

GROUP 15

INTAKE AND EXHAUST

CONTENTS

GENERAL DESCRIPTION.....	15-2	INTAKE MANIFOLD.....	15-7
		REMOVAL AND INSTALLATION	15-7
INTAKE AND EXHAUST DIAGNOSIS	15-2	INSPECTION.....	15-9
INTRODUCTION.....	15-2		
TROUBLESHOOTING STRATEGY	15-2	EXHAUST MANIFOLD	15-10
SYMPTOM CHART.....	15-2	REMOVAL AND INSTALLATION	15-10
SYMPTOM PROCEDURES	15-2	INSPECTION.....	15-13
SPECIAL TOOLS.....	15-3	EXHAUST PIPE AND MAIN MUFFLER	15-14
		REMOVAL AND INSTALLATION	15-14
AIR CLEANER.....	15-4	SPECIFICATIONS	15-16
REMOVAL AND INSTALLATION	15-4	FASTENER TIGHTENING SPECIFICATIONS	15-16
INTAKE MANIFOLD PLENUM	15-5	SERVICE SPECIFICATION	15-18
REMOVAL AND INSTALLATION	15-5	SEALANTS	15-18

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 Step 1.

NO : Go to Step 3.

STEP 3. Check for loose coupling sections.

Q: Are there any loose each sections?

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.

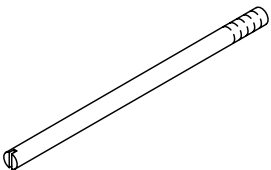
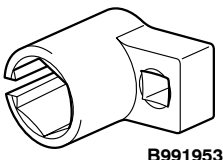
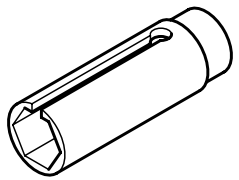
Q: Are any heat protectors loose or damaged?
YES : Tighten or replace, then go to Step 1.
NO : Go to Step 6.

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

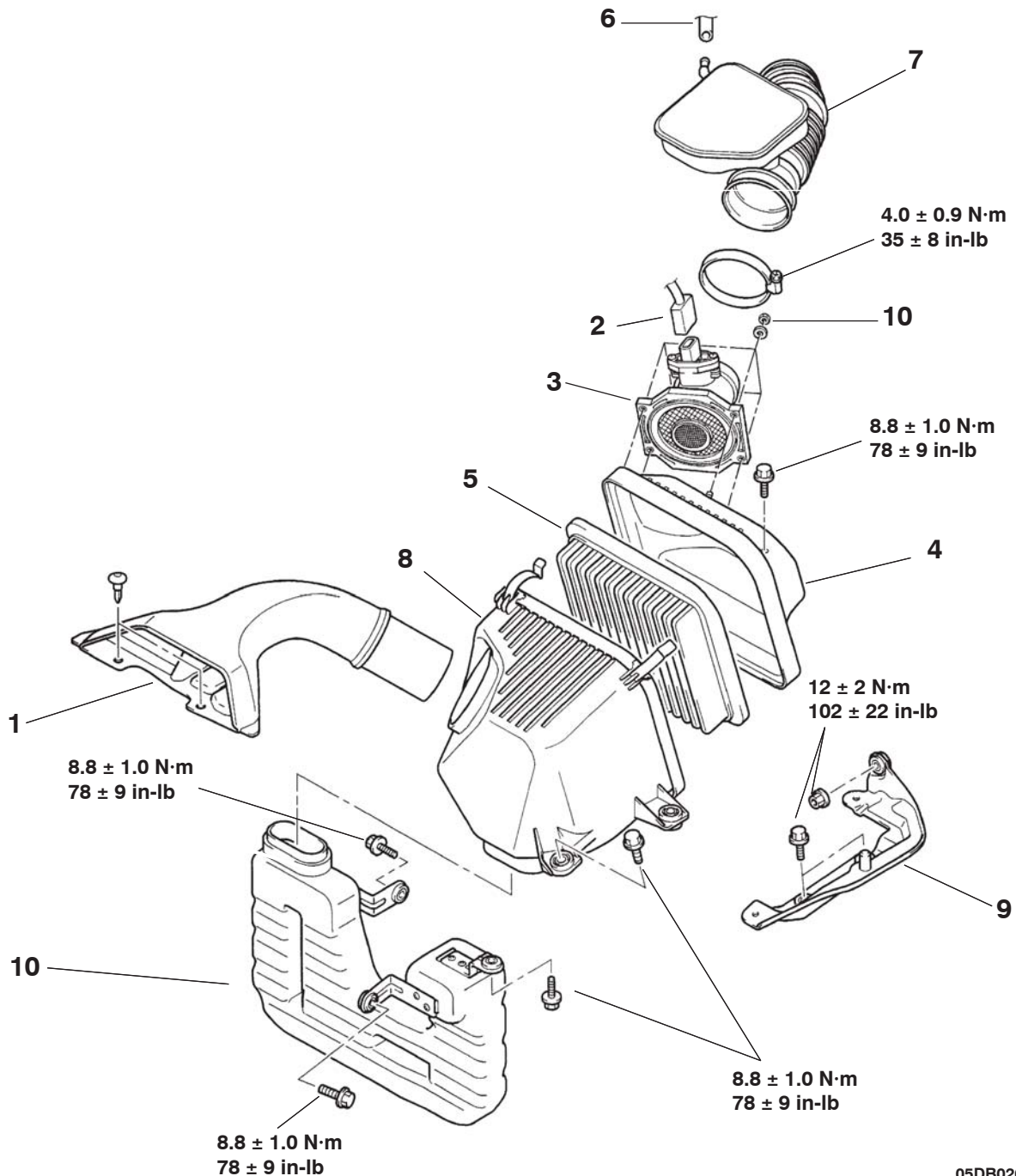
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TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
	MD998412 Guide	MD998412	Installation of intake manifold plenum
	MB991953 Oxygen sensor wrench	-	Removal and installation of heated oxygen sensor
	MD998770 Oxygen sensor wrench	MD998770-01 or General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

