

GROUP 15

INTAKE AND EXHAUST

CONTENTS

GENERAL DESCRIPTION	15-2	REMOVAL AND INSTALLATION <3.8L ENGINE (EXCEPT MIVEC)>	15-16
INTAKE AND EXHAUST DIAGNOSIS	15-2	REMOVAL AND INSTALLATION <3.8L ENGINE-MIVEC>	15-19
INTRODUCTION	15-2	INSPECTION	15-21
TROUBLESHOOTING STRATEGY	15-2	EXHAUST MANIFOLD	15-22
SYMPTOM CHART	15-2	REMOVAL AND INSTALLATION <2.4L ENGINE>	15-22
SYMPTOM PROCEDURES	15-2	REMOVAL AND INSTALLATION <3.8L ENGINE (EXCEPT MIVEC)>	15-24
INSPECTION PROCEDURE 1: Exhaust Leakage	15-2	REMOVAL AND INSTALLATION <3.8L ENGINE-MIVEC>	15-27
INSPECTION PROCEDURE 2: Abnormal Noise	15-3	INSPECTION	15-31
SPECIAL TOOLS	15-3	EXHAUST PIPE AND MAIN MUFFLER	15-32
AIR CLEANER	15-4	REMOVAL AND INSTALLATION	15-32
REMOVAL AND INSTALLATION	15-4	SPECIFICATION(S)	15-33
INSPECTION	15-7	FASTENER TIGHTENING SPECIFICATIONS	15-33
INTAKE MANIFOLD PLENUM	15-8	SERVICE SPECIFICATION	15-35
REMOVAL AND INSTALLATION <3.8L ENGINE (EXCEPT MIVEC)>	15-8	SEALANTS	15-35
INTAKE MANIFOLD	15-13		
REMOVAL AND INSTALLATION <2.4L ENGINE>	15-13		

GENERAL DESCRIPTION

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The exhaust pipe is divided into four parts.

INTAKE AND EXHAUST DIAGNOSIS

INTRODUCTION

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Intake leaks usually create driveability issues that are not obviously related to the intake system.

Exhaust leaks or abnormal noise is caused by cracks, gaskets and fittings, or by exhaust pipe or muffler damage due to impacts during travel. The exhaust leaks from these sections and causes the exhaust noise to increase. There may be cases when the system contacts the body and vibration noise is generated.

TROUBLESHOOTING STRATEGY

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Use these steps to plan your diagnostic strategy. If you follow them carefully, you will be sure that you have exhausted most of the possible ways to find an intake or exhaust system fault.

1. Gather information from the customer.

2. Verify that the condition described by the customer exists.

3. Find the malfunction by following the Symptom Chart.

4. Verify malfunction is eliminated.

SYMPTOM CHART

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SYMPTOM	INSPECTION PROCEDURE	REFERENCE PAGE
Exhaust Leakage	1	P.15-2
Abnormal Noise	2	P.15-3

SYMPTOM PROCEDURES

INSPECTION PROCEDURE 1: Exhaust Leakage

DIAGNOSIS

STEP 1. Start the engine. Have an assistant stay in the driver's seat. Raise the vehicle on a hoist. Have the assistant rev the engine while searching for exhaust leaks.

Q: Is the exhaust leaking?

YES : Go to Step 2.

NO : The procedure is complete.

STEP 2. Check the gasket for cracks, damage.

Q: Is the gasket damaged?

YES : Replace the gasket, then go to Step 1.

NO : Go to Step 3.

STEP 3. Check for loosening in each coupling section.

Q: Is there any loosening in any section?

YES : Tighten, then go to Step 1.

NO : There is no action to be taken.

INSPECTION PROCEDURE 2: Abnormal Noise

DIAGNOSIS

STEP 1. Start the engine. Have an assistant stay in the drivers seat. Raise the vehicle on a hoist. Have the assistant rev the engine while searching for exhaust leaks.

Q: Is any abnormal noise generated?
YES : Go to Step 2.
NO : The procedure is complete.

STEP 2. Check for missing parts in the muffler. Tap the muffler lightly to check for loose baffles, etc.

Q: Are there any missing parts in the muffler?
YES : Replace, then go to Step 1.
NO : Go to Step 3.

STEP 3. Check the hanger for cracks.

Q: Is the hanger cracked?
YES : Replace, then go to Step 1.
NO : Go to Step 4.

STEP 4. Check for interference of the pipes and muffler with the body.

Q: Are the pipes and muffler interfering with the body?
YES : Repair, then go to Step 1.
NO : Go to Step 5.

STEP 5. Check the heat protectors.

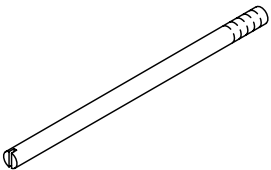
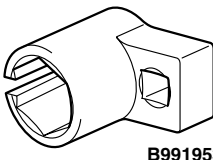
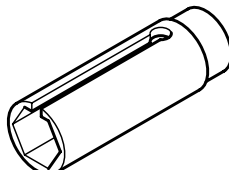
Q: Are any heat protectors loose or damaged?
YES : Tighten or replace, then go to Step 1.
NO : Go to Step 6.

STEP 6. Check the pipes and muffler for damage.

Q: Are the pipes and muffler damaged?
YES : Replace, then go to Step 1.
NO : There is no action to be taken.

SPECIAL TOOLS

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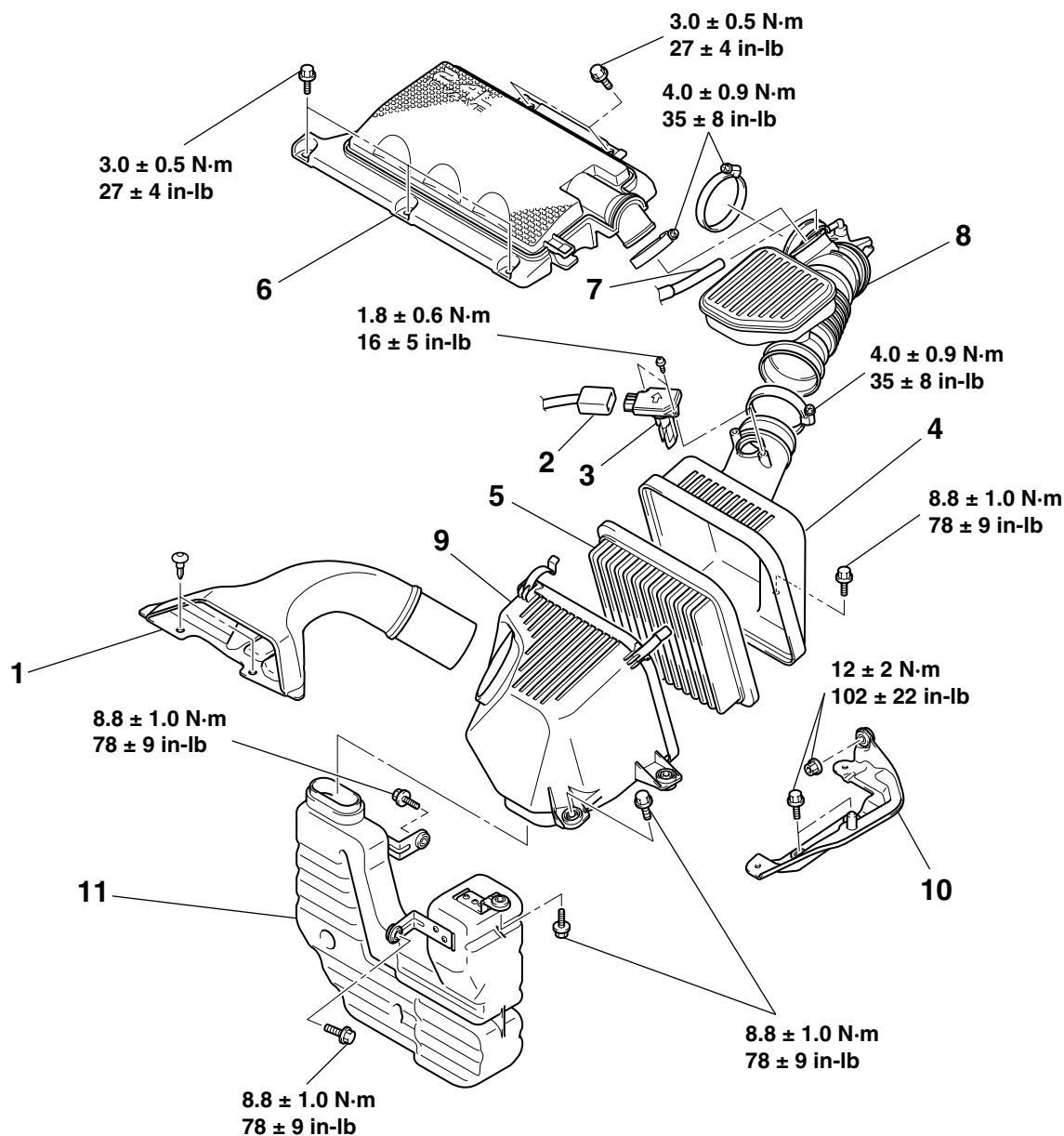
TOOL	TOOL NUMBER AND NAME	SUPERSESSON	APPLICATION
	MD998412 Guide	MD998412	Installation of intake manifold plenum
	MB991953 Oxygen sensor wrench	-	Removal and installation of heated oxygen sensor
	MD998770 Oxygen sensor wrench	MD998770-01 or General service tool	Removal and installation of heated oxygen sensor

AIR CLEANER

REMOVAL AND INSTALLATION

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<2.4L ENGINE>



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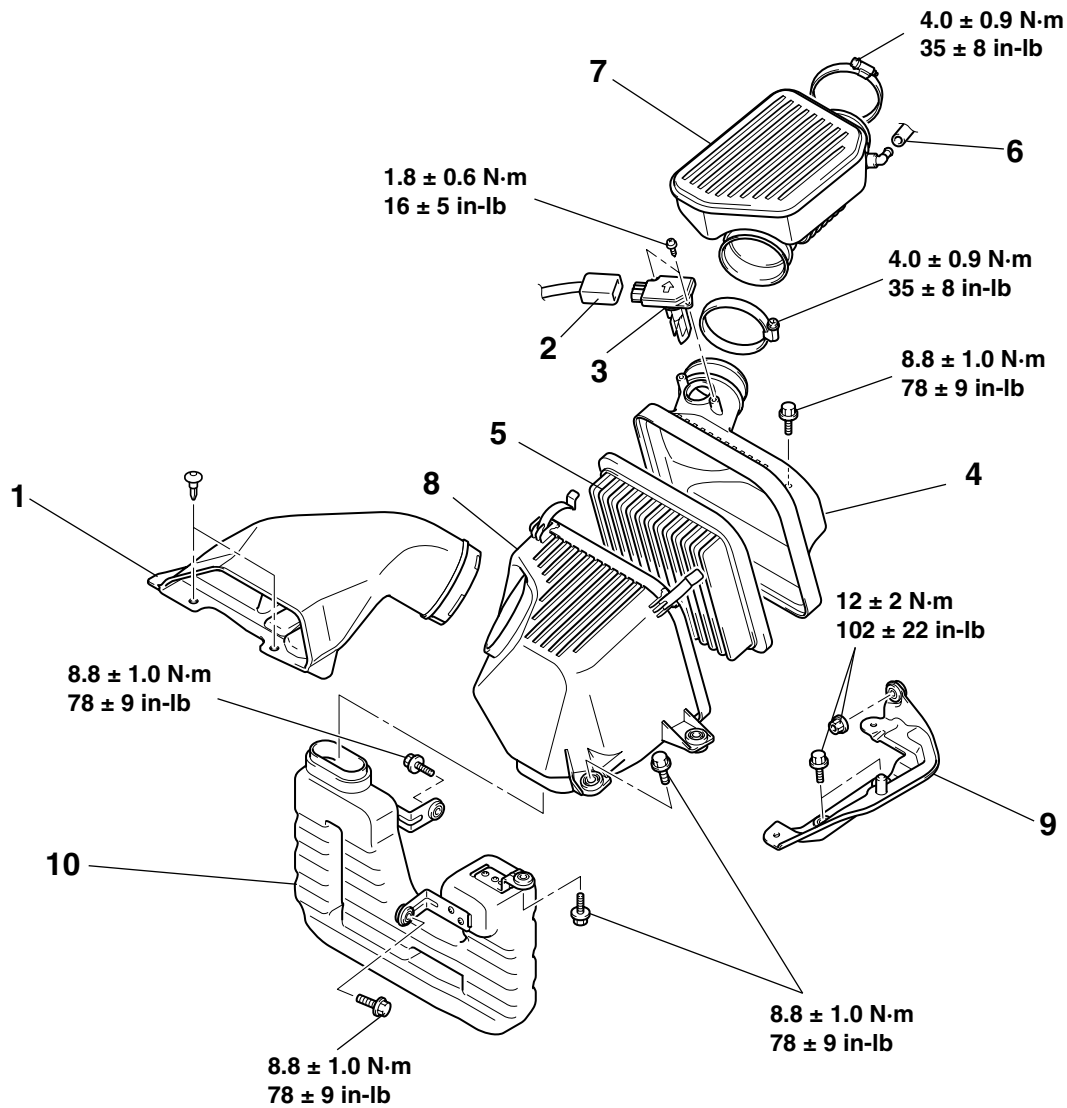
REMOVAL STEPS

1. AIR DUCT
2. MASS AIRFLOW SENSOR CONNECTOR
3. MASS AIRFLOW SENSOR
4. AIR CLEANER COVER
5. AIR CLEANER ELEMENT
6. AIR CLEANER RESONATOR
7. BREATHER HOSE CONNECTION
8. AIR INTAKE HOSE

REMOVAL STEPS (Continued)

- POWERTRAIN CONTROL MODULE (PCM) (REFER TO GROUP 13A, POWERTRAIN CONTROL MODULE (PCM) [P.13A-1180](#)).
- 9. AIR CLEANER BODY
- 10. AIR CLEANER BRACKET
- UNDER COVER (LH)
- 11. AIR CLEANER RESONATOR

