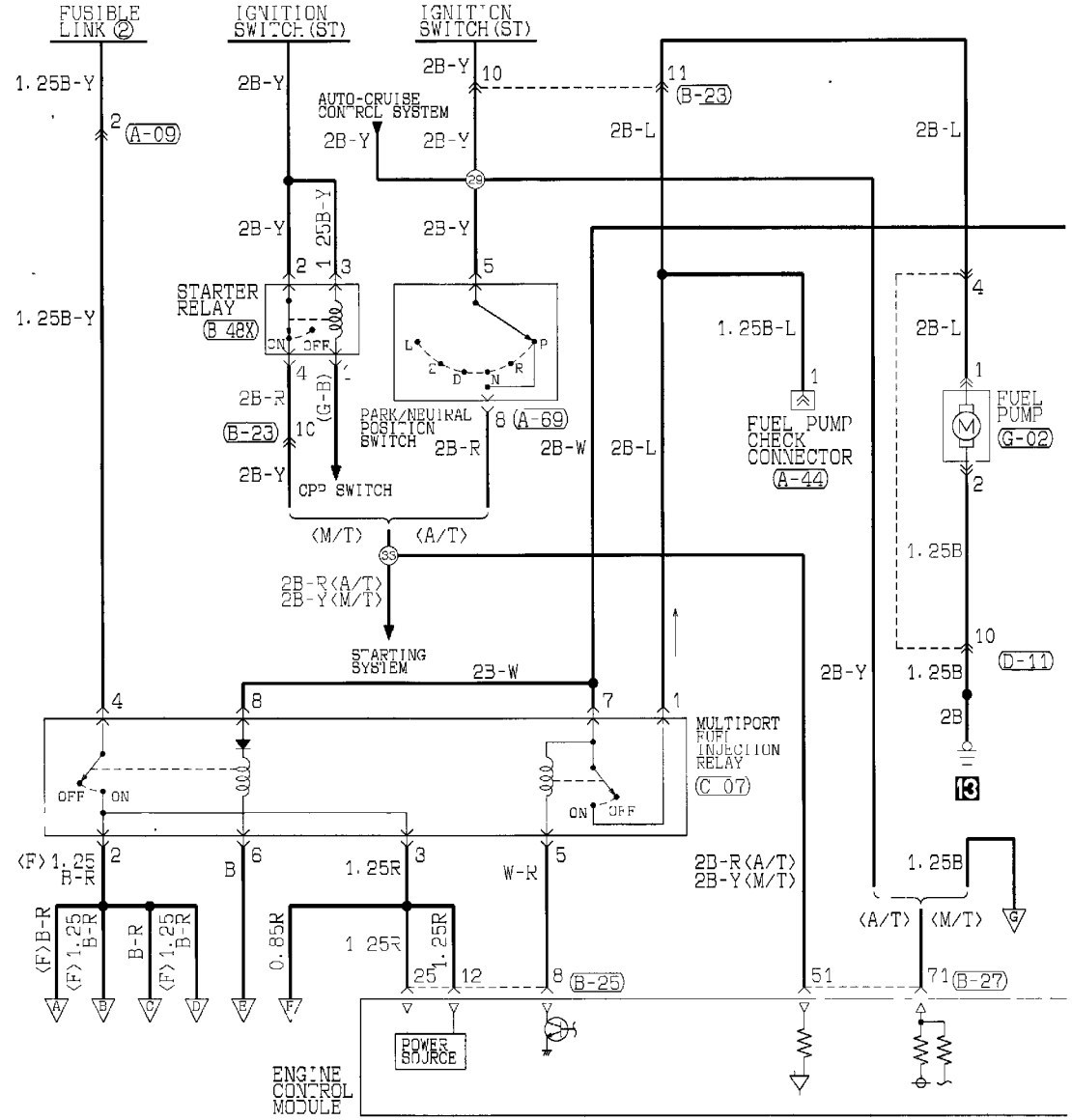
(A-37)
(A-42)
(A-43)
(A-56)
(A-57)
(A-60)
(A-61)
(B-09)
(B-12)
(B-22)
(B-25)
(B-26)
(B-27)
(B-51)
FRONT SIDE
REAR SIDE
(B-62)
(B-63)
(B-69)
FRONT SIDE

HE05M05CB

MFI SYSTEM

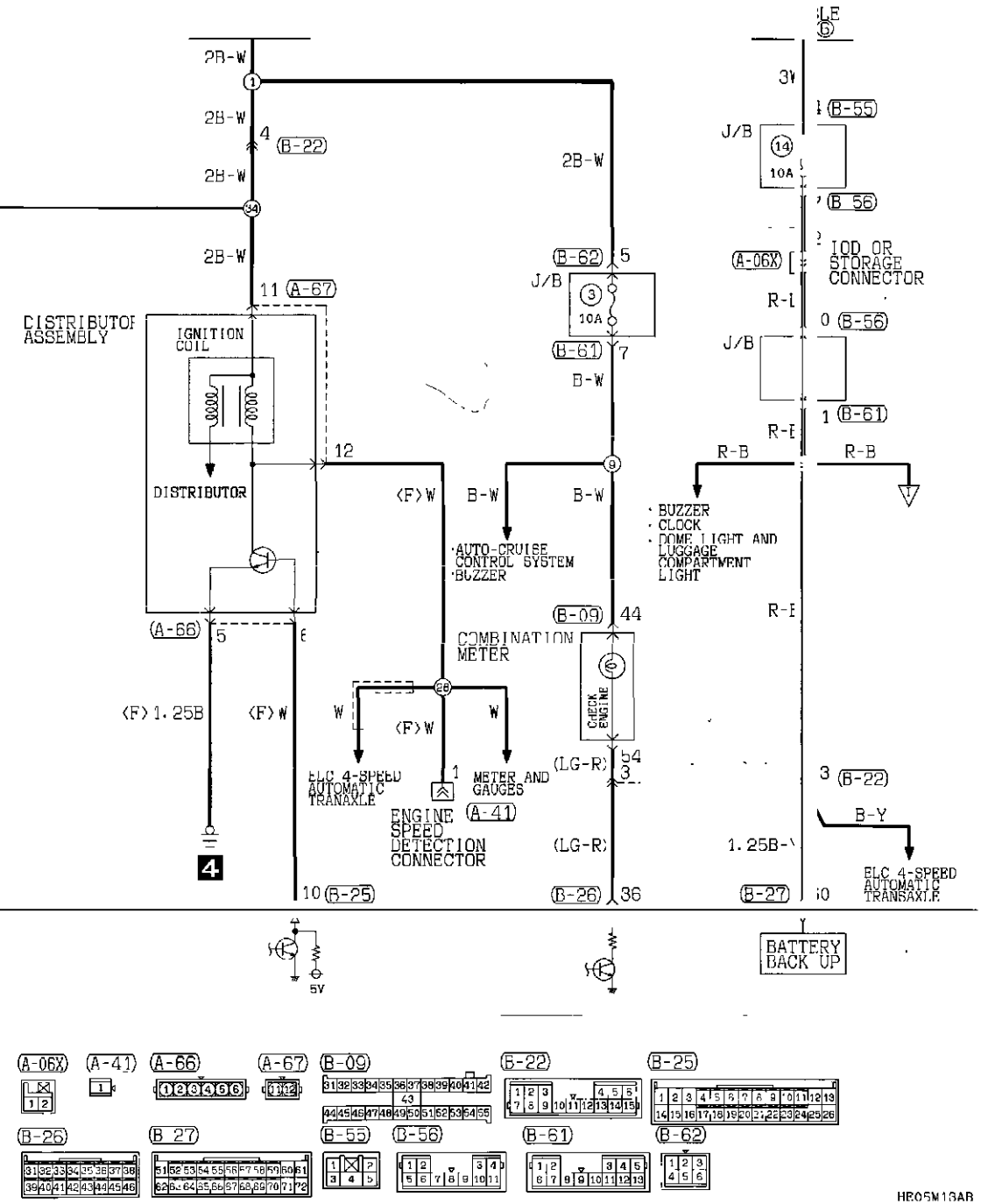
110003559

<1.8L ENGINE (1995 MODELS FOR FEDERAL)>



HE05M13AA

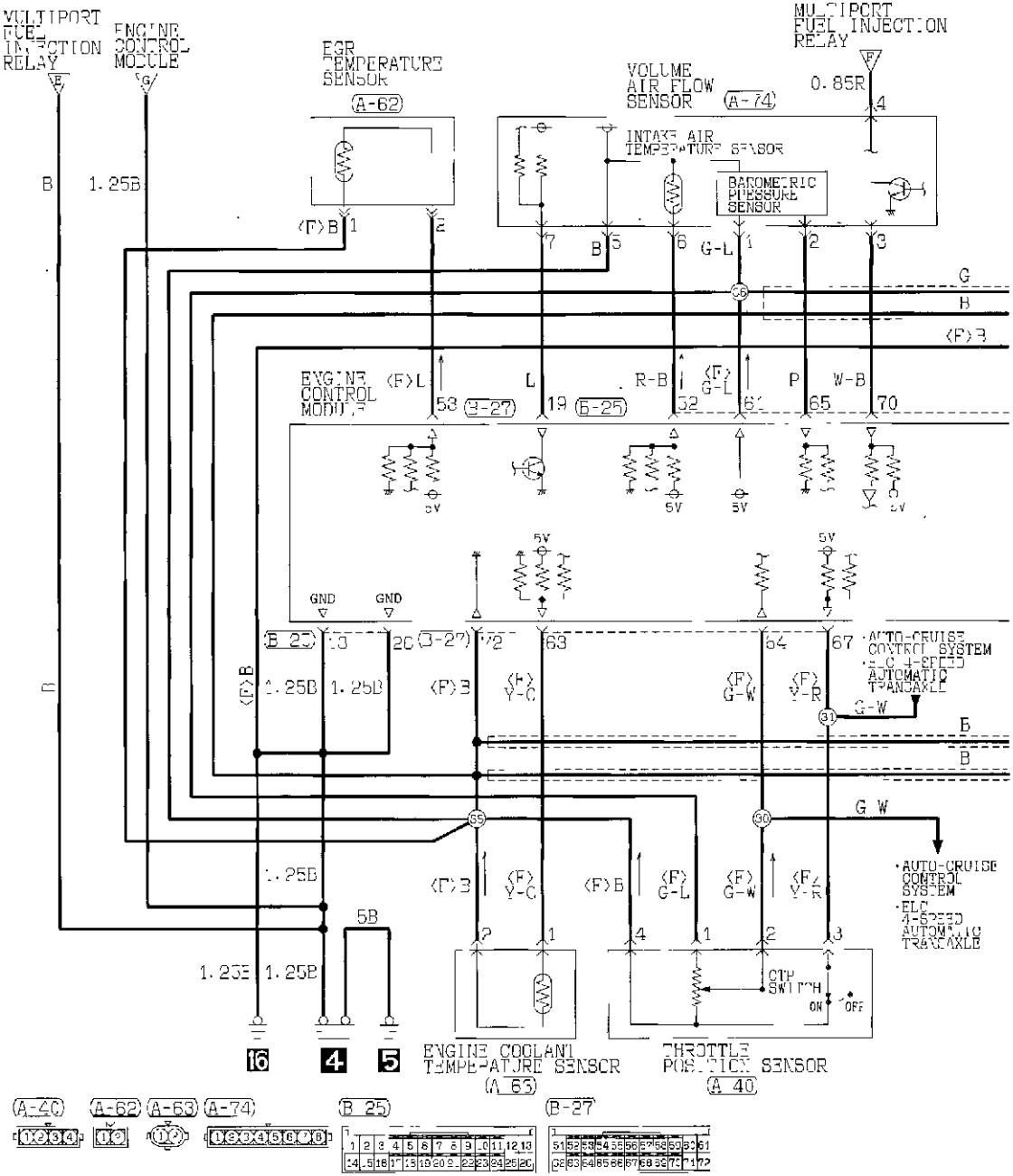
TSB Revision

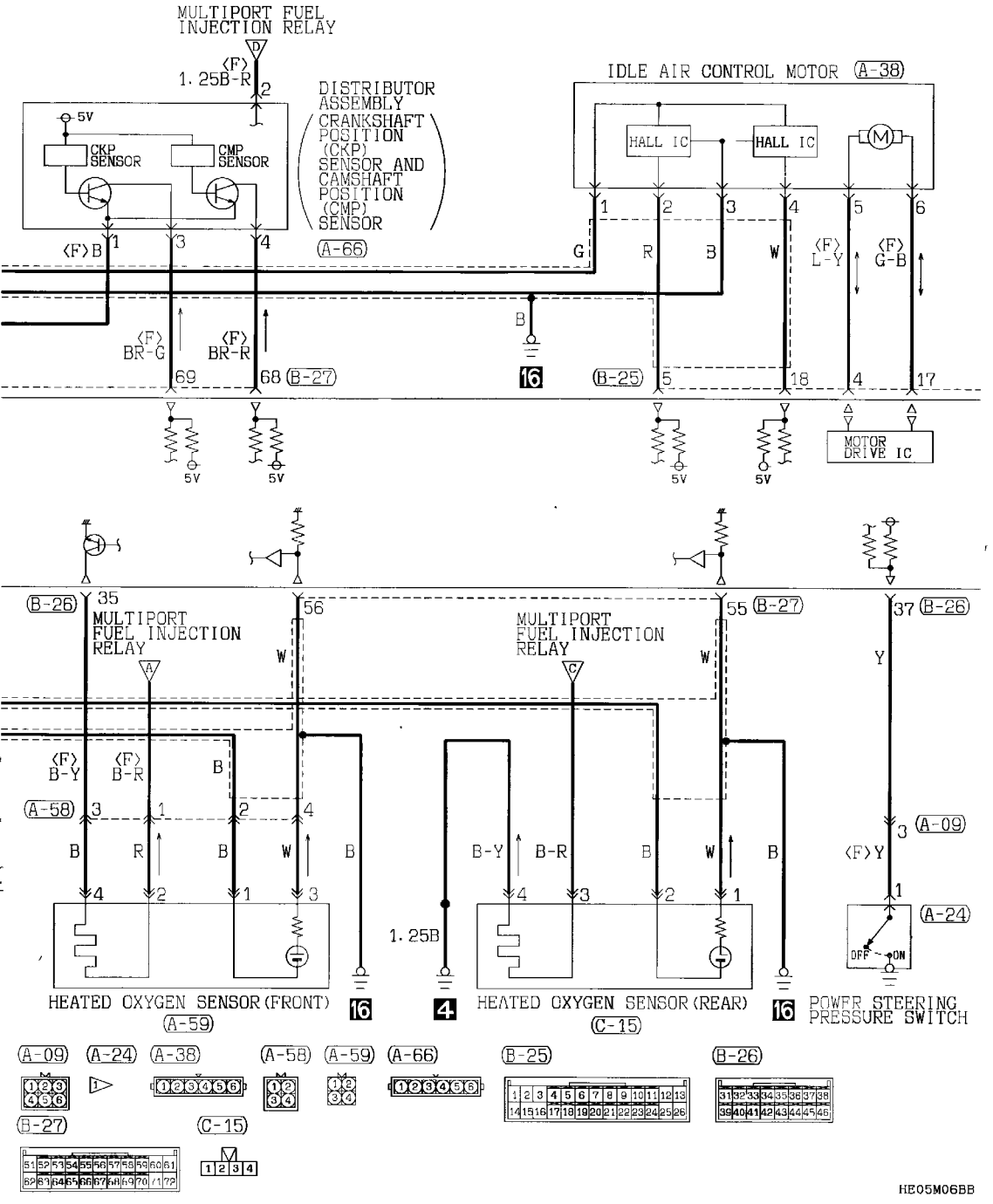


HB05M13AB

TSB Revision

MFI SYSTEM <1.8L ENGINE (1995 MODELS FOR FEDERAL)> (CONTINUED)

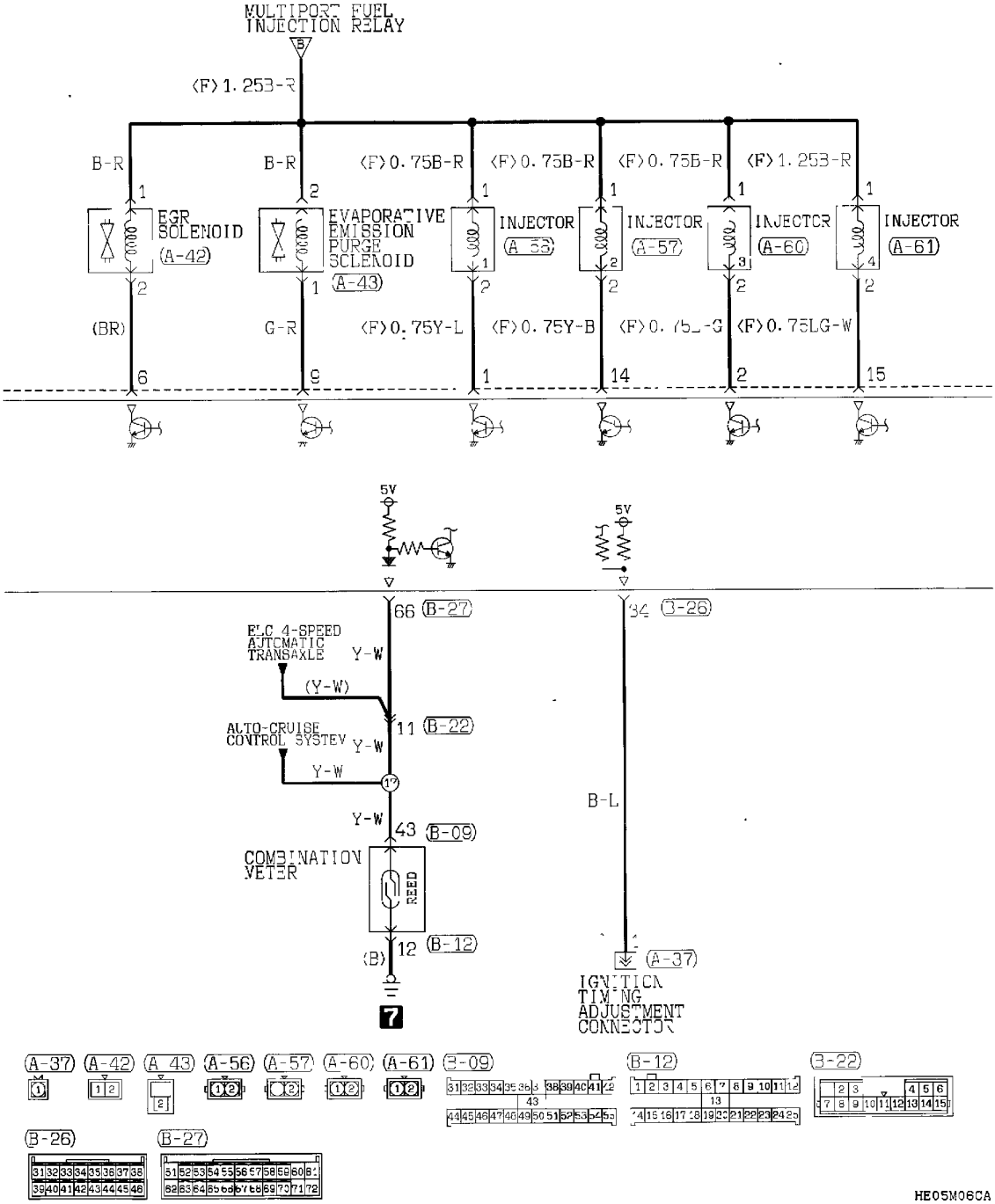




HE05M06BB

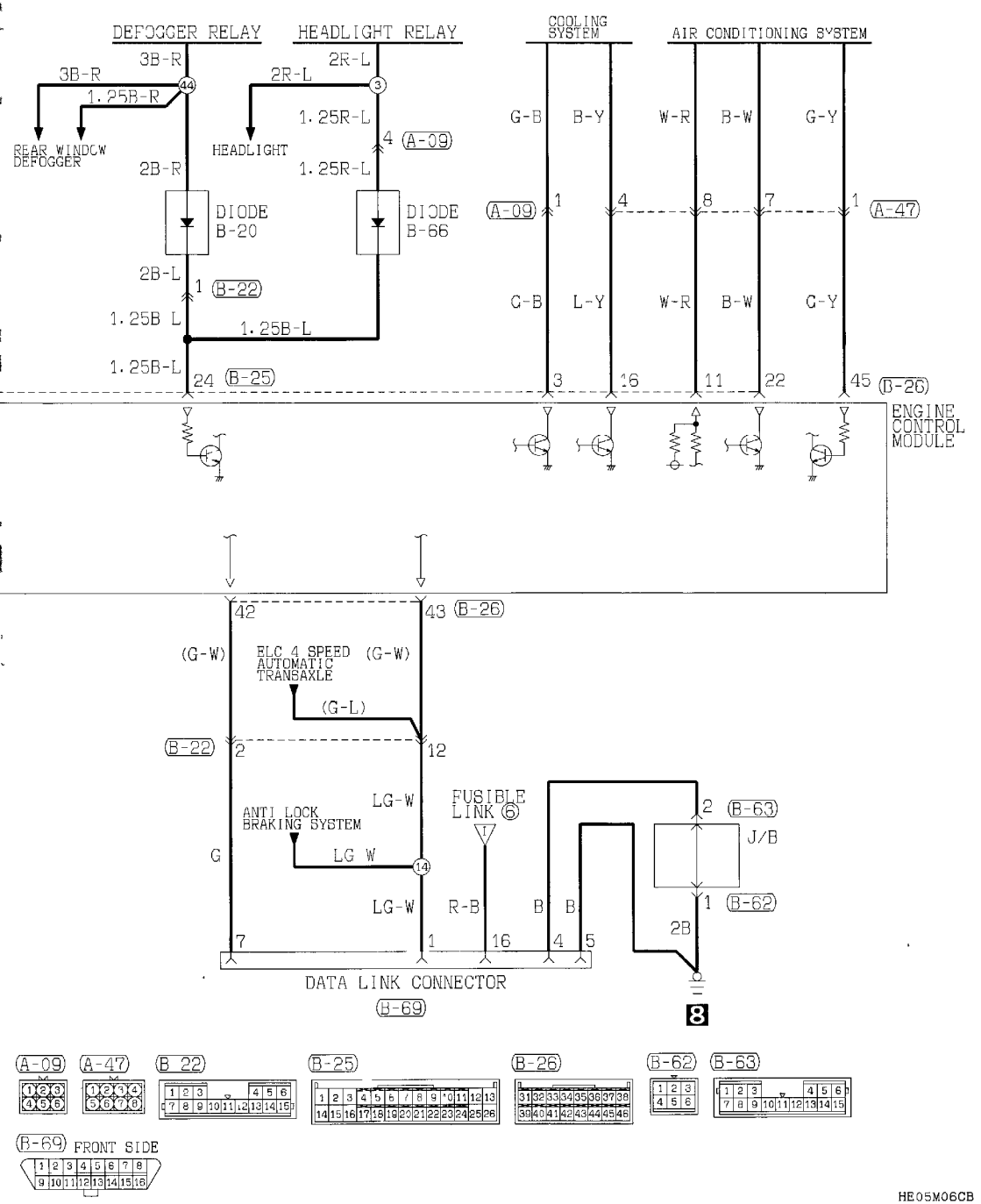
TSB Revision

MFI SYSTEM <1.8L ENGINE (1995 MODELS FOR FEDERAL)> (CONTINUED)



HE05M06CA

TSB Revision



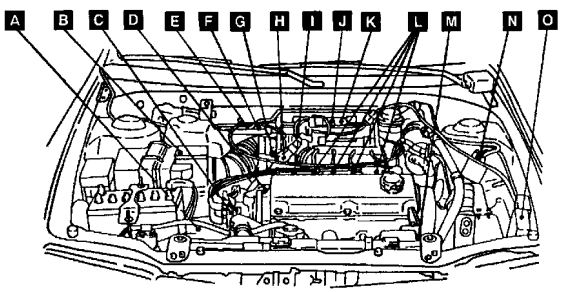
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TSB Revision

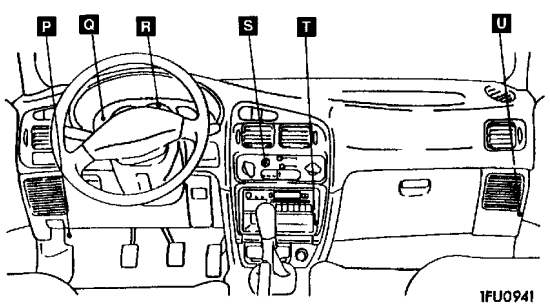
COMPONENT LOCATION <1.8L ENGINE (Up to 1994 models for California, Up to 1995 models for Federal)>

110007463

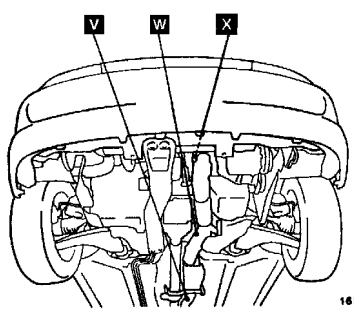
Name	Symbol	Name	Symbol
Air conditioning compressor clutch relay	O	Heated oxygen sensor (Front) <Federal–From 1994 models, California>	W
Air conditioning refrigerant intermediate pressure switch	N	Heated oxygen sensor (Rear) <Federal–From 1994 models, California>	V
Air conditioning switch	S	Idle air control motor	G
Check engine / Malfunction indicator lamp	Q	Ignition timing adjustment connector	E
Data link connector	P	Injectors	L
Distributor (with built-in camshaft position sensor, crankshaft position sensor, ignition coil and ignition power transistor)	C	Multiport fuel injection (MFI) relay	T
EGR solenoid <Federal–From 1994 models, California>	J	Oxygen sensor <Federal–1993 models>	X
EGR temperature sensor <Federal–From 1994 models, California>	I	Park / Neutral position switch	A
EGR control module	U	Power steering pressure switch	M
Engine coolant temperature sensor	D	Throttle position sensor (with built-in closed throttle position switch)	H
Evaporative emission purge solenoid	K	Vehicle speed sensor (reed switch)	R
Fuel pump check terminal	F	Volume air flow sensor (with built-in intake air temperature sensor and barometric pressure sensor)	B



9FU0241



1FU0941

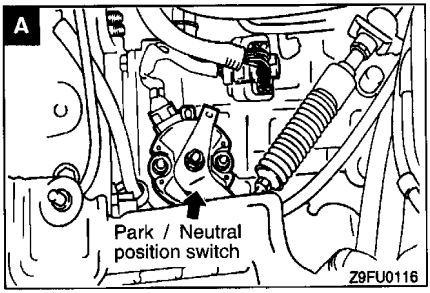


16S0231

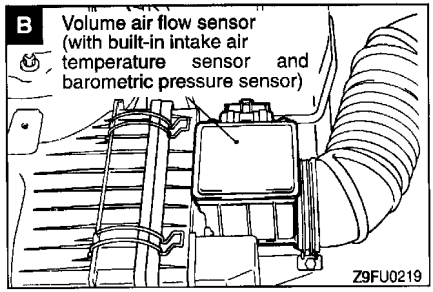
A9FU0461

TSB Revision

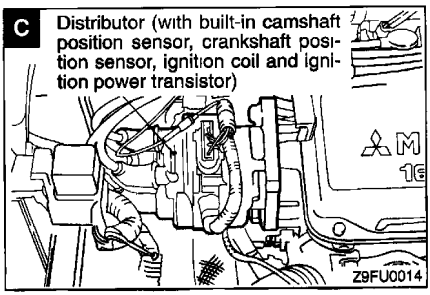
A



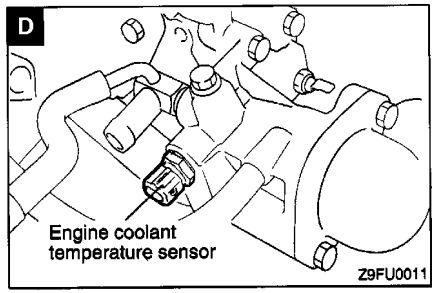
B



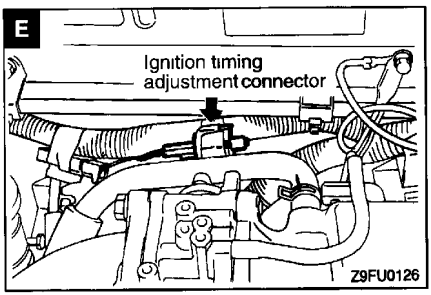
C



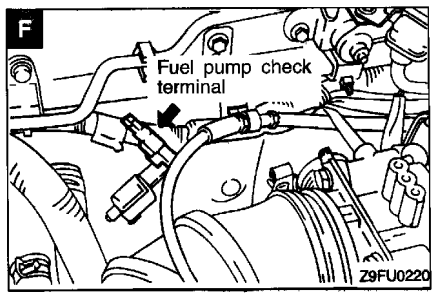
D



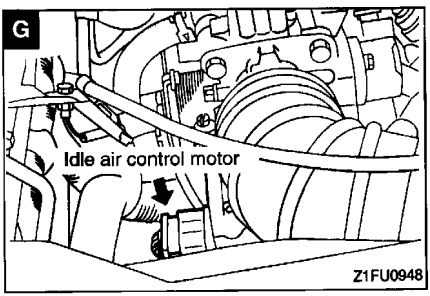
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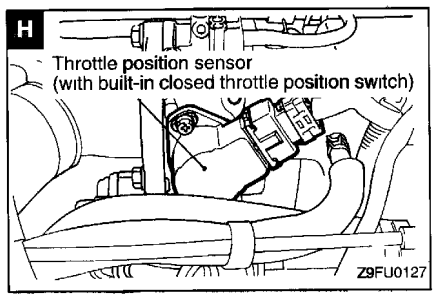
F



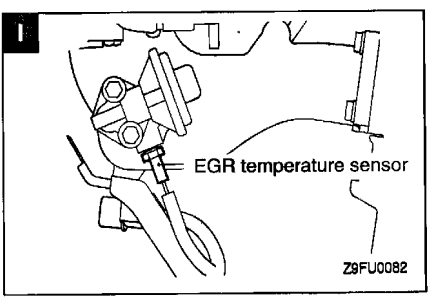
G



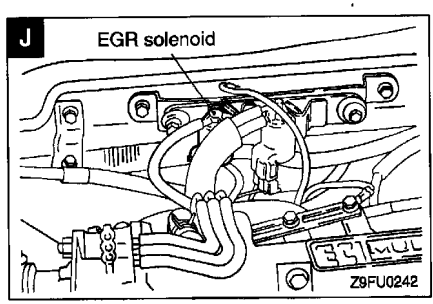
H



I

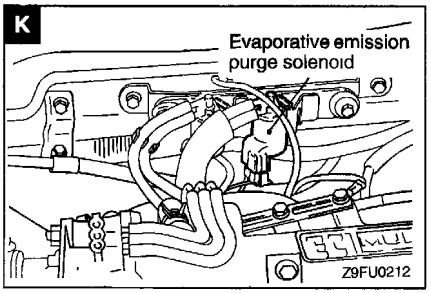


J

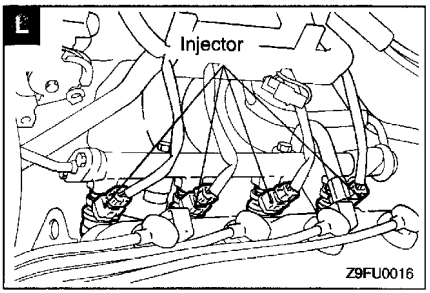


TSB Revision

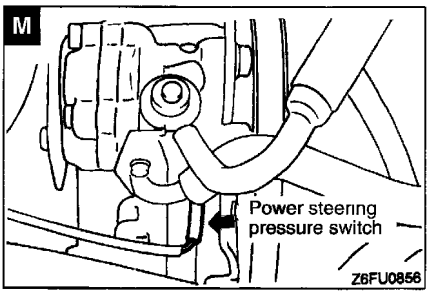
K



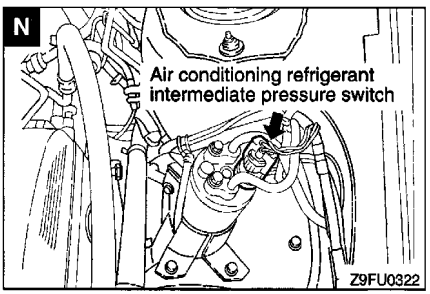
L



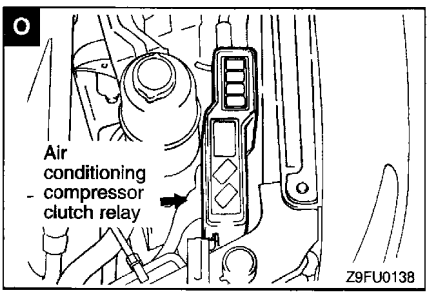
M



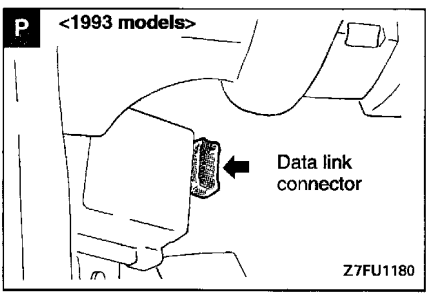
N



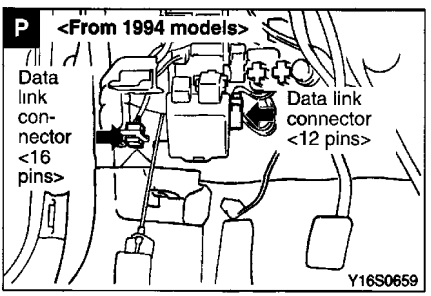
O



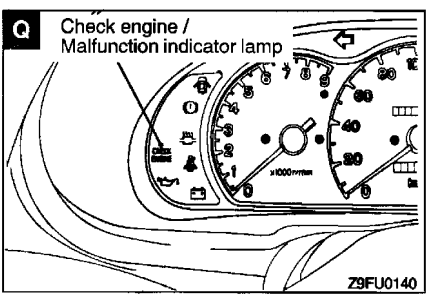
P <1993 models>



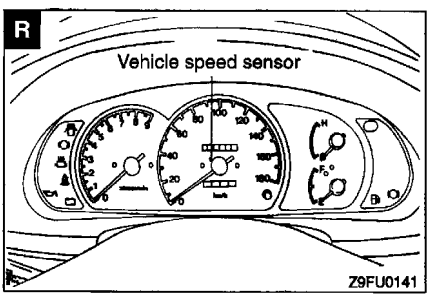
P <From 1994 models>



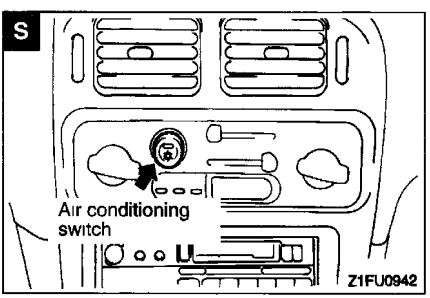
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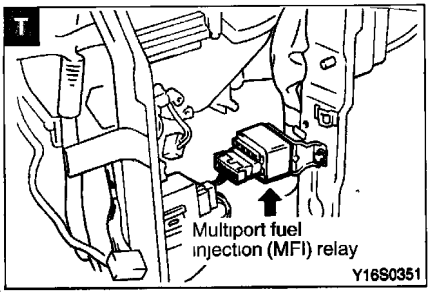
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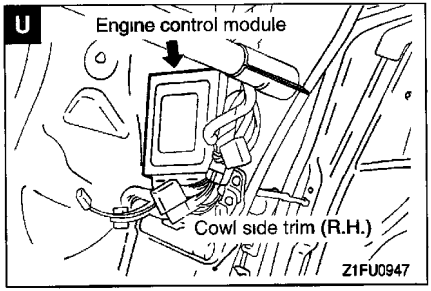
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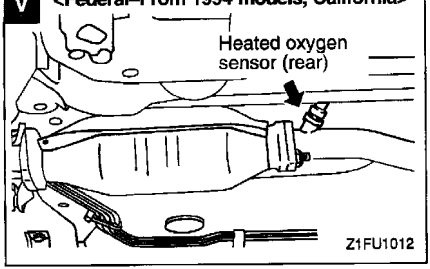
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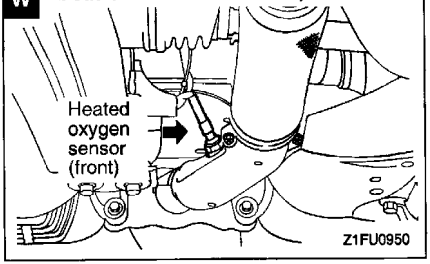
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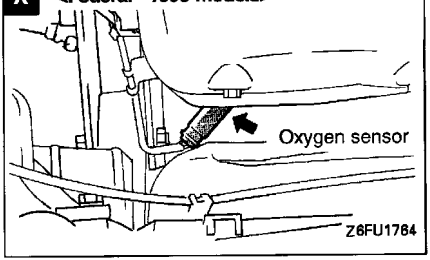
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W <Federal–From 1994 models, California>



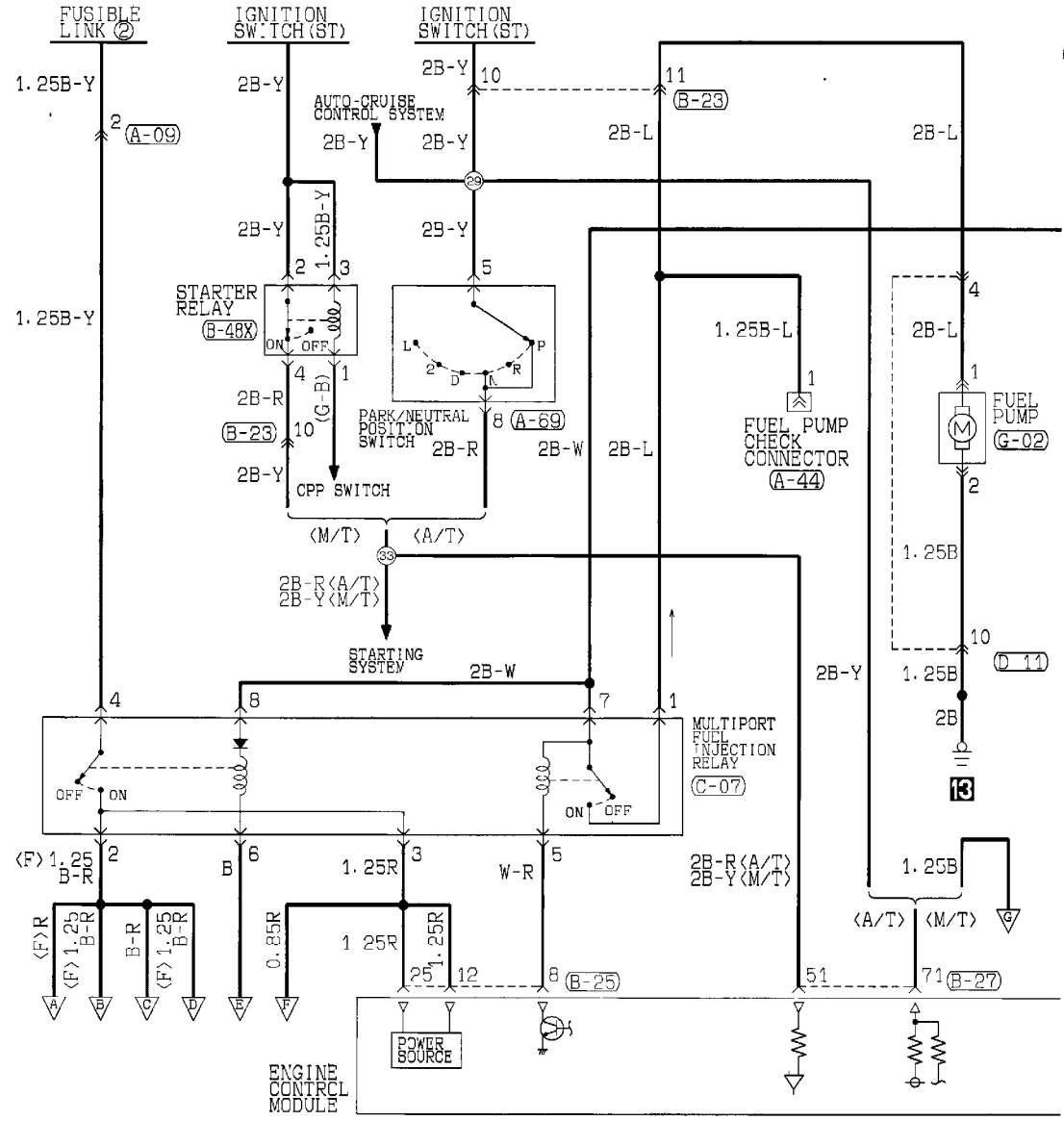
X <Federal– 1993 models>



MFI SYSTEM

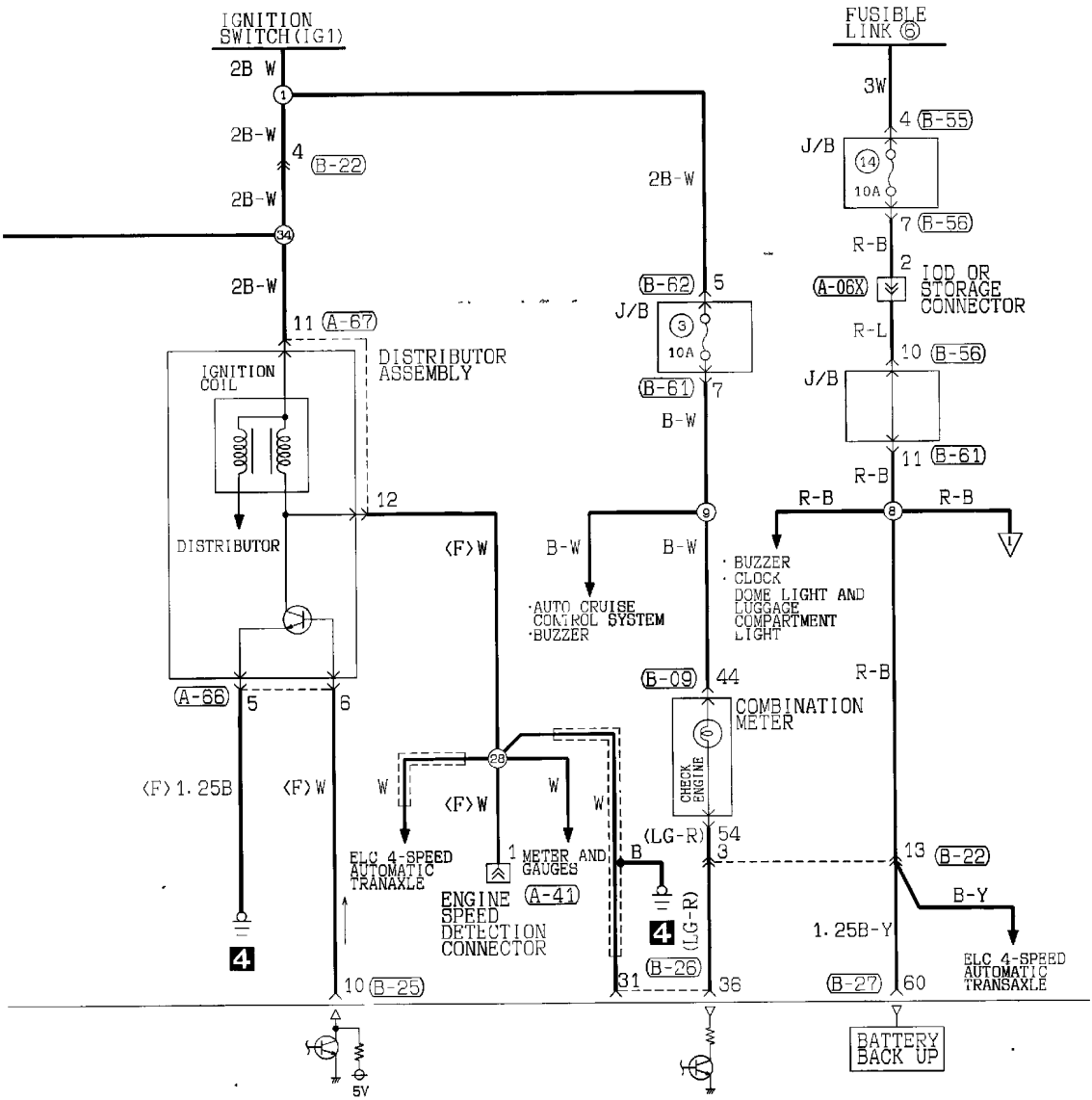
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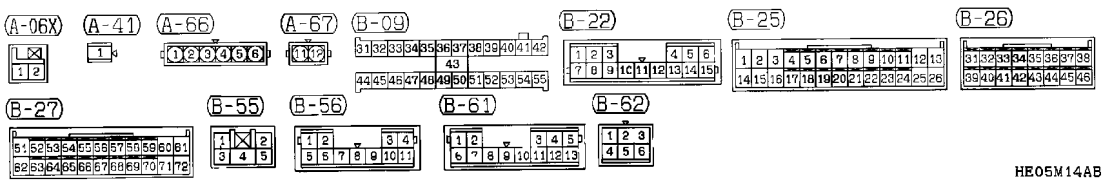
<1.8L ENGINE (FROM 1996 MODELS FOR FEDERAL)>



HE05M14AA

TSB Revision

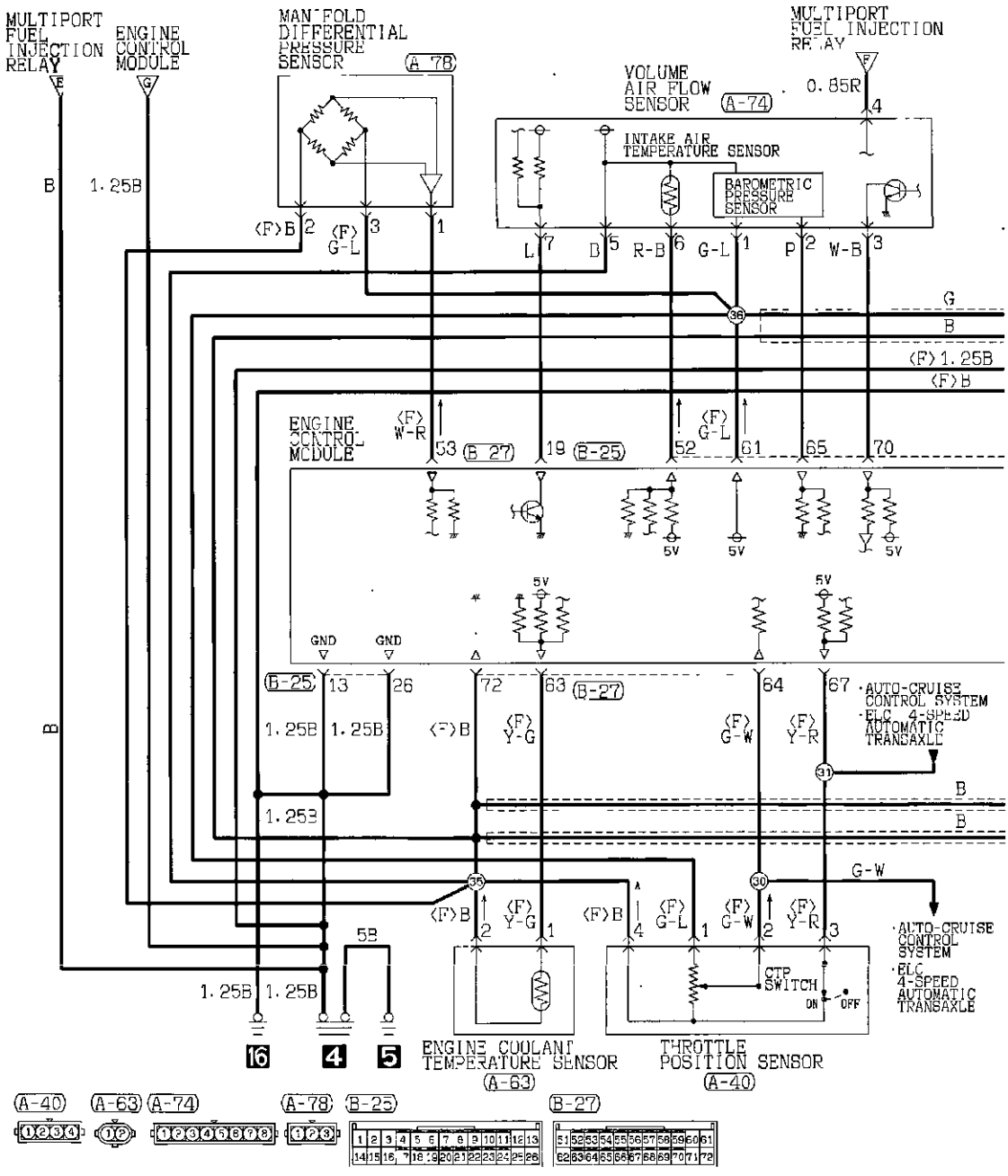




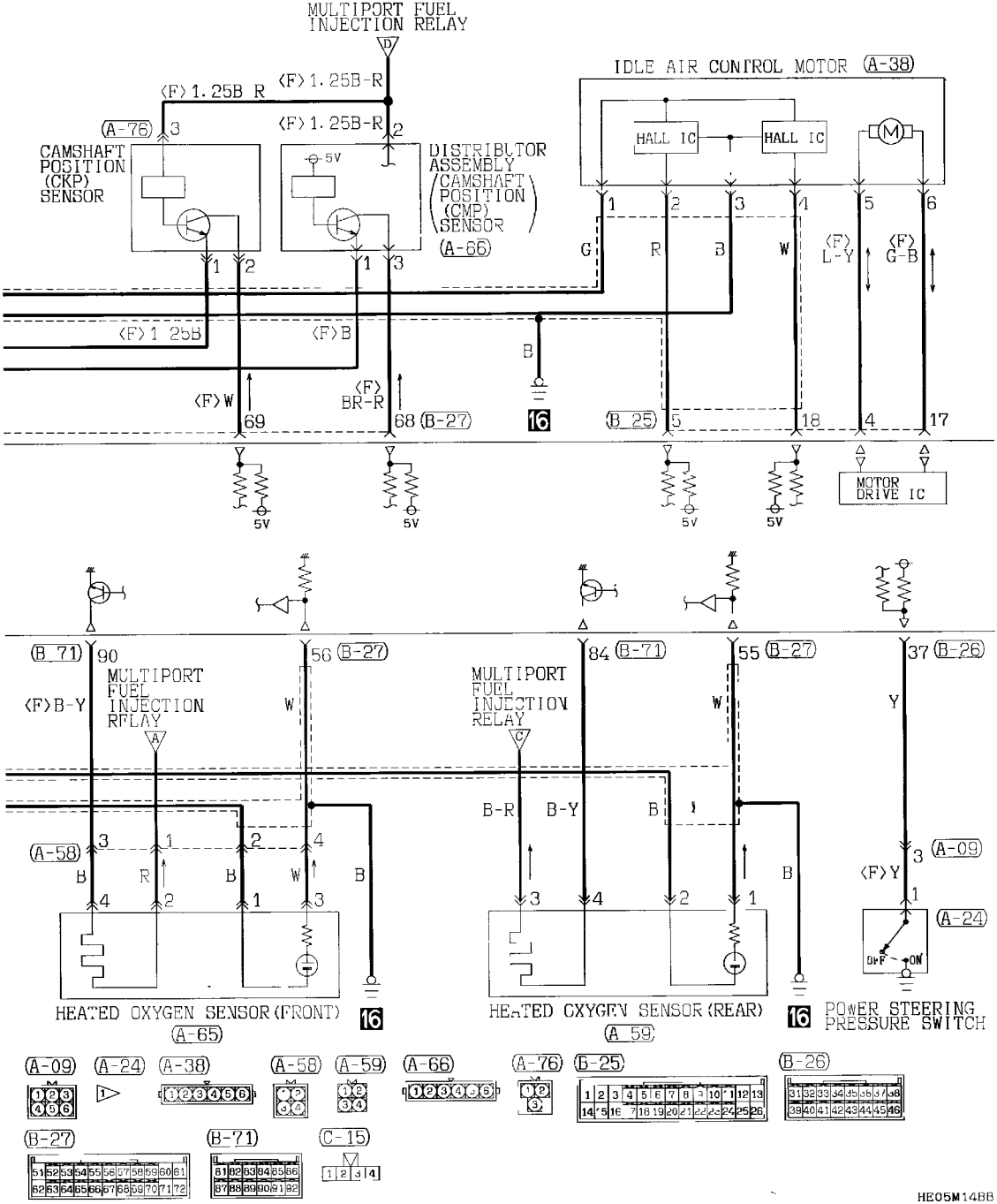
HE05M14AB

TSB Revision

MFI SYSTEM <1.8L ENGINE (FROM 1996 MODELS FOR FEDERAL)> (CONTINUED)



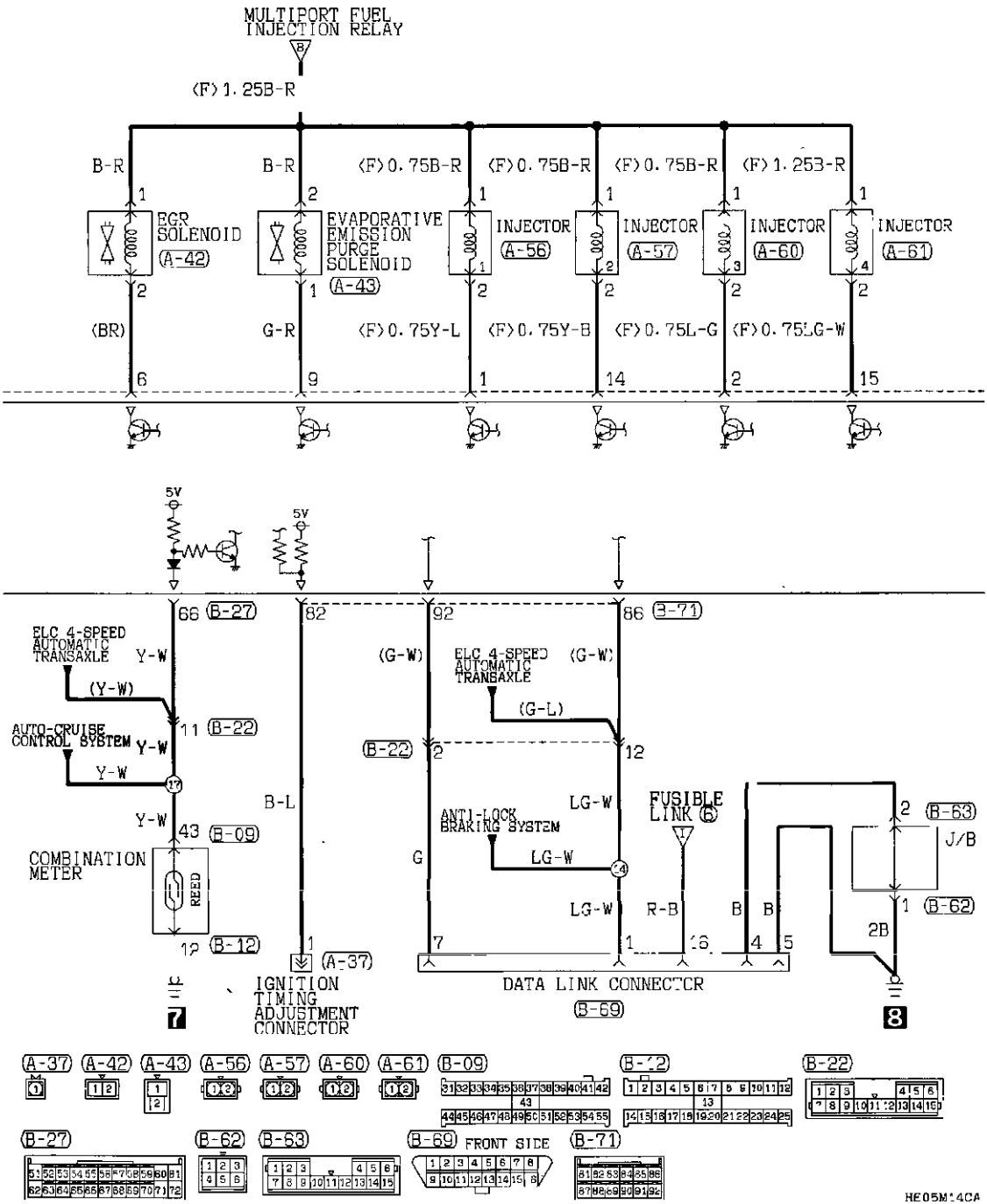
TSB Revision



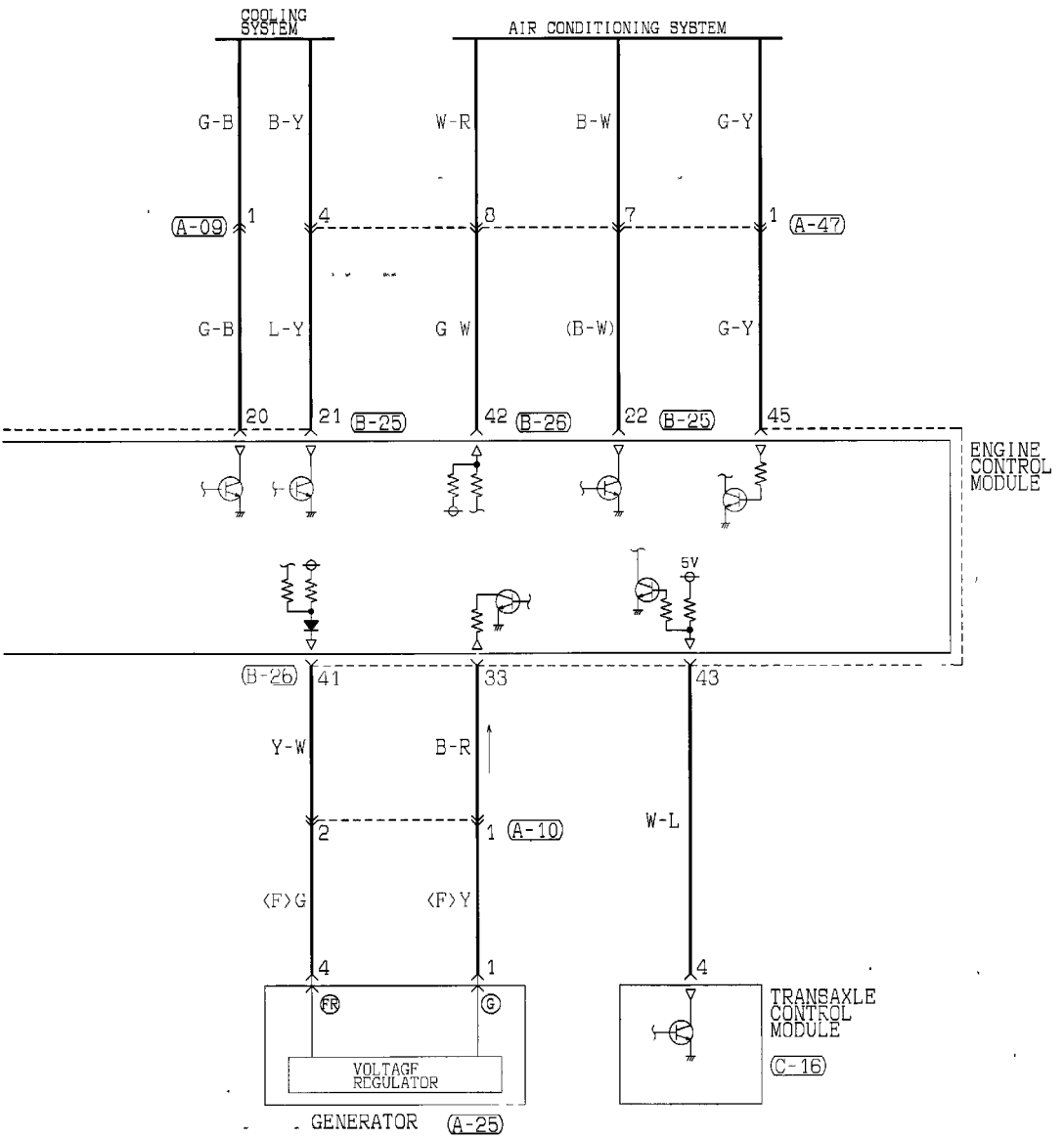
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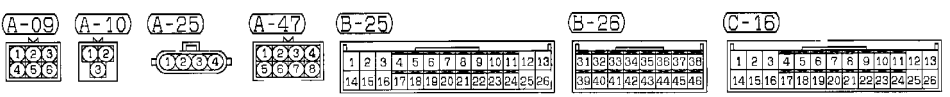
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MFI SYSTEM <1.8L ENGINE (FROM 1996 MODELS FOR FEDERAL)> (CONTINUED)



TSB Revision

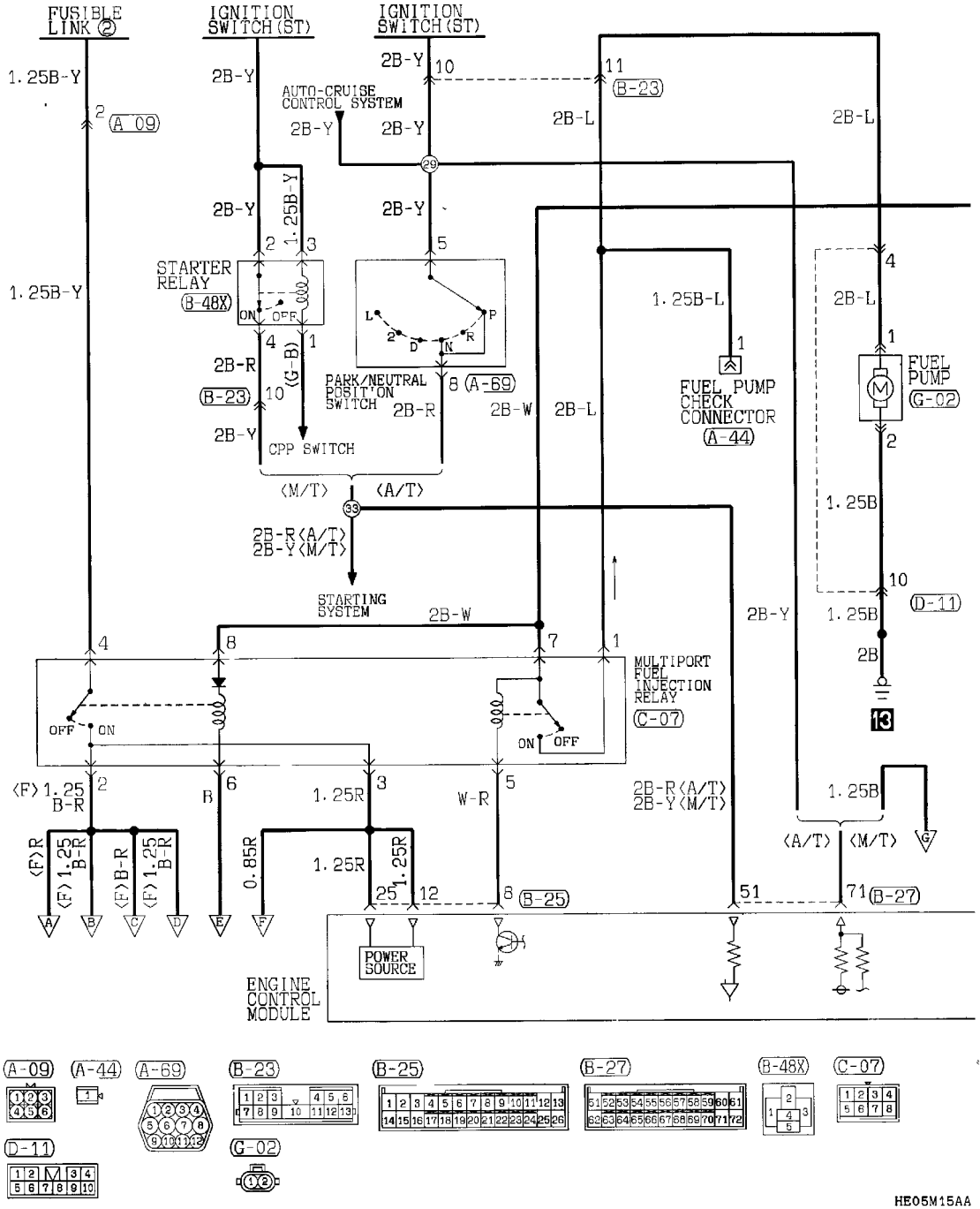

COOLING SYSTEM
AIR CONDITIONING SYSTEM
G-B
B-Y
W-R
B-W
G-Y
A-09
1
4
8
7
1
A-47
G-B
L-Y
G W
(B-W)
G-Y
20
21
B-25
42
B-25
22
B-25
45
ENGINE CONTROL MODULE
5V
B-26
41
33
43
Y-W
B-R
2
1
A-10
W-L
(F)G
(F)Y
4
1
4
FR
G
VOLTAGE REGULATOR
GENERATOR
A-25
TRANSAXLE CONTROL MODULE
C-16


A-09
A-10
A-25
A-47
B-25
B-26
C-16

MFI SYSTEM

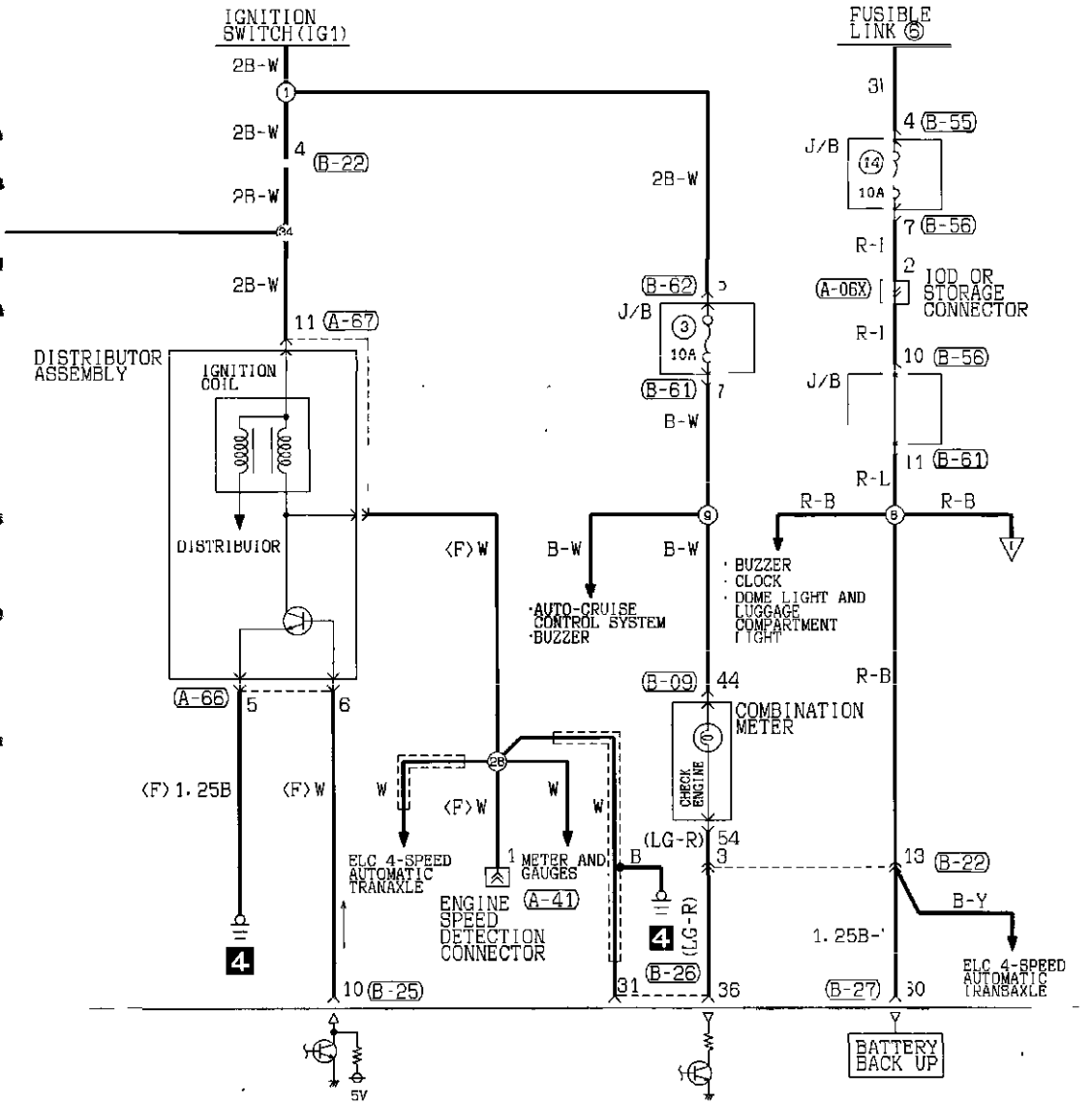
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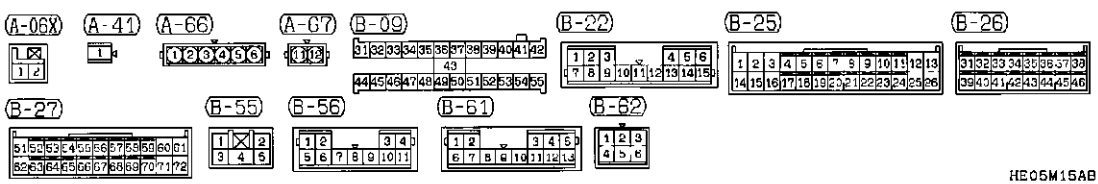
<1.8L ENGINE (FROM 1995 MODELS FOR CALIFORNIA)>



