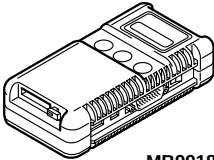
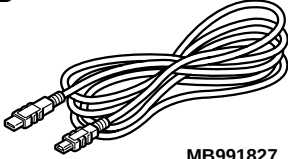
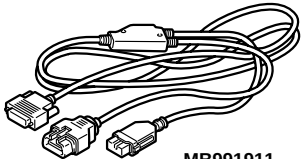
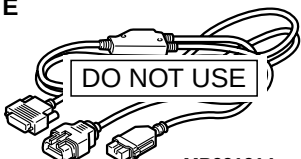
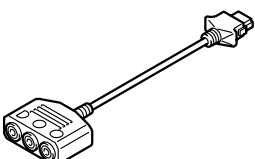
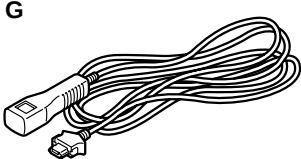
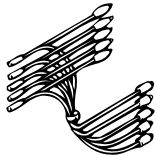
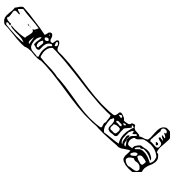


SPECIAL TOOLS

M1131000600632

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
A  MB991824 B  MB991827 C  MB991910 D  MB991911 E  MB991914 F  MB991825 G  MB991826 MB991958	MB991958 A: MB991824 B: MB991827 C: MB991910 D: MB991911 E: MB991914 F: MB991825 G: MB991826 MUT-III sub assembly A: Vehicle communication interface (V.C.I.) B: MUT-III USB cable C: MUT-III main harness A (Vehicles with CAN communication system) D: MUT-III main harness B (Vehicles without CAN communication system) E: MUT-III main harness C (for Daimler Chrysler models only) F: MUT-III adapter harness G: MUT-III trigger harness	MB991824-KIT <i>NOTE: G: MB991826 MUT-III Trigger Harness is not necessary when pushing V.C.I. ENTER key.</i>	- Reading diagnostic trouble code - MFI system inspection - Measurement of fuel pressure CAUTION MUT-III Main Harness B (MB991911) should be used. MUT-III main harness A and C should not be used for this vehicle.
 MB991348	MB991348 Test harness set	MB991348-01	Inspection using an oscilloscope

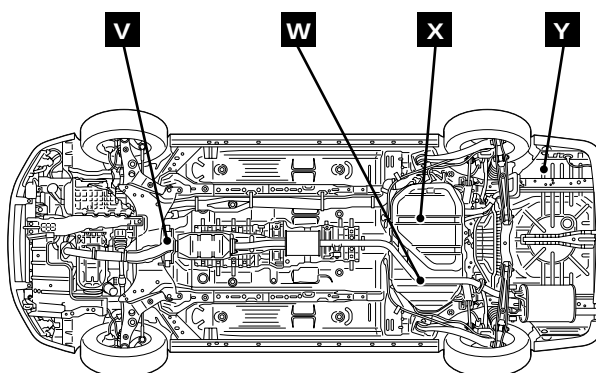
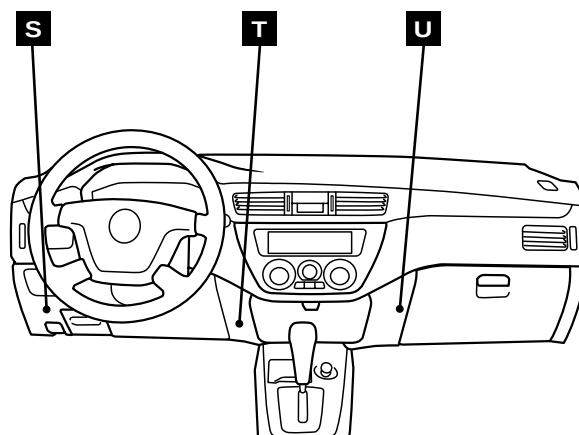
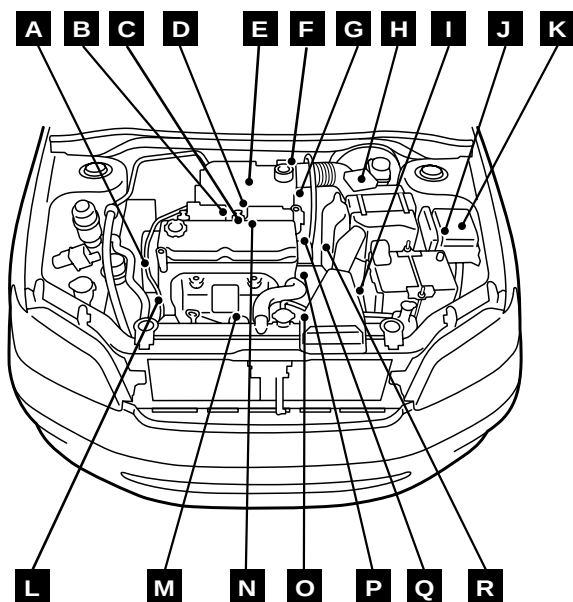
TOOL	TOOL NUMBER AND NAME	SUPERSESSON	APPLICATION
	MB991709 Test harness set	MB991709-01	• Inspection using an oscilloscope • Inspection of idle air control motor • Adjustment of throttle position sensor
 MB991658	MB991658 Test harness SET	Tool not available	• Inspection using an oscilloscope • Inspection of heated oxygen sensor (rear)
	MD998464 Test harness (4 pin, square)	MD998464-01	• Inspection of heated oxygen sensor (front) • Inspection using an oscilloscope
	MD998709 Adaptor hose	MIT210196	Measurement of fuel pressure
	MD998742 Hose adaptor	MD998742-01	
 MB991637	MB991637 Fuel pressure gauge set	Tool not available	

ON-VEHICLE SERVICE

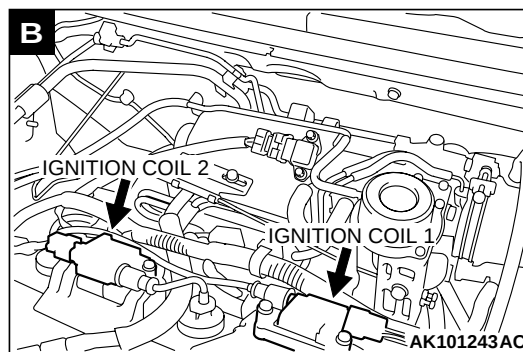
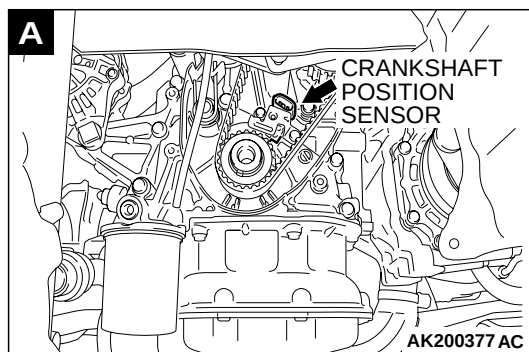
COMPONENT LOCATION