<3.8L ENGINE (EXCEPT MIVEC)>



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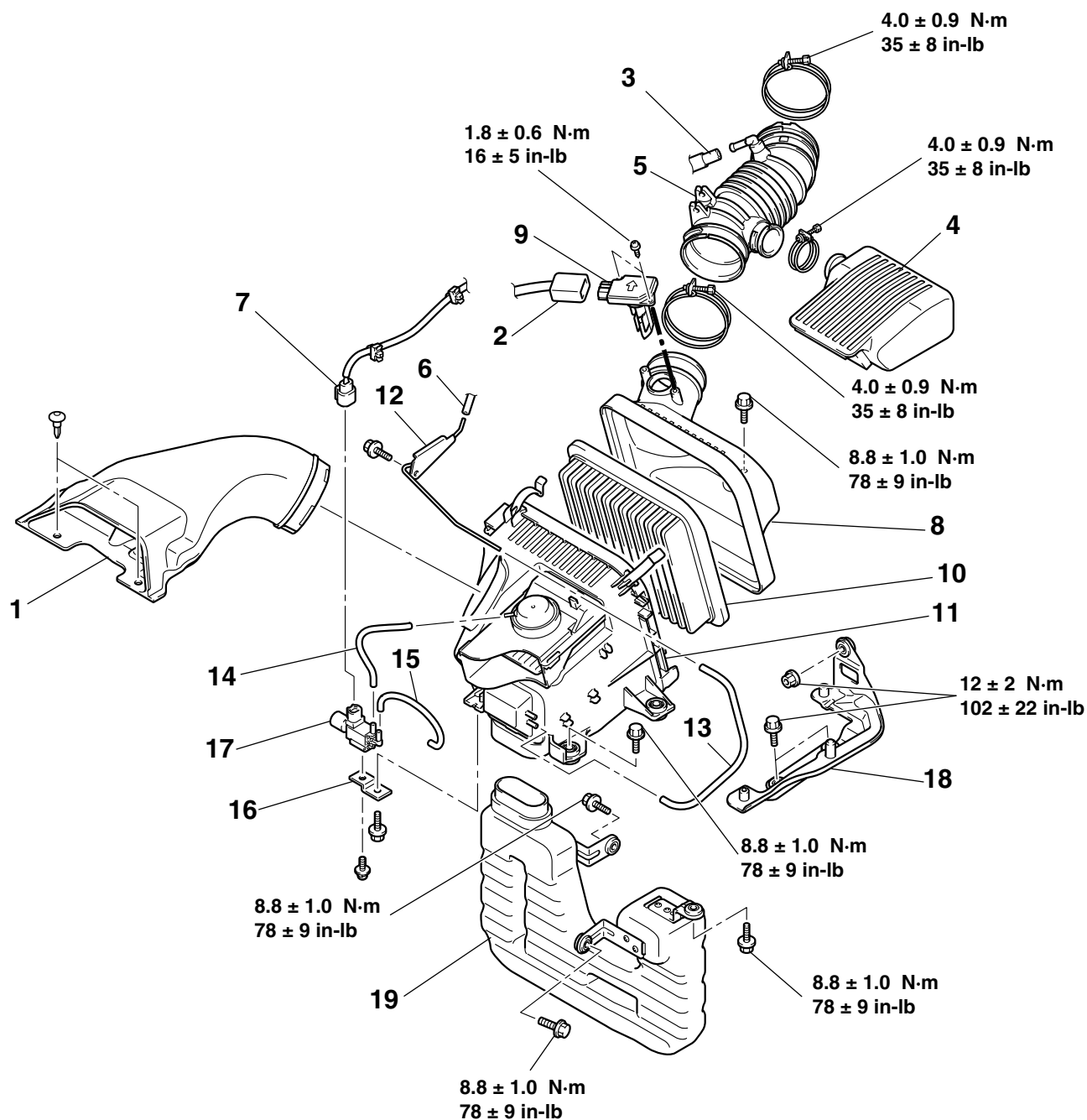
REMOVAL STEPS

1. AIR DUCT
2. MASS AIRFLOW SENSOR CONNECTOR
3. MASS AIRFLOW SENSOR
4. AIR CLEANER COVER
5. AIR CLEANER ELEMENT
6. BREATHER HOSE CONNECTION
7. AIR INTAKE HOSE

REMOVAL STEPS (Continued)

- POWERTRAIN CONTROL MODULE (PCM) (REFER TO GROUP 13B, POWERTRAIN CONTROL MODULE (PCM) [P.13B-1447](#)).
- 8. AIR CLEANER BODY
- 9. AIR CLEANER BRACKET
- UNDER COVER (LH)
- 10. AIR CLEANER RESONATOR

<3.8L ENGINE-MIVEC>



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REMOVAL STEPS

1. AIR CLEANER INTAKE DUCT
2. MASS AIRFLOW SENSOR CONNECTOR
3. BREATHER HOSE CONNECTION
4. AIR CLEANER RESONATOR
5. AIR CLEANER TO THROTTLE BODY DUCT
6. VACUUM HOSE CONNECTION
7. VARIABLE INTAKE AIR CONTROL SOLENOID VALVE CONNECTOR

REMOVAL STEPS (Continued)

- POWERTRAIN CONTROL MODULE (PCM) (REFER TO GROUP 13B, POWERTRAIN CONTROL MODULE (PCM) [P.13B-1447](#)).
- 8. AIR CLEANER COVER
- 9. MASS AIRFLOW SENSOR
- 10. AIR CLEANER ELEMENT
- 11. AIR CLEANER BODY
- 12. VACUUM PIPE
- 13. VACUUM HOSE

REMOVAL STEPS (Continued)

14. VACUUM HOSE
15. VACUUM HOSE
16. SOLENOID VALVE STAY
17. VARIABLE AIR INTAKE SOLENOID
18. AIR CLEANER BRACKET
 - UNDER COVER (LH)
 - TRANSMISSION FLUID COOLER LINE TUBE ASSEMBLY AND TRANSMISSION FLUID COOLER LINE HOSE ASSEMBLY B CONNECTION (REFER TO GROUP 23A, TRANSMISSION FLUID COOLER [P.23A-405](#)).
19. AIR CLEANER RESONATOR

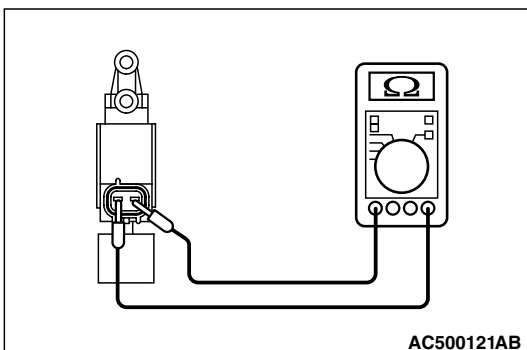
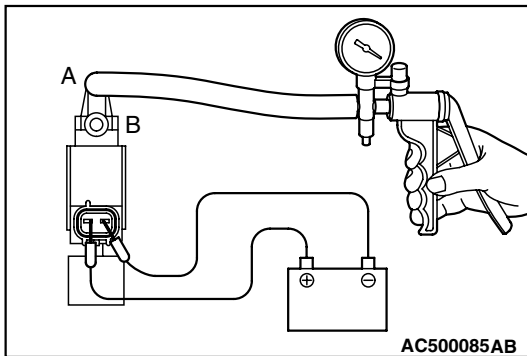
INSPECTION

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VARIABLE AIR INTAKE SOLENOID CHECK

1. Connect a hand vacuum pump to nipple (A) of the solenoid.
2. Check air tightness by applying a vacuum with voltage applied directly from the battery to the variable air intake 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: 29 – 35 Ω [at 20°C (68°F)]

INTAKE MANIFOLD PLENUM

REMOVAL AND INSTALLATION <3.8L ENGINE (EXCEPT MIVEC)>

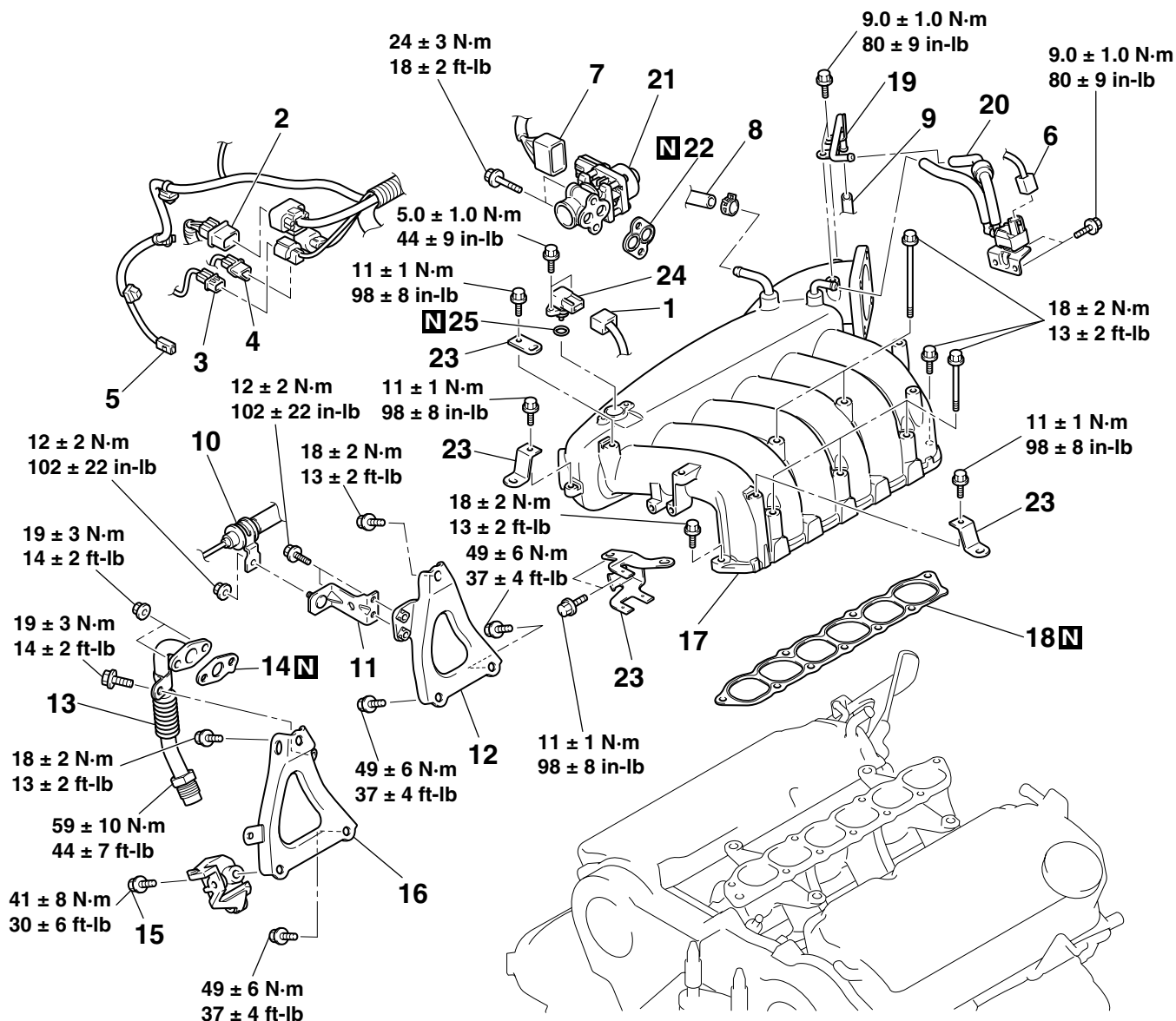
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Pre-removal Operation

- Engine Coolant Draining (Refer to GROUP 14, On-vehicle Service [P.14-7](#)).
- Engine Cover Removal (Refer to GROUP 11C, Engine Assembly [P.11C-22](#)).
- Air Cleaner Cover and Air Intake Hose Removal (Refer to [P.15-4](#)).
- Throttle Body Removal (Refer to GROUP 13B, Throttle Body [P.13B-1444](#)).

Post-installation Operation

- Throttle Body Installation (Refer to GROUP 13B, Throttle Body [P.13B-1444](#)).
- Air Cleaner Cover and Air Intake Hose Installation (Refer to [P.15-4](#)).
- Engine Cover Installation (Refer to GROUP 11C, Engine Assembly [P.11C-22](#)).
- Engine Coolant Supplying (Refer to GROUP 14, On-vehicle Service [P.14-7](#)).



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REMOVAL STEPS

1. MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR
2. CONTROL WIRING HARNESS AND INJECTOR WIRING HARNESS COMBINATION CONNECTOR
3. CRANKSHAFT POSITION SENSOR CONNECTOR
4. KNOCK SENSOR CONNECTOR
5. POWER STEERING PRESSURE SWITCH CONNECTOR
6. EVAPORATIVE EMISSION PURGE SOLENOID CONNECTOR
7. EXHAUST GAS RECIRCULATION VALVE CONNECTOR
8. VACUUM HOSE CONNECTION
9. PURGE HOSE CONNECTION
10. POWER STEERING PRESSURE HOSE CLAMP
11. POWER STEERING PRESSURE HOSE CLAMP BRACKET
12. INTAKE MANIFOLD PLENUM STAY, REAR

REMOVAL STEPS (Continued)

- POWER STEERING GEAR AND LINKAGE PROTECTOR (REFER TO 37, POWER STEERING GEAR BOX AND LINKAGE [P.37-31](#))
- 13. EGR PIPE
- 14. EGR PIPE GASKET
- POWER STEERING OIL PUMP (REFER TO 37, POWER STEERING OIL PUMP ASSEMBLY [P.37-52](#))
- 15. POWER STEERING OIL PUMP BRACKET CONNECTING BOLT
- 16. INTAKE MANIFOLD PLENUM STAY, FRONT
- >>A<< 17. INTAKE MANIFOLD PLENUM
- 18. INTAKE MANIFOLD PLENUM GASKET
- 19. VACUUM PIPE
- 20. EVAPORATIVE EMISSION PURGE SOLENOID
- 21. EXHAUST GAS RECIRCULATION VALVE
- 22. GASKET
- 23. HARNESS BRACKET
- 24. MANIFOLD ABSOLUTE PRESSURE SENSOR
- 25. O-RING

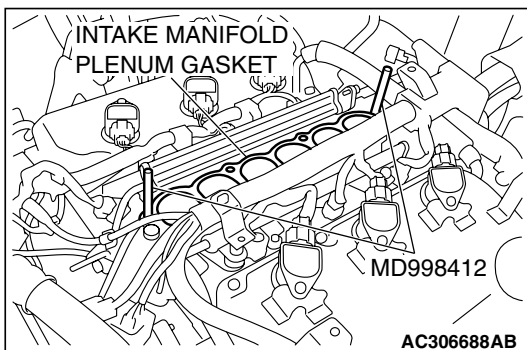
Required Special Tool:

- MD998412: Guide

INSTALLATION SERVICE POINT

>>A<< INTAKE MANIFOLD PLENUM INSTALLATION

Use special tool MD998412 to install the intake manifold plenum.