HE05M15AA

TSB Revision

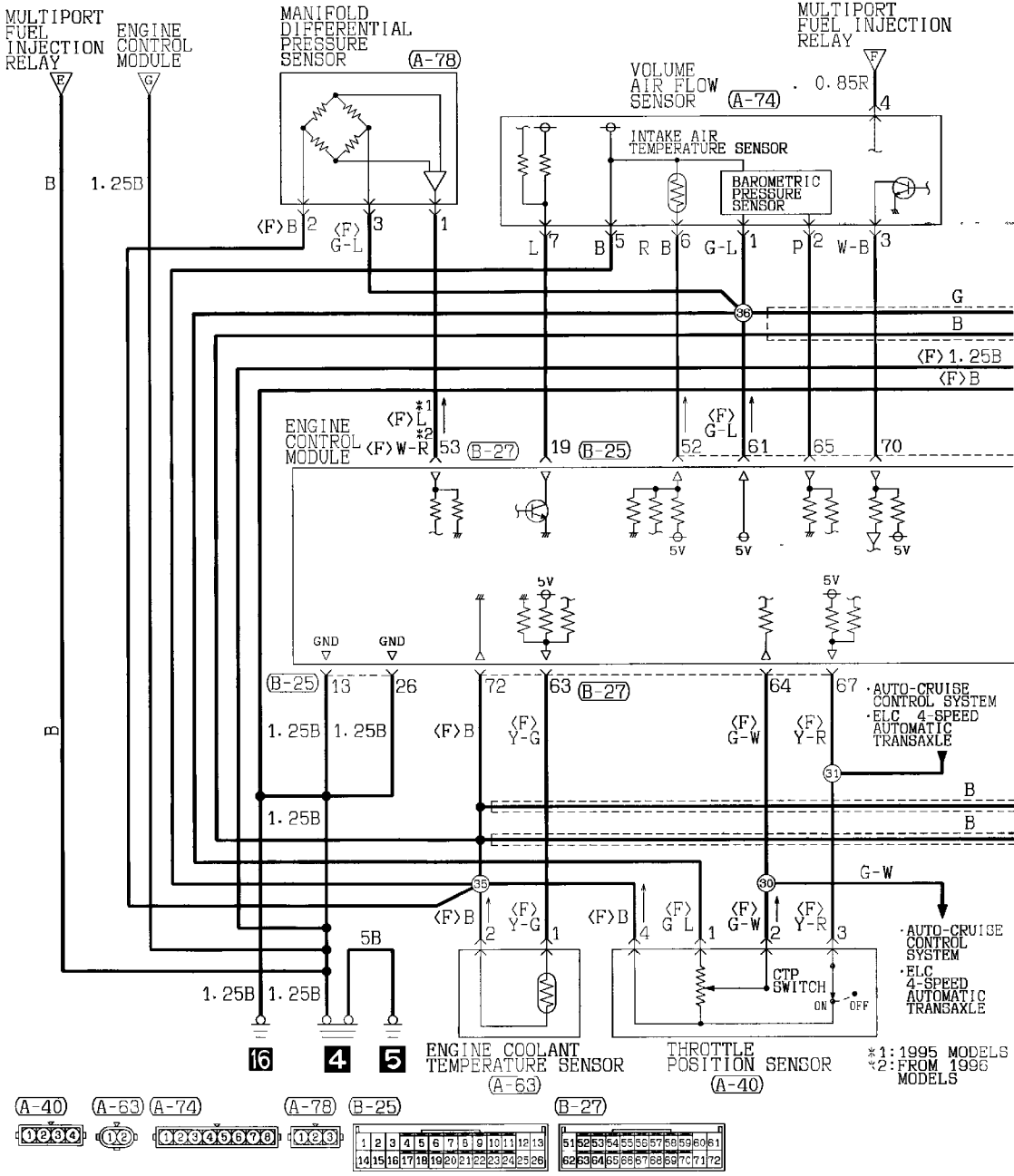


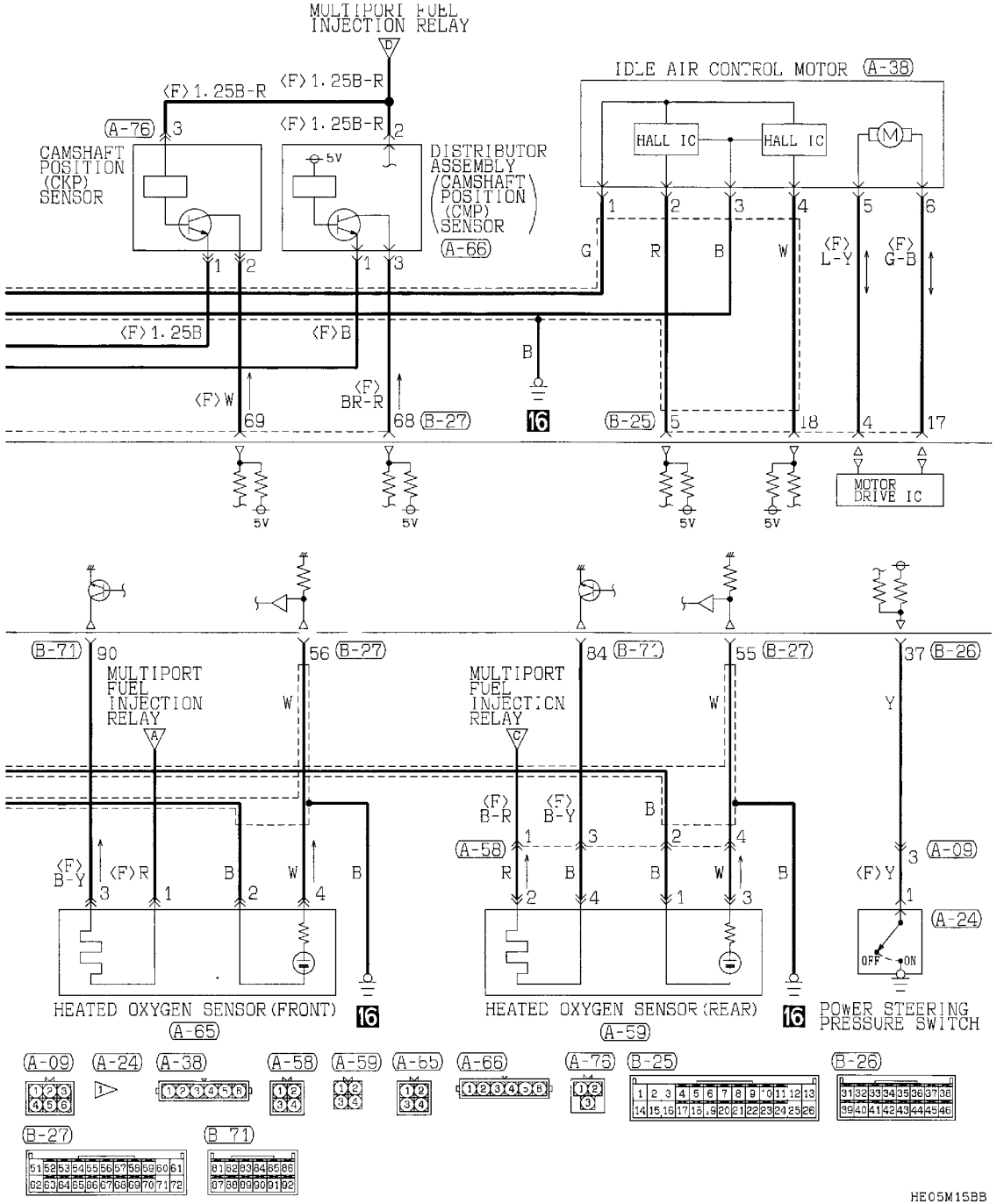


HE05M15AB

TSB Revision

MFI SYSTEM <1.8L ENGINE (FROM 1995 MODELS FOR CALIFORNIA)> (CONTINUED)

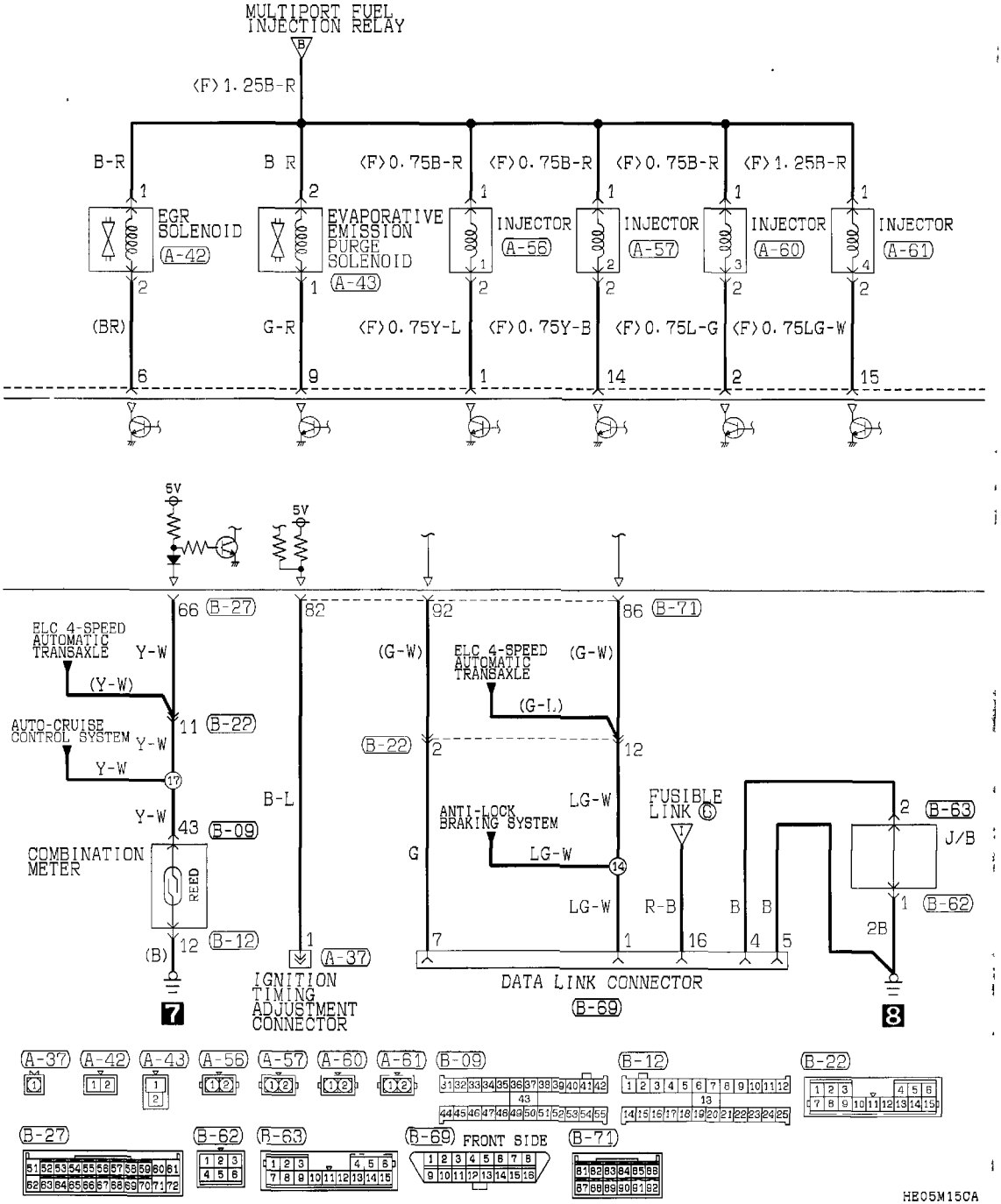




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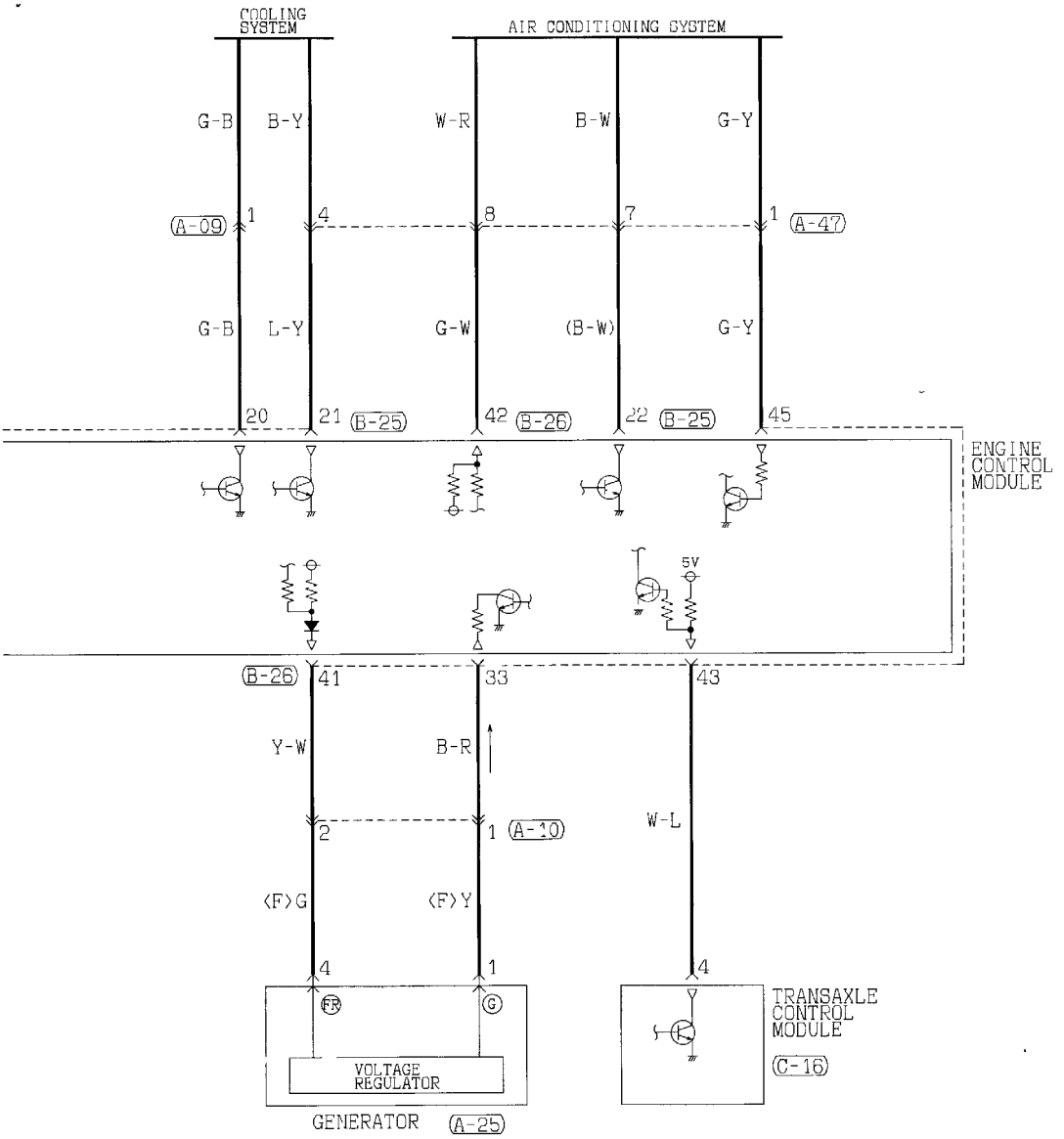
TSB Revision

MFI SYSTEM <1.8L ENGINE (FROM 1995 MODELS FOR CALIFORNIA)> (CONTINUED)



HE05M15CA

TSB Revision



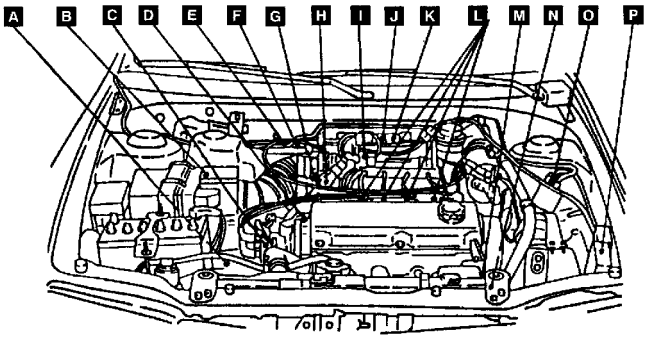
HE05M15CB

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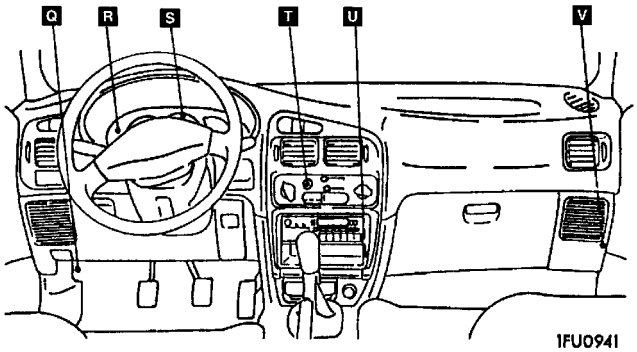
COMPONENT LOCATION <1.8L ENGINE (1995 models from California, From 1996 models)>

110003561

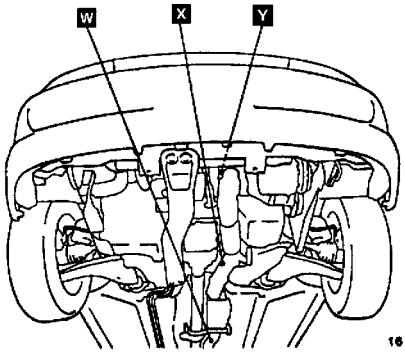
Name	Symbol	Name	Symbol
Air conditioning compressor clutch relay	P	Heated oxygen sensor (Front) <Federal>	X
Air conditioning refrigerant intermediate pressure switch	O	Heated oxygen sensor (Rear) <California>	X
Air conditioning switch	T	Heated oxygen sensor (Rear) <Federal>	W
Check engine / Malfunction indicator lamp	R	Idle air control motor	G
Crankshaft position sensor	N	Ignition timing adjustment connector	E
Data link connector	Q	Injectors	L
Distributor (with built-in camshaft position sensor, ignition coil and ignition power transistor)	C	Manifold differential pressure sensor	I
EGR solenoid	J	Multiport fuel injection (MFI) relay	U
Engine control module	V	Park / Neutral position switch	A
Engine coolant temperature sensor	D	Power steering pressure switch	M
Evaporative emission purge solenoid	K	Throttle position sensor (with built-in closed throttle position switch)	H
Fuel pump check terminal	F	Vehicle speed sensor (reed switch)	S
Heated oxygen sensor (Front) <California>	Y	Volume air flow sensor (with built-in intake air temperature sensor and barometric pressure sensor)	B



9FU0241



1FU0941

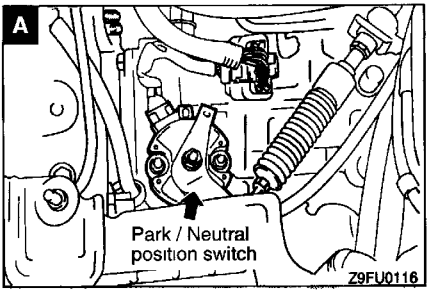


1690231

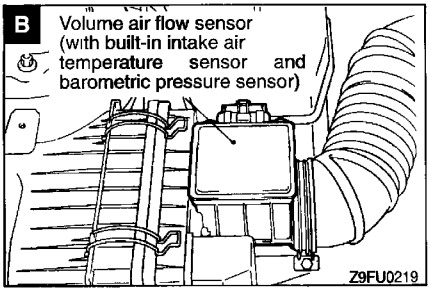
B9FU0474

TSB Revision

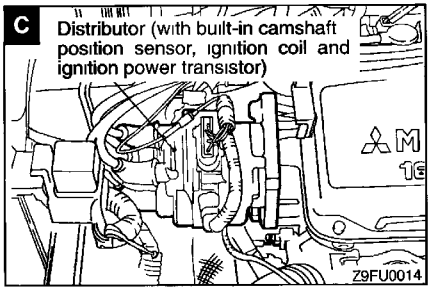
A


Park / Neutral
position switch
Z9FU0116

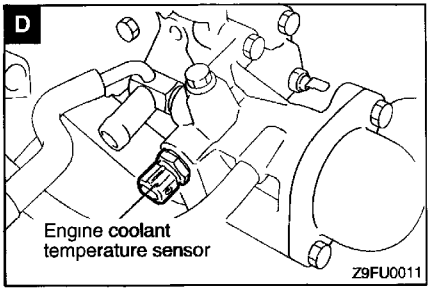
B


Volume air flow sensor
(with built-in intake air
temperature sensor and
barometric pressure sensor)
Z9FU0219

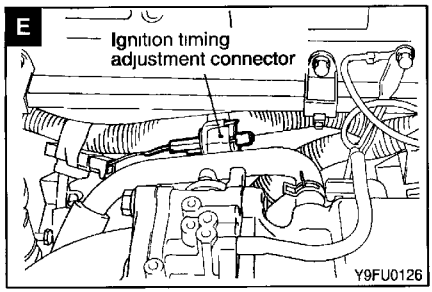
C


Distributor (with built-in camshaft
position sensor, ignition coil and
ignition power transistor)
Z9FU0014

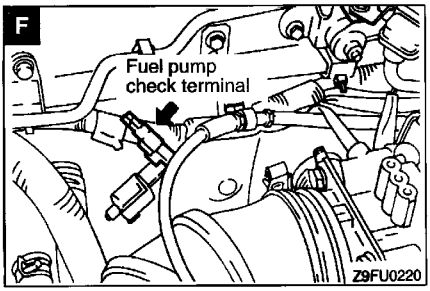
D


Engine coolant
temperature sensor
Z9FU0011

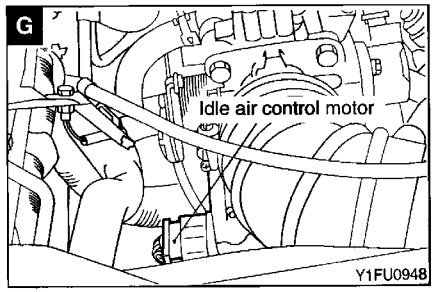
E


Ignition timing
adjustment connector
Y9FU0126

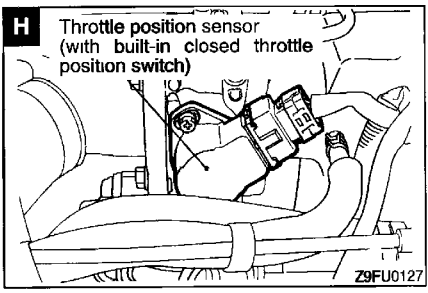
F


Fuel pump
check terminal
Z9FU0220

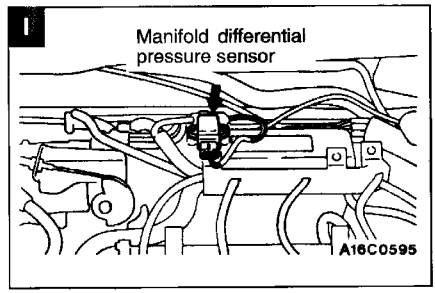
G


Idle air control motor
Y1FU0948

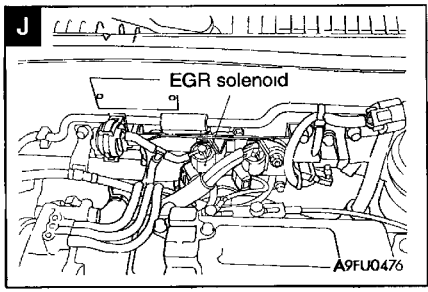
H


Throttle position sensor
(with built-in closed throttle
position switch)
Z9FU0127

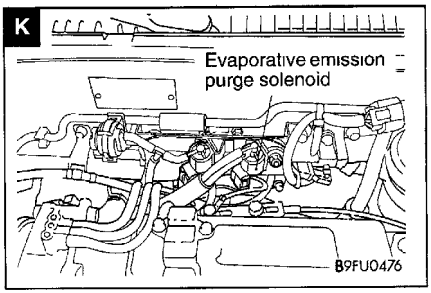
I


Manifold differential
pressure sensor
A16C0595

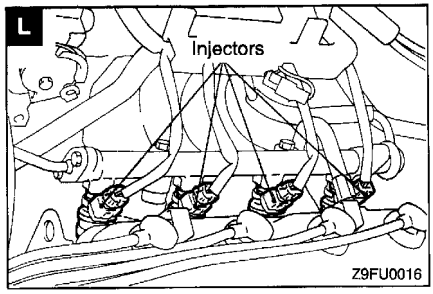
J


EGR solenoid
A9FU0476

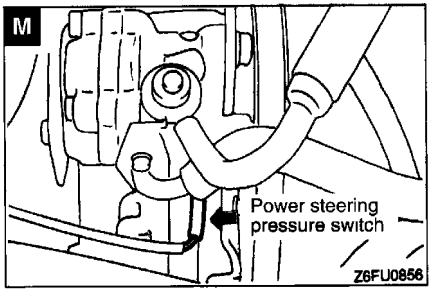
K


Evaporative emission purge solenoid
B9FU0476

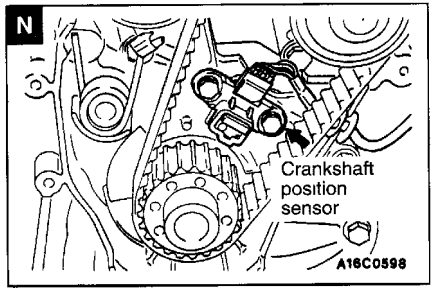
L


Injectors
Z9FU0016

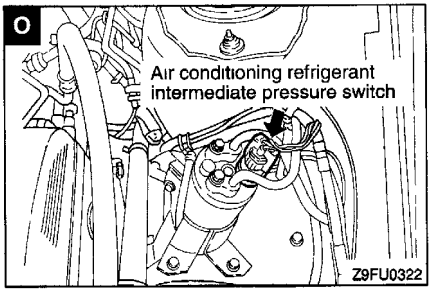
M


Power steering pressure switch
Z6FU0856

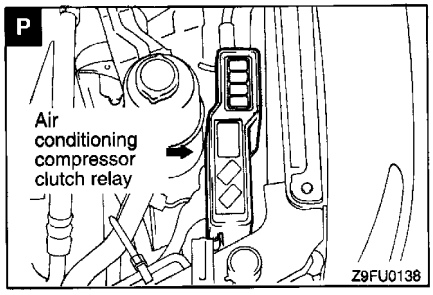
N


Crankshaft position sensor
A16C0598

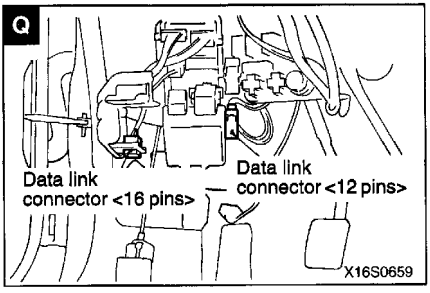
O


Air conditioning refrigerant intermediate pressure switch
Z9FU0322

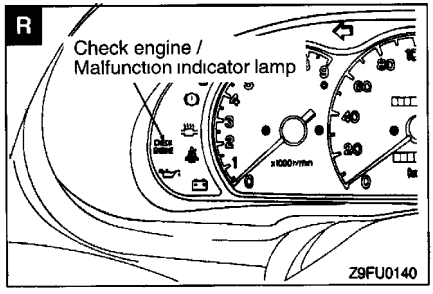
P


Air conditioning compressor clutch relay
Z9FU0138

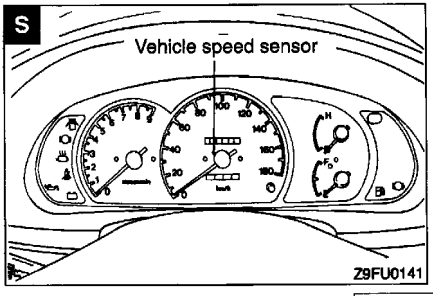
Q


Data link connector <16 pins>
Data link connector <12 pins>
X16S0659

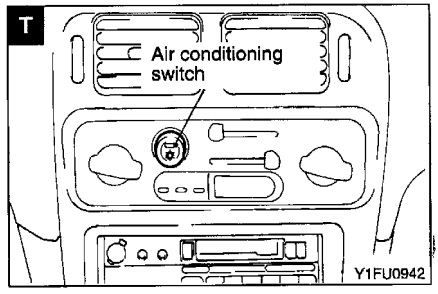
R


Check engine / Malfunction indicator lamp
Z9FU0140

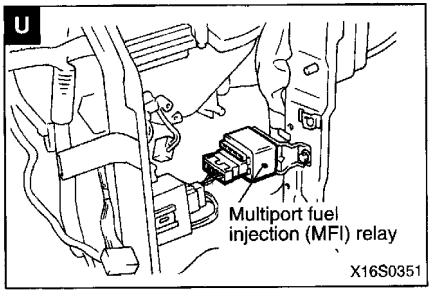
S


Vehicle speed sensor
Z9FU0141

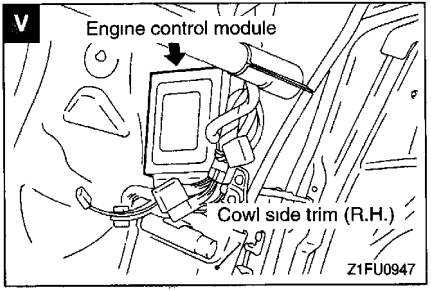
T


Air conditioning switch
Y1FU0942

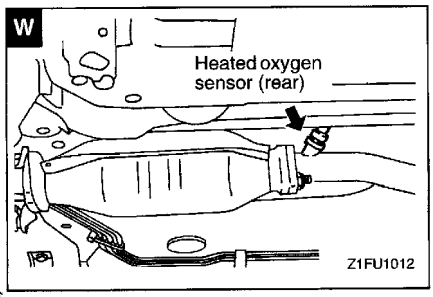
U


Multiport fuel injection (MFI) relay
X16S0351

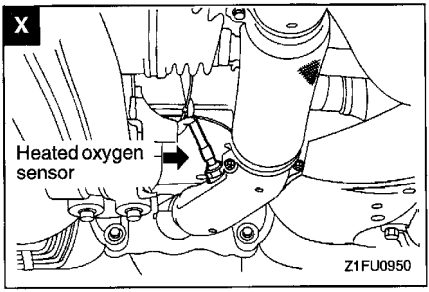
V


Engine control module
Cowl side trim (R.H.)
Z1FU0947

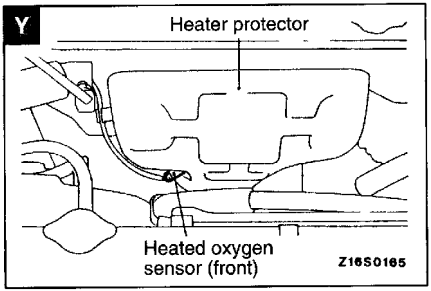
W


Heated oxygen sensor (rear)
Z1FU1012

X


Heated oxygen sensor
Z1FU0950

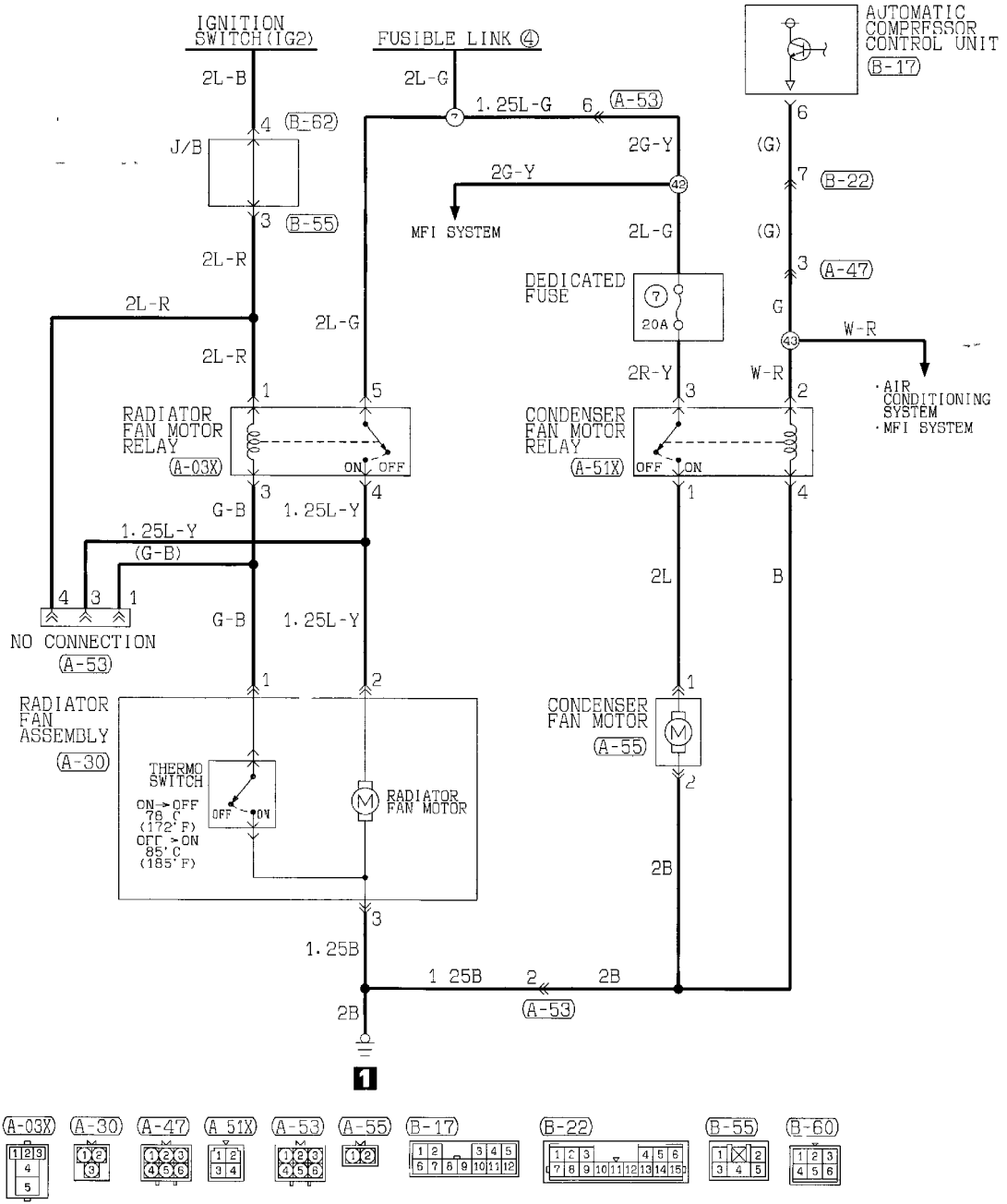
Y


Heater protector
Heated oxygen sensor (front)
Z16S0165

COOLING SYSTEM

110003562

<1.5L ENGINE (M/T–1993 MODELS)>



(A-03X) (A-30) (A-47) (A-51X) (A-53) (A-55) (B-17) (B-22) (B-55) (B-60)

<1.5L Engine (M/T–1993 MODELS)>

110003563

OPERATION

1. When auto compressor control unit outputs LO signal (0 V)

- When the engine coolant temperature goes up to 85°C (185°F), the thermo switch of radiator is activated.
- This energizes the radiator fan motor relay, causing the radiator fan to start rotating.

2. When auto compressor control unit outputs HI signal (Battery positive voltage)

The condenser fan motor relay is turned on by the power from the auto compressor control unit, and this runs the condenser fan.

TROUBLESHOOTING HINTS

1. Radiator fan does not operate.
   (1) Disconnect the radiator fan assembly connector, and ground the "1" terminal to run the fan.
   - Check thermo switch.

   (2) Even if "1" terminal is grounded, the fan does not run.
   - Check radiator fan motor relay.
   - Check radiator fan motor.
2. Neither radiator fan nor condenser fan operates.
   - Check fusible link No. 4.
   - Check to see if auto compressor control unit outputs a signal.
3. Condenser fan does not operate at all.
   - Check dedicated fuse No. 7.
   - Check condenser fan motor.
   - Check condenser fan motor relay.

NOTE
For troubleshooting of the auto compressor control unit, refer to GROUP 55 – Troubleshooting.

Auto Compressor Control Unit HI Signal Output Conditions

Ignition switch (IG_2)	ON	Remark The auto compressor control unit outputs a LO signal (0 V) if any one of the switches and sensors is deactivated.
Blower switch	ON	
Air conditioning switch	ON (ECONO or DRY)	
Air thermo sensor	ON [3.2°C (38°F) or higher] (DRY mode)	
	ON [8°C (46°F) or higher] (ECONO mode)	

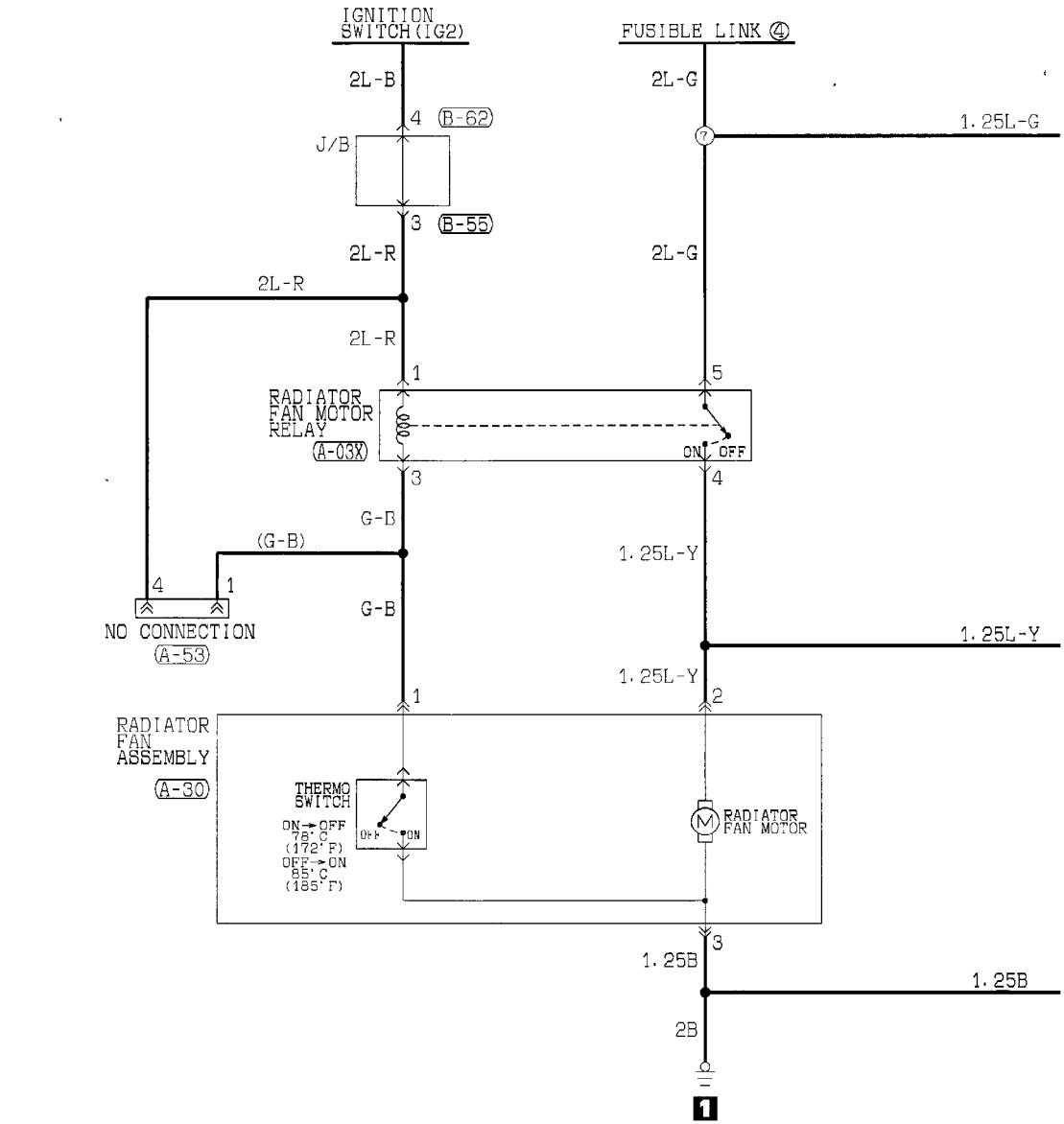
Fan Operating Conditions

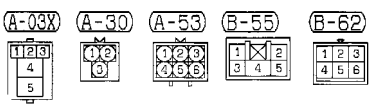
Auto compressor control unit output	Thermo switch position [ON with 85°C (185°F) or higher]	Radiator fan operating condition	Condenser fan operating condition
LO (0 V)	OFF	OFF	OFF
	ON	ON	OFF
HI (Battery positive voltage)	OFF	OFF	ON
	ON	ON	ON

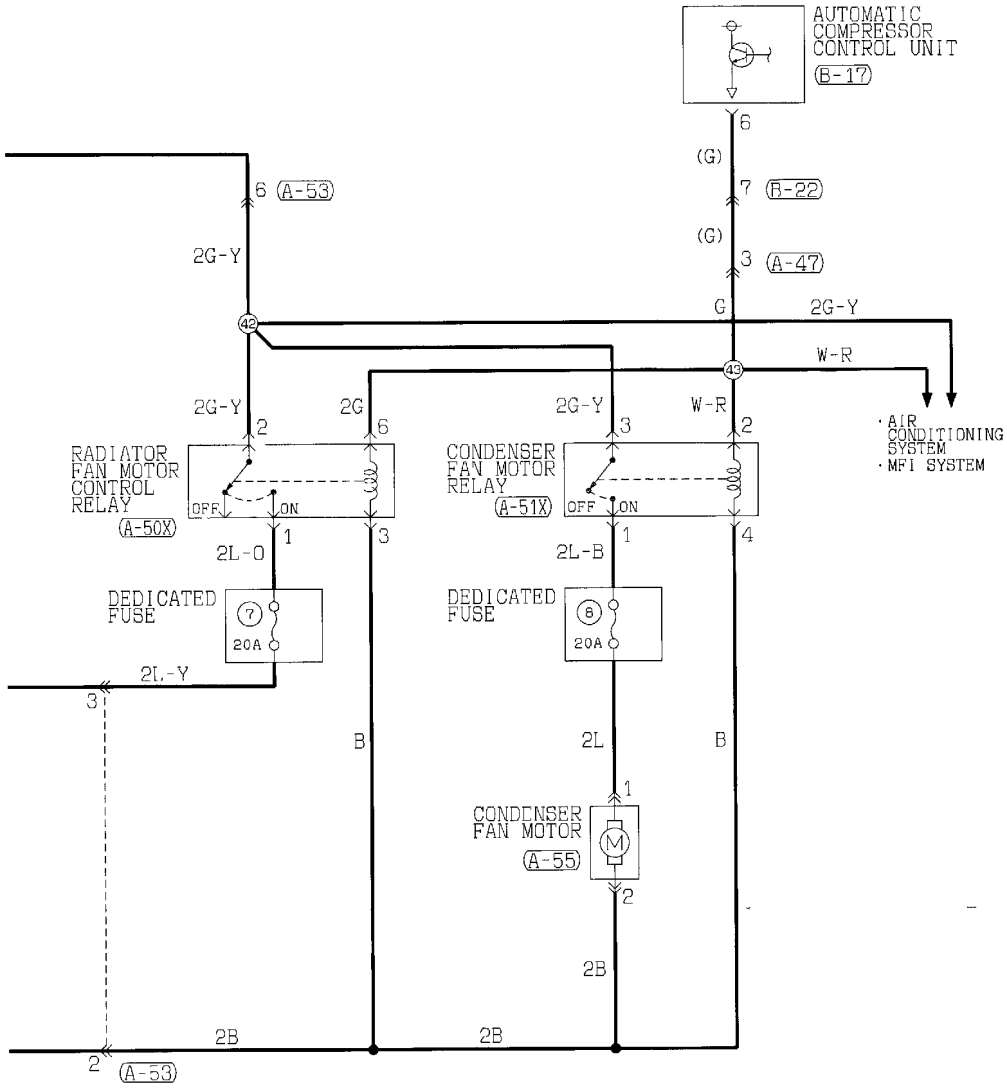
COOLING SYSTEM

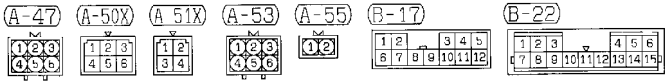
110003564

<1.5L ENGINE (A/T–1993 MODELS)>






AUTOMATIC COMPRESSOR CONTROL UNIT
B-17
6
(G)
7 B-22
(G)
3 A-47
G
2G-Y
W-R
43
42
6 A-53
2G-Y
2G-Y
2G
2G-Y
W-R
RADIATOR FAN MOTOR CONTROL RELAY
A-50X
OFF
ON
CONDENSER FAN MOTOR RELAY
A-51X
OFF
ON
· AIR CONDITIONING SYSTEM
· MFI SYSTEM
2L-O
2L-B
DEDICATED FUSE
7
20A
DEDICATED FUSE
8
20A
2L-Y
3
B
2L
B
CONDENSER FAN MOTOR
A-55
M
2B
2B
2B
2
A-53


A-47
A-50X
A 51X
A-53
A-55
B-17
B-22

<1.5L Engine (A/T–1993 Models)>

110003565

OPERATION

1. **When auto compressor control unit outputs LO signal (0 V)**

- When the engine coolant temperature goes up to 85°C (185°F), the thermo switch of radiator is activated.
- This energizes the radiator fan motor relay, causing the radiator fan to start rotating.

2. **When auto compressor control unit outputs HI signal (Battery positive voltage)**

The condenser fan motor relay and radiator fan motor control relay are turned on by the power from the auto compressor control unit, and this runs the condenser fan and radiator fan.

TROUBLESHOOTING HINTS

1. Radiator fan does not operate.
   (1) Disconnect the radiator fan assembly connector, and earth the "1" terminal to run the fan.
   - Check thermo switch.

   (2) Even if "1" terminal is earthed, the fan does not run.
   - Check radiator fan motor relay.
   - Check radiator fan motor.

2. Neither radiator fan nor condenser fan operates.
   - Check fusible link No. 4.
   - Check to see if auto compressor control unit outputs a signal.

3. Only the radiator fan does not operate at all.
   - Check dedicated fuse No. 7.
   - Check radiator fan motor control relay.

4. Condenser fan only does not operate at all.
   - Check dedicated fuse No. 8.
   - Check condenser fan motor.
   - Check condenser fan motor relay.

NOTE
For troubleshooting of the auto compressor control unit, refer to GROUP 55 – Troubleshooting.

Auto Compressor Control Unit HI Signal Output Conditions

Ignition switch (IG_2)	ON	Remark The auto compressor control unit outputs a LO signal (0 V) if any one of the switches and sensors is deactivated.
Blower switch	ON	
Air conditioning switch	ON (ECONO or DRY)	
Air thermo sensor	ON [3.2°C (38°F) or higher] (DRY mode)	
	ON [8°C (46°F) or higher] (ECONO mode)	

Fan Operating Conditions

Auto compressor control unit output	Thermo switch position [ON with 85°C (185°F) or higher]	Radiator fan operating condition	Condenser fan operating condition
LO (0 V)	OFF	OFF	OFF
	ON	ON	OFF
HI (Battery positive voltage)	OFF	ON	ON
	ON	ON	ON

<1.5L Engine (From 1994 Models)>

110003566

OPERATION

1. **When auto compressor control unit outputs LO signal (0 V)**

- When the engine coolant temperature goes up to 85°C (185°F), the thermo switch of radiator is activated.
- This energizes the radiator fan motor relay, causing the radiator fan to start rotating.

2. **When auto compressor control unit outputs HI signal (Battery positive voltage)**

The condenser fan motor relay and radiator fan motor control relay are turned on by the power from the auto compressor control unit, and this runs the condenser fan and radiator fan.

TROUBLESHOOTING HINTS

1. Radiator fan does not operate.
   (1) Disconnect the radiator fan assembly connector, and earth the "1" terminal to run the fan.
      - Check thermo switch.
   (2) Even if "1" terminal is earthed, the fan does not run.
      - Check radiator fan motor relay.
      - Check radiator fan motor.
2. Neither radiator fan nor condenser fan operates.
   - Check fusible link No. 4.
   - Check to see if auto compressor control unit outputs a signal.
3. Only the radiator fan does not operate at all.
   - Check radiator fan motor control relay.
4. Condenser fan only does not operate at all.
   - Check dedicated fuse No. 7.
   - Check condenser fan motor.
   - Check condenser fan motor relay.

NOTE
For troubleshooting of the auto compressor control unit, refer to GROUP 55 – Troubleshooting.

Auto Compressor Control Unit HI Signal Output Conditions

Ignition switch (IG_2)	ON	Remark The auto compressor control unit outputs a LO signal (0 V) if any one of the switches and sensors is deactivated.
Blower switch	ON	
Air conditioning switch	ON (ECONO or DRY)	
Air thermo sensor	ON [3.2°C (38°F) or higher] (DRY mode)	
	ON [8°C (46°F) or higher] (ECONO mode)	

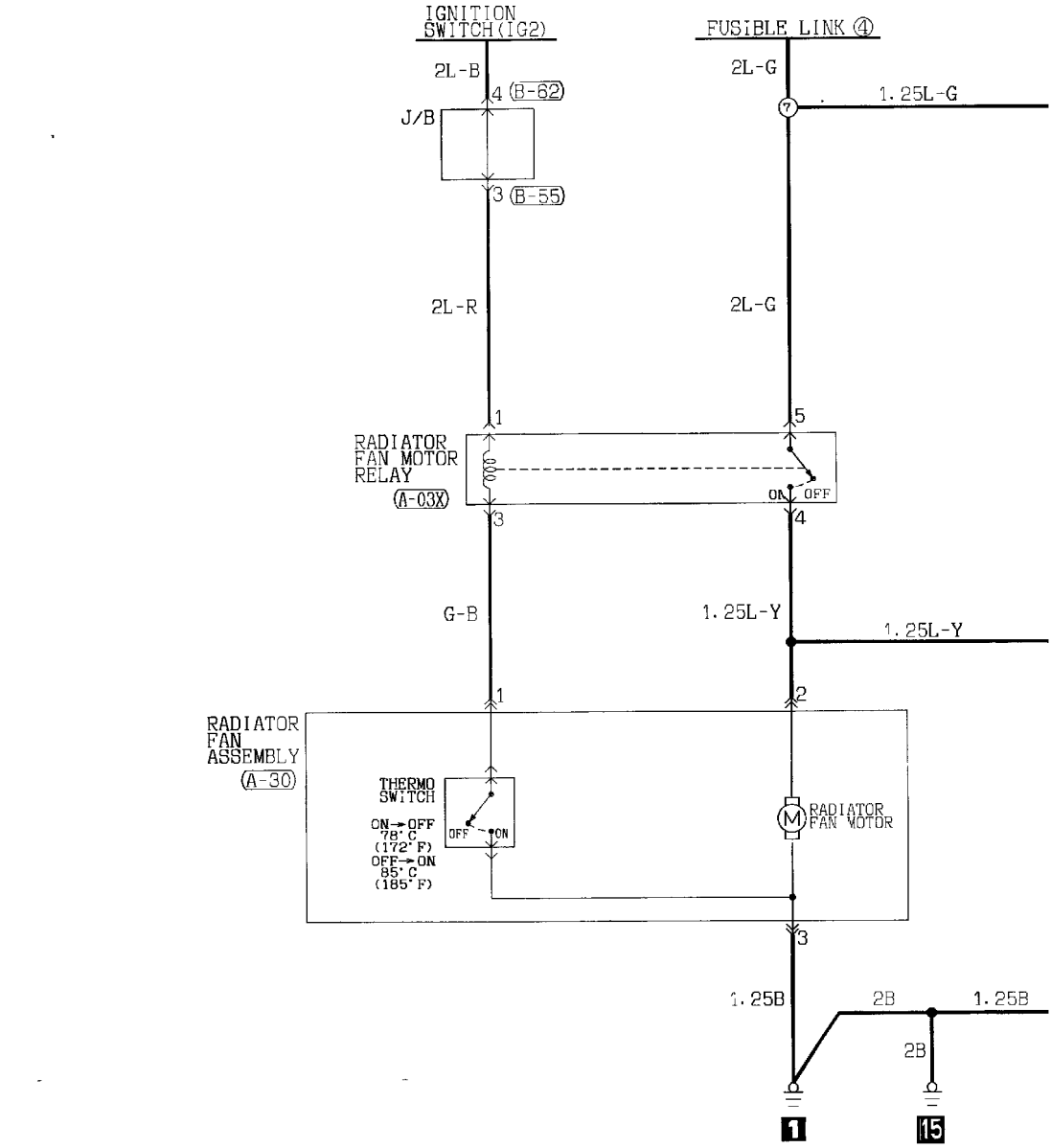
Fan Operating Conditions

Auto compressor control unit output	Thermo switch position [ON with 85°C (185°F) or higher]	Radiator fan operating condition	Condenser fan operating condition
LO (0 V)	OFF	OFF	OFF
	ON	ON	OFF
HI (Battery positive voltage)	OFF	ON	ON
	ON	ON	ON

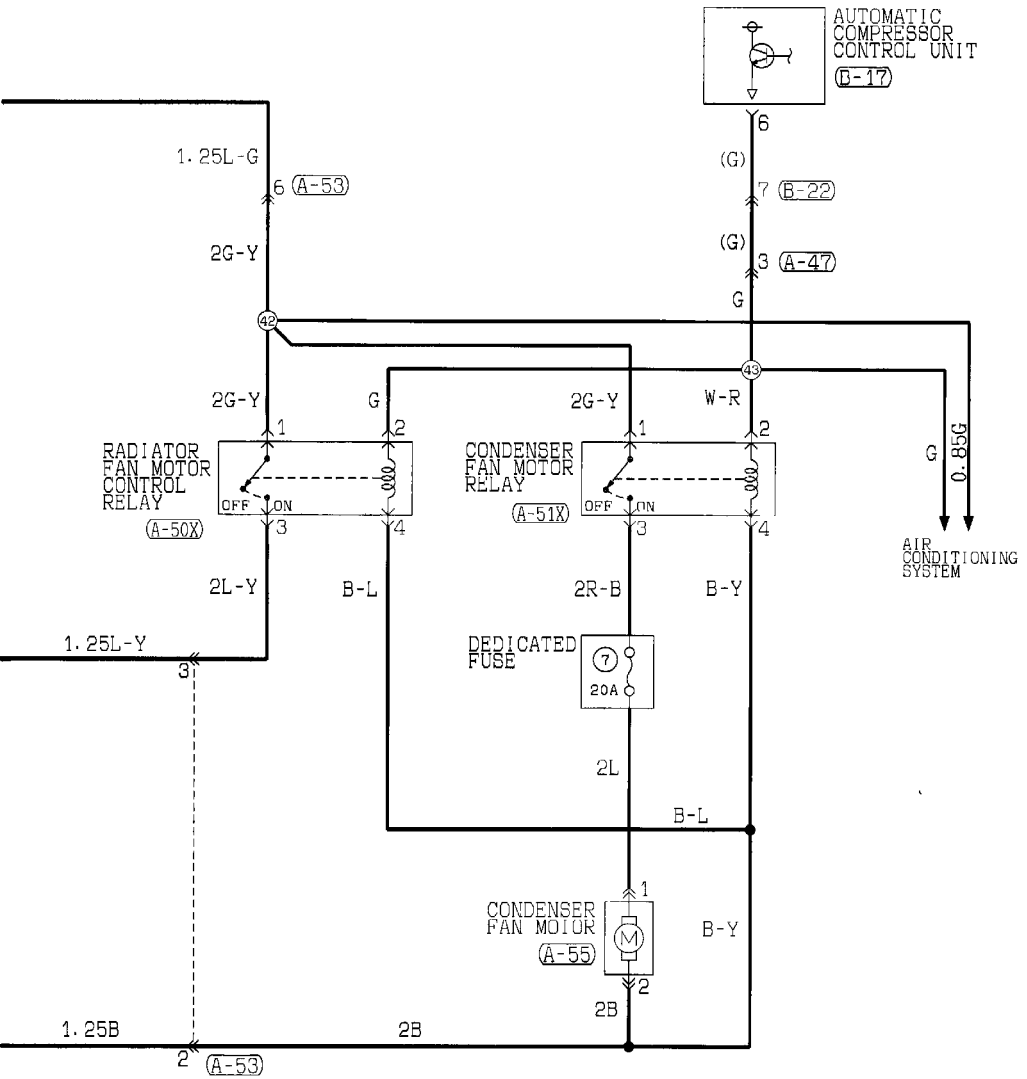
COOLING SYSTEM

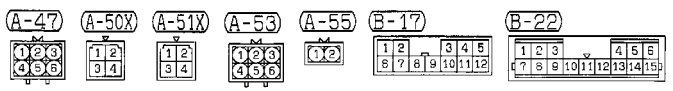
110003567

<1.5L ENGINE (FROM 1994 MODELS)>



(A-03X) (A-30) (B-55) (B-62)

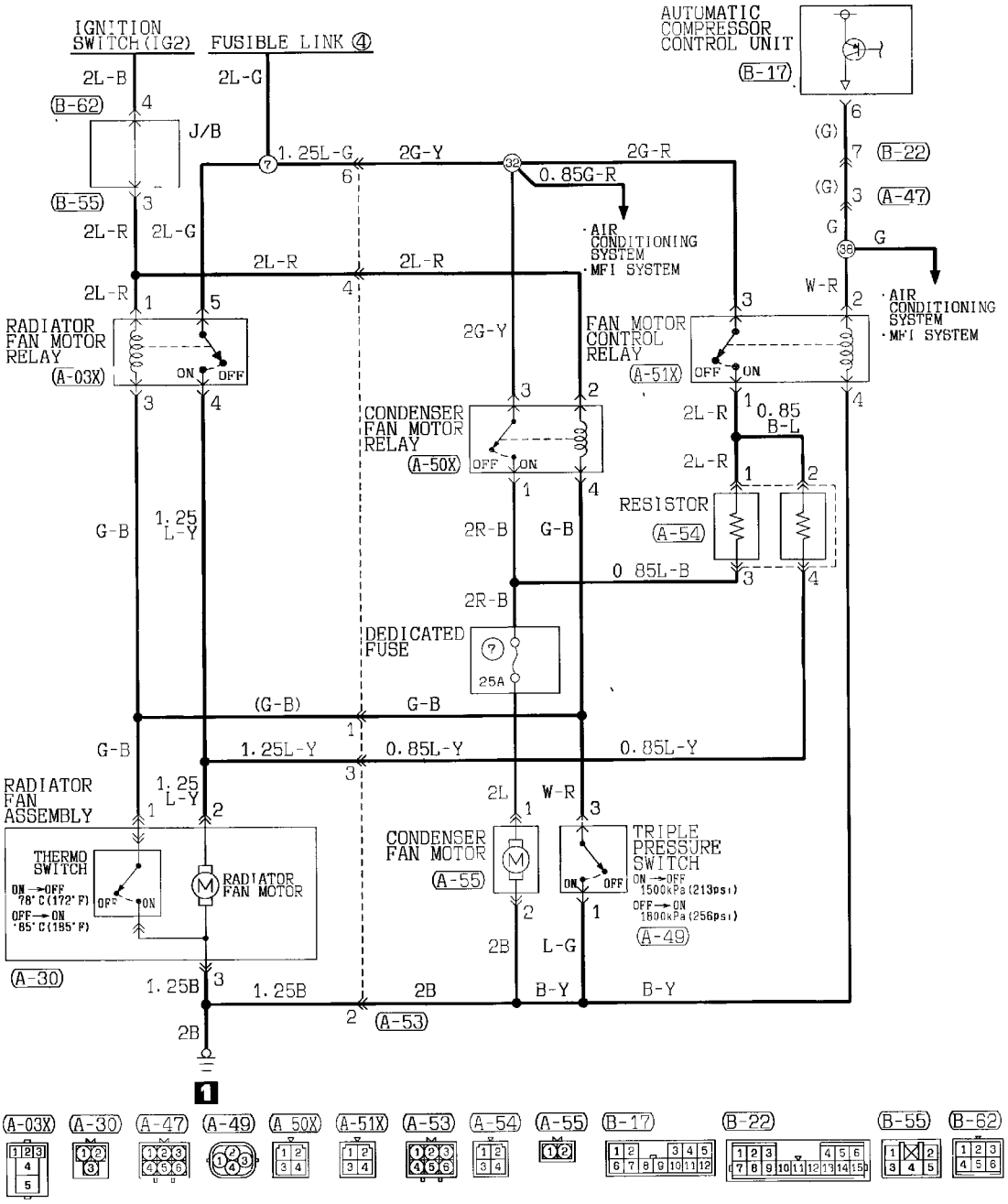

AUTOMATIC COMPRESSOR CONTROL UNIT
B-17
6
(G)
7 B-22
(G)
3 A-47
G
1.25L-G
6 A-53
2G-Y
42
43
2G-Y
G
2G-Y
W-R
G
0.85G
RADIATOR FAN MOTOR CONTROL RELAY
A-50X
OFF
ON
CONDENSER FAN MOTOR RELAY
A-51X
AIR CONDITIONING SYSTEM
2L-Y
B-L
2R-B
B-Y
1.25L-Y
DEDICATED FUSE
7
20A
2L
B-L
CONDENSER FAN MOTOR
A-55
B-Y
2B
1.25B
2B
2 A-53


A-47
A-50X
A-51X
A-53
A-55
B-17
B-22

COOLING SYSTEM

110003568

<1.8L ENGINE (1993 MODELS)>



<1.8L Engine (1993 Models)>

110003569

OPERATION

1. When auto compressor control unit outputs LO signal (0 V)

- When the engine coolant temperature reaches 85°C (185°F), the thermo switch of radiator is activated.
- This energizes the radiator fan motor relay and condenser fan motor relay causing the radiator fan and condenser fan to rotate at high speed.

2. When auto compressor control unit outputs HI signal (Battery positive voltage)

- The fan motor control relay is turned on by the power from the auto compressor control unit, and this is transmitted through the resistor to nonconditionally run the condenser fan and radiator fan at low speed.
- At high temperatures in summer, etc, when the refrigerant line pressure on the medium-pressure side becomes high to turn on the triple pressure switch (medium-pressure) or the temperature of the engine coolant rises to 85°C (185°F) and the thermo switch is turned on, the condenser fan motor relay becomes also turned on. As the result, the condenser fan runs also turned on. As the result, the condenser fan runs also at high speed together with the radiator fan.

TROUBLESHOOTING HINTS

1. Radiator fan does not operate.
   (1) Disconnect the radiator fan assembly connector, and earth the "1" terminal to run the fan.
   - Check thermo switch.

   (2) Even if "1" terminal is earthed, the fan does not run.
   - Check radiator fan motor relay.
   - Check radiator fan motor.
2. Neither radiator fan nor condenser fan operates.
   - Check fusible link No. 4.
3. Condenser fan does not operate at all.
   - Check dedicated fuse No. 7.
   - Check condenser fan motor.
4. Only the radiator fan does not rotate at low speed.
   - Check fan motor control relay.
5. Only condenser fan does not rotate at high speed.
   - Check fan motor control relay.
6. Radiator fan and condenser fan do not run at low speed alone.
   - Check resistor.

NOTE
For troubleshooting of the auto compressor control unit, refer to GROUP 55 – Troubleshooting.

Auto Compressor Control Unit HI Signal Output Conditions

Ignition switch (IG_2)	ON	Remark The auto compressor control unit outputs a LO signal (0 V) when any one of the switches and sensors is deactivated.
Blower switch	ON	
Air conditioning switch	ON (ECONO or DRY)	
Air thermo sensor	ON [3.2°C (38°F) or higher] (DRY mode)	
	ON [8°C (46°F) or higher] (ECONO mode)	

Fan Operating Conditions

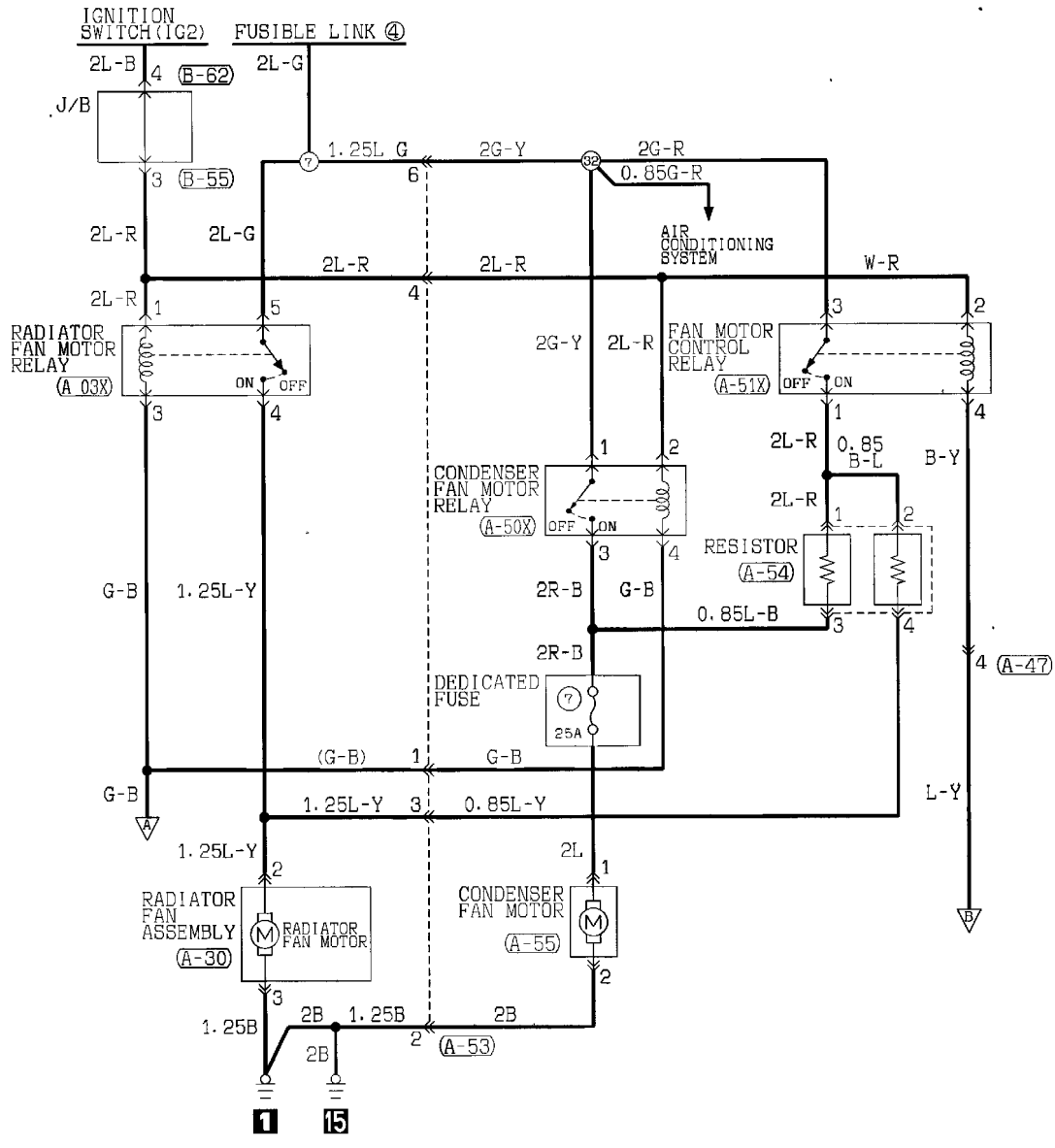
Auto compressor control unit output	Triple pressure switch position [ON with 1800 kPa (256 psi) or higher]	Thermo switch position [ON with 85°C (185°F) or higher]	Radiator fan operating condition	Condenser fan operating condition
LO (0 V)	OFF	OFF	OFF	OFF
	OFF	ON	HIGH	HIGH
HI (Battery positive voltage)	OFF	OFF	LOW	LOW
	OFF	ON	HIGH	HIGH
	ON	OFF	HIGH	HIGH
	ON	ON	HIGH	HIGH

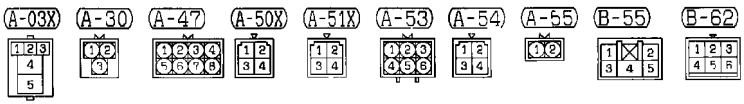
TSB Revision

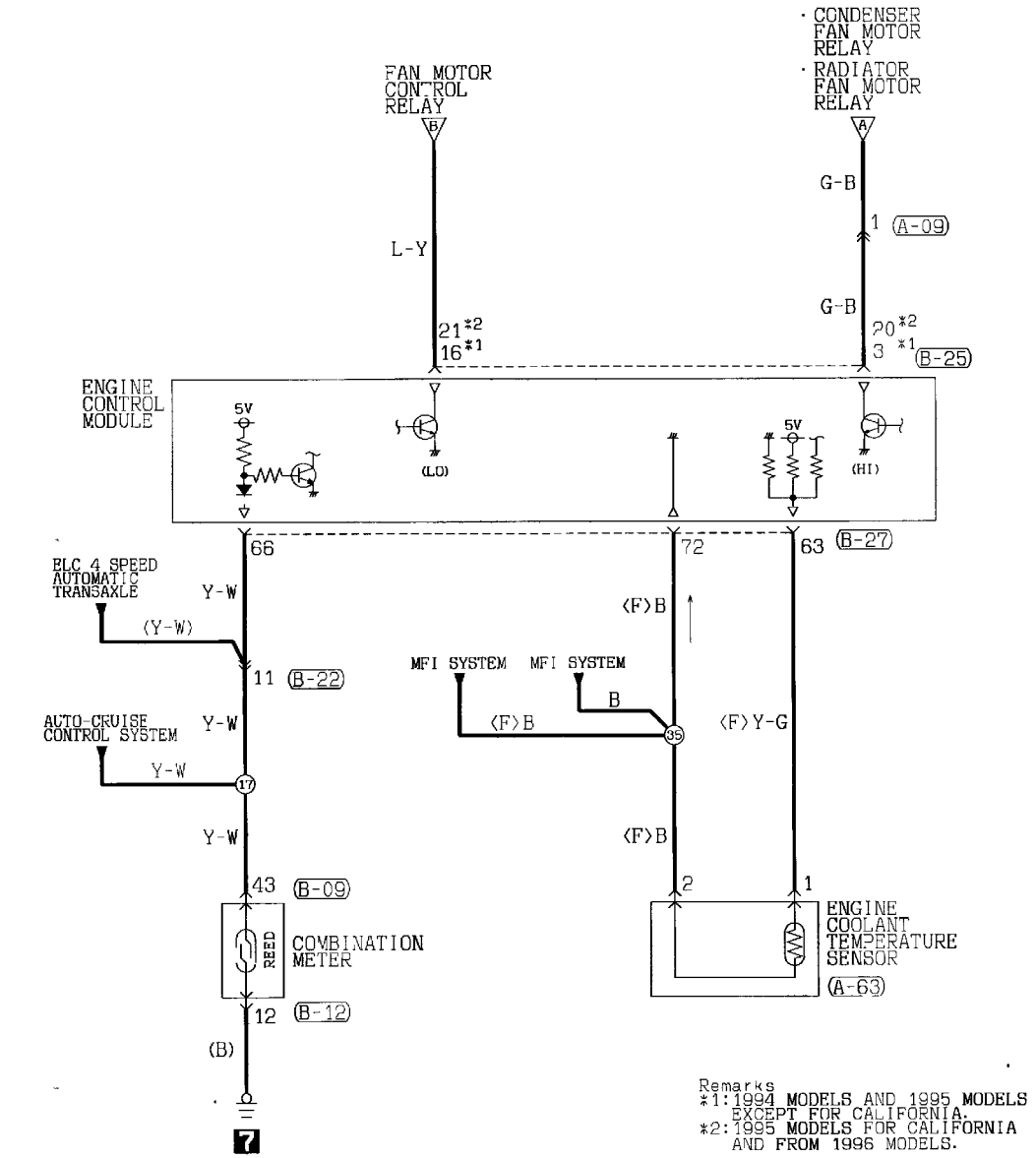
COOLING SYSTEM

110003570

<1.8L ENGINE (FROM 1994 MODELS)>

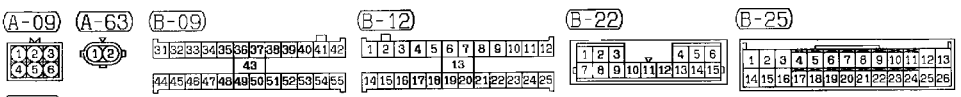




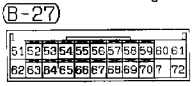


Remarks
*1: 1994 MODELS AND 1995 MODELS EXCEPT FOR CALIFORNIA.
*2: 1995 MODELS FOR CALIFORNIA AND FROM 1996 MODELS.

(A-09) (A-63) (B-09) (B-12) (B-22) (B-25)



(B-27)



HE06M06AB

TSB Revision

<1.8L Engine (From 1994 Models)>

110003571

OPERATION

- The engine control module controls the power transistors (high speed and low speed) in the module to provide radiator fan motor and condenser fan motor rotation controls in accordance with the engine coolant temperature and vehicle speed.
- When the engine control module turns on the power transistor in the module, the current flows to the engine control module through the fan motor relay coil.
  If the current flows to the fan motor relay coil, the switch of the relay turns on to supply the motor driving power. This will cause the current to flow from the battery to the radiator fan motor and the condenser fan motor through the respective relay switches.
- When both air conditioning switch and refrigerant medium pressure switch are ON, the radiator fan motor and the condenser fan motor rotate at high speeds regardless of the vehicle speed and the engine coolant temperature.

TROUBLESHOOTING HINTS

1. Radiator fan does not operate.
   - Check radiator fan motor relay.
   - Check radiator fan motor.
2. Neither radiator fan nor condenser fan operates.
   - Check fusible link No. 4.
3. Condenser fan does not operate at all.
   - Check dedicated fuse No. 7.
   - Check condenser fan motor relay.
   - Check condenser fan motor.
4. Radiator fan and condenser fan do not run at low speed alone.
   - Check resistor.
   - Check fan motor control relay.
   - Check the engine control module. (Refer to GROUP 13A – Troubleshooting.)
5. Radiator fan and condenser fan do not operate in the high speed mode, but operate otherwise.
   - Check the radiator fan motor relay and condenser fan motor relay.
   - Check the engine control module. (Refer to GROUP 13A – Troubleshooting.)