AIR CLEANER

REMOVAL AND INSTALLATION

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REMOVAL STEPS

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

REMOVAL STEPS (Continued)

7. AIR INTAKE HOSE
 - ENGINE CONTROL UNIT (ECU)).
8. AIR CLEANER BODY
9. AIR CLEANER BRACKET
 - UNDER COVER (LH)
10. AIRFLOW SENSOR NUT

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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
8. VACUUM HOSE CONNECTION
9. PURGE HOSE
10. POWER STEERING PRESSURE HOSE CLAMP
11. POWER STEERING PRESSURE HOSE CLAMP BRACKET
12. INTAKE MANIFOLD PLENUM STAY, REAR

REMOVAL STEPS (Continued)

- STEERING GEAR AND LINKAGE PROTECTOR (REFER TO 37, STEERING GEAR BOX AND LINKAGE P.37-30)
- POWER STEERING OIL PUMP (REFER TO 37, POWER STEERING OIL PUMP ASSEMBLY P.37-43)
- 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 ASSEMBLY
- 23. HARNESS BRACKET
- 24. MANIFOLD ABSOLUTE PRESSURE SENSOR
- 25. O-RING

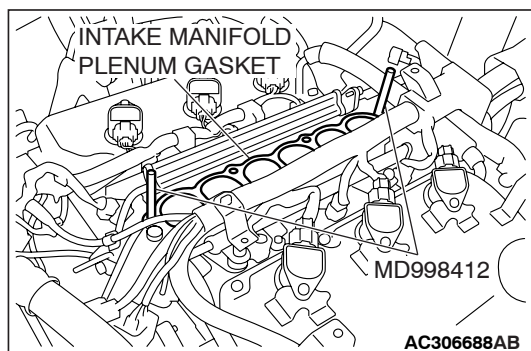
Required Special Tool:

- MD998412: Guide

INSTALLATION SERVICE POINT

>>A<< INTAKE MANIFOLD PLENUM INSTALLATION

Use special tool MD998412 to install the intake manifold plenum.