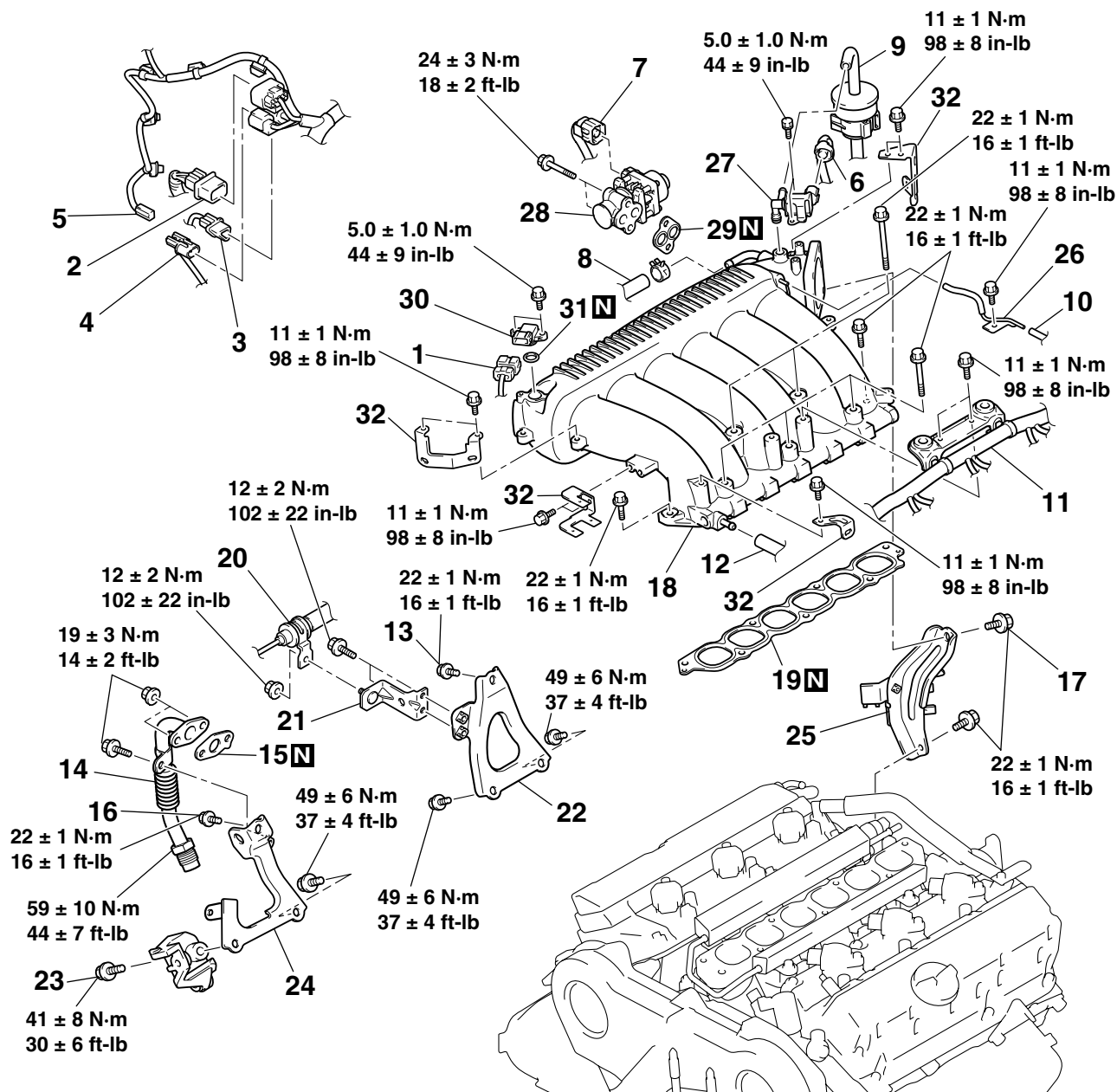
REMOVAL AND INSTALLATION <3.8L ENGINE-MIVEC>

Pre-removal Operation

- Engine Coolant Draining (Refer to GROUP 14, On-vehicle Service – Engine Coolant Replacement [P.14-7](#)).
- Engine Cover Removal (Refer to GROUP 11E, Engine Assembly [P.11E-25](#)).
- Strut Tower Bar Removal (Refer to GROUP 42, Strut Tower Bar [P.42-11](#)).
- Air Cleaner Cover and Air Cleaner to Throttle Body Duct Removal (Refer to [P.15-4](#)).
- Throttle Body Removal (Refer to GROUP 13B, Throttle Body [P.13B-1444](#)).

Post-installation Operation

- Throttle Body Installation (Refer to GROUP 13B, Throttle Body [P.13B-1444](#)).
- Air Cleaner Cover and Air Cleaner to Throttle Body Duct Installation (Refer to [P.15-4](#)).
- Strut Tower Bar Installation (Refer to GROUP 42, Strut Tower Bar [P.42-11](#)).
- Engine Cover Installation (Refer to GROUP 11E, Engine Assembly [P.11E-25](#)).
- Engine Coolant Supplying (Refer to GROUP 14, On-vehicle Service – Engine Coolant Replacement [P.14-7](#)).



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REMOVAL STEPS

1. MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR
2. CONTROL WIRING HARNESS AND INJECTOR WIRING HARNESS COMBINATION CONNECTOR
3. CRANKSHAFT POSITION SENSOR CONNECTOR
4. KNOCK SENSOR CONNECTOR
5. POWER STEERING PRESSURE SWITCH CONNECTOR
6. EVAPORATIVE EMISSION PURGE SOLENOID CONNECTOR
7. EXHAUST GAS RECIRCULATION VALVE CONNECTOR
8. BRAKE BOOSTER VACUUM HOSE CONNECTION
9. EVAPORATIVE EMISSION PURGE HOSE CONNECTION
10. VACUUM HOSE CONNECTION
11. CONTROL WIRING HARNESS AND ENGINE COVER BRACKET ASSEMBLY
12. PCV HOSE CONNECTION
13. INTAKE MANIFOLD PLENUM STAY (REAR) CONNECTING BOLT
14. EGR PIPE
15. EGR PIPE GASKET
16. INTAKE MANIFOLD PLENUM STAY (FRONT) CONNECTING BOLT
17. THROTTLE BODY STAY CONNECTING BOLT

>>B<<

REMOVAL STEPS (Continued)

18. INTAKE MANIFOLD PLENUM
19. INTAKE MANIFOLD PLENUM GASKET
20. POWER STEERING PRESSURE HOSE CLAMP
21. POWER STEERING PRESSURE HOSE CLAMP BRACKET
22. INTAKE MANIFOLD PLENUM STAY (REAR)
 - STEERING GEAR AND LINKAGE PROTECTOR (REFER TO GROUP 37, STEERING GEAR BOX AND LINKAGE [P.37-31](#)).
 - POWER STEERING OIL PUMP (REFER TO GROUP 37, POWER STEERING OIL PUMP ASSEMBLY [P.37-52](#)).
23. POWER STEERING OIL PUMP BRACKET CONNECTING BOLT
24. INTAKE MANIFOLD PLENUM STAY (FRONT)
25. THROTTLE BODY STAY
26. VACUUM PIPE AND HOSE ASSEMBLY
27. EVAPORATIVE EMISSION PURGE SOLENOID
28. EXHAUST GAS RECIRCULATION VALVE
29. EXHAUST GAS RECIRCULATION VALVE GASKET
30. MANIFOLD ABSOLUTE PRESSURE SENSOR
31. O-RING
32. HARNESS BRACKET

>>A<<

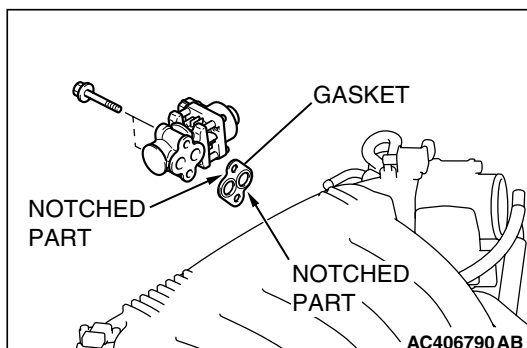
Required Special Tool:

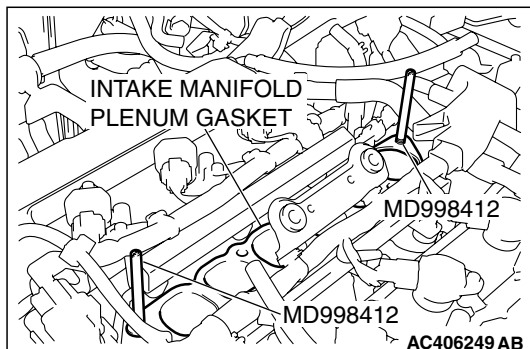
- MD998412: Guide

INSTALLATION SERVICE POINTS

>>A<< EXHAUST GAS RECIRCULATION VALVE GASKET INSTALLATION

Install the exhaust gas recirculation valve gasket as shown in the illustration.



**>>B<< INTAKE MANIFOLD PLENUM INSTALLATION**

Use special tool MD998412 to install the intake manifold plenum.

INTAKE MANIFOLD

REMOVAL AND INSTALLATION <2.4L ENGINE>

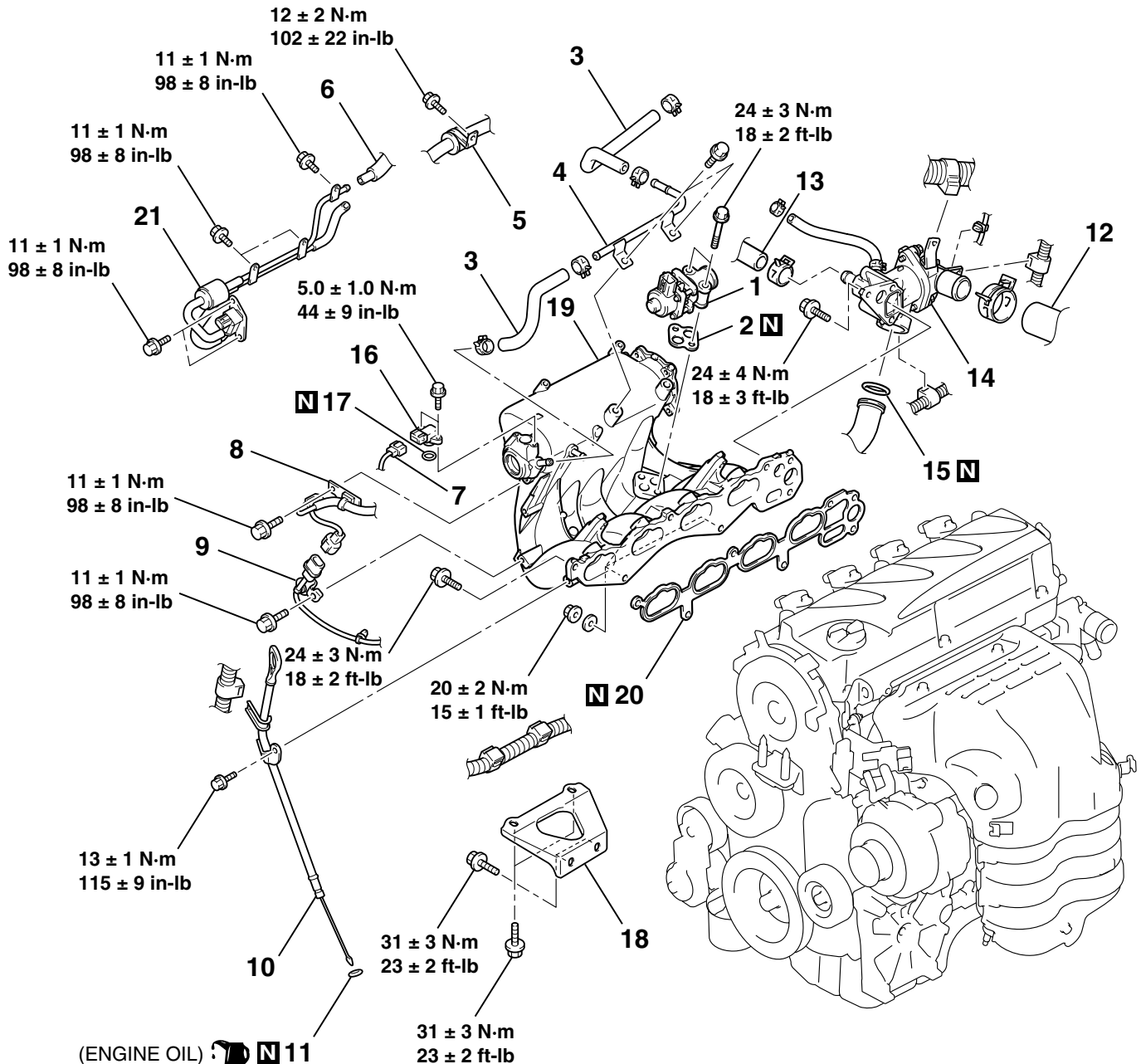
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Pre-removal Operation

- Fuel Line Pressure Reduction [Refer to GROUP 13A, On-vehicle Service – Fuel Pump Connector Disconnection (How to Reduce Pressurized Fuel Lines) [P.13A-1166](#)].
- Engine Coolant Draining (Refer to GROUP 14, On-vehicle Service – Engine Coolant Replacement [P.14-7](#)).
- Air Cleaner Cover and Air Intake Hose Removal (Refer to [P.15-4](#)).
- Throttle Body Removal (Refer to GROUP 13A, Throttle Body [P.13A-1178](#)).
- Delivery Pipe and Injector Assembly Removal (Refer to GROUP 13A, Injector [P.13A-1175](#)).

Post-installation Operation

- Delivery Pipe and Injector Assembly Installation (Refer to GROUP 13A, Injector [P.13A-1175](#)).
- Throttle Body Installation (Refer to GROUP 13A, Throttle Body [P.13A-1178](#)).
- Air Cleaner Cover and Air Intake Hose Installation (Refer to [P.15-4](#)).
- Engine Coolant Refilling (Refer to GROUP 14, On-vehicle Service – Engine Coolant Replacement [P.14-7](#)).



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REMOVAL STEPS

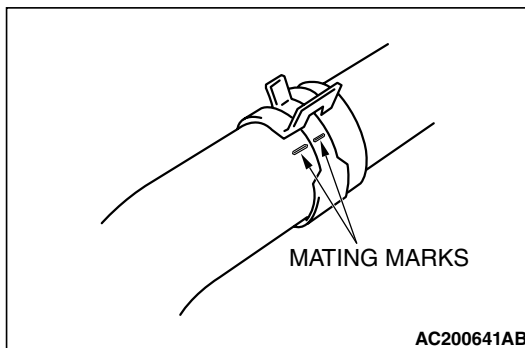
1. EXHAUST GAS RECIRCULATION VALVE
- >>D<< 2. EXHAUST GAS RECIRCULATION VALVE GASKET
- >>C<< 3. BRAKE BOOSTER VACUUM HOSE
4. BRAKE BOOSTER VACUUM PIPE
5. PRESSURE HOSE CLAMP
6. EVAPORATIVE EMISSION VACUUM HOSE CONNECTION
7. MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR
8. HARNESS CRAMP
9. KNOCK SENSOR CONNECTOR BRACKET
10. ENGINE OIL DIPSTICK AND DIPSTICK GUIDE
11. O-RING

REMOVAL STEPS (Continued)

- <<A>> >>B<< 12. RADIATOR LOWER HOSE CONNECTION
13. HEATER WATER HOSE CONNECTION
- >>A<< 14. THERMOSTAT CASE ASSEMBLY
15. O-RING
16. MANIFOLD ABSOLUTE PRESSURE SENSOR
17. O-RING
18. INTAKE MANIFOLD STAY
19. INTAKE MANIFOLD
20. INTAKE MANIFOLD GASKET
21. EVAPORATIVE EMISSION PURGE SOLENOID VALVE, EVAPORATIVE EMISSION VACUUM HOSE AND PIPE ASSEMBLY

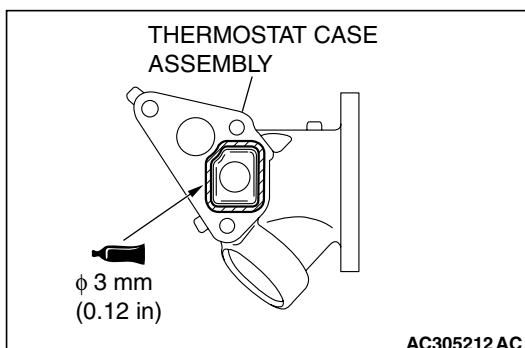
REMOVAL SERVICE POINT**<<A>> RADIATOR LOWER HOSE DISCONNECTION**

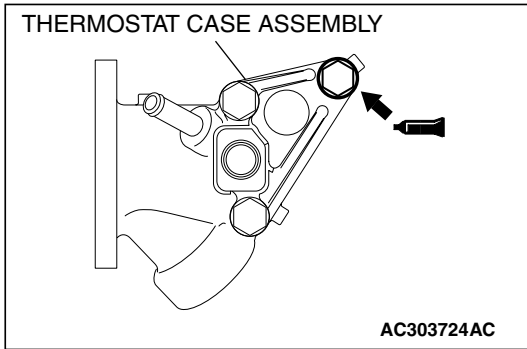
Make mating marks on the radiator hose and the hose clamp. Disconnect the radiator hose.