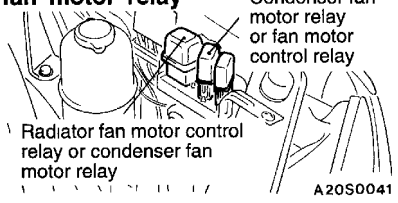
Fan Operating Mode

Air conditioning switch conditions	Triple pressure switch conditions <Turn to ON at 1800 kPa (256 psi) or more>	Vehicle speed sensor (mph)	Engine coolant temperature sensor °C (°F)	Radiator fan motor operation condition	Condenser fan motor operation condition
OFF	OFF	28 or less	95 (203) or less	OFF	OFF
			95 (203)–105 (221)	LOW	LOW
			105 (221) or more	HIGH	HIGH
		28 – 50	90 (194) or less	OFF	OFF
			90 (194) –105 (221)	LOW	LOW
			105 (221) or more	HIGH	HIGH
		50 or more	105 (221) or less	OFF	OFF
			105 (221) or more	HIGH	HIGH
ON	OFF	–	105 (221) or less	LOW	LOW
			105 (221) or more	HIGH	HIGH
	ON	–	–	HIGH	HIGH

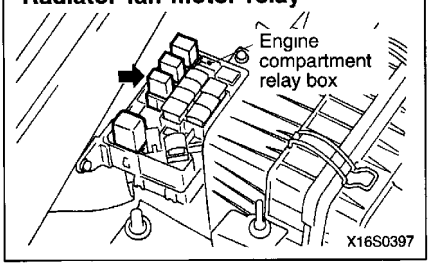
COMPONENT LOCATION

110003572

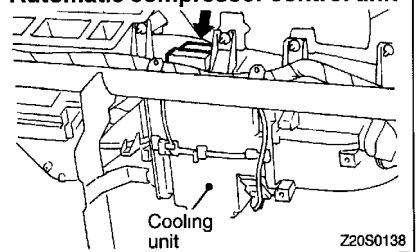
Radiator fan motor control relay, fan motor control relay and condenser fan motor relay



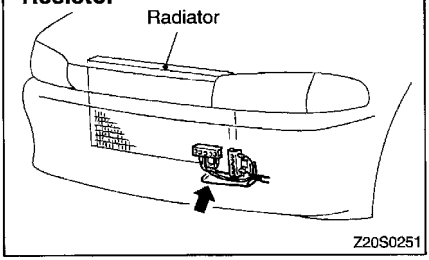
Radiator fan motor relay



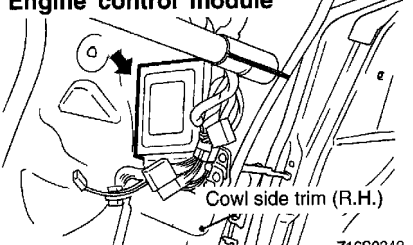
Automatic compressor control unit



Resistor



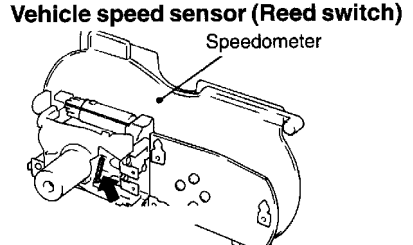
Engine control module



Engine coolant temperature sensor

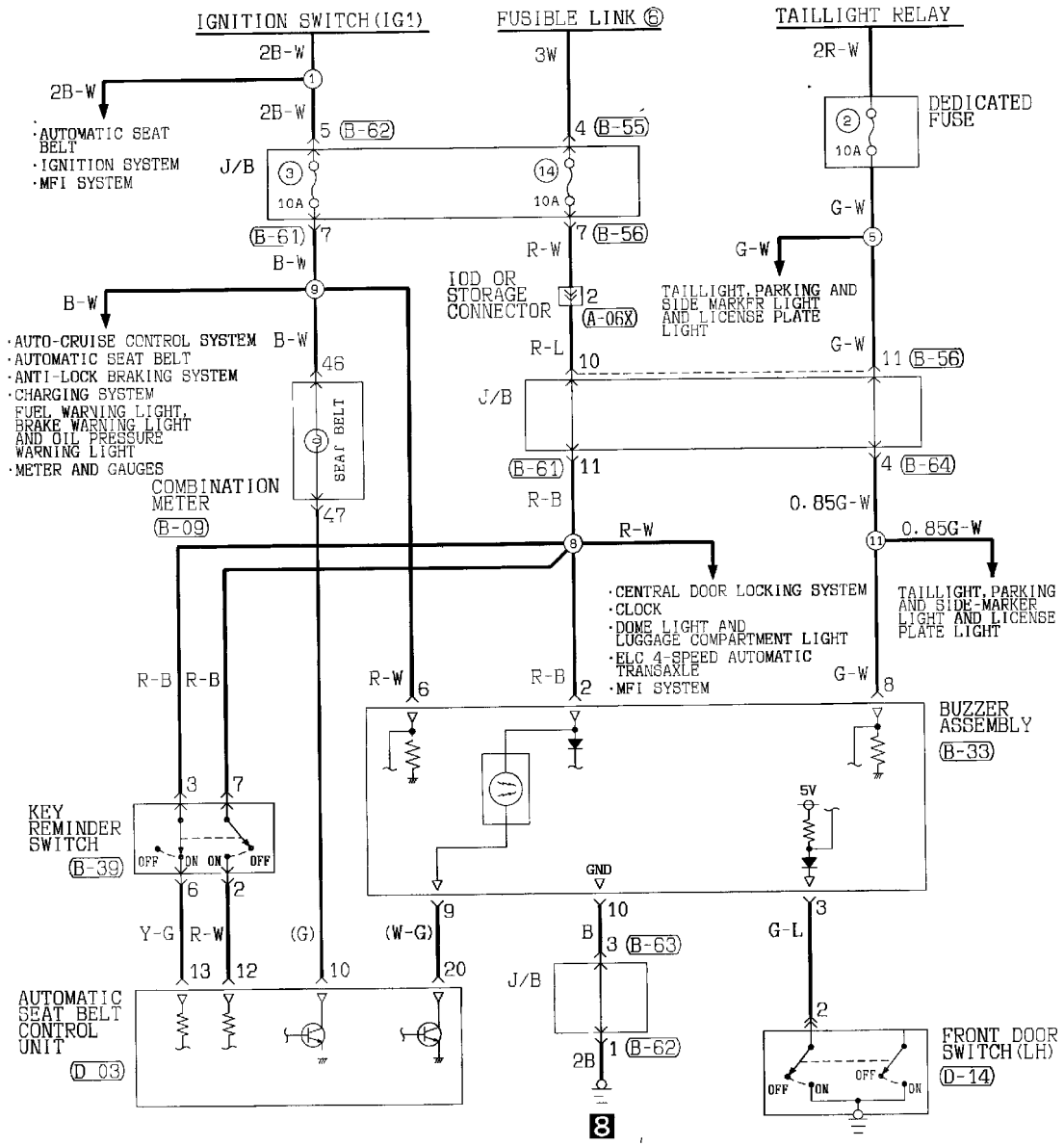


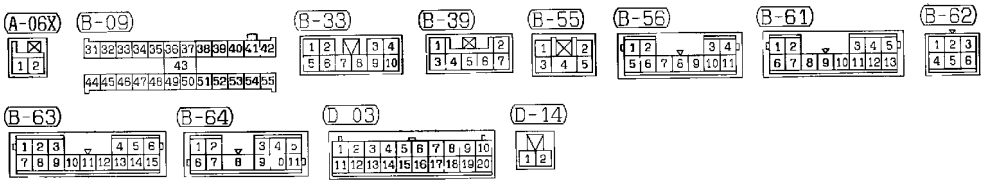
Vehicle speed sensor (Reed switch)



BUZZER <1993 MODELS>

110003573



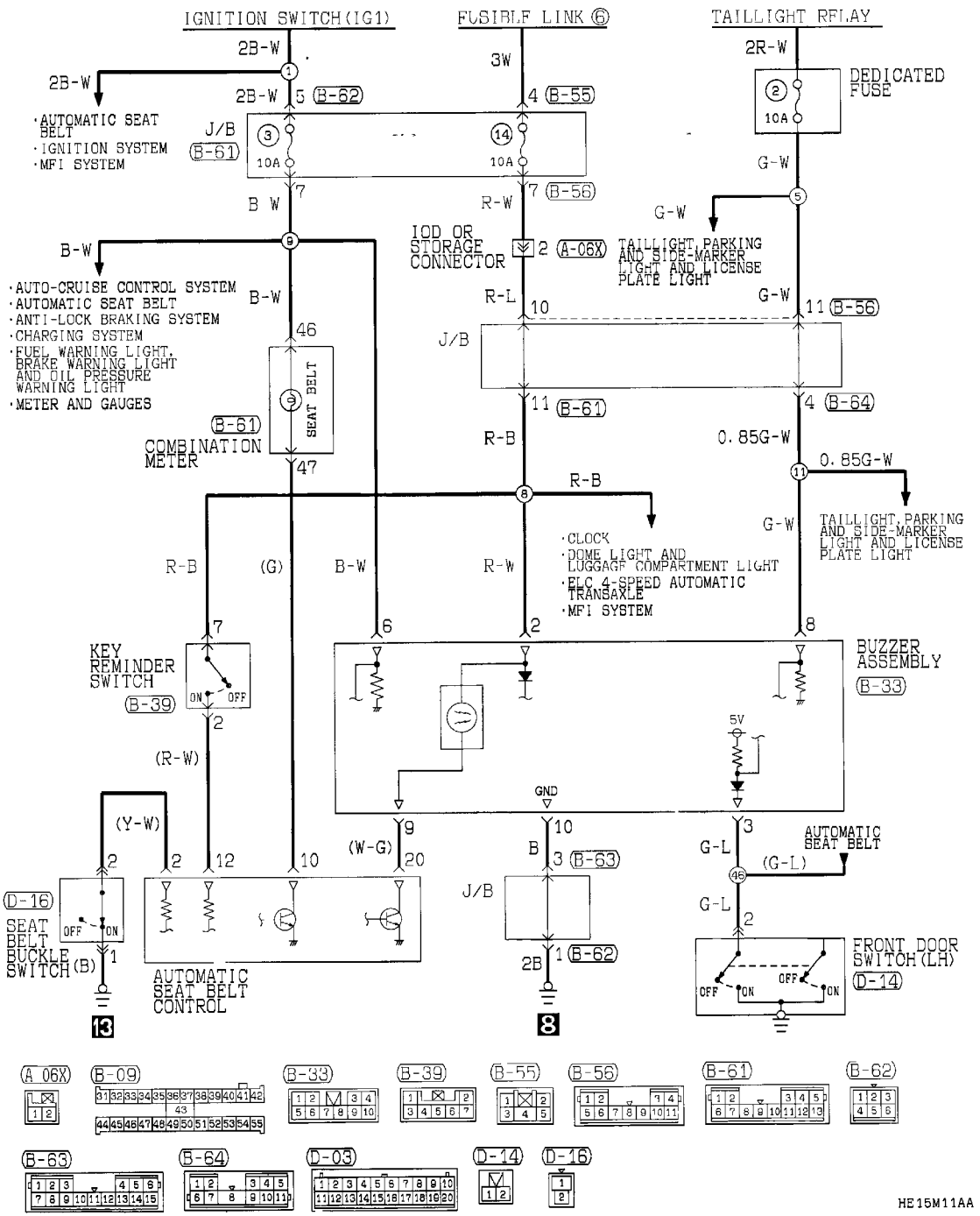


HE15M10AA

TSB Revision

BUZZER <1994 MODELS>

110003574



HE15M11AA

TSB Revision

<Up to 1994 Models>

110003575

OPERATION

Ignition switch position	Buckle switch position	Key reminder switch position	Front door switch (LH) position	Lighting switch position	Key reminder warning buzzer	Lighting monitor buzzer
LOCK or ACC	–	ON	ON	OFF	ON	–
–	–	–	ON	ON	–	ON
LOCK or ACC	–	ON	ON	ON	ON	–

TROUBLESHOOTING HINTS

Key Reminder Warning

Key reminder buzzer does not sound.
(1) Lighting monitor buzzer sounds.
- Check key reminder switch.

(2) Lighting monitor buzzer also does not sound. (except taillight which comes on)
- Check buzzer.
- Check door switch.

NOTE
For troubleshooting of the seat belt warning, refer to GROUP 52A – Troubleshooting.

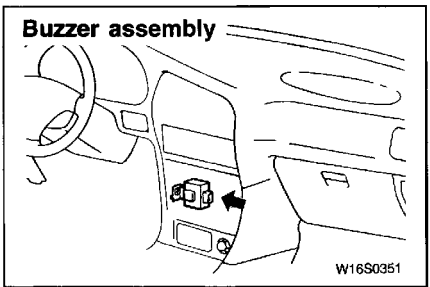
Seat Belt Warning

1. Seat belt warning buzzer does not sound.
   (1) Seat belt warning light goes on.
   - Check buckle switch.

   (2) Seat belt warning light does not go on, and key reminder buzzer does not sound.
   - Check buzzer.
   - Check key reminder switch.
2. Buzzer fails to stop sounding after driver's seat belt is fastened.
   - Check buckle switch.
3. Seat belt warning light does not go on, but buzzer sounds.
   - Check bulb.

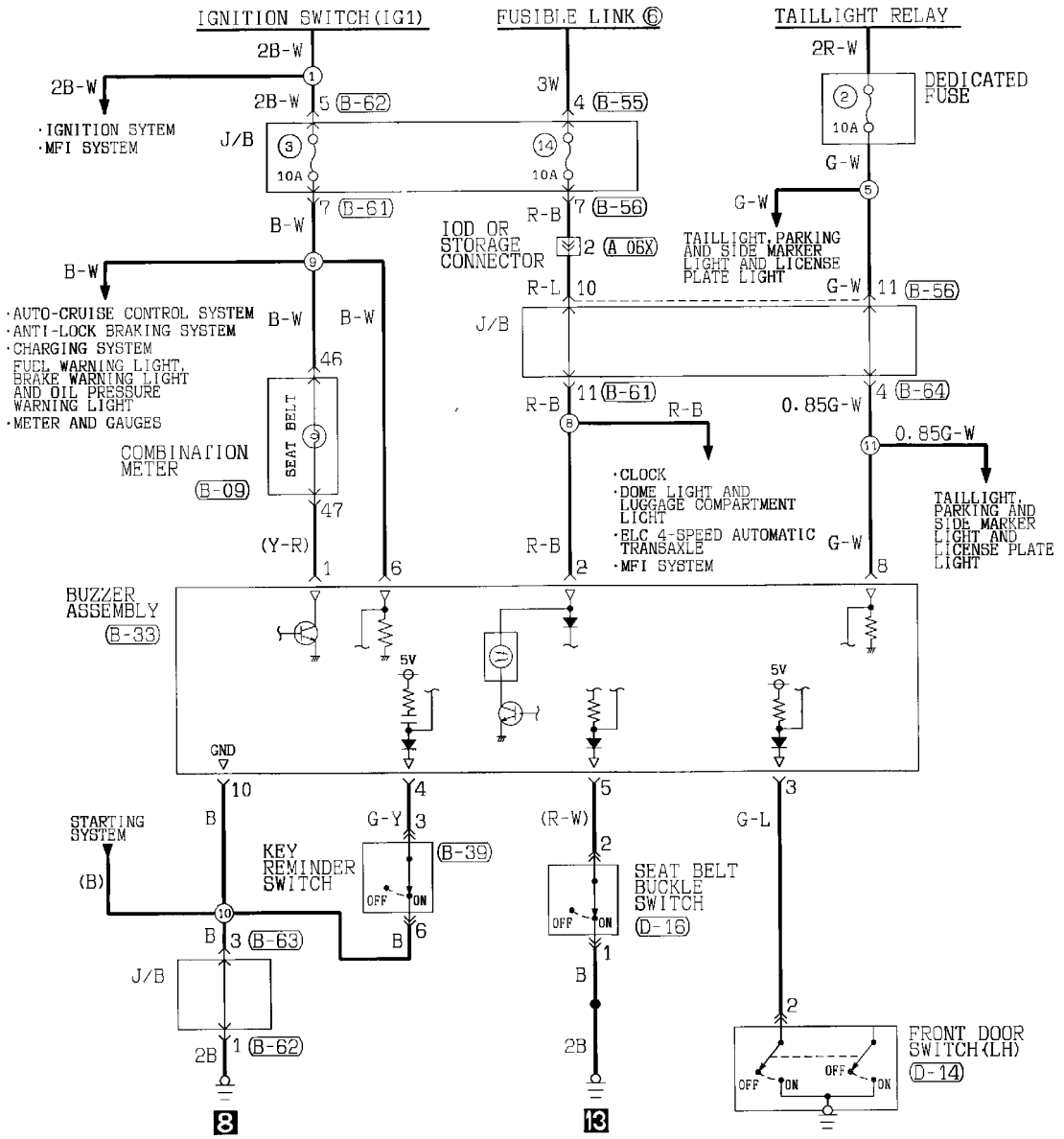
COMPONENT LOCATION

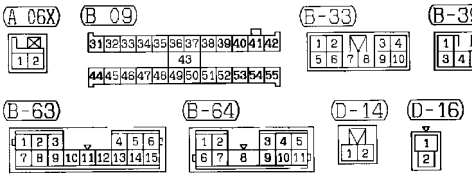
110003793



BUZZER <FROM 1995 MODELS>

110003576





HE15M12AA

TSB Revision

<From 1995 Models>

110003577

OPERATION

Ignition switch position	Buckle switch position	Key reminder switch position	Front door switch (LH) position	Lighting switch position	Key reminder warning buzzer	Lighting monitor buzzer	Seat belt warning light	Seat belt warning buzzer
LOCK or ACC	–	OFF	ON	OFF	ON	–	–	–
–	–	ON	ON	ON	–	ON	–	–
LOCK or ACC	–	OFF	ON	ON	ON	–	–	–
ON	ON	OFF	–	–	–	–	ON	ON
ON	OFF	OFF	–	–	–	–	ON	–

TROUBLESHOOTING HINTS

Key Reminder Warning

Key reminder buzzer does not sound.
(1) Lighting monitor buzzer sounds.
- Check key reminder switch.

(2) Lighting monitor buzzer also does not sound. (except taillight which comes on)
- Check buzzer.
- Check door switch.

Seat Belt Warning

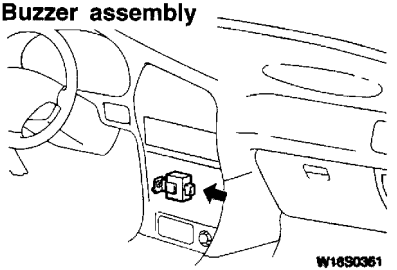
1. Seat belt warning buzzer does not sound.
   (1) Seat belt warning light goes on.
   - Check buckle switch.

   (2) Seat belt warning light does not go on, and key reminder buzzer does not sound.
   - Check buzzer.
   - Check key reminder switch.
2. Buzzer fails to stop sounding after driver's seat belt is fastened.
   - Check buckle switch.
3. Seat belt warning light does not go on, but buzzer sounds.
   - Check bulb.

COMPONENT LOCATION

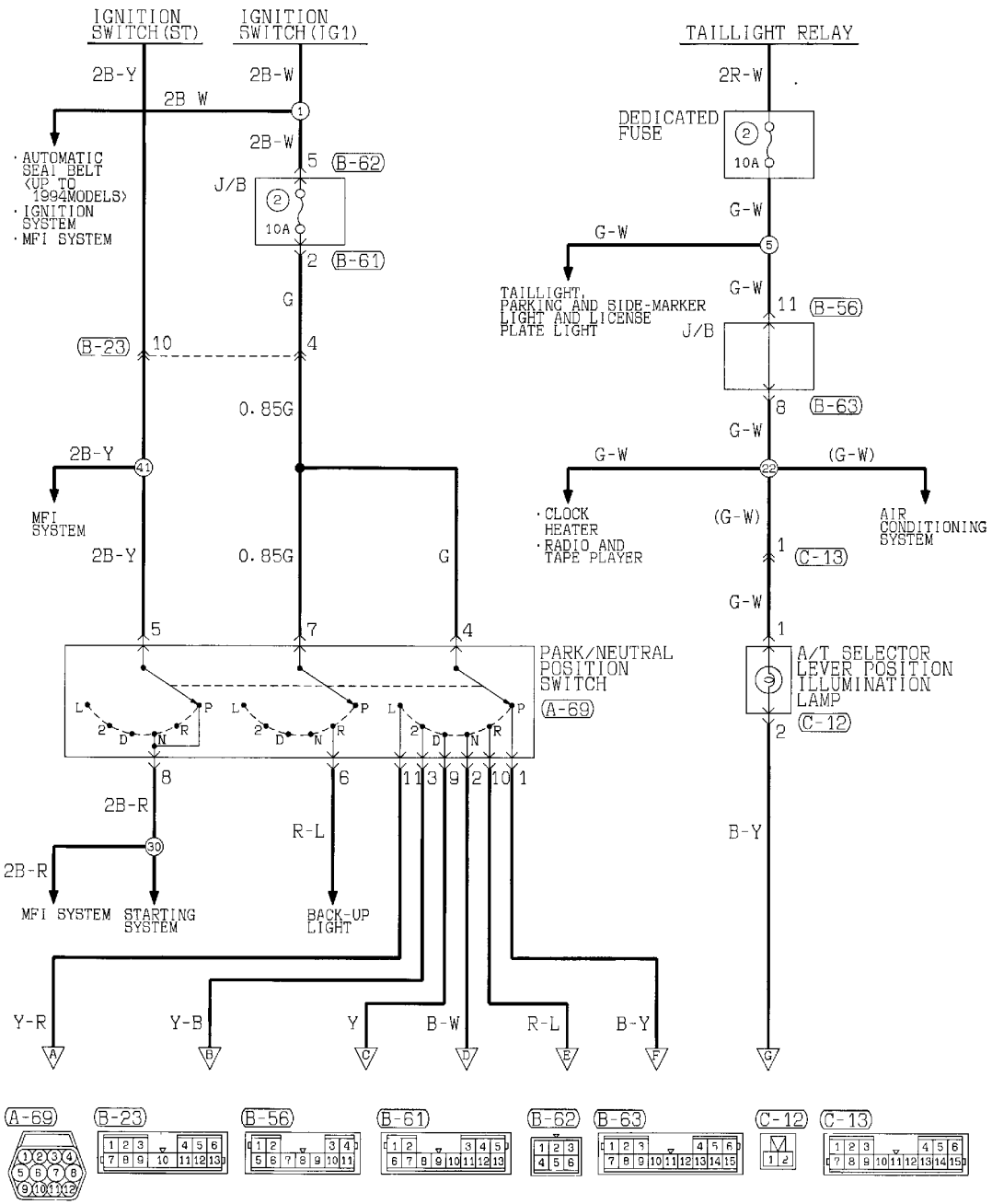
110003794

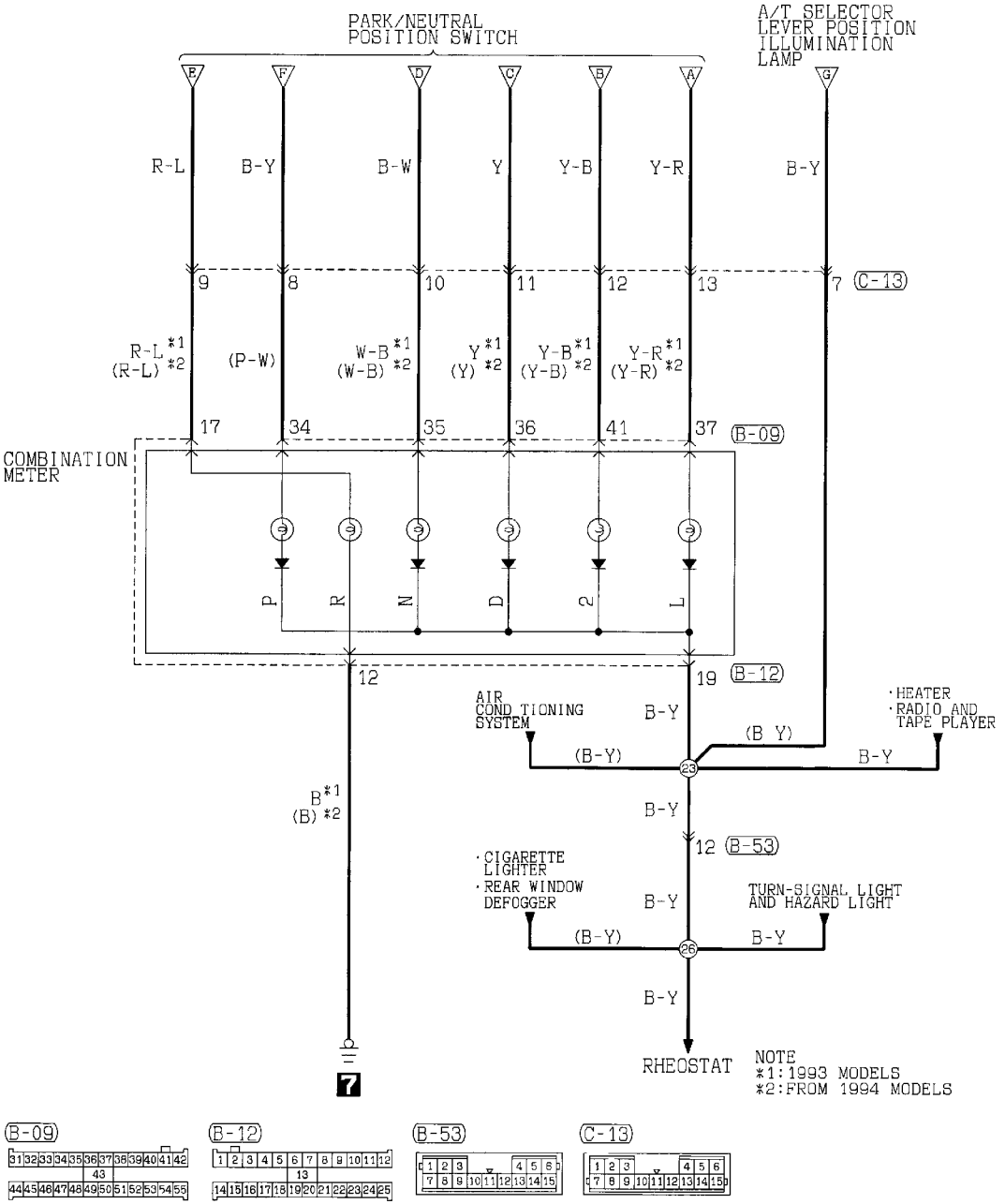
Buzzer assembly



3-SPEED AUTOMATIC TRANSAXLE

110003578

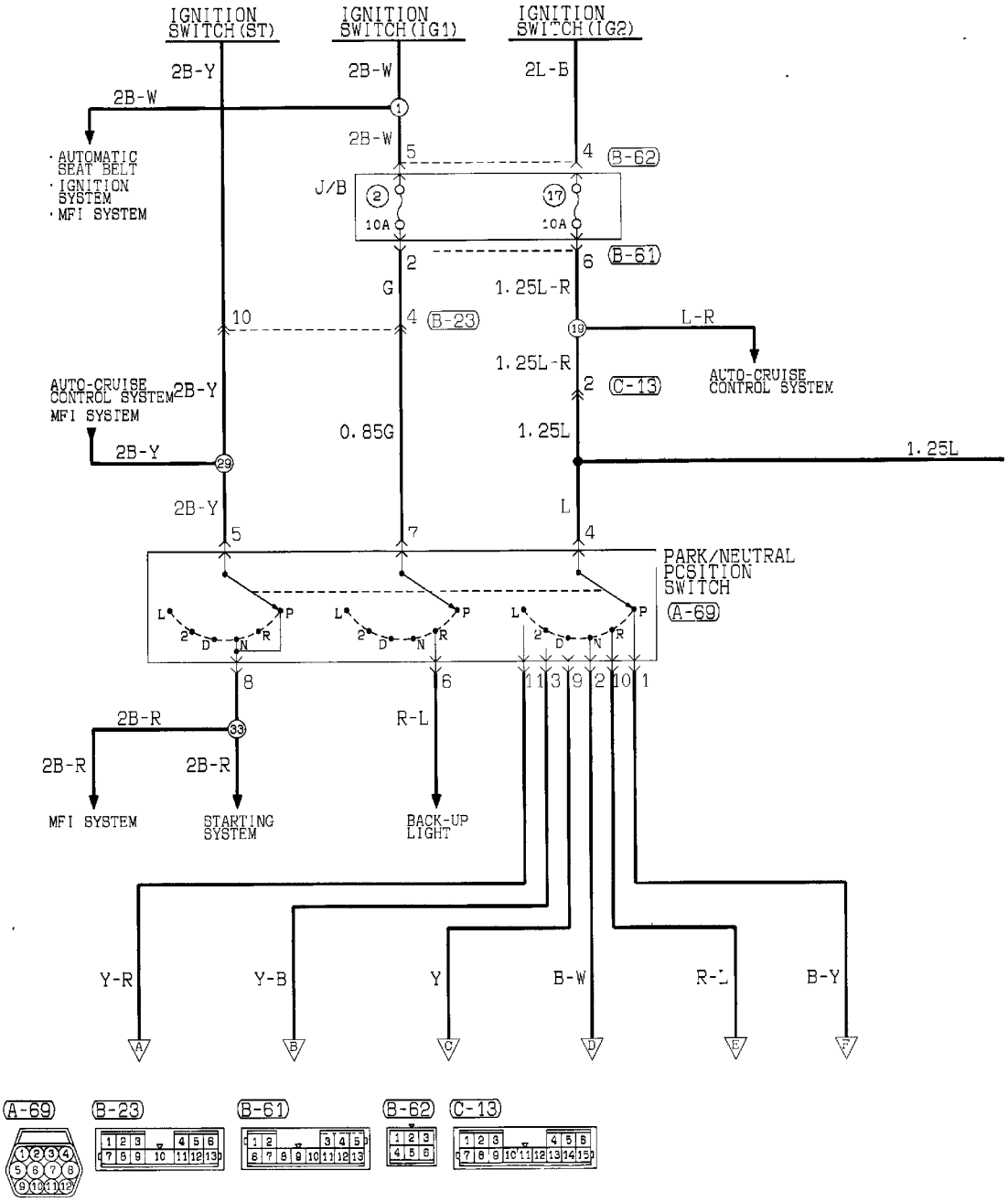


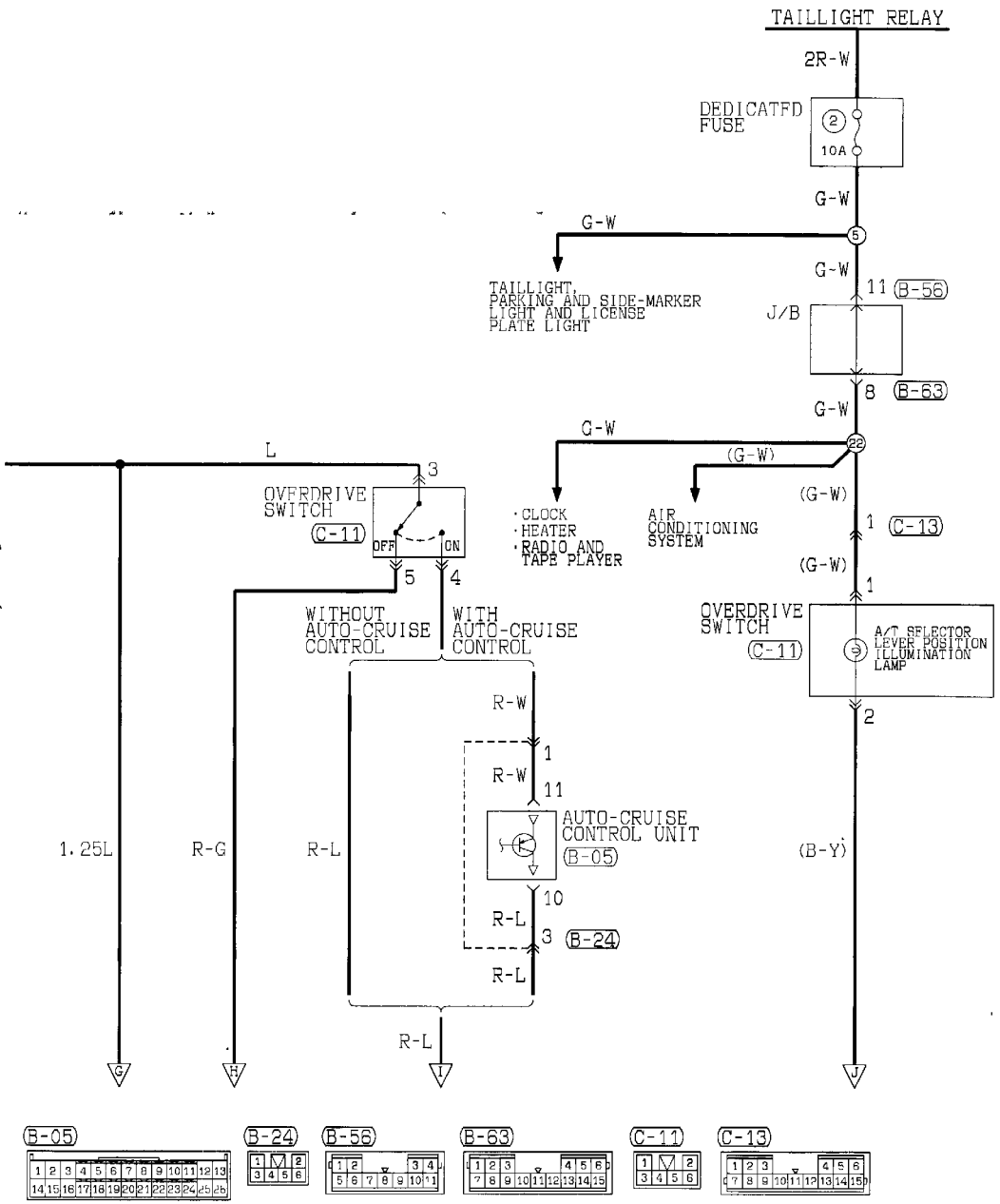

PARK/NEUTRAL POSITION SWITCH
A/T SELECTOR LEVER POSITION ILLUMINATION LAMP
E
F
D
C
B
A
G
R-L
B-Y
B-W
Y
Y-B
Y-R
B-Y
9
8
10
11
12
13
7 (C-13)
R-L *1 (R-L) *2
(P-W)
W-B *1 (W-B) *2
Y *1 (Y) *2
Y-B *1 (Y-B) *2
Y-R *1 (Y-R) *2
17
34
35
36
41
37 (B-09)
COMBINATION METER
P
R
N
D
2
L
12
19 (B-12)
AIR CONDITIONING SYSTEM
B-Y
(B-Y)
(B Y)
B-Y
·HEATER
·RADIO AND TAPE PLAYER
23
B-Y
B *1 (B) *2
12 (B-53)
·CIGARETTE LIGHTER
·REAR WINDOW DEFOGGER
B-Y
(B-Y)
TURN-SIGNAL LIGHT AND HAZARD LIGHT
26
B-Y
RHEOSTAT
7
NOTE
*1: 1993 MODELS
*2: FROM 1994 MODELS

(B-09)
(B-12)
(B-53)
(C-13)

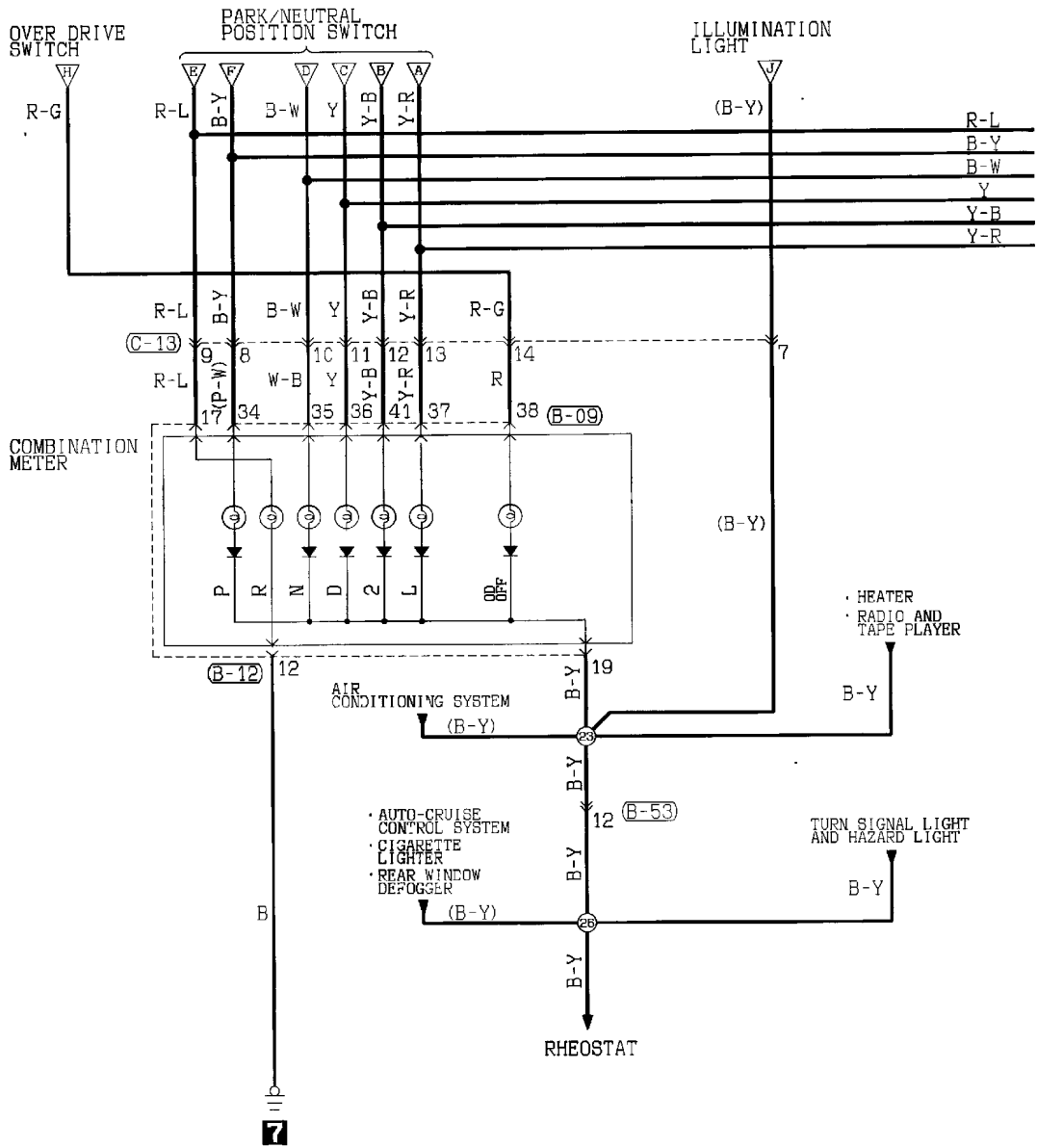
ELC 4-SPEED AUTOMATIC TRANSAXLE <1993 MODELS>

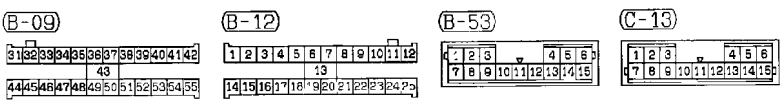
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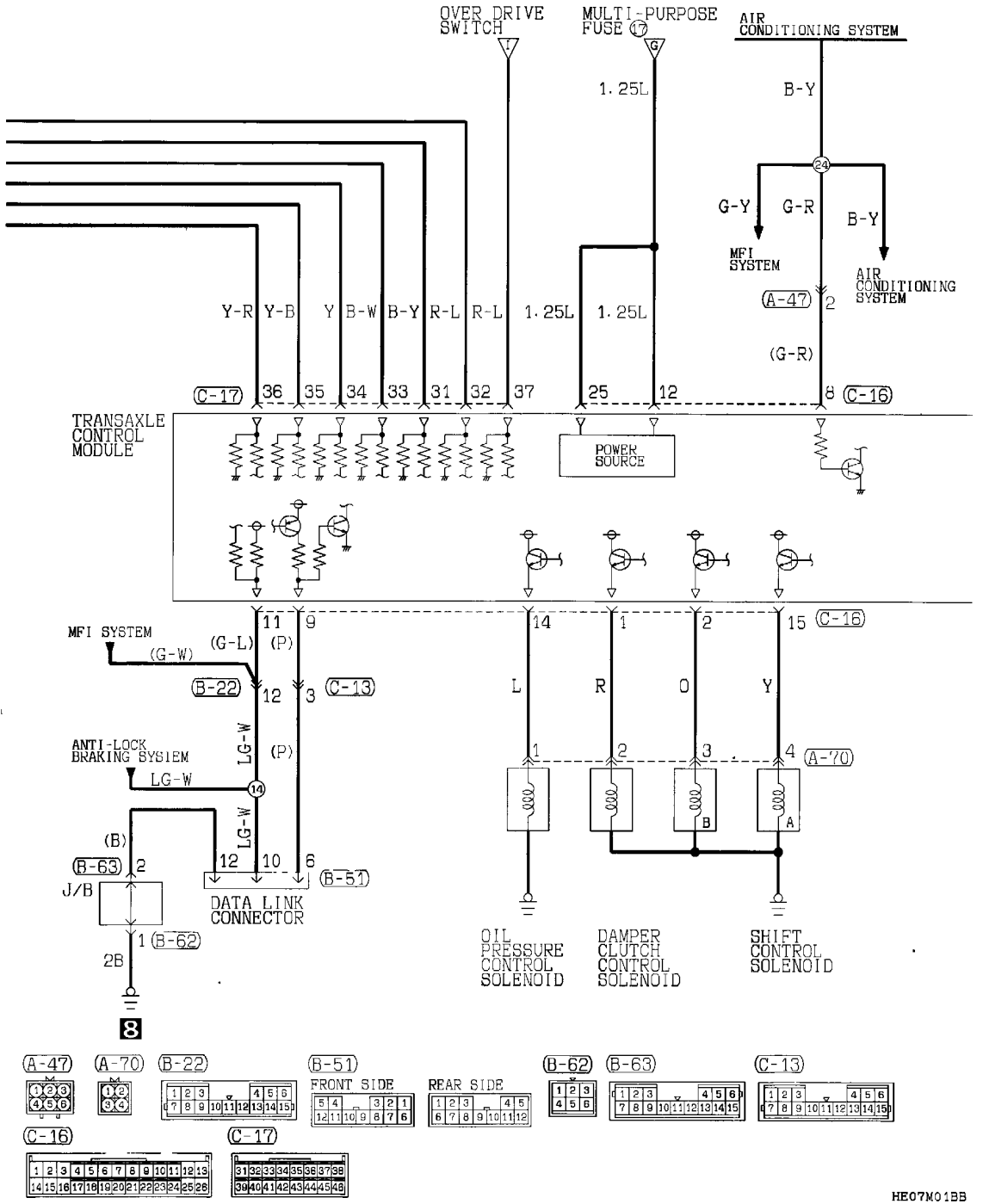



TAILLIGHT RELAY
2R-W
DEDICATED FUSE
2
10A
G-W
5
G-W
TAILLIGHT, PARKING AND SIDE-MARKER LIGHT AND LICENSE PLATE LIGHT
G-W
11 B-56
J/B
8 B-63
G-W
22
G-W
(G-W)
(G-W)
1 C-13
CLOCK
HEATER
RADIO AND TAPE PLAYER
AIR CONDITIONING SYSTEM
(G-W)
1
OVERDRIVE SWITCH C-11
A/T SELECTOR LEVER POSITION ILLUMINATION LAMP
2
L
3
OVERDRIVE SWITCH C-11
OFF
ON
5
4
WITHOUT AUTO-CRUISE CONTROL
WITH AUTO-CRUISE CONTROL
R-W
1
R-W
11
AUTO-CRUISE CONTROL UNIT B-05
10
R-L
3 B-24
R-L
R-L
1.25L
R-G
R-L
(B-Y)
G
H
I
J
B-05
B-24
B-56
B-63
C-11
C-13

ELC 4-SPEED AUTOMATIC TRANSAXLE <1993 MODELS> (CONTINUED)



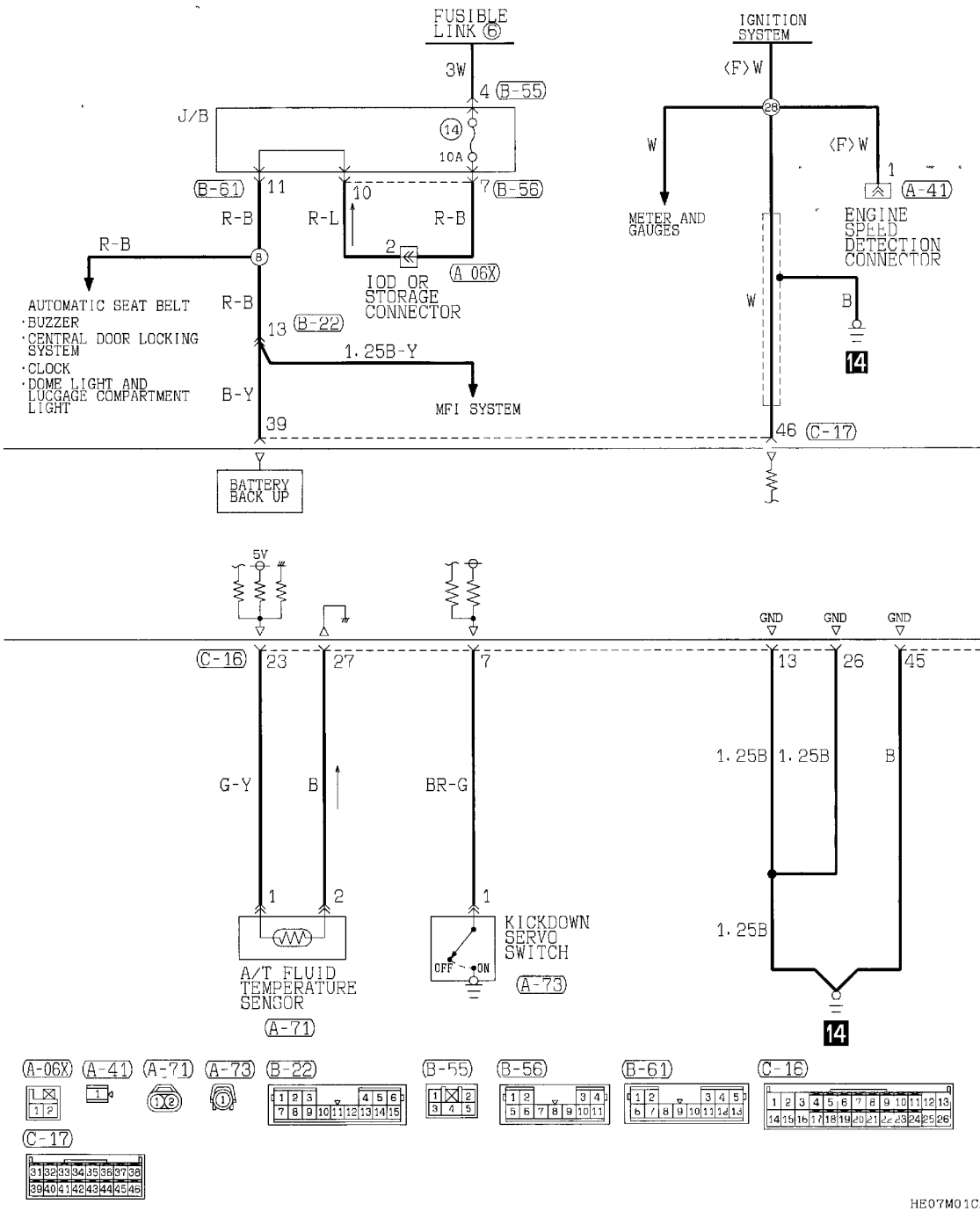




HE07M01BB

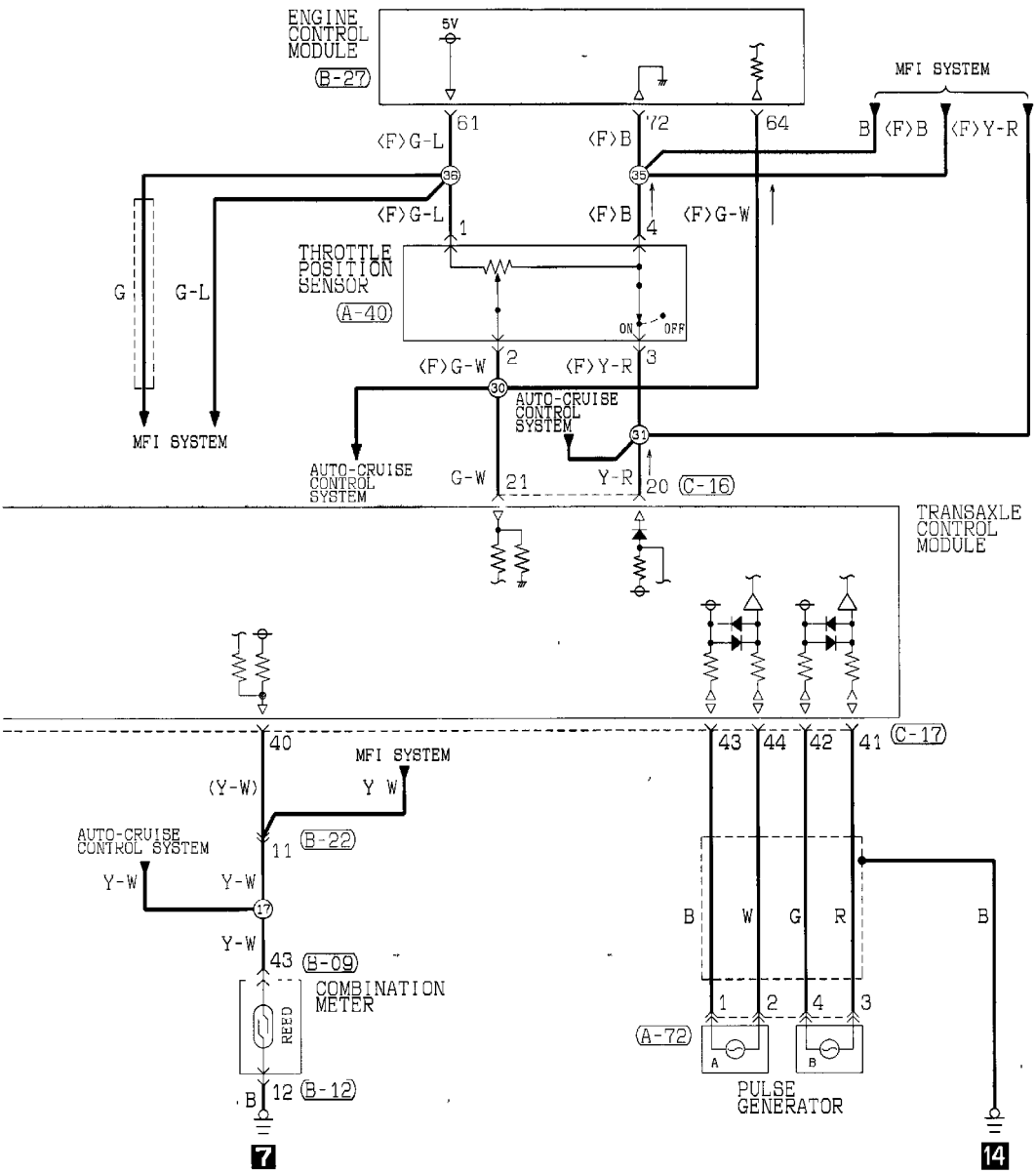
TSB Revision

ELC 4-SPEED AUTOMATIC TRANSAXLE <1993 MODELS> (CONTINUED)



HE07M01CA

TSB Revision

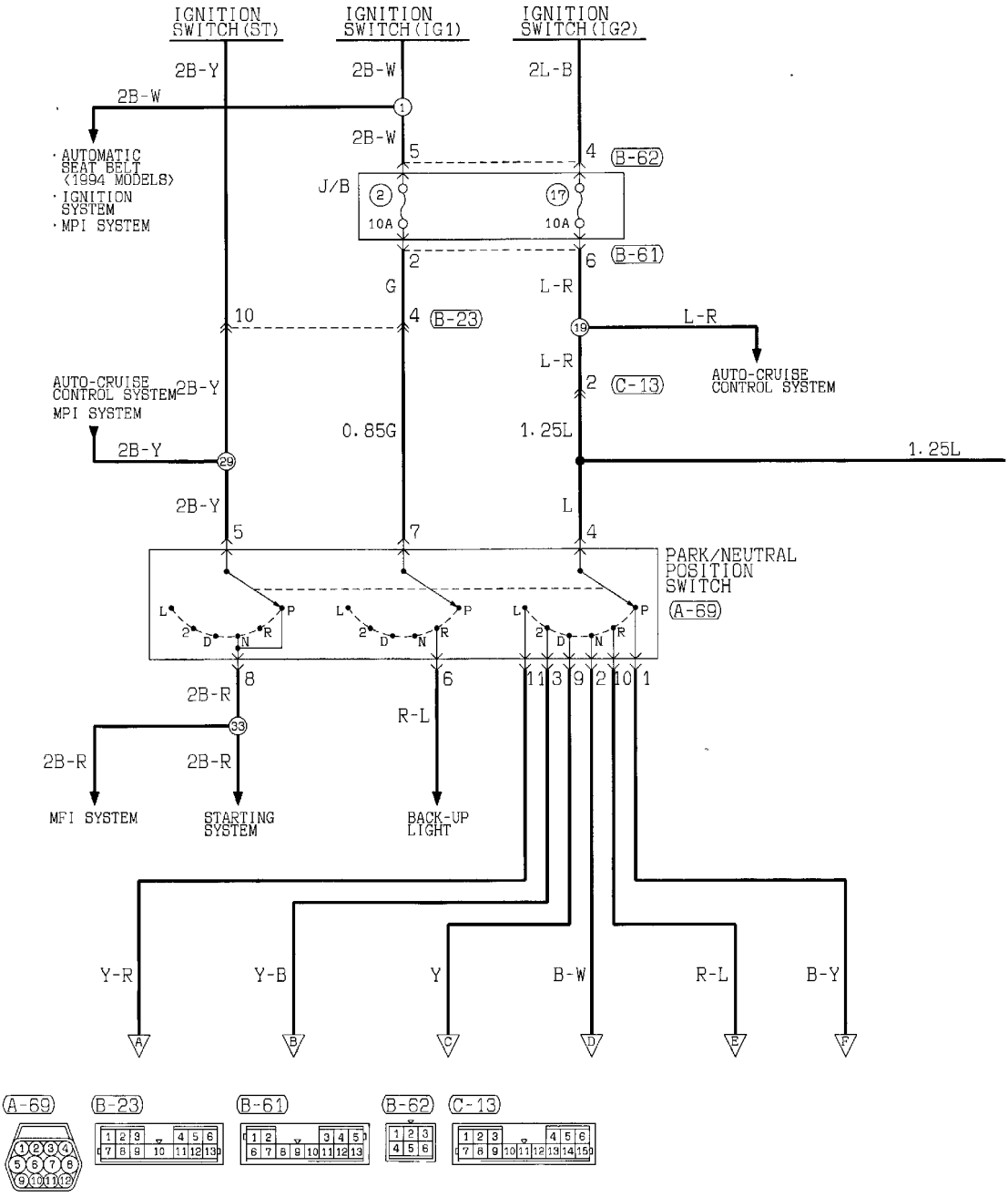


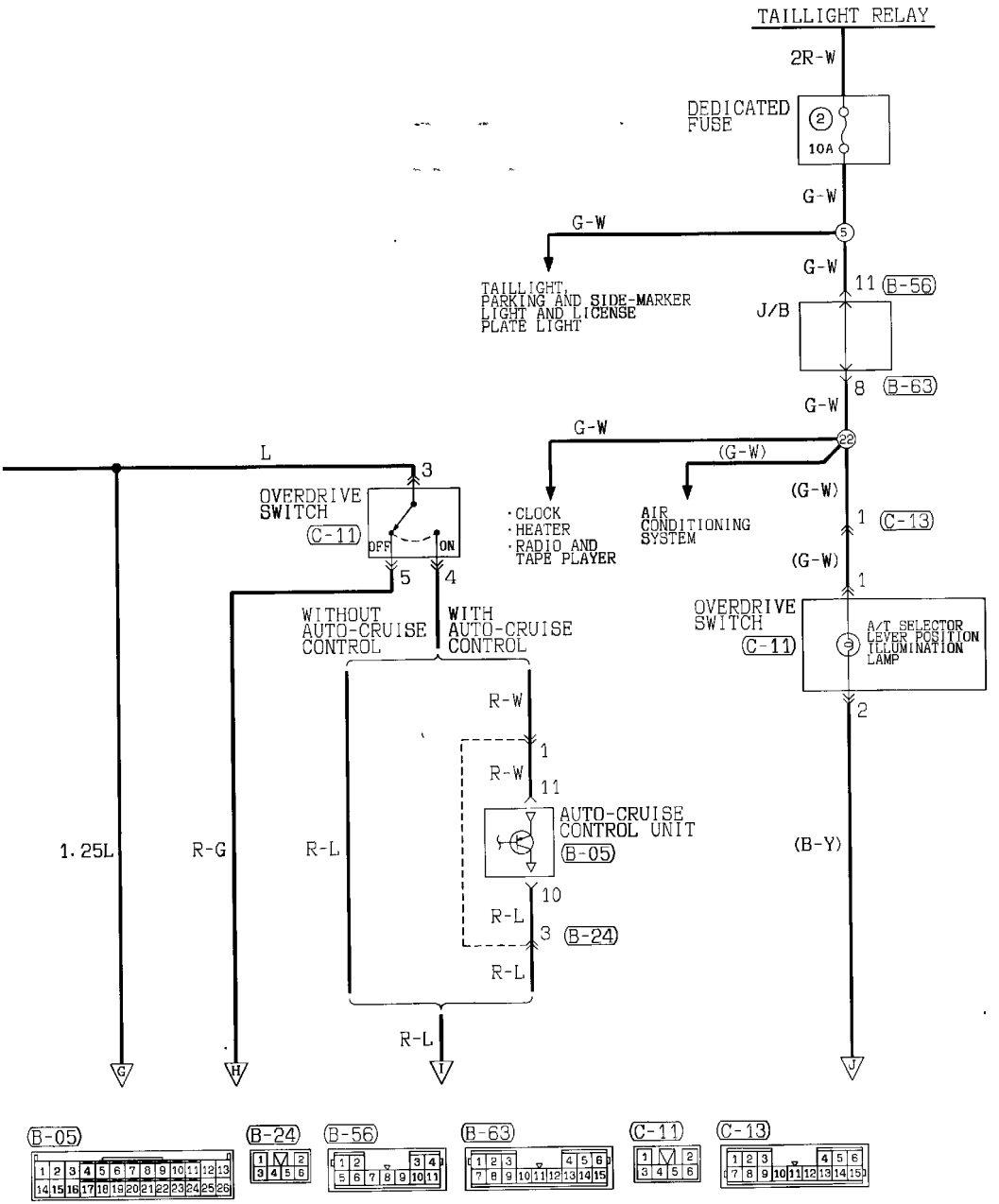
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TSB Revision

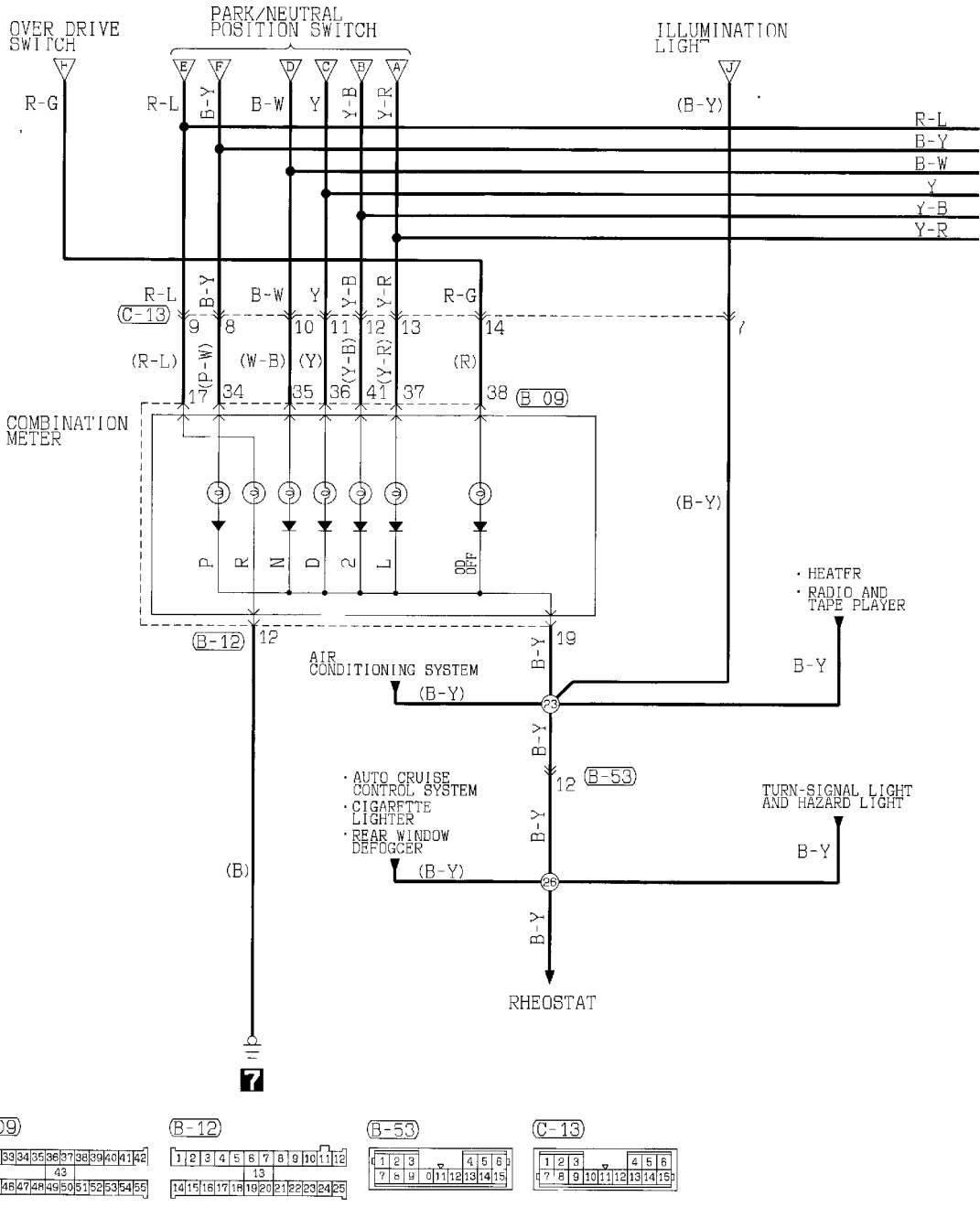
ELC 4-SPEED AUTOMATIC TRANSAXLE <FROM 1994 MODELS>

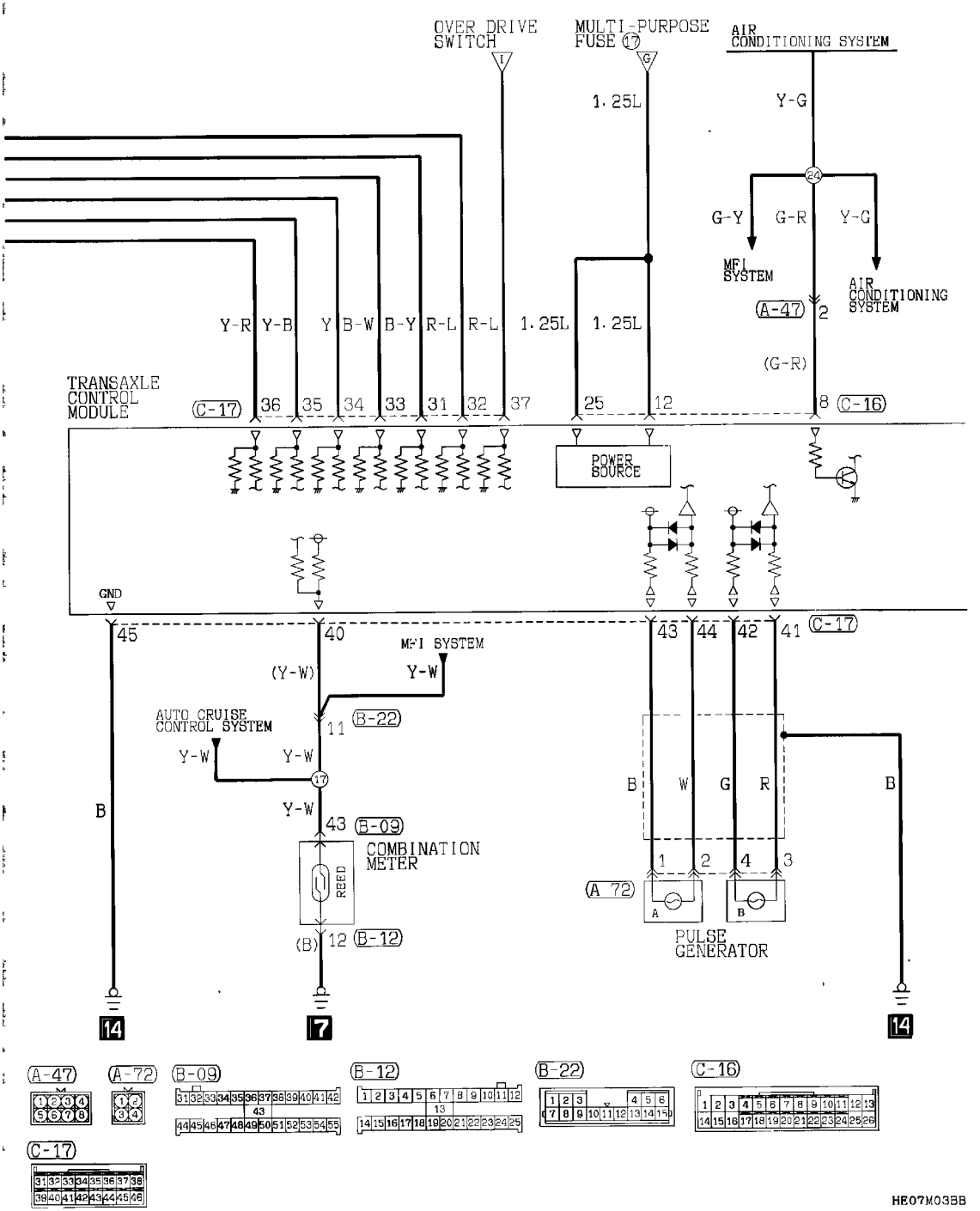
110003580




TAILLIGHT RELAY
2R-W
DEDICATED FUSE
2
10A
G-W
5
G-W
TAILLIGHT, PARKING AND SIDE-MARKER LIGHT AND LICENSE PLATE LIGHT
G-W
11 B-56
J/B
8 B-63
G-W
22
G-W
(G-W)
·CLOCK
·HEATER
·RADIO AND TAPE PLAYER
AIR CONDITIONING SYSTEM
(G-W)
1 C-13
(G-W)
1
OVERDRIVE SWITCH
C-11
9
A/T SELECTOR LEVER POSITION ILLUMINATION LAMP
2
L
3
OVERDRIVE SWITCH
C-11
OFF
ON
5
4
WITHOUT AUTO-CRUISE CONTROL
WITH AUTO-CRUISE CONTROL
R-W
1
R-W
11
AUTO-CRUISE CONTROL UNIT
B-05
10
R-L
3 B-24
R-L
1.25L
R-G
R-L
(B-Y)
R-L
G
H
I
J
B-05
B-24
B-56
B-63
C-11
C-13

ELC 4-SPEED AUTOMATIC TRANSAXLE <FROM 1994 MODELS> (CONTINUED)





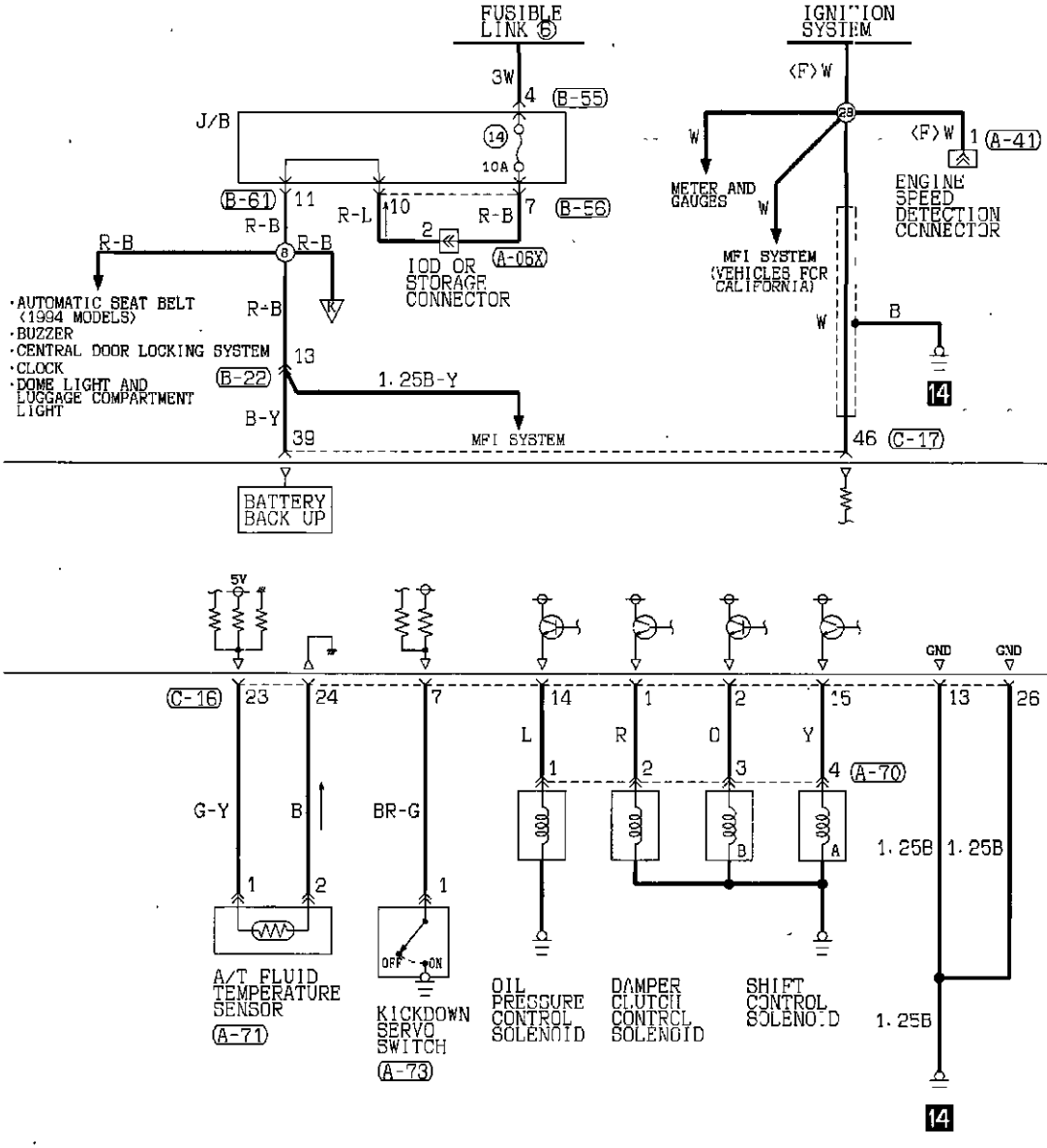
A-47 A-72 B-09 B-12 B-22 C-16

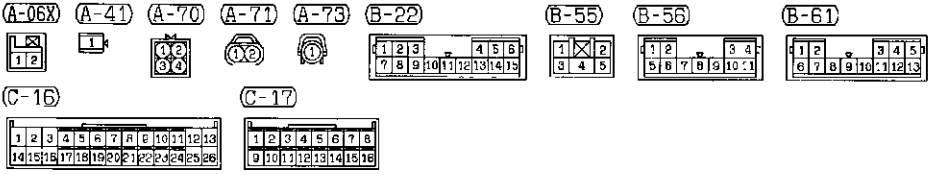
C-17

HE07M03BB

TSB Revision

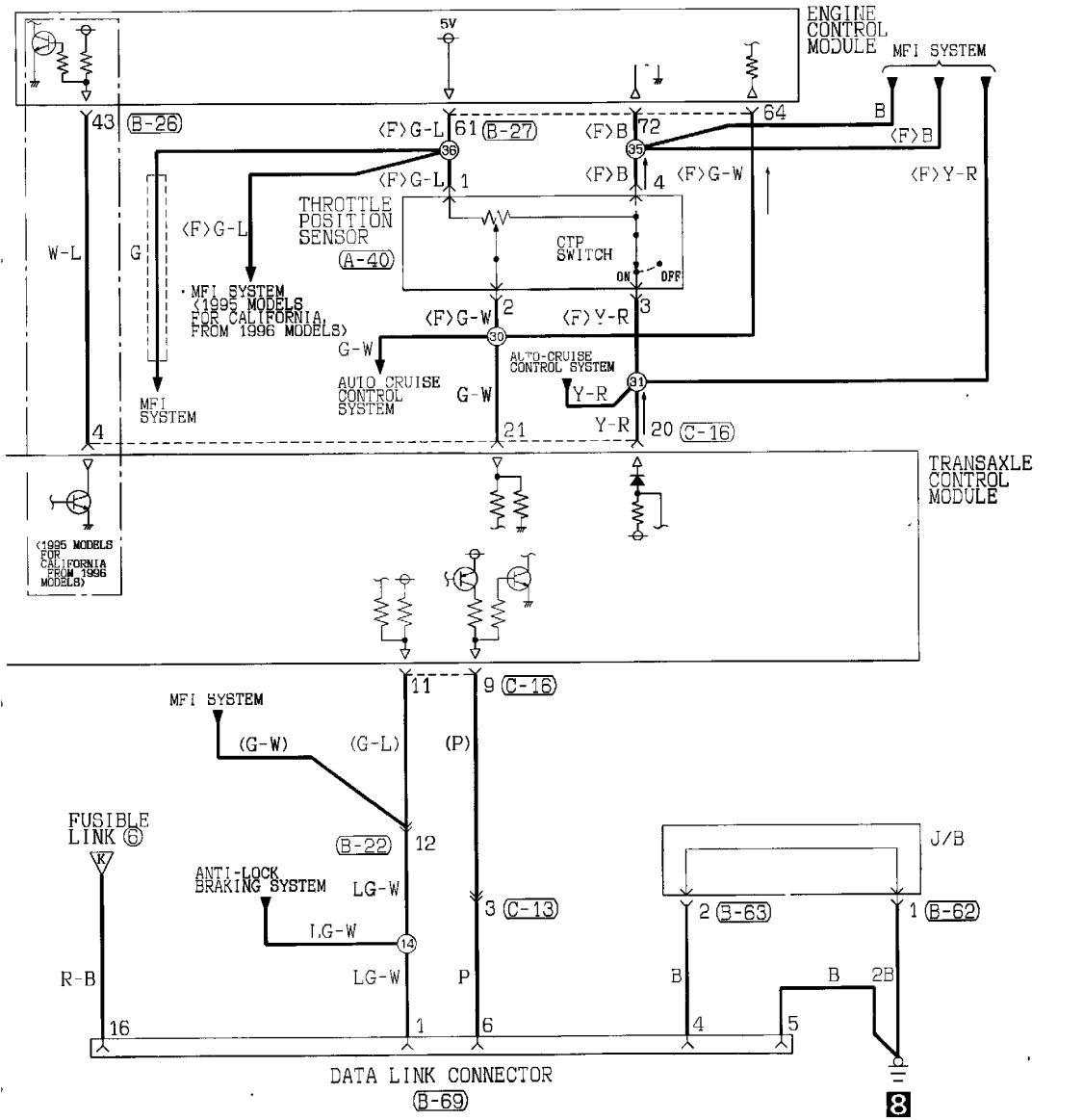
ELC 4-SPEED AUTOMATIC TRANSAXLE <FROM 1994 MODELS> (CONTINUED)