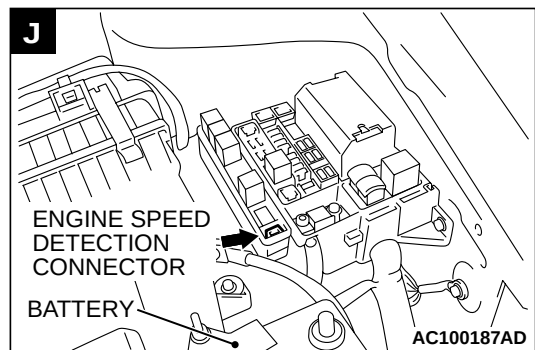
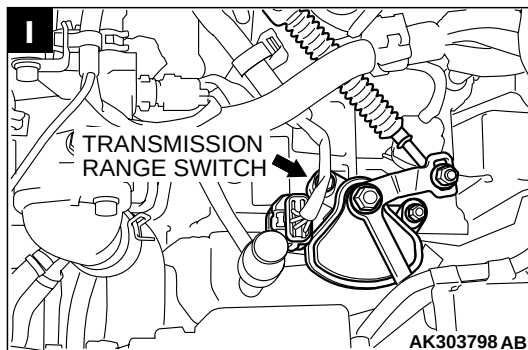
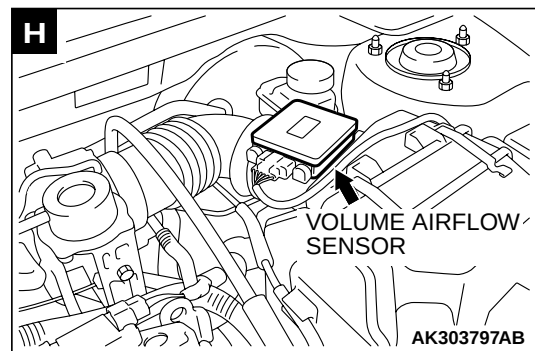
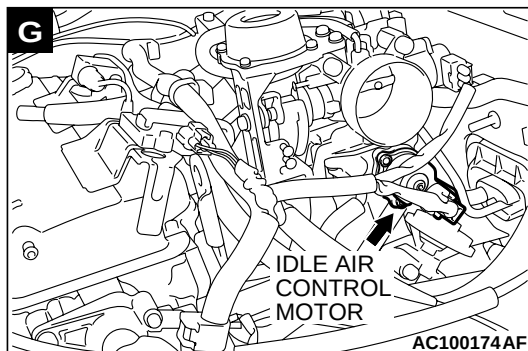
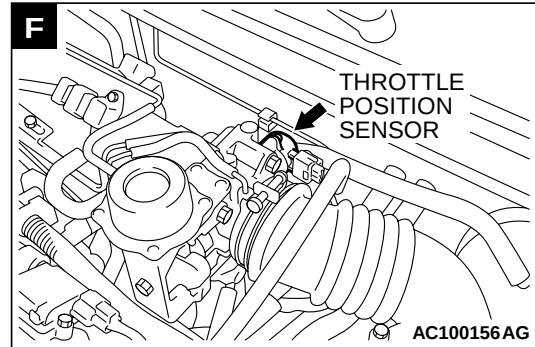
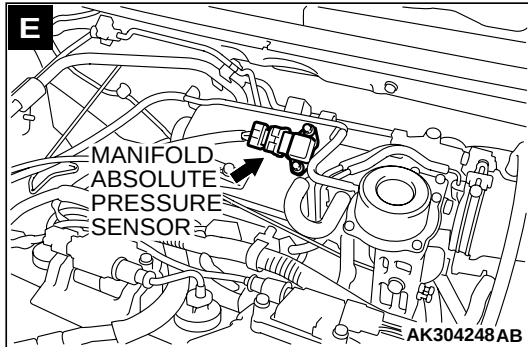
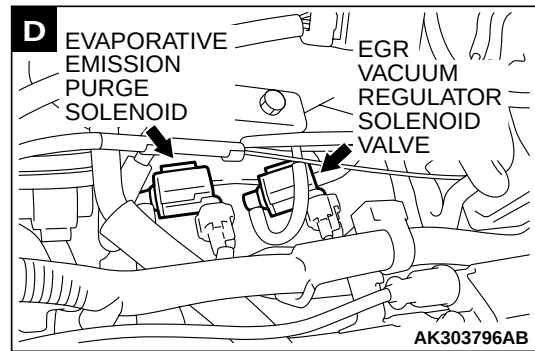
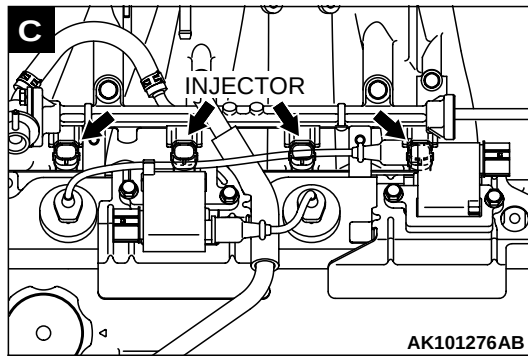
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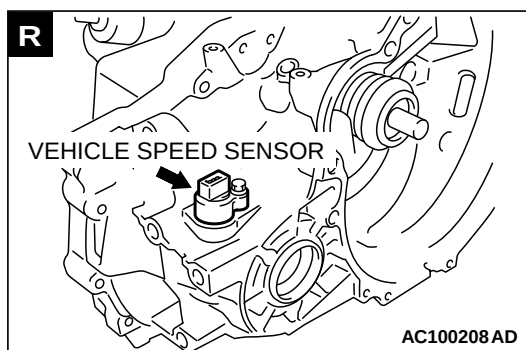
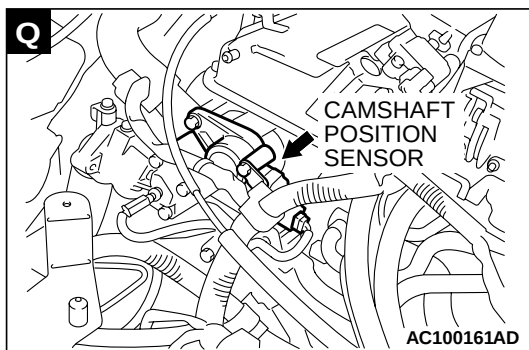
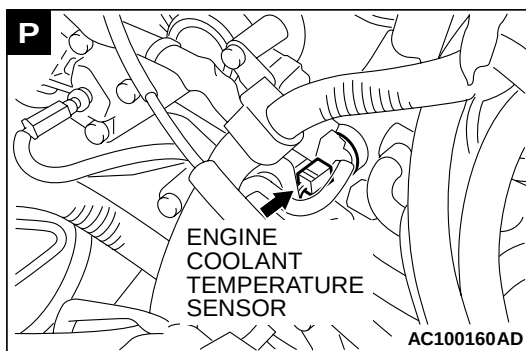
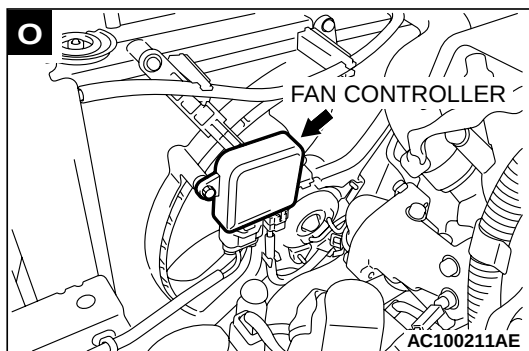
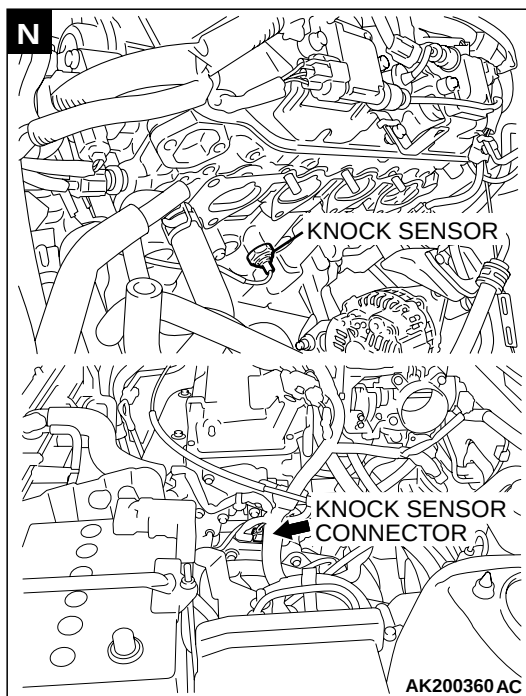
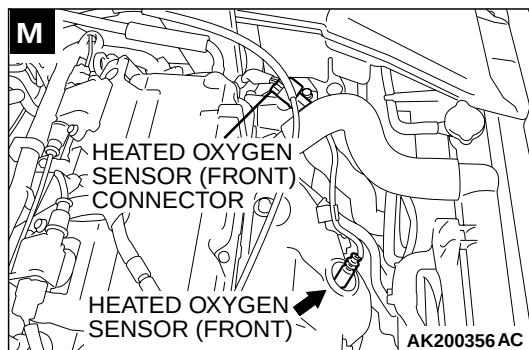
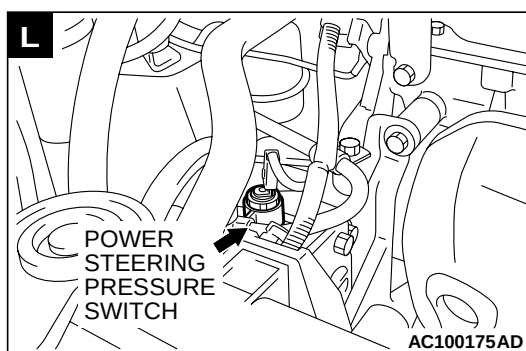
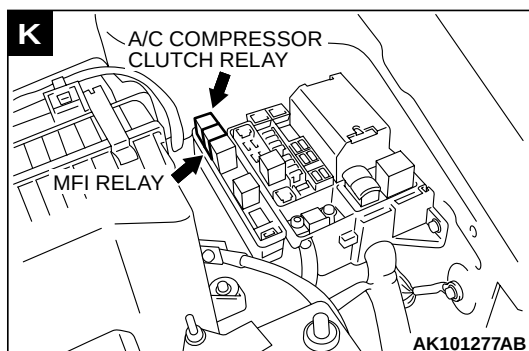
NAME	SYMBOL	NAME	SYMBOL
A/C compressor clutch relay	K	Heated oxygen sensor (front)	M
Camshaft position sensor	Q	Heated oxygen sensor (rear)	V
Crankshaft position sensor	A	Idle air control motor	G
Data link connector	T	Ignition coil	B
EGR vacuum regulator solenoid valve	D	Injector	C
Engine control module (ECM) <M/T>	U	Knock sensor	N
Engine coolant temperature sensor	P	Manifold differential pressure sensor	E
Engine speed detection connector	J	Multiport fuel injection (MFI) relay	K
Evaporative emission purge solenoid	D	Transmission range switch <A/T>	I
Evaporative emission ventilation solenoid	Y	Powertrain control module (PCM) <A/T>	U
Fan controller	O	Power steering pressure switch	L
Fuel level sensor (Fuel tank temperature sensor)	W	Throttle position sensor	F
Fuel tank differential pressure sensor	X	Vehicle speed sensor <M/T>	R
Fuel pump relay 1, 2	S	Volume airflow sensor (with built-in intake air temperature sensor and barometric pressure sensor)	H

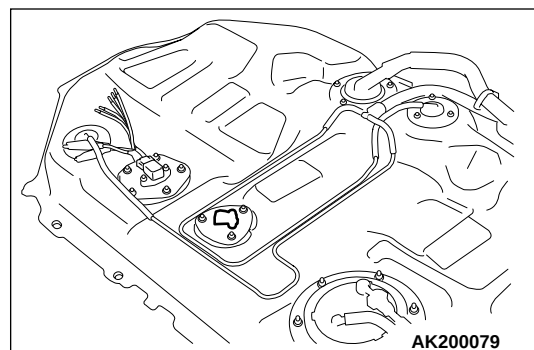
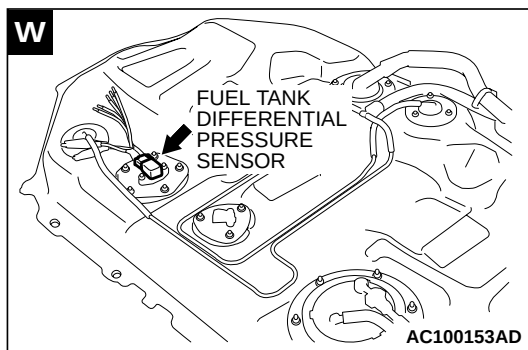
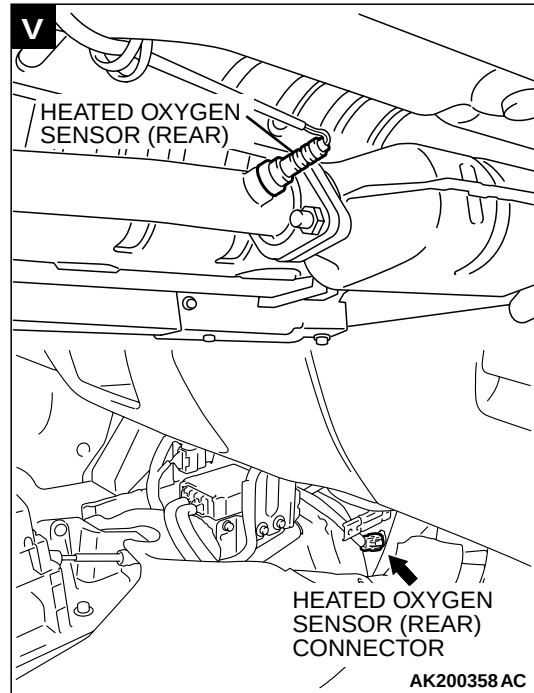
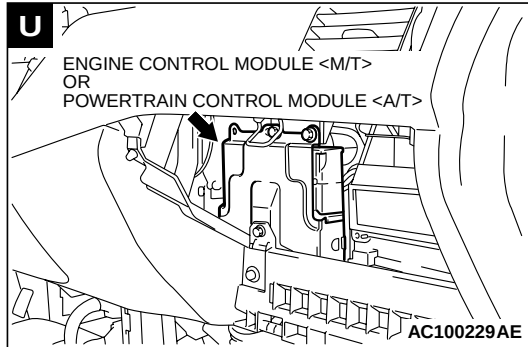
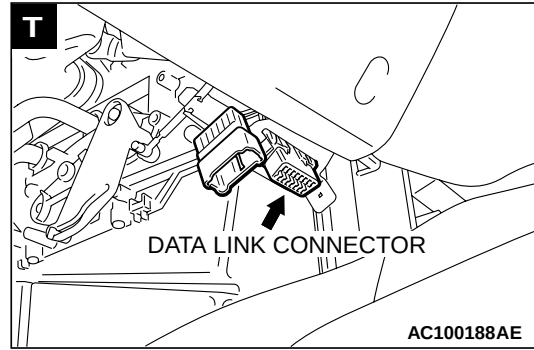
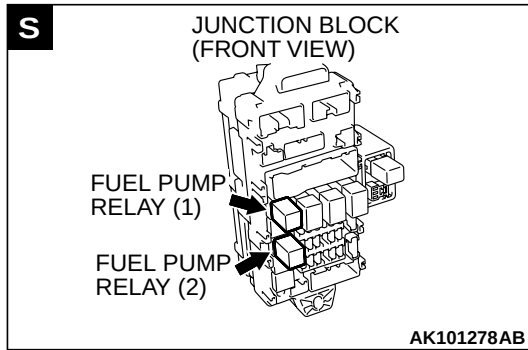


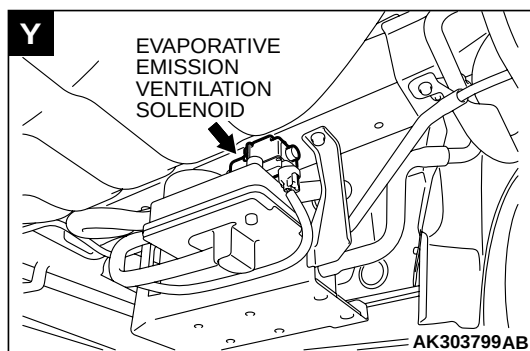
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THROTTLE BODY CLEANING

M1131001000536

Required Special Tools:

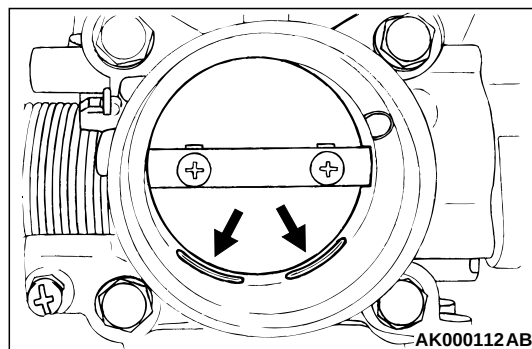
- MB991958: Scan Tool (MUT-III Sub Assembly)
 - MB991824: V.C.I.
 - MB991827: USB Cable
 - MB991911: Main Harness B

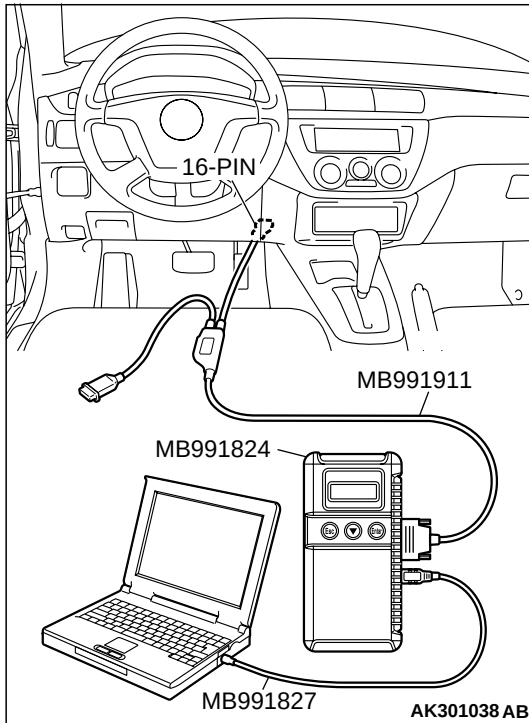
1. Start the engine and warm it up until the coolant is heated to 80°C (176°F) or higher. Then stop the engine.
2. Remove the air intake hose from the throttle body.