INTAKE MANIFOLD

REMOVAL AND INSTALLATION

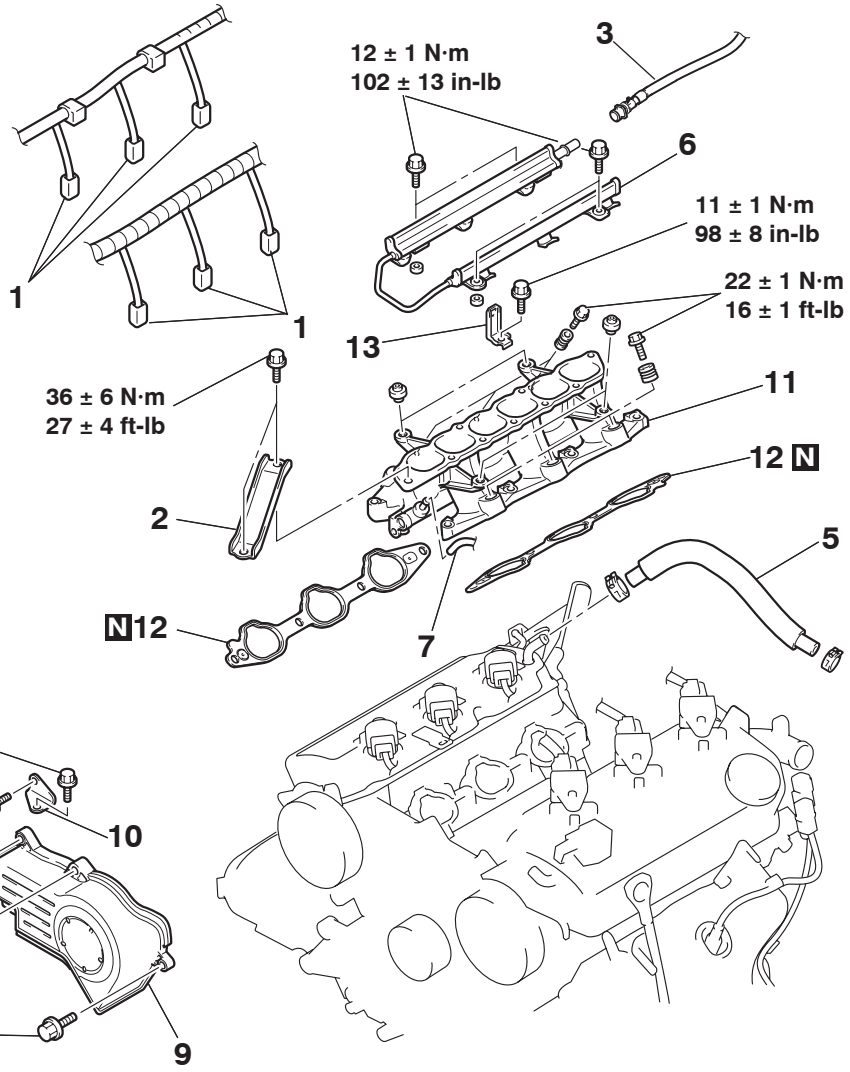
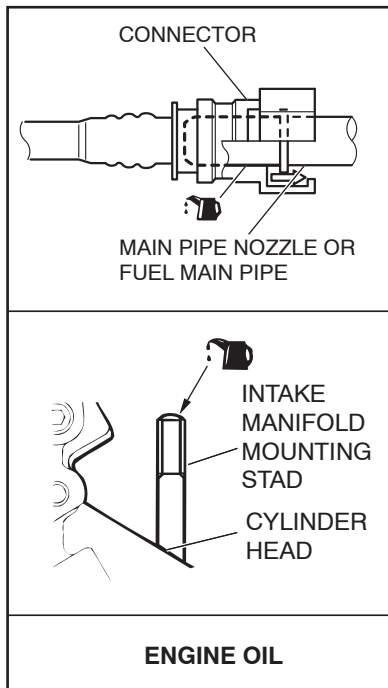
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Pre-removal Operation

- Fuel Discharge Prevention [Refer to GROUP 13B, On-vehicle Service – Fuel Pump Relay Disconnection (How to Reduce Pressurized Fuel Lines) [13A-663.](#)]
- Intake Manifold Plenum Removal (Refer to [P.15-5.](#))