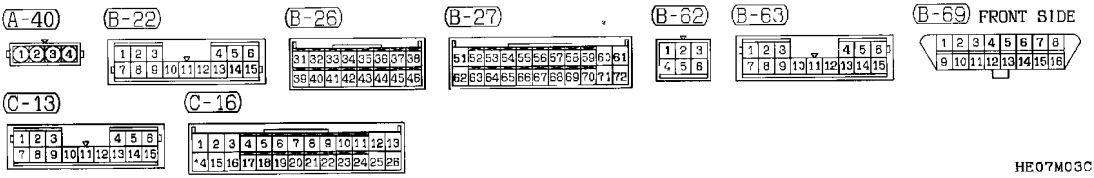




HE07M03CA

TSB Revision





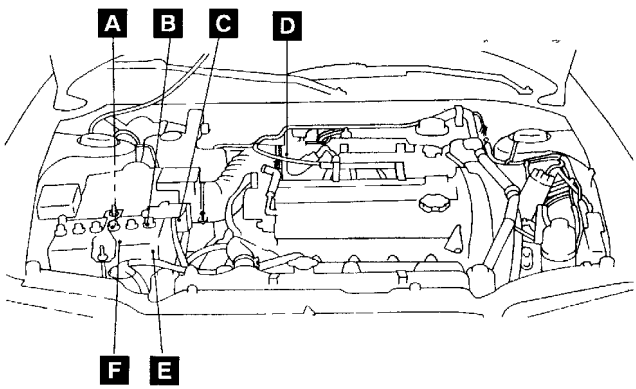
HE07M03CB

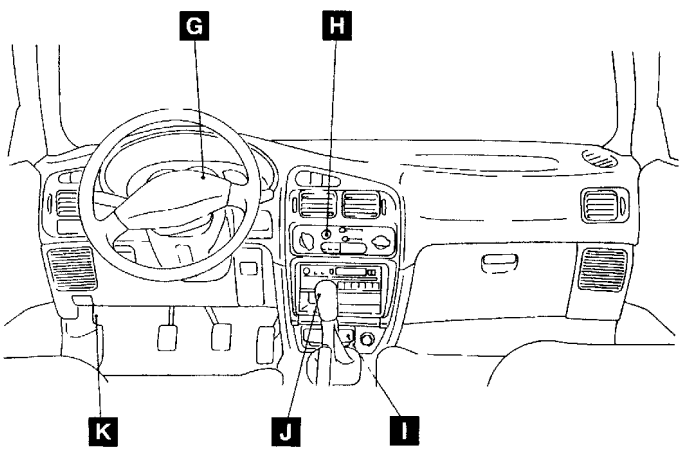
TSB Revision

COMPONENT LOCATION

110003581

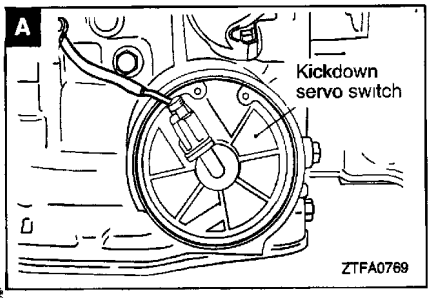
Name	Symbol	Name	Symbol
Air conditioning switch	H	Pulse generator A and B	B
Data link connector	K	Solenoid valves	F
Kickdown servo switch	A	Throttle position sensor (With built-in closed throttle position switch)	D
OD-OFF switch	J	Transaxle control module	I
Oil temperature sensor	E	Vehicle speed reed switch	G
Park / Neutral position switch	C		



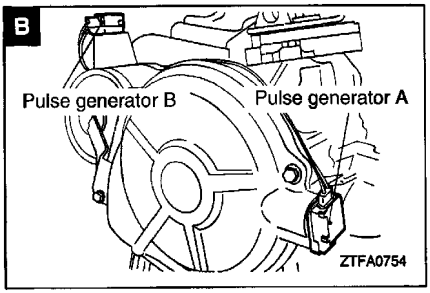


ATFA1289

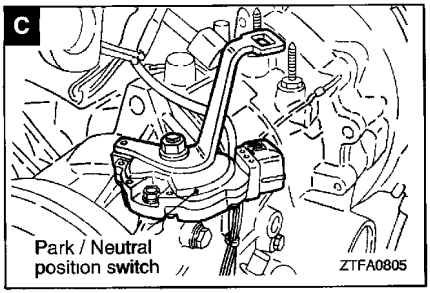
A


Kickdown
servo switch
ZTFA0769

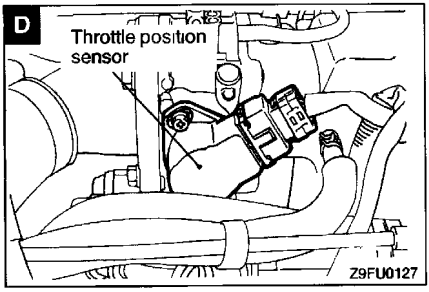
B


Pulse generator B
Pulse generator A
ZTFA0754

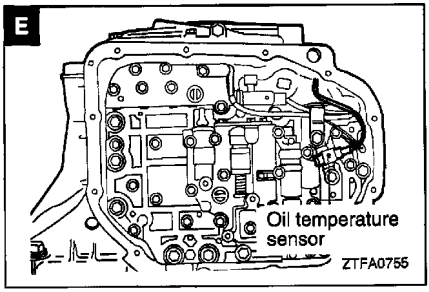
C


Park / Neutral
position switch
ZTFA0805

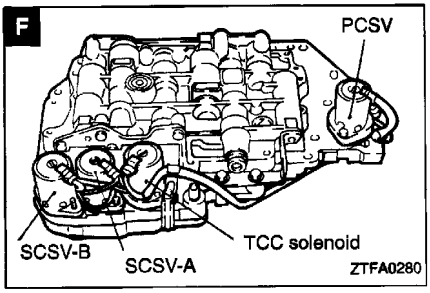
D


Throttle position
sensor
Z9FU0127

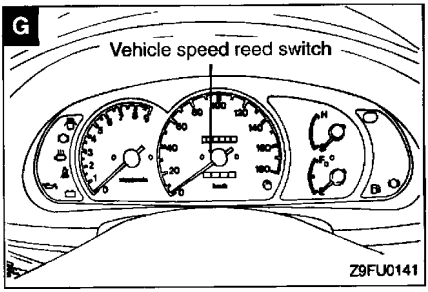
E


Oil temperature
sensor
ZTFA0755

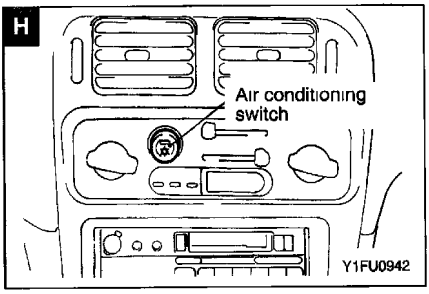
F


PCSV
SCSV-B
SCSV-A
TCC solenoid
ZTFA0280

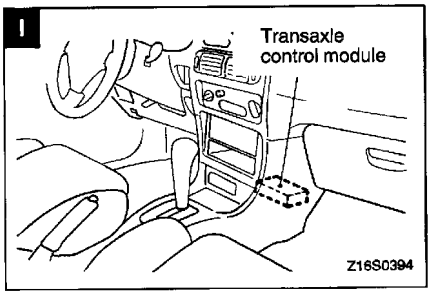
G


Vehicle speed reed switch
Z9FU0141

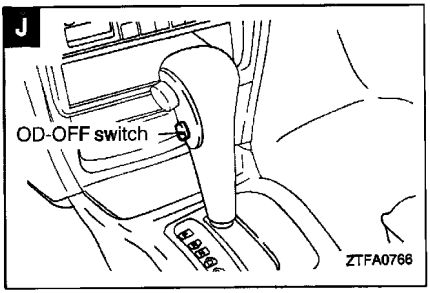
H

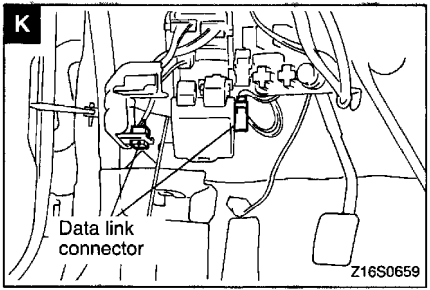

Air conditioning
switch
Y1FU0942

I


Transaxle
control module
Z16S0394

J


OD-OFF switch
ZTFA0766

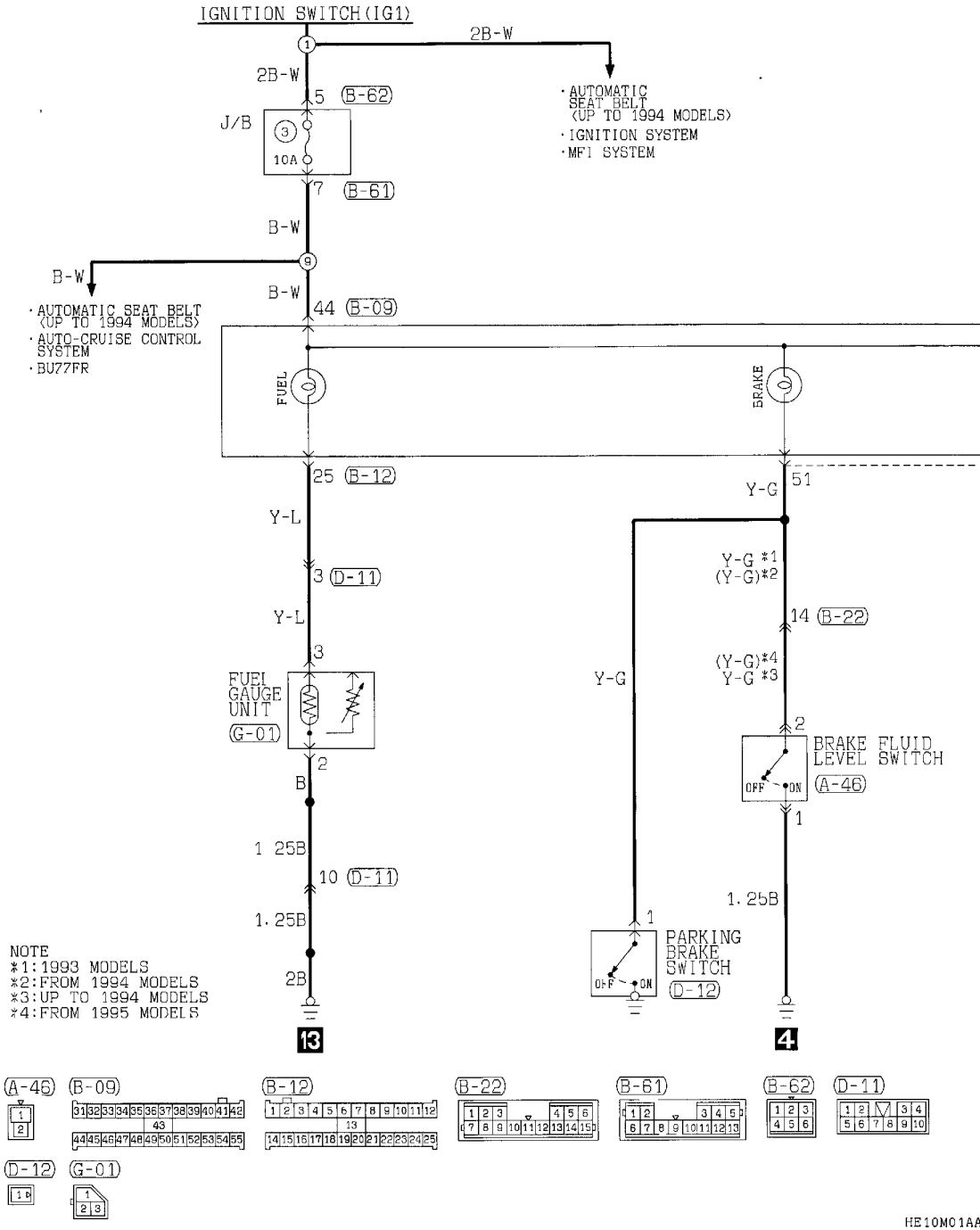

K
Data link
connector
Z16S0659

FUEL WARNING LIGHT, BRAKE WARNING LIGHT AND OIL PRESSURE WARNING LIGHT

110003582

FUEL WARNING LIGHT

BRAKE WARNING LIGHT



NOTE
*1:1993 MODELS
*2:FROM 1994 MODELS
*3:UP TO 1994 MODELS
*4:FROM 1995 MODELS

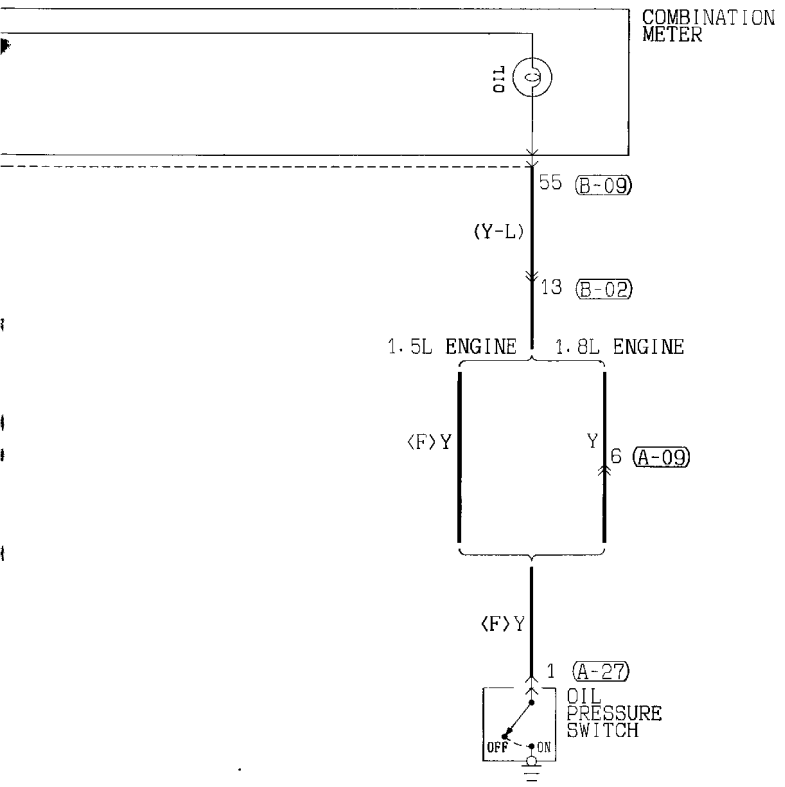
(A-46) (B-09) (B-12) (B-22) (B-61) (B-62) (D-11)

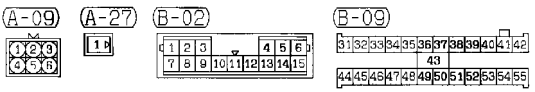
(D-12) (G-01)

HE10M01AA

TSB Revision

OIL PRESSURE WARNING LIGHT





OPERATION

110003583

<Fuel warning light>

- When the fuel level goes down causing the level sensor to be exposed, with the ignition switch in the ON position, the resistance of level sensor becomes small. When this resistance goes down below the predetermined level, the fuel warning light lights up to warn the driver that the amount of fuel still available for use is small.

<Brake warning light>

- When the brake fluid level goes down below a predetermined level or parking brake lever is pulled, with the ignition switch in the ON position, the brake fluid level sensor is activated or the parking brake switch is turned ON, causing the brake warning light to light up.

<Oil pressure warning light>

- When the lubrication system fails after engine starting, resulting in the oil pressure failing to build up, the oil pressure switch turns ON causing the oil pressure warning light to light up.

POWER WINDOWS <4-DOOR MODELS ONLY>

OPERATION

110003584

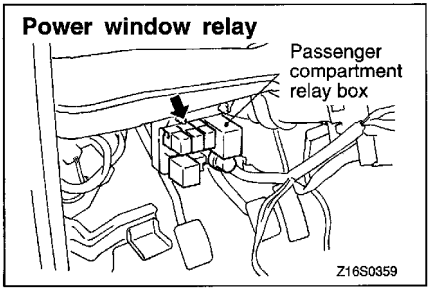
- When the power window (main or sub) switch is depressed (UP or DOWN) with the ignition switch in the ON position, current flows through fusible link No. 7 to the power window motor. This energizes the power window motor causing the door window glass to open or close.
- When the DOWN side of the power window main switch (driver's seat side switch) is depressed all the way, it is locked in the depressed position and the power window motor is operated until the door glass is fully opened.
- When the power window lock switch is placed in the LOCK (OFF) position, operating a switch other than the ones for the driver's side window (main) does not cause the power window motor to be operated.
- The power window motor is provided with a circuit breaker that protects the motor from damage caused by overcurrent.
  Reference: Circuit breaker characteristics
  Restricts the motor at room temperature [20 to 25°C (68 to 77°F)];
  Opens following 4-to-40-sec. initial energization time;
  Resets with 60 seconds if left open thereafter.

TROUBLESHOOTING HINTS

1. All door glasses cannot be opened or closed.
   - Check fusible link No. 7.
   - Check multi-purpose fuse No. 15.
   - Check power window relay.
   - Check power window main switch.
2. Some door glass cannot be opened or closed.
   1) Neither power window main nor sub switch is activated.
      - Check power window main switch.
      - Check defective power window motor.
   2) Either power window main or sub switch is inoperative.
      - Check inoperative power window switch.
3. One-touch switch function is not operational.
   - Replace power window main switch.

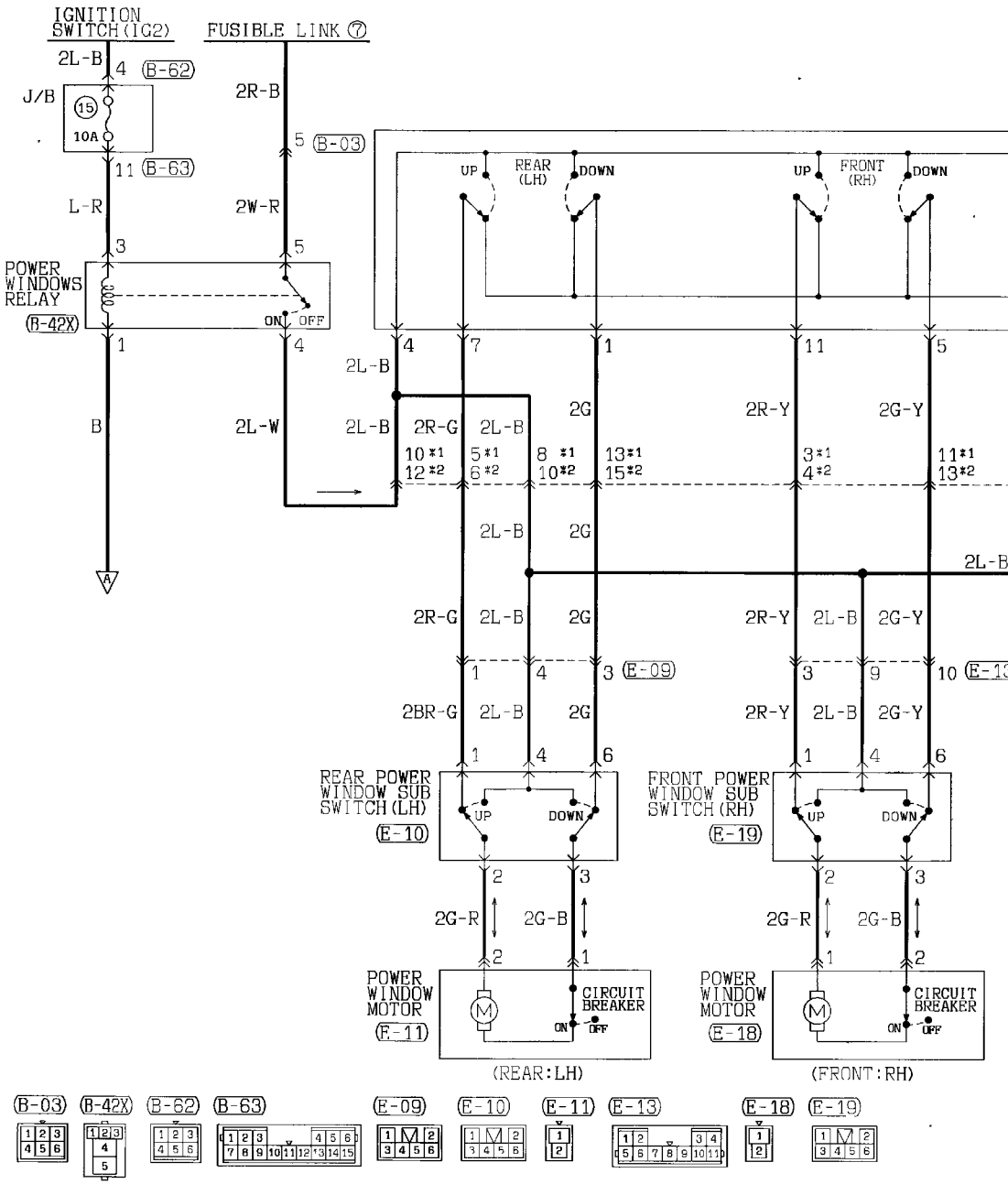
COMPONENT LOCATION

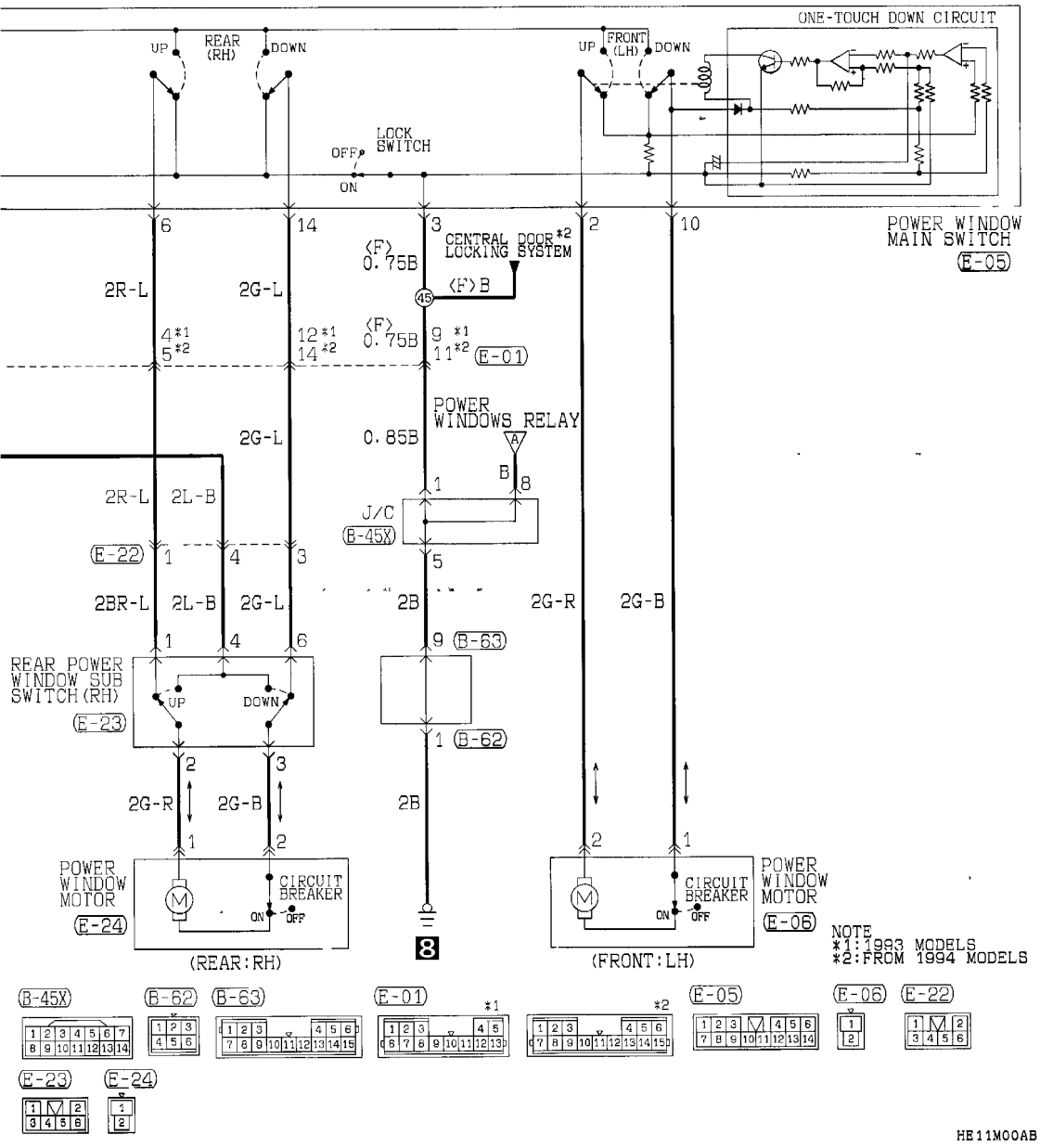
110003585



POWER WINDOWS <4-DOOR MODELS ONLY>

110003586

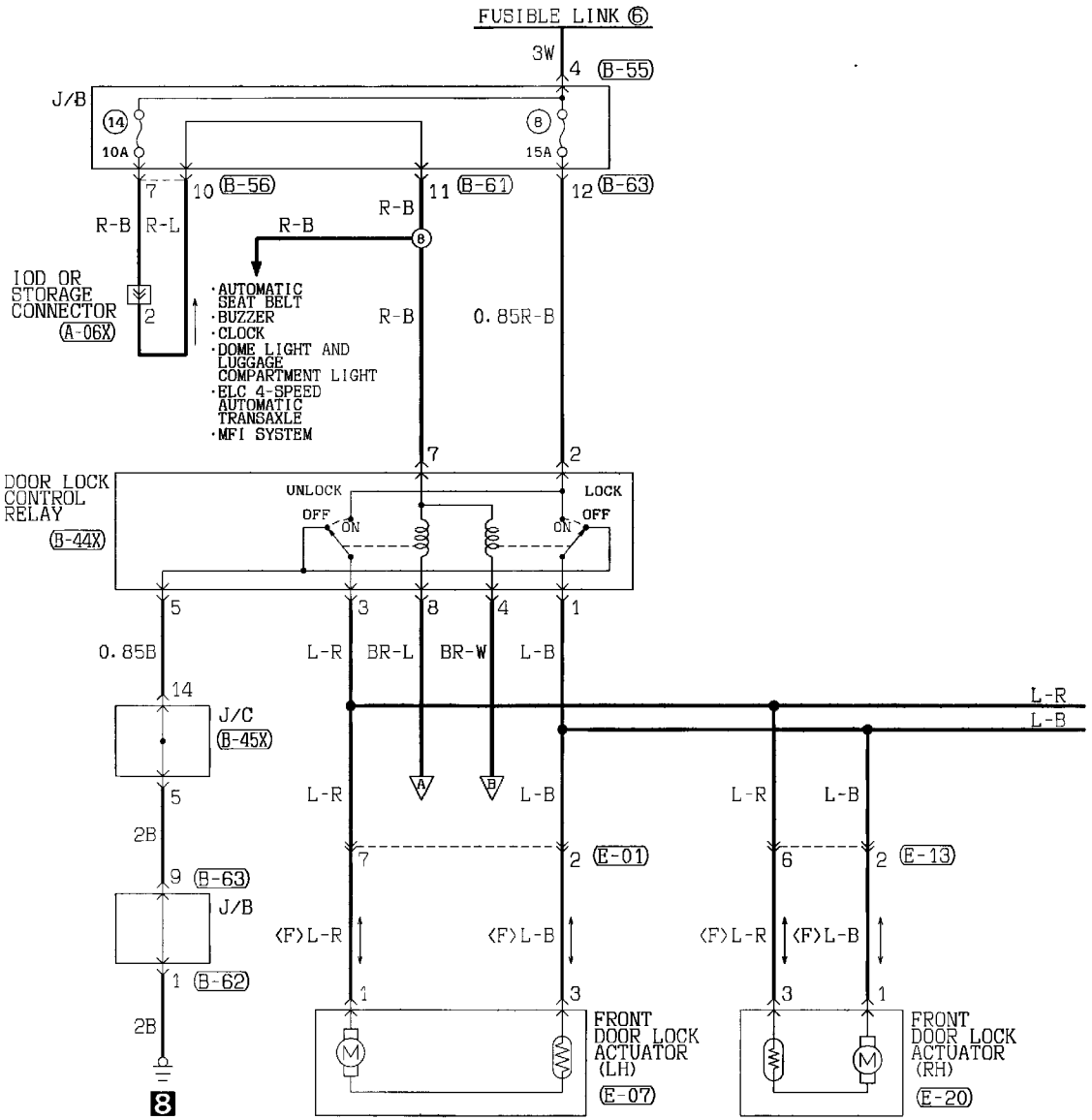




TSB Revision

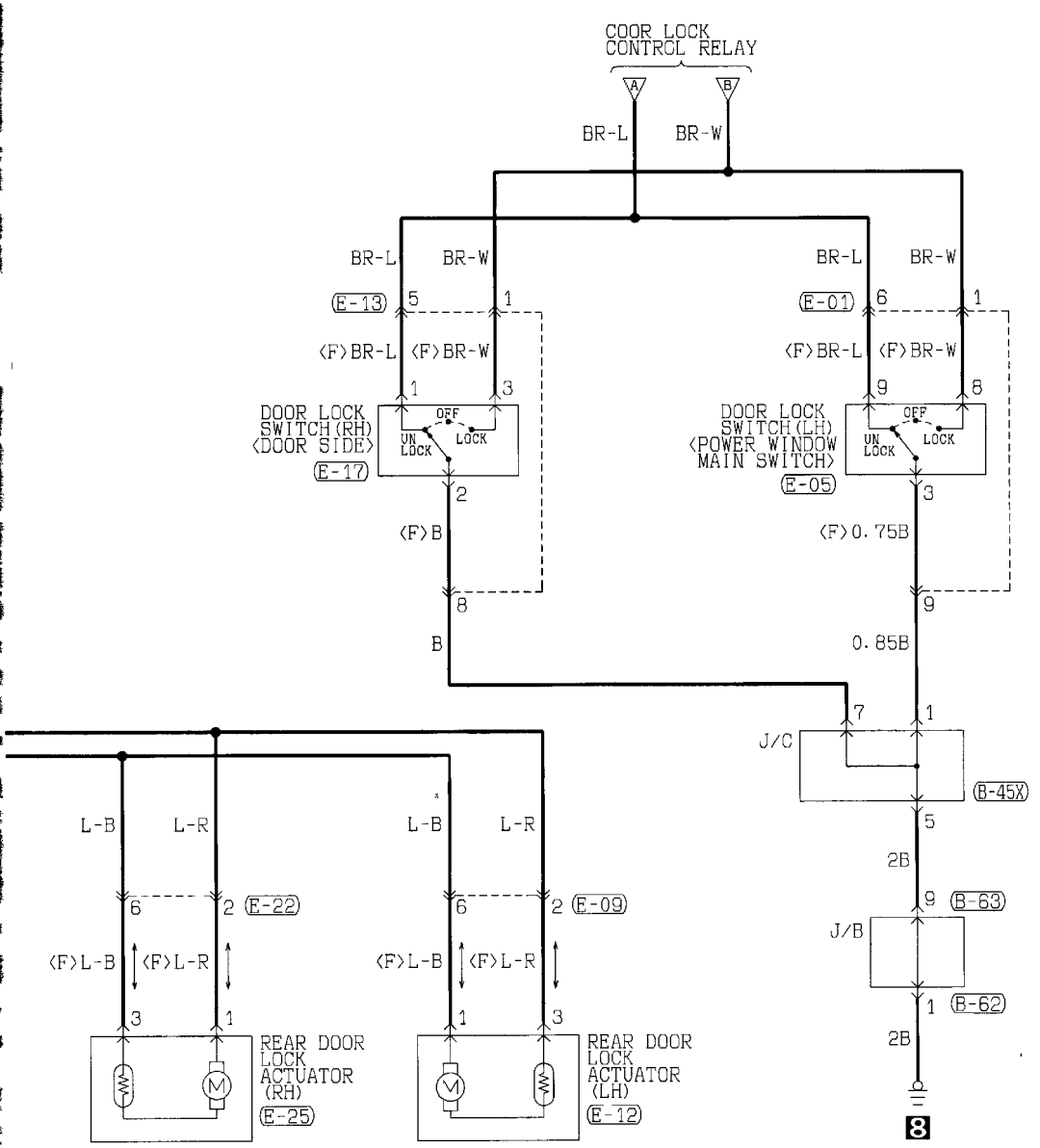
CENTRAL DOOR LOCKING SYSTEM <4-DOOR MODELS ONLY–1993 MODELS>

110003587



HE11M01AA

TSB Revision

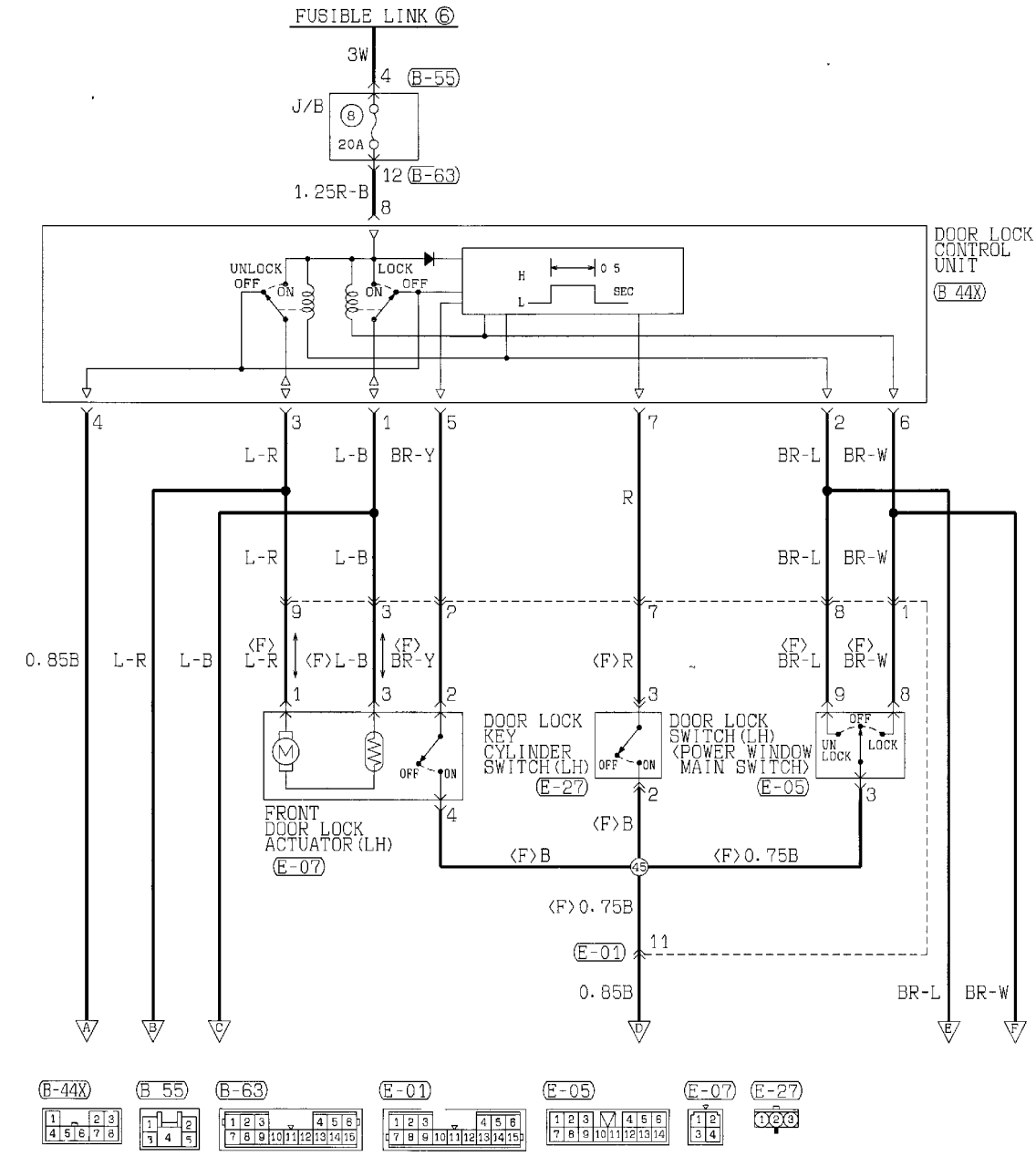


HE11M01AB

TSB Revision

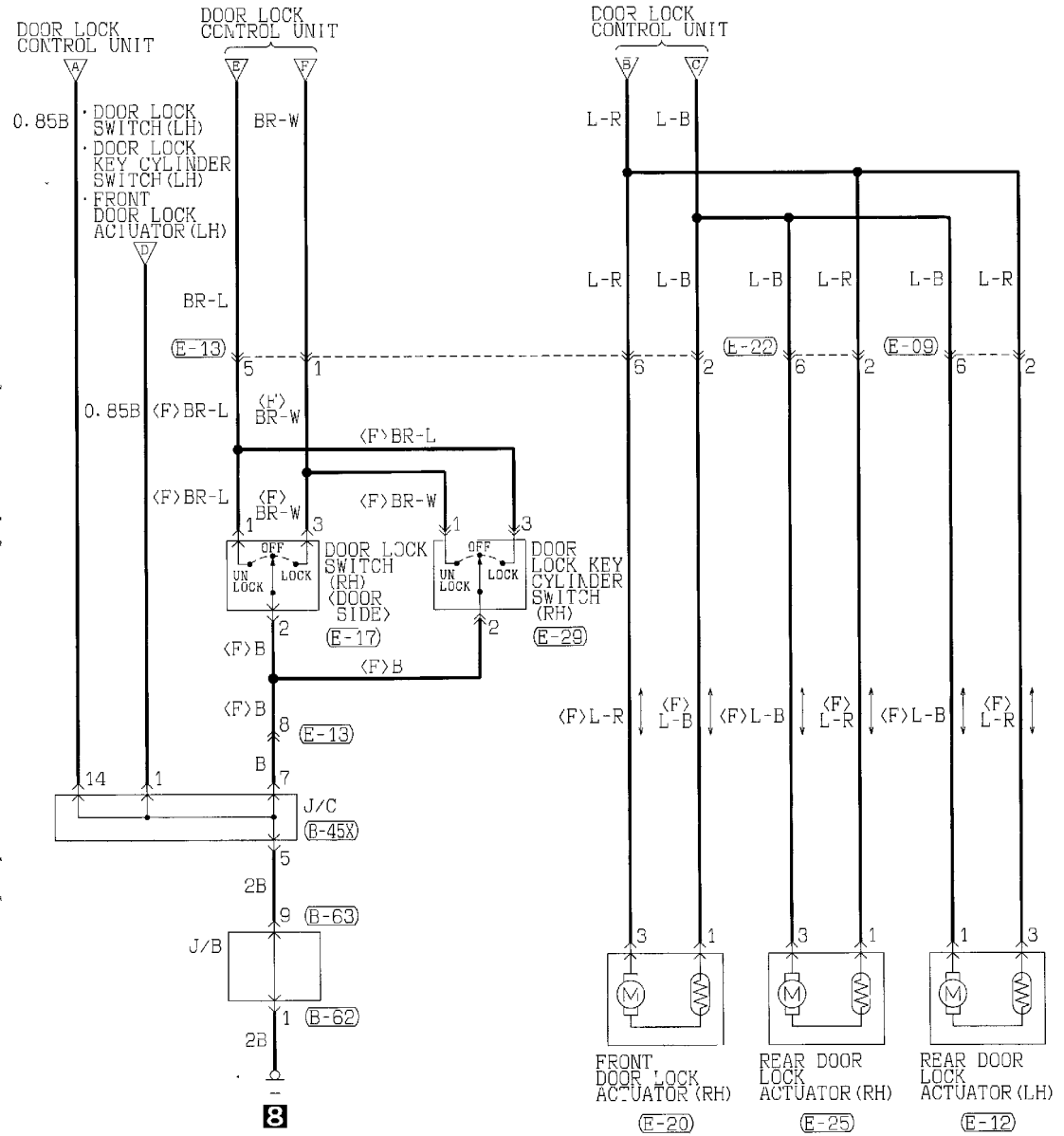
CENTRAL DOOR LOCKING SYSTEM <4-DOOR MODELS ONLY–FROM 1994 MODELS>

110003588



HE11M03AA

TSB Revision



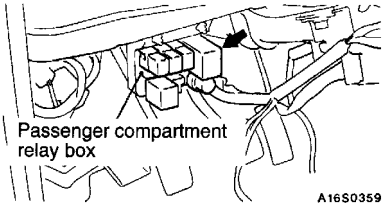
HE11M03AB

TSB Revision

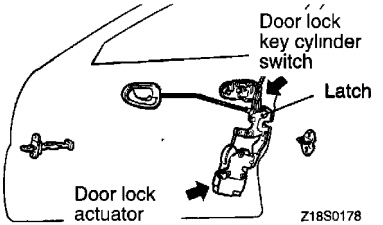
COMPONENT LOCATION

110003589

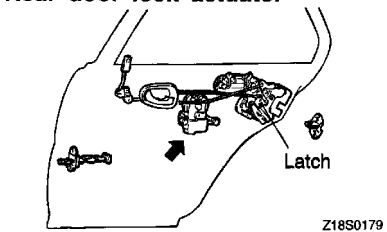
Door lock control relay <1993 models>
Door lock control unit
<From 1994 models>



Front door lock actuator and door lock key cylinder switch <From 1994 models>



Rear door lock actuator



NOTE
The RH side door lock actuator and door lock key cylinder switch is shown.

HEATER

OPERATION

110003590

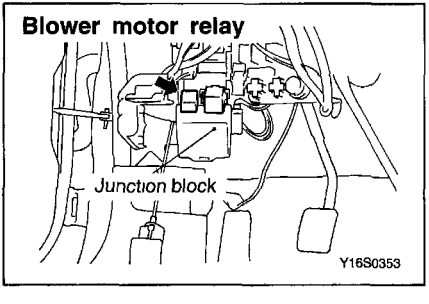
- When the ignition switch is turned ON, the blower relay is energized. If the blower switch is turned ON (LO, ML, MH, or HI position) in this condition, the blower is activated through the circuit via resistor at a speed corresponding to the blower switch position.

TROUBLESHOOTING HINTS

1. Blower motor is energized at one switch position and not energized at another.
   - Check harness and connectors between defective switch position and resistor (or blower motor in HI position).
2. Blower motor is energized only when switch is positioned in HI.
   - Check resistor.
3. Blower motor speed does not represent the switch position.
   - Check blower switch.

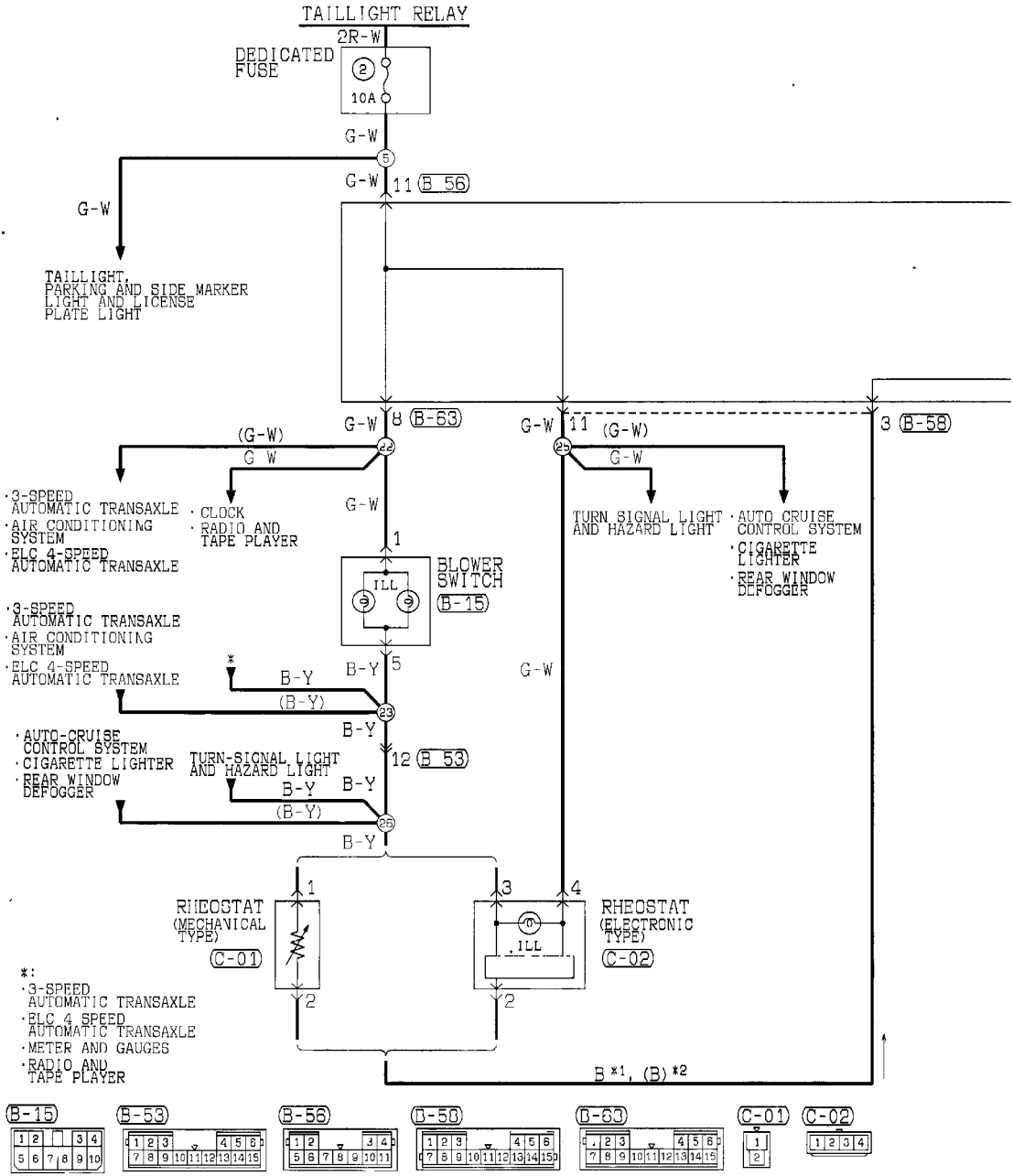
COMPONENT LOCATION

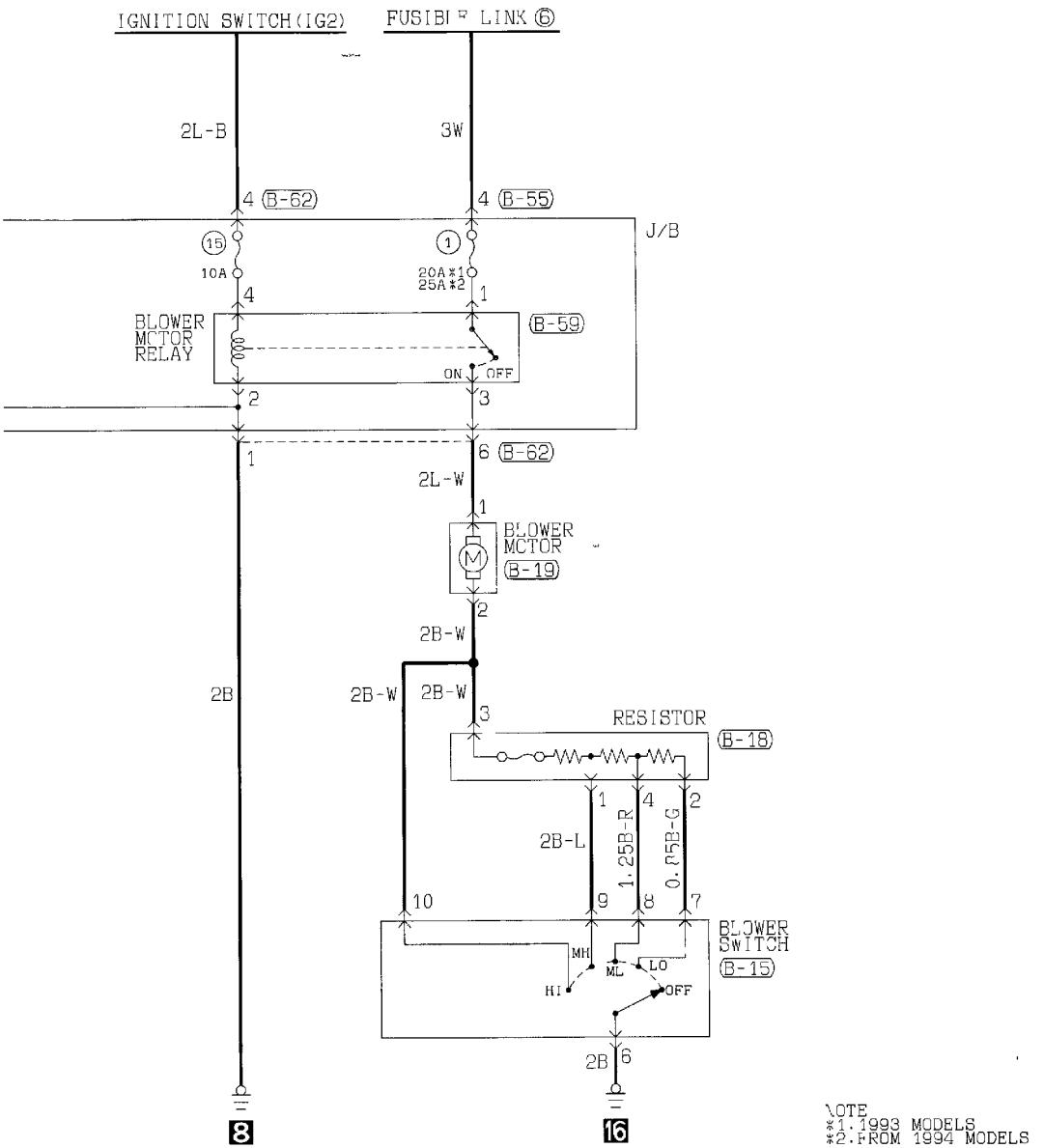
110003591



HEATER

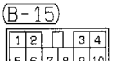
110003592





NOTE
*1.1993 MODELS
*2.FROM 1994 MODELS

B-15



B-18



B-19



B-55



B-59



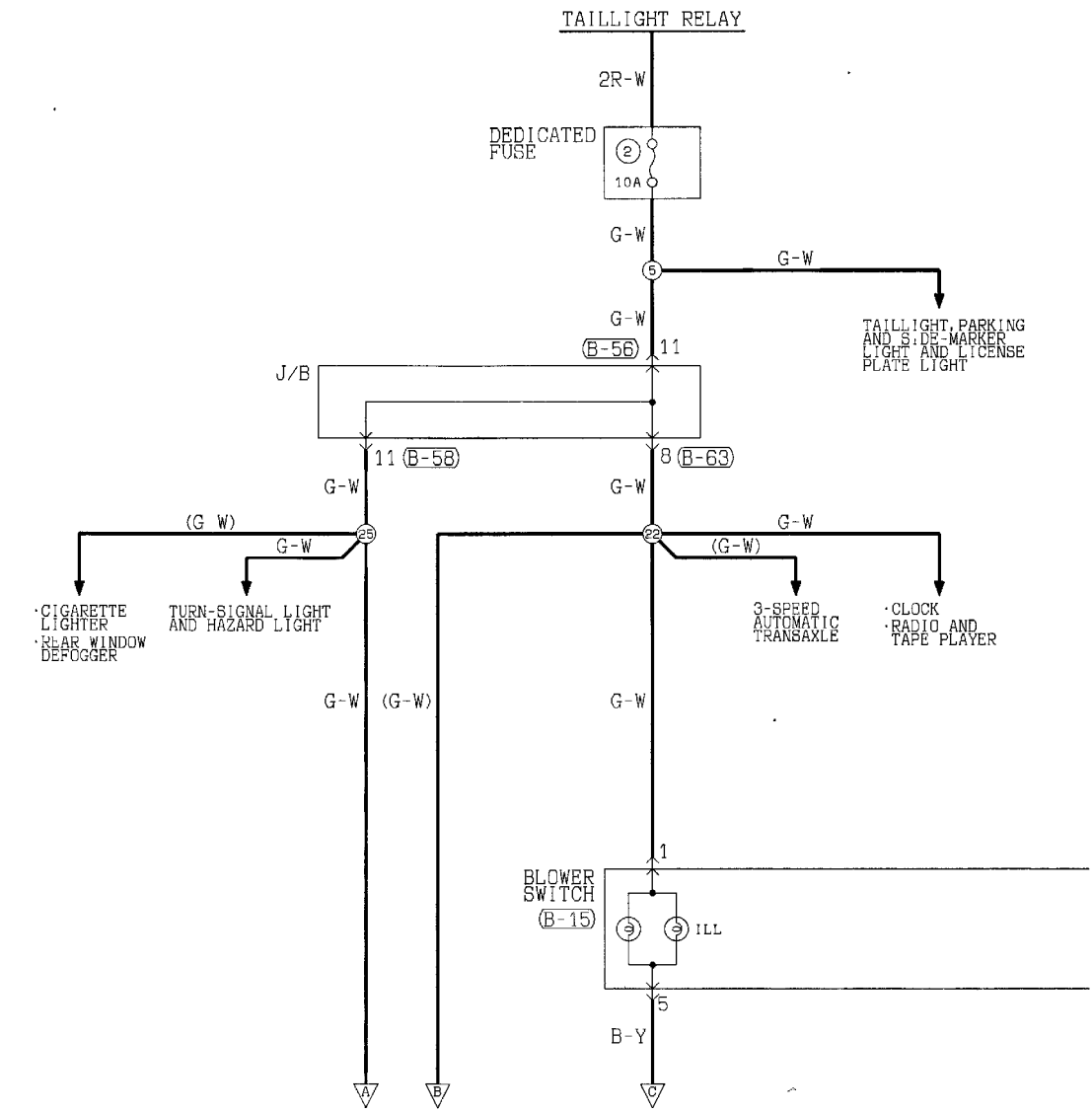
B-62

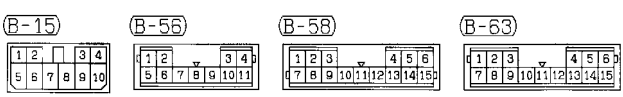


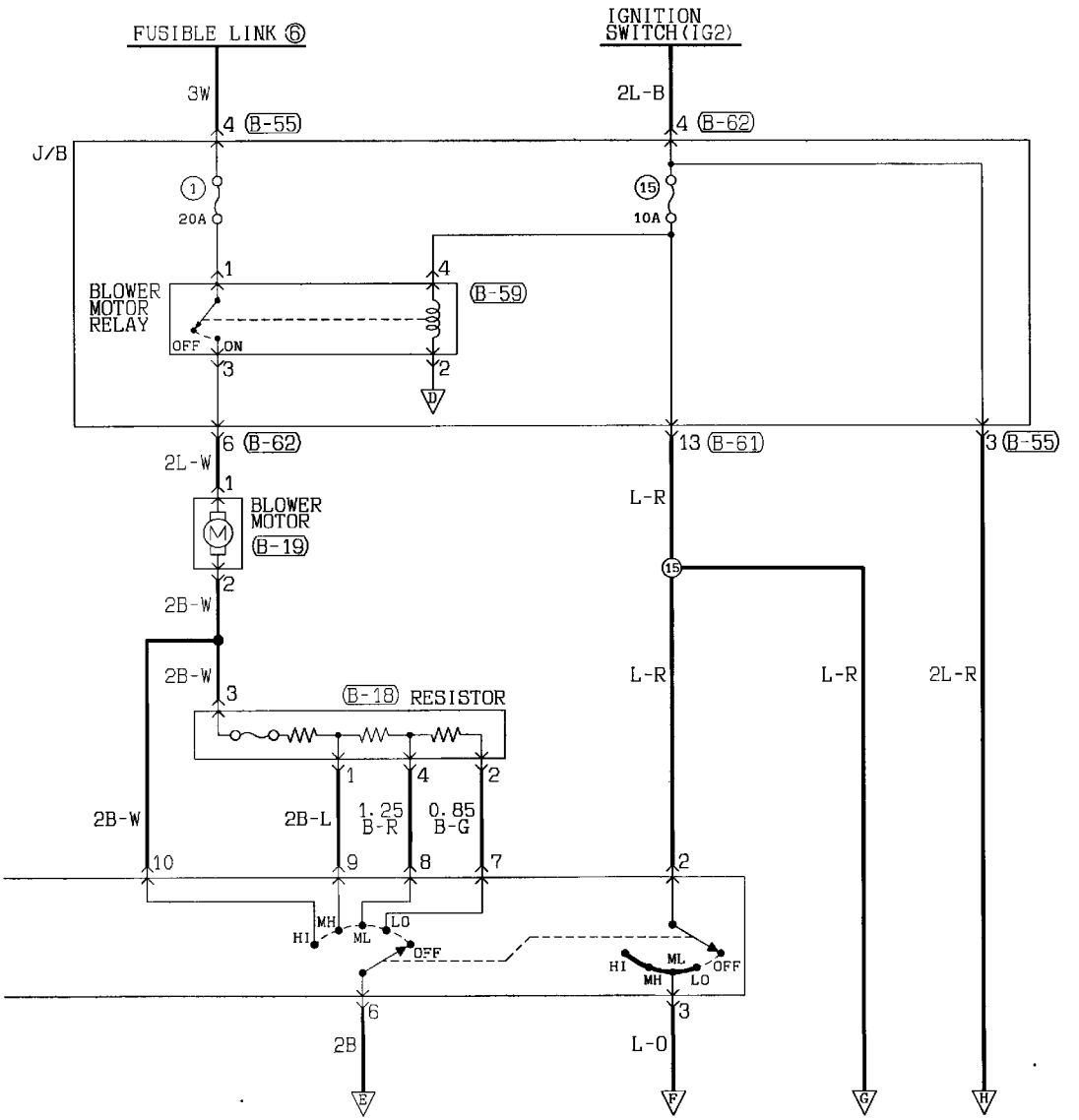
AIR CONDITIONING SYSTEM

110003593

<1.5L ENGINE–1993 MODELS>

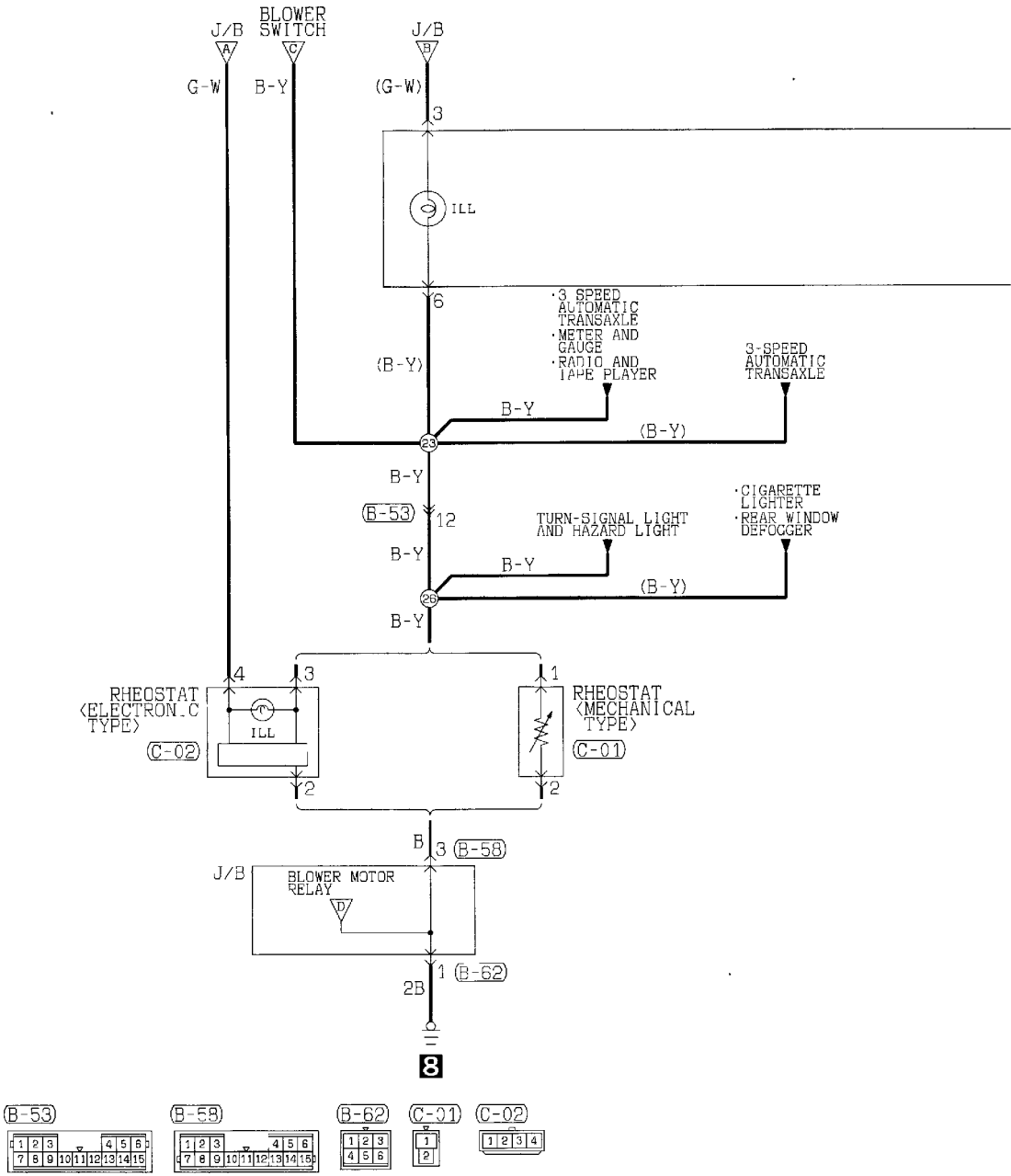


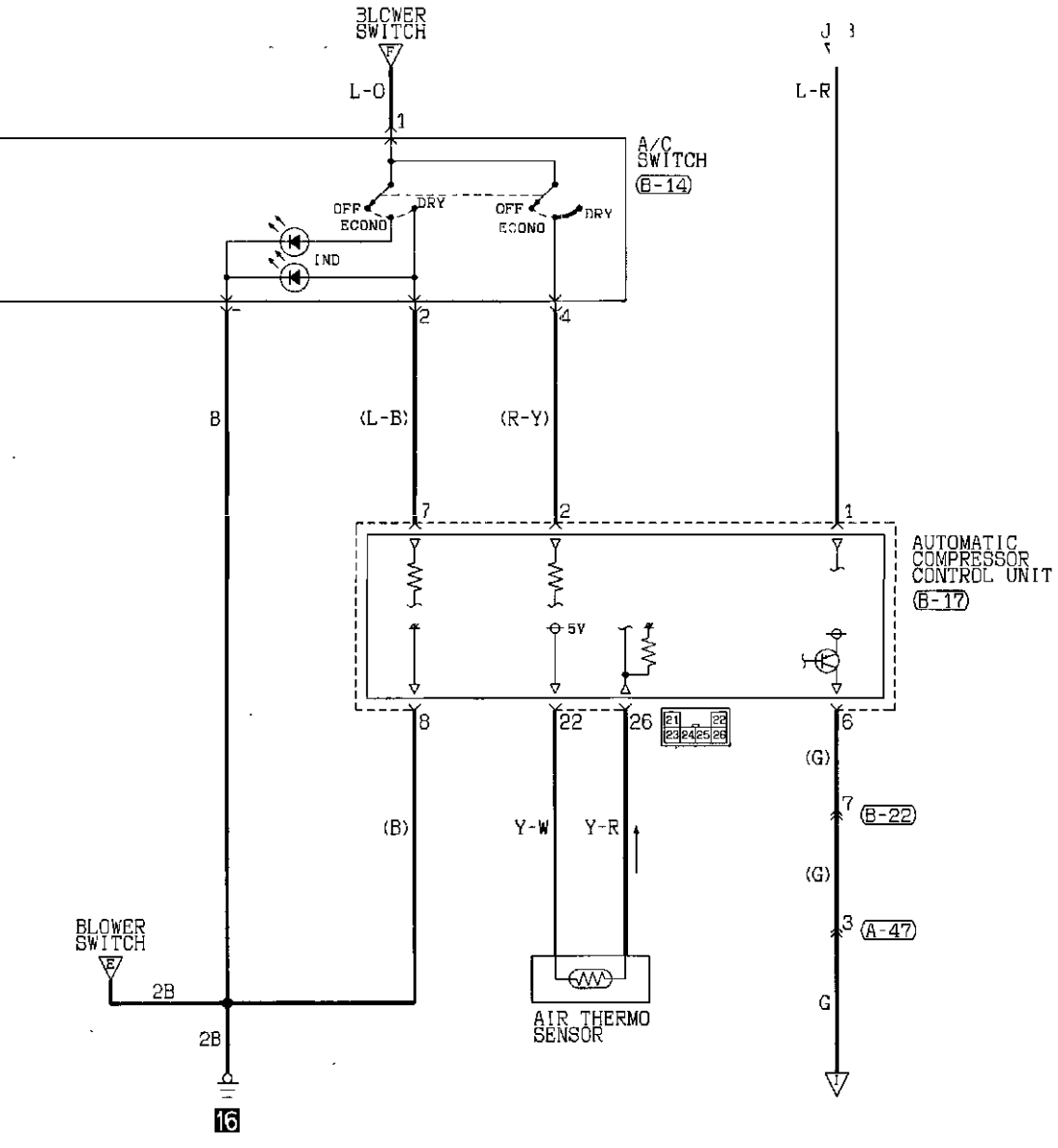


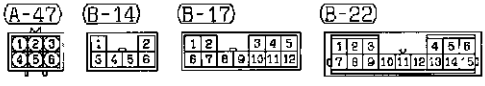


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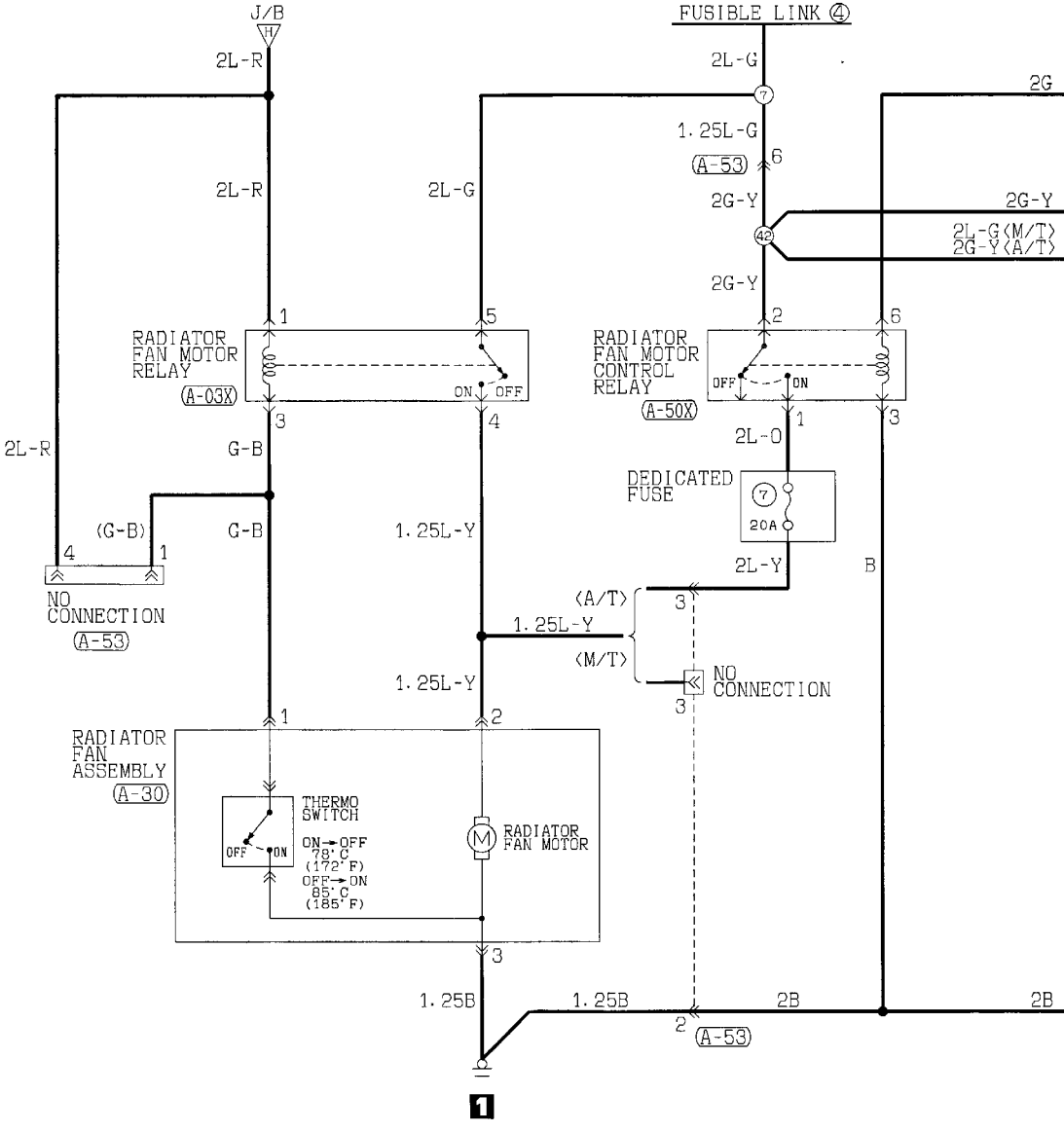
AIR CONDITIONING SYSTEM <1.5L ENGINE–1993 MODELS> (CONTINUED)

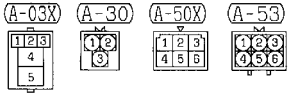


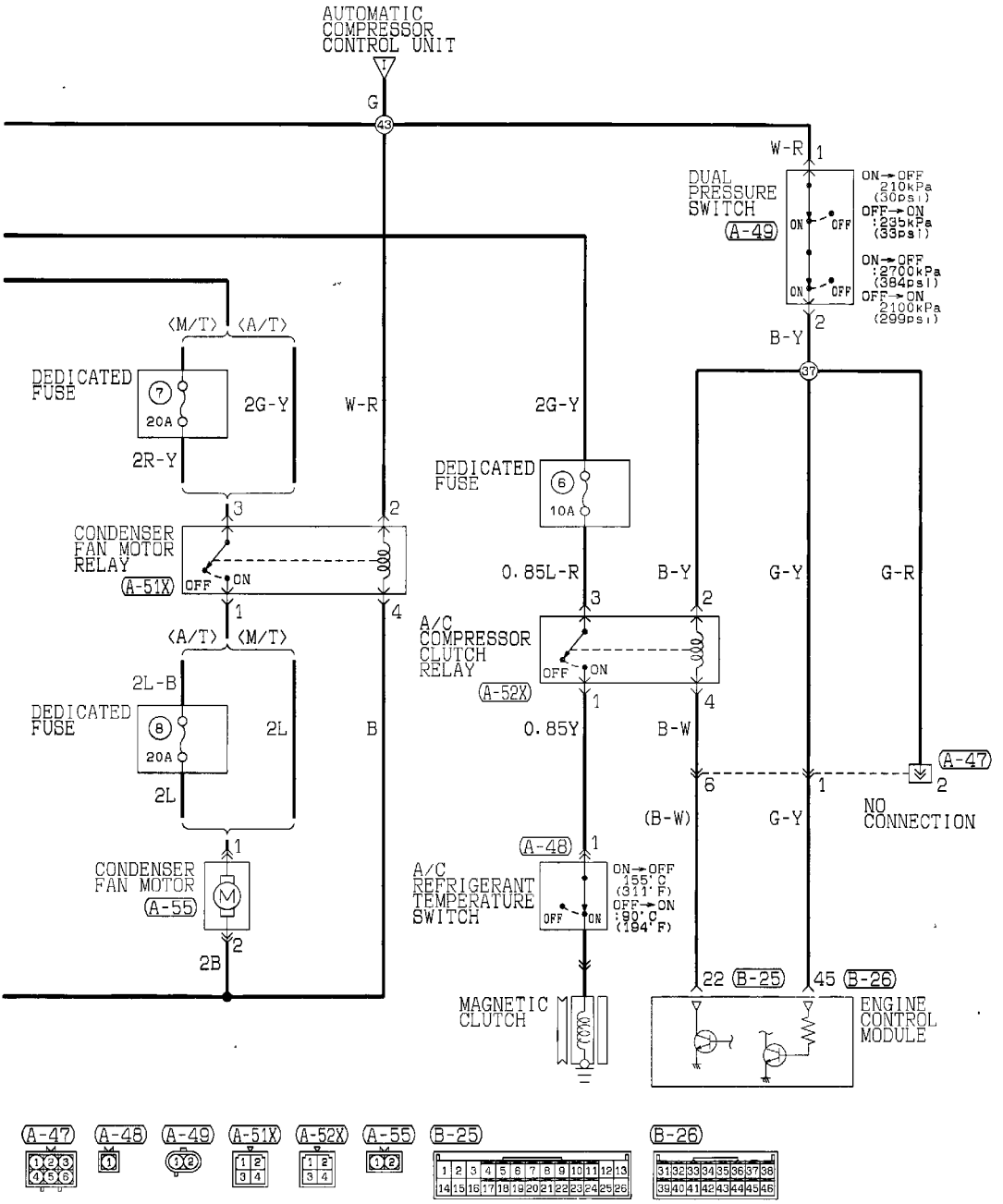

BLOWER SWITCH
F
L-O
1
A/C SWITCH
B-14
OFF
ECONO
DRY
IND
L-R
B
(L-B)
(R-Y)
2
4
7
AUTOMATIC COMPRESSOR CONTROL UNIT
B-17
5V
8
22
26
6
(G)
7
B-22
3
A-47
G
(B)
Y-W
Y-R
AIR THERMO SENSOR
BLOWER SWITCH
E
2B
16