CAUTION

Do not allow cleaning solvent to enter the bypass passage.

3. Plug the bypass passage inlet (arrow) of the throttle body.
4. Spray cleaning solvent into the valve through the throttle body intake port and leave it for approximately five minutes.
5. Start the engine, rev it several times and then idle it for about one 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.





⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting the scan tool MB991958.

9. Use the scan tool to erase any diagnostic trouble code.

10. Adjust the basic idle speed. (Refer to [P.13A-903.](#))

⚠ WARNING

Battery posts, terminals and related accessories contain lead and lead compounds. WASH HANDS AFTER HANDLING.

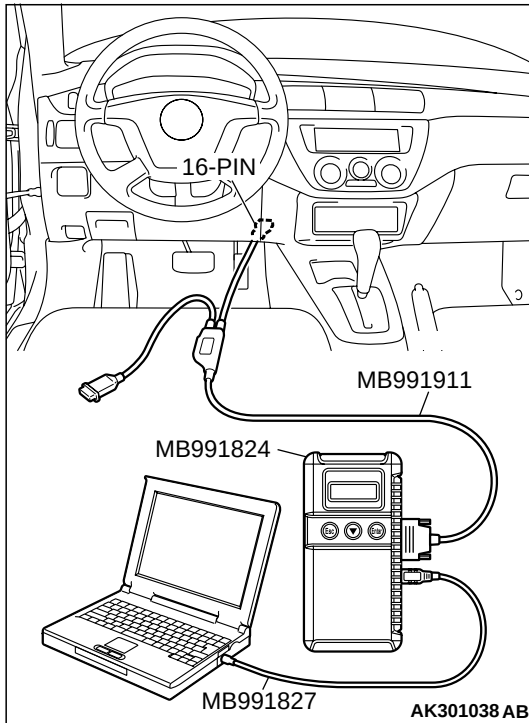
NOTE: If the engine hunts while idling after adjustment of the basic idle speed, disconnect the negative cable from the battery for 10 seconds or more, and then reconnect it and run the engine at idle for about 10 minutes after the engine is warmed up.

THROTTLE POSITION SENSOR ADJUSTMENT

M1131001100566

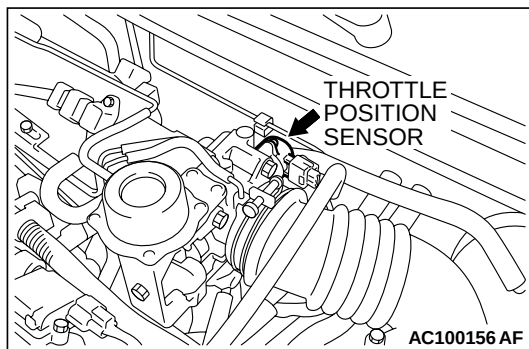
Required Special Tools:

- MB991958: Scan Tool (MUT-III Sub Assembly)
 - MB991824: V.C.I.
 - MB991827: USB Cable
 - MB991911: Main Harness B
- MB991709: Test Harness Set

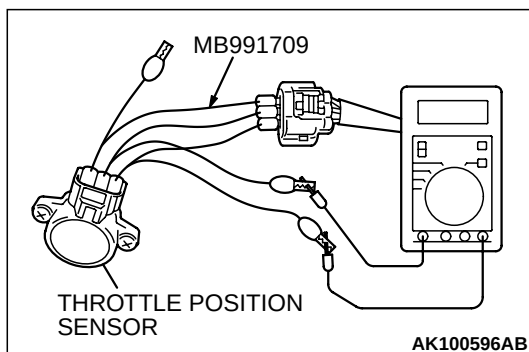
**CAUTION**

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting the scan tool MB991958.

1. Connect scan tool MB991958 to the data link connector.
When not using scan tool follow the steps below.



- (1) Disconnect the throttle position sensor connector, and connect the special tool MB991709 in between. (All terminals should be connected.)



- (2) Connect a digital voltmeter between throttle position sensor terminal No. 1 (sensor output) and terminal No. 2 (sensor ground).

2. Turn the ignition switch to the "ON" position (but do not start the engine).
3. Check the throttle position sensor output voltage.

Standard value: 335 – 935 mV

4. If not within the standard value range, adjust by loosening throttle position sensor mounting bolts and turning the throttle position sensor body. After adjusting, tighten the bolts securely.
5. Turn the ignition switch to the "LOCK" (OFF) position.
6. Disconnect scan tool MB991958. When the scan tool is not used, remove special tool MB991709, and connect the throttle position sensor connector.

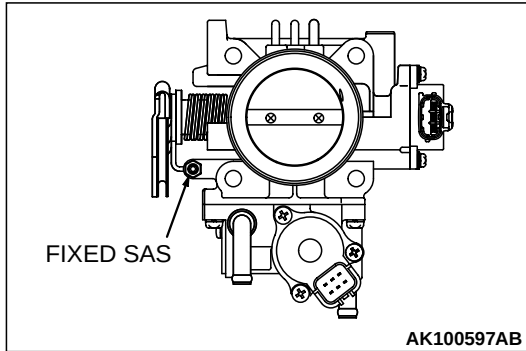
CLOSED THROTTLE POSITION ADJUSTING SCREW ADJUSTMENT

M1131001500133

CAUTION

The closed throttle position adjusting screw should not be moved unnecessarily; it has been precisely adjusted by the manufacturer. If the adjustment is disturbed for any reason, readjust as follows.

1. Loosen the tension of the accelerator cable sufficiently.
2. Back out the closed throttle position adjusting screw lock nut.
3. Turn the closed throttle position adjusting screw counterclockwise until it is sufficiently backed out, and fully close the throttle valve.
4. Turn the closed throttle position adjusting screw clockwise until the throttle lever is touched (i.e., the point at which the throttle valve begins to open).
From that point, turn the closed throttle position adjusting screw clockwise another 1-1/4 turn.
5. While holding the closed throttle position adjusting screw 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. (Refer to [P.13A-903.](#))
8. Adjust the throttle position sensor. (Refer to [P.13A-901.](#))



BASIC IDLE SPEED ADJUSTMENT

M1131001800628

Required Special Tools:

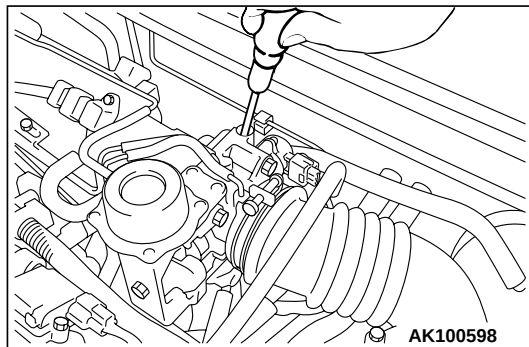
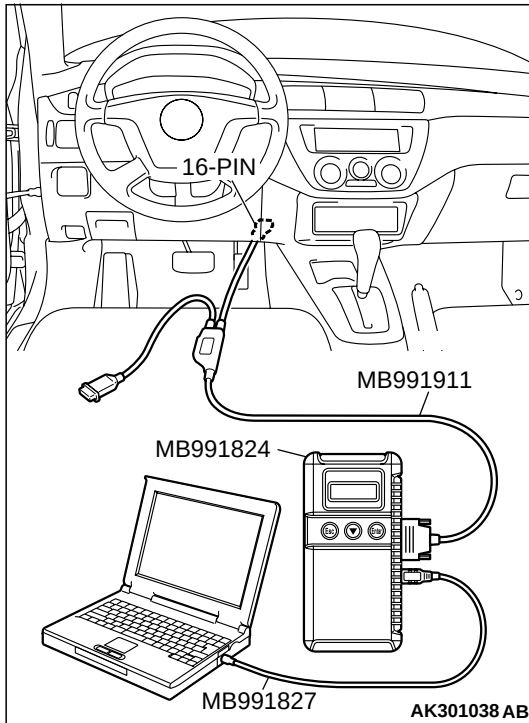
- MB991958: Scan Tool (MUT-III Sub Assembly)
 - MB991824: V.C.I.
 - MB991827: USB Cable
 - MB991911: Main Harness B
- MB991658: Test Harness Set

NOTE: The standard idle speed has been adjusted with the speed adjusting screw (SAS), by the manufacturer, and there should be no need for readjustment.

NOTE: 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 A/C, defogger, etc. are placed on the engine. If this occurs, adjust by the following procedure.

NOTE: The adjustment, if made, should be made after first confirming that the spark plugs, the injectors, the idle air control motor, compression, 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, electric cooling fan and accessories: OFF
 - Transaxle: Neutral (A/T for "P" range)

**CAUTION**

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

2. Connect scan tool MB991958 to the data link connector (16-pin).

3. Start the engine and run at idle.

4. Select the item number 30 of the scan tool Actuator test.

NOTE: Use the scan tool to hold 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: 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.

NOTE: 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-900](#).)

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 closed throttle position adjusting screw has been moved. If there is an indication that it has been moved, adjust the closed throttle position adjusting screw. (Refer to [P.13A-903](#).)

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 for 27 minutes.

8. Turn the ignition switch to the "LOCK" (OFF) position.

9. Disconnect scan tool MB991958.

10. Start the engine again and let it idle for about 10 minutes. Check that the idling condition is normal.

FUEL PRESSURE TEST

Required Special Tools:

- MB991958: Scan Tool (MUT-III Sub Assembly)
 - MB991824: V.C.I.
 - MB991827: USB Cable
 - MB991911: Main Harness B
- MB991658: Test Harness Set
- MB991637: Fuel Pressure Gauge Set
- MD998709: Adaptor Hose
- MD998742: Hose Adaptor

1. Release residual pressure from the fuel line to prevent fuel spray. (Refer to [P.13A-908.](#))

⚠ WARNING

To prevent a fire, cover the hose connection with shop towels to prevent splashing of fuel that could be caused by some residual pressure in the fuel pipe line.

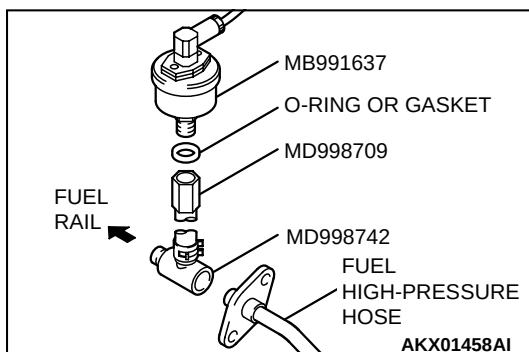
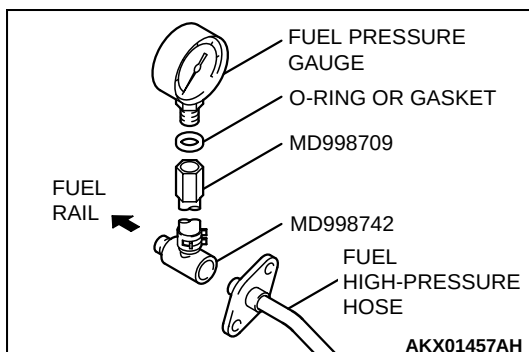
2. Disconnect the fuel high-pressure hose at the fuel rail side.
3. Assemble the fuel pressure measurement tools as follows.

