

## GROUP 15

# INTAKE AND EXHAUST

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## GENERAL DESCRIPTION

M1151000100457

The exhaust pipe is divided into three parts.

## INTAKE AND EXHAUST DIAGNOSIS

### INTRODUCTION

M1151006900332

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

M1151007000332

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

M1151007100339

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 loosening in each coupling section.**

**Q: Is there any loosening in each 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.**

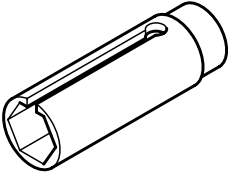
**Q: Are any heat protectors loose or damaged?**  
**YES :** Tighten or replace, then go to Step 1.  
**NO :** Go to Step 6.

**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 TOOL**

M1151000600430

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
	MD998770 Oxygen sensor wrench	MD998770-01 or General service tool	Removal and installation of heated oxygen sensor

## AIR CLEANER

## REMOVAL AND INSTALLATION

M1151002100538

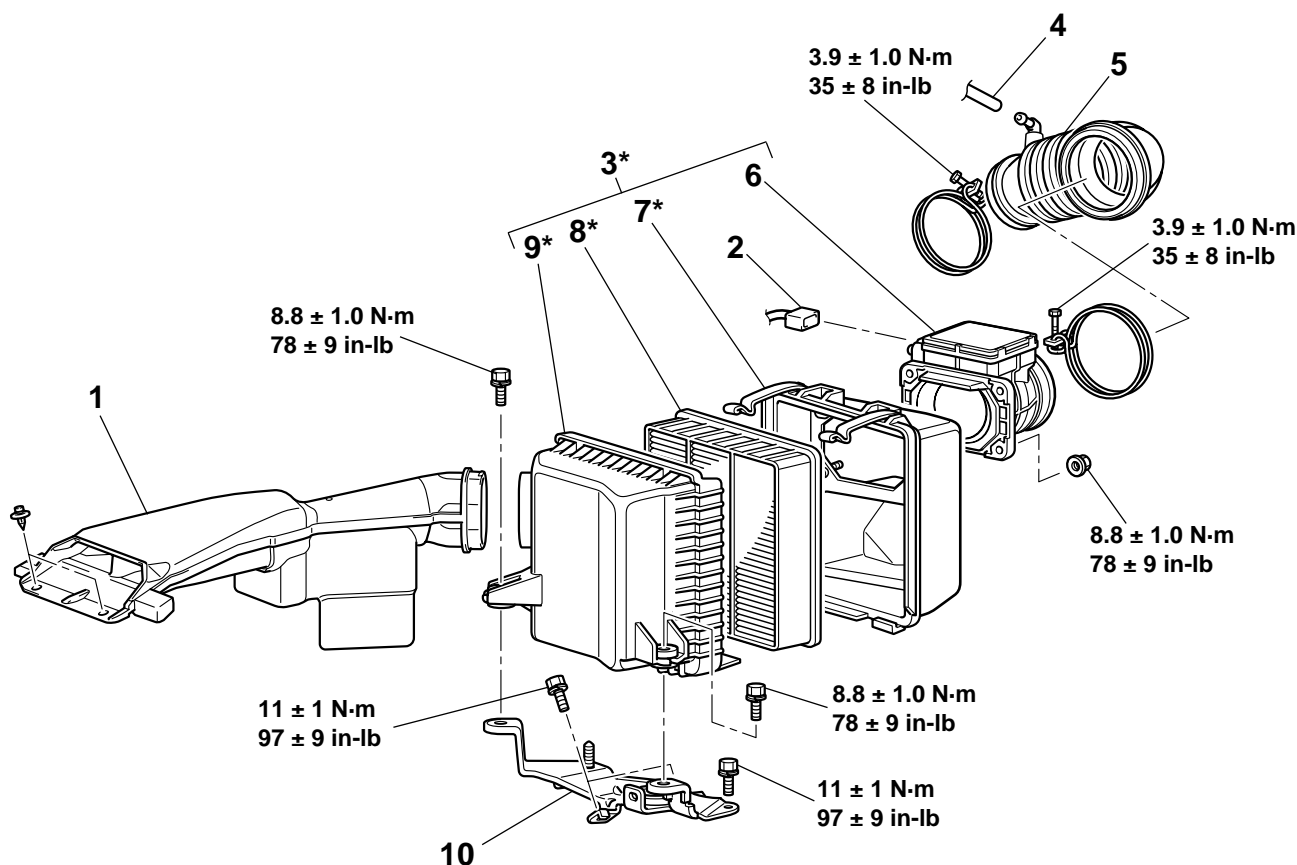
**CAUTION**

Parts marked by \* are made of recycled-paper mixed plastic material, so observe the following precautions.

- Avoid any shock or load to these parts when removing and installing them.
- When installing, securely set the air cleaner housing cover clamp to the air cleaner housing.