A-47
B-14
B-17
B-22

AIR CONDITIONING SYSTEM <1.5L ENGINE–1993 MODELS> (CONTINUED)





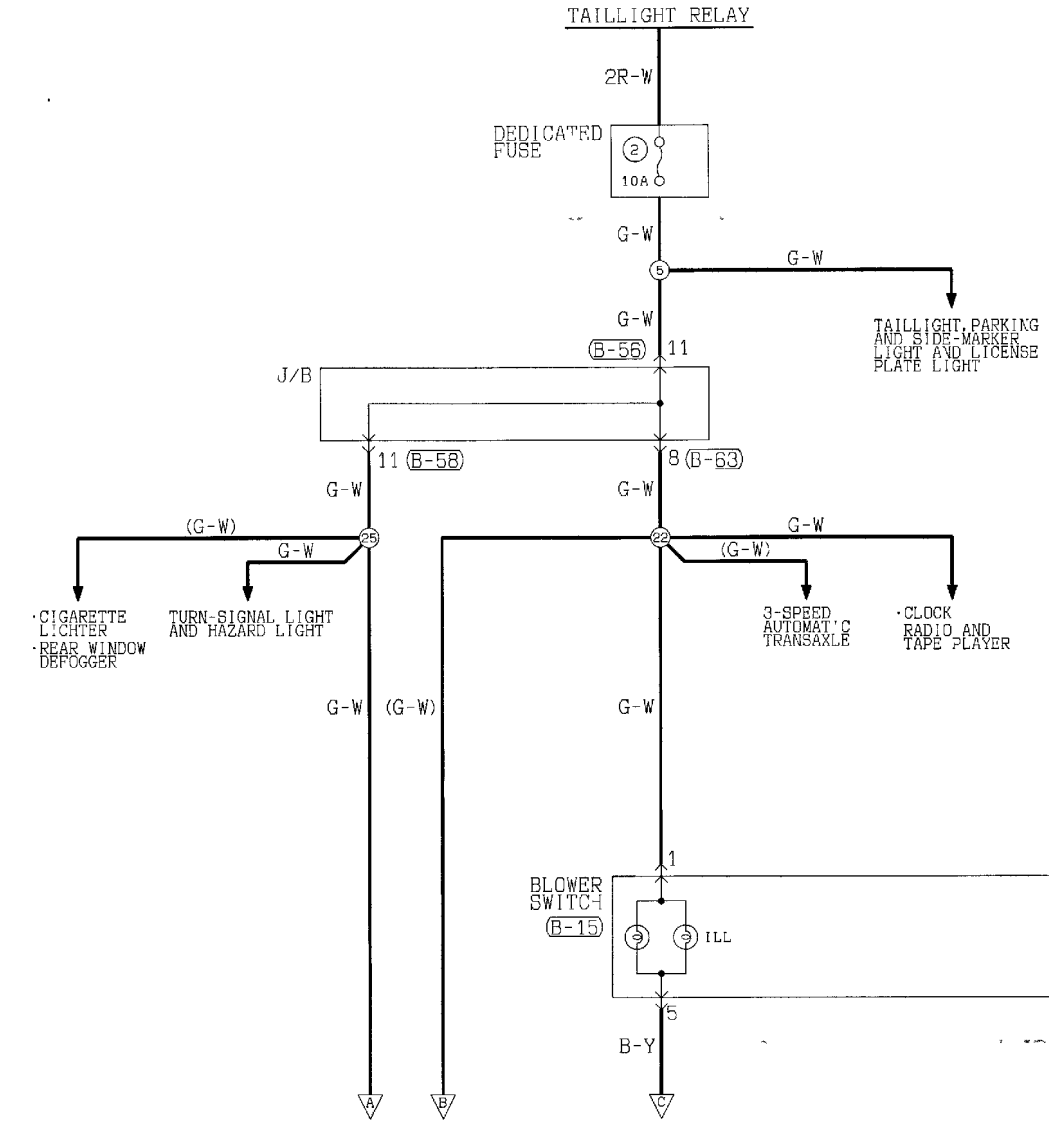


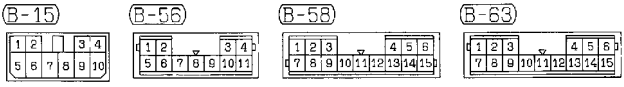
A-47 A-48 A-49 A-51X A-52X A-55 B-25 B-26

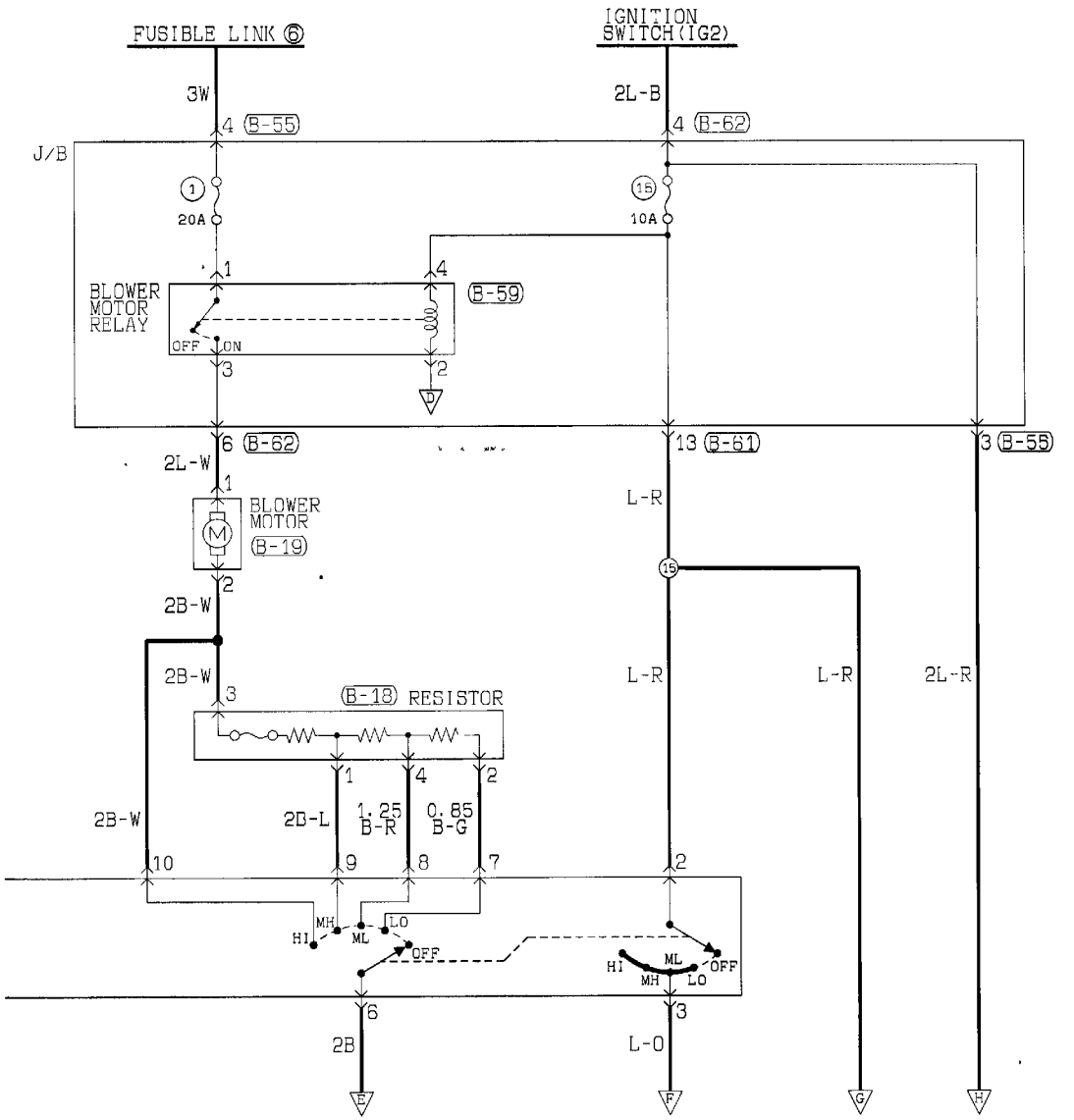
AIR CONDITIONING SYSTEM

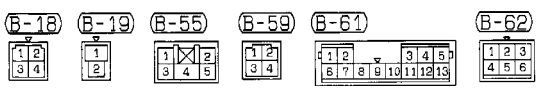
11000359

<1.5L ENGINE–FROM 1994 MODELS>

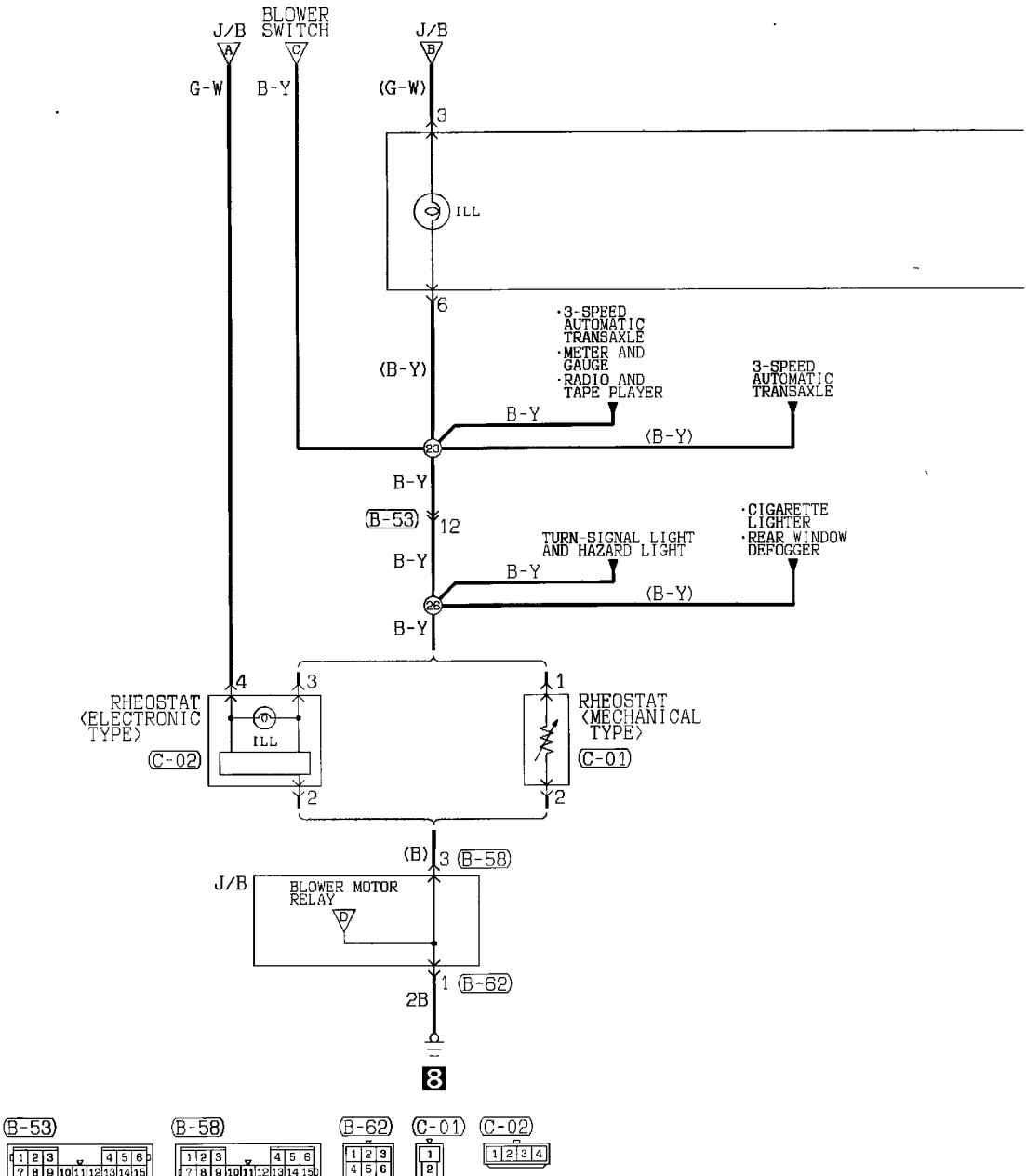


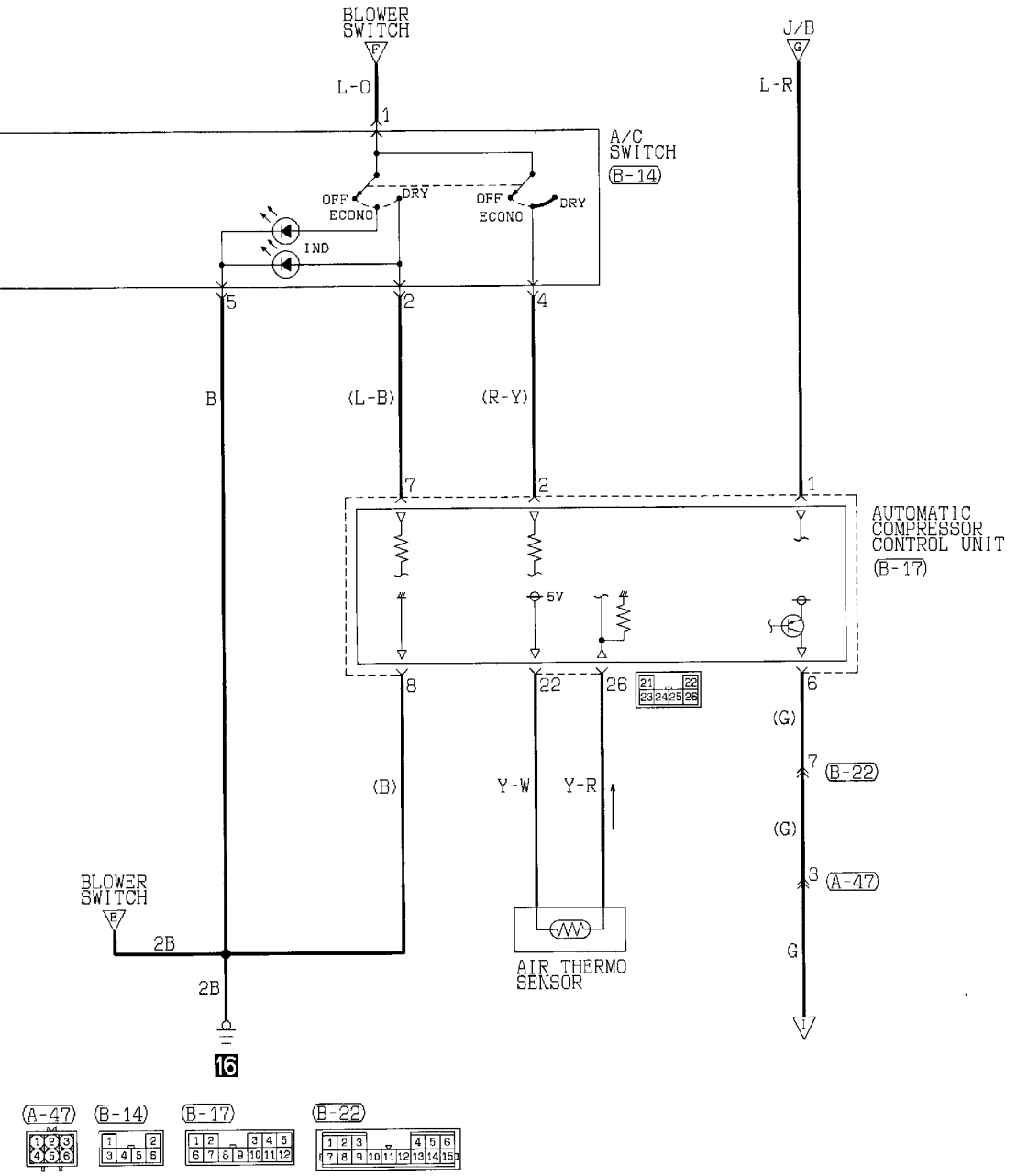



FUSIBLE LINK ⑥
IGNITION SWITCH(IG2)
3W
2L-B
4 (B-55)
4 (B-62)
J/B
1
20A
15
10A
BLOWER MOTOR RELAY
OFF
ON
(B-59)
6 (B-62)
13 (B-61)
3 (B-55)
2L-W
L-R
BLOWER MOTOR (B-19)
2B-W
2B-W
(B-18) RESISTOR
L-R
L-R
2L-R
2B-W
2B-L
1.25 B-R
0.85 B-G
HI
MH
ML
LO
OFF
2B
L-O
E
F
G
H


(B-18)
(B-19)
(B-55)
(B-59)
(B-61)
(B-62)

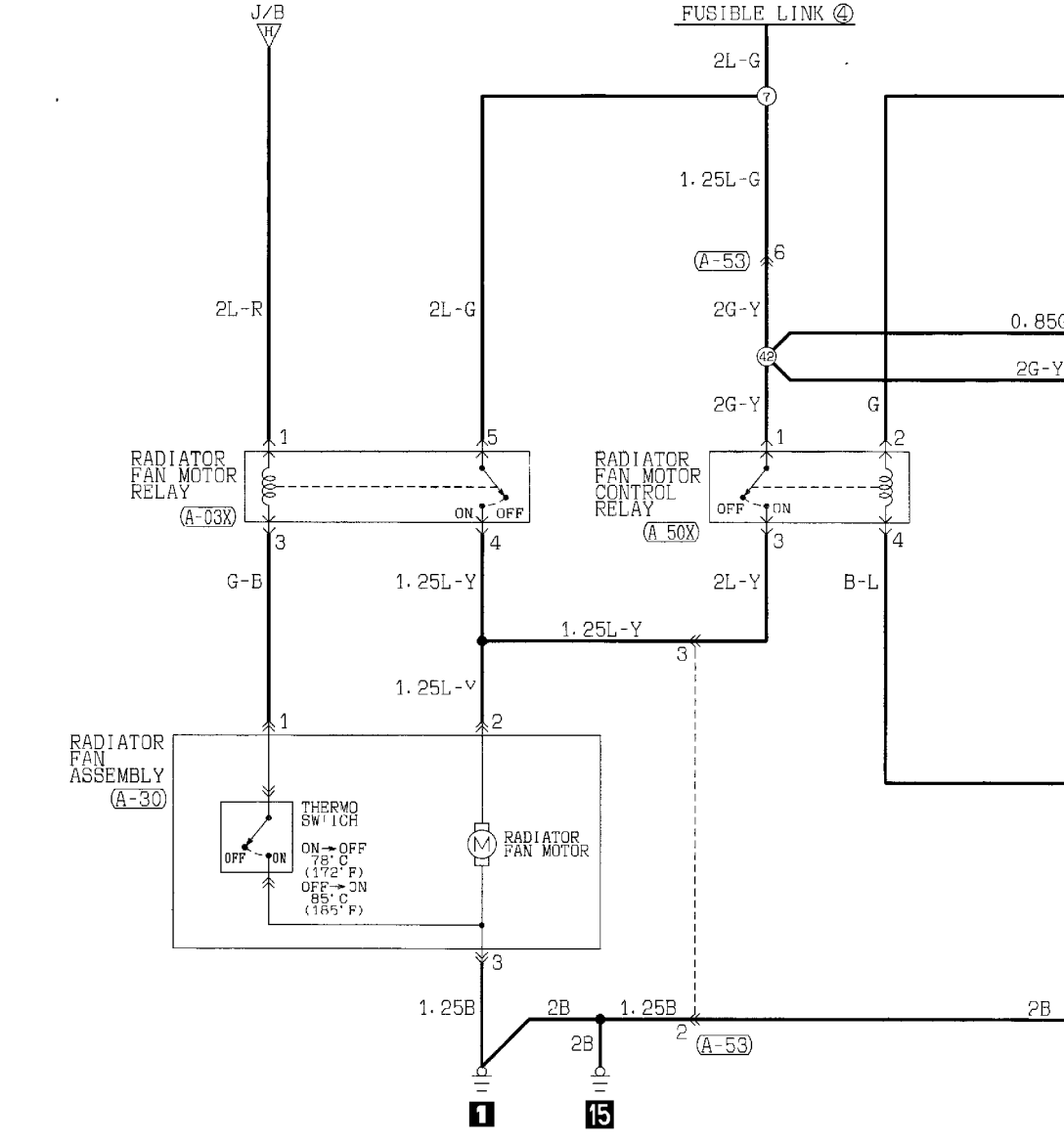
AIR CONDITINING SYSTEM <1.5L ENGINE–FROM 1994 MODELS> (CONTINUED)

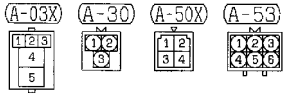


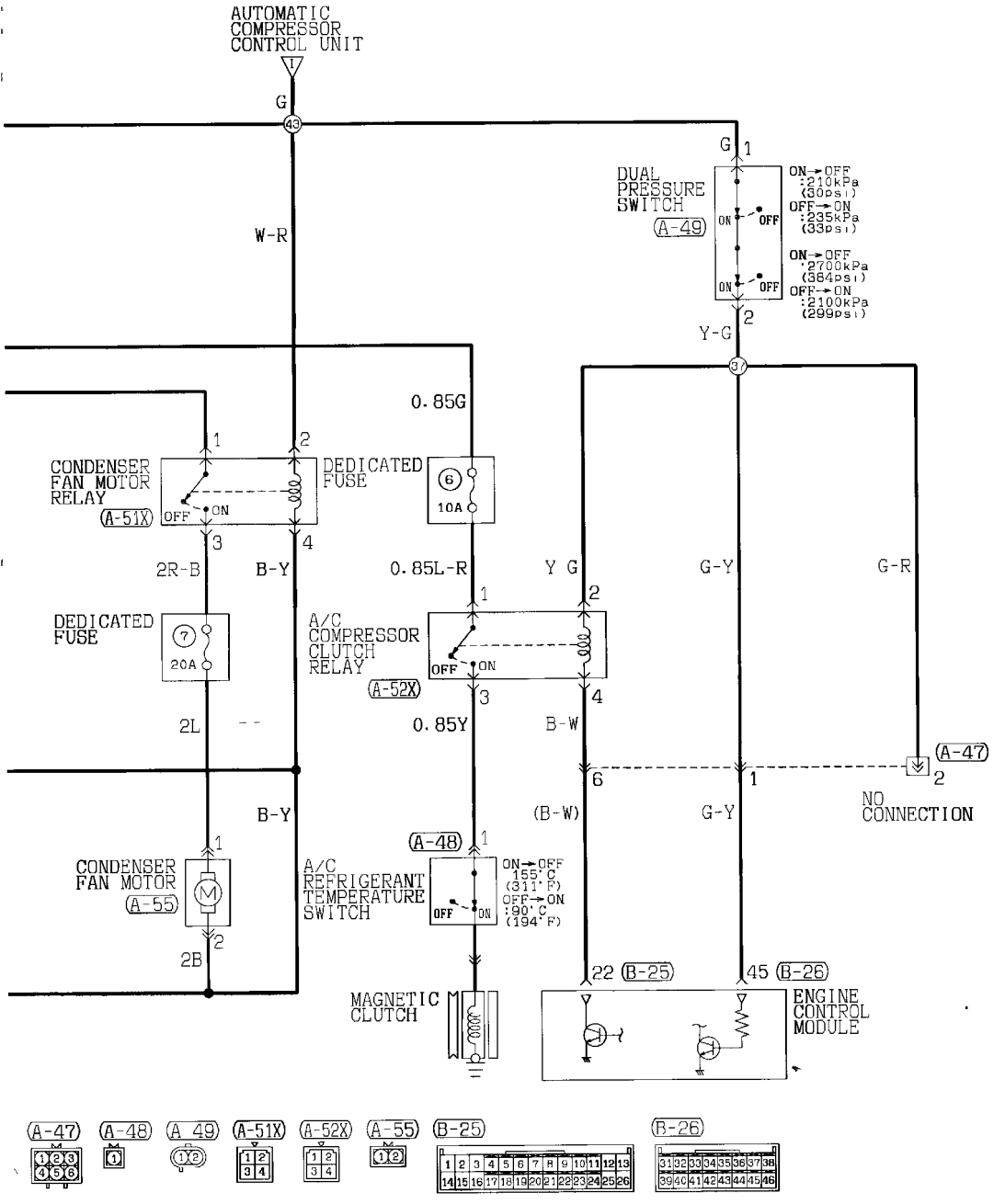

BLOWER SWITCH
F
L-O
1
A/C SWITCH
B-14
OFF
ECONO
DRY
IND
5
2
4
B
(L-B)
(R-Y)
J/B
G
L-R
7
2
1
AUTOMATIC COMPRESSOR CONTROL UNIT
B-17
5V
8
22
26
6
(G)
7
B-22
(G)
3
A-47
G
(B)
Y-W
Y-R
AIR THERMO SENSOR
BLOWER SWITCH
F
2B
2B
16

A-47
B-14
B-17
B-22

AIR CONDITIONING SYSTEM <1.5L ENGINE–FROM 1994 MODELS> (CONTINUED)





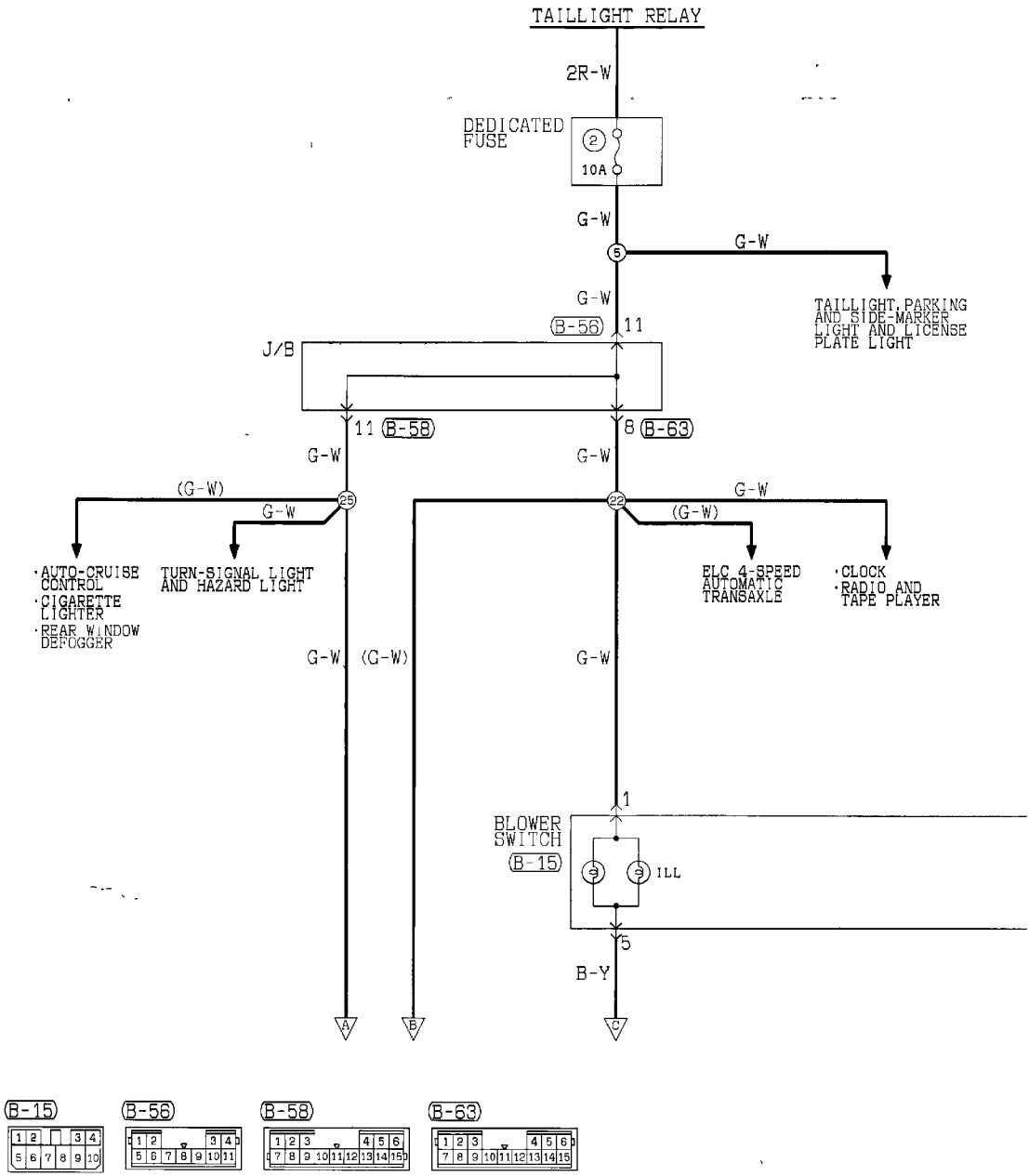


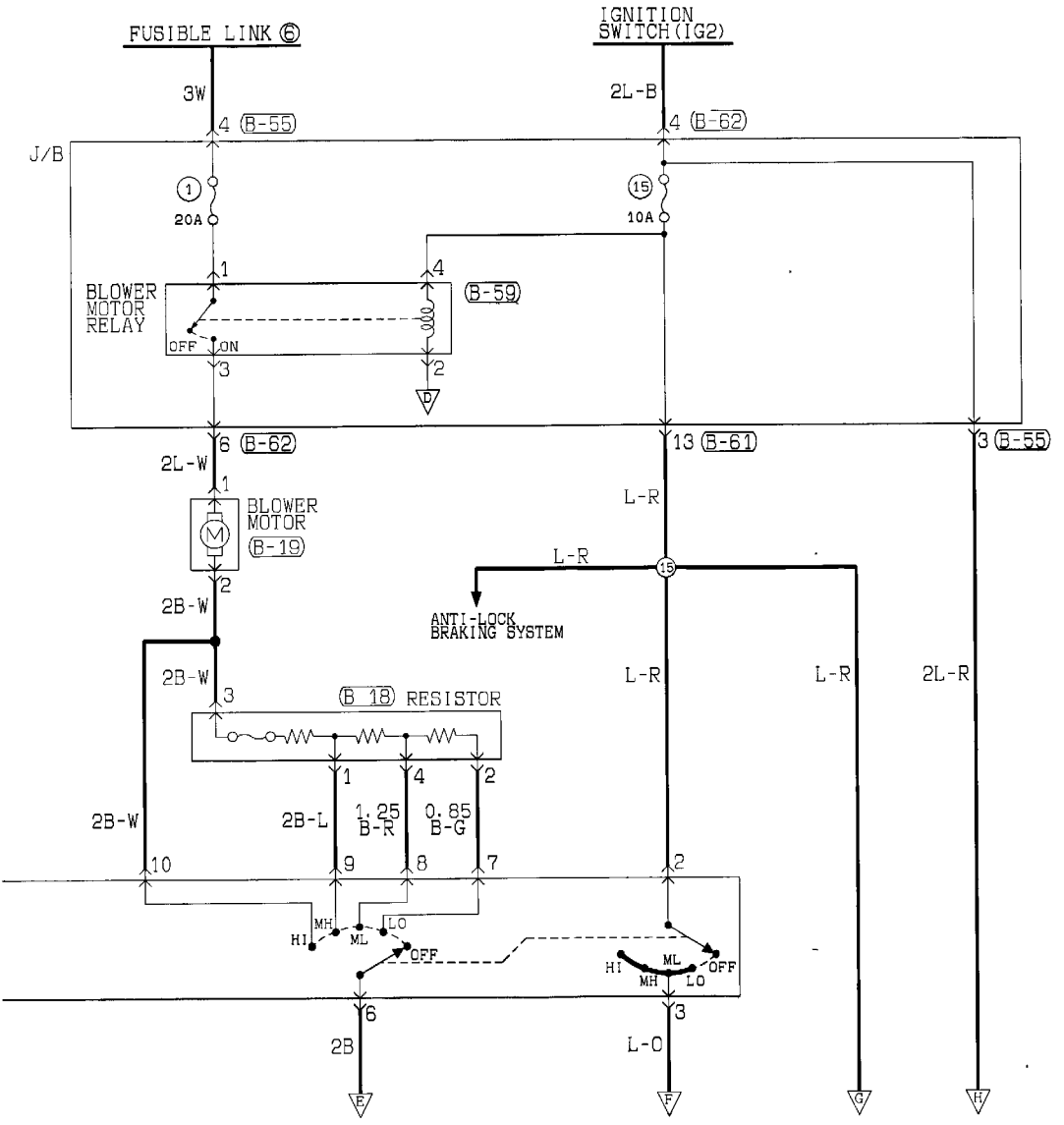
A-47 A-48 A 49 A-51X A-52X A-55 B-25 B-26

AIR CONDITIONING SYSTEM

110003595

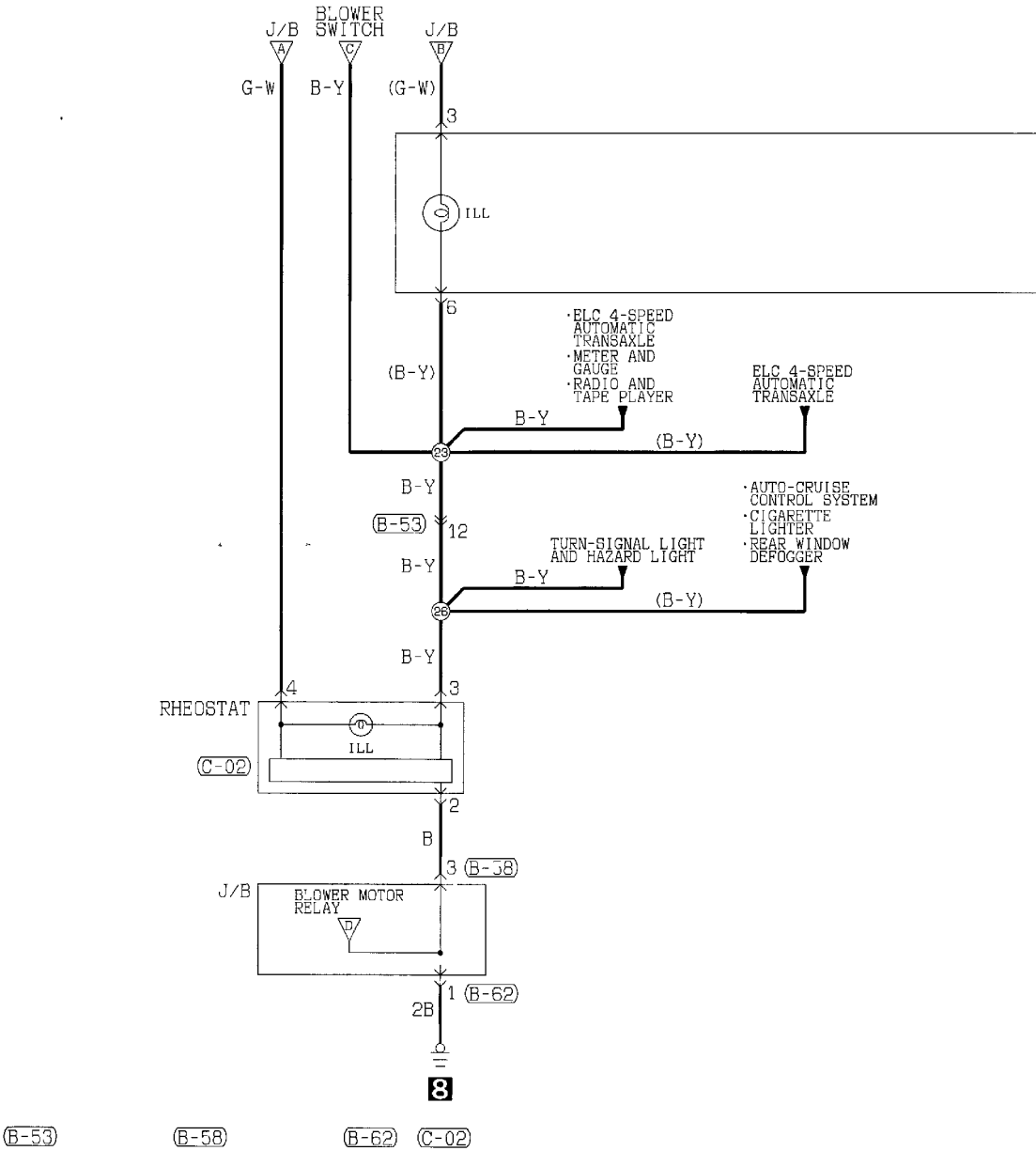
<1.8L ENGINE–1993 MODELS>

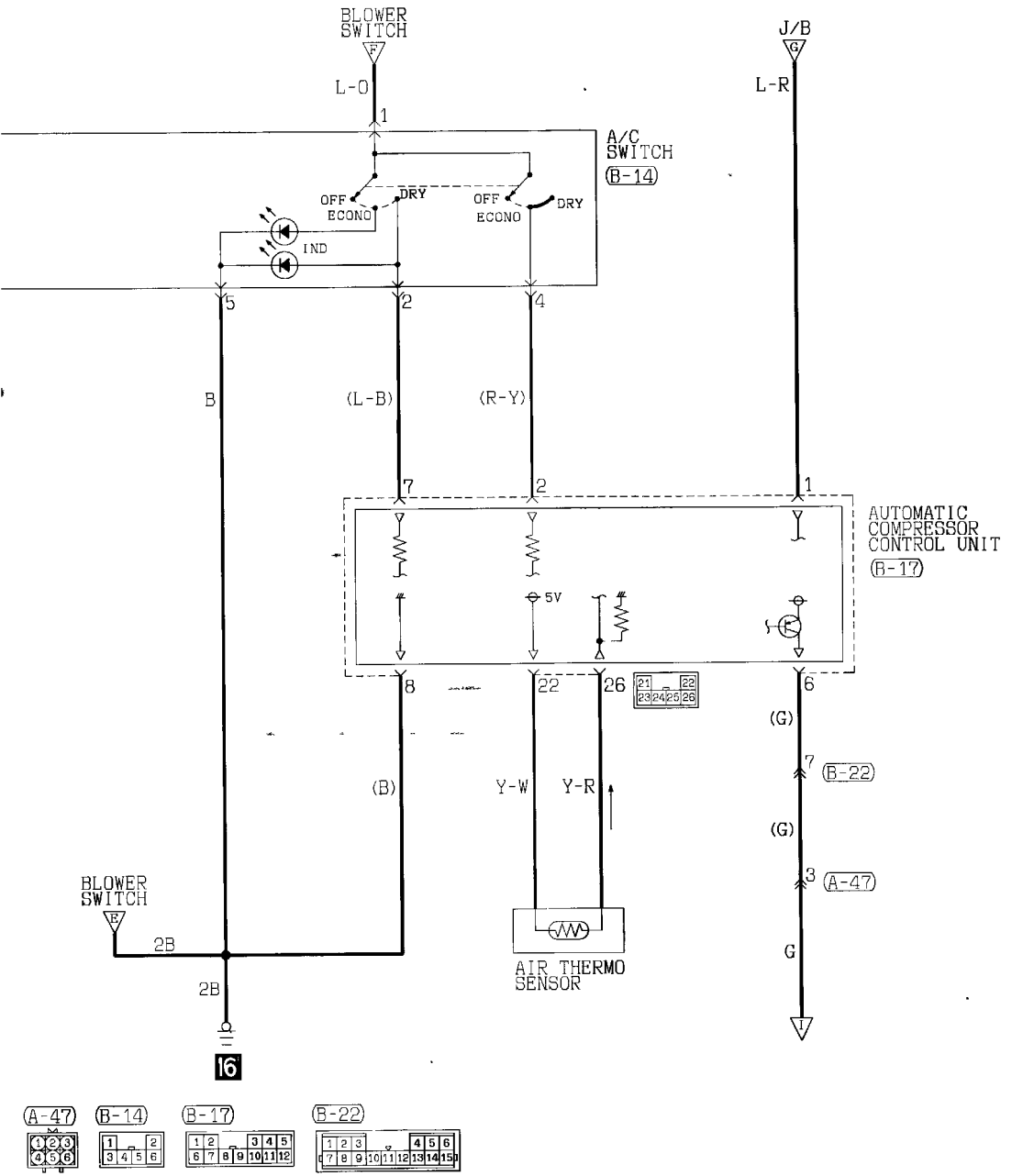




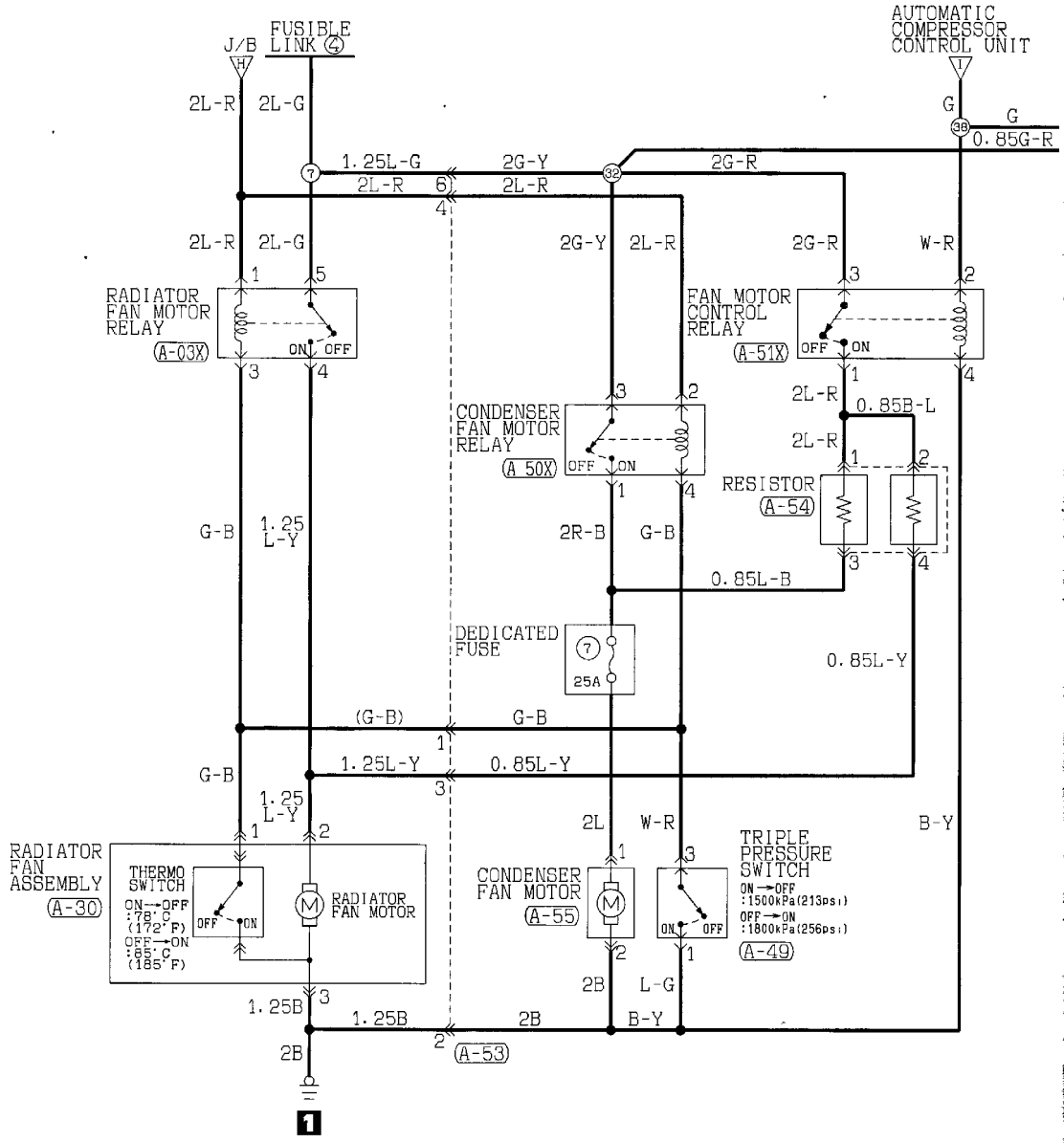
(B-18) (B-19) (B-55) (B-59) (B-61) (B-62)

AIR CONDITIONING SYSTEM <1.8L ENGINE–1993 MODELS> (CONTINUED)

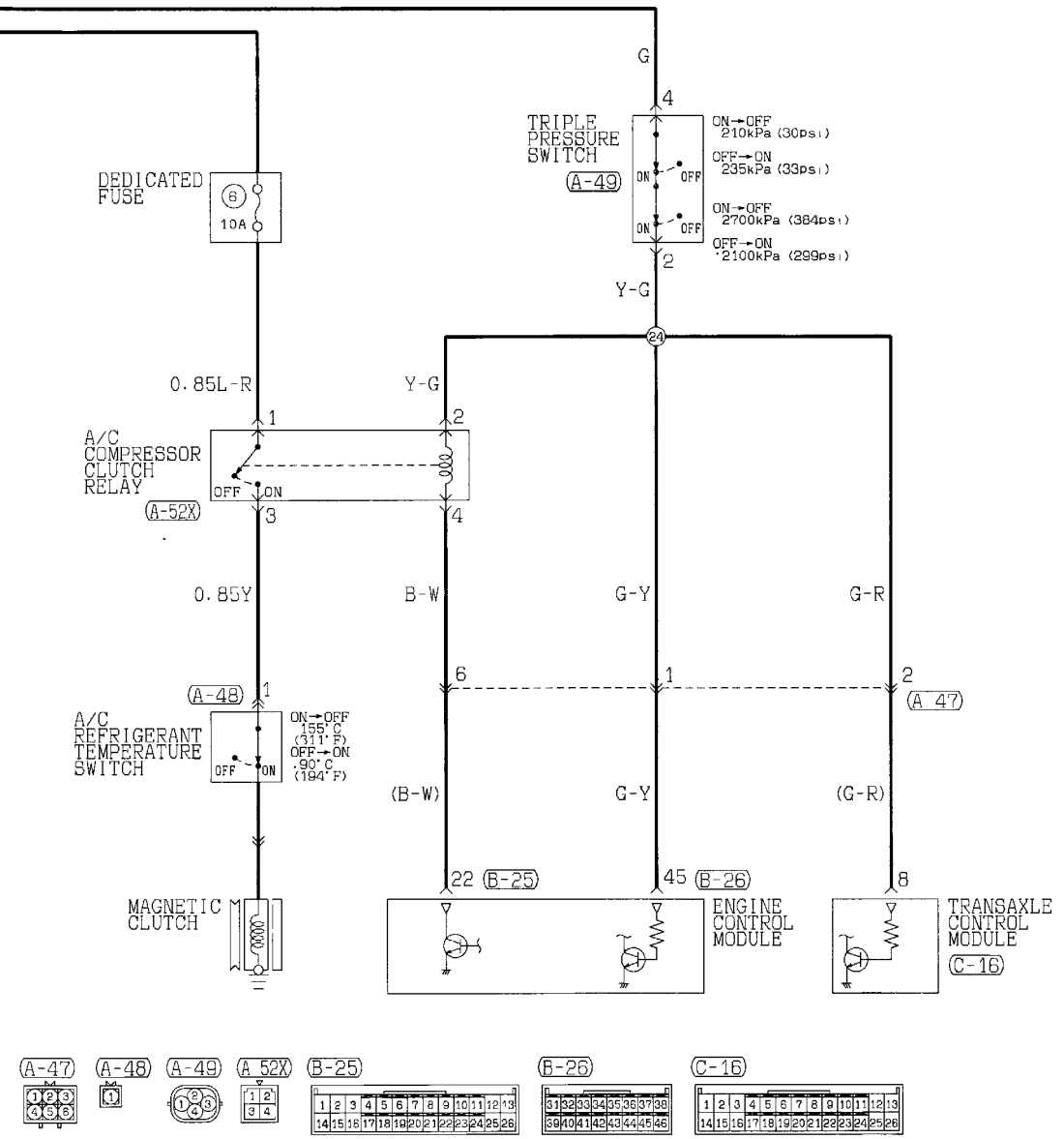



BLOWER SWITCH
F
L-O
1
A/C SWITCH
B-14
OFF
ECONO
DRY
OFF
ECONO
DRY
IND
5
2
4
J/B
G
L-R
B
(L-B)
(R-Y)
7
2
1
AUTOMATIC COMPRESSOR CONTROL UNIT
B-17
5V
8
22
26
21 22
23 24 25 26
6
(G)
7
B-22
(B)
Y-W
Y-R
(G)
3
A-47
BLOWER SWITCH
E
2B
G
2B
AIR THERMO SENSOR
16
A-47
B-14
B-17
B-22

AIR CONDITIONING SYSTEM <1.8L ENGINE–1993 MODELS> (CONTINUED)



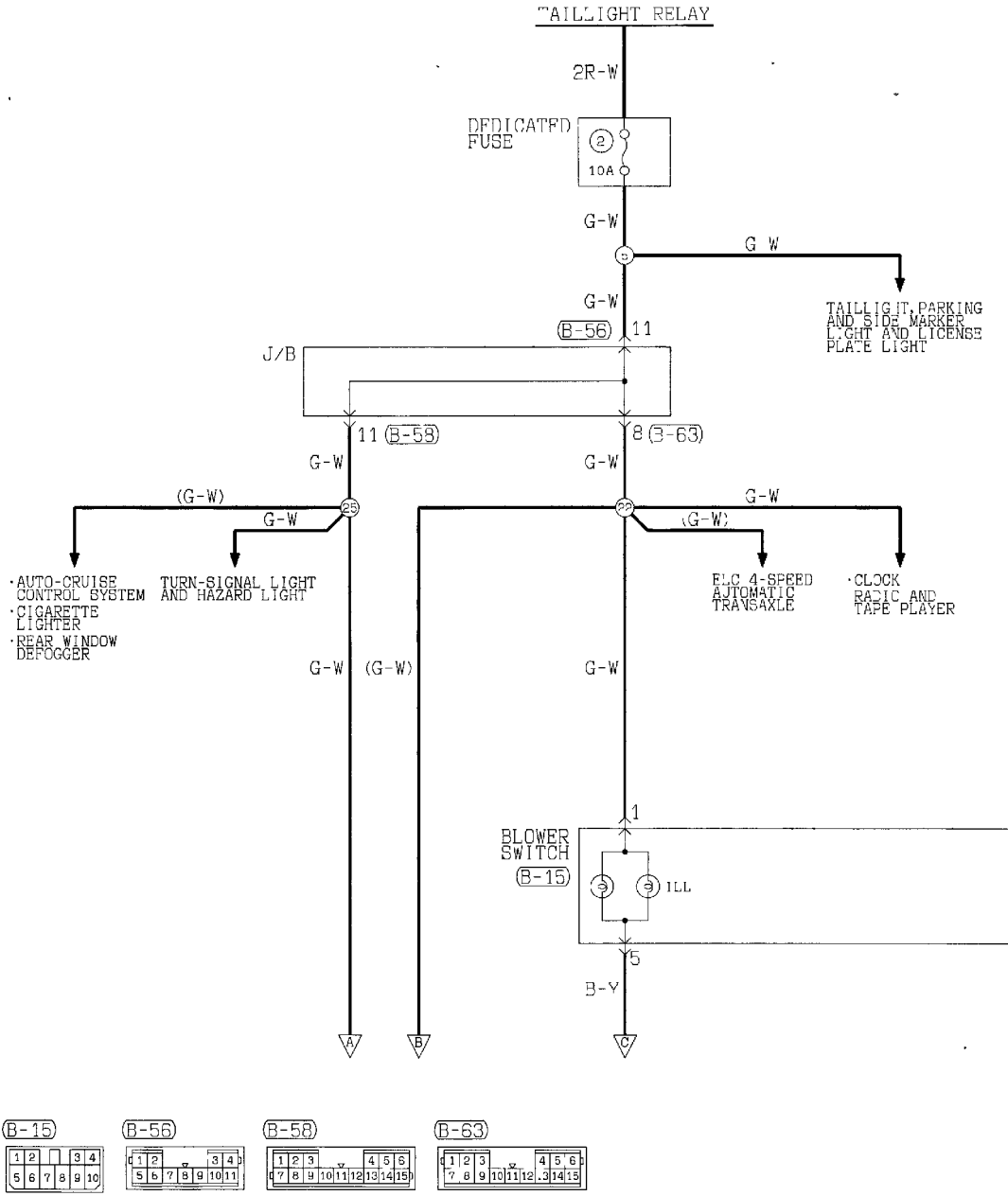
A-03X A-30 A-49 A-50X A-51X A-53 A-54 A-55

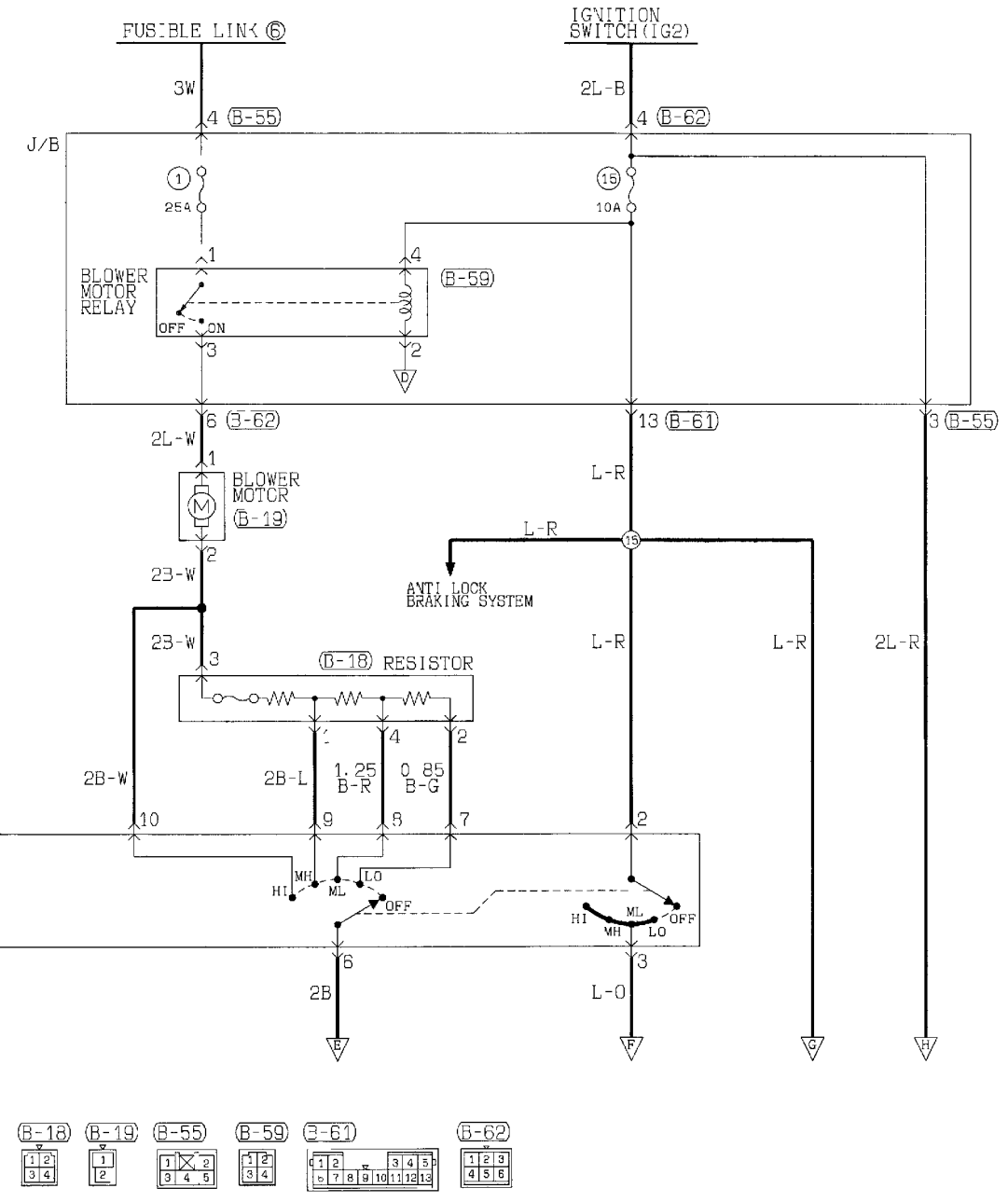

G
4
TRIPLE PRESSURE SWITCH
A-49
ON→OFF 210kPa (30psi)
OFF→ON 235kPa (33psi)
ON→OFF 2700kPa (384psi)
OFF→ON 2100kPa (299psi)
ON
OFF
2
Y-G
24
DEDICATED FUSE
6
10A
0.85L-R
Y-G
1
2
A/C COMPRESSOR CLUTCH RELAY
A-52X
OFF
ON
3
4
0.85Y
B-W
G-Y
G-R
A-48
6
1
2
A 47
A/C REFRIGERANT TEMPERATURE SWITCH
ON→OFF 155°C (311°F)
OFF→ON 90°C (194°F)
(B-W)
G-Y
(G-R)
MAGNETIC CLUTCH
22 B-25
45 B-26
8
ENGINE CONTROL MODULE
TRANSAXLE CONTROL MODULE
C-16
A-47
A-48
A-49
A 52X
B-25
B-26
C-16

AIR CONDITIONING SYSTEM

11000359

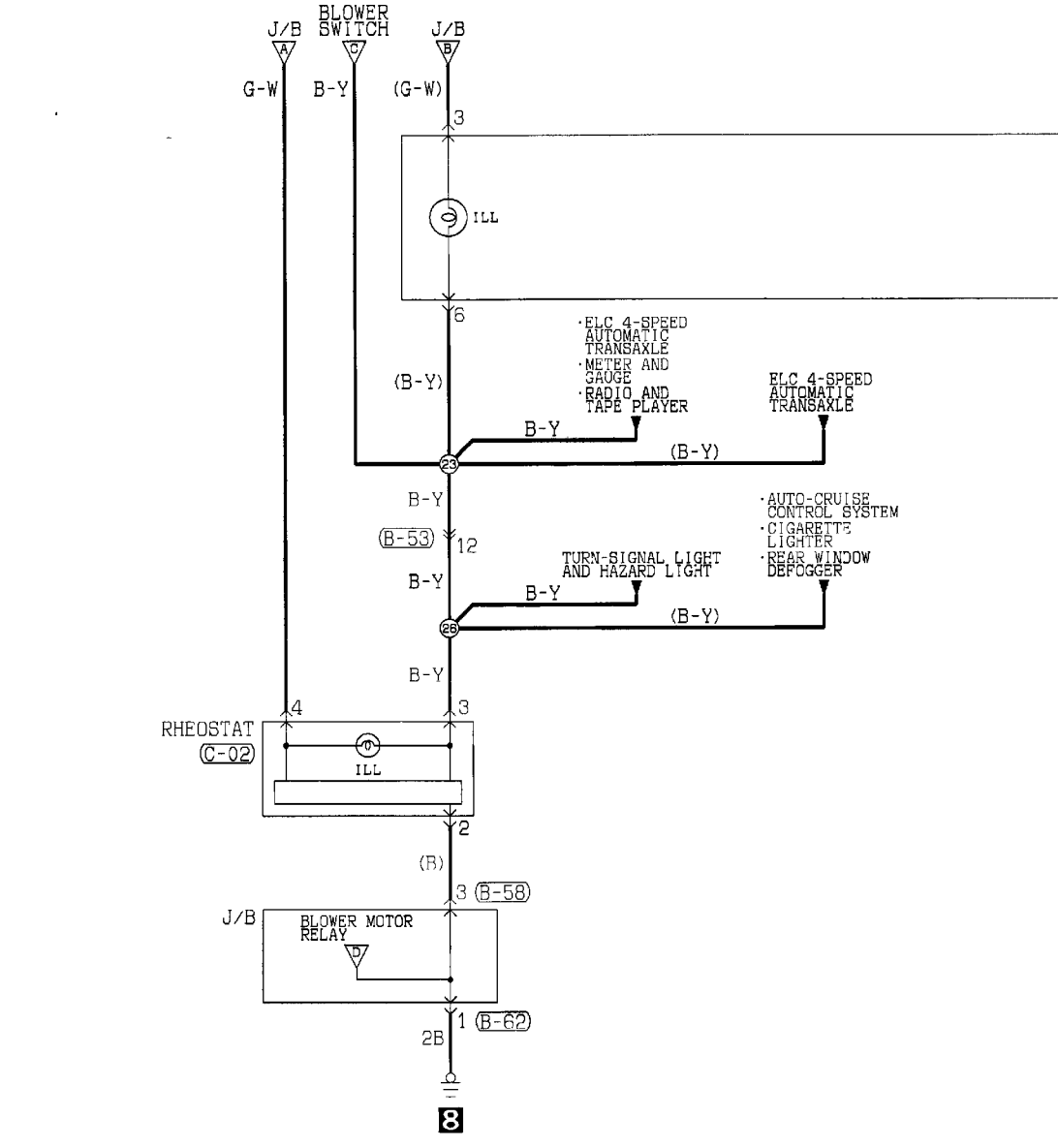
<1.8L ENGINE–FROM 1994 MODELS>

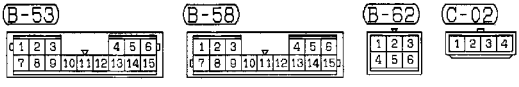


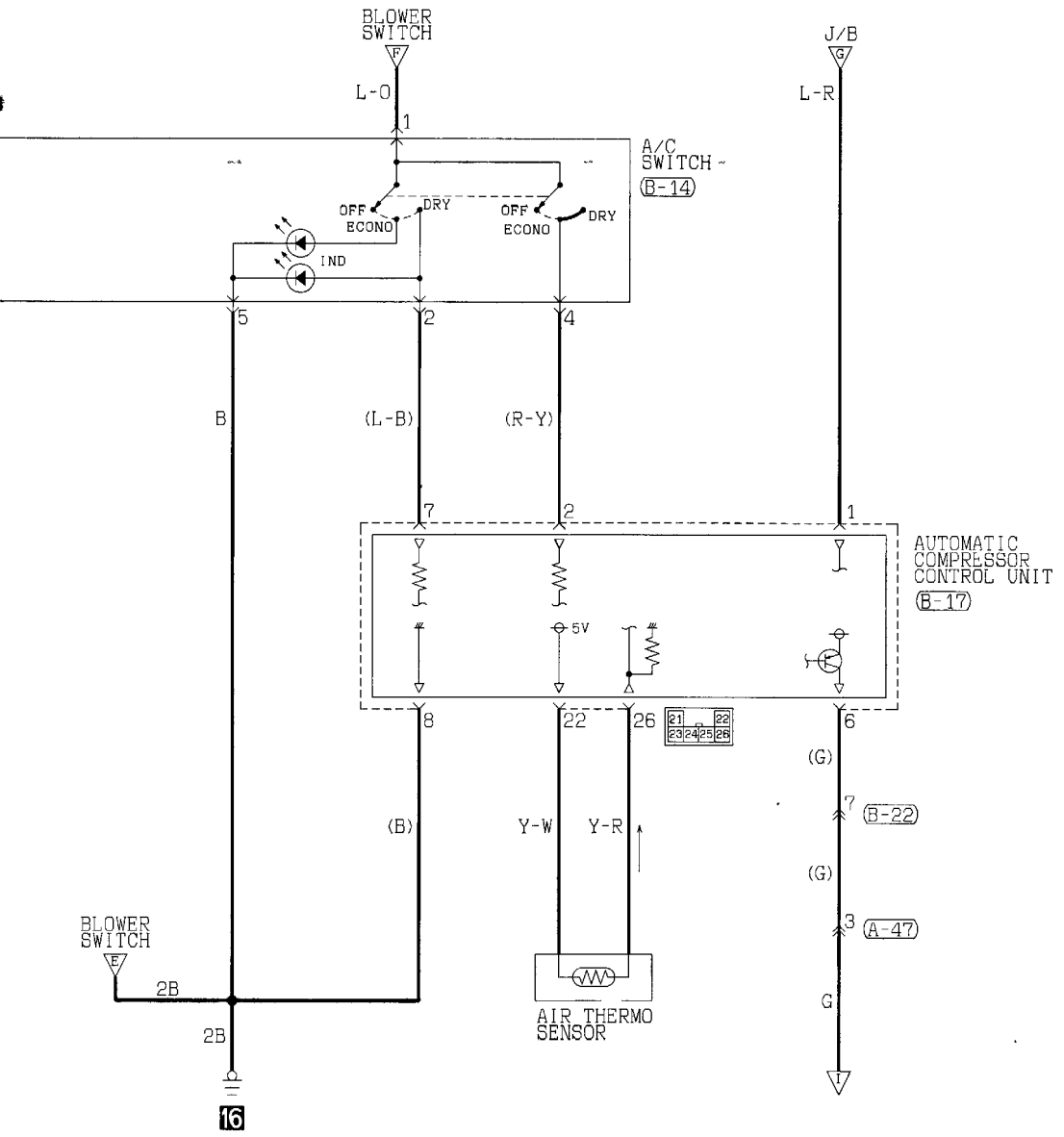

FUSIBLE LINK ⑥
IGNITION SWITCH (IG2)
3W
2L-B
4 B-55
4 B-62
J/B
1
25A
15
10A
BLOWER MOTOR RELAY
OFF
ON
B-59
6 B-62
13 B-61
3 B-55
2L-W
BLOWER MOTOR
B-19
L-R
ANTI LOCK BRAKING SYSTEM
2B-W
B-18 RESISTOR
2L-R
2B-L
1.25 B-R
0.85 B-G
MH
HI
ML
LO
OFF
2B
L-O
E
F
G
H

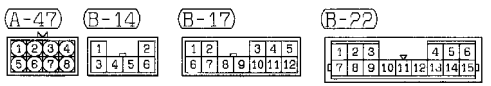
B-18
B-19
B-55
B-59
B-61
B-62

AIR CONDITIONING SYSTEM <1.8L ENGINE–FROM 1994 MODELS> (CONTINUED)

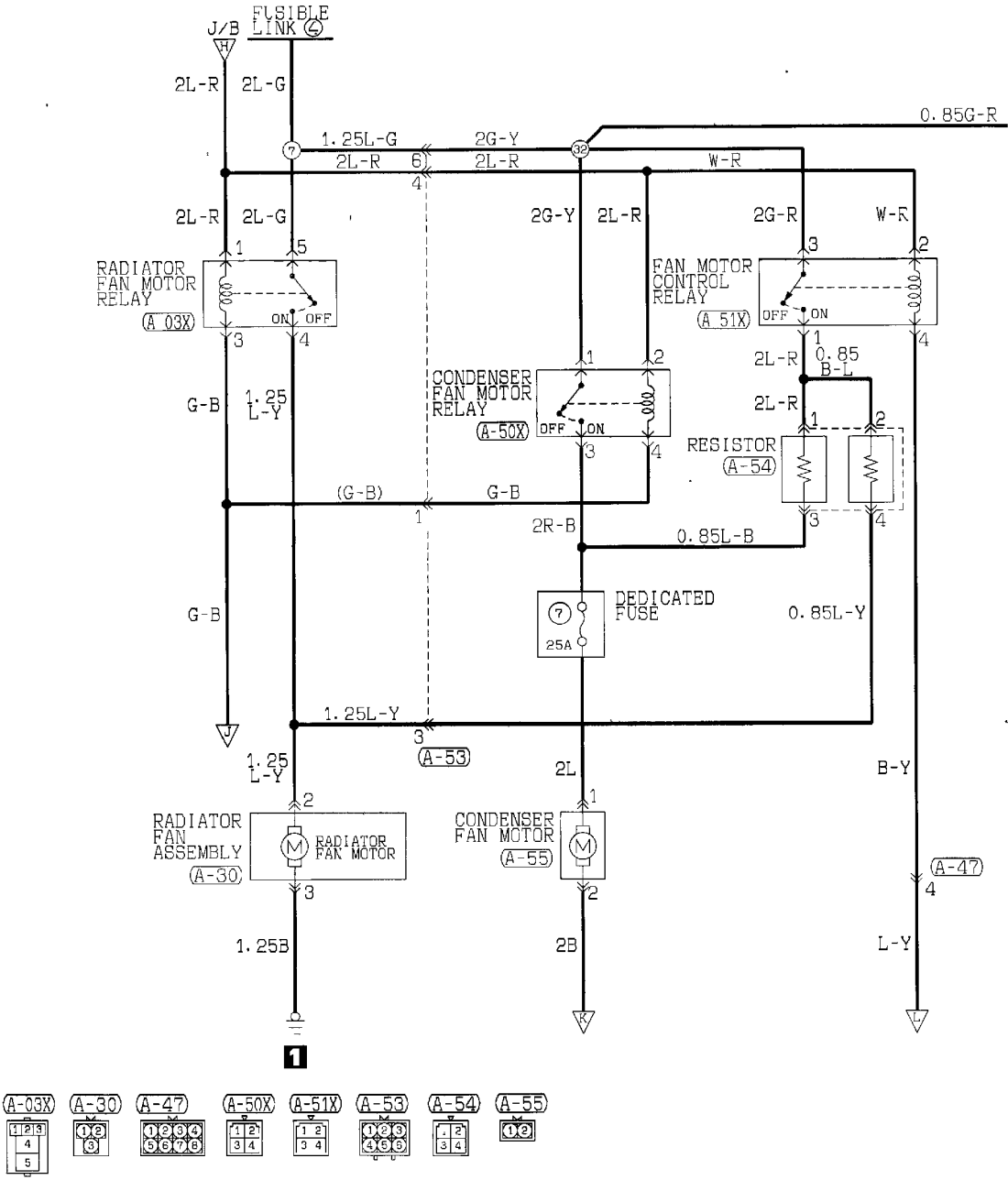




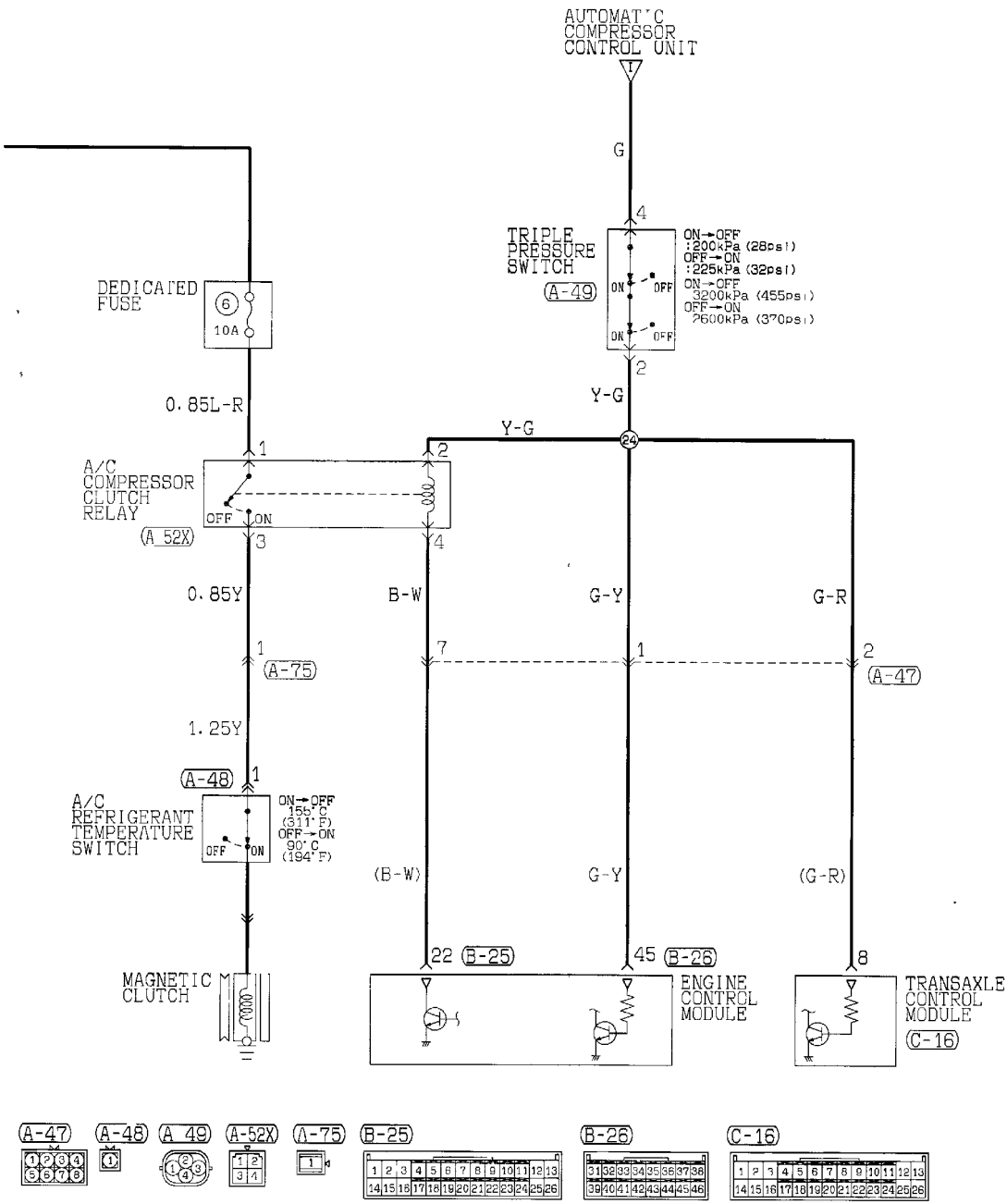

BLOWER SWITCH
F
L-O
1
A/C SWITCH
B-14
OFF
ECONO
DRY
IND
J/B
G
L-R
5
2
4
B
(L-B)
(R-Y)
7
2
1
AUTOMATIC COMPRESSOR CONTROL UNIT
B-17
5V
8
22
26
6
(G)
7
B-22
(B)
Y-W
Y-R
(G)
3
A-47
G
BLOWER SWITCH
E
2B
2B
16
AIR THERMO SENSOR


A-47
B-14
B-17
B-22

AIR CONDITIONING SYSTEM <1.8L ENGINE–FROM 1994 MODELS> (CONTINUED)

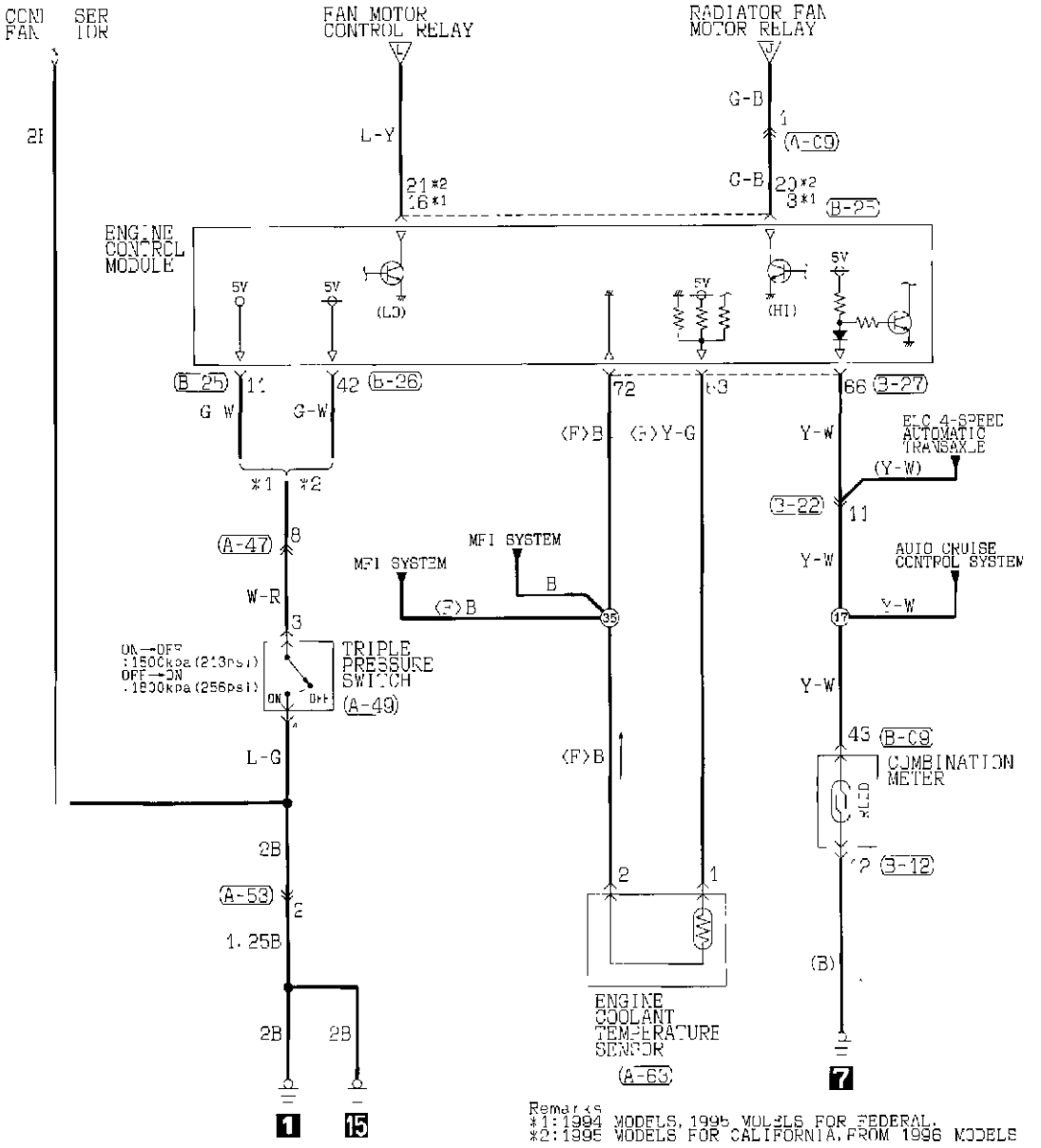


A-03X A-30 A-47 A-50X A-51X A-53 A-54 A-55

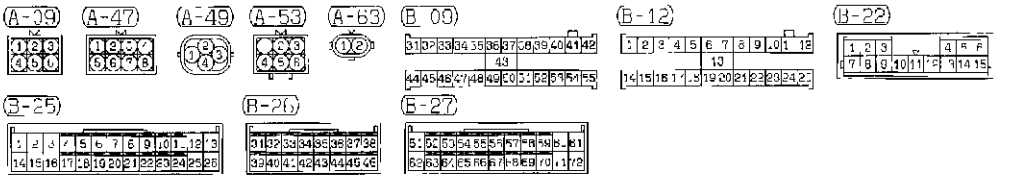

AUTOMATIC COMPRESSOR CONTROL UNIT
G
4
TRIPLE PRESSURE SWITCH
A-49
ON→OFF :200kPa (28psi)
OFF→ON :225kPa (32psi)
ON→OFF 3200kPa (455psi)
OFF→ON 2600kPa (370psi)
ON OFF
2
Y-G
DEDICATED FUSE
6
10A
0.85L-R
Y-G
24
1
2
A/C COMPRESSOR CLUTCH RELAY
A-52X
OFF ON
3
4
0.85Y
B-W
G-Y
G-R
1
A-75
7
1
2
A-47
1.25Y
A-48
A/C REFRIGERANT TEMPERATURE SWITCH
ON→OFF 155°C (311°F)
OFF→ON 90°C (194°F)
OFF ON
(B-W)
G-Y
(G-R)
MAGNETIC CLUTCH
22 B-25
45 B-26
8
ENGINE CONTROL MODULE
TRANSAXLE CONTROL MODULE
C-16

A-47
A-48
A-49
A-52X
A-75
B-25
B-26
C-16

AIR CONDITIONING SYSTEM <1.8L ENGINE–FROM 1994 MODELS> (CONTINUED)



Remarks
*1: 1994 MODELS, 1995 MODELS FOR FEDERAL
*2: 1995 MODELS FOR CALIFORNIA, FROM 1996 MODELS



FB12M05D

TSB Revision

OPERATION <1.5L ENGINE, 1.8L ENGINE–1993 MODELS> 110003597

<Condenser fan and radiator fan control>

- For the operation of each fan, see COOLING CIRCUIT. (P.172)

<Compressor control>

- The refrigerant temperature switch, which senses the temperature of the refrigerant, is deactivated with temperature 155°C (311°F) or higher.
- When the air conditioning switch is set to the "DRY" mode, the air thermo sensor detects the temperature of the air emitted from the evaporator; the A/C compressor clutch relay is switched OFF if the temperature is 2.2°C (36°F) or lower. Furthermore, when the air conditioning switch is set to the "ECONO" mode, the A/C compressor clutch relay is switched off at temperatures of 7°C (45°F) or below.
- The dual pressure switch <1.5L Engine> or triple pressure switch <1.8L Engine> turns OFF when the refrigerant pressure becomes excessively high or low, thus protecting the compressor circuit. (See Table below.)
- The air conditioning compressor clutch relay is energized when the refrigerant–temperature switch, the air thermo sensor are ON, and the dual-pressure switch <1.5L Engine> or triple pressure switch <1.8L Engine> is ON, and the ignition switch, blower switch and air conditioning switch are all ON.
- However, note that the air conditioning compressor clutch relay is switched OFF when starting and during low rpm operation until a certain fixed time has passed, depending upon the running conditions, in order to prevent engine stall and engine vibrations. In addition, for 4-speed automatic transaxle models, when the throttle valve opening is large (throttle-position sensor output voltage approximately 4V and throttle valve opening approximatery 65° or greater) during acceleration, the air conditioning compressor clutch relay drive transistor (located within the engine control module) is switched OFF for about five seconds and the air conditioning compressor clutch relay is switched OFF in order to maintain acceleration performance.