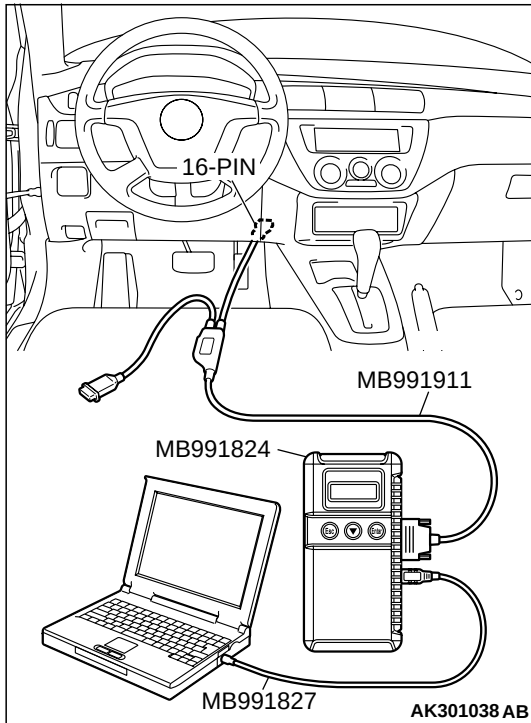
<When using the fuel pressure gauge>

1. Remove the union joint and bolt from special tool MD998709 (adaptor hose) and instead attach special tool MD998742 (hose adaptor) to the adaptor hose.
2. Place a suitable O-ring or gasket on assembled special tools MD998709 and MD998742 and install the fuel pressure gauge.
3. Install the assembled fuel pressure measurement tools between the fuel rail and fuel high-pressure hose.

<When using the special tool MB991637 (fuel pressure gauge set)>

1. Remove the union joint and bolt from special tool MD998709 (adaptor hose) and instead attach special tool MD998742 (hose adaptor) to the adaptor hose.
2. Install special tool MB991637 (fuel pressure gauge set) to assembled special tools MD998709 and MD998742 via a gasket.
3. Install the assembled fuel pressure measurement tools between the fuel rail and the fuel high-pressure hose.

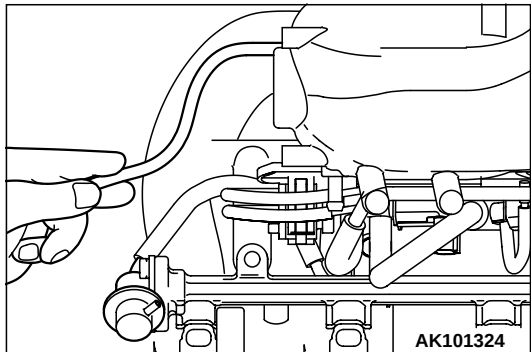


**CAUTION**

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

4. Connect scan tool MB991958 to the data link connector.
5. Use the Actuator test 07 to drive the fuel pump. Check that there is no fuel leaking from any section when the fuel pump is operating.
6. Stop the fuel pump.
7. Start the engine and run at idle.
8. Measure fuel pressure while the engine is running at idle.

Standard value: Approximately 270 kPa (80 in.Hg) at curb idle



9. Disconnect the vacuum hose from the fuel pressure regulator and measure fuel pressure with the hose end closed with your finger.
10. Check to see that fuel pressure at idle does not drop even after the engine has been revved several times.
11. Revving the engine repeatedly, hold the fuel return hose lightly with your 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.

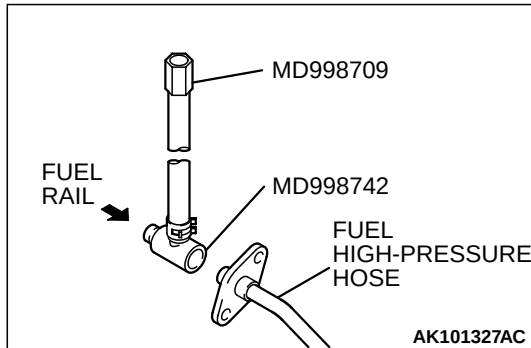
12.If any of fuel pressure measured in steps 10 to 13 is out of specification, troubleshoot and repair according to the table below.

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
	Defective fuel pressure regulator	Replace fuel pressure regulator

13.Stop the engine and observe fuel pressure gauge reading. It is normal if the reading does not drop within two minutes. If it does, observe the rate of drop and troubleshoot and repair according to the table below. Start, then stop the engine.

- (1) Squeeze the fuel return line closed to confirm leak-down occurs from defective fuel pressure regulator.
- (2) Squeeze the fuel supply line closed 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



14. Release residual pressure from the fuel pipe line. (Refer to [P.13A-908.](#))

⚠ WARNING

Cover the hose connection with shop towels to prevent splash of fuel that could be caused by some residual pressure in the fuel pipe line.

15. Remove the fuel pressure gauge or special tool MB991637, and special tools MD998709 and MD998742 from the fuel rail.
16. Replace the O-ring at the end of the fuel high-pressure hose with a new one.
17. Fit the fuel high-pressure hose into the fuel rail and tighten the bolts to specified torque.

Tightening torque: 4.9 ± 1.0 (44 ± 8 in-lb)

18. Check for fuel leaks.
- (1) Use scan tool MB991958 to operate the fuel pump.
 - (2) Check the fuel line for leaks, and repair as needed.
19. Disconnect scan tool MB991958.

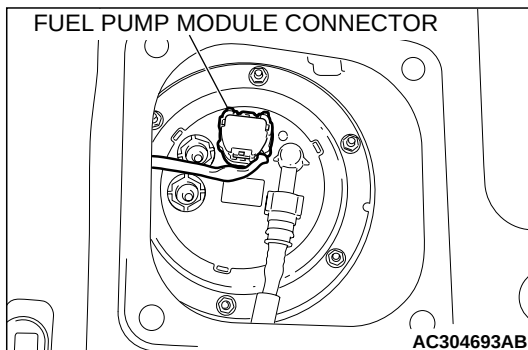
FUEL PUMP CONNECTOR DISCONNECTION (HOW TO REDUCE PRESSURIZED FUEL LINES)

M1131000900655

⚠ WARNING

When removing the fuel pipe, etc., release fuel pressure to prevent fuel spray.

1. Remove the rear seat assembly (Refer to GROUP 52A [P.52A-23.](#))
2. Remove the protector.
3. Disconnect the fuel pump module connector.
4. After starting the engine and letting it run until it stops naturally, turn the ignition switch to the "LOCK" (OFF) position.
5. Connect the fuel pump module connector.
6. Install the protector and rear seat assembly (Refer to GROUP 52A [P.52A-23.](#))



FUEL PUMP OPERATION CHECK

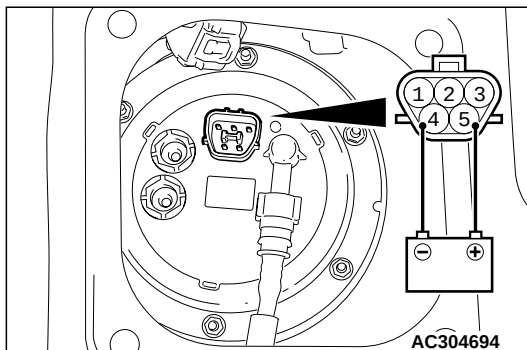
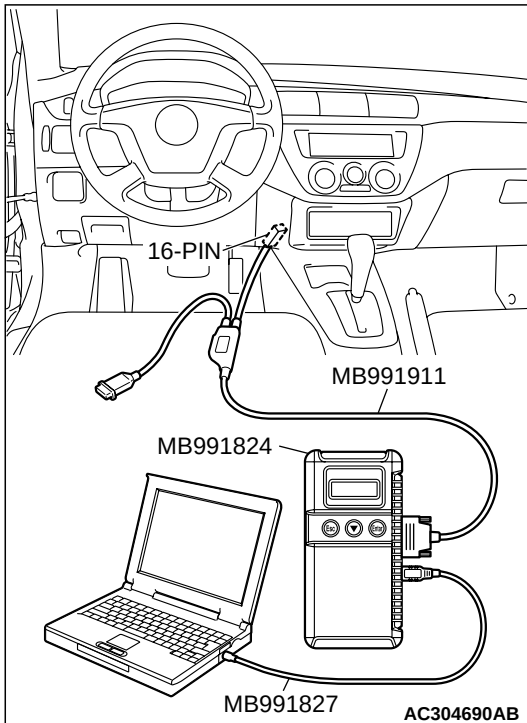
Required Special Tools:

- MB991958: Scan Tool (MUT-III Sub Assembly)
 - MB991824: V.C.I.
 - MB991827: MUT-III USB Cable
 - MB991911: MUT-III Main Harness B

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

1. Check the operating of the fuel pump by using scan tool MB991958 to force-drive the fuel pump.
2. If the fuel pump will not operate, check by using the following procedure. If normal, check the fuel pump drive circuit.
 - (1) Turn the ignition switch to the "LOCK" (OFF) position.
 - (2) Remove the rear seat assembly (Refer to GROUP 52A [P.52A-23.](#))
 - (3) Remove the protector.
 - (4) Disconnect the fuel pump module connector.



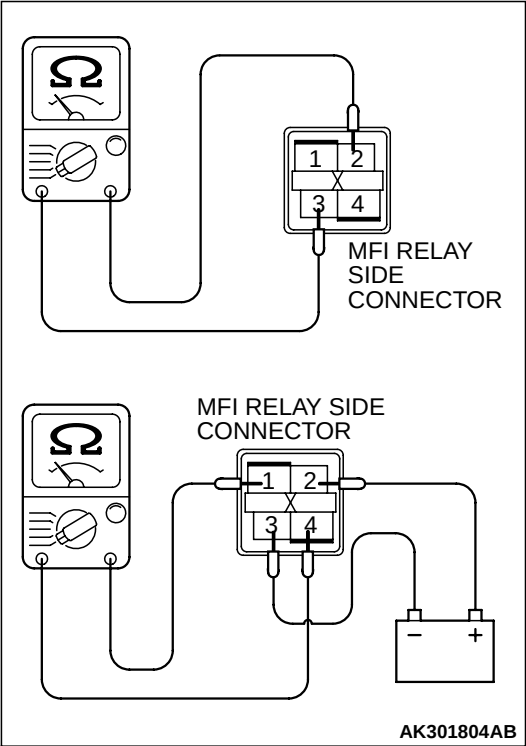
- (5) When the fuel pump drive connector is attached directly to the battery, check if the sound of the fuel pump operation can be heard.

NOTE: As the fuel pump is an in-tank type, the fuel pump sound is hard to hear. Remove the fuel tank filler tube cap and check from the tank inlet.