**INSTALLATION SERVICE POINTS****>>A<< THERMOSTAT CASE ASSEMBLY INSTALLATION**

1. Use a gasket scraper or wire brush to completely eliminate all gasket material on the gasket mounting surface.
2. Apply a bead of the sealant to the cylinder head mating surface of the thermostat case assembly as shown.

Specified Sealant: 3M™ AAD Part No.8672, 3M™ AAD part No.8679/8678 or equivalent

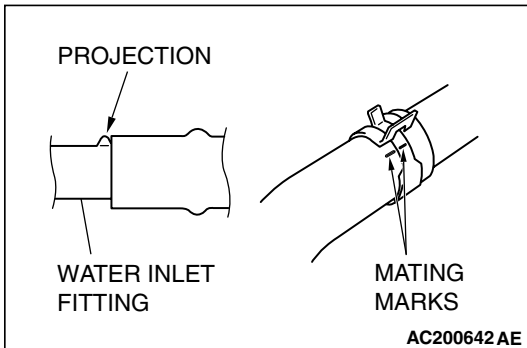




3. Apply sealant to the thread of the thermostat case assembly bolts as shown.

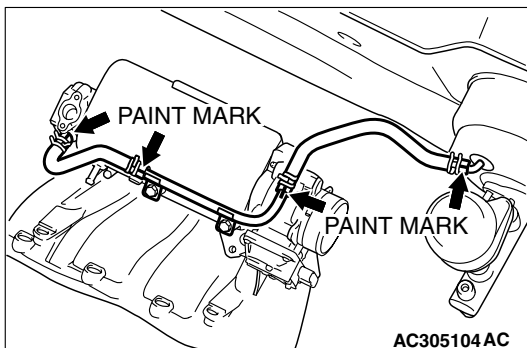
Specified Sealant: 3M™ AAD Part No.8730, 8731 or equivalent

4. With the sealant still wet (within 15 minutes after the sealant is applied), install the thermostat case assembly. Do not apply the sealant in an area more than the required.



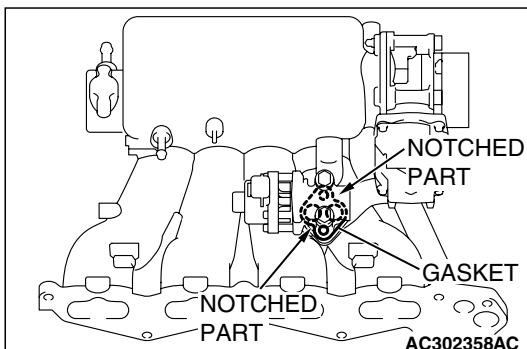
>>B<< RADIATOR LOWER HOSE CONNECTION

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.



>>C<< BRAKE BOOSTER VACUUM HOSE CONNECTION

Insert vacuum hose with its paint mark facing upward.



>>D<< EXHAUST GAS RECIRCULATION VALVE GASKET INSTALLATION

Install the exhaust gas recirculation valve gasket as shown in the illustration.

REMOVAL AND INSTALLATION <3.8L ENGINE (EXCEPT MIVEC)>

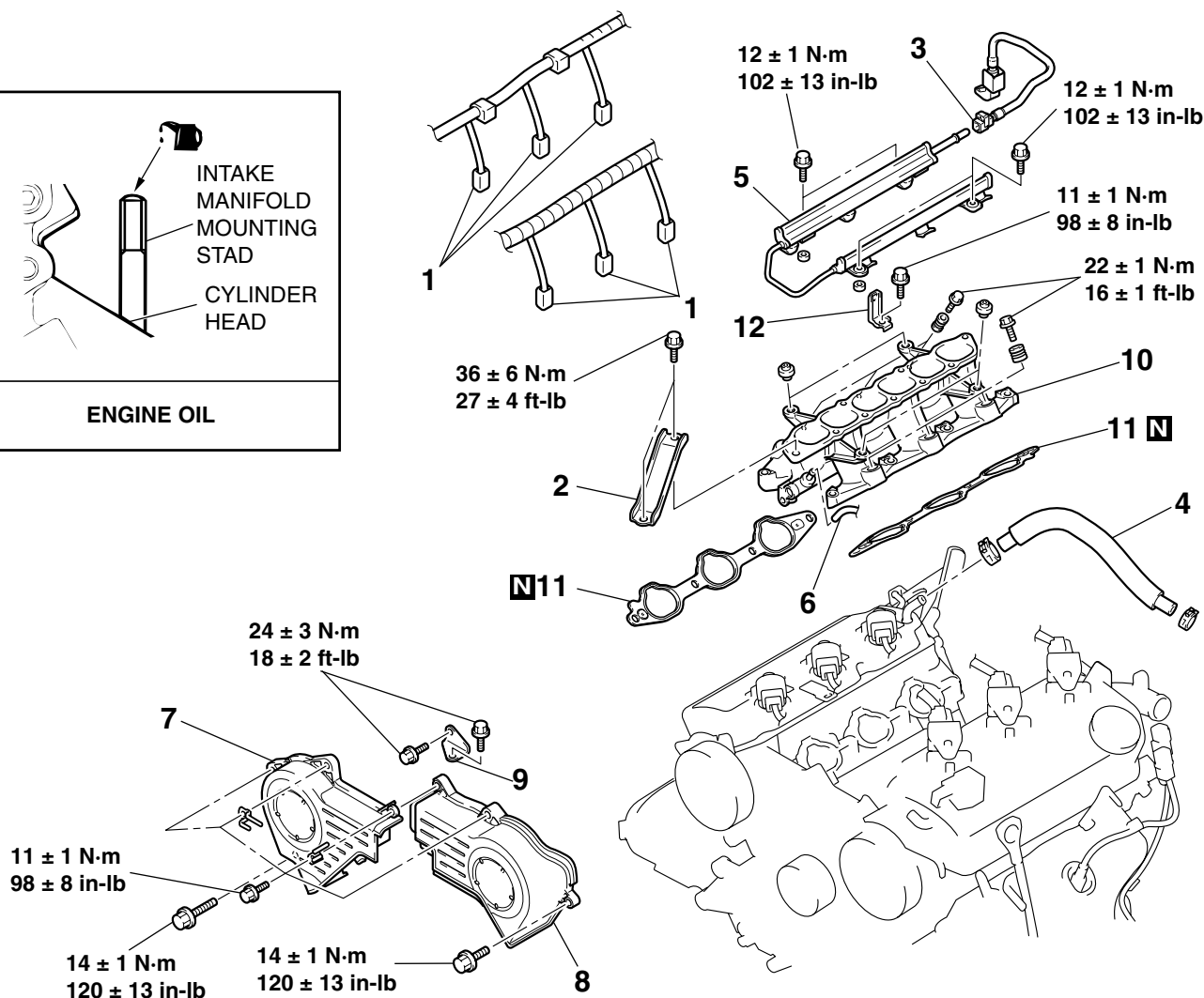
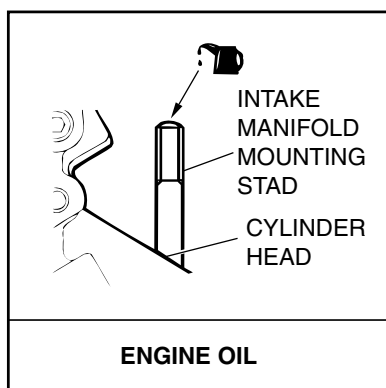
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Pre-removal Operation

- Fuel Discharge Prevention [Refer to GROUP 13B, On-vehicle Service – Fuel Pump Relay Disconnection (How to Reduce Pressurized Fuel Lines) P.13B-1430.]
- Intake Manifold Plenum Removal (Refer to P.15-8.)

Post-installation Operation

- Intake Manifold Plenum Installation (Refer to P.15-8.)
- Fuel Leakage Inspection



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REMOVAL STEPS

- <<A>> >>C<<
1. INJECTOR CONNECTOR
 2. ENGINE MOUNTING STAY
 3. FUEL HIGH-PRESSURE HOSE CONNECTION (FUEL RAIL SIDE)
 4. BLOW-BY HOSE
 5. FUEL RAIL AND FUEL INJECTOR ASSEMBLY
 6. PCV HOSE CONNECTION
- <>

REMOVAL STEPS (Continued)

7. TIMING BELT FRONT UPPER COVER, RIGHT
8. TIMING BELT FRONT UPPER COVER, LEFT
9. WATER PUMP BRACKET
- >>B<< 10. INTAKE MANIFOLD
- >>A<< 11. INTAKE MANIFOLD GASKET
12. CONTROL HARNESS CLAMP

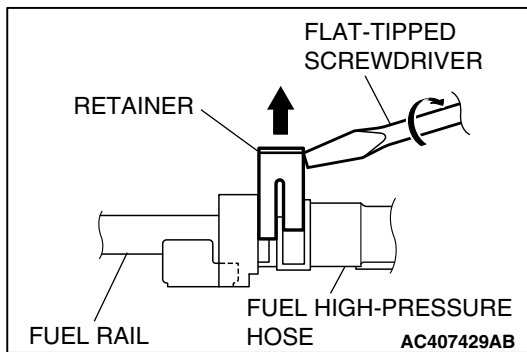
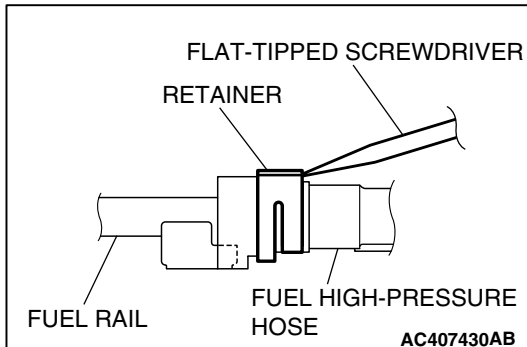
REMOVAL SERVICE POINTS

<<A>> FUEL HIGH-PRESSURE HOSE DISCONNECTION

CAUTION

Do not kink the fuel high-pressure hose as it is made of plastics.

1. Insert a flat-tipped screwdriver [width 6 mm (0.24 inch), thickness 1 mm (0.04 inch)] to the retainer.
2. Turn the flat-tipped screwdriver approximately 90° to the arrowed direction, and lift the retainer to unlock and disconnect the fuel high-pressure hose.



<> FUEL RAIL AND INJECTOR ASSEMBLY REMOVAL

CAUTION

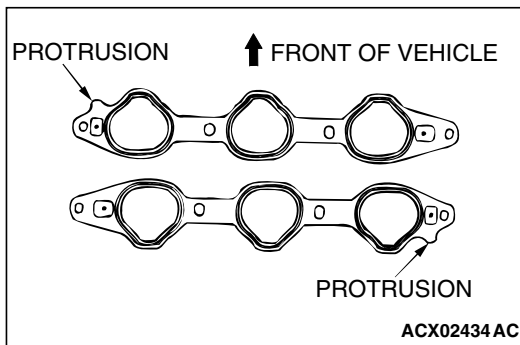
Care must be taken when removing the fuel rail not to drop the injector.

Remove the fuel rail with the injectors attached to it.

INSTALLATION SERVICE POINTS

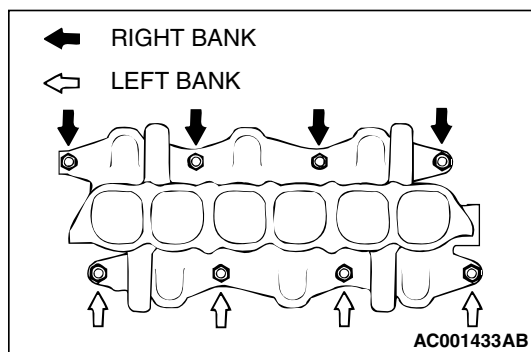
>>A<< INTAKE MANIFOLD GASKET INSTALLATION

Install the gasket with the protrusions in the position illustrated.



>>B<< INTAKE MANIFOLD INSTALLATION

1. Coat the intake manifold mounting studs with engine oil.

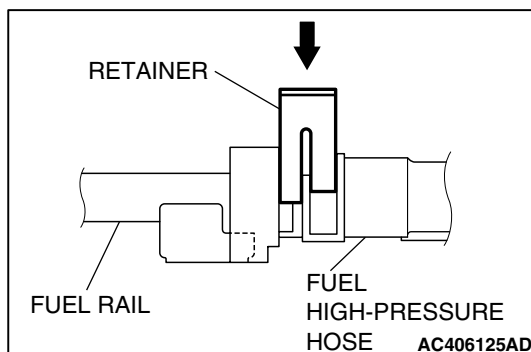
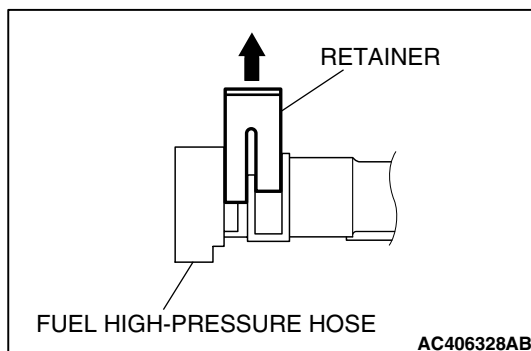


2. Tighten the intake manifold mounting nuts by the following procedure.

ORDER	MOUNTING NUTS	TIGHTENING TORQUE
1st	Right-bank nuts	6.5 ± 1.5 N·m (58 ± 13 in-lb)
2nd	Left-bank nuts	22 ± 1 N·m (16 ± 1 ft-lb)
3rd	Right-bank nuts	22 ± 1 N·m (16 ± 1 ft-lb)
4th	Left-bank nuts	22 ± 1 N·m (16 ± 1 ft-lb)
5th	Right-bank nuts	22 ± 1 N·m (16 ± 1 ft-lb)

>>C<< FUEL HIGH-PRESSURE HOSE CONNECTION

1. Pull up the lock of fuel high-pressure hose to unlock before installing.



2. Install the fuel high-pressure hose to the fuel rail securely and push the lock of fuel high-pressure hose downward and lock thoroughly.
3. After installing, slightly pull the fuel high-pressure hose and ensure that there is no disengaged fuel high-pressure hose. Also confirm that there is approximately 1 mm (0.04 inch) play at this time.