TROUBLESHOOTING HINTS

<Condenser fan and radiator fan control>

- See COOLING CIRCUIT. (P.172)

<Compressor control>

- See GROUP 55 – Troubleshooting.

Air Conditioning Compressor Clutch Relay ON Conditions
If any one of the switches, sensors or the control unit is OFF, the air conditioning compressor clutch relay will turn OFF.

Ignition switch (IG_2)		ON
Blower switch		ON
Air conditioning switch		ON (ECONO or DRY)
Refrigerant temperature switch		ON [90°C (194°F) or below]
Air thermo sensor		ON [3.2°C (38°F) or higher] (DRY mode)
		ON [8°C (46°F) or higher] (ECONO mode)
Dual pressure switch <1.5L Engine> or tripple pressure switch <1.8L Engine>	Low-pressure side	ON [235 kPa (33 psi) or higher]
	High-pressure side	ON [2,100 kPa (229 psi) or higher]
Air conditioning compressor clutch relay driving transistor (within engine control module)		ON

OPERATION 110003598

<1.8L ENGINE–FROM 1994 MODELS>

<Condenser fan and radiator fan control>

- For the operation of each fan, see COOLING CIRCUIT. (P.182)

<Compressor control>

- The refrigerant temperature switch, which senses the temperature of the refrigerant, is deactivated with temperature 155°C (311°F) or higher.
- When the air conditioning switch is set to the "DRY" mode, the air thermo sensor detects the temperature of the air emitted from the evaporator; the A/C compressor clutch relay is switched OFF if the temperature is 2.2°C (36°F) or lower. Furthermore, when the air conditioning switch is set to the "ECONO" mode, the A/C compressor clutch relay is switched off at temperatures of 7°C (45°F) or below.
- The engine coolant temperature sensor senses the temperature of engine coolant, and it is turned off at 115°C (239°F) or higher temperatures.
- The triple pressure switch turns OFF when the refrigerant pressure becomes excessively high or low, thus protecting the compressor circuit. (See Table below.)
- The air conditioning compressor clutch relay is energized when the refrigerant-temperature switch, the air thermo sensor are ON, and the triple pressure switch is ON, and the ignition switch, blower switch and air conditioning switch are all ON.
- However, note that the air conditioning compressor clutch relay is switched OFF when starting and during low rpm operation until a certain fixed time has passed, depending upon the running conditions, in order to prevent engine stall and engine vibrations. In addition, for 4-speed automatic transaxle models, when the throttle valve opening is large (throttle-position sensor output voltage approximately 4 V and throttle valve opening approximately 65° or greater) during acceleration, the air conditioning compressor clutch relay drive transistor (located within the engine control module) is switched OFF for about five seconds and the air conditioning compressor clutch relay is switched OFF in order to maintain acceleration performance.

TROUBLESHOOTING HINTS

<Condenser fan and radiator fan control>

- See COOLING CIRCUIT. (P.182)

<Compressor control>

- See GROUP 55 – Troubleshooting.

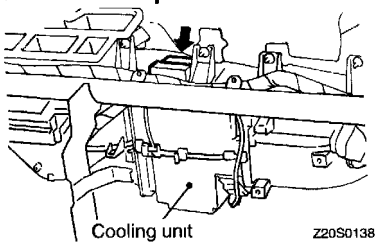
Air Conditioning Compressor Clutch Relay ON Conditions
If any one of the switches, sensors or the control unit is OFF, the air conditioning compressor clutch relay will turn OFF.

Ignition switch (IG_2)		ON
Blower switch		ON
Air conditioning switch		ON (ECONO or DRY)
Refrigerant temperature switch		ON [90°C (194°F) or below]
Air thermo sensor		ON [3.2°C (38°F) or higher] (DRY mode)
		ON [8°C (46°F) or higher] (ECONO mode)
Engine coolant temperature sensor		ON [108°C (226°F) or below]
Triple pressure switch	Low-pressure side	ON [225 kPa (32 psi) or higher]
	High-pressure side	ON [2,600 kPa (370 psi) or higher]
Air conditioning compressor clutch relay driving transistor (within engine control module)		ON

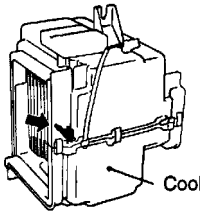
COMPONENT LOCATION

110003599

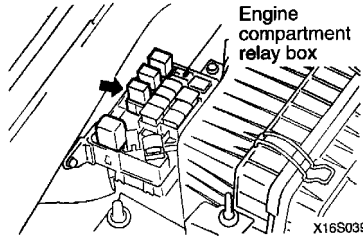
Automatic compressor control unit



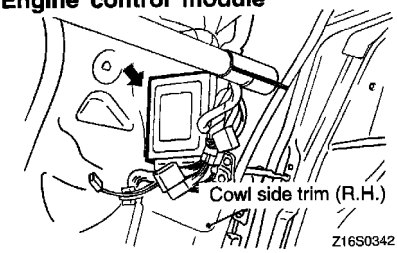
Air thermo sensor



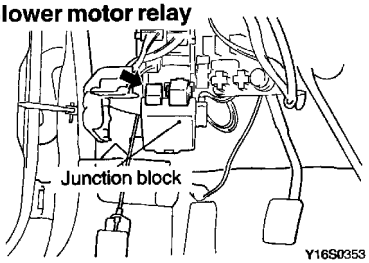
Radiator fan motor relay



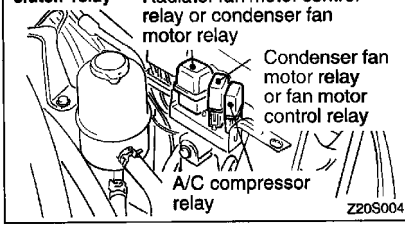
Engine control module



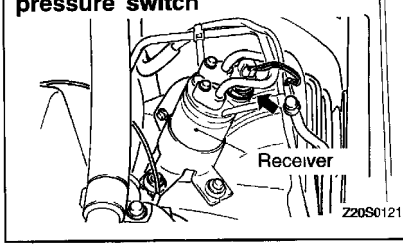
Blower motor relay



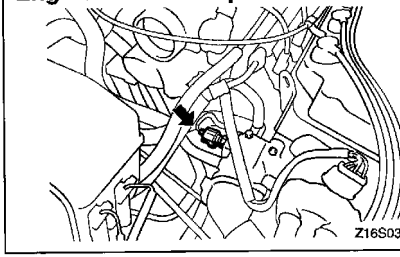
Radiator fan motor control relay, condenser fan motor relay, fan motor relay and A/C compressor clutch relay



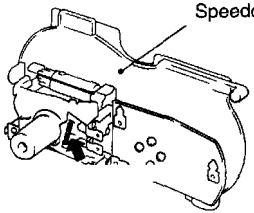
Dual pressure switch or triple pressure switch



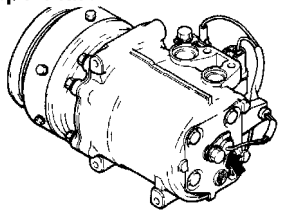
Engine coolant temperature sensor



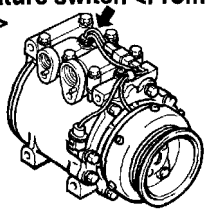
Vehicle speed sensor (Reed switch)



Air conditioning refrigerant temperature switch <1993 models>

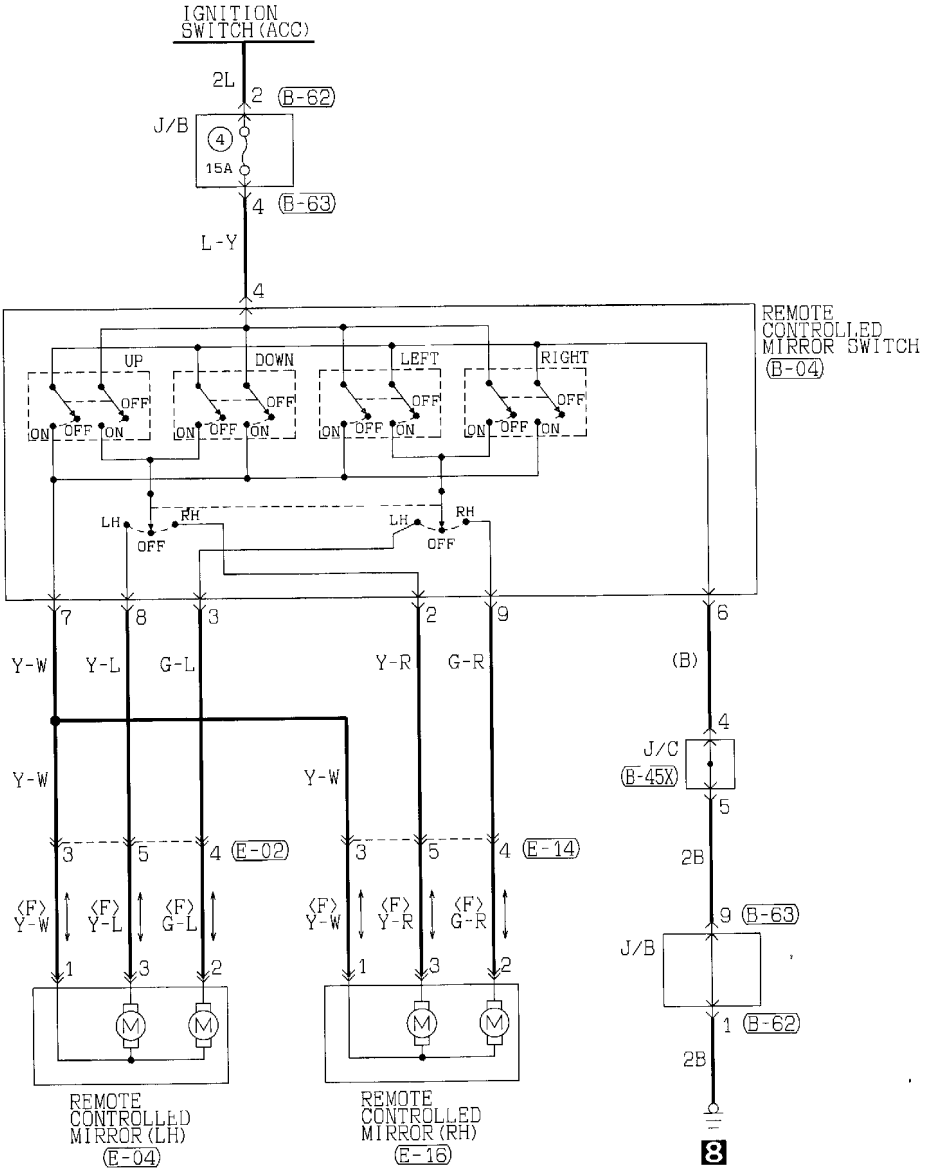


Air conditioning refrigerant temperature switch <From 1994 models>



REMOTE CONTROLLED MIRROR

110003600

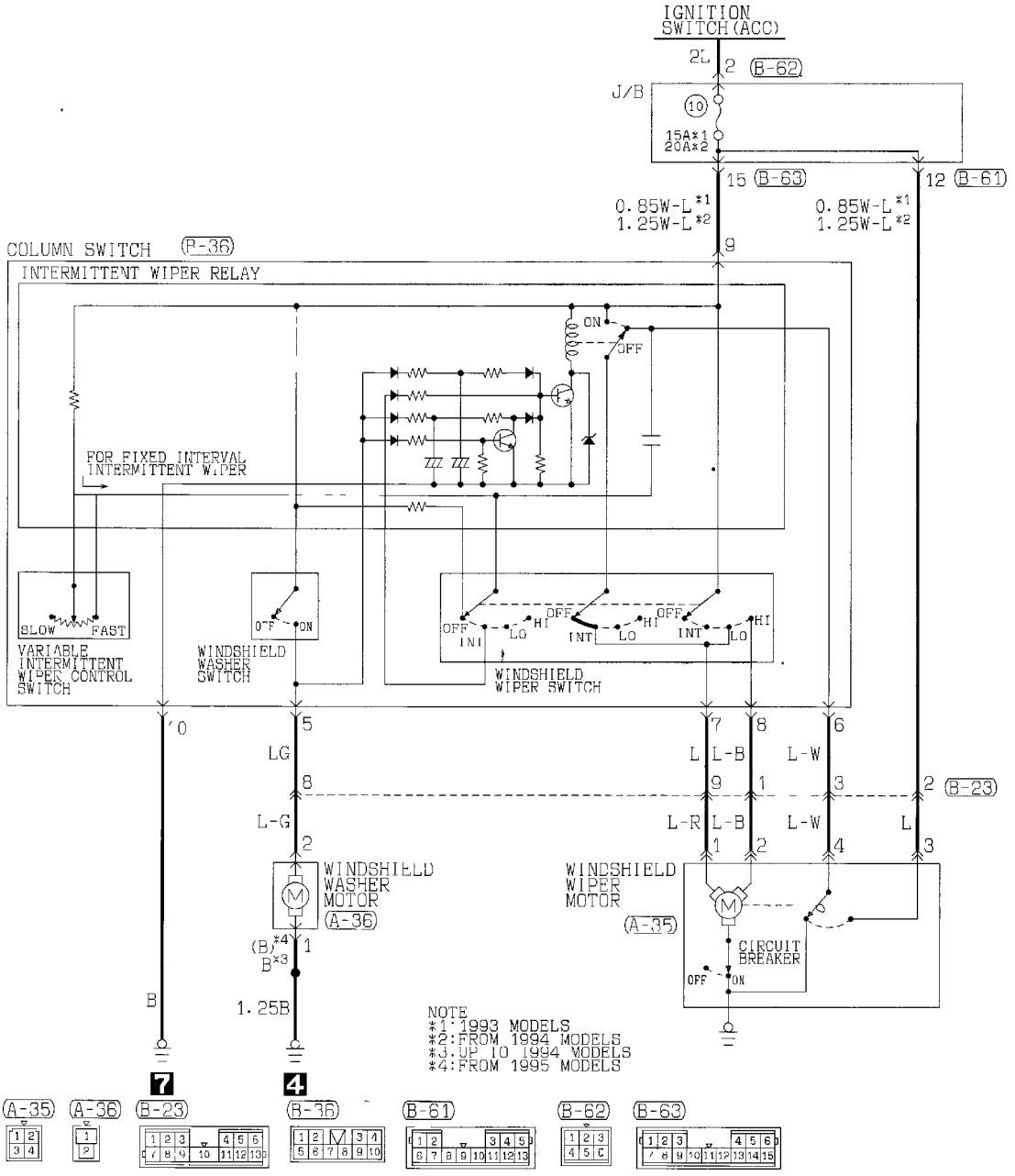


B-04 B-45X B-62 B-63 E-02 E-04 E-14 E-16

WINDSHIELD WIPER AND WASHER

110003601

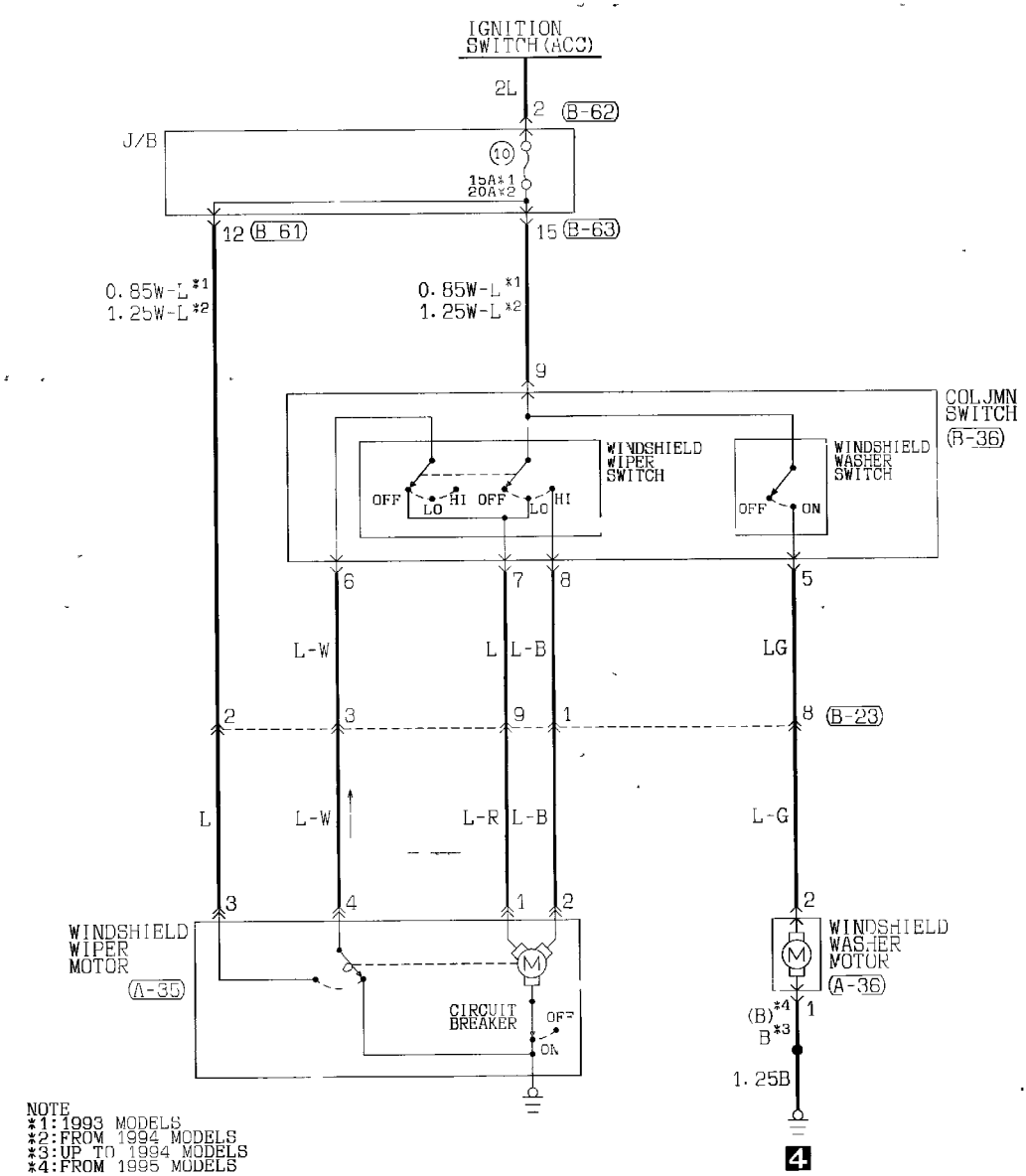
<Vehicles with intermittent wiper>



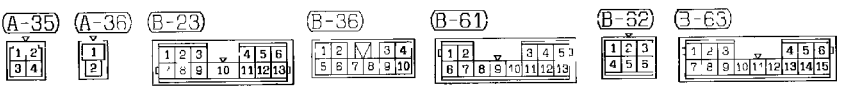
WINDSHIELD WIPER AND WASHER

110003602

<Vehicles without intermittent wiper>



NOTE
*1: 1993 MODELS
*2: FROM 1994 MODELS
*3: UP TO 1994 MODELS
*4: FROM 1995 MODELS



OPERATION

110003603

<Low-speed (and high-speed) wiper operation>

- When the wiper switch is placed in the LO position with the ignition switch in the ACC or ON position, wipers operate continuously at low speed.
- Placing the wiper switch in the HI position causes the wipers to operate at high speed.

<Auto wiper stop operation>

- When the wiper switch is placed in the OFF position, the cam contacts of wiper motor causes current to flow through the auto wiper stop circuit, allowing the wiper blades to cycle before they reach to the stop positions.

<Intermittent wiper operation>

- When the wiper switch is placed in the INT position with the ignition switch in ACC or ON position, the intermittent wiper relay is energized causing the intermittent wiper relay contacts to close and open repeatedly.
- When the contacts are closed, the wiper motor is energized.
- When the wiper motor is energized, the relay contacts open; however, the cam contacts keep the wiper motor energized until the wiper blades return to their stop position.

<Washer-wiper operation>

- When the washer switch is turned ON, the intermittent wiper relay contacts close causing wipers to cycle two to three times.

Remark

- The washer-wiper operates in the priority even during intermittent operation of the wiper.

TROUBLESHOOTING HINTS

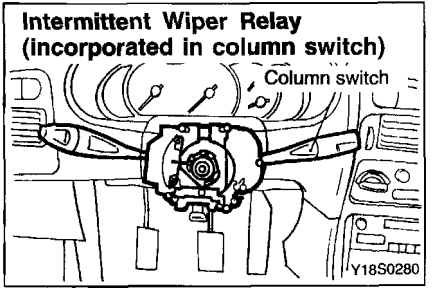
1. Wipers do not operate.
   1) Washer is not operative, either.
      - Check multi-purpose fuse No. 10
      - Check ground.
2. Low-speed (or high-speed) wiper operation only is inoperative.
   - Check wiper switch.
3. Wipers do not stop.
   - Check wiper motor.
   - Check intermittent wiper relay.
   - Check wiper switch.
4. Intermittent wiper operation is inoperative.
   - Check terminal voltage of steering-column switch (with a built-in intermittent wiper relay) with the intermittent wiper relay energized. (See the fig.1.)
5. The length of pause for intermittent operation cannot be varied.
   - Check variable intermittent wiper control switch.
   - Check intermittent wiper relay.
6. Washer is inoperative.
   1) Wiper is operative on washer-wiper operation.
      - Check washer motor.
   2) Washer-wiper operation is inoperative also.
      - Check washer switch.
7. Washer-wiper operation is inoperative.
   - Check intermittent wiper relay.

<Fig.1>

Terminal No.	Voltage	Check
10	0V	Intermittent wiper relay or wiper switch
	System voltage	Intermittent wiper relay
	0 ↔ System voltage (alternating)	– (Normal)

COMPONENT LOCATION

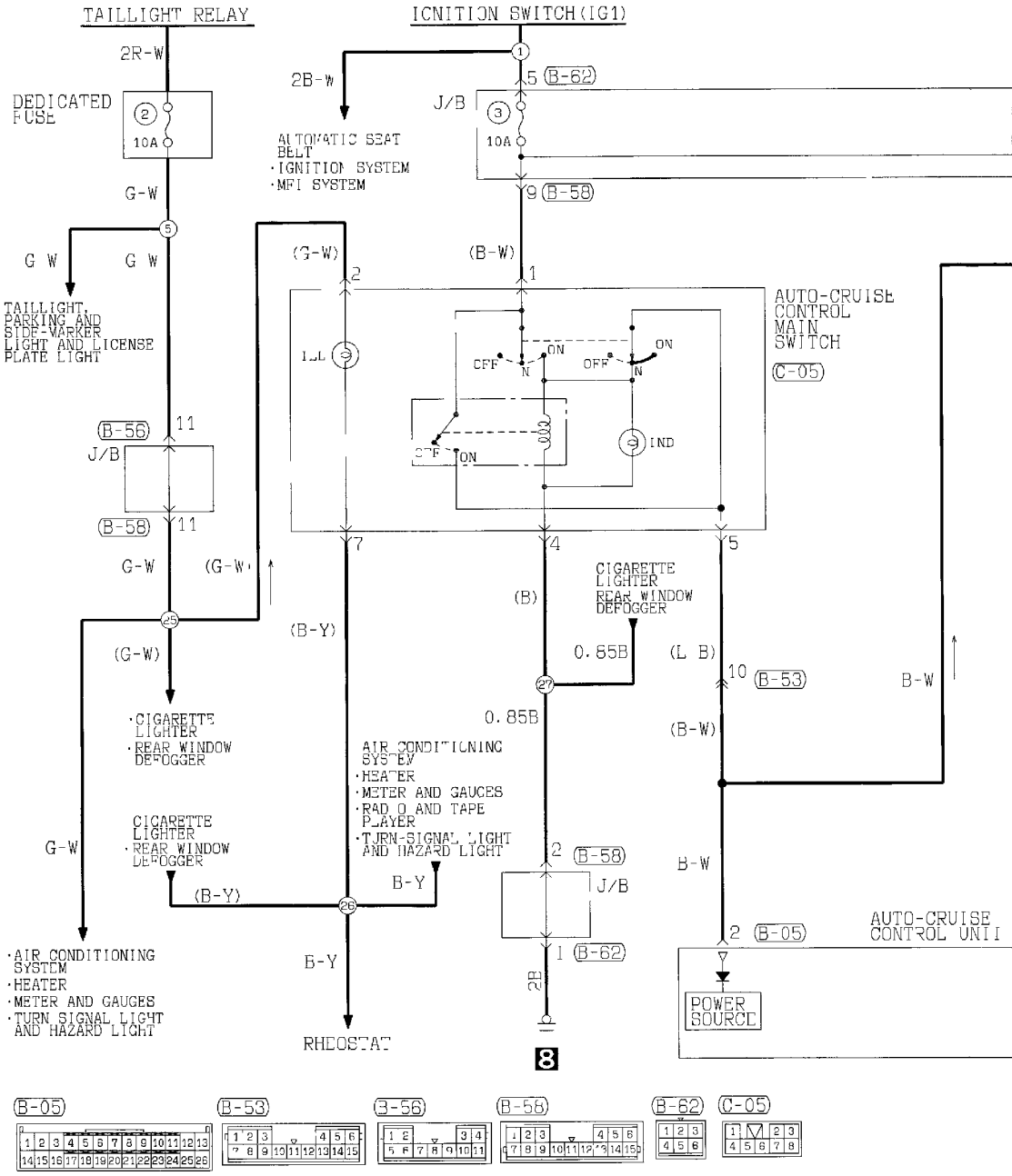
110003604

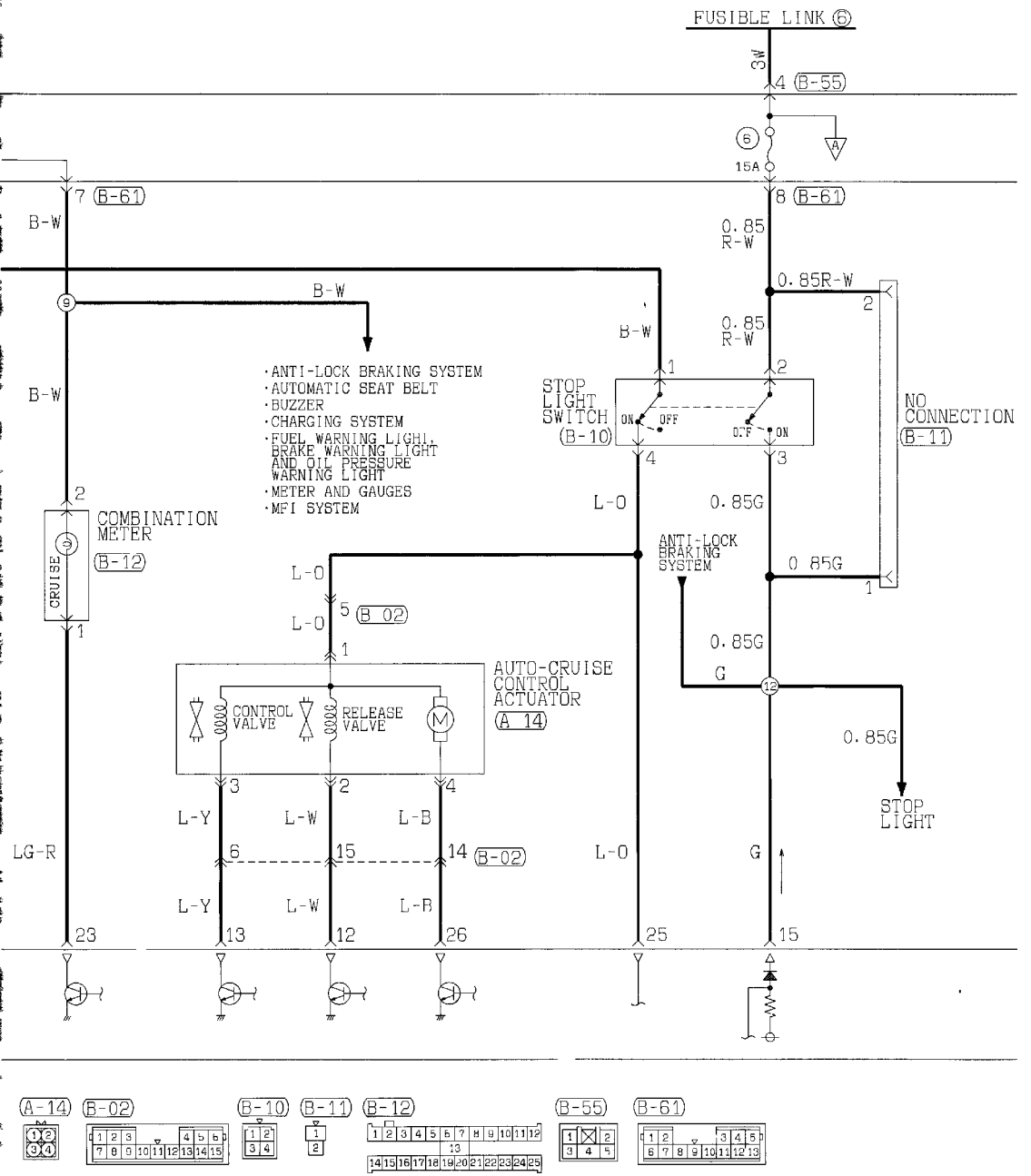


AUTO-CRUISE CONTROL SYSTEM

110003605

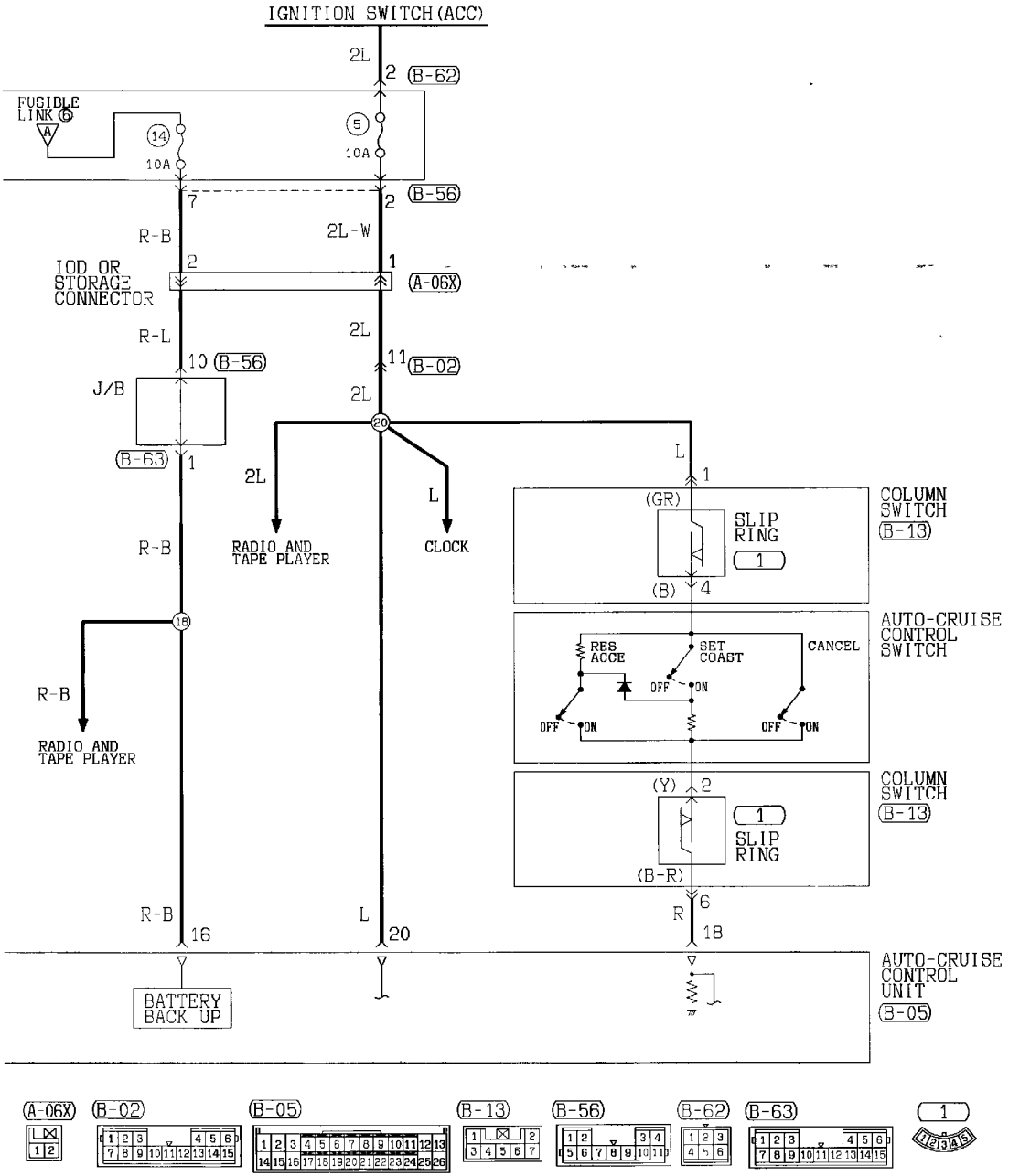
<M/T–1993 MODELS>

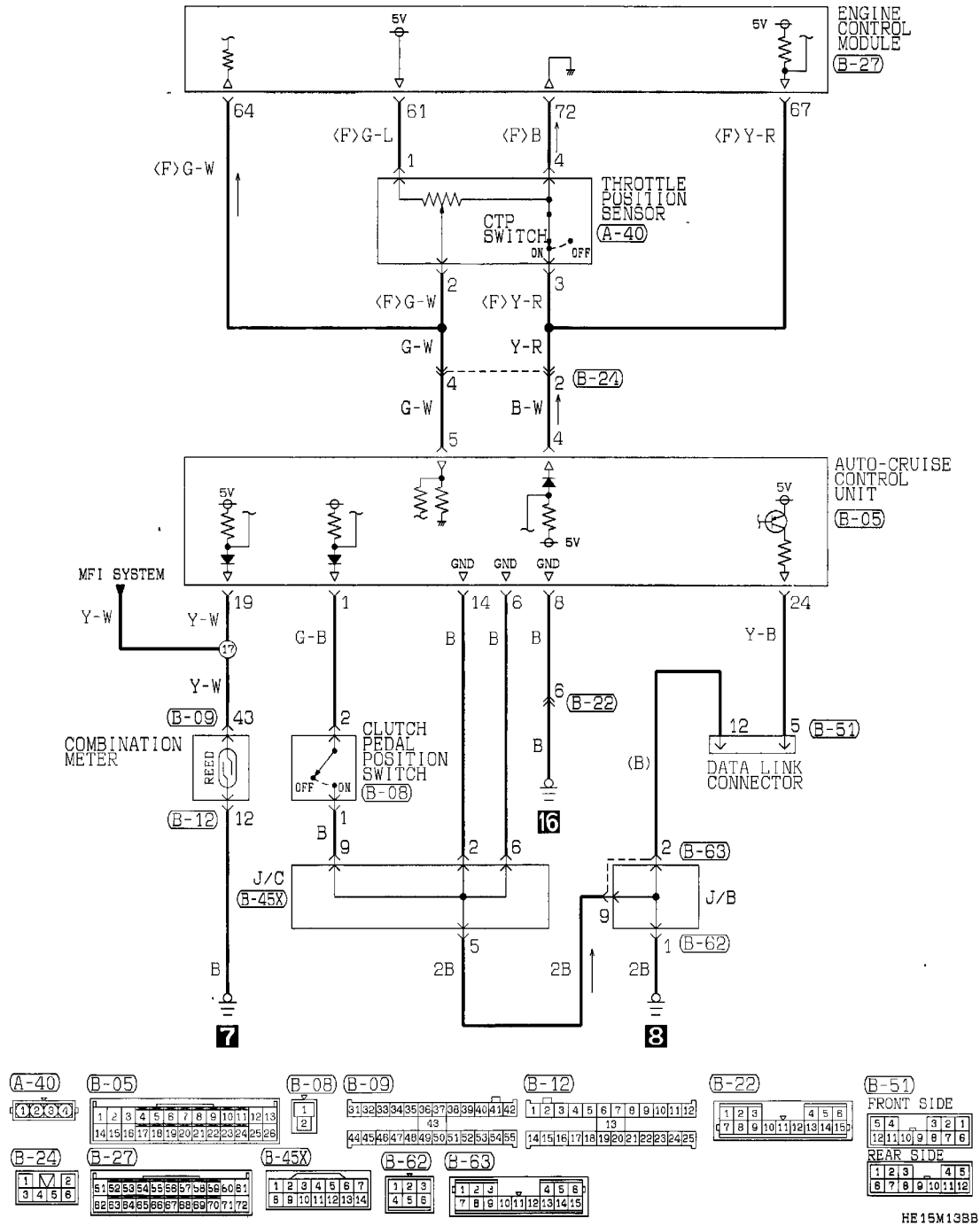




(A-14) (B-02) (B-10) (B-11) (B-12) (B-55) (B-61)

AUTO-CRUISE CONTROL SYSTEM <M/T–1993 MODELS> (CONTINUED)





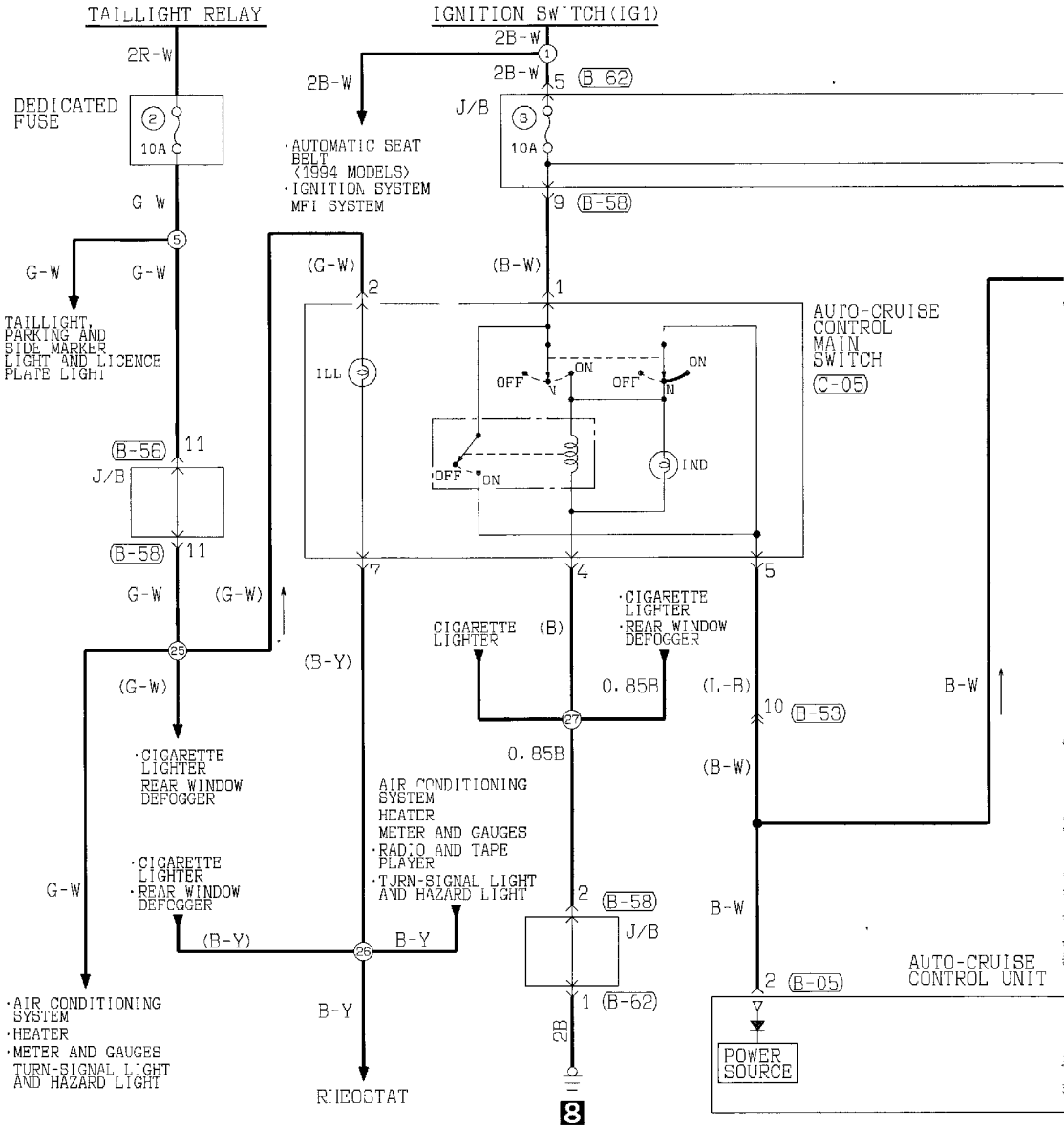
HE15M138B

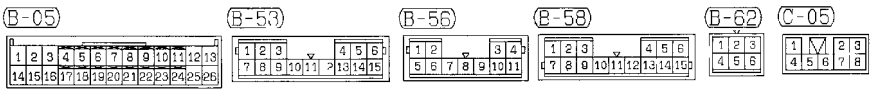
TSB Revision

AUTO-CRUISE CONTROL SYSTEM

110003606

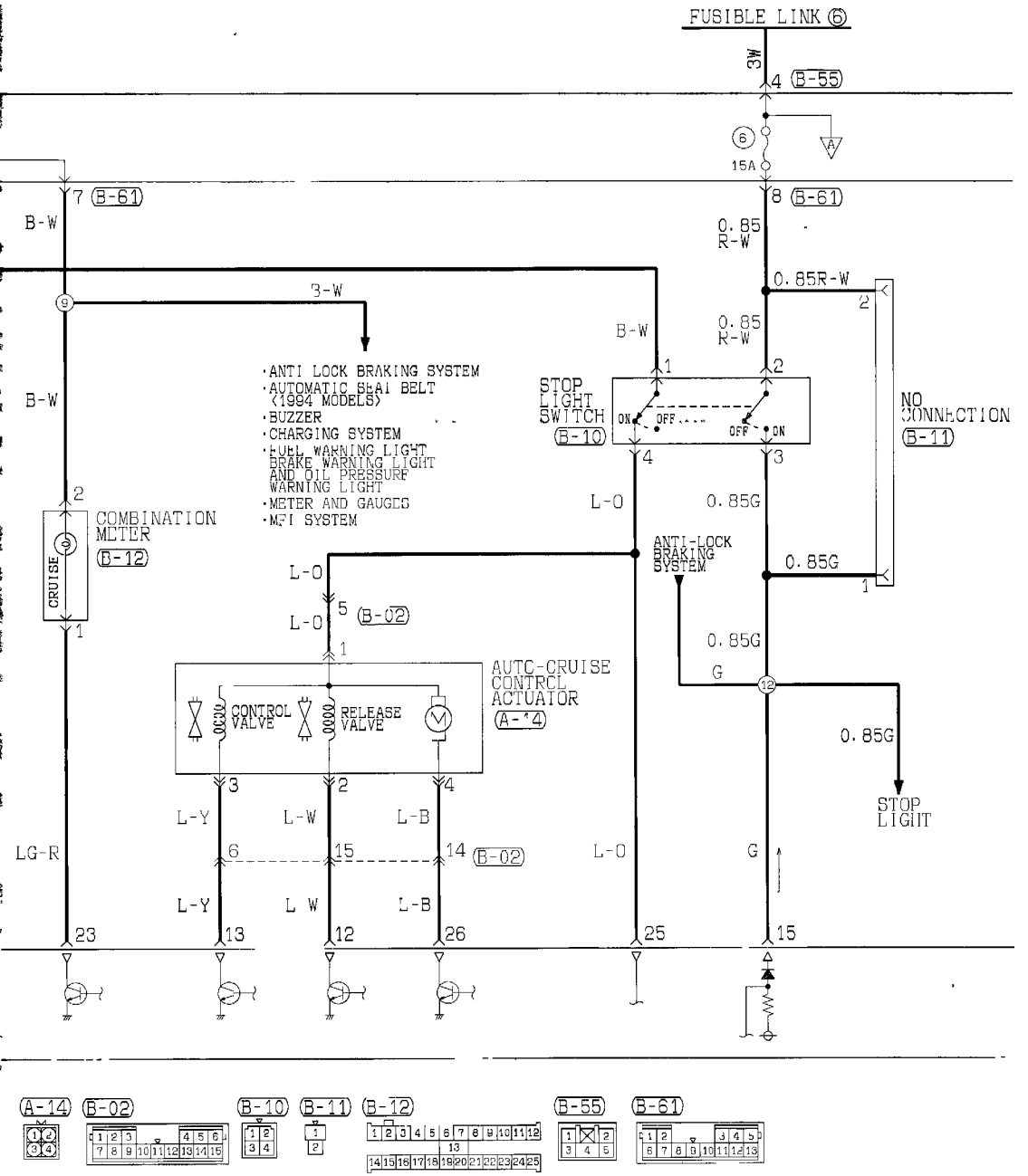
<M/T–FROM 1994 MODELS>





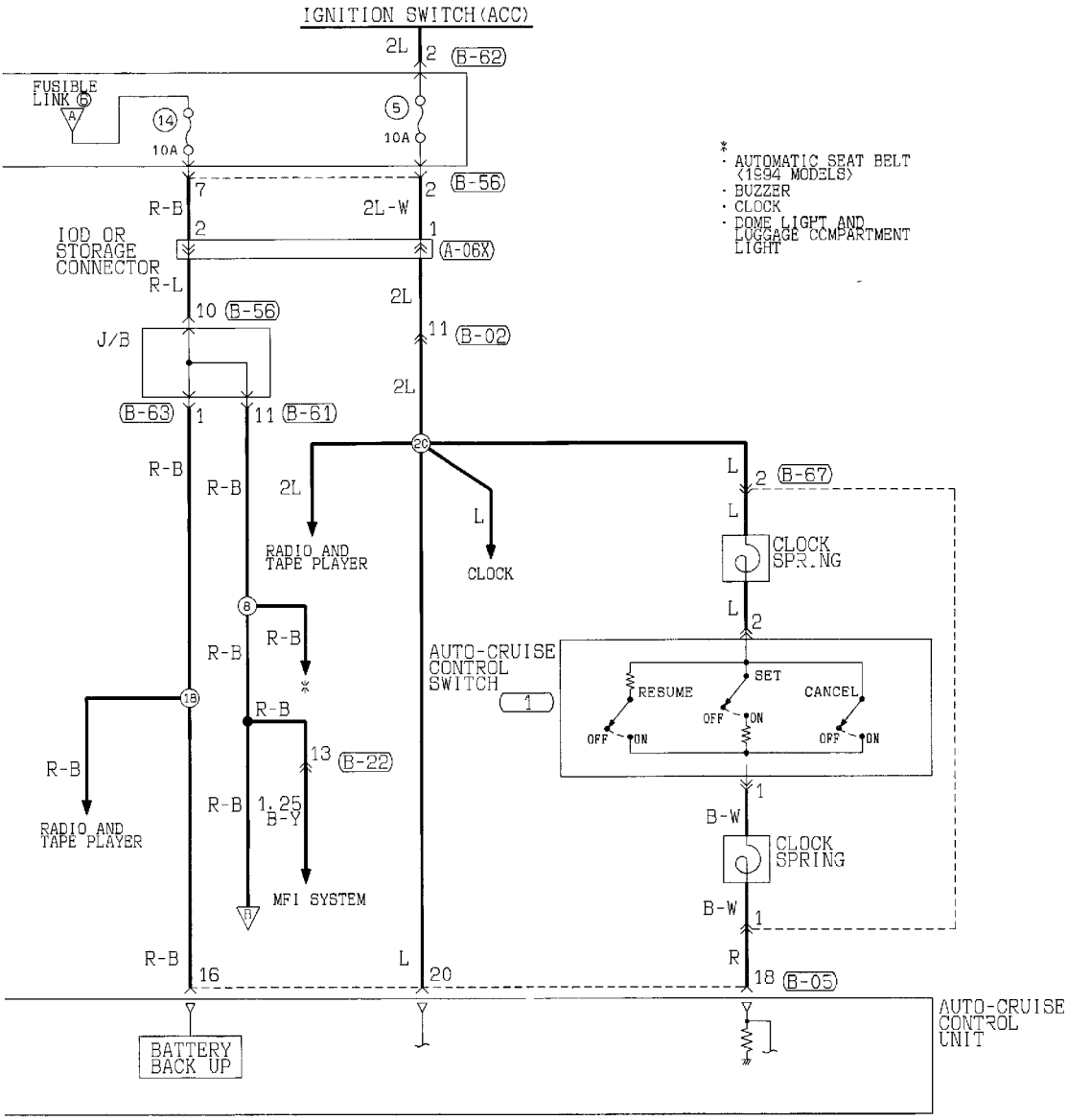
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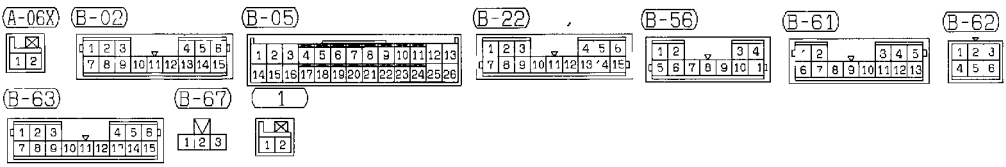
TSB Revision


FUSIBLE LINK ⑥
3W
4 (B-55)
⑥
15A
A
7 (B-61)
8 (B-61)
B-W
0.85 R-W
0.85R-W
2
B-W
0.85 R-W
B-W
·ANTI LOCK BRAKING SYSTEM
·AUTOMATIC SEAT BELT (1994 MODELS)
·BUZZER
·CHARGING SYSTEM
·FUEL WARNING LIGHT BRAKE WARNING LIGHT AND OIL PRESSURE WARNING LIGHT
·METER AND GAUGES
·MFI SYSTEM
STOP LIGHT SWITCH (B-10)
ON OFF OFF ON
NO CONNECTION (B-11)
2
COMBINATION METER (B-12)
CRUISE
L-O
0.85G
ANTI-LOCK BRAKING SYSTEM
L-O
5 (B-02)
0.85G
AUTO-CRUISE CONTROL ACTUATOR (A-14)
CONTROL VALVE
RELEASE VALVE
0.85G
G
STOP LIGHT
L-Y
L-W
L-B
LG-R
6
15
14 (B-02)
L-O
G
L-Y
L W
L-B
23
13
12
26
25
15

A-14
B-02
B-10
B-11
B-12
B-55
B-61

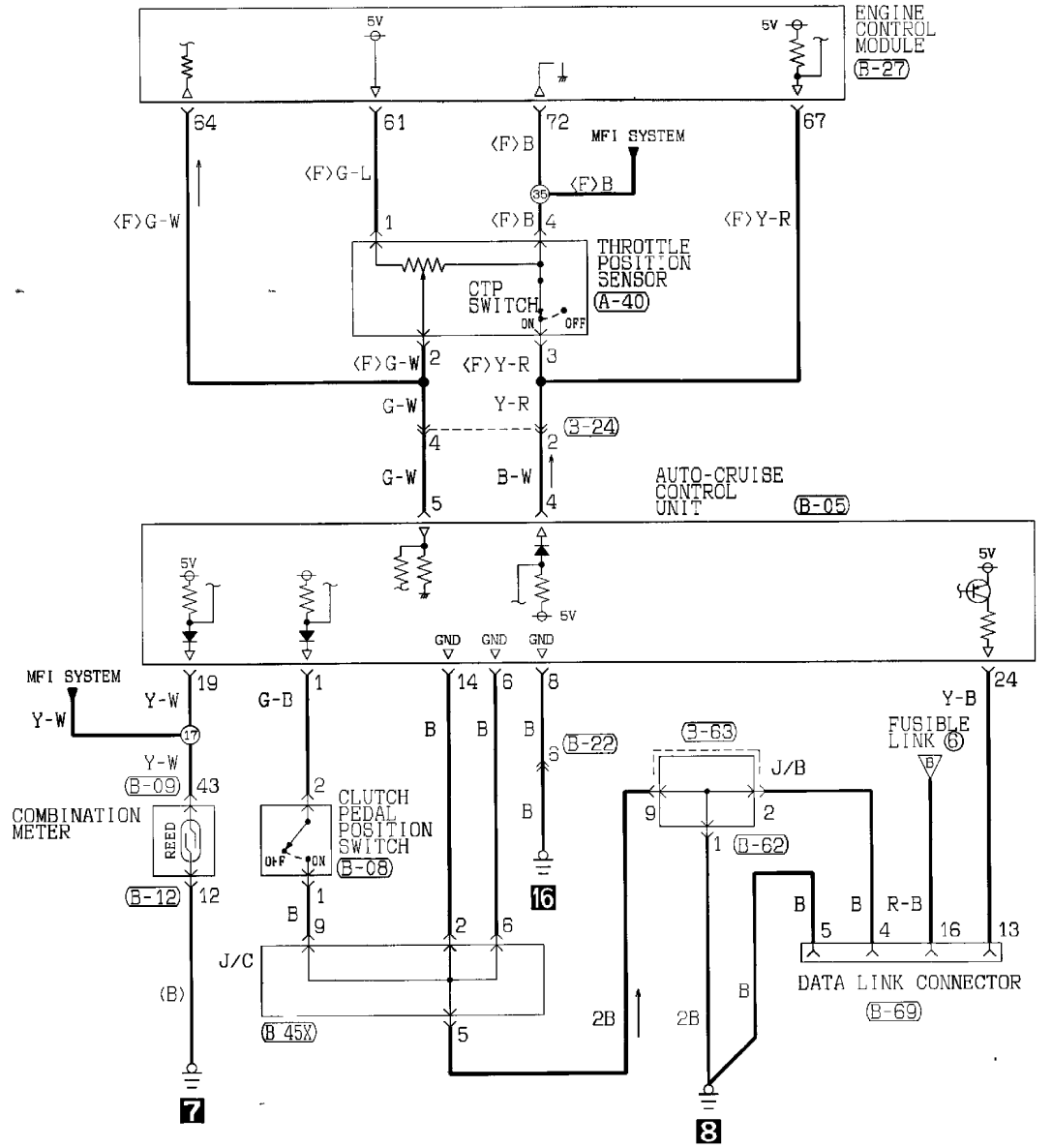
AUTO-CRUISE CONTROL SYSTEM <M/T–FROM 1994 MODELS> (CONTINUED)

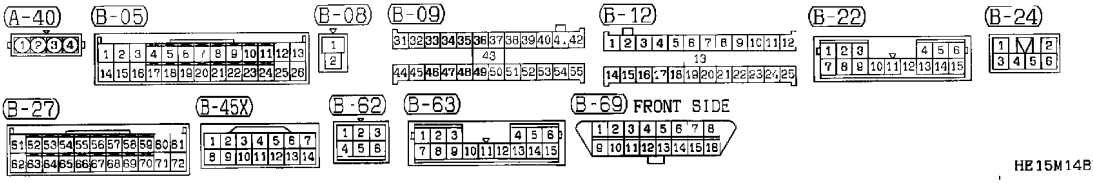




HE15M14BA

TSB Revision

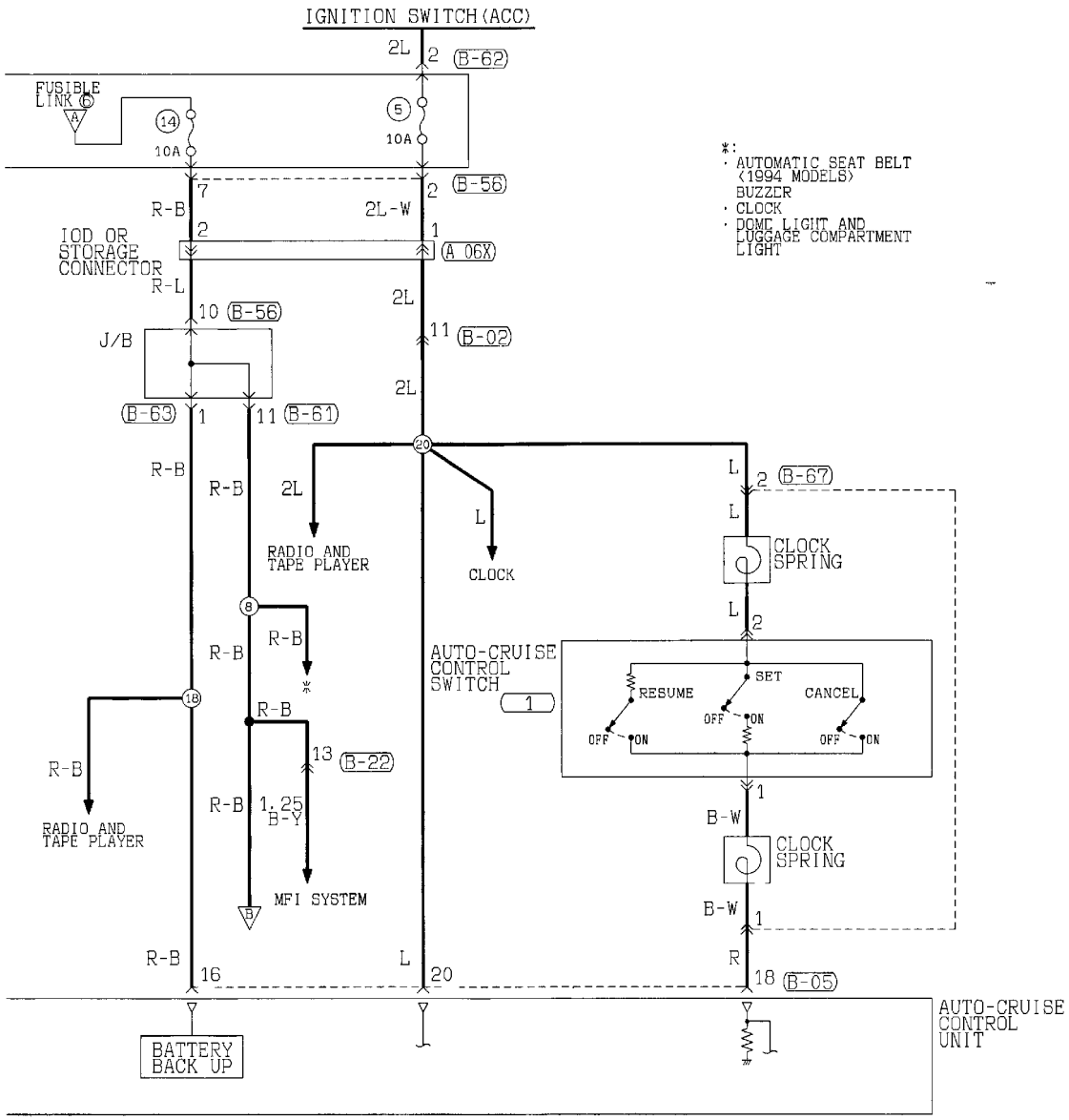


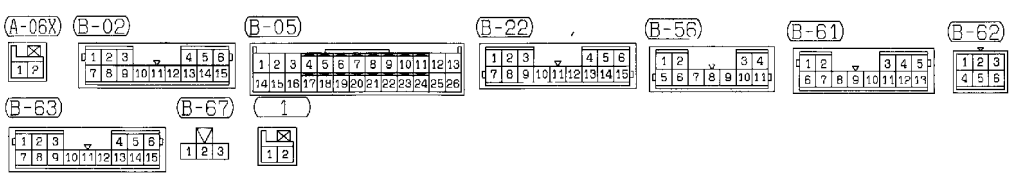


HE15M14BB

TSB Revision

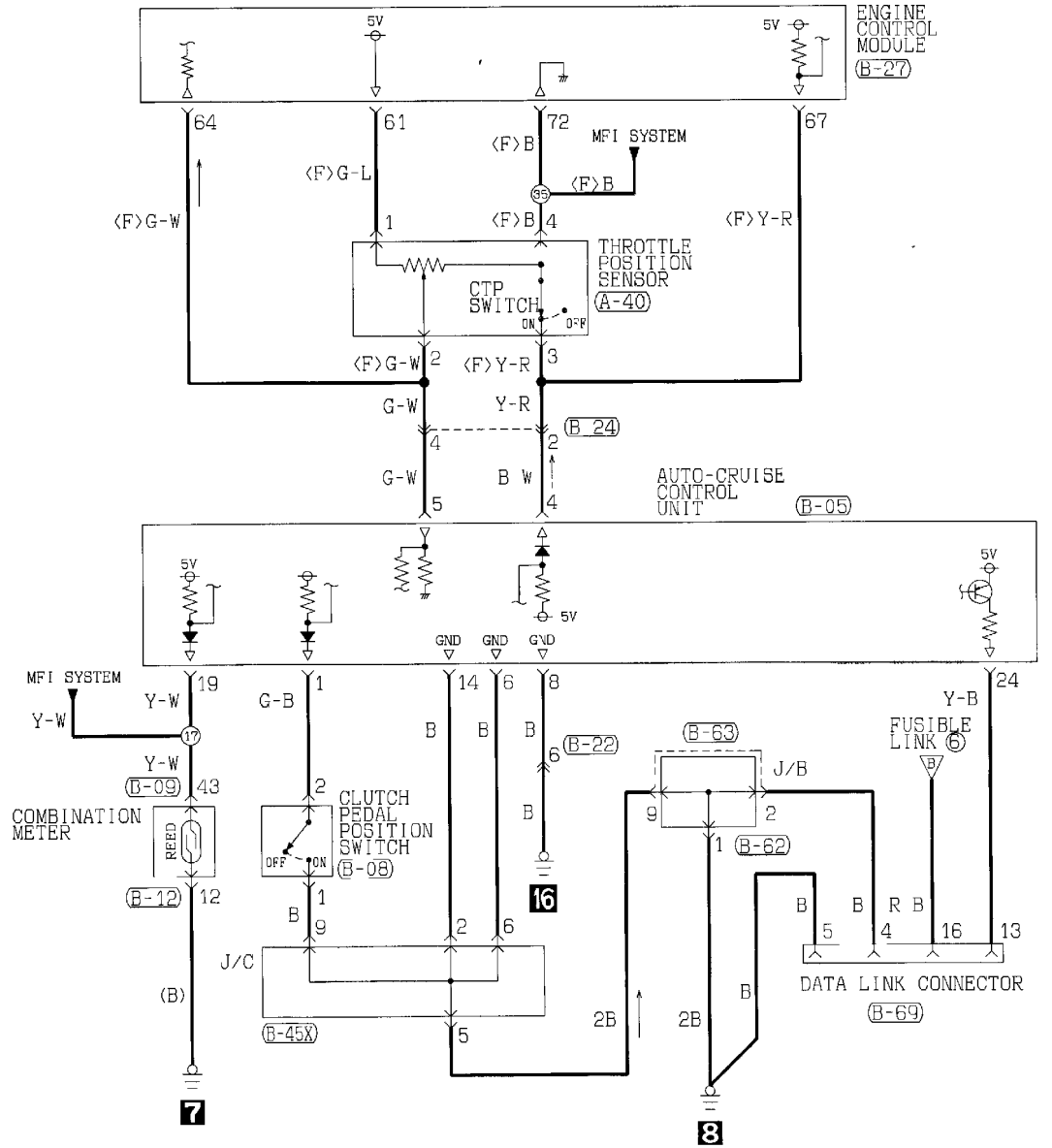
AUTO-CRUISE CONTROL SYSTEM <M/T–FROM 1994 MODELS> (CONTINUED)