- (6) Check for fuel pressure by pinching the fuel hose with fingertips.
- (7) Connect the fuel pump module connector.
- (8) Install the protector and rear seat assembly (Refer to GROUP 52A [P.52A-23.](#))

MULTIPOINT FUEL INJECTION (MFI) RELAY
CONTINUITY CHECK

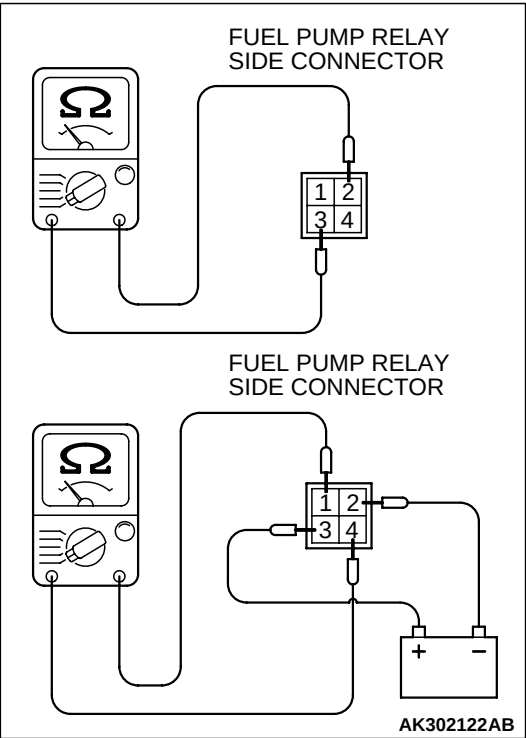
M1131050000367



BATTERY VOLTAGE	TERMINAL NO. TO BE CONNECTED TO BATTERY	TERMINAL NO. TO BE CONDUCTED
Not supplied	–	2 – 3
Supplied	2 – 3	1 – 4

FUEL PUMP RELAY CONTINUITY CHECK

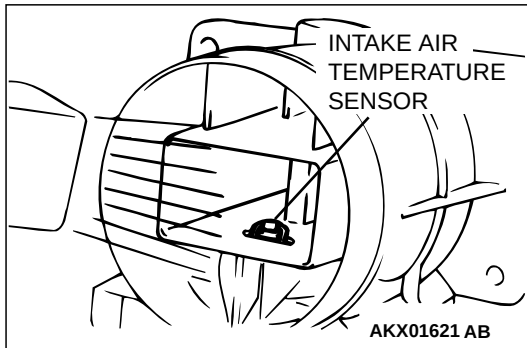
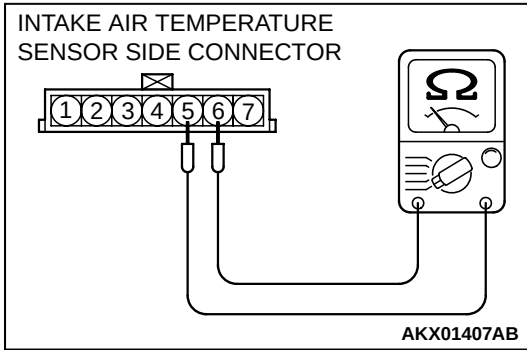
M1131033000375



BATTERY VOLTAGE	TERMINAL NO. TO BE CONNECTED TO BATTERY	TERMINAL NO. TO BE CONDUCTED
Not supplied	–	2 – 3
Supplied	2 – 3	1 – 4

M1131002800580

INTAKE AIR TEMPERATURE SENSOR CHECK



1. Disconnect the volume airflow sensor connectors.
2. Measure resistance between terminal No. 5 and No. 6.

Standard value:

13 – 17 kΩ [at –20°C (–4°F)]
5.3 – 6.7 kΩ [at 0°C (32°F)]
2.3 – 3.0 kΩ [at 20°C (68°F)]
1.0 – 1.5 kΩ [at 40°C (104°F)]
0.56 – 0.76 kΩ [at 60°C (140°F)]
0.30 – 0.42 kΩ [at 80°C (176°F)]

3. If not within specifications, replace the volume airflow sensor.
4. Measure resistance while heating the sensor using a hair dryer.

Normal condition:

TEMPERATURE	RESISTANCE (kΩ)
Higher	Smaller

5. If resistance does not decrease as heat increases, replace the volume airflow sensor assembly.

ENGINE COOLANT TEMPERATURE SENSOR CHECK

M1131003100540

⚠ CAUTION

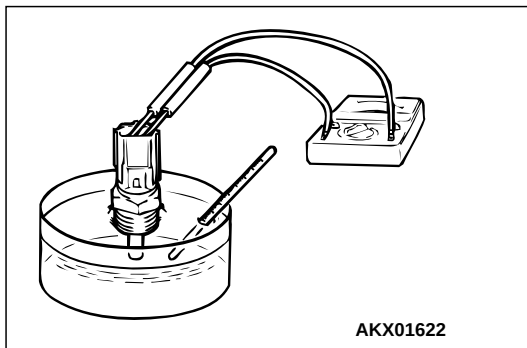
Be careful not to touch the connector (resin section) with the tool when removing and installing.

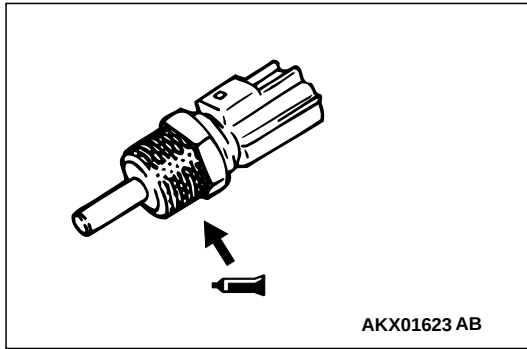
1. Drain engine coolant, then remove the engine coolant temperature sensor.
2. With the temperature sensing portion of engine coolant temperature sensor immersed in hot water, check the resistance.

Standard value:

14 – 17 kΩ [at –20°C (–4°F)]
5.1 – 6.5 kΩ [at 0°C (32°F)]
2.1 – 2.7 kΩ [at 20°C (68°F)]
0.9 – 1.3 kΩ [at 40°C (104°F)]
0.48 – 0.68 kΩ [at 60°C (140°F)]
0.26 – 0.36 kΩ [at 80°C (176°F)]

3. If resistance deviates from the standard value greatly, replace the sensor.





4. Apply 3M™ AAD part number 8731 or equivalent to threaded portion.
5. Install the engine coolant temperature sensor and tighten it to the specified torque.

Tightening torque: 29 ± 10 N·m (22 ± 7 ft·lb)

THROTTLE POSITION SENSOR CHECK

M1131003200558

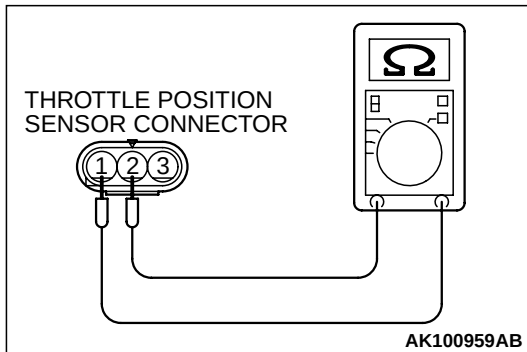
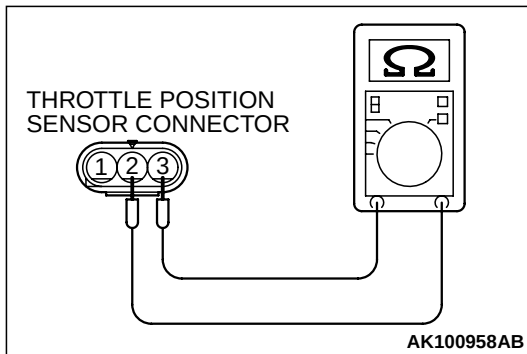
Required Special Tool:

- MB991709: Test Harness Set

Checking the Terminal Resistance

1. Disconnect the throttle position sensor connector.
2. Measure resistance between the throttle position sensor side connector terminal No. 2 and terminal No. 3.

Standard value: 2.0 – 4.0 k Ω



3. Measure resistance between the throttle position sensor side connector terminal No. 1 and terminal No. 2.

Normal condition:

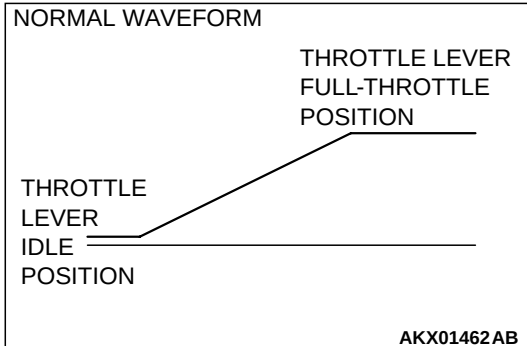
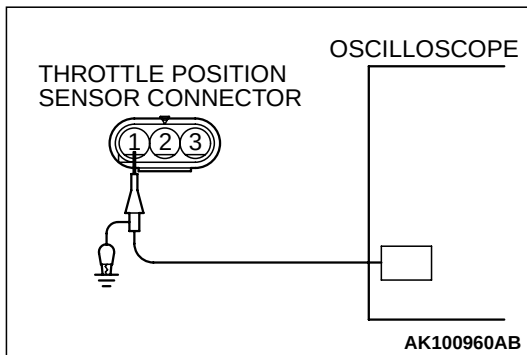
Throttle valve slowly open until fully open from the idle position	Changes smoothly in proportion to the opening angle of the throttle valve
--	---

4. If 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. (Refer to [P.13A-901.](#))

Check using oscilloscope

1. Disconnect the throttle position sensor connector and connect the test harness special tool (MB991709) in between. (All terminals should be connected.)



2. Connect the oscilloscope probe to the throttle position sensor side connector terminal No. 1.
3. Turn the ignition switch "ON" position.

4. Slowly move the throttle lever from the idle position to the full-throttle position and check then if the waveform is free from any noise.
5. If any noise is recognized, replace the throttle position sensor.

NOTE: After replacement, the throttle position sensor should be adjusted. (Refer to P.13A-901.)

HEATED OXYGEN SENSOR CHECK

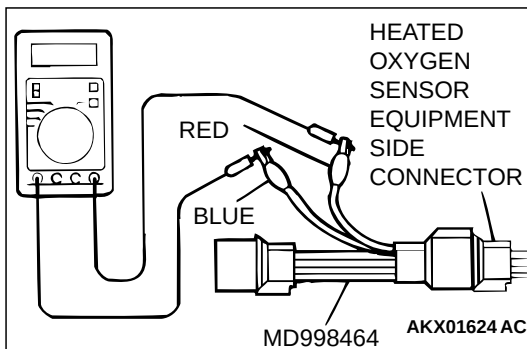
M1131005000721

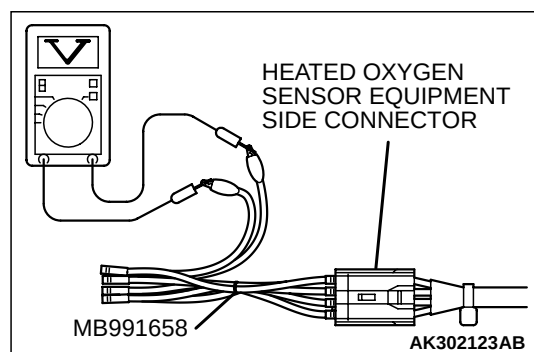
Required Special Tools:

- MB991958: Scan Tool (MUT-III Sub Assembly)
 - MB991824: V.C.I.
 - MB991827: USB Cable
 - MB991911: Main Harness B
- MB991658: Test Harness Set
- MD998464: Test Harness

<Heated oxygen sensor (front)>

1. Using the scan tool MB991958, observe HO₂S 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 special tool MD998464 to the connector on the heated oxygen sensor side.
 - (2) Make sure that there is continuity [4.5 – 8.0 ohms at 20°C (68°F)] between terminal No. 1 (red clip of special tool) and terminal No. 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) Perform a revving for 5 minutes or more with the engine speed of 4,500 r/min.
- (6) Connect a digital voltage meter between terminal No. 1 and terminal No. 2.

2. While repeatedly revving the engine, measure the heated oxygen sensor output voltage.

Standard value:

ENGINE	HEATED OXYGEN SENSOR OUTPUT VOLTAGE	REMARKS
When revving engine	0.6 – 1.0 volt	If you make the air/fuel ratio rich by revving the engine repeatedly, a normal heated oxygen sensor will output a voltage of 0.6 – 1.0 volt.

⚠ CAUTION

- Be very careful when connecting the jumper wire; incorrect connection can damage the heated oxygen sensor.
- Be careful the heater is broken when voltage of beyond 12 volts is applied to the heated oxygen sensor heater.