REMOVAL AND INSTALLATION <3.8L ENGINE-MIVEC>

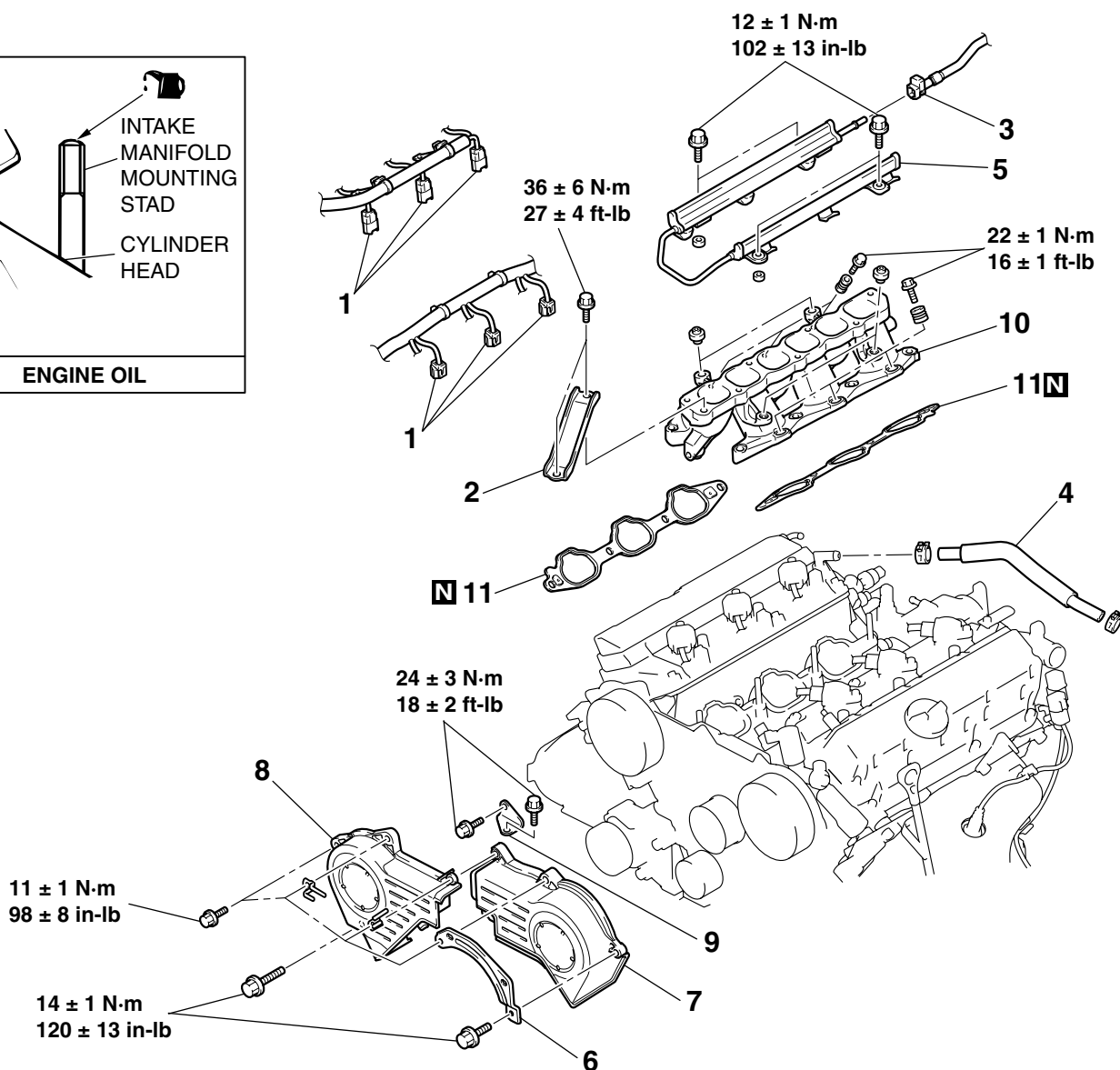
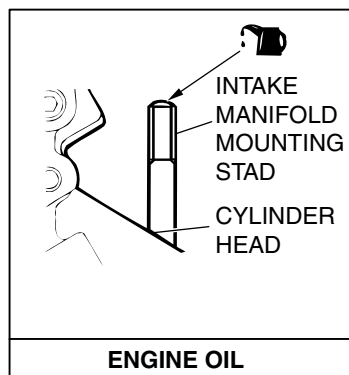
M1151003001753

Pre-removal Operation

- Fuel Discharge Prevention [Refer to GROUP 13B, On-vehicle Service – Fuel Pump Relay Disconnection (How to Reduce Pressurized Fuel Lines) P.13B-1430].
- Intake Manifold Plenum Removal (Refer to P.15-8).

Post-installation Operation

- Intake Manifold Plenum Installation (Refer to P.15-8).
- Fuel Leakage Inspection



AC406189AB

REMOVAL STEPS

- <<A>> >>C<<
1. INJECTOR CONNECTOR
 2. ENGINE MOUNTING STAY
 3. FUEL HIGH-PRESSURE HOSE CONNECTION
 4. PCV HOSE CONNECTION
 5. FUEL RAIL AND INJECTOR
 6. HARNESS BRACKET
- <>

REMOVAL STEPS (Continued)

7. TIMING BELT FRONT UPPER COVER, LEFT
 8. TIMING BELT FRONT UPPER COVER, RIGHT
 9. WATER PUMP BRACKET
 10. INTAKE MANIFOLD
 11. INTAKE MANIFOLD GASKET
- >>B<<
>>A<<

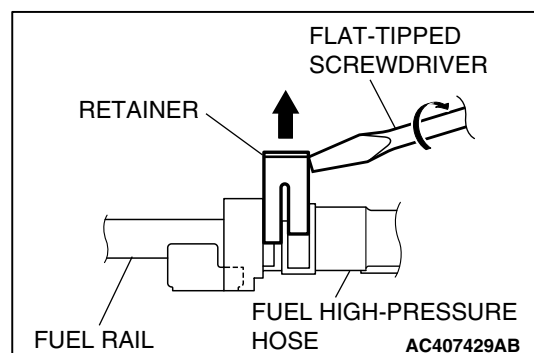
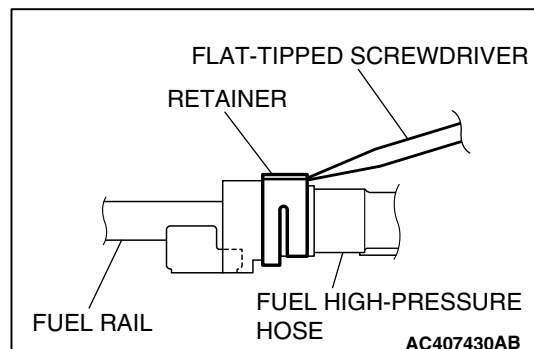
REMOVAL SERVICE POINTS

<<A>> FUEL HIGH-PRESSURE HOSE DISCONNECTION

⚠ CAUTION

Do not kink the fuel high-pressure hose as it is made of plastic and will become damaged.

1. Insert a flat-tipped screwdriver [width 6 mm (0.24 inch), thickness 1 mm (0.04 inch)] to the retainer.



2. Turn the flat-tipped screwdriver approximately 90° to the arrowed direction, and lift the retainer to unlock and disconnect the fuel high-pressure hose.

<> FUEL RAIL AND INJECTOR REMOVAL

⚠ CAUTION

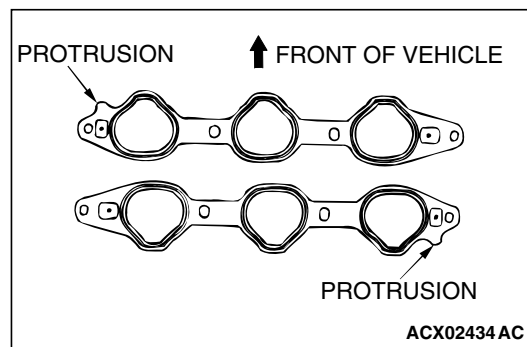
Care must be taken when removing the fuel rail not to drop the injector.

Remove the fuel rail with the injectors attached to it.

INSTALLATION SERVICE POINTS

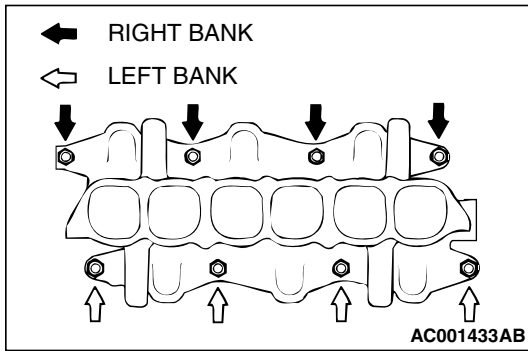
>>A<< INTAKE MANIFOLD GASKET INSTALLATION

Install the gasket with the protrusions in the position illustrated.



>>B<< INTAKE MANIFOLD INSTALLATION

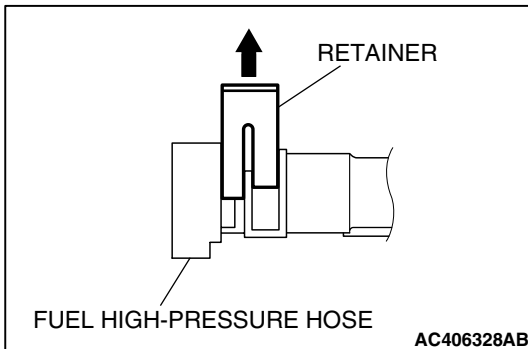
1. Coat the intake manifold mounting studs with engine oil.



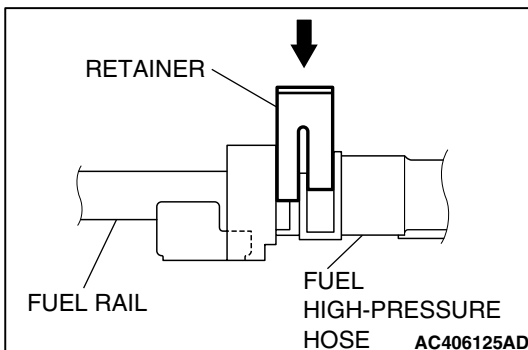
2. Tighten the intake manifold mounting nuts by the following procedure.

ORDER	MOUNTING NUTS	TIGHTENING TORQUE
1st	Right-bank nuts	6.5 ± 1.5 N·m (58 ± 13 in-lb)
2nd	Left-bank nuts	22 ± 1 N·m (16 ± 1 ft-lb)
3rd	Right-bank nuts	22 ± 1 N·m (16 ± 1 ft-lb)
4th	Left-bank nuts	22 ± 1 N·m (16 ± 1 ft-lb)
5th	Right-bank nuts	22 ± 1 N·m (16 ± 1 ft-lb)

>>C<< FUEL HIGH-PRESSURE HOSE CONNECTION



1. Pull up the lock of fuel high-pressure hose to unlock before installing.



2. Install the fuel high-pressure hose to the fuel rail securely and push the lock of fuel high-pressure hose downward and lock thoroughly.
3. After installing, slightly pull the fuel high-pressure hose and ensure that there is no disengaged fuel high-pressure hose. Also confirm that there is approximately 1 mm (0.04 inch) play at this time.

INSPECTION

M1151003100672

Check the following points; replace the part if a problem is found.

Intake Manifold Check

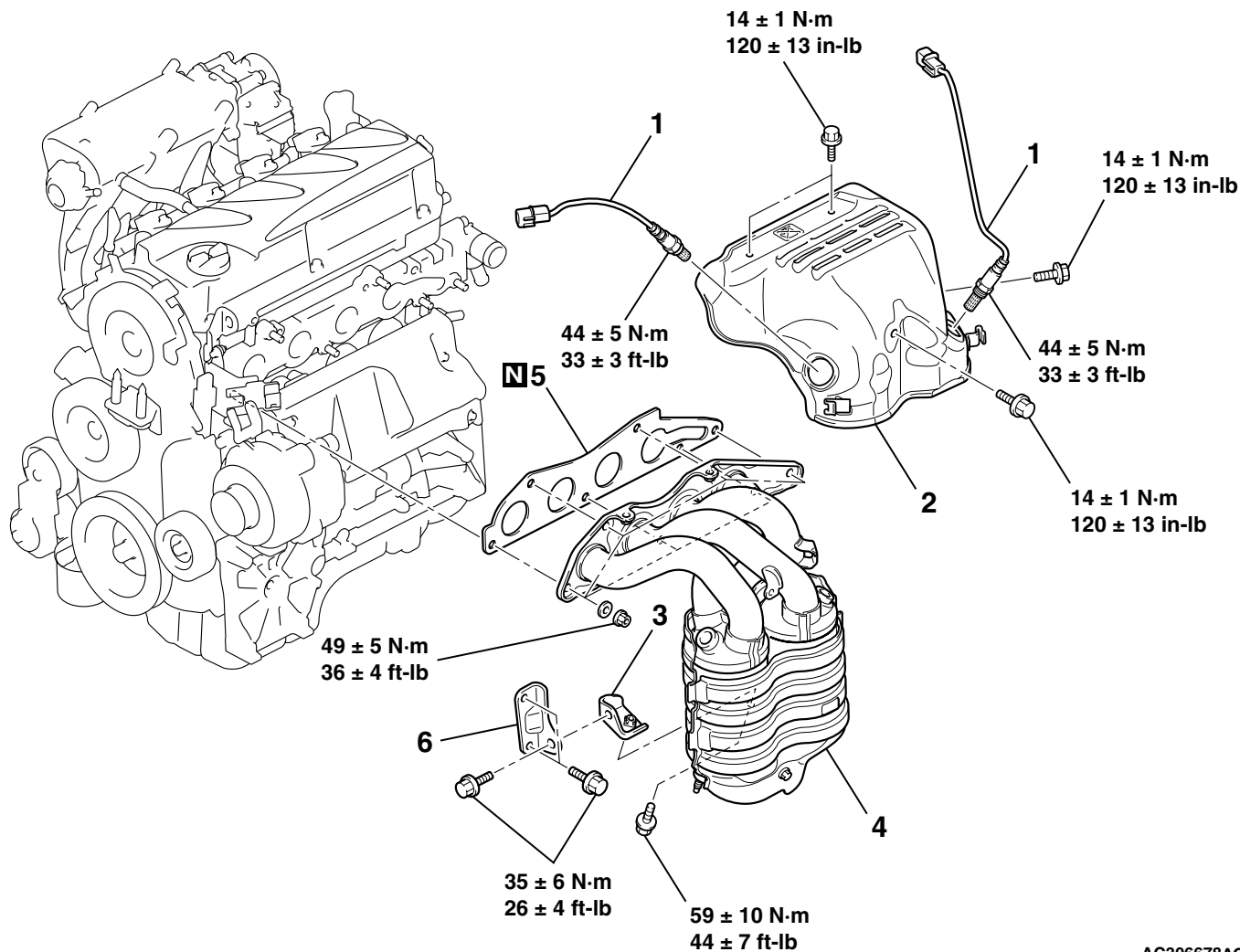
1. Check for damage or cracking of any part.
2. Clogging of the negative pressure (vacuum) outlet port, or clogging of the exhaust gas recirculation passages.
3. Using a straight edge and feeler gauge, check for distortion of the cylinder head installation surface.

Standard value: 0.15 mm (0.006 inch) or less

Limit: 0.20 mm (0.008 inch)

EXHAUST MANIFOLD**REMOVAL AND INSTALLATION <2.4L ENGINE>**

M1151003301237



AC306678AC

REMOVAL STEPS

- <<A>> >>A<<
1. HEATED OXYGEN SENSOR
 2. EXHAUST MANIFOLD COVER
 - FRONT NO.1 EXHAUST PIPE (REFER TO [P.15-32](#)).
 3. EXHAUST MANIFOLD BRACKET B

REMOVAL STEPS (Continued)

4. EXHAUST MANIFOLD
5. EXHAUST MANIFOLD GASKET
6. EXHAUST MANIFOLD BRACKET A

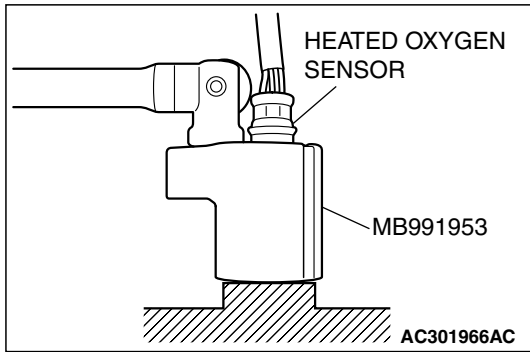
Required Special Tool:

- MB991953: Oxygen Sensor Wrench

REMOVAL SERVICE POINT

<<A>> HEATED OXYGEN SENSOR REMOVAL

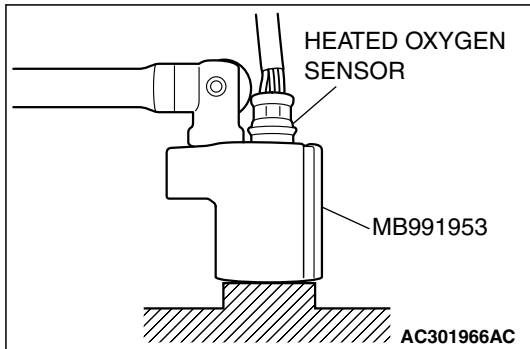
Use special tool MB991953 to remove the heated oxygen sensor.