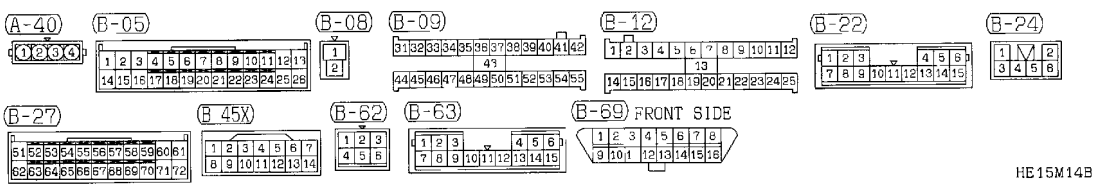




HE15M148A

TSB Revision





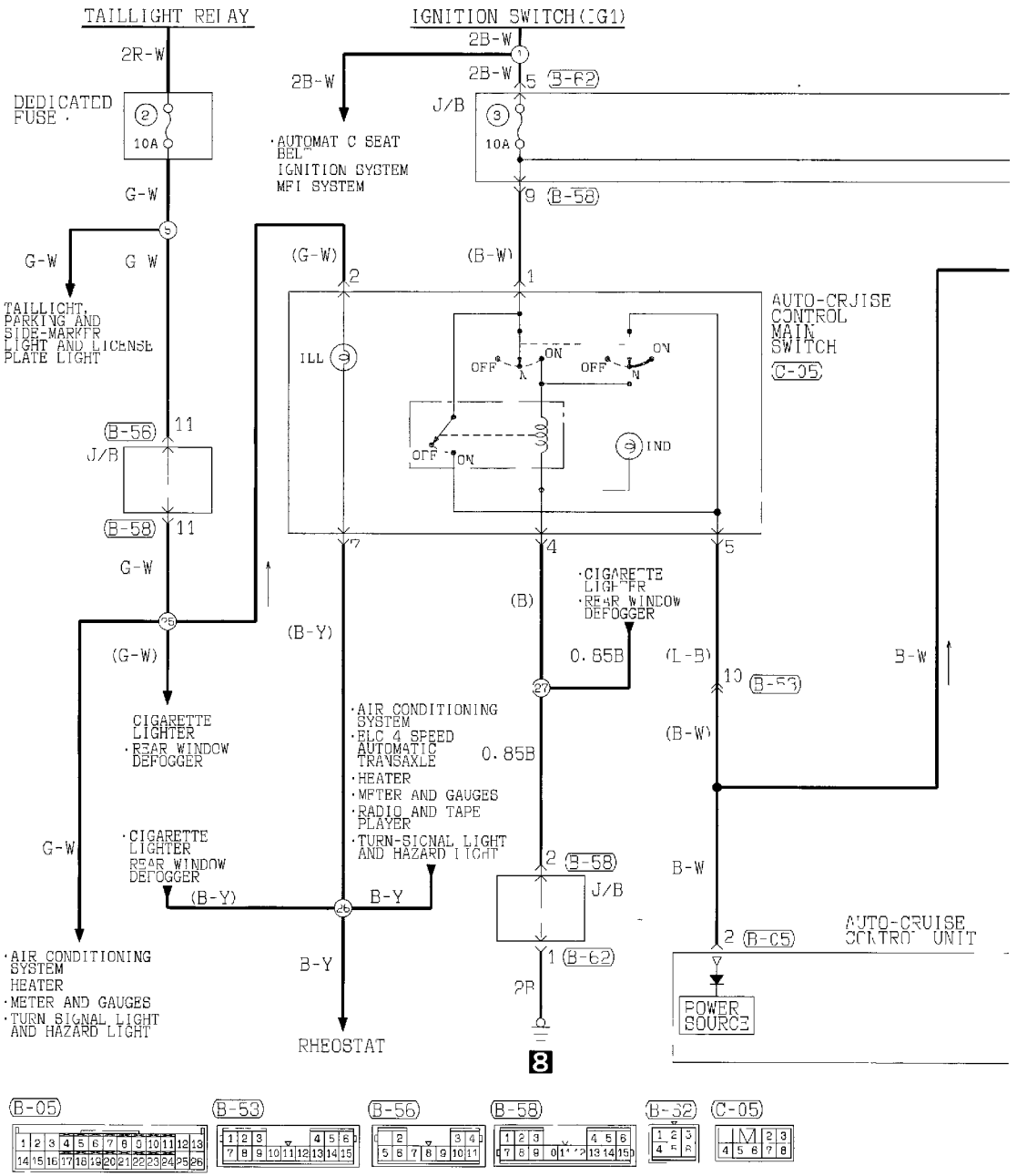
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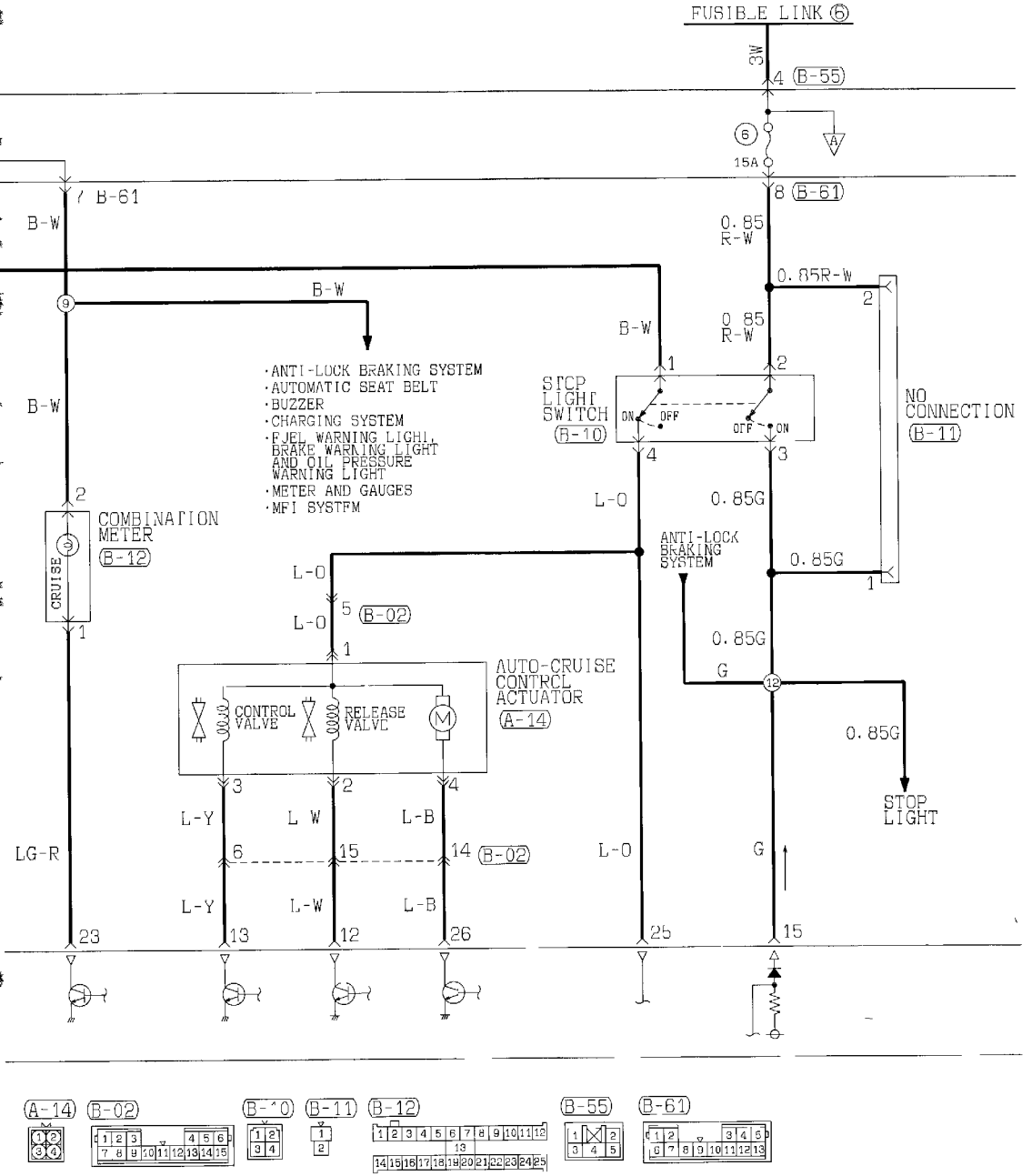
TSB Revision

AUTO-CRUISE CONTROL SYSTEM

110003607

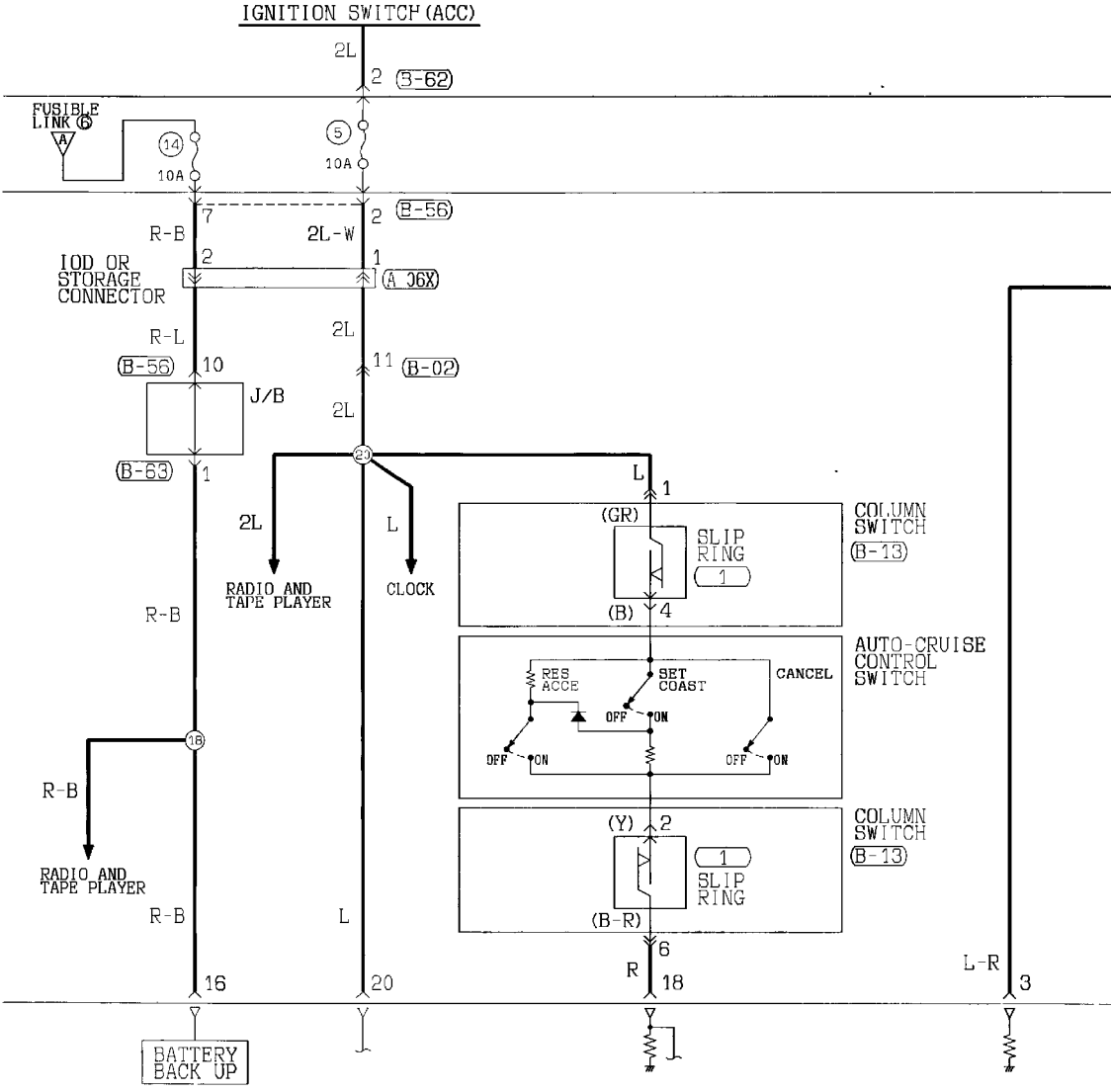
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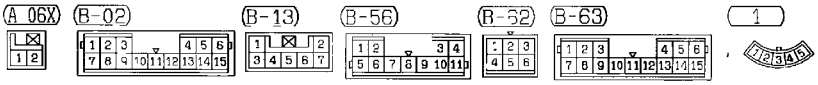


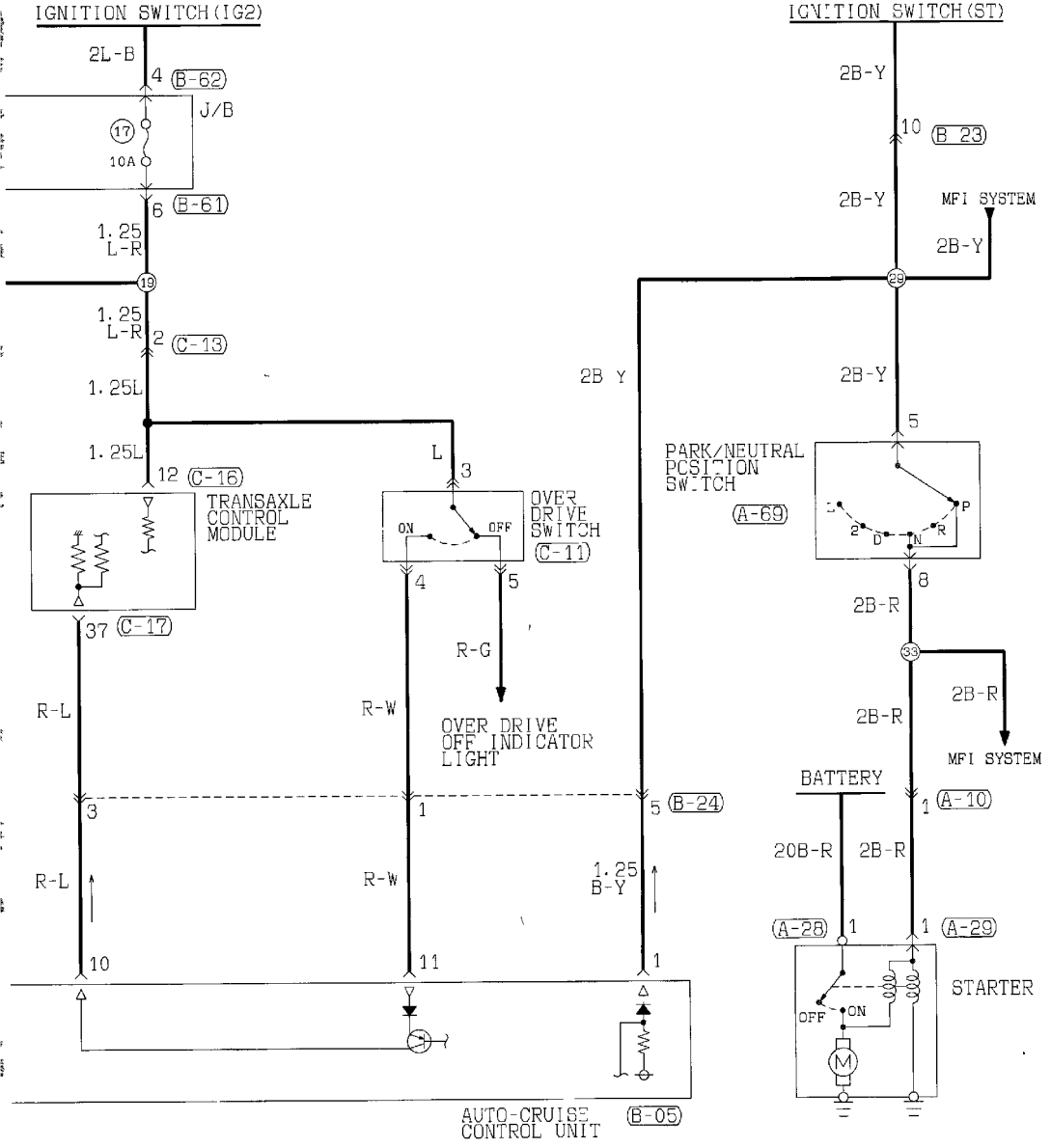

FUSIBLE LINK ⑥
3W
4 (B-55)
⑥
15A
A
8 (B-61)
0.85 R-W
0.85R-W
2
NO CONNECTION (B-11)
B-W
0.85 R-W
1
2
STOP LIGHT SWITCH (B-10)
ON
OFF
OFF
ON
4
3
L-O
0.85G
ANTI-LOCK BRAKING SYSTEM
0.85G
1
0.85G
G
12
0.85G
STOP LIGHT
/ B-61
B-W
9
B-W
·ANTI-LOCK BRAKING SYSTEM
·AUTOMATIC SEAT BELT
·BUZZER
·CHARGING SYSTEM
·FUEL WARNING LIGHT, BRAKE WARNING LIGHT AND OIL PRESSURE WARNING LIGHT
·METER AND GAUGES
·MFI SYSTEM
B-W
2
COMBINATION METER (B-12)
CRUISE
9
1
L-O
L-O
5 (B-02)
1
AUTO-CRUISE CONTROL ACTUATOR (A-14)
CONTROL VALVE
RELEASE VALVE
M
3
2
4
L-Y
L W
L-B
LG-R
6
15
14 (B-02)
L-O
G
L-Y
L-W
L-B
23
13
12
26
25
15

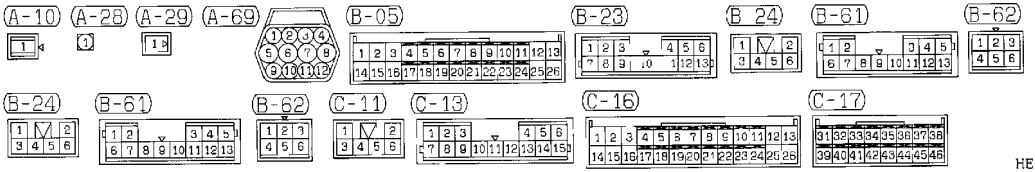
(A-14)
(B-02)
(B-10)
(B-11)
(B-12)
(B-55)
(B-61)

AUTO-CRUISE CONTROL SYSTEM <A/T–1993 MODELS> (CONTINUED)





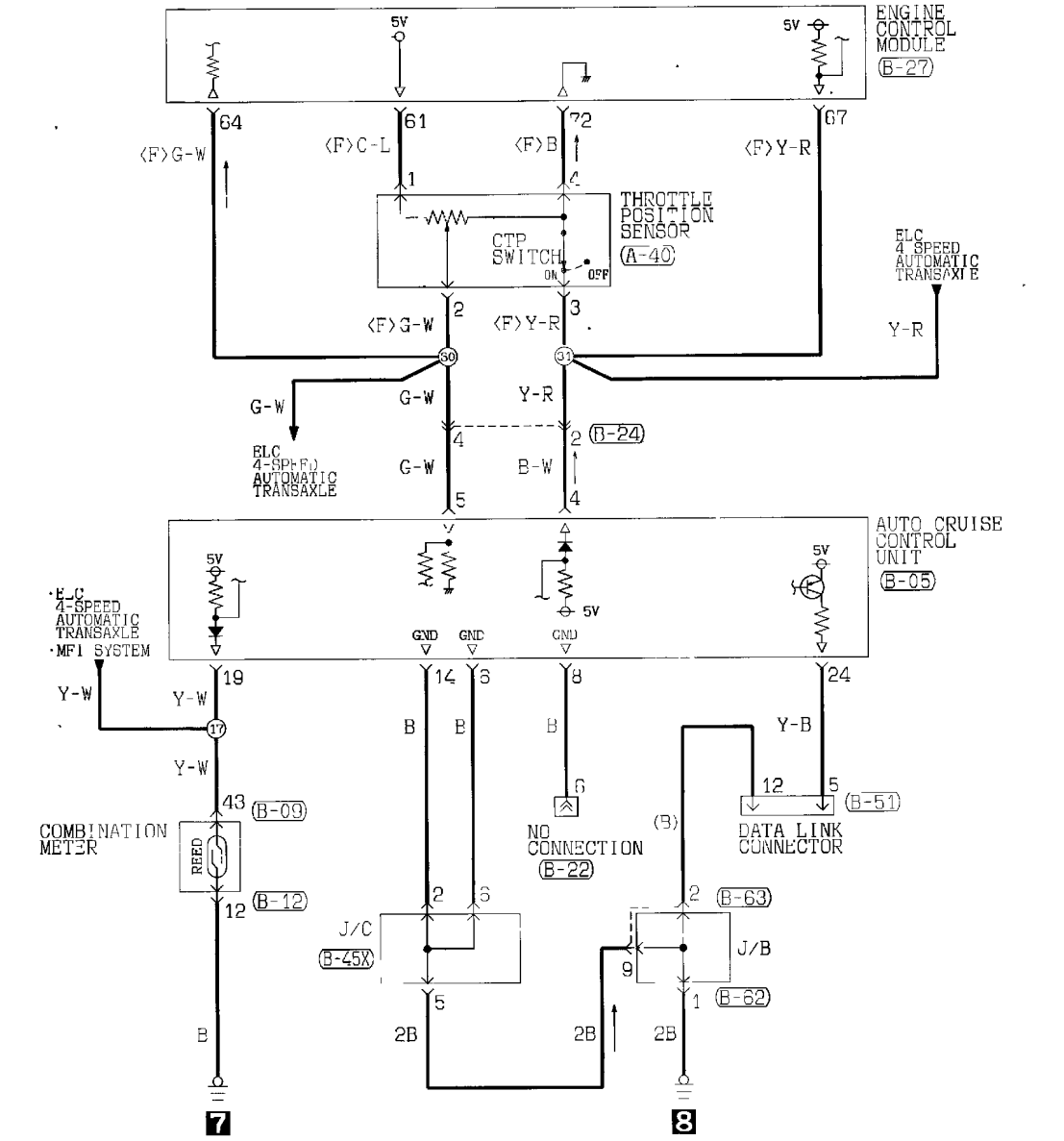


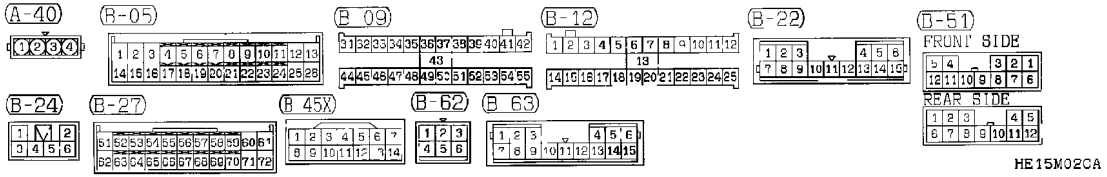


HE15M15BB

TSB Revision

AUTO-CRUISE CONTROL SYSTEM <A/T–1993 MODELS> (CONTINUED)

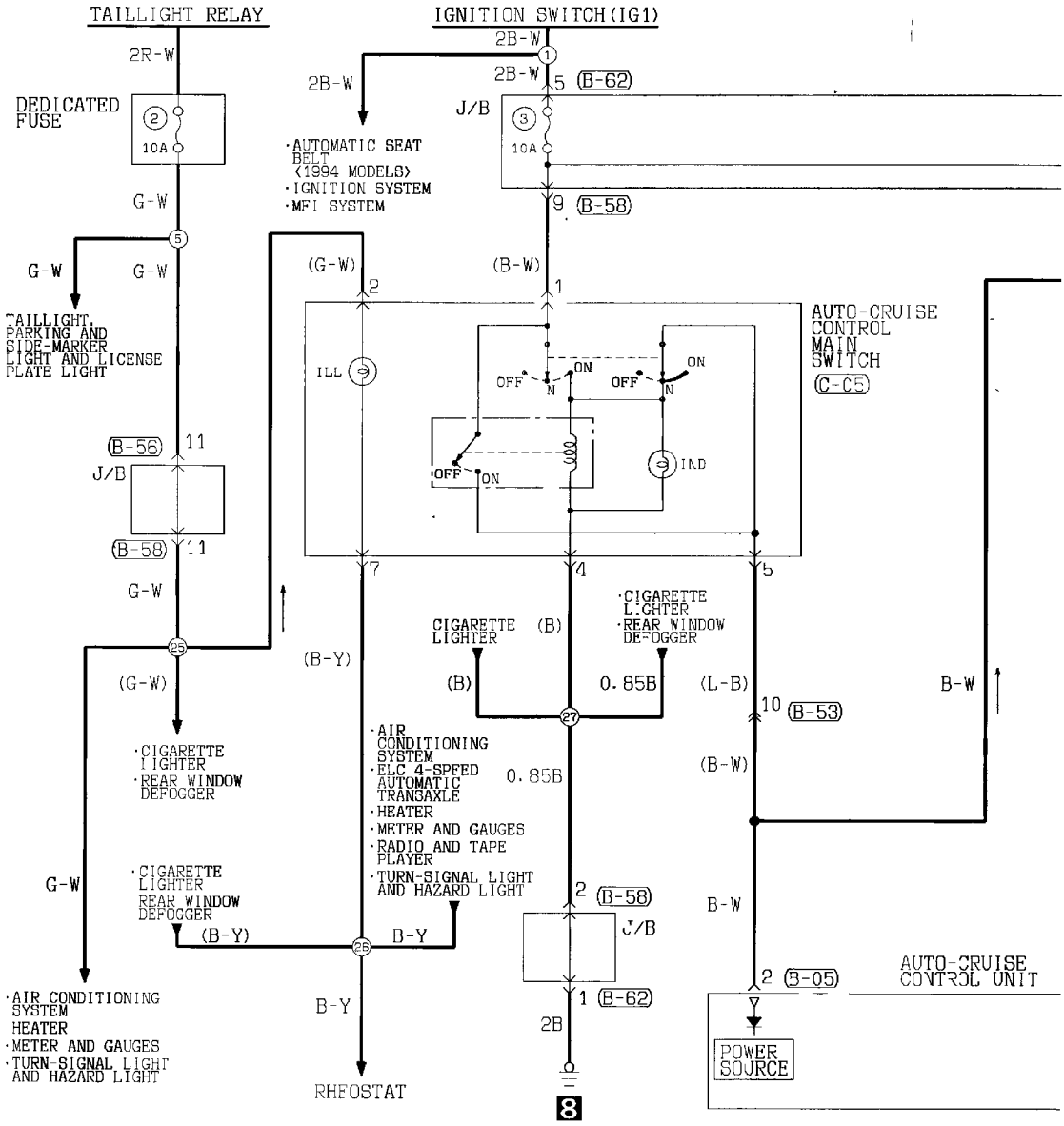


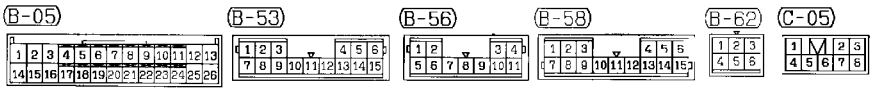


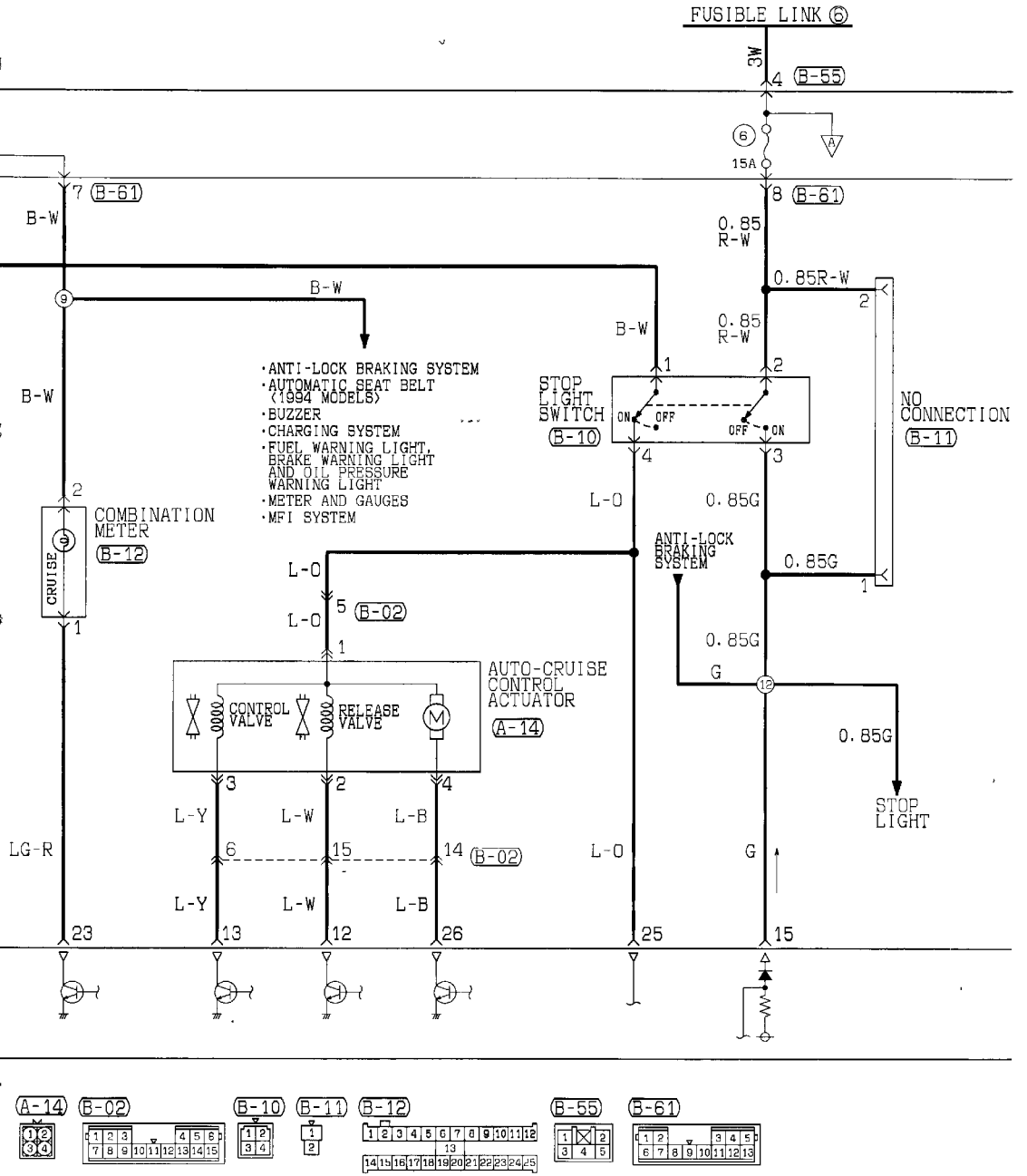
AUTO-CRUISE CONTROL SYSTEM

110003608

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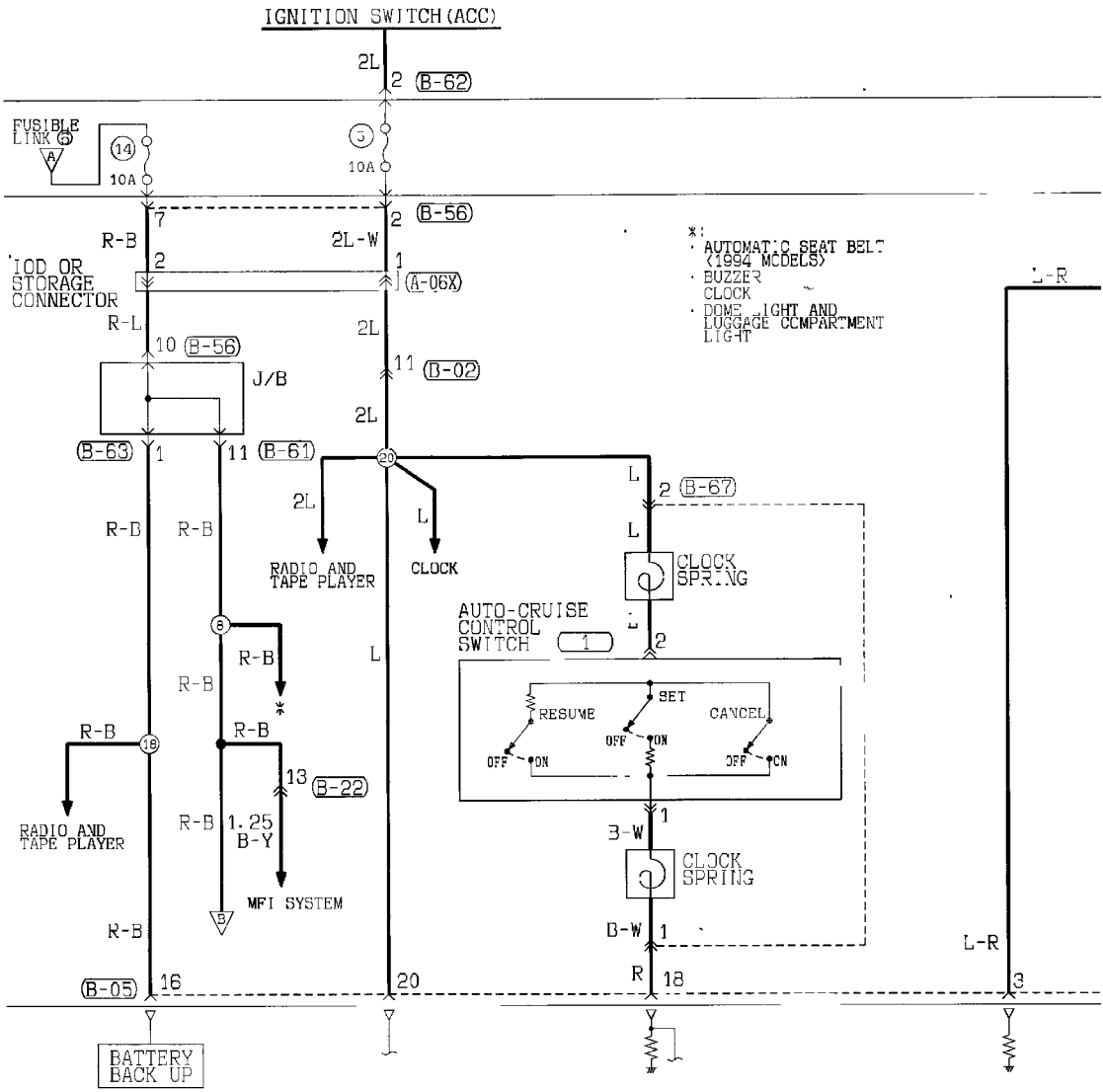


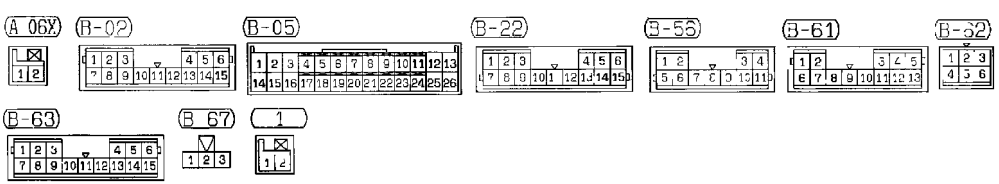



FUSIBLE LINK ⑥
3W
4 B-55
⑥
15A
7 B-61
8 B-61
B-W
0.85 R-W
0.85R-W
2
B-W
9
B-W
0.85 R-W
·ANTI-LOCK BRAKING SYSTEM
·AUTOMATIC SEAT BELT (1994 MODELS)
·BUZZER
·CHARGING SYSTEM
·FUEL WARNING LIGHT, BRAKE WARNING LIGHT AND OIL PRESSURE WARNING LIGHT
·METER AND GAUGES
·MFI SYSTEM
STOP LIGHT SWITCH
B-10
ON OFF
OFF ON
NO CONNECTION
B-11
B-W
2
COMBINATION METER
B-12
CRUISE
9
1
L-O
0.85G
ANTI-LOCK BRAKING SYSTEM
L-O
5 B-02
L-O
0.85G
1
0.85G
G
12
AUTO-CRUISE CONTROL ACTUATOR
A-14
CONTROL VALVE
RELEASE VALVE
0.85G
STOP LIGHT
3
2
4
L-Y
L-W
L-B
LG-R
6
15
14 B-02
L-O
G
L-Y
L-W
L-B
23
13
12
26
25
15

A-14
B-02
B-10
B-11
B-12
B-55
B-61

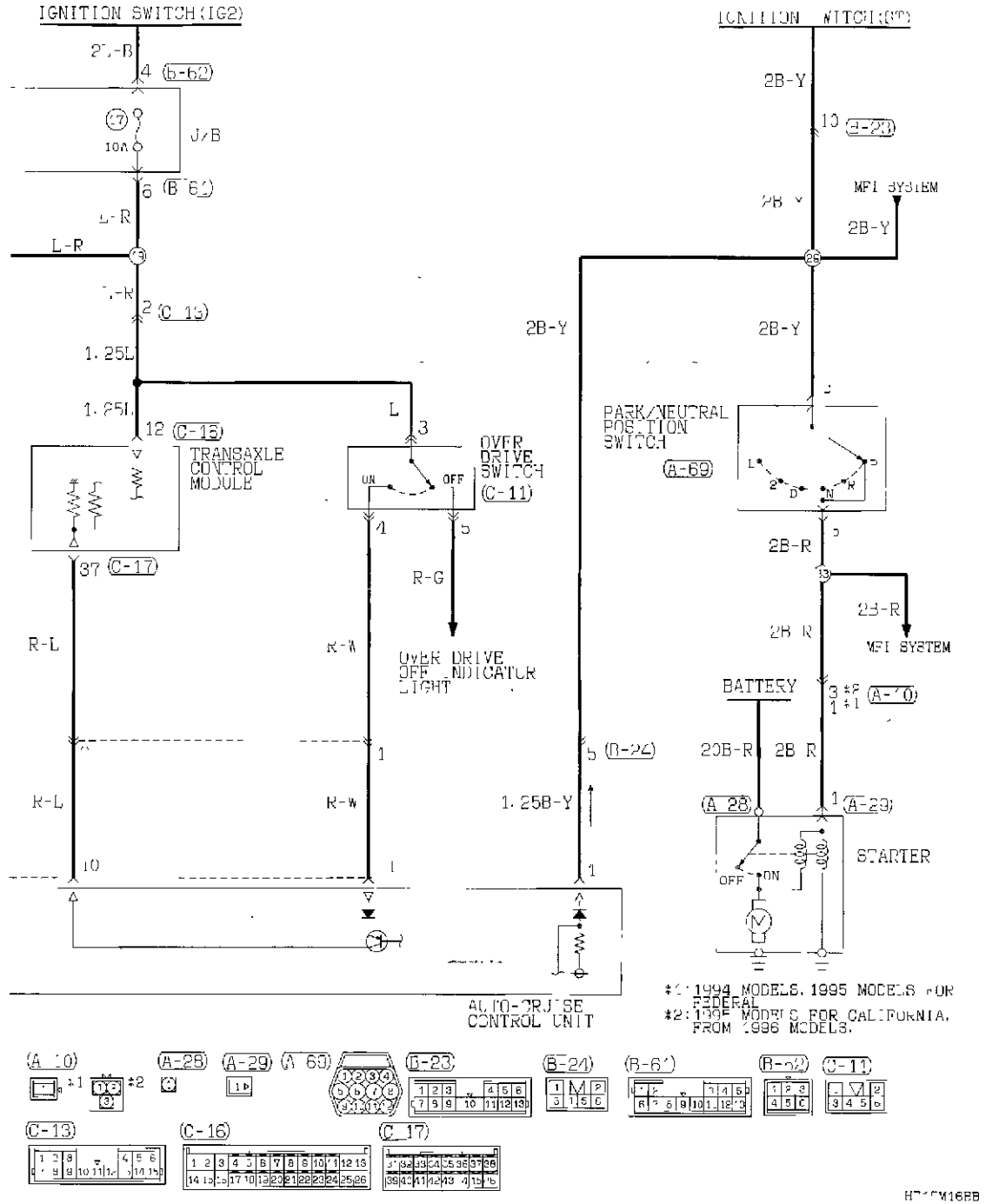
AUTO-CRUISE CONTROL SYSTEM <A/T–FROM 1994 MODELS> (CONTINUED)





HB15M16BA

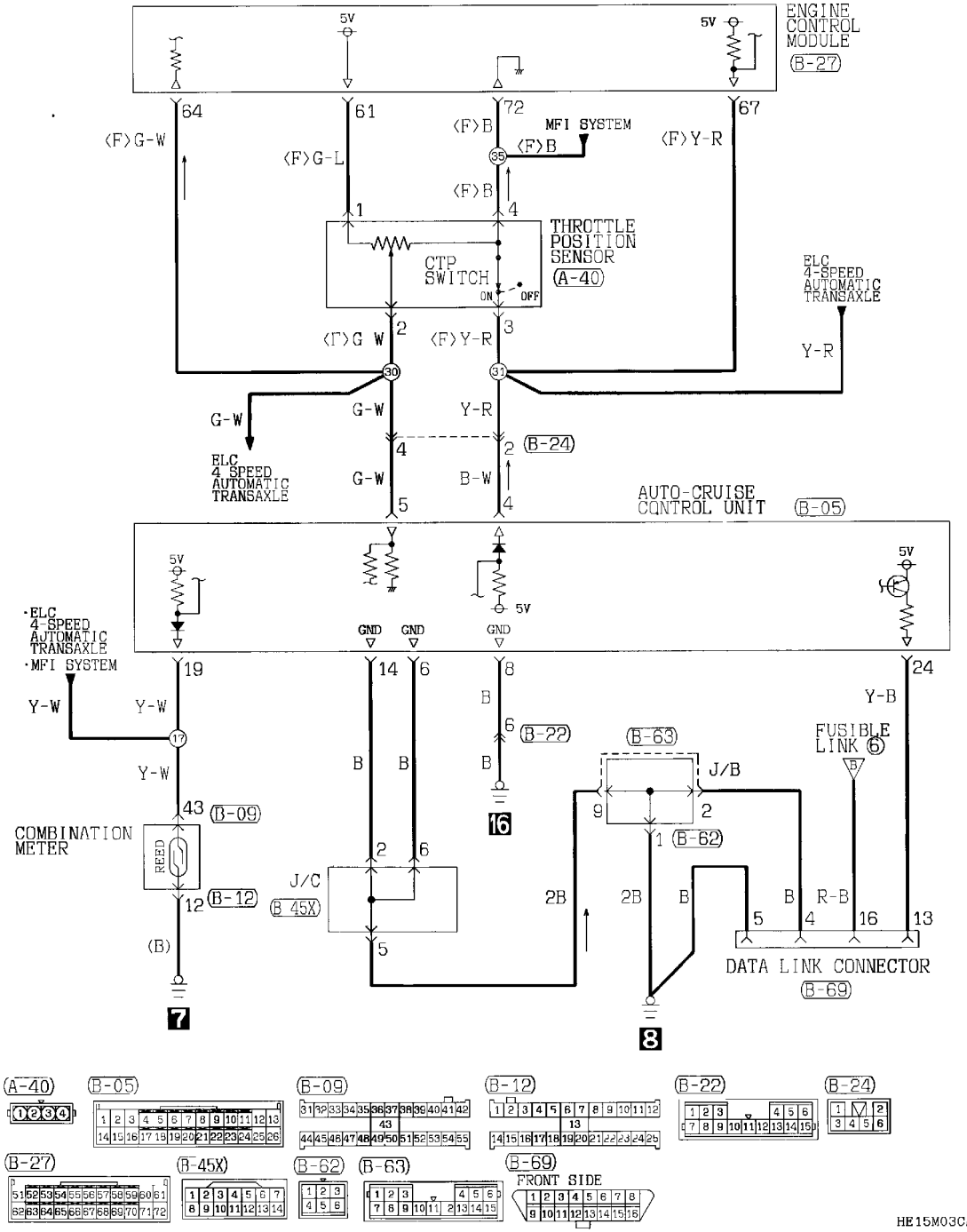
TSB Revision



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TSB Revision

AUTO-CRUISE CONTROL SYSTEM <A/T–FROM 1994 MODELS> (CONTINUED)

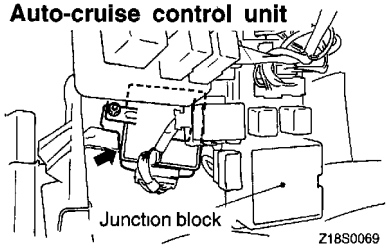


TSB Revision

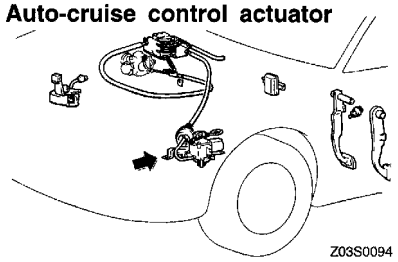
COMPONENT LOCATION

110003609

Auto-cruise control unit

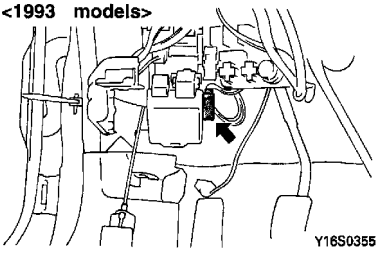


Auto-cruise control actuator

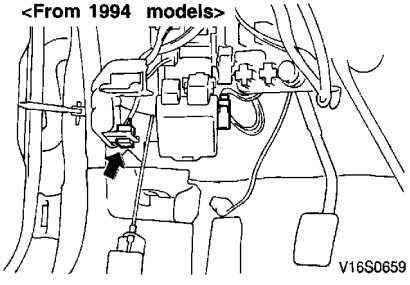


Data link connector

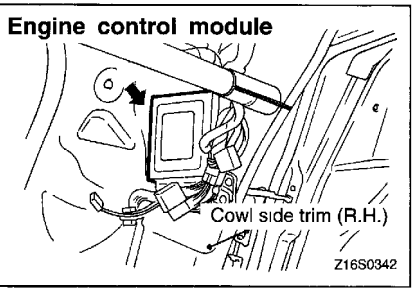
<1993 models>



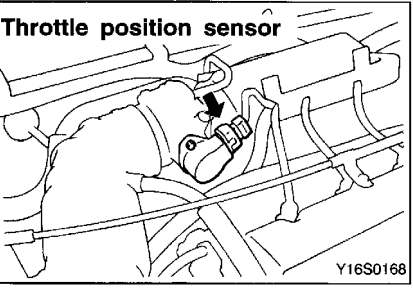
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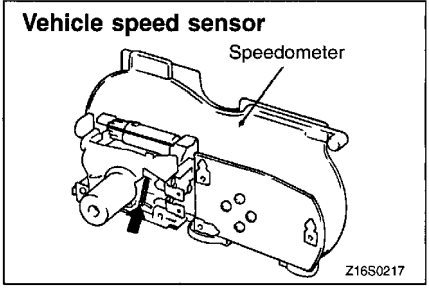
Engine control module



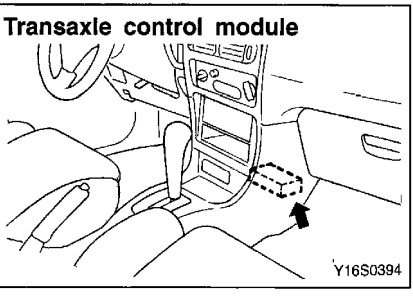
Throttle position sensor



Vehicle speed sensor

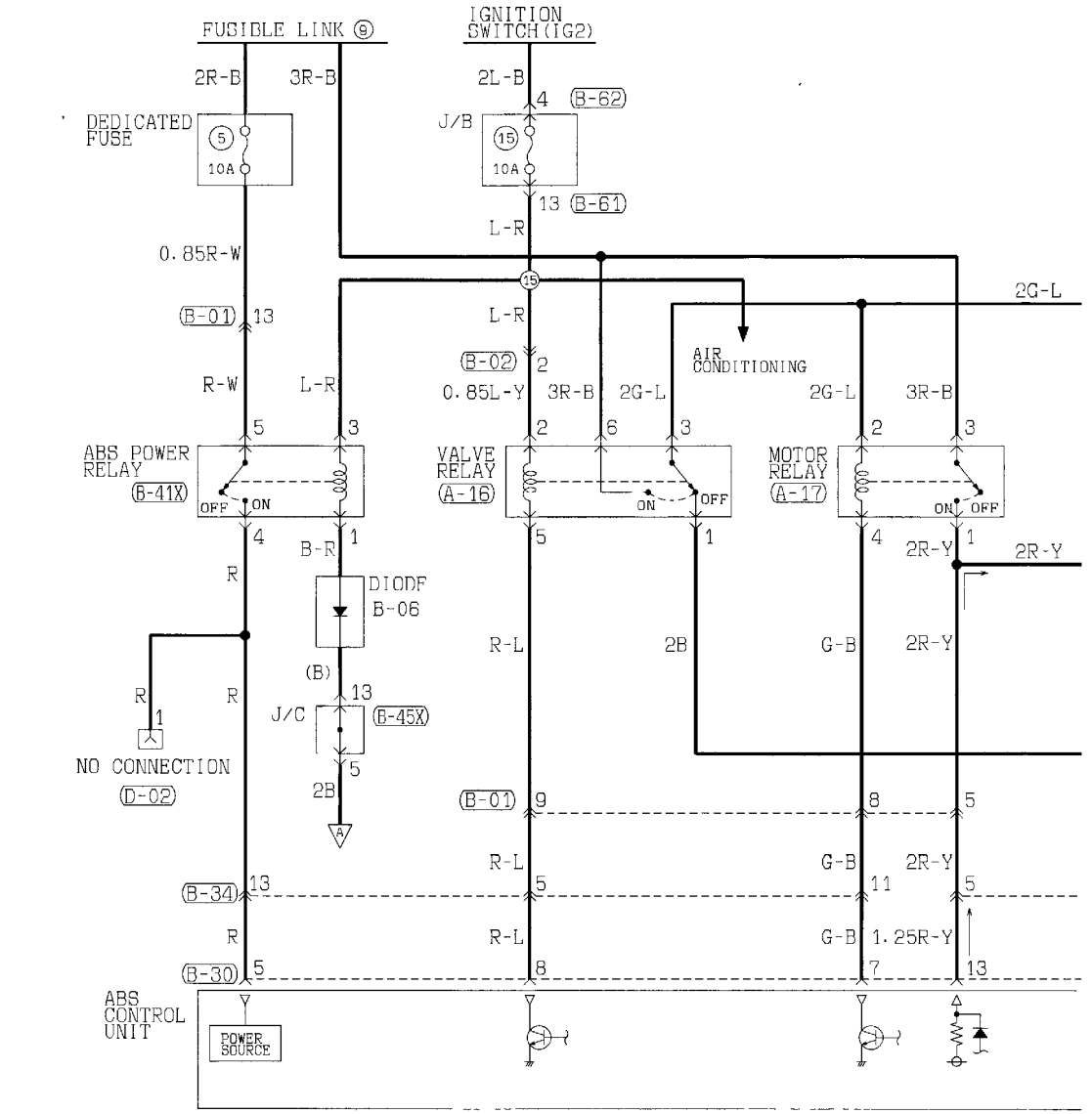


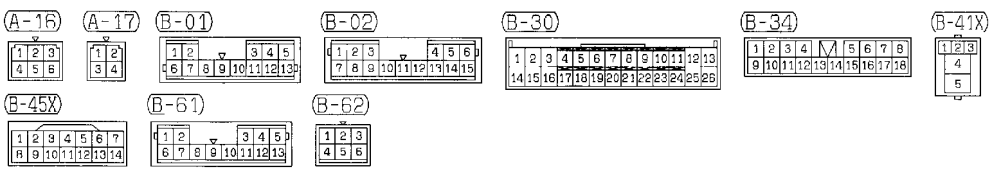
Transaxle control module



ANTI-LOCK BRAKING SYSTEM <1993 MODELS>

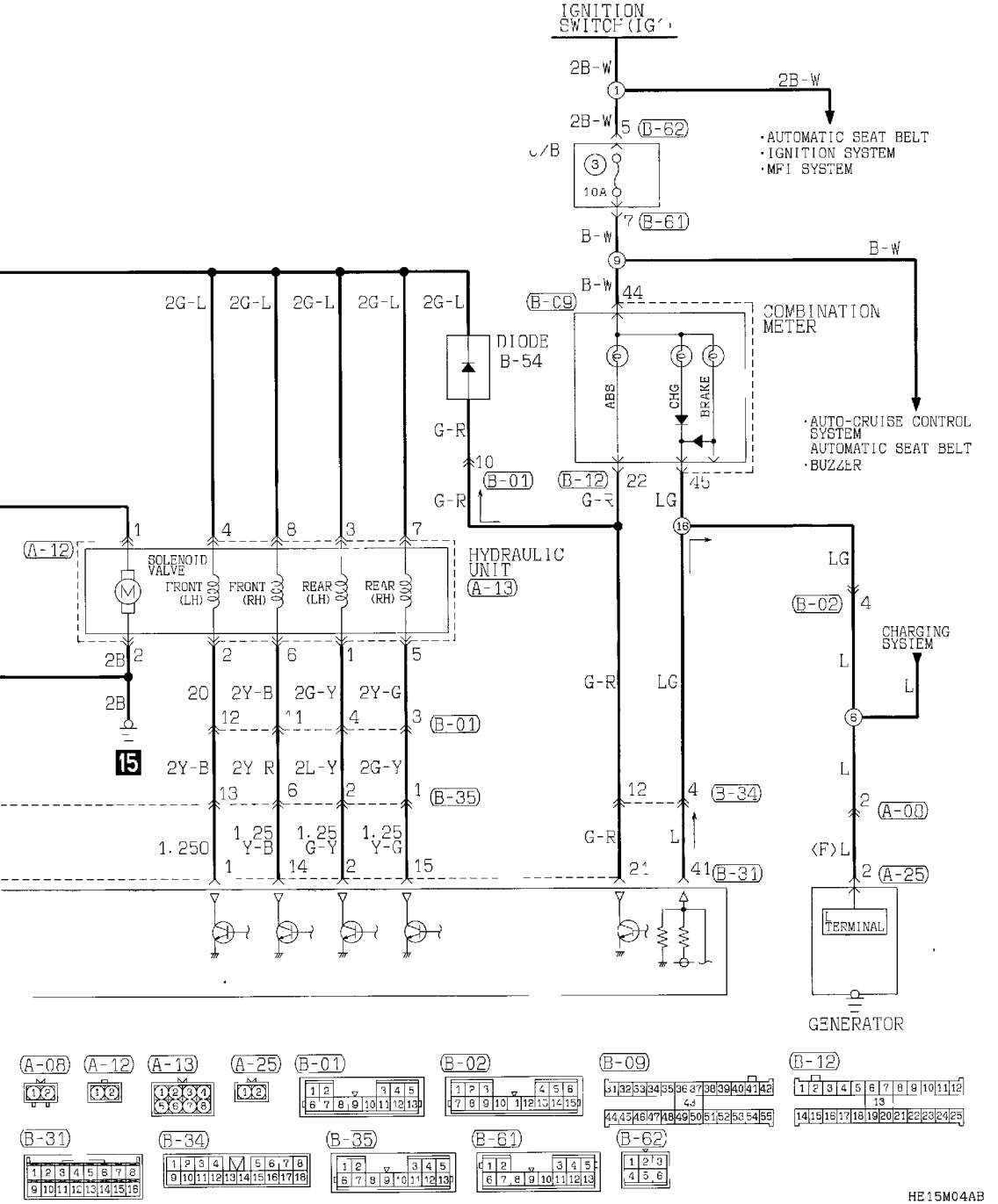
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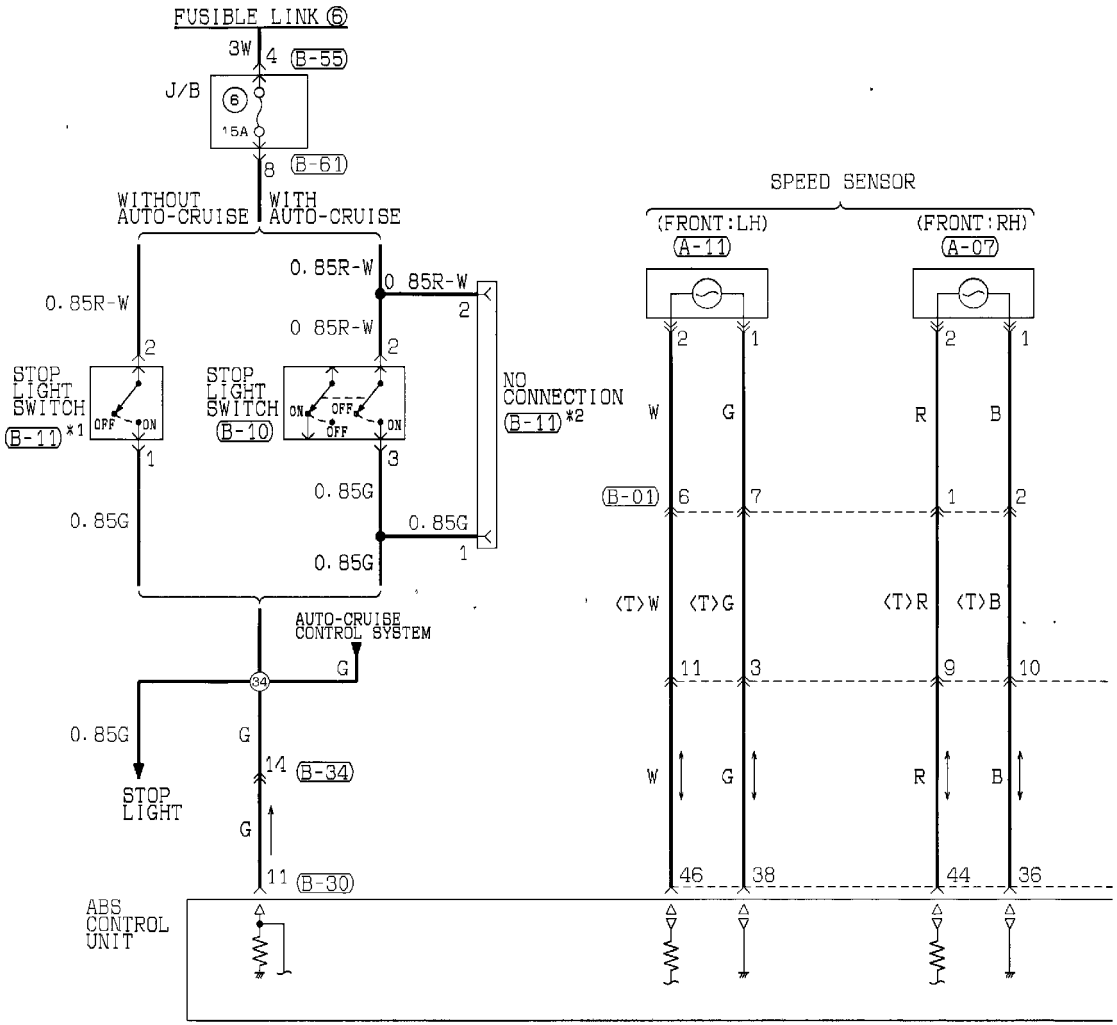
TSB Revision

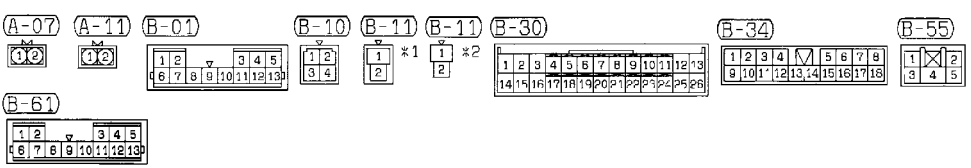


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TSB Revision

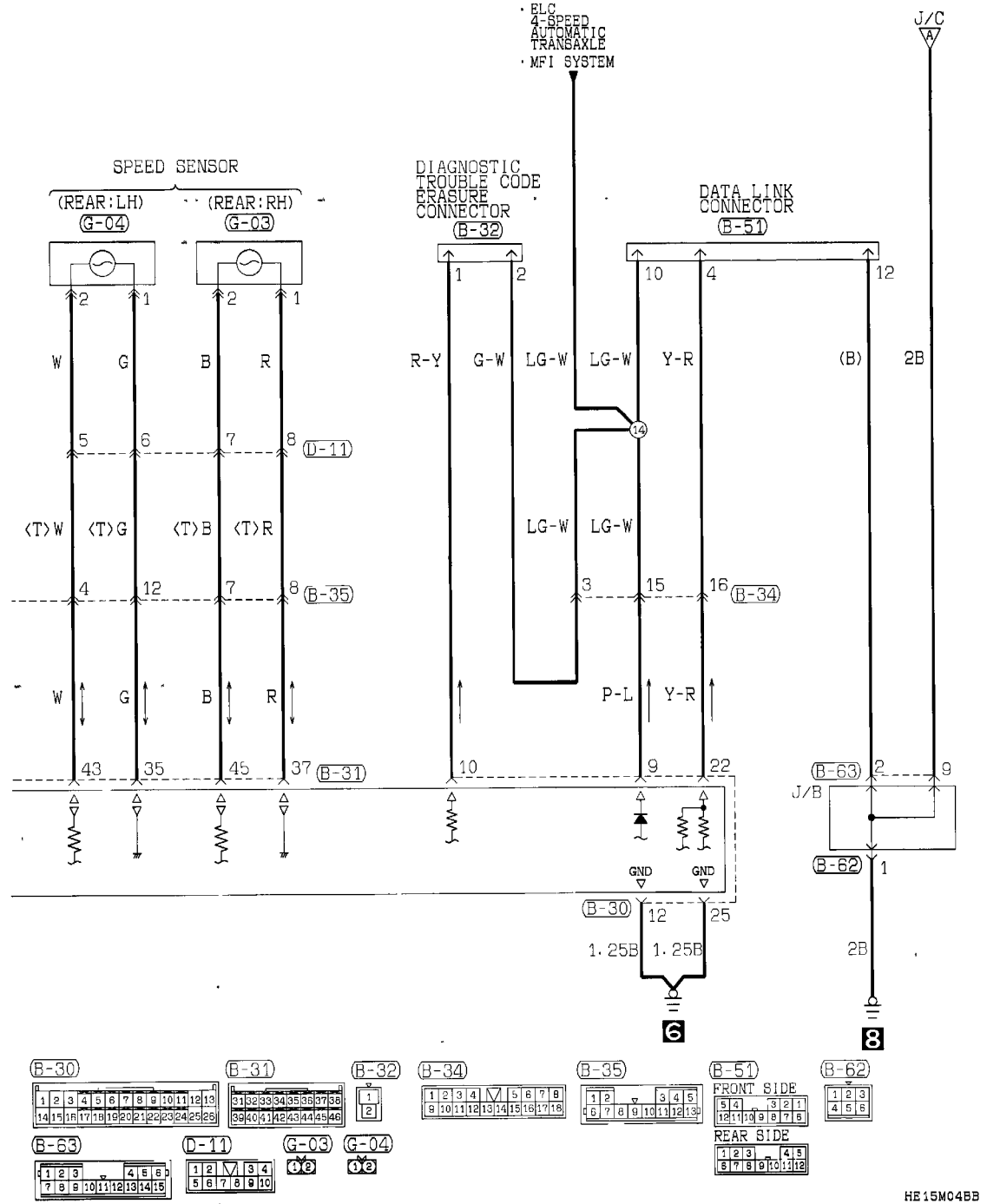
ANTI-LOCK BRAKING SYSTEM <1993 MODELS> (CONTINUED)





HE15M04BA

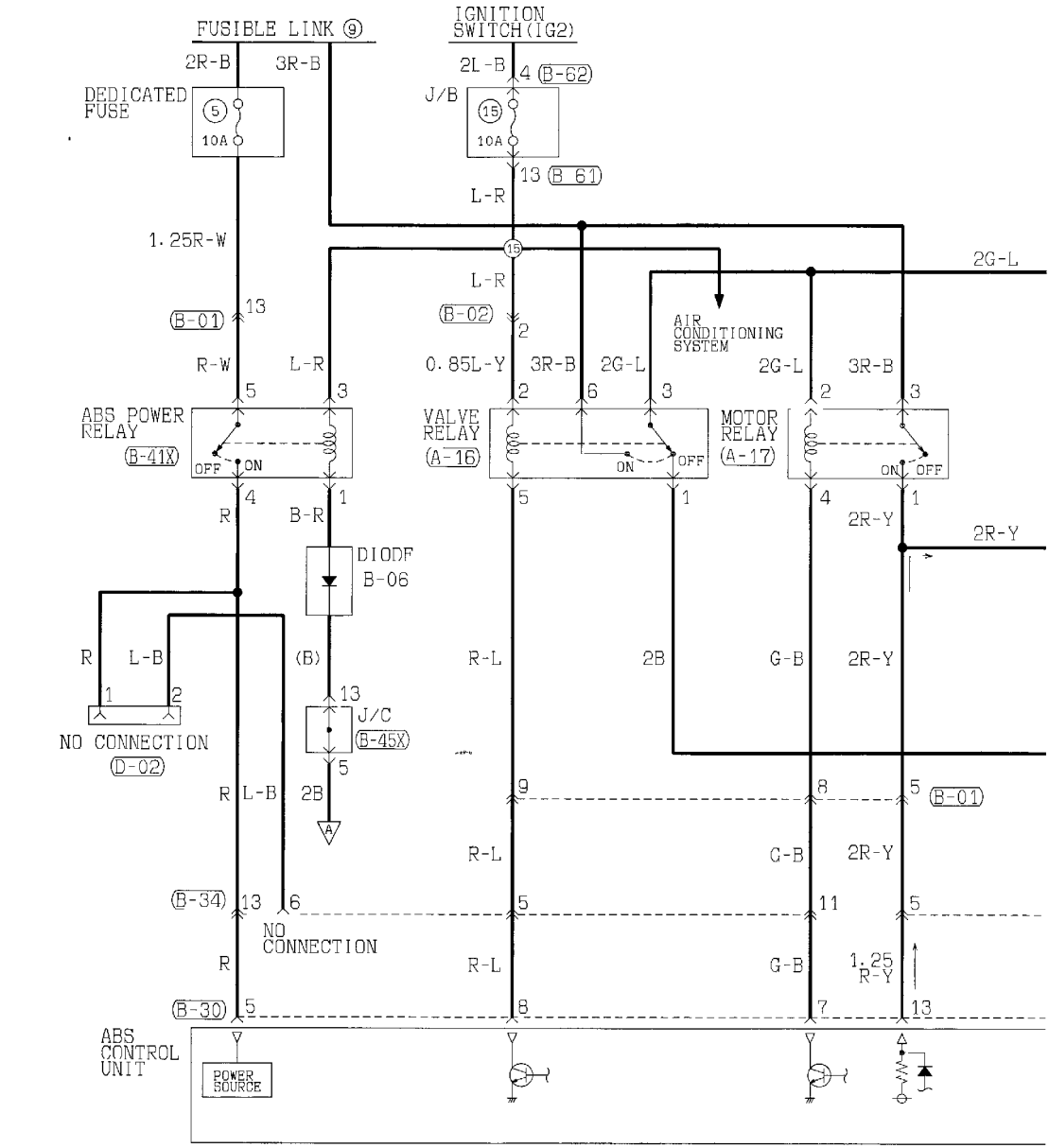
TSB Revision

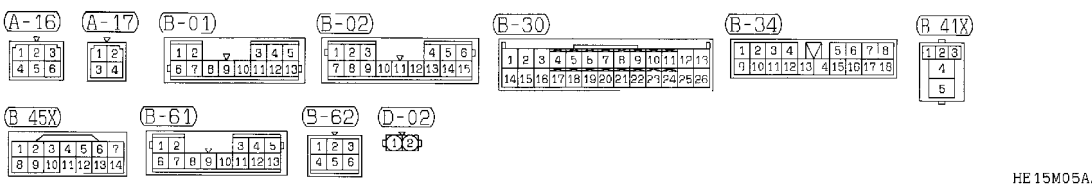


TSB Revision

ANTI-LOCK BRAKING SYSTEM <FROM 1994 MODELS>

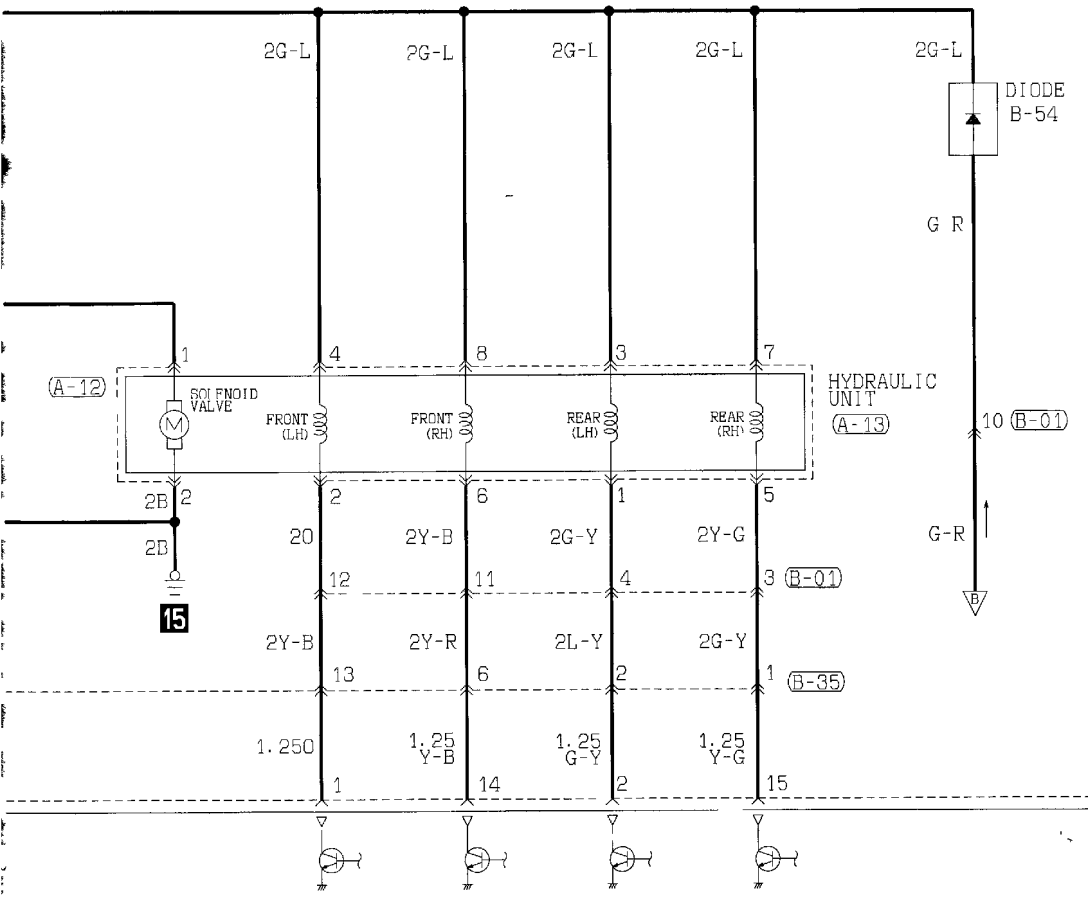
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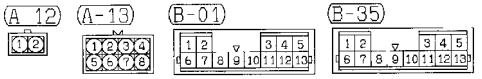