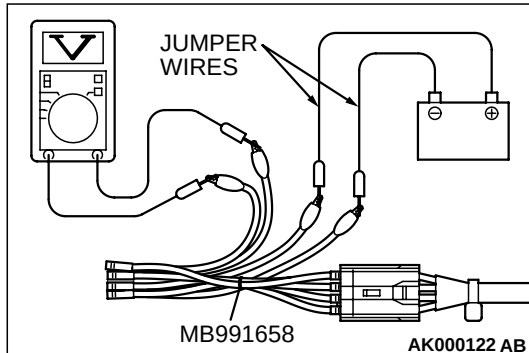
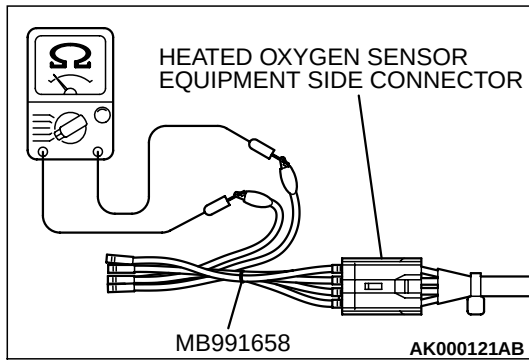
NOTE: If the sufficiently high temperature [of approximate 400°C (752°F) or more] is not reached although the heated oxygen sensor is normal, the output voltage would be possibly low although the rich air/fuel ratio. Therefore, if the output voltage is low, use jumper wires to connect the terminal No. 3 and the terminal No. 4 of the heated oxygen sensor with a (+) terminal and (-) terminal of 12 volts power supply respectively, then check again.

3. If the output voltage is not within the standard value, replace the heated oxygen sensor.

NOTE: For removal and installation of the heated oxygen sensor, refer to GROUP 15, Exhaust Manifold P.15-11.

<Heated oxygen sensor (rear)>

1. Using scan tool MB991958, observe HO₂S 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 special tool MB991658 to the connector on the heated oxygen sensor side.



- (2) Make sure that there is continuity [11 – 18 ohms at 20°C (68°F)] between terminal No. 3 and terminal No. 4 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) Perform a revving for 5 minutes or more with the engine speed of 4,500 r/min.

- (6) Connect a digital voltage meter between terminal No. 4 and terminal No. 2.

2. While repeatedly revving the engine, measure the heated oxygen sensor output voltage.

Standard value:

ENGINE	HEATED OXYGEN SENSOR OUTPUT VOLTAGE	REMARKS
When revving engine	0.6 – 1.0 volt	If you make the air/fuel ratio rich by revving the engine repeatedly, a normal heated oxygen sensor will output a voltage of 0.6 – 1.0 volt.

⚠ CAUTION

- Be very careful when connecting the jumper wire; incorrect connection can damage the heated oxygen sensor.
- Be careful the heater is broken when voltage of beyond 12 volts is applied to the heated oxygen sensor heater.

NOTE: If the sufficiently high temperature [of approximate 400°C (752°F) or more] is not reached although the heated oxygen sensor is normal, the output voltage would be possibly low although the rich air/fuel ratio. Therefore, if the output voltage is low, use jumper wires to connect the terminal No. 3 and the terminal No. 4 of the heated oxygen sensor with a (+) terminal and (-) terminal of 12 volts power supply respectively, then check again.

3. If the output voltage is not within the standard value, replace the heated oxygen sensor.

NOTE: For removal and installation of the heated oxygen sensor, refer to GROUP 15, Exhaust Pipe and Main Muffler P.15-13.

INJECTOR CHECK

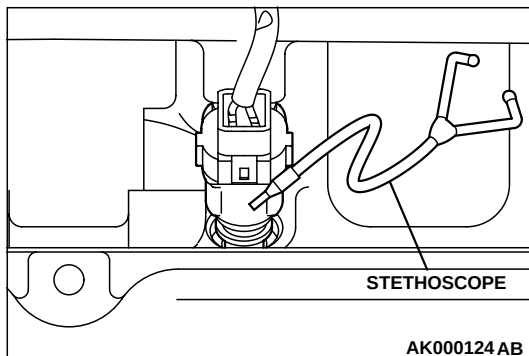
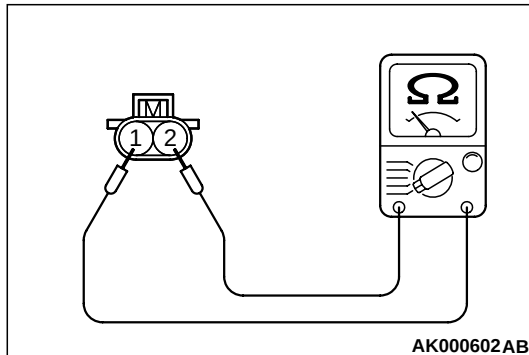
M1131005200543

Measurement of Resistance between Terminals

1. Disconnect the injector connector.
2. Measure resistance between terminals.

Standard value: 13 – 16 ohms [at 20°C (68°F)]

3. If not within specification, replace the injector.
4. 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 may 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 (ECM) <M/T> or powertrain control module (PCM) <A/T> is suspected.

IDLE AIR CONTROL MOTOR (STEPPER MOTOR) CHECK

M1131005400570

Required Special Tool:

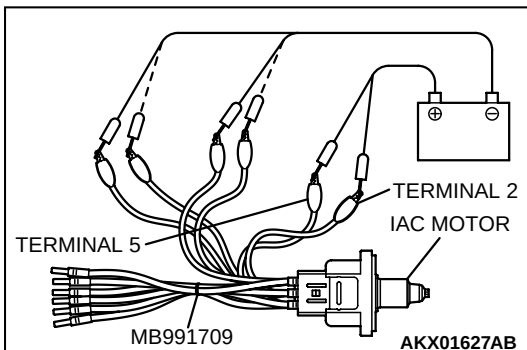
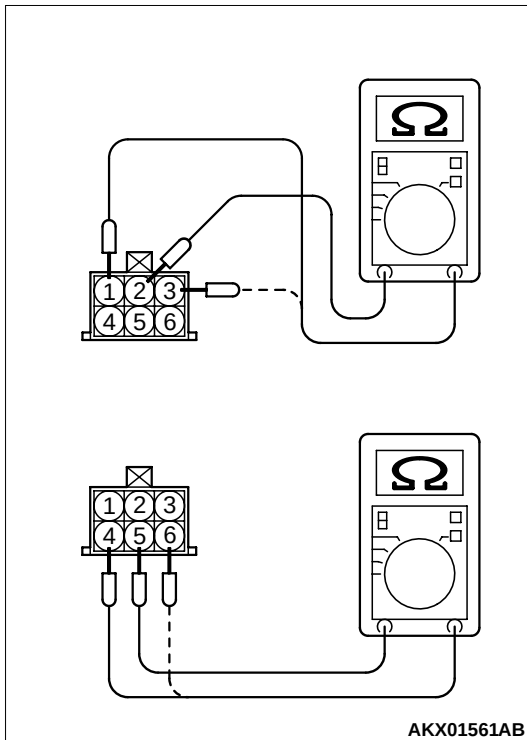
- MB991709: Test Harness Set

Checking the Operation Sound

1. Check that the engine coolant temperature is 20°C (68°F) or below.

NOTE: If necessary, you can disconnect the engine coolant temperature sensor connector and connect the harness-side of the connector to another engine coolant temperature sensor that is at 20°C (68°F) or below.

2. Check that the operation sound of the stepper motor can be heard after the ignition is switched ON (but do not start the engine).
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 engine control module (ECM) <M/T> or powertrain control module (PCM) <A/T>.



Checking the Coil Resistance

1. Disconnect the idle air control motor connector.
2. Measure resistance between terminal No. 2 and either terminal No. 1 or terminal No. 3 of the connector at the idle air control motor side.

Standard value: 28 – 33 ohms [at 20°C (68°F)]

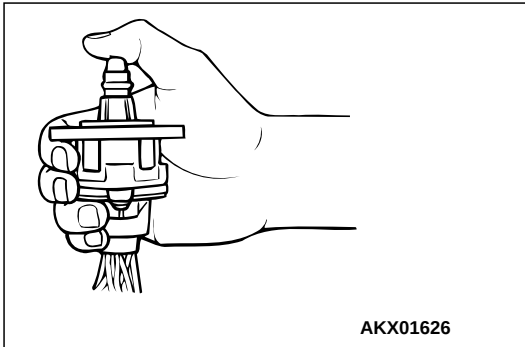
3. If resistance is not within the standard value, replace the IAC motor.
4. Measure the resistance between terminal No. 5 and either terminal No. 6 or terminal No. 4 of the connector at the idle air control motor side.

Standard value: 28 – 33 ohms [at 20°C (68°F)]

5. If resistance is not within the standard value, replace the IAC motor.

<Operation Check>

1. Remove the throttle body.
2. Remove the idle air control motor.
3. Connect special tool MB991709 to the idle air control motor connector.
4. Connect the positive (+) terminal of a power supply (approximately 6 volts) to terminal No. 2 and the terminal No. 5.
5. Connect the negative (–) terminal of the power supply to each clip as described in the following steps. Then check whether or not the stepper motor vibrates slightly as it operates.
 - (1) Connect the negative terminal of the power supply to terminal No. 1 and terminal No. 4.
 - (2) Connect the negative terminal of the power supply to terminal No. 3 and terminal No. 4.
 - (3) Connect the negative terminal of the power supply to terminal No. 3 and terminal No. 6.
 - (4) Connect the negative terminal of the power supply to terminal No. 1 and terminal No. 6.
 - (5) Connect the negative terminal of the power supply to terminal No. 1 and terminal No. 4.
 - (6) Repeat the tests in sequence from (5) to (1) to test opposite movement of the IAC.



6. If vibration is detected during the test, the stepper motor can be considered to be normal.

EVAPORATIVE EMISSION PURGE SOLENOID CHECK

M1131005600262

Refer to GROUP 17, Emission Control System – Evaporative Emission System – Evaporative Emission Purge Solenoid Check [P.17-218](#).

EGR VACUUM REGULATOR SOLENOID VALVE CHECK

M1131005700247

Refer to GROUP 17, Emission Control System – Exhaust Gas Recirculation (EGR) System – EGR Vacuum Regulator Solenoid Valve Check [P.17-225](#).

EVAPORATIVE EMISSION VENTILATION SOLENOID CHECK

M1131012800246

Refer to GROUP 17, Emission Control System – Evaporative Emission Canister and Fuel Tank Pressure Relief Valve – Fuel Tank Pressure Relief Valve Inspection [P.17-230](#).