INSTALLATION SERVICE POINT

>>A<< HEATED OXYGEN SENSOR INSTALLATION

Use special tool MB991953 to install the heated oxygen sensor.



REMOVAL AND INSTALLATION <3.8L ENGINE (EXCEPT MIVEC)>

M1151003301431

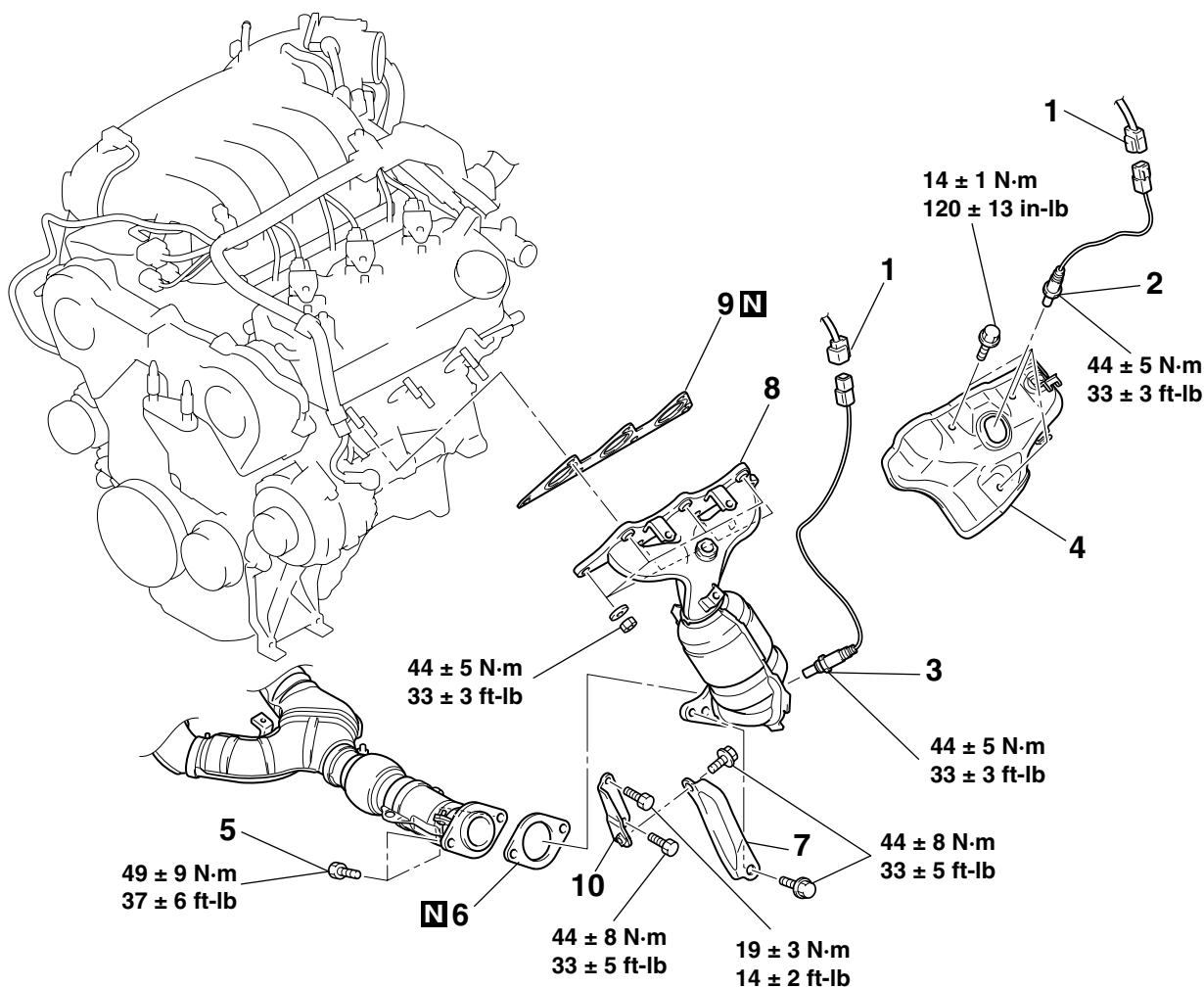
<LEFT BANK>

Pre-removal Operation

- Front Bumper Under Cover Removal (Refer to GROUP 51, Front Bumper P.51-2).
- Air Cleaner Intake Duct Removal (Refer to P.15-4).

Post-installation Operation

- Air Cleaner Intake Duct Installation (Refer to P.15-4).
- Front Bumper Under Cover Installation (Refer to GROUP 51, Front Bumper P.51-2).



AC500457AB

REMOVAL STEPS

- <<A>> >>A<<
1. LEFT HEATED OXYGEN SENSOR CONNECTOR
 2. LEFT BANK HEATED OXYGEN SENSOR (FRONT)
- <> >>B<<
3. LEFT BANK HEATED OXYGEN SENSOR (REAR)
 4. HEAT PROTECTOR
 5. FRONT EXHAUST PIPE CONNECTING BOLTS

REMOVAL STEPS (Continued)

6. FRONT EXHAUST PIPE GASKET
7. EXHAUST MANIFOLD STAY, LEFT B
8. EXHAUST MANIFOLD
9. EXHAUST MANIFOLD GASKET
10. EXHAUST MANIFOLD STAY, LEFT A

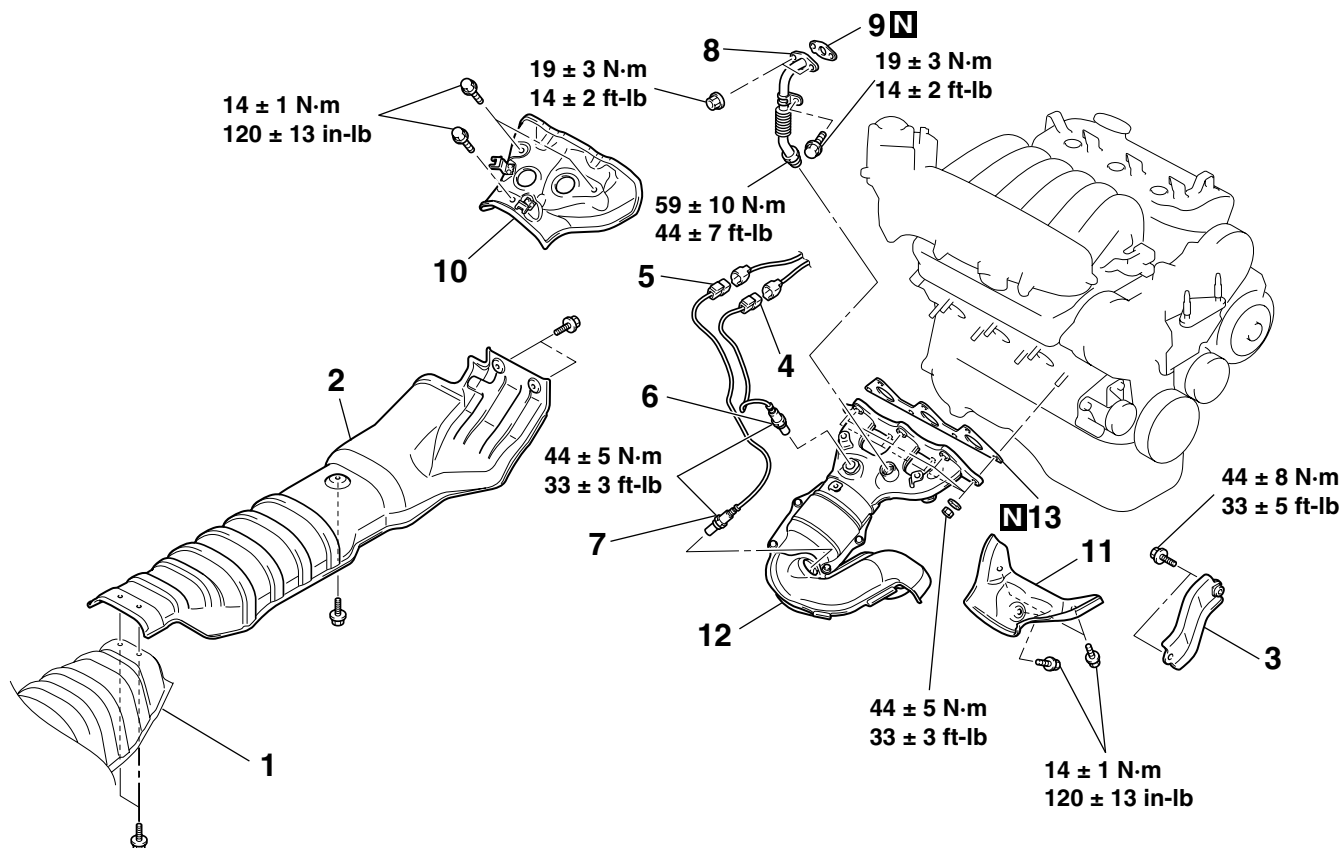
<RIGHT BANK>

Pre-removal Operation

- Air Cleaner Cover and Air Cleaner Air Intake Duct Removal (Refer to P.15-4).
- Battery Removal
- Front Exhaust Pipe, Center Exhaust Pipe Removal (Refer to P.15-32).
- Engine Coolant Draining (Refer to GROUP 14, On-vehicle Service – Engine Coolant Replacement P.14-7).

Post-installation Operation

- Engine Coolant Refilling (Refer to GROUP 14, On-vehicle Service – Engine Coolant Replacement P.14-7).
- Front Exhaust Pipe, Center Exhaust Pipe Installation (Refer to P.15-32).
- Battery Installation
- Air Cleaner Cover and Air Cleaner Air Intake Duct Installation (Refer to P.15-4).



AC308063AB

REMOVAL STEPS

1. CENTER UNDER FLOOR HEAT PROTECTOR
- STEERING GEAR AND LINKAGE PROTECTOR (REFER TO GROUP 37, POWER STEERING GEAR BOX AND LINKAGE P.37-31)
2. FRONT UNDER FLOOR HEAT PROTECTOR
3. EXHAUST MANIFOLD STAY, RIGHT B
4. RIGHT BANK HEATED OXYGEN SENSOR (FRONT) CONNECTOR

REMOVAL STEPS (Continued)

5. RIGHT BANK HEATED OXYGEN SENSOR (REAR) CONNECTOR
6. RIGHT BANK HEATED OXYGEN SENSOR (FRONT)
7. RIGHT BANK HEATED OXYGEN SENSOR (REAR)
8. EGR PIPE
9. EGR PIPE GASKET
10. UPPER HEAT PROTECTOR
11. LOWER HEAT PROTECTOR
12. EXHAUST MANIFOLD
13. EXHAUST MANIFOLD GASKET

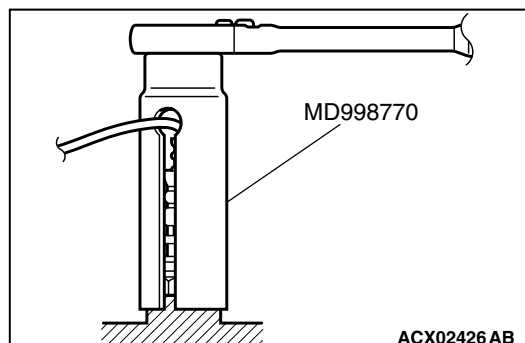
Required Special Tools:

- MB991953: Oxygen Sensor Wrench
- MD998770: Oxygen Sensor Wrench

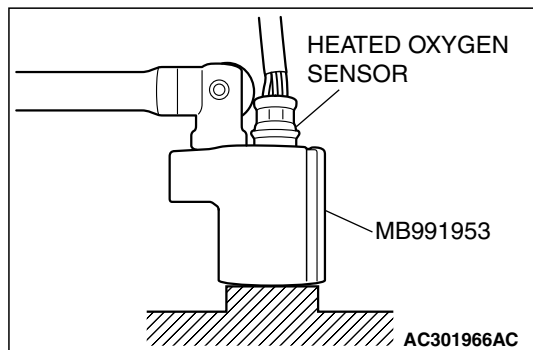
REMOVAL SERVICE POINTS

<<A>> LEFT BANK HEATED OXYGEN SENSOR (FRONT)/
RIGHT BANK HEATED OXYGEN SENSOR (FRONT)/RIGHT
BANK HEATED OXYGEN SENSOR (REAR) REMOVAL

Use special tool MD998770 to remove the heated oxygen sensor.

<> LEFT BANK HEATED OXYGEN SENSOR (REAR)
REMOVAL

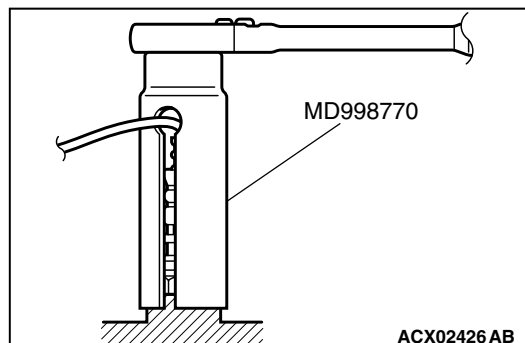
Use special tool MB991953 to remove the heated oxygen sensor.



INSTALLATION SERVICE POINTS

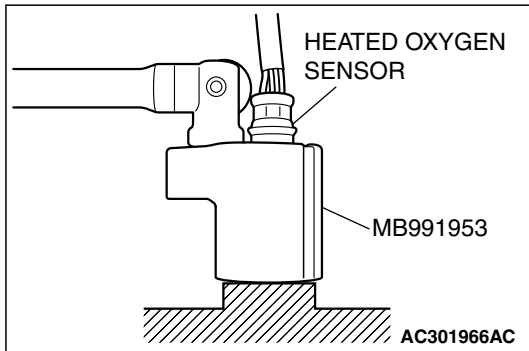
>>A<< RIGHT BANK HEATED OXYGEN SENSOR (REAR)/
RIGHT BANK HEATED OXYGEN SENSOR (FRONT)/LEFT
BANK HEATED OXYGEN SENSOR (FRONT) INSTALLA-
TION

Use special tool MD998770 to install the heated oxygen sensor.



>>B<< LEFT BANK HEATED OXYGEN SENSOR (REAR)
INSTALLATION

Use special tool MB991953 to install the heated oxygen sensor.