Post-installation Operation

- Intake Manifold Plenum Installation (Refer to [P.15-5.](#))
- Fuel Leakage Inspection



REMOVAL STEPS

- INJECTOR CONNECTOR
- ENGINE MOUNTING STAY
- FUEL HIGH-PRESSURE HOSE CONNECTION
- BLOW-BY HOSE
- FUEL RAIL AND INJECTOR
- PCV HOSE CONNECTION

REMOVAL STEPS (Continued)

- TIMING BELT FRONT UPPER COVER, RIGHT
- TIMING BELT FRONT UPPER COVER, LEFT
- WATER PUMP BRACKET
- INTAKE MANIFOLD
- INTAKE MANIFOLD GASKET
- CONTROL HARNESS CLAMP

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REMOVAL SERVICE POINT

<<A>> FUEL RAIL AND INJECTOR REMOVAL

CAUTION

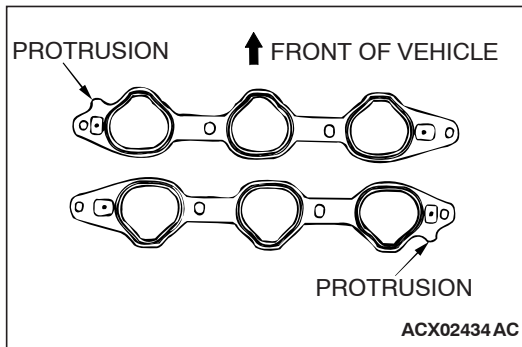
Care must be taken when removing the fuel rail not to drop the injector.

Remove the fuel rail with the injectors attached to it.

INSTALLATION SERVICE POINTS

>>A<< INTAKE MANIFOLD GASKET INSTALLATION

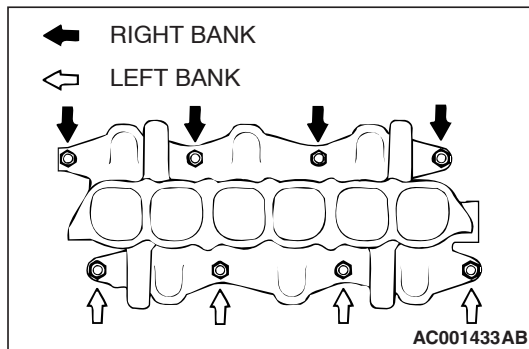
Install the gasket with the protrusions in the position illustrated.



>>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.

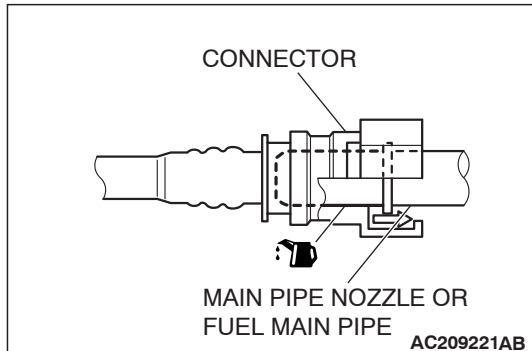
ORDER	MOUNTING NUTS	TIGHTENING TORQUE
1st	Right-bank nuts	6.5 ± 1.5 N·m (58 ± 13 in-lb)
2nd	Left-bank nuts	22 ± 1 N·m (16 ± 1 ft-lb)
3rd	Right-bank nuts	22 ± 1 N·m (16 ± 1 ft-lb)
4th	Left-bank nuts	22 ± 1 N·m (16 ± 1 ft-lb)
5th	Right-bank nuts	22 ± 1 N·m (16 ± 1 ft-lb)



>>C<< FUEL HIGH-PRESSURE HOSE INSTALLATION

CAUTION

- Be careful not to allow any engine oil to enter the fuel rail.
- Be careful not to bend the fuel high-pressure hose as it is made of plastics.



1. When connecting the fuel high-pressure hose to the fuel rail, apply a small amount of new engine oil to the O-ring and then insert the fuel high-pressure hose, being careful not to damage the O-ring.
2. While turning the fuel high-pressure hose to the left and right, install it to the fuel rail.
3. Check that the injector turns smoothly. If it does not turn smoothly, the O-ring may be trapped. Remove the fuel high-pressure hose and then re-insert it into the fuel rail and check again.