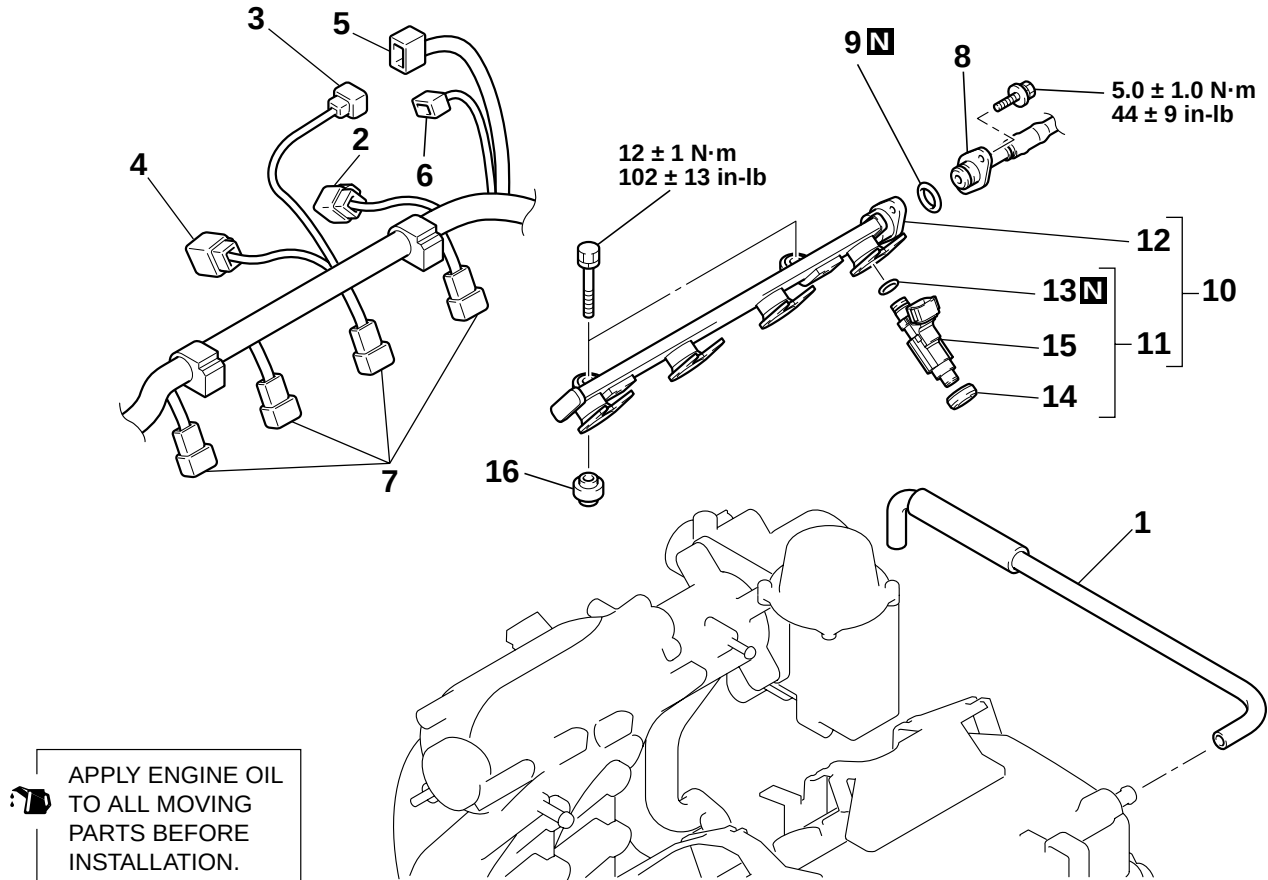
INJECTOR

REMOVAL AND INSTALLATION

M1131007100779

Pre-removal Operation

- Fuel Discharge Prevention (Refer to P.13A-908.)



APPLY ENGINE OIL
TO ALL MOVING
PARTS BEFORE
INSTALLATION.

AC307980AB

REMOVAL STEPS

- PCV HOSE CONNECTION
- EGR SOLENOID VALVE CONNECTOR
- MANIFOLD DIFFERENTIAL PRESSURE SENSOR CONNECTOR
- PURGE CONTROL SOLENOID VALVE CONNECTOR
- THROTTLE POSITION SENSOR CONNECTOR
- IDLE AIR CONTROL MOTOR CONNECTOR
- INJECTOR CONNECTOR

<<A>>

REMOVAL STEPS (Continued)

- FUEL HIGH-PRESSURE HOSE CONNECTION
- O-RING
- FUEL RAIL AND INJECTOR ASSEMBLY
- INJECTOR ASSEMBLY
- FUEL RAIL
- O-RING
- INSULATORS
- INJECTORS
- GROMMETS

>>A<<

REMOVAL SERVICE POINT**<<A>> FUEL RAIL AND INJECTOR ASSEMBLY REMOVAL**

Do not drop the injector.

Remove the fuel rail with the injectors attached to it.

INSTALLATION SERVICE POINT**>>A<< INJECTORS/FUEL HIGH-PRESSURE HOSE INSTALLATION**

Do not let the engine oil get into the fuel rail will be damaged.

1. Apply a drop of new engine oil to the O-ring.
2. Turn the injector. To the right and left to install to the fuel rail. Repeat for fuel pressure regulator and fuel high-pressure hose. Be careful not to damage the O-ring. After installing, check that the item turns smoothly.
3. If it does not turn smoothly, the O-ring may be trapped, remove the item, re-install it into the fuel rail and check again.
4. Tighten the fuel pressure regulator and fuel high-pressure hose to the specified torque.

Tightening torque:

5.0 ± 1.0 N·m (44 ± 9 in-lb) <Fuel high-pressure hose>

THROTTLE BODY ASSEMBLY

REMOVAL AND INSTALLATION

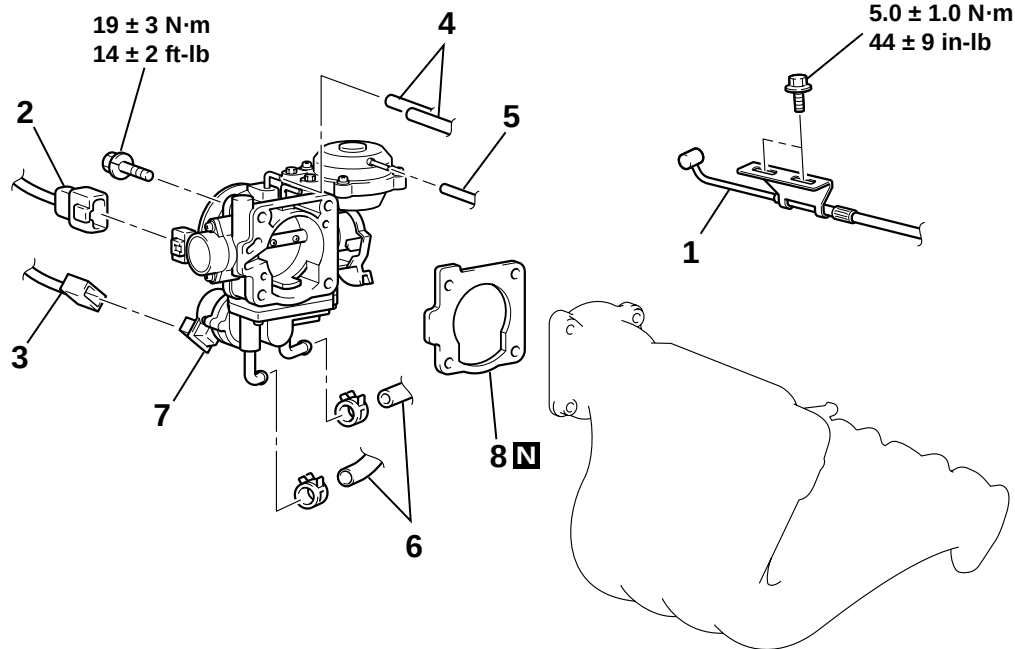
M1131007700674

Pre-removal Operation

- Engine Coolant Draining [Refer to GROUP 00, Maintenance Service – Engine Coolant (Change) [P.00-56.](#)]
- Air Cleaner Removal (Refer to GROUP 15, Air Cleaner [P.15-4.](#))

Post-installation Operation

- Air Cleaner Installation (Refer to GROUP 15, Air Cleaner [P.15-4.](#))
- Engine Coolant Refilling [Refer to GROUP 00, Maintenance Service – Engine Coolant (Change) [P.00-56.](#)]
- Accelerator Cable Adjustment (Refer to GROUP 17, On-vehicle Service – Accelerator Cable Check and Adjustment [P.17-6.](#))



AC100464 AB

REMOVAL STEPS

1. ACCELERATOR CABLE CONNECTION
2. THROTTLE POSITION SENSOR CONNECTOR
3. IDLE AIR CONTROL MOTOR CONNECTOR
4. VACUUM HOSE CONNECTION

REMOVAL STEPS (Continued)

5. VACUUM HOSE CONNECTION <VEHICLES WITH AUTO-CRUISE CONTROL SYSTEM>
6. WATER HOSE CONNECTION
7. THROTTLE BODY
8. THROTTLE BODY GASKET

>>A<<

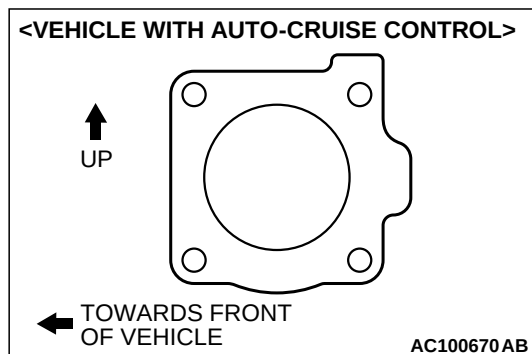
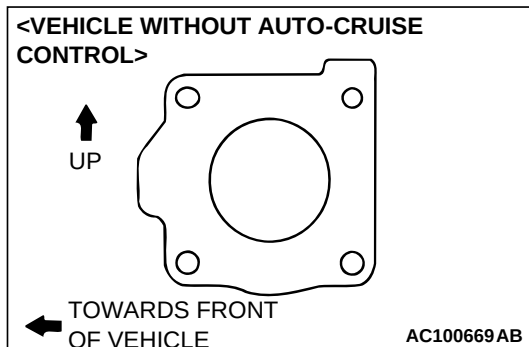
INSTALLATION SERVICE POINT

>>A<<THROTTLE BODY GASKET INSTALLATION

 CAUTION

Poor idling etc. may result if the throttle body gasket is installed incorrectly.

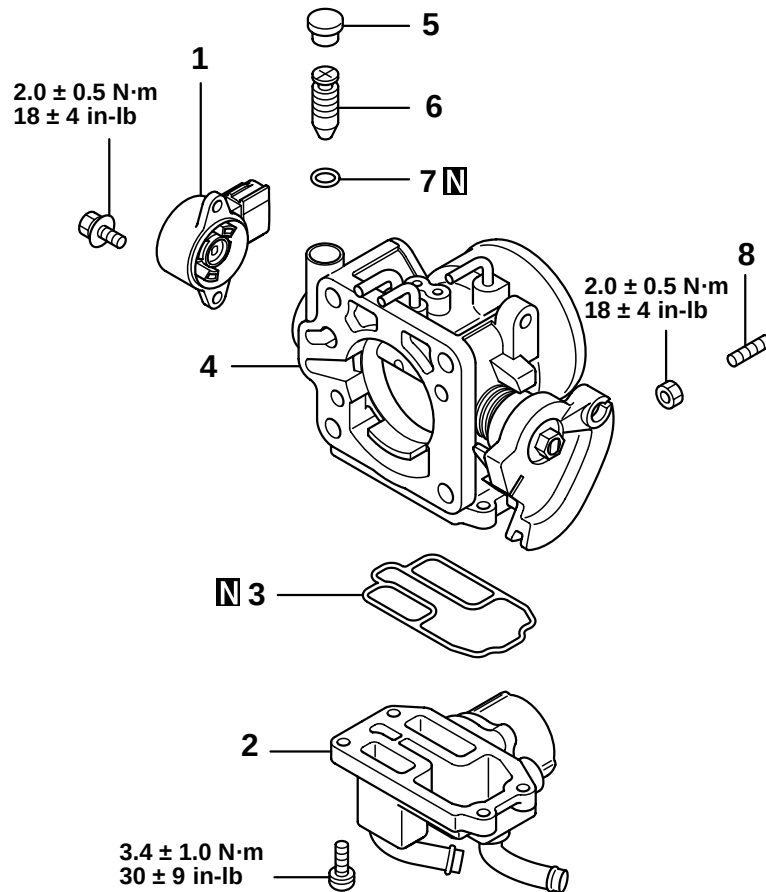
Install the throttle body gasket as shown in the illustration.