REMOVAL AND INSTALLATION <3.8L ENGINE-MIVEC>

M1151003301420

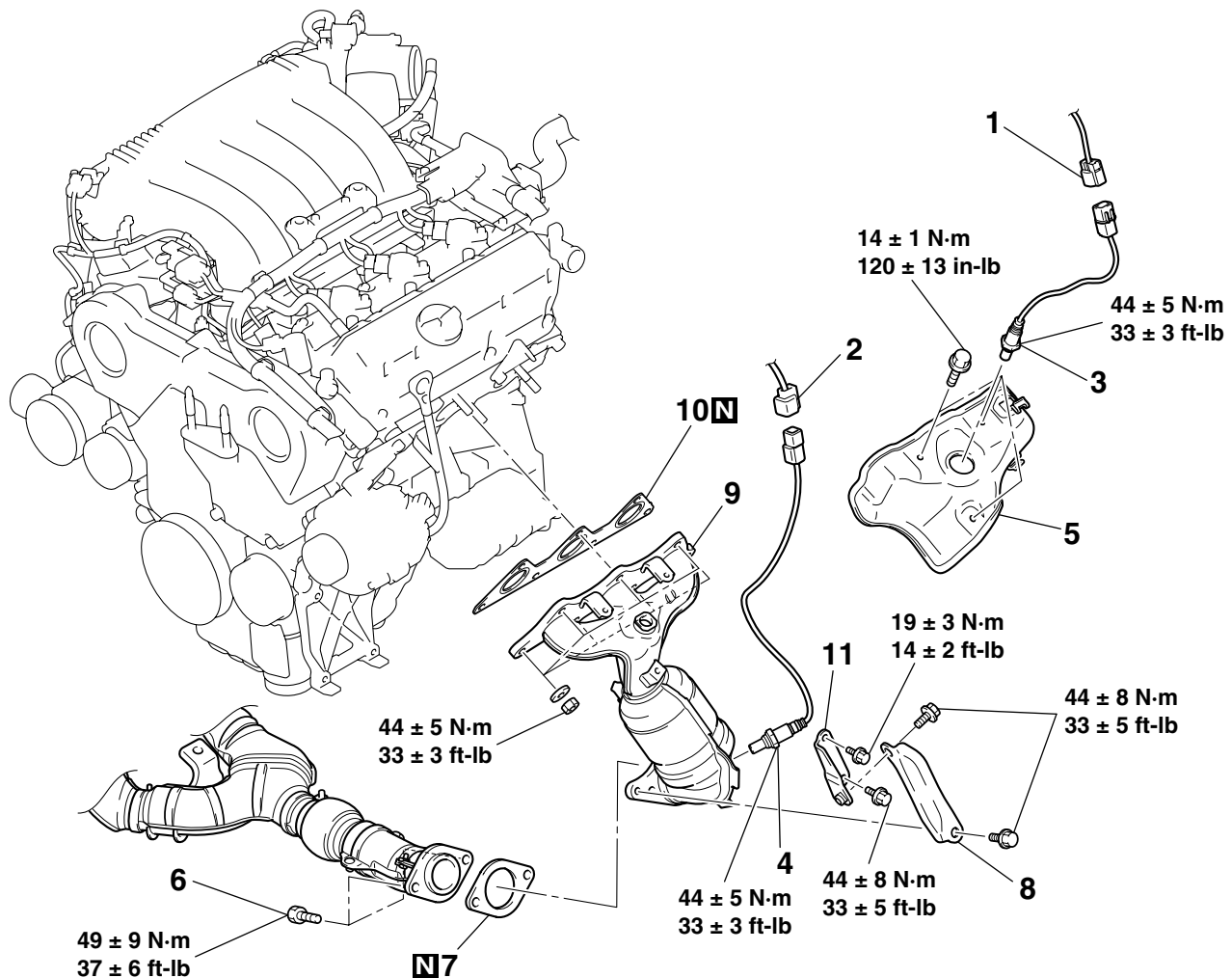
<LEFT BANK>

Pre-removal Operation

- Front Bumper Under Cover Removal (Refer to GROUP 51, Front Bumper P.51-2).
- Air Cleaner Intake Duct Removal (Refer to P.15-4).

Post-installation Operation

- Air Cleaner Intake Duct Installation (Refer to P.15-4).
- Front Bumper Under Cover Installation (Refer to GROUP 51, Front Bumper P.51-2).



AC406190AB

REMOVAL STEPS

- | | | |
|-------------|----|---|
| | 1. | LEFT BANK HEATED OXYGEN
SENSOR (FRONT) CONNECTOR |
| | 2. | LEFT BANK HEATED OXYGEN
SENSOR (REAR) CONNECTOR |
| <<A>> >>B<< | 3. | LEFT BANK HEATED OXYGEN
SENSOR (FRONT) |
| <> >>A<< | 4. | LEFT BANK HEATED OXYGEN
SENSOR (REAR) |
| | 5. | HEAT PROTECTOR |

REMOVAL STEPS (Continued)

- | | |
|-----|--|
| 6. | FRONT EXHAUST PIPE
CONNECTING BOLTS |
| 7. | FRONT EXHAUST PIPE GASKET |
| 8. | EXHAUST MANIFOLD STAY, LEFT
B |
| 9. | EXHAUST MANIFOLD |
| 10. | EXHAUST MANIFOLD GASKET |
| 11. | EXHAUST MANIFOLD STAY, LEFT
A |

Required Special Tools:

- | | |
|----------------------------------|----------------------------------|
| • MB991953: Oxygen Sensor Wrench | • MD998770: Oxygen Sensor Wrench |
|----------------------------------|----------------------------------|

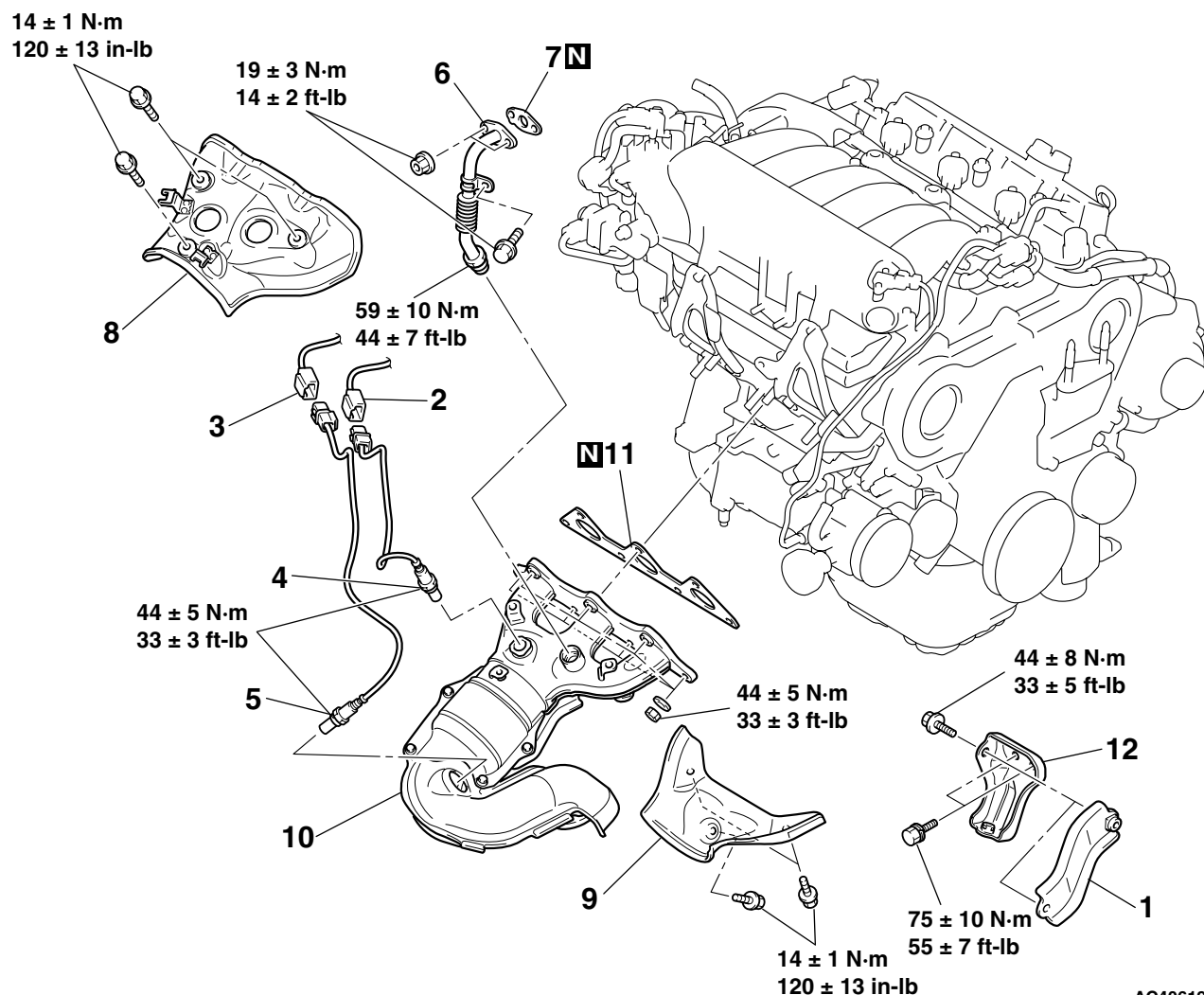
<RIGHT BANK>

Pre-removal Operation

- Air Cleaner Cover and Air Cleaner Air Intake Duct Removal (Refer to P.15-4).
- Battery Removal
- Front Exhaust Pipe, Center Exhaust Pipe Removal (Refer to P.15-32).
- Strut Tower Bar Removal (Refer to GROUP 42, Strut Tower Bar P.42-11).
- Engine Coolant Draining (Refer to GROUP 14, On-vehicle Service – Engine Coolant Replacement P.14-7).

Post-installation Operation

- Engine Coolant Refilling (Refer to GROUP 14, On-vehicle Service – Engine Coolant Replacement P.14-7).
- Strut Tower Bar Installation (Refer to GROUP 42, Strut Tower Bar P.42-11).
- Front Exhaust Pipe, Center Exhaust Pipe Installation (Refer to P.15-32).
- Battery Installation
- Air Cleaner Cover and Air Cleaner Air Intake Duct Installation (Refer to P.15-4).



AC406191AB

REMOVAL STEPS

- STEERING GEAR AND LINKAGE PROTECTOR (REFER TO GROUP 37, POWER STEERING GEAR BOX AND LINKAGE P.37-31).
- CENTER UNDER FLOOR HEAT PROTECTOR (REFER TO P.15-32).
- FRONT UNDER FLOOR HEAT PROTECTOR (REFER TO P.15-32).

REMOVAL STEPS (Continued)

1. EXHAUST MANIFOLD STAY, RIGHT B
2. RIGHT BANK HEATED OXYGEN SENSOR (FRONT) CONNECTOR
3. RIGHT BANK HEATED OXYGEN SENSOR (REAR) CONNECTOR
4. RIGHT BANK HEATED OXYGEN SENSOR (FRONT)
5. RIGHT BANK HEATED OXYGEN SENSOR (REAR)
6. EGR PIPE
7. EGR PIPE GASKET

REMOVAL STEPS (Continued)

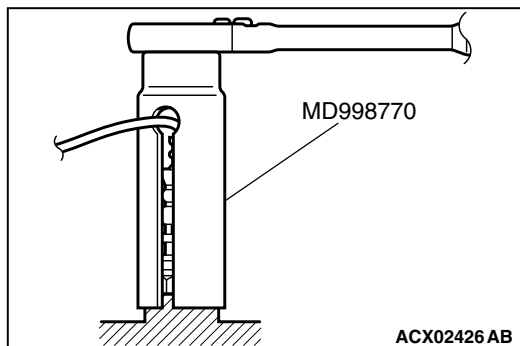
8. UPPER HEAT PROTECTOR
9. LOWER HEAT PROTECTOR
10. EXHAUST MANIFOLD
11. EXHAUST MANIFOLD GASKET
12. EXHAUST MANIFOLD STAY,
RIGHT A

Required Special Tools:

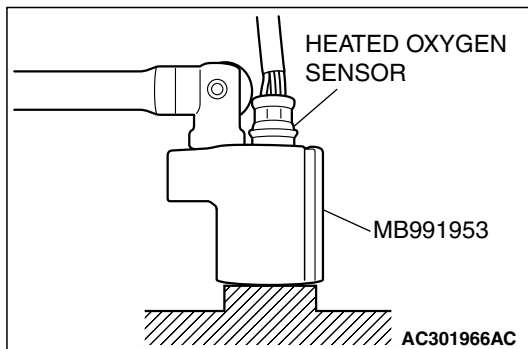
- MB991953: Oxygen Sensor Wrench
- MD998770: Oxygen Sensor Wrench

REMOVAL SERVICE POINTS**<<A>> LEFT BANK HEATED OXYGEN SENSOR (FRONT)/
RIGHT BANK HEATED OXYGEN SENSOR (FRONT)
REMOVAL**

Use special tool MD998770 to remove the heated oxygen sensor.

**<> LEFT BANK HEATED OXYGEN SENSOR (REAR)/
RIGHT BANK HEATED OXYGEN SENSOR (REAR)
REMOVAL**

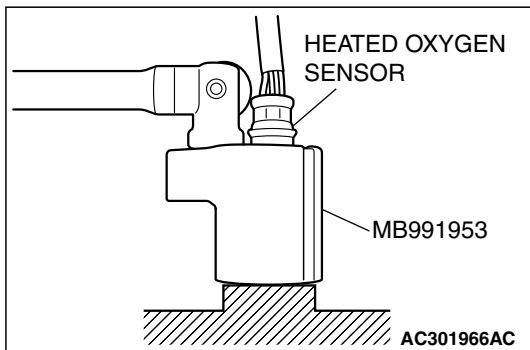
Use special tool MB991953 to remove the heated oxygen sensor.



INSTALLATION SERVICE POINTS

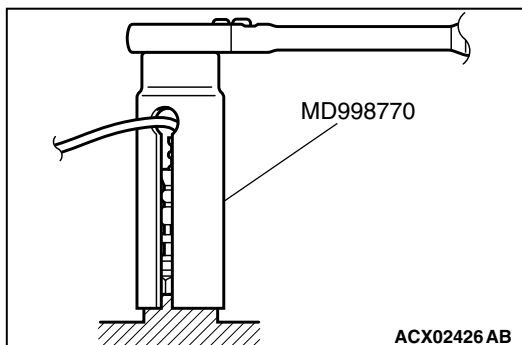
>>A<< RIGHT BANK HEATED OXYGEN SENSOR (REAR)/ LEFT BANK HEATED OXYGEN SENSOR (REAR) INSTAL- LATION

Use special tool MB991953 to install the heated oxygen sensor.



>>B<< RIGHT BANK HEATED OXYGEN SENSOR (FRONT)/ LEFT BANK HEATED OXYGEN SENSOR (FRONT) INSTALLATION

Use special tool MD998770 to install the heated oxygen sensor.



INSPECTION

M1151003400587

Check the following points; replace the part if a problem is found.

Exhaust Manifold Check

1. Check for damage or cracking of any part.
2. Using a straight edge and a feeler gauge, check for distortion of the cylinder head installation surface.