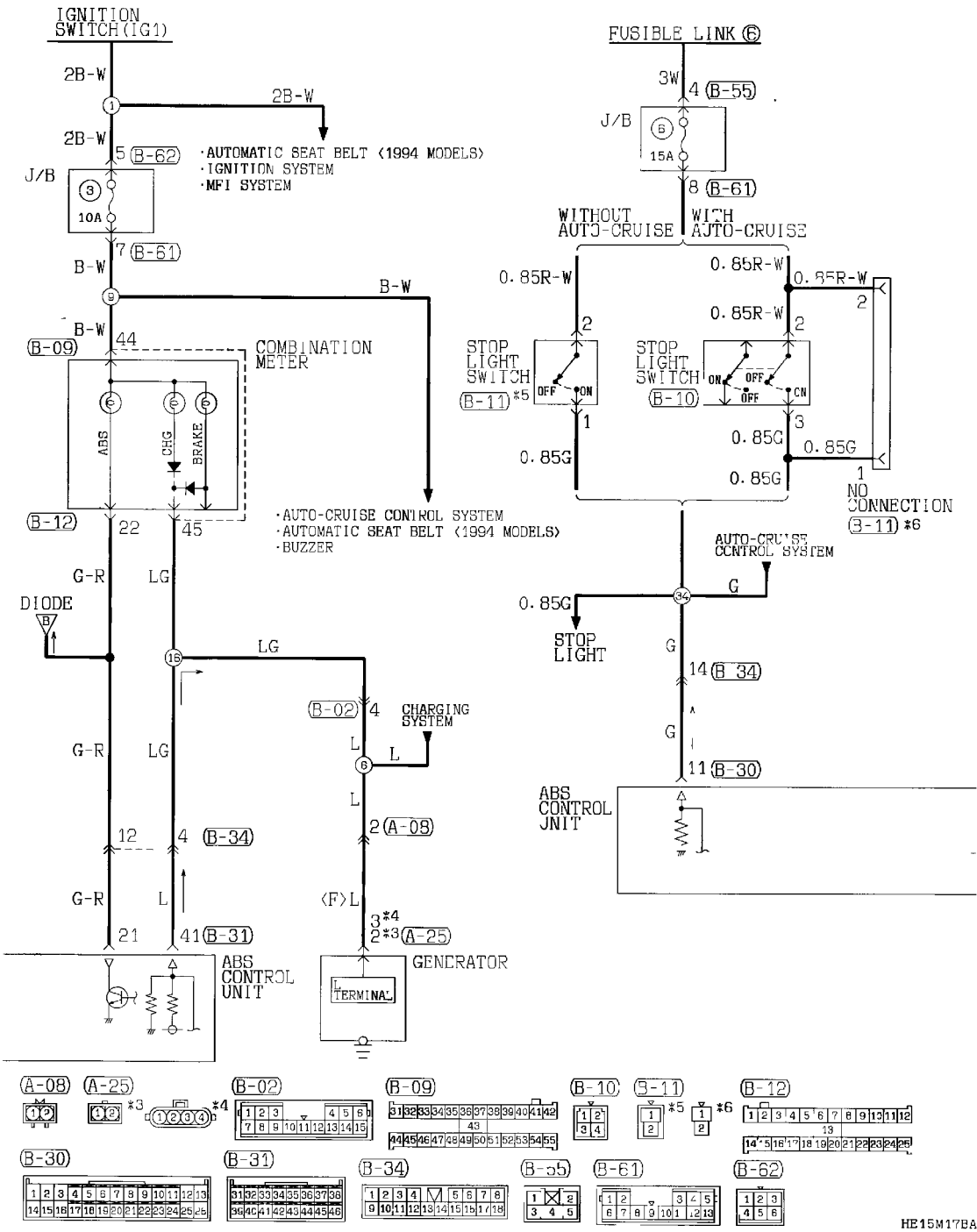
HE15M05AA

TSB Revision


2G-L
2G-L
2G-L
2G-L
2G-L
DIODE
B-54
G R
A-12
1
4
8
3
7
SOLENOID
VALVE
FRONT
(LH)
FRONT
(RH)
REAR
(LH)
REAR
(RH)
HYDRAULIC
UNIT
A-13
10 B-01
2B 2
2B
15
2
6
1
5
2O
2Y-B
2G-Y
2Y-G
G-R
12
11
4
3 B-01
2Y-B
2Y-R
2L-Y
2G-Y
13
6
2
1 B-35
1.250
1.25
Y-B
1.25
G-Y
1.25
Y-G
1
14
2
15

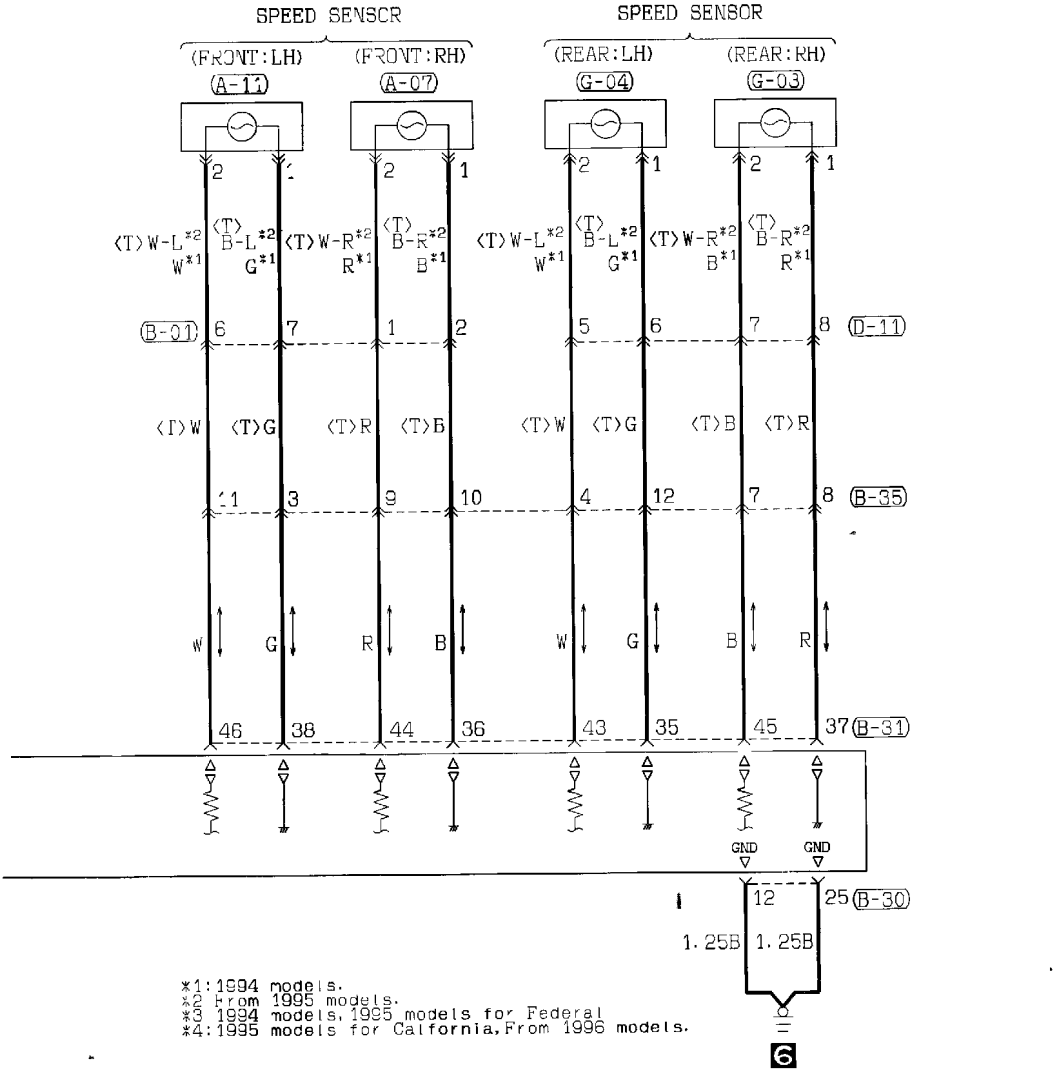

A-12
A-13
B-01
B-35

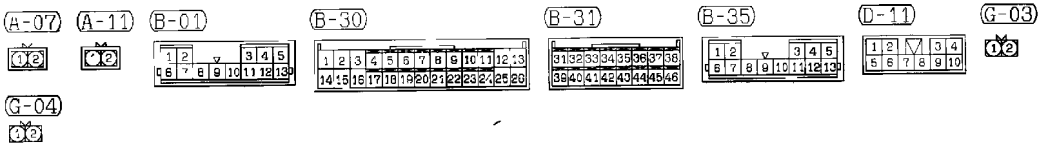
ANTI-LOCK BRAKING SYSTEM <FROM 1994 MODELS> (CONTINUED)



HE15M17BA

TSB Revision

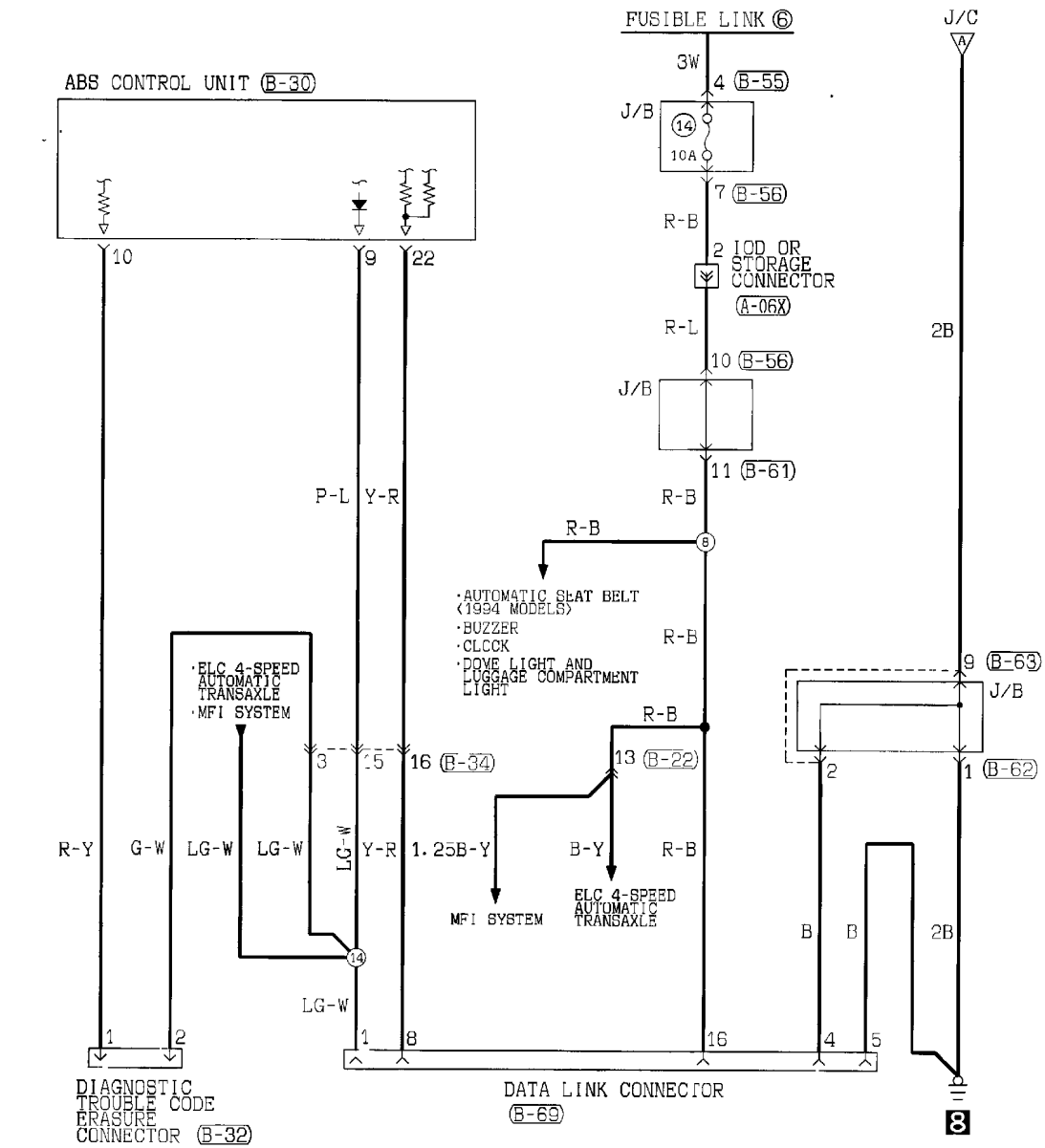


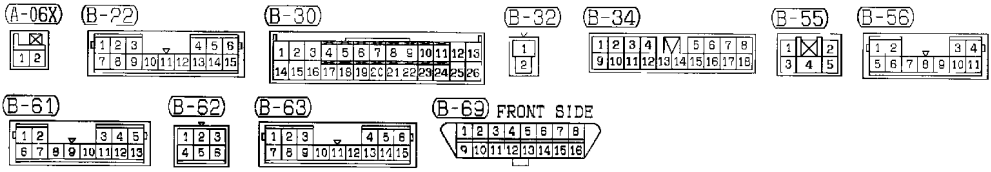


HE15M17BB

TSB Revision

ANTI-LOCK BRAKING SYSTEM <FROM 1994 MODELS> (CONTINUED)





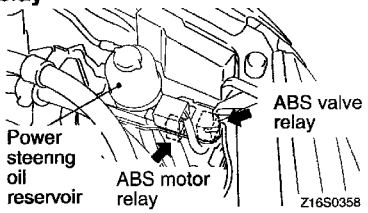
HE15M05CA

TSB Revision

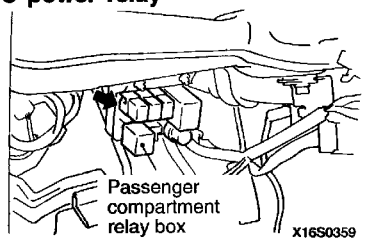
COMPONENT LOCATION

110003612

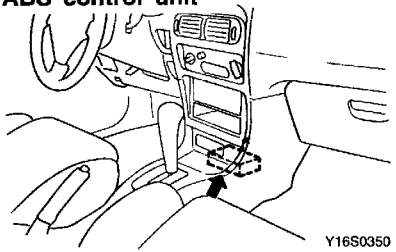
ABS motor relay and ABS valve relay



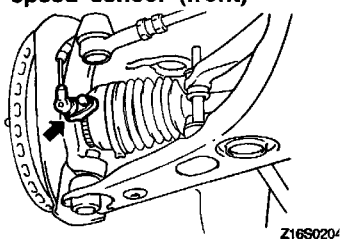
ABS power relay



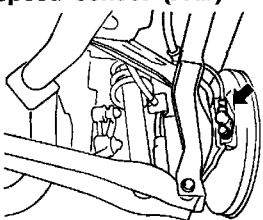
ABS control unit



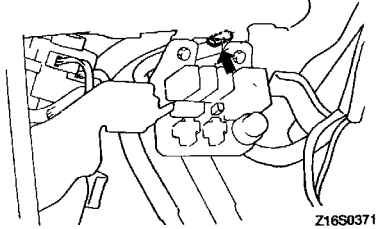
ABS speed sensor (front)



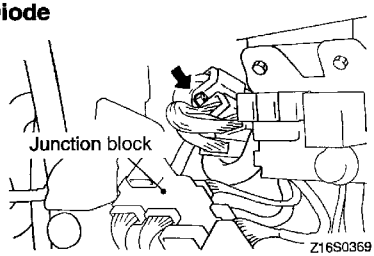
ABS speed sensor (rear)



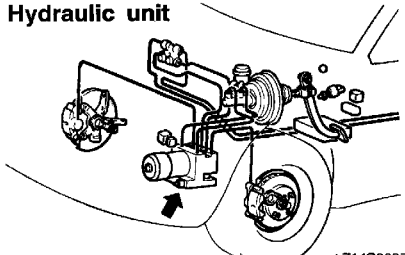
Diode



Diode

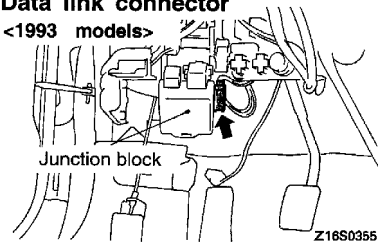


Hydraulic unit

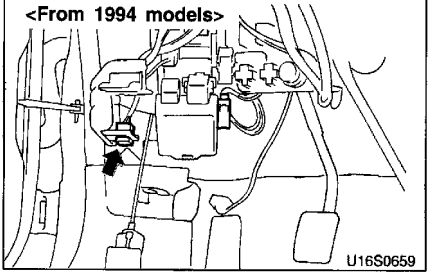


Data link connector

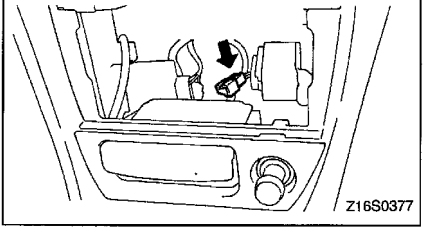
<1993 models>



<From 1994 models>

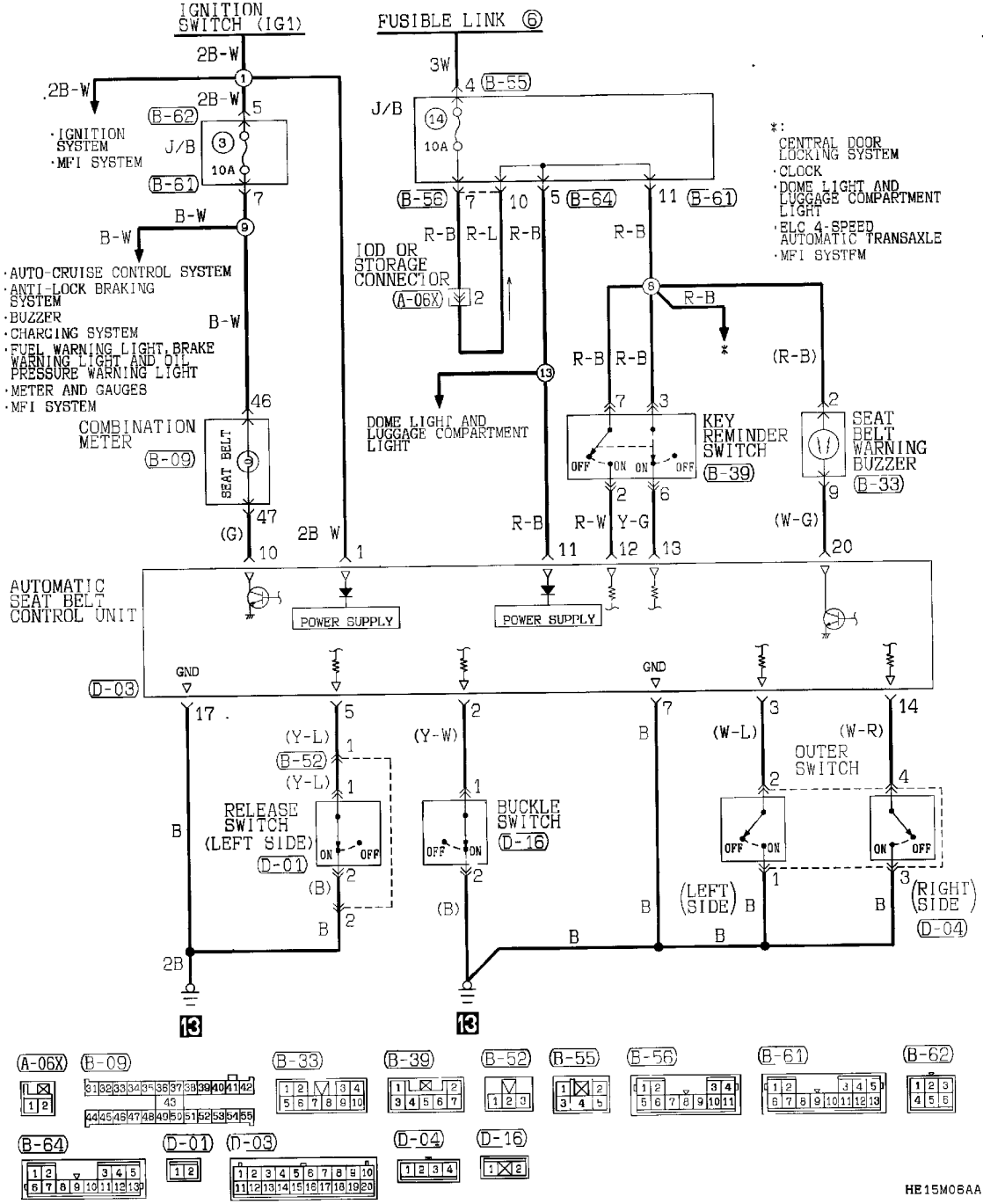


Diagnostic trouble code erasure connector



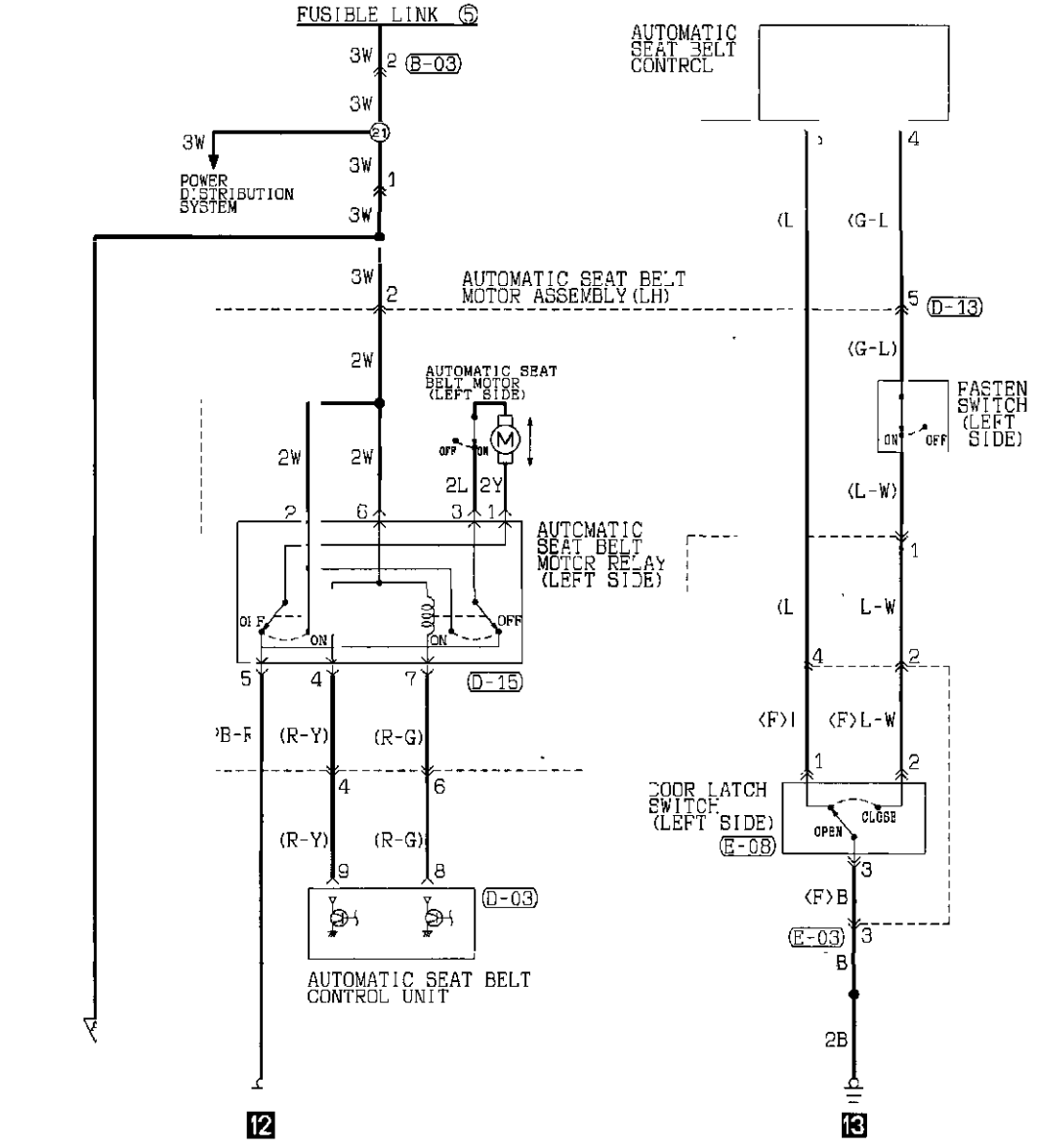
AUTOMATIC SEAT BELT <1993 MODELS>

110003613

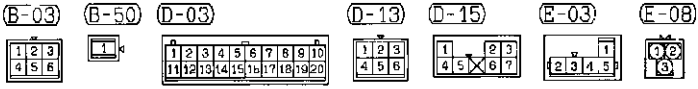


HE15M06AA

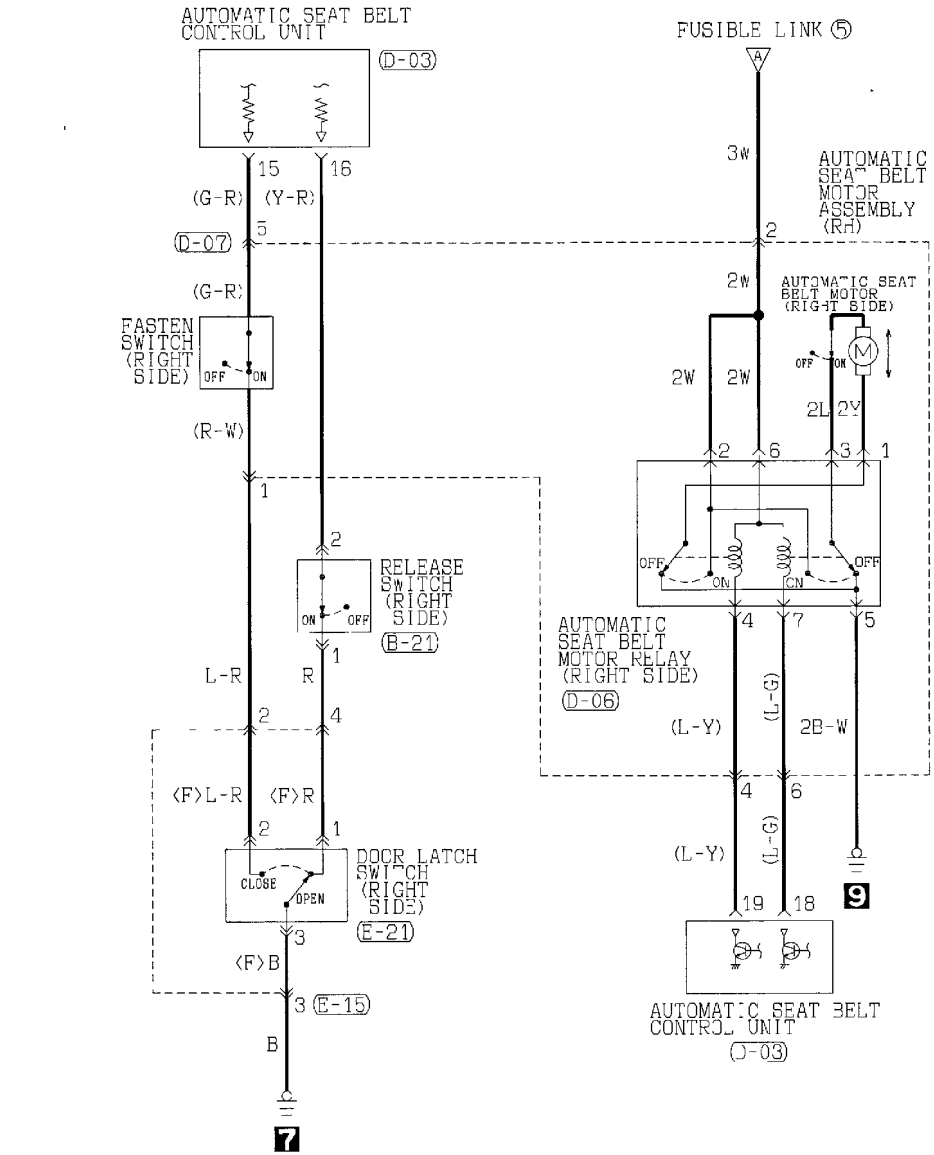
TSB Revision

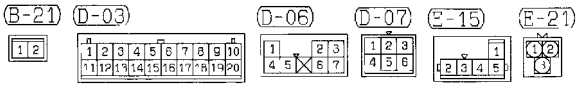


B-03 B-50 D-03 D-13 D-15 E-03 E-08



AUTOMATIC SEAT BELT <1993 MODELS> (CONTINUED)





OPERATION

110003614

<1993 models>

Automatic Seat Belt Warning Light

This warning light warns the driver and front passenger to fasten their seat belts. If one or more seat belts are not fastened, the automatic seat belt control unit detects that fact and causes the warning light to be illuminated or flash. How long the light is illuminated or how many times it flashes depends on whether only one, or both of the belts remain unfastened.

Automatic Seat Belt Warning Buzzer

This warning buzzer also warns the driver and front passenger to fasten their seat belts as the warning light does. It sounds continuously or intermittently, depending on how the belts remain unfastened.

<1994 models>

Automatic Seat Belt

The shoulder belt moves automatically to the set (fasten) position when the front passenger door is closed and the ignition key is turned to the "ON" position. When the front passenger door is opened, the shoulder belt automatically moves to the OFF (unfastened) position.

Automatic Seat Belt Warning Light

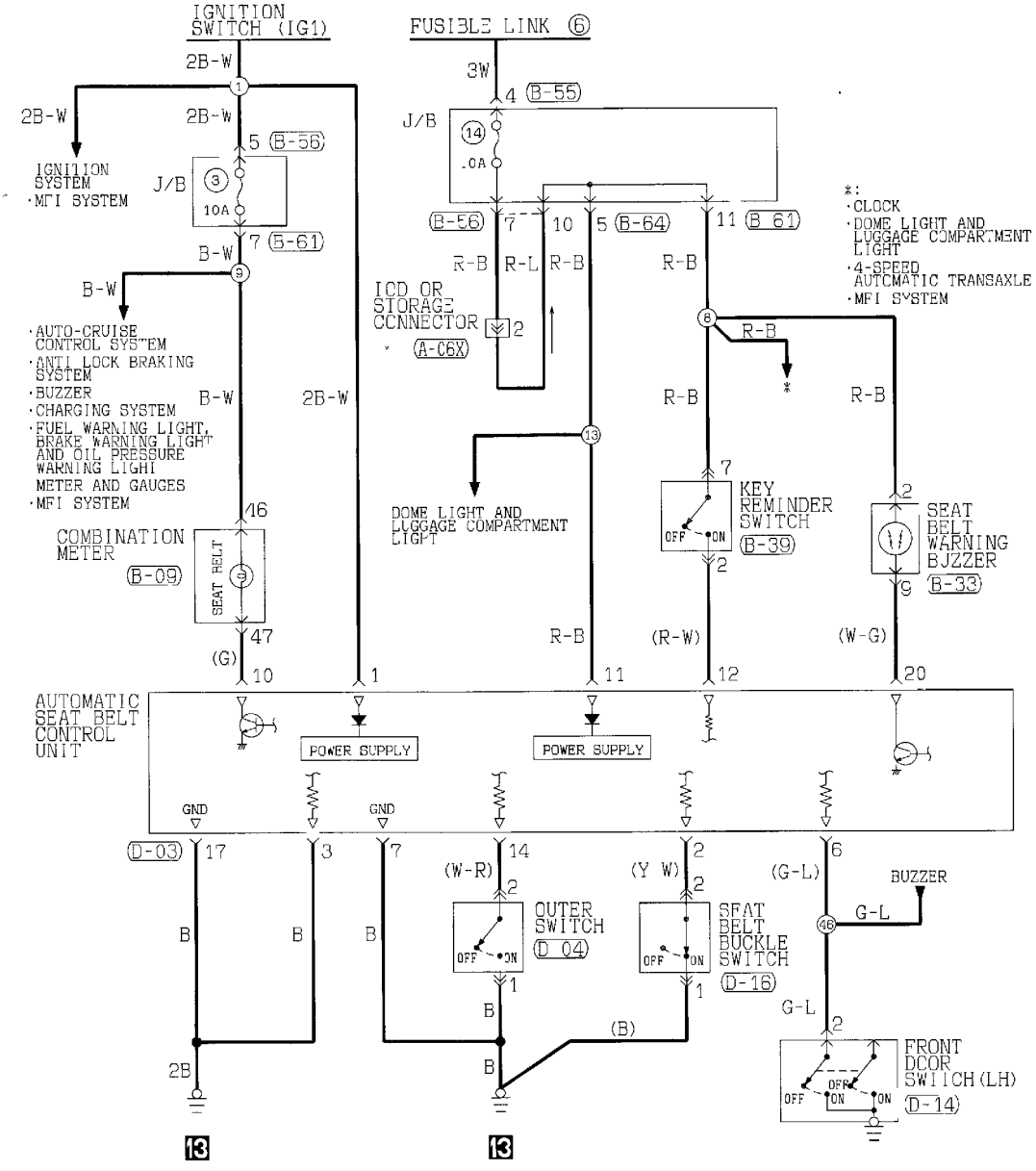
- Illuminates for 6 seconds as soon as the ignition switch is placed in "ON" position.
- Blinks when the "Fasten" switch is turned on while the ignition switch is placed in "ON" position and the front passenger door is closed.
- Illuminates for approx. 1 minute when the ignition switch is turned from "OFF" to "ON" position with the outer switch turned off.

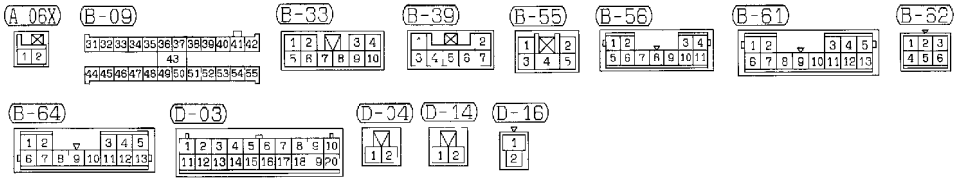
Seat Belt Warning Buzzer

- When the front passenger door is opened and the sliding anchor begins to move to release the shoulder belt, the buzzer sounds for about 1 second.
- When the ignition switch is turned from "OFF" to "ON" position with the driver seat buckle switch OFF, the buzzer sounds intermittently for approx. 6 seconds.

AUTOMATIC SEAT BELT <1994 MODELS>

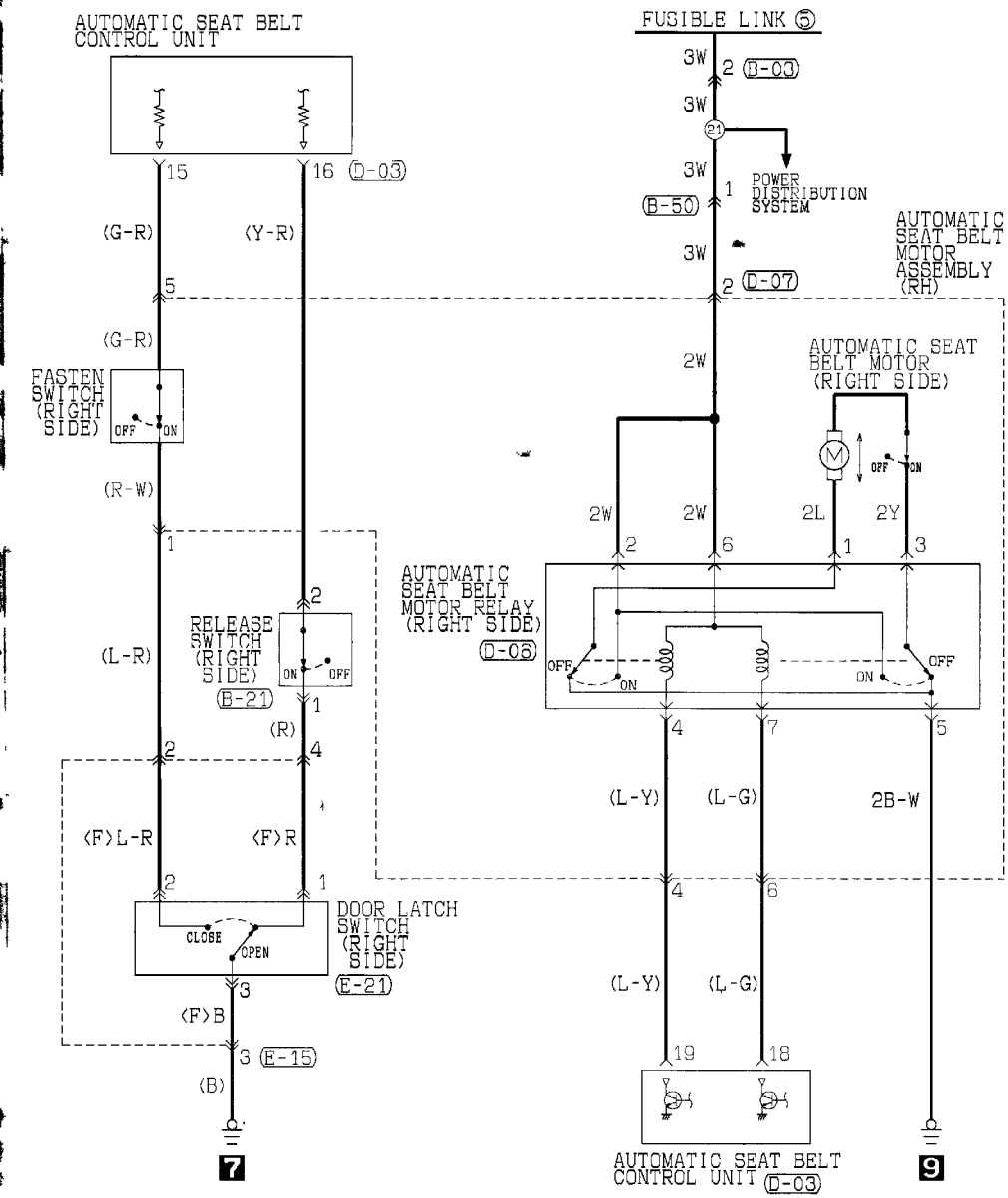
110003615

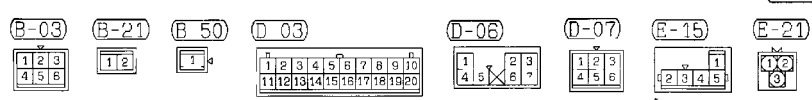




HE15M07AA

TSB Revision





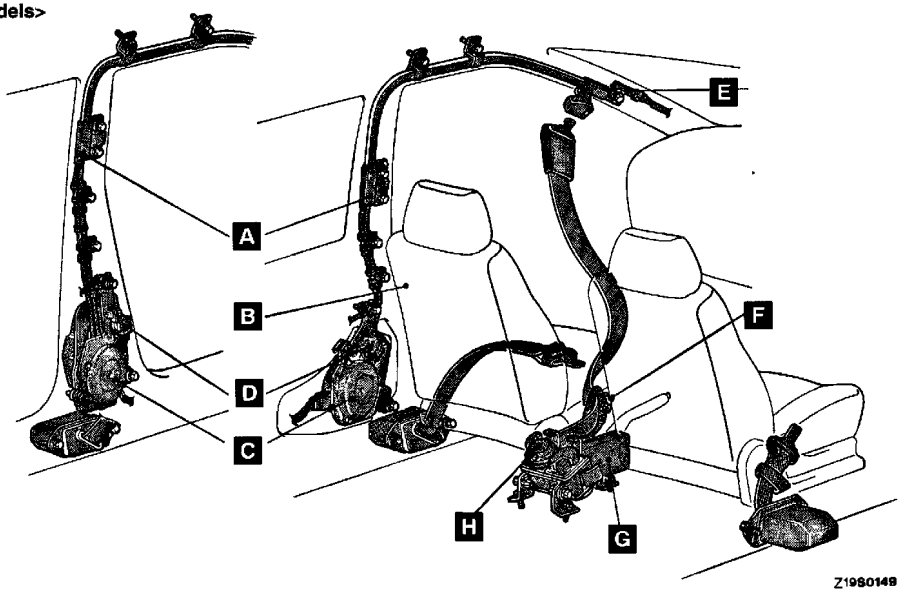
HE15M07AB

TSB Revision

COMPONENT LOCATION

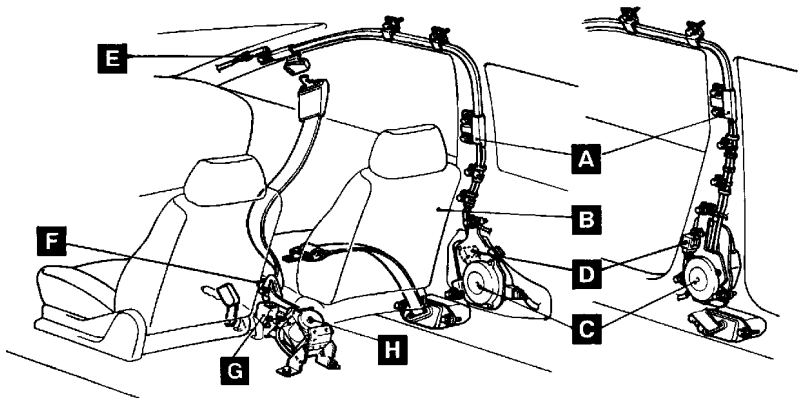
110003618

<1993 models>

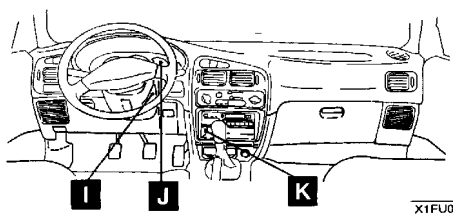


Z19S0149

<1994 models>



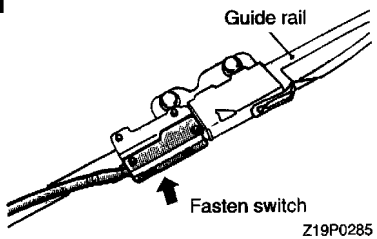
Z19S0256



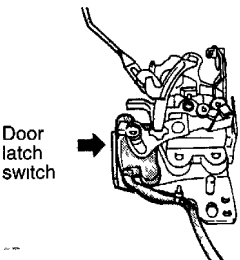
X1FU0941

Name	Symbol	Name	Symbol
Automatic seat belt control unit	G	Fasten switch	A
Automatic seat belt motor	C	Key reminder switch	I
Automatic seat belt motor relay	D	Outer switch	H
Buckle switch	F	Seat belt warning light	J
Buzzer	K	Release switch	E
Door latch switch	B		

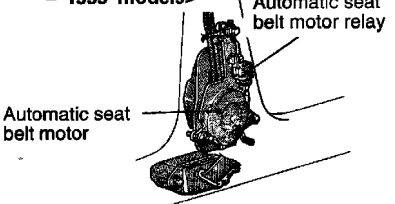
A



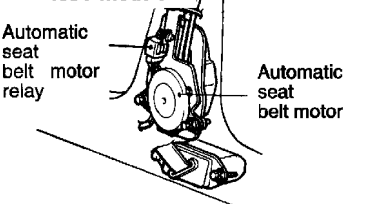
B



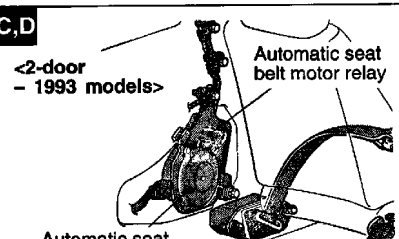
C,D <4-door – 1993 models>



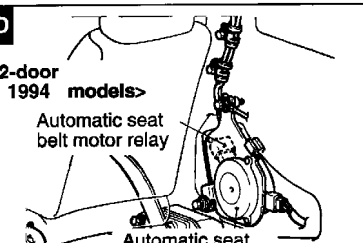
C,D <4-door – 1994 models>



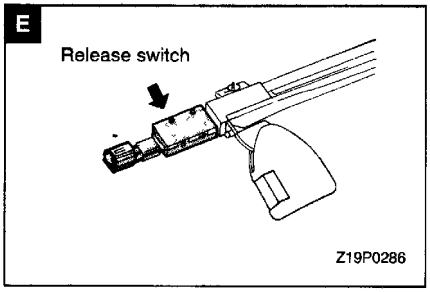
C,D <2-door – 1993 models>



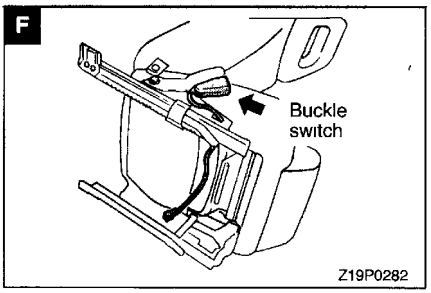
C,D <2-door – 1994 models>



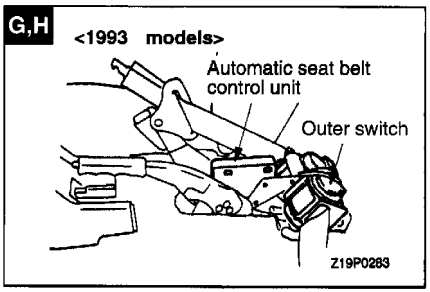
E



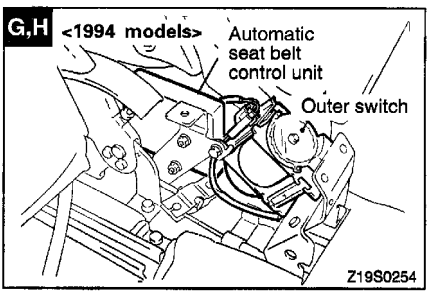
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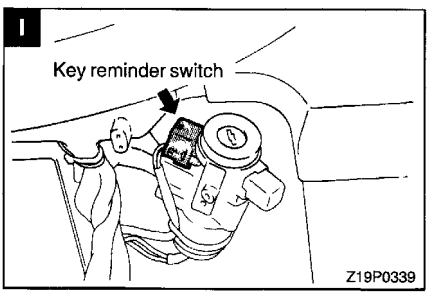
G,H <1993 models>



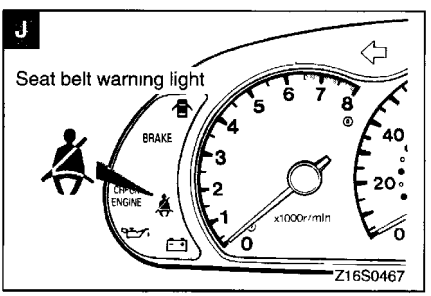
G,H <1994 models>



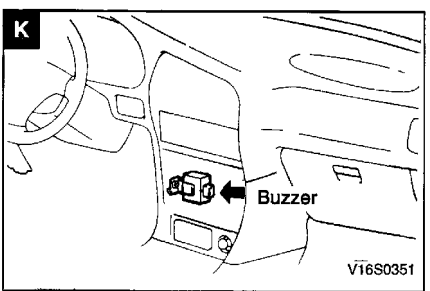
I



J



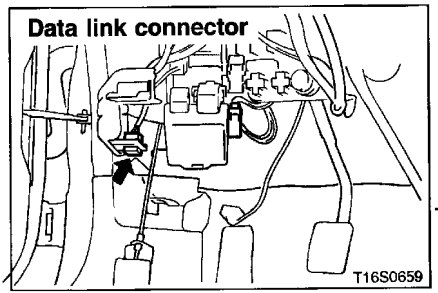
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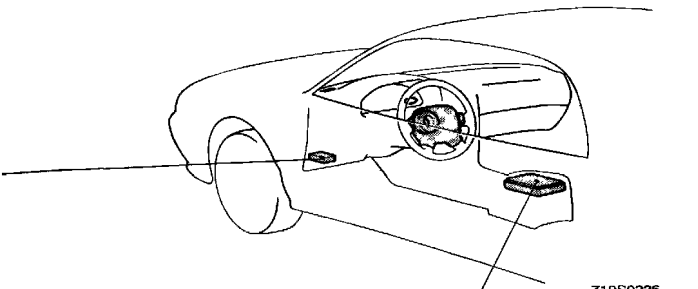


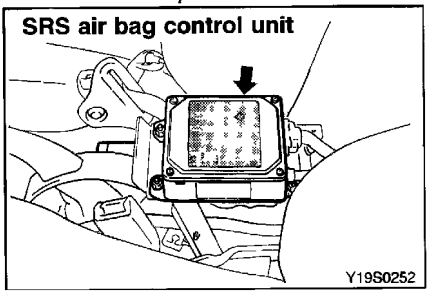
SUPPLEMENTAL RESTRAINT SYSTEM (SRS)

COMPONENT LOCATION

110003617

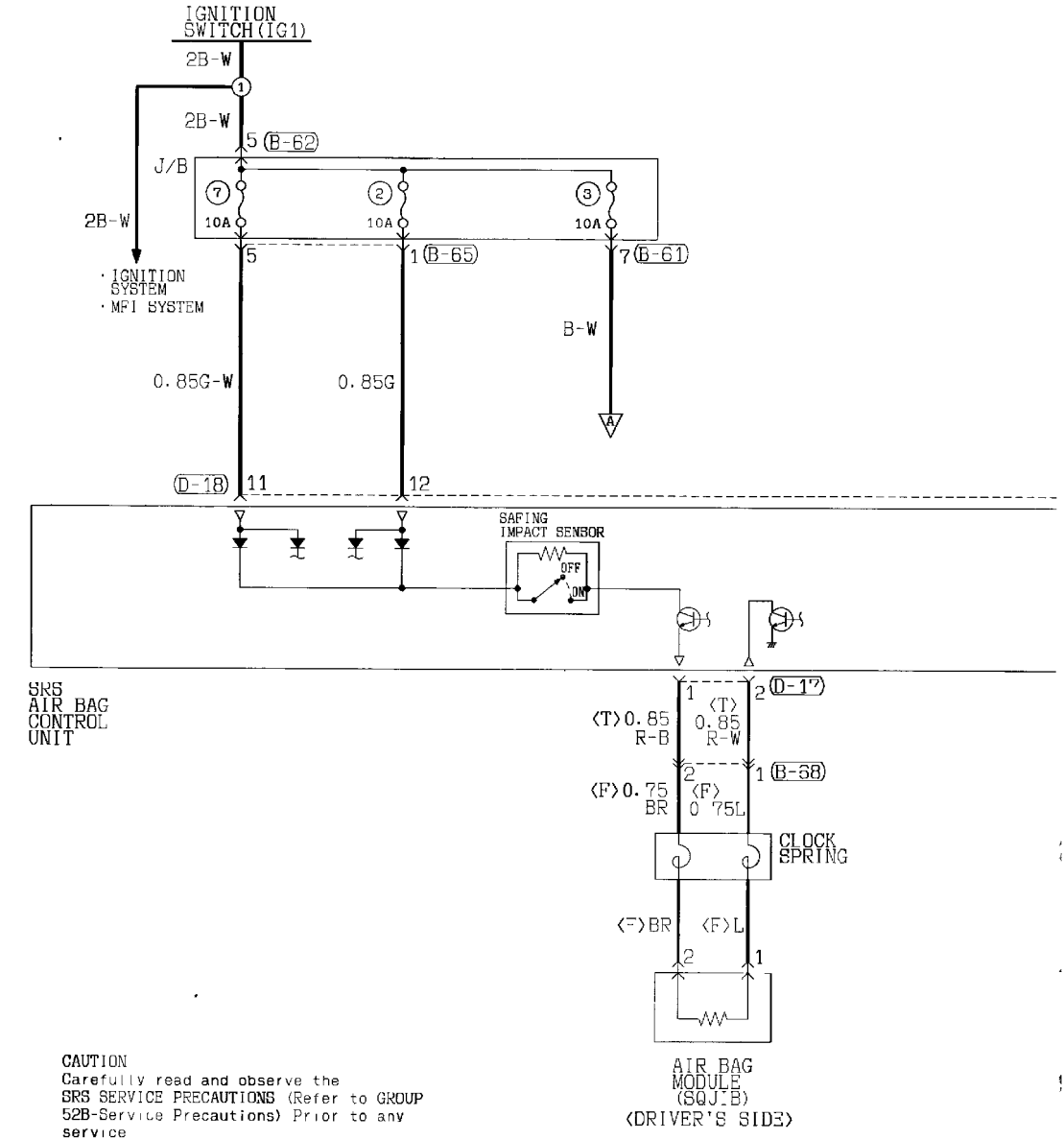




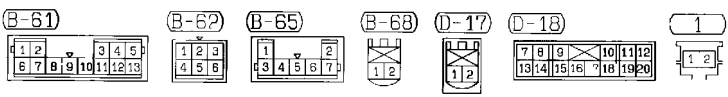


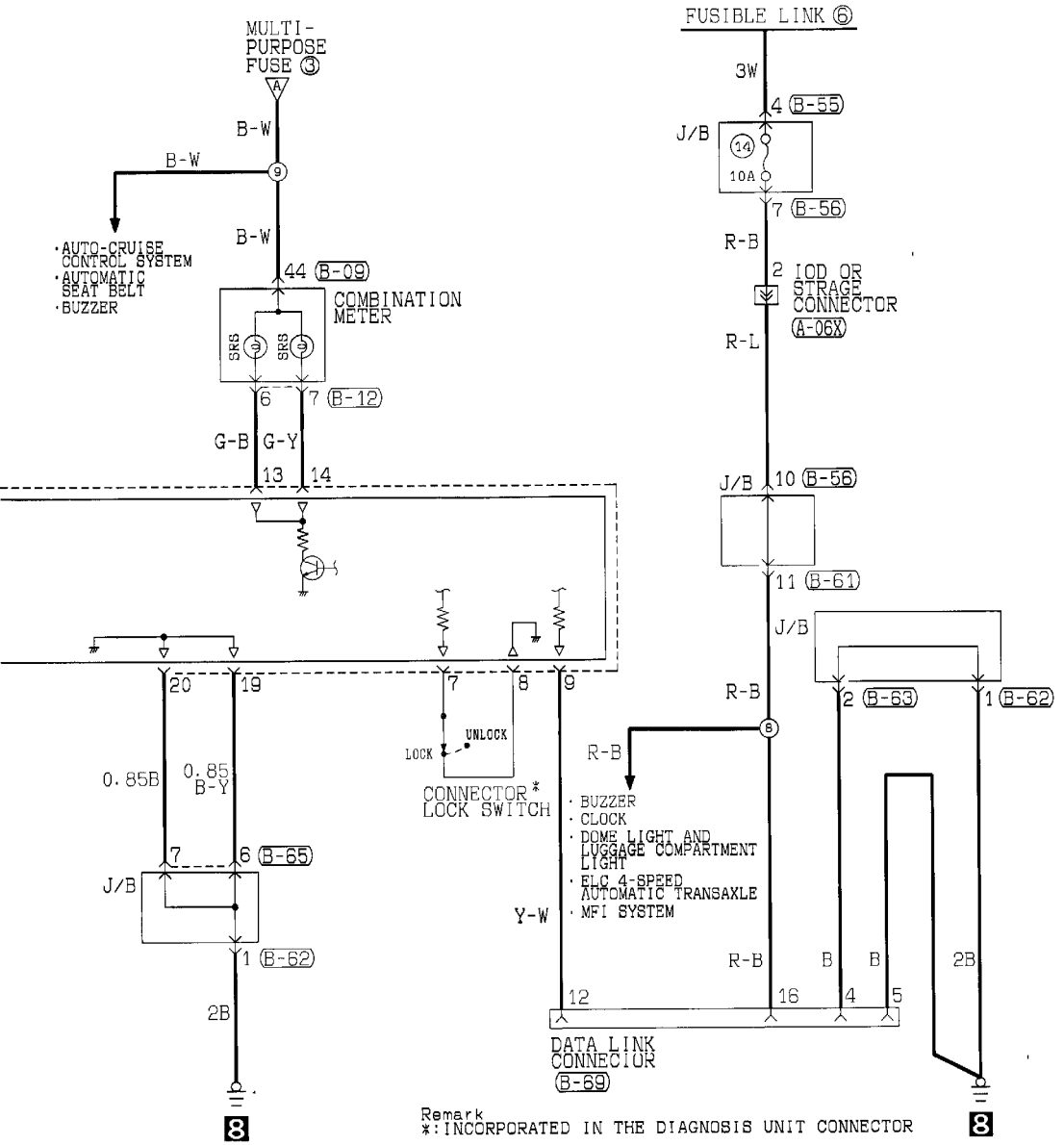
SUPPLEMENTAL RESTRAINT SYSTEM (SRS) <UP TO 1994 MODELS>

110003618

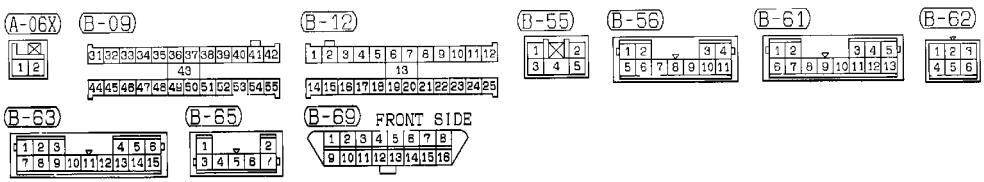


CAUTION
Carefully read and observe the SRS SERVICE PRECAUTIONS (Refer to GROUP 52B-Service Precautions) Prior to any service





Remark
*: INCORPORATED IN THE DIAGNOSIS UNIT CONNECTOR

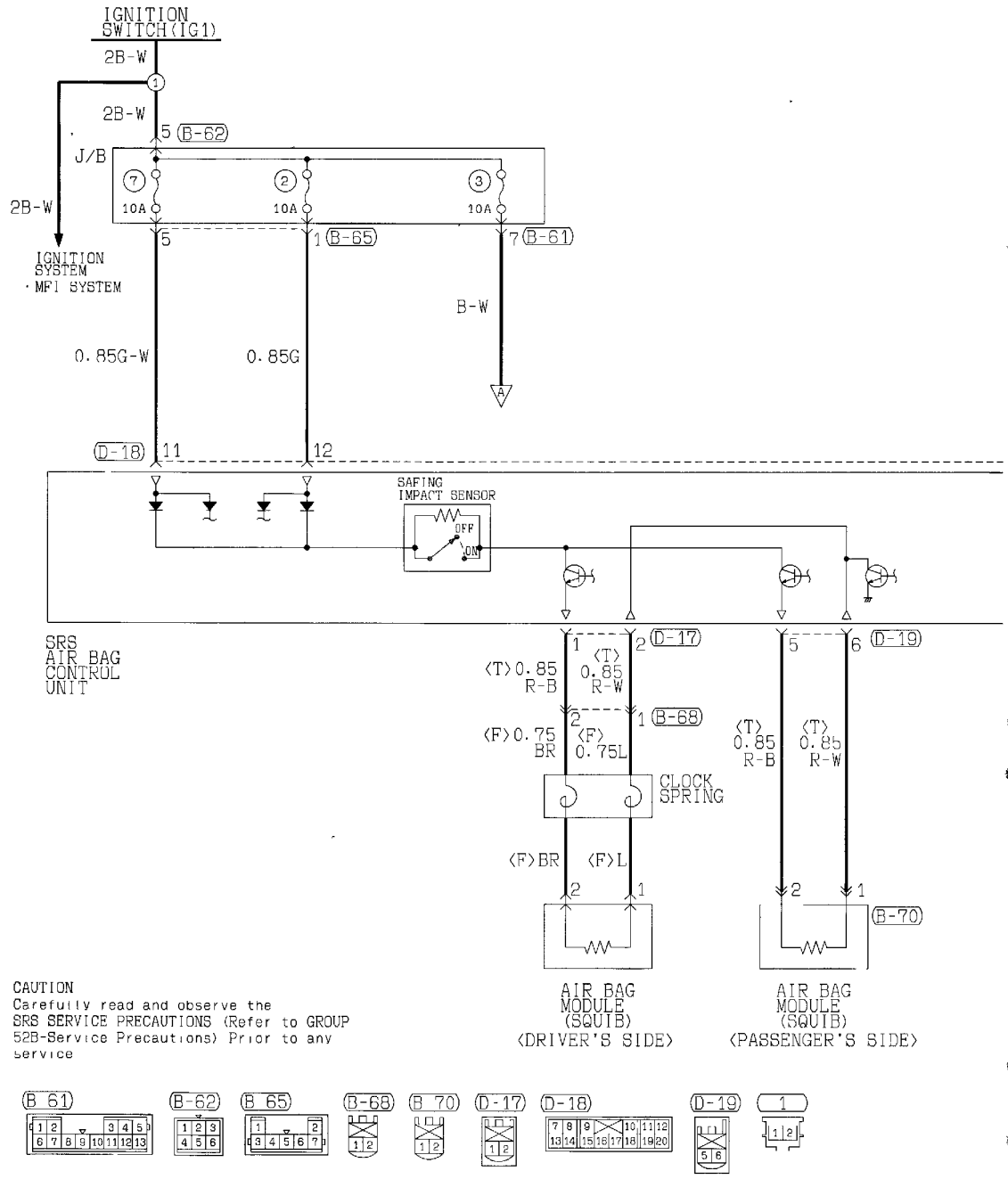


HE15M18AB

TSB Revision

SUPPLEMENTAL RESTRAINT SYSTEM (SRS) <1995 MODELS>

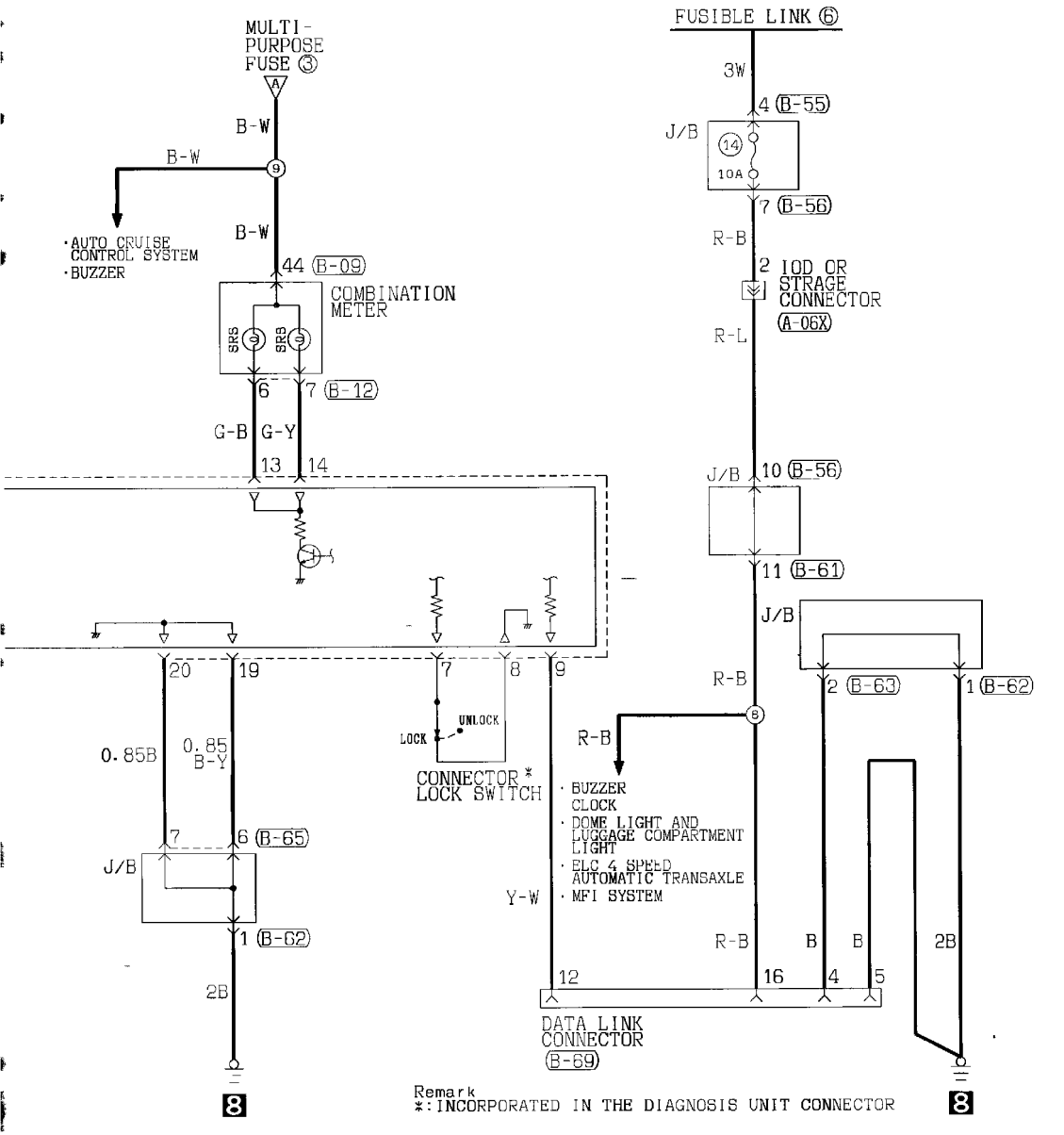
110003619



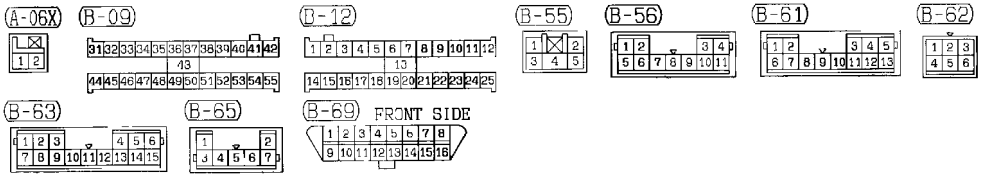
CAUTION
Carefully read and observe the SRS SERVICE PRECAUTIONS (Refer to GROUP 52B-Service Precautions) Prior to any service

HE15M19AA

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Remark
*: INCORPORATED IN THE DIAGNOSIS UNIT CONNECTOR

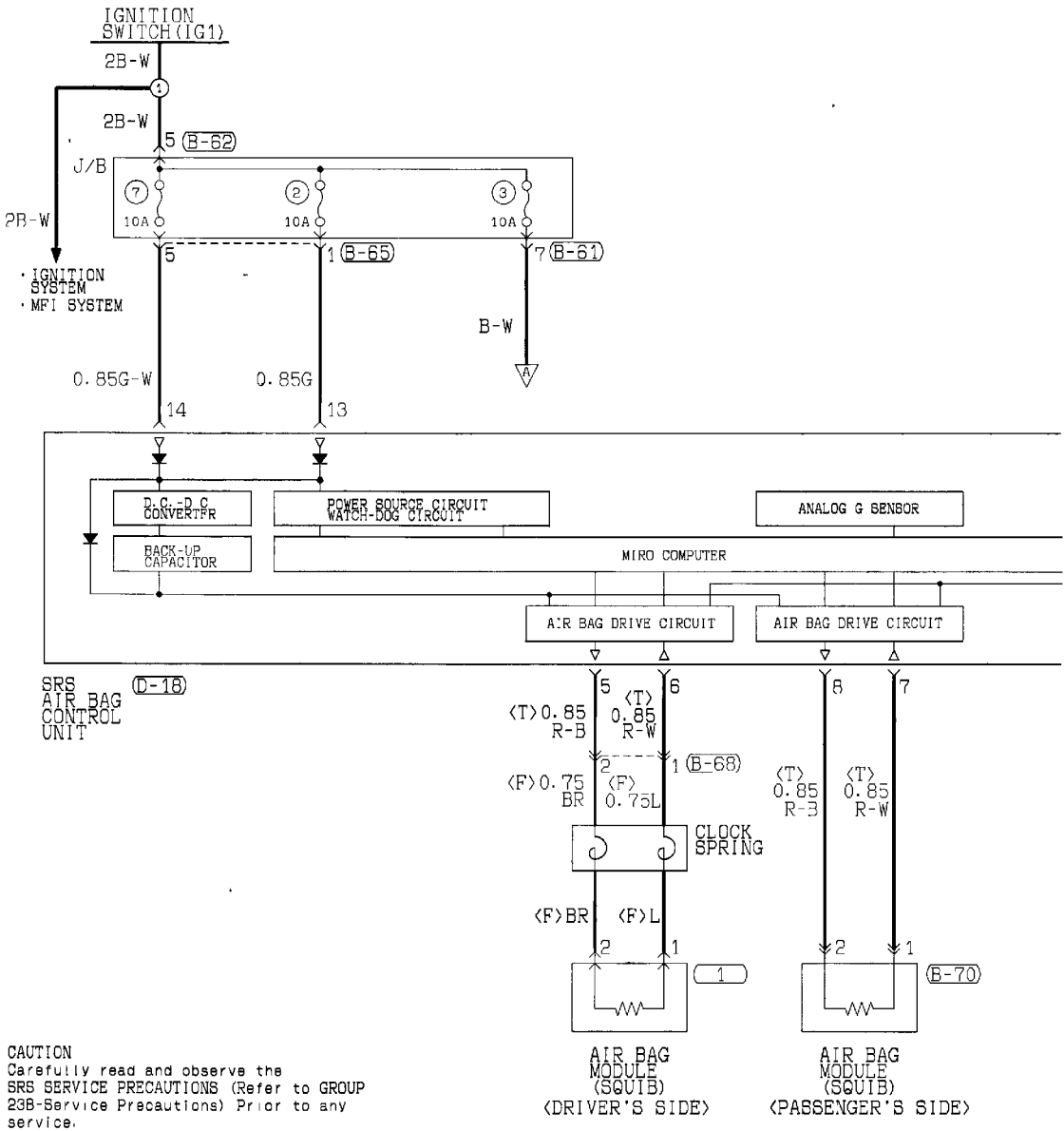


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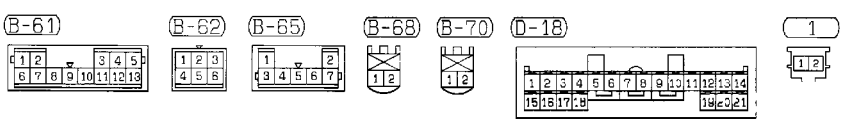
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SUPPLEMENTAL RESTRAINT SYSTEM (SRS) <FROM 1996 MODELS>

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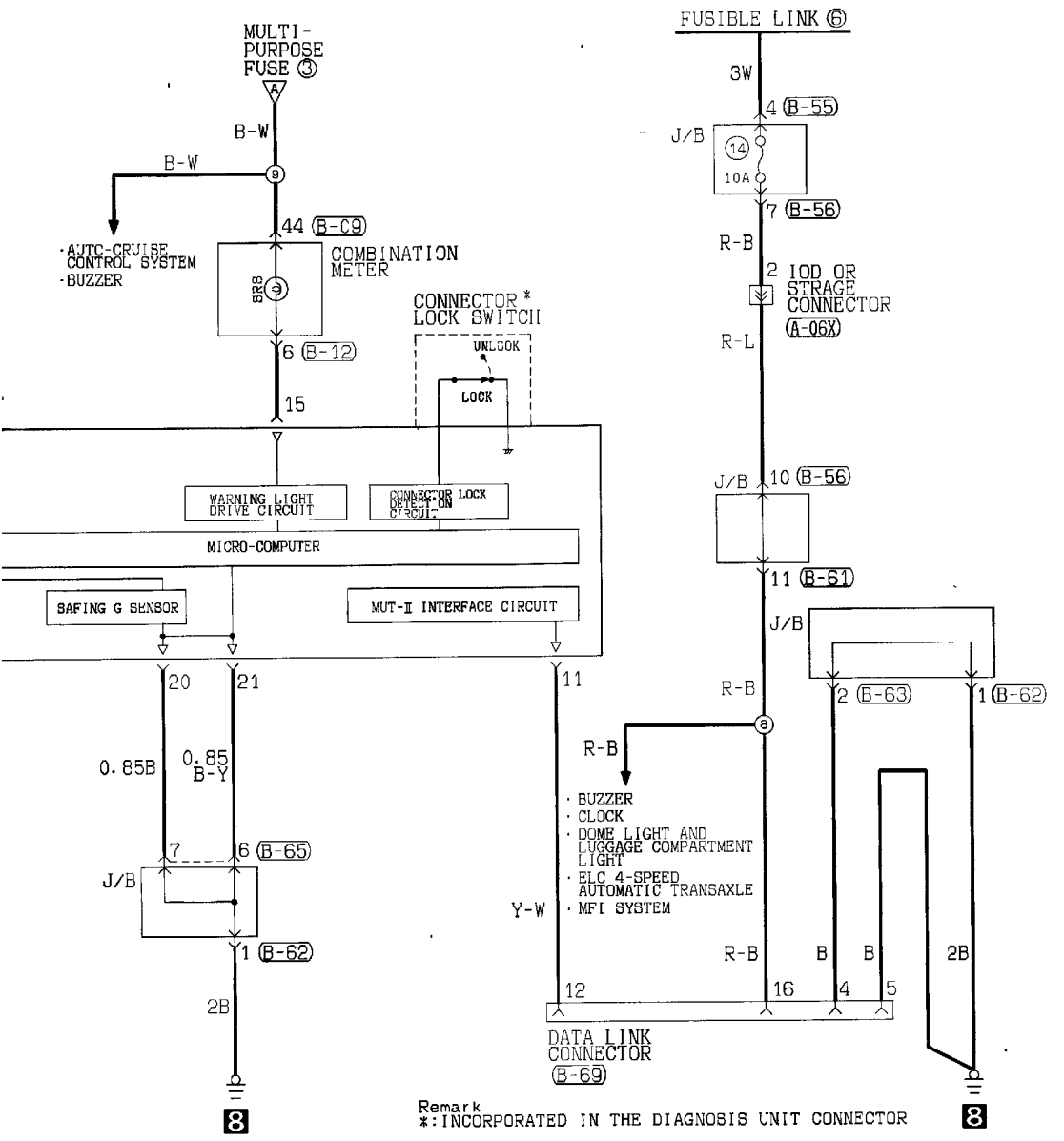


CAUTION
Carefully read and observe the SRS SERVICE PRECAUTIONS (Refer to GROUP 23B-Service Precautions) Prior to any service.

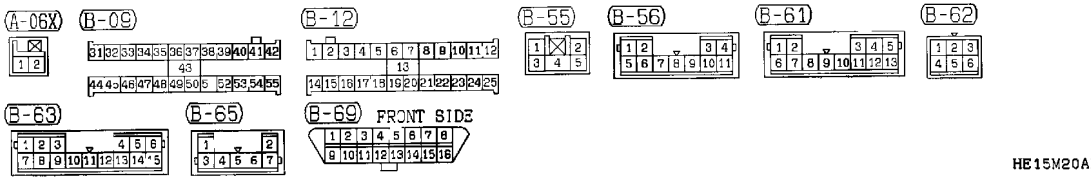


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