DISASSEMBLY AND ASSEMBLY

M1131009700346

<VEHICLES WITHOUT AUTO-CRUISE CONTROL SYSTEM>



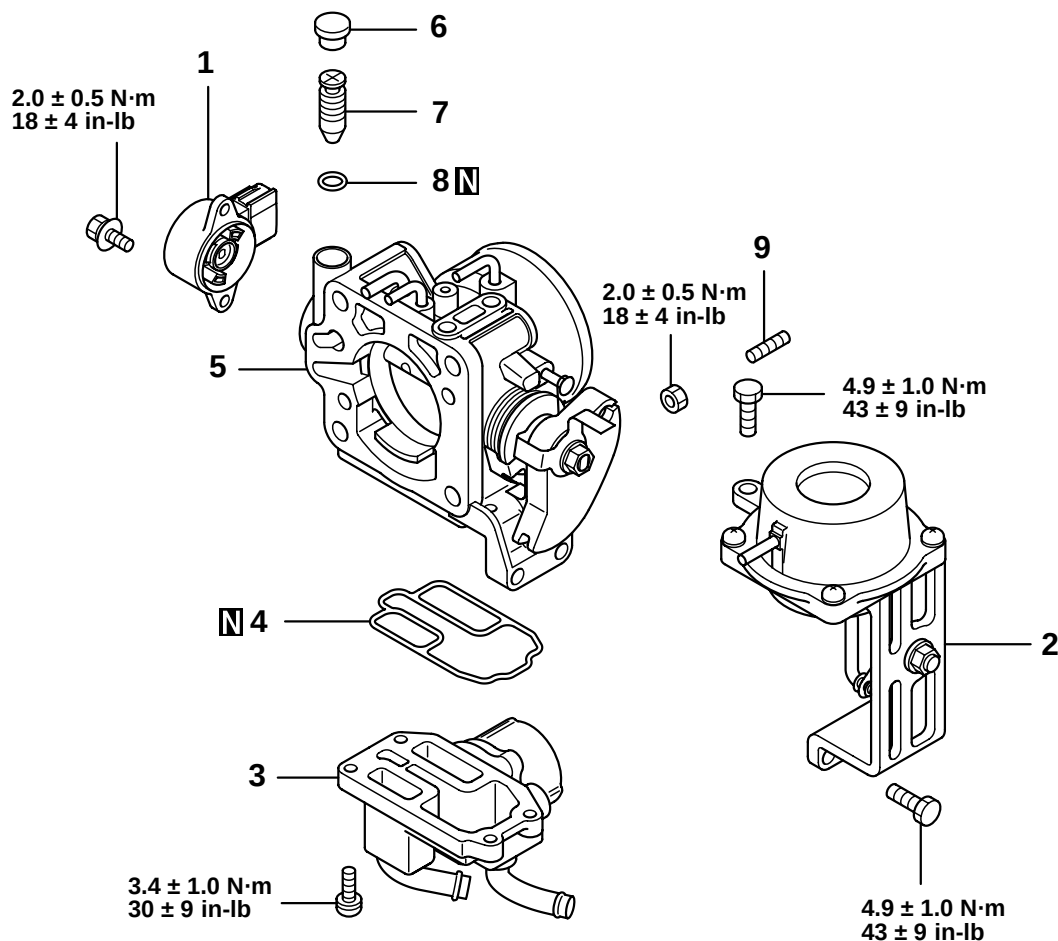
AK200501AB

- <<A>> >>A<<
- REMOVAL STEPS**
1. THROTTLE POSITION SENSOR
 2. FAST IDLE AIR VALVE
 3. GASKET
- <>
4. THROTTLE BODY
 5. CAP
 6. SPEED ADJUSTING SCREW

- REMOVAL STEPS (Continued)**
7. O-RING
 8. THROTTLE SPEED ADJUSTING SCREW

NOTE: IF THE ADJUSTING SCREW WAS HAPPEN TO HAVE BEEN REMOVED, PERFORM SPEED ADJUSTING SCREW ADJUSTMENT.

<VEHICLES WITH AUTO-CRUISE CONTROL SYSTEM>



AK200502AB

REMOVAL STEPS

- <<A>> >>A<<
1. THROTTLE POSITION SENSOR
 2. LEVER ASSEMBLY
 3. FAST IDLE AIR VALVE
- <>
4. GASKET
 5. THROTTLE BODY
 6. CAP
 7. SPEED ADJUSTING SCREW

REMOVAL STEPS (Continued)

8. O-RING
9. THROTTLE SPEED ADJUSTING SCREW

NOTE: IF THE ADJUSTING SCREW WAS HAPPEN TO HAVE BEEN REMOVED, PERFORM SPEED ADJUSTING SCREW ADJUSTMENT.

DISASSEMBLY SERVICE POINTS

<<A>> THROTTLE POSITION SENSOR DISASSEMBLY

1. Do not disassemble the sensor and motor.
2. Do not clean the sensor and motor by dipping them into cleaning solvent. Clean them with shop towel.

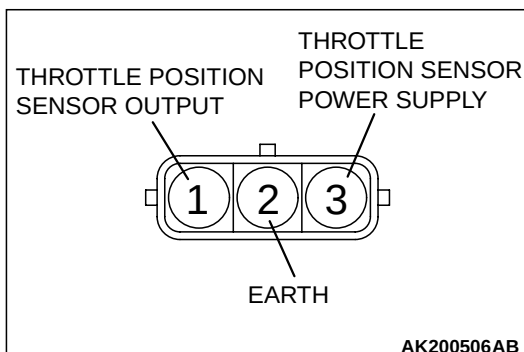
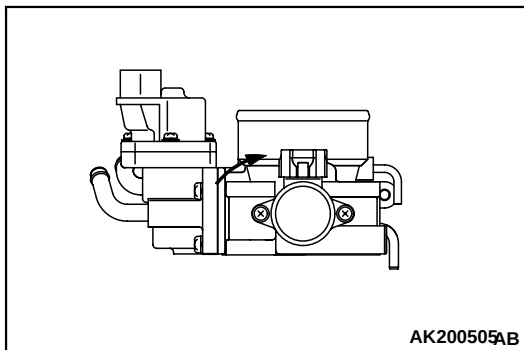
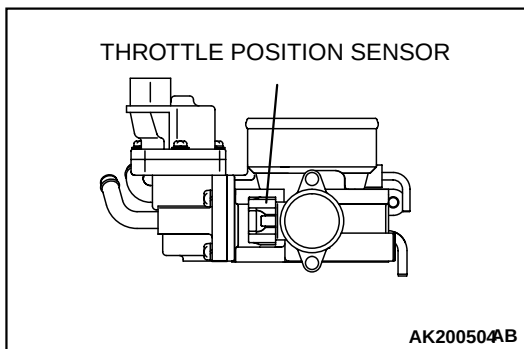
<> THROTTLE BODY DISASSEMBLY

1. Do not disassemble the throttle body.
2. Check if the vacuum port or passage is clogged. Use compressed air to clean the vacuum passage.

ASSEMBLY SERVICE POINTS

>>A<< THROTTLE POSITION SENSOR (TPS) INSTALLATION

1. Install the throttle position sensor to the throttle body as shown in the illustration.
2. Turn the throttle position sensor 90 degrees clockwise to set it, and tighten the screws.
3. Connect an ohmmeter between terminals 2 (ground) and 1 (output), or between terminals 1 (output) and 3 (power). Then, make sure that the resistance changes smoothly when the throttle valve is slowly moved to the fully open position.



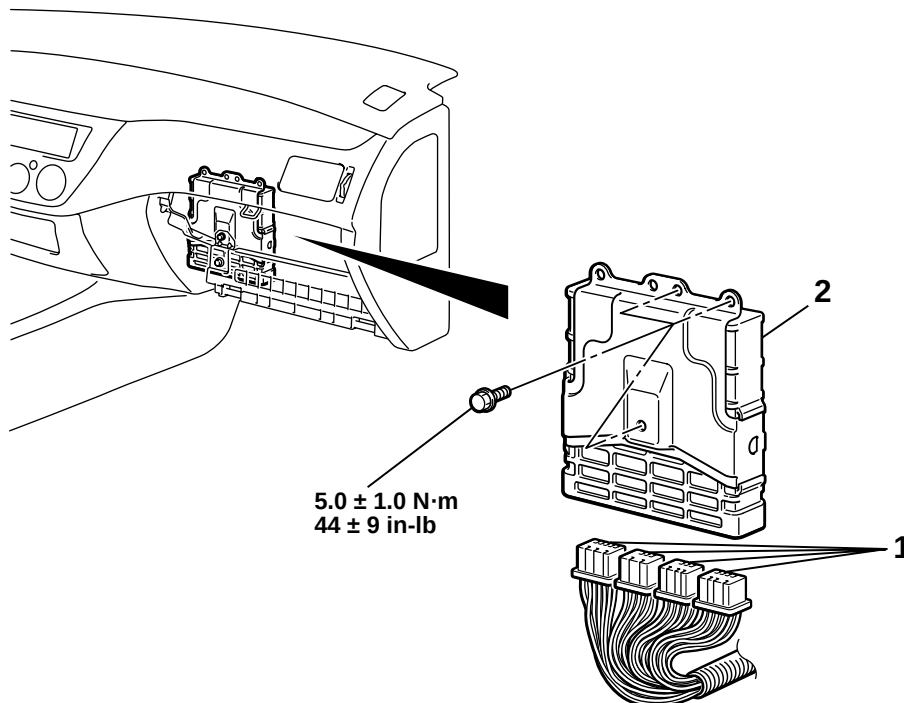
ENGINE CONTROL MODULE (ECM) AND POWERTRAIN CONTROL MODULE (PCM)

REMOVAL AND INSTALLATION

M1131022500020

Pre-removal and Post-installation Operation

- Glove Box Assembly Removal and Installation (Refer to GROUP 52A, INTERIOR P.52A-3.)
- Harness Cover Removal and Installation (Refer to GROUP 52A, INTERIOR P.52A-3.)



AC208496AB

REMOVAL STEPS

1. ECM <M/T> OR PCM <A/T>
CONNECTORS
2. ECM <M/T> OR PCM <A/T>

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATION S

M1131011600539

ITEM	SPECIFICATION
Accelerator cable mounting bolts	5.0 ± 1.0 N·m (44 ± 9 in-lb)
Fuel rail mounting bolt	12 ± 1 N·m (102 ± 13 in-lb)
Fuel high-pressure hose bolt	5.0 ± 1.0 N·m (44 ± 9 in-lb)
Throttle body mounting bolt	19 ± 3 N·m (14 ± 2 ft-lb)
ECM (M/T) or PCM (A/T) bracket bolt	5.0 ± 1.0 N·m (44 ± 9 in-lb)

GENERAL SPECIFICATIONS

M1131000200593

ITEMS		SPECIFICATIONS
Throttle body	Throttle bore mm (in.)	55 (2.2)
	Throttle position sensor	Variable resistor type
	Idle air control motor	Stepper motor (stepper motor type by-pass air control system)
Engine control module (ECM) <M/T>	Identification model No.	E6T34983
Powertrain control module (PCM) <A/T>	Identification model No.	E6T31096 <Tire size: 185/65 R14> E6T31095 <Tire size: 195/60 R15>
Sensors	Volume airflow 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 <M/T>	Electromagnetic resistance element type
	Transmission range switch <A/T>	Contact switch type
	Camshaft position sensor	Electromagnetic resistance element type
	Crankshaft position sensor	Hall element type
	Knock sensor	Piezoelectric type
	Power steering pressure switch	Contact switch type
	Manifold absolute pressure sensor	Semiconductor 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	CDH240
	EGR vacuum regulator solenoid valve	Duty cycle type solenoid valve
	Evaporative emission purge solenoid	Duty cycle type solenoid valve
Fuel pressure regulator	Regulator pressure kPa (in.Hg)	335 (99)

SERVICE SPECIFICATIONS

M1131000300727

ITEMS		STANDARD VALUE
Throttle position sensor adjusting voltage mV		335 – 935
Basic idle speed r/min		700 ± 50
Fuel pressure kPa (in.Hg)	Vacuum hose disconnected	330 – 350 (97 – 103) at curb idle
	Vacuum hose connected	Approximately 270 (80) at curb idle
Intake air temperature sensor resistance kΩ	–20°C (–4°F)	13 – 17
	0°C (32°F)	5.3 – 6.7
	20°C (86°F)	2.3 – 3.0
	40°C (104°F)	1.0 – 1.5
	60°C (140°F)	0.56 – 0.76
	80°C (176°F)	0.30 – 0.42
Engine coolant temperature sensor resistance kΩ	–20°C (–4°F)	14 – 17
	0°C (32°F)	5.1 – 6.5
	20°C (86°F)	2.1 – 2.7
	40°C (104°F)	0.9 – 1.3
	60°C (140°F)	0.48 – 0.68
	80°C (176°F)	0.26 – 0.36
Throttle position sensor resistance kΩ		2.0 – 4.0
Heated oxygen sensor output voltage V		0.6 – 1.0
Heated oxygen sensor heater resistance Ω	<Front>	4.5 – 8.0
	<Rear>	11 – 18
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 AND ADHESIVE

M1131000500453

ITEM	SPECIFIED SEALANT
Engine coolant temperature sensor threaded portion	3M™ AAD part number 8731 or equivalent