INSPECTION

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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.
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

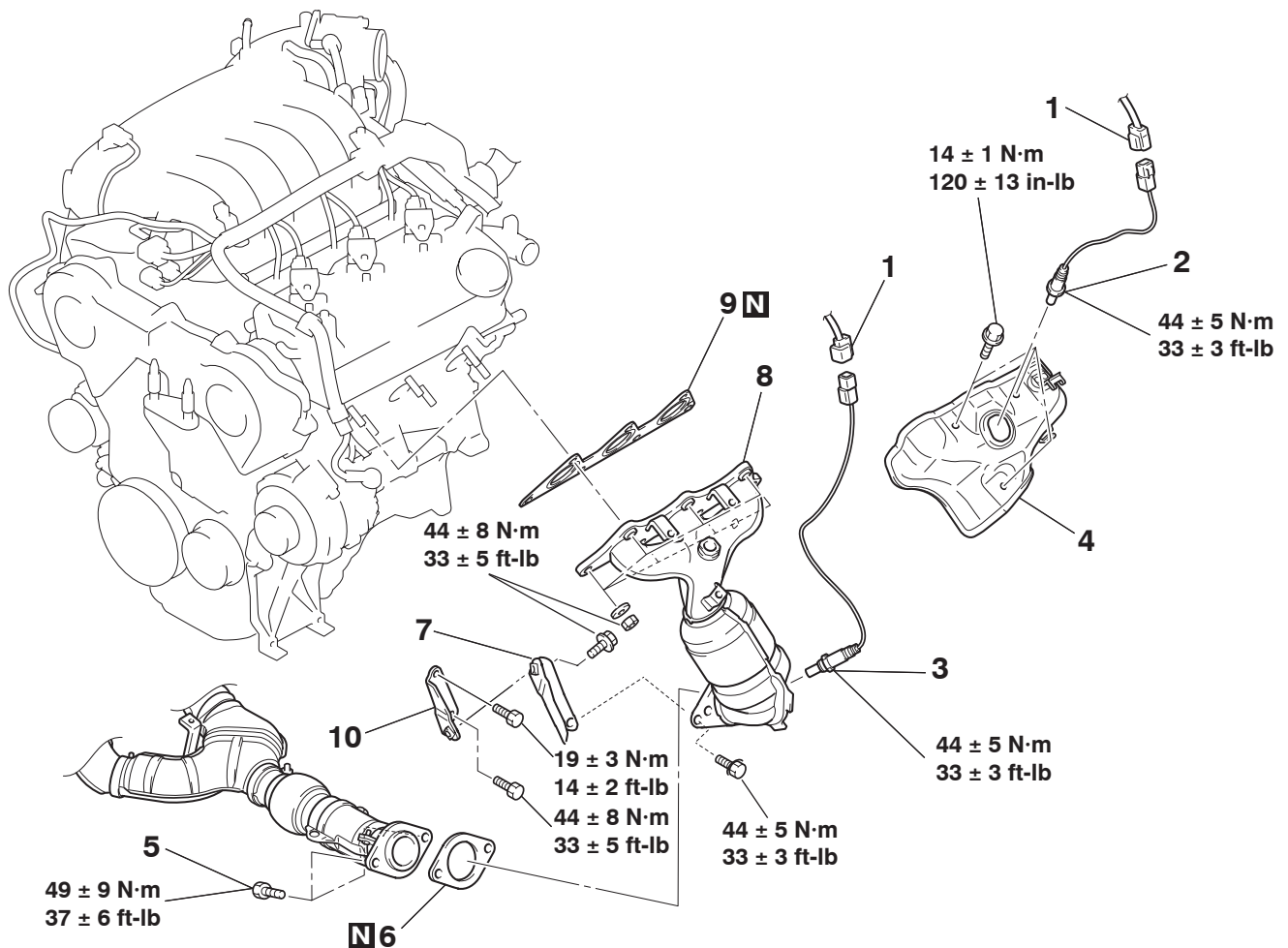
REMOVAL AND INSTALLATION

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<LEFT BANK>

Pre-removal and Post-installation Operation

- Under Cover Removal and Installation (Refer to GROUP 51, Under Cover P.51-13).
- Air Duct Removal and Installation (Refer to P.15-4).