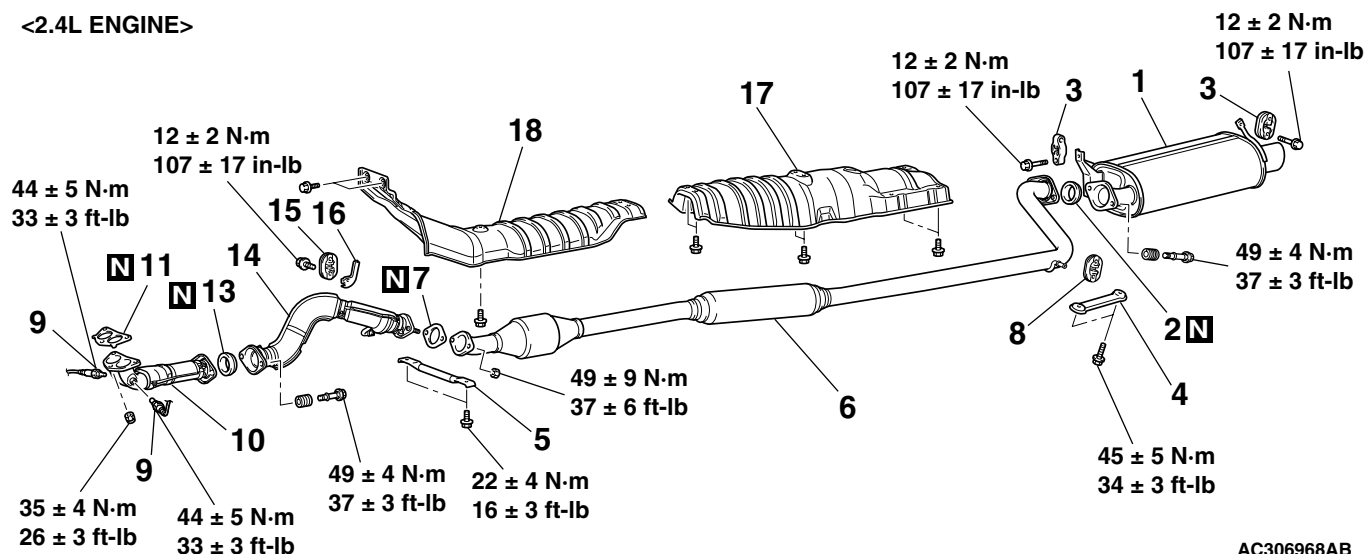
Standard value: 0.15 mm (0.006 inch) or less

Limit: 0.20 mm (0.008 inch)

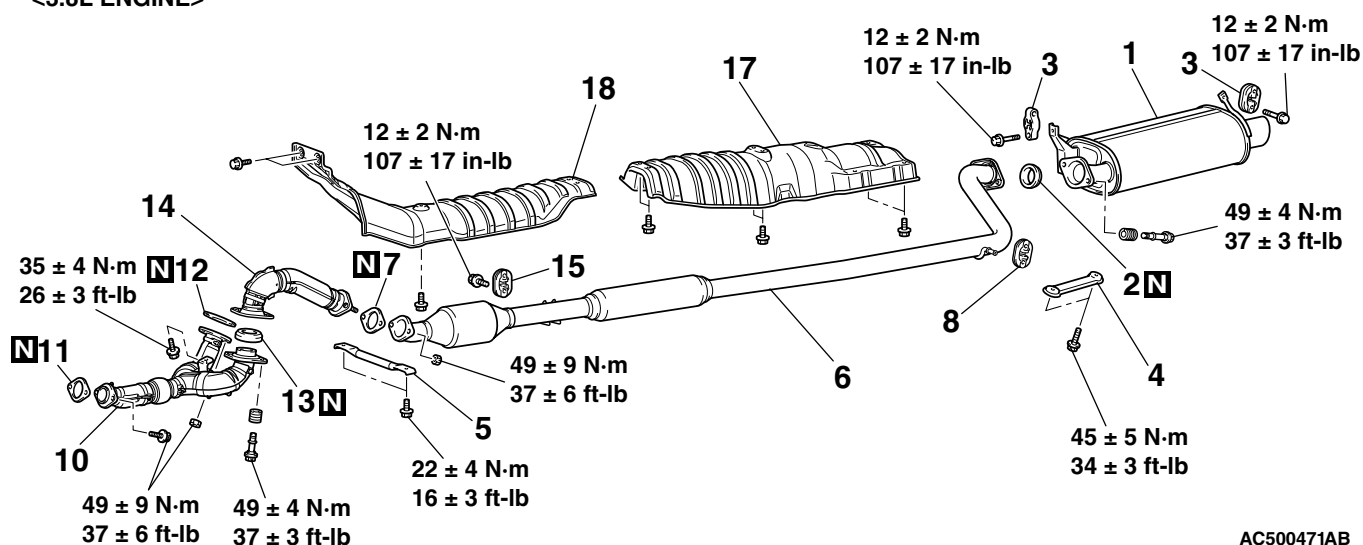
EXHAUST PIPE AND MAIN MUFFLER**REMOVAL AND INSTALLATION**

M1151008700851

<2.4L ENGINE>



<3.8L ENGINE>

**MAIN MUFFLER REMOVAL STEPS**

1. MAIN MUFFLER
2. SEAL RING
3. HANGER

CENTER EXHAUST PIPE REMOVAL STEPS

4. CROSSMEMBER STAY
5. FRONT FLOOR BACKBONE BRACE
6. CENTER EXHAUST PIPE
2. SEAL RING
7. GASKET
8. HANGER

FRONT EXHAUST PIPE REMOVAL STEPS

- <<A>> >>A<<
9. HEATED OXYGEN SENSOR <2.4L ENGINE>
 10. FRONT NO.1 EXHAUST PIPE
 11. GASKET
 12. GASKET <3.8L ENGINE>
 13. SEAL RING
 14. FRONT NO.2 EXHAUST PIPE
 7. GASKET
 15. HANGER
 16. PROTECTOR <2.4L ENGINE>
 17. CENTER UNDER FLOOR HEAT PROTECTOR
 18. FRONT UNDER FLOOR HEAT PROTECTOR

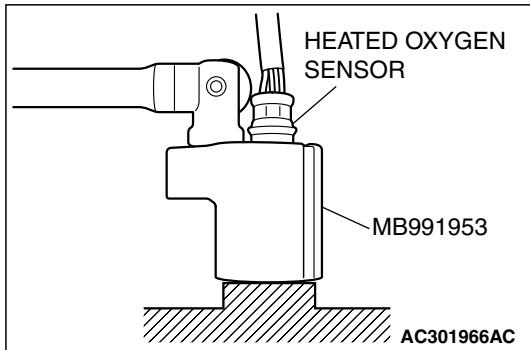
Required Special Tool:

- MB991953: Oxygen Sensor Wrench

REMOVAL SERVICE POINT

<<A>> HEATED OXYGEN SENSOR REMOVAL

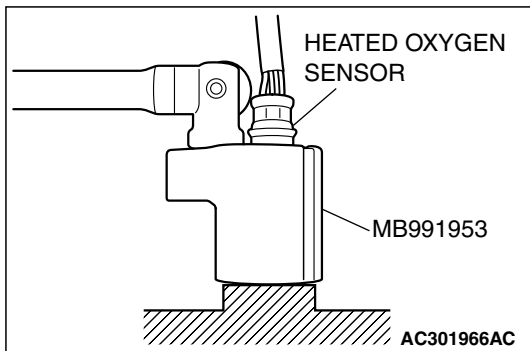
Use special tool MB991953 to remove the heated oxygen sensor.



INSTALLATION SERVICE POINT

>>A<< HEATED OXYGEN SENSOR INSTALLATION

Use special tool MB991953 to install the heated oxygen sensor.



SPECIFICATION(S)

FASTENER TIGHTENING SPECIFICATIONS

M1151006800614

ITEM	SPECIFICATION
Air cleaner	
Air cleaner bolt	8.8 ± 1.0 N·m (78 \pm 9 in-lb)
Air cleaner bracket bolt and nut	12 ± 2 N·m (102 \pm 22 in-lb)
Air cleaner resonator bolt <2.4L ENGINE>	3.0 ± 0.5 N·m (27 \pm 4 in-lb)
Air cleaner resonator bolt	8.8 ± 1.0 N·m (78 \pm 9 in-lb)
Air intake hose clamp bolt	4.0 ± 0.9 N·m (35 \pm 8 in-lb)
Mass airflow sensor bolt	1.8 ± 0.6 N·m (16 \pm 5 in-lb)
Exhaust manifold <2.4L ENGINE>	
Exhaust manifold bracket A bolt	35 ± 6 N·m (26 \pm 4 ft-lb)
Exhaust manifold bracket B bolt	59 ± 10 N·m (44 \pm 7 ft-lb)
Exhaust manifold cover bolt	14 ± 1 N·m (120 \pm 13 in-lb)
Exhaust manifold nut	49 ± 5 N·m (36 \pm 4 ft-lb)
Heated oxygen sensor	44 ± 5 N·m (33 \pm 3 ft-lb)
Exhaust manifold <Left bank> <3.8L ENGINE>	

ITEM		SPECIFICATION
Exhaust manifold nut		44 ± 5 N·m (33 ± 3 ft-lb)
Front exhaust pipe bolt		49 ± 9 N·m (37 ± 6 ft-lb)
Exhaust manifold stay, left A bolt	M8	19 ± 3 N·m (14 ± 2 ft-lb)
	M10	44 ± 8 N·m (33 ± 5 ft-lb)
Heat protector bolt		14 ± 1 N·m (120 ± 13 in-lb)
Heated oxygen sensor		44 ± 5 N·m (33 ± 3 ft-lb)
Exhaust manifold <Right bank> <3.8L ENGINE>		
EGR pipe		59 ± 10 N·m (44 ± 7 ft-lb)
EGR pipe clamp bolt		19 ± 3 N·m (14 ± 2 ft-lb)
EGR pipe connecting nut		19 ± 3 N·m (14 ± 2 ft-lb)
Exhaust manifold nut		44 ± 5 N·m (33 ± 3 ft-lb)
Exhaust manifold stay, right A bolt		75 ± 10 N·m (55 ± 7 ft-lb)
Exhaust manifold stay, right B bolt		44 ± 8 N·m (33 ± 5 ft-lb)
Heat protector bolt		14 ± 1 N·m (120 ± 13 in-lb)
Heated oxygen sensor		44 ± 5 N·m (33 ± 3 ft-lb)
Exhaust pipe and main muffler		
Crossmember stay bolt		45 ± 5 N·m (34 ± 3 ft-lb)
Center exhaust pipe nut		49 ± 9 N·m (37 ± 6 ft-lb)
Front floor backbone brace bolt		22 ± 4 N·m (16 ± 3 ft-lb)
Front no.1 exhaust pipe nut <2.4L ENGINE>		35 ± 4 N·m (26 ± 3 ft-lb)
Front no.2 exhaust pipe bolt <2.4L ENGINE>		49 ± 4 N·m (37 ± 3 ft-lb)
Front no.1 exhaust pipe bolt <3.8L ENGINE>		35 ± 4 N·m (26 ± 3 ft-lb)
Front no.1 exhaust pipe to front no.2 exhaust pipe bolt <3.8L ENGINE>		49 ± 4 N·m (37 ± 3 ft-lb)
Front no.1 exhaust pipe to right bank exhaust manifold nut <3.8L ENGINE>		49 ± 9 N·m (37 ± 6 ft-lb)
Front no.1 exhaust pipe to left bank exhaust manifold bolt <3.8L ENGINE>		49 ± 9 N·m (37 ± 6 ft-lb)
Hanger bolt		12 ± 2 N·m (107 ± 17 in-lb)
Heated oxygen sensor <2.4L ENGINE>		44 ± 5 N·m (33 ± 3 ft-lb)
Main muffler bolt		49 ± 4 N·m (37 ± 3 ft-lb)
Intake manifold <2.4L ENGINE>		
Engine oil dipstick guide bolt		13 ± 1 N·m (115 ± 9 in-lb)
Evaporative emission purge solenoid valve bolt		11 ± 1 N·m (98 ± 8 in-lb)
Evaporative emission vacuum pipe bolt		11 ± 1 N·m (98 ± 8 in-lb)
Exhaust gas recirculation valve bolt		24 ± 3 N·m (18 ± 2 ft-lb)
Harness clamp bolt		11 ± 1 N·m (98 ± 8 in-lb)
Intake manifold bolt		24 ± 3 N·m (18 ± 2 ft-lb)
Intake manifold nut		20 ± 2 N·m (15 ± 1 ft-lb)
Intake manifold stay bolt		31 ± 3 N·m (23 ± 2 ft-lb)
Knock sensor connector bracket bolt		11 ± 1 N·m (98 ± 8 in-lb)
Manifold absolute pressure sensor bolt		5.0 ± 1.0 N·m (44 ± 9 in-lb)
Pressure hose clamp bolt		12 ± 2 N·m (102 ± 22 in-lb)

ITEM		SPECIFICATION
Thermostat case assembly bolt		24 ± 4 N·m (18 ± 3 ft-lb)
Intake manifold <3.8L ENGINE>		
Control harness clamp bolt		11 ± 1 N·m (98 ± 8 in-lb)
Engine mounting stay bolt		36 ± 6 N·m (27 ± 4 ft-lb)
Fuel rail and injector bolt		12 ± 1 N·m (102 ± 13 in-lb)
Intake manifold bolt		22 ± 1 N·m (16 ± 1 ft-lb)
Timing belt front upper cover bolt	M6	11 ± 1 N·m (98 ± 8 in-lb)
	M8	14 ± 1 N·m (120 ± 13 in-lb)
Water pump bracket bolt		24 ± 3 N·m (18 ± 2 ft-lb)
Intake manifold plenum		
Exhaust gas recirculation valve bolt		24 ± 3 N·m (18 ± 2 ft-lb)
EGR pipe		59 ± 10 N·m (44 ± 7 ft-lb)
EGR pipe clamp bolt		19 ± 3 N·m (14 ± 2 ft-lb)
EGR pipe connection nut		19 ± 3 N·m (14 ± 2 ft-lb)
Evaporative emission purge solenoid bolt		9.0 ± 1.0 N·m (80 ± 9 in-lb)
Harness bracket bolt		11 ± 1 N·m (98 ± 8 in-lb)
Intake manifold plenum bolt <3.8L Engine (Except MIVEC)>		18 ± 2 N·m (13 ± 2 ft-lb)
Intake manifold plenum bolt <3.8L Engine-MIVEC>		22 ± 1 N·m (16 ± 1 ft-lb)
Intake manifold plenum stay bolt <3.8L Engine (Except MIVEC)>	M8	18 ± 2 N·m (13 ± 2 ft-lb)
	M10	49 ± 6 N·m (37 ± 4 ft-lb)
Intake manifold plenum stay bolt <3.8L Engine-MIVEC>	M8	22 ± 1 N·m (16 ± 1 ft-lb)
	M10	49 ± 6 N·m (37 ± 4 ft-lb)
Manifold absolute pressure sensor bolt		5.0 ± 1.0 N·m (44 ± 9 in-lb)
Power steering pressure hose clamp nut		12 ± 2 N·m (102 ± 22 in-lb)
Power steering pressure hose clamp bracket bolt		12 ± 2 N·m (102 ± 22 in-lb)
Power steering oil pump bracket connecting bolt		41 ± 8 N·m (30 ± 6 ft-lb)
Vacuum pipe bolt <3.8L Engine (Except MIVEC)>		9.0 ± 1.0 N·m (80 ± 9 in-lb)
Vacuum pipe bolt <3.8L Engine-MIVEC>		11 ± 1 N·m (98 ± 8 in-lb)

SERVICE SPECIFICATION

M1151000300462

ITEM	STANDARD VALUE	LIMIT
Manifold distortion of the installation surface mm (in)	0.15 (0.006) or less	0.20 (0.008)

SEALANTS

M1151000500187

ITEM	SPECIFIED SEALANT
Thermostat case assembly	3M™ AAD Part No.8672, 3M™ AAD Part No.8679/8678 or equivalent
Thermostat case assembly bolt	3M™ AAD Part No. 8730, 8731 or equivalent