*NOTE: Parts marked by \* are made of recycled-paper mixed plastic material. Dispose of according to state and local laws*

## &lt;2.0L ENGINE&gt;



AC308628AB

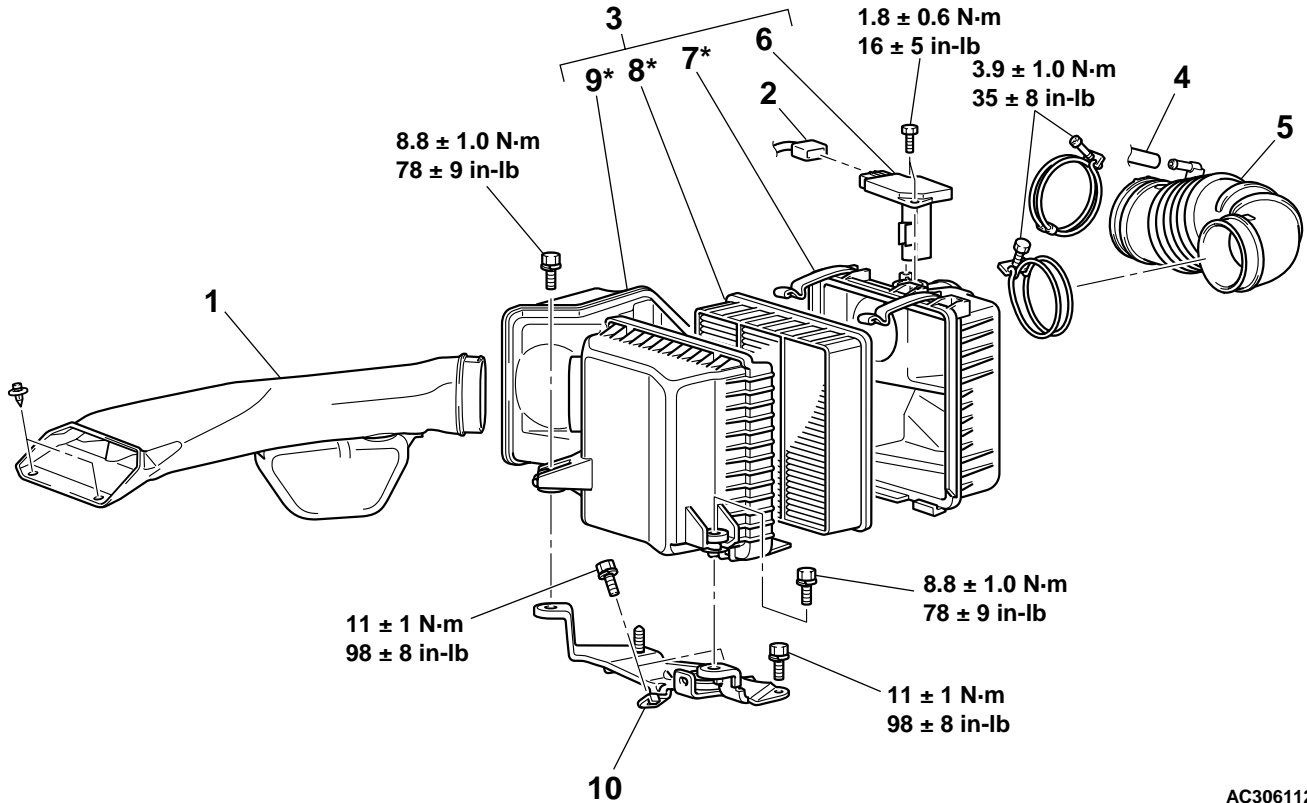
**REMOVAL STEPS**

1. AIR DUCT
2. VOLUME AIR FLOW SENSOR CONNECTOR
3. AIR CLEANER ASSEMBLY
4. ROCKER COVER BREATHER HOSE CONNECTION
5. AIR INTAKE HOSE

**REMOVAL STEPS (Continued)**

6. VOLUME AIR FLOW SENSOR
7. AIR CLEANER HOUSING COVER
8. AIR CLEANER ELEMENT
9. AIR CLEANER HOUSING ASSEMBLY
10. AIR CLEANER BRACKET

<2.4L ENGINE>



AC306112AB

**REMOVAL STEPS**

1. AIR CLEANER INTAKE DUCT
2. MASS AIRFLOW SENSOR CONNECTOR
3. AIR CLEANER AND MASS AIRFLOW SENSOR ASSEMBLY
4. ROCKER COVER BREATHER HOSE CONNECTION
- ENGINE COVER (REFER TO GROUP 11C, CAMSHAFT AND VALVE STEM SEAL [P.11C-27](#))

**REMOVAL STEPS (Continued)**

5. AIR INTAKE HOSE
6. MASS AIRFLOW SENSOR
7. AIR CLEANER HOUSING COVER
8. AIR CLEANER ELEMENT
9. AIR CLEANER HOUSING ASSEMBLY
10. AIR CLEANER BRACKET

# INTAKE MANIFOLD

## REMOVAL AND INSTALLATION <2.0L ENGINE>