REMOVAL STEPS

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

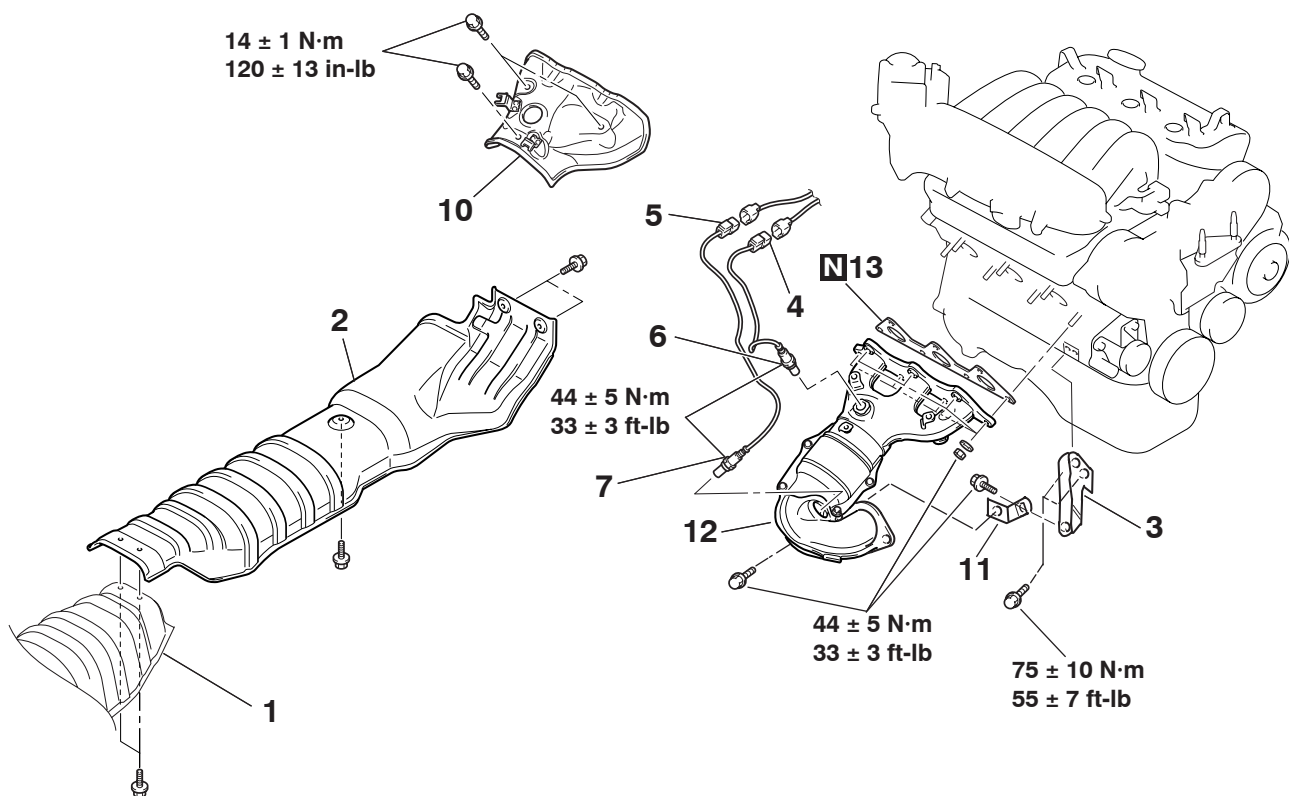
REMOVAL STEPS (Continued)

- 05DB028A
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 and Post-installation Operation

- Air Cleaner Cover and Air Intake Duct Removal and Installation (Refer to P.15-4).
- Battery Removal and Installation
- Under Cover Removal and Installation (Refer to GROUP 51, Under Cover P.51-13).
- Front Exhaust Pipe, Center Exhaust Pipe Removal and Installation (Refer to P.15-14).
- Strut Tower Bar Removal and Installation (Refer to GROUP 42, Strut Tower Bar P.42-12).
- Engine Coolant Draining and Refilling (Refer to GROUP 14, On-vehicle Service – Engine Coolant Replacement P.14-27).



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REMOVAL STEPS

1. CENTER UNDER FLOOR HEAT PROTECTOR
- STEERING GEAR AND LINKAGE PROTECTOR (REFER TO GROUP 37, POWERSTEERING GEAR BOX AND LINKAGE P.37-30)
2. FRONT UNDER FLOOR HEAT PROTECTOR
3. EXHAUST MANIFOLD STAY, RIGHT A
4. RIGHT BANK HEATED OXYGEN SENSOR (FRONT) CONNECTOR

<<A>> >>A<<

<<A>> >>A<<

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)
10. UPPER HEAT PROTECTOR
11. EXHAUST MANIFOLD STAY, RIGHT B
12. EXHAUST MANIFOLD
13. EXHAUST MANIFOLD GASKET

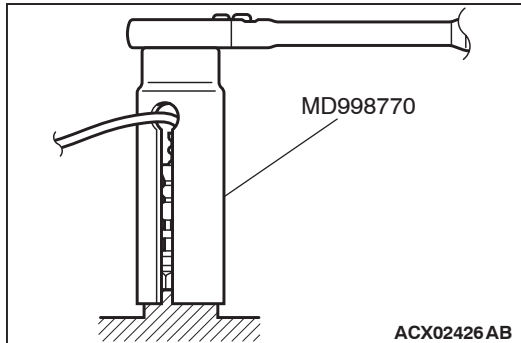
Required Special Tools:

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

REMOVAL SERVICE POINTS

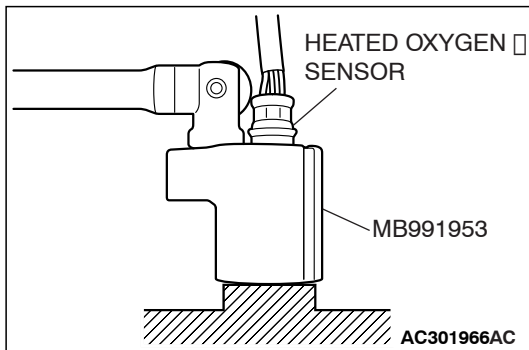
<<A>> LEFT BANK HEATED OXYGEN SENSOR (FRONT)/RIGHT BANK HEATED OXYGEN SENSOR (FRONT)/RIGHT BANK HEATED OXYGEN SENSOR (REAR) REMOVAL

Use special tool MD998770 to remove the heated oxygen sensor.



<> LEFT BANK HEATED OXYGEN SENSOR (REAR) REMOVAL

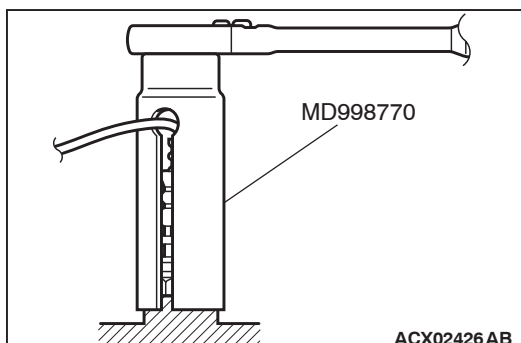
Use special tool MB991953 to remove the heated oxygen sensor.



INSTALLATION SERVICE POINTS

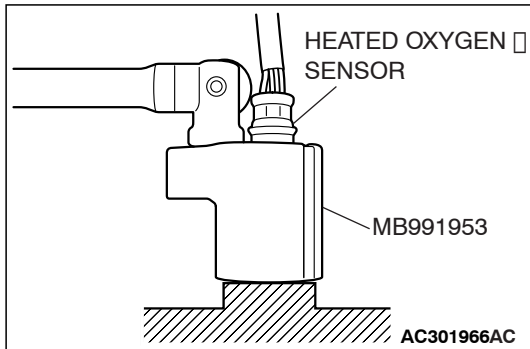
>>A<< RIGHT BANK HEATED OXYGEN SENSOR (REAR)/RIGHT BANK HEATED OXYGEN SENSOR (FRONT)/LEFT BANK HEATED OXYGEN SENSOR (FRONT) INSTALLATION

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.



INSPECTION

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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

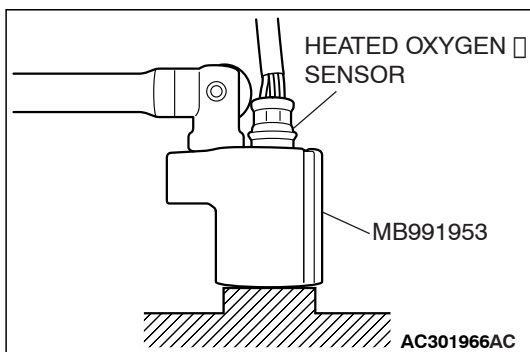
Limit: 0.20 mm (0.008 inch)

REMOVAL AND INSTALLATION

<3.8L ENGINE>



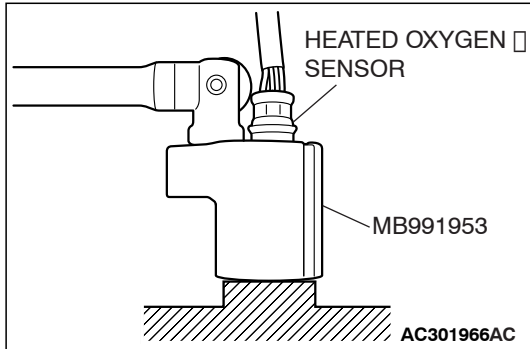
4. CROSSMEMBER STAY
5. FRONT FLOOR BACKBONE BRACE
6. CENTER EXHAUST PIPE
2. SEAL RING
7. GASKET
8. HANGER



INSTALLATION SERVICE POINT

>>A<< HEATED OXYGEN SENSOR INSTALLATION

Use special tool MB991953 to install the heated oxygen sensor.



SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

M1151006800506

ITEM		SPECIFICATION
Air cleaner		
Air cleaner bolt		8.8 ± 1.0 N·m (78 ± 9 in-lb)
Air cleaner bracket bolt and nut		12 ± 2 N·m (102 ± 22 in-lb)
Air cleaner resonator bolt		8.8 ± 1.0 N·m (78 ± 9 in-lb)
Air intake hose clamp bolt		4.0 ± 0.9 N·m (35 ± 8 in-lb)
Airflow sensor nut		8.0 ± 1.0 N·m
Exhaust manifold <Left bank>		
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)
Exhaust manifold stay, left B bolt	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>		
Exhaust manifold nut		44 ± 5 N·m (33 ± 3 ft-lb)
Exhaust manifold stay, right A bolt	M12	75 ± 10 N·m (55 ± 7 ft-lb)
Exhaust manifold stay, right B bolt	M10	44 ± 5 N·m (33 ± 3 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 bolt		35 ± 4 N·m (26 ± 3 ft-lb)
Front no.1 exhaust pipe to front no.2 exhaust pipe bolt		49 ± 4 N·m (37 ± 3 ft-lb)
Front no.1 exhaust pipe to right bank exhaust manifold nut		49 ± 9 N·m (37 ± 6 ft-lb)
Front no.1 exhaust pipe to left bank exhaust manifold bolt		49 ± 9 N·m (37 ± 6 ft-lb)
Hanger bolt		12 ± 2 N·m (107 ± 17 in-lb)
Main muffler bolt		49 ± 4 N·m (37 ± 3 ft-lb)
Heat protector bolt		14 ± 1 N·m (120 ± 13 in-lb)
Intake manifold		
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)

ITEM	SPECIFICATION
Water pump bracket bolt	24 ± 3 N·m (18 ± 2 ft-lb)

ITEM		SPECIFICATION
Intake manifold plenum		
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		18 ± 2 N·m (13 ± 2 ft-lb)
Intake manifold plenum stay bolt	M8	18 ± 2 N·m (13 ± 2 ft-lb)
	M10	36 ± 6 N·m (27 ± 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)

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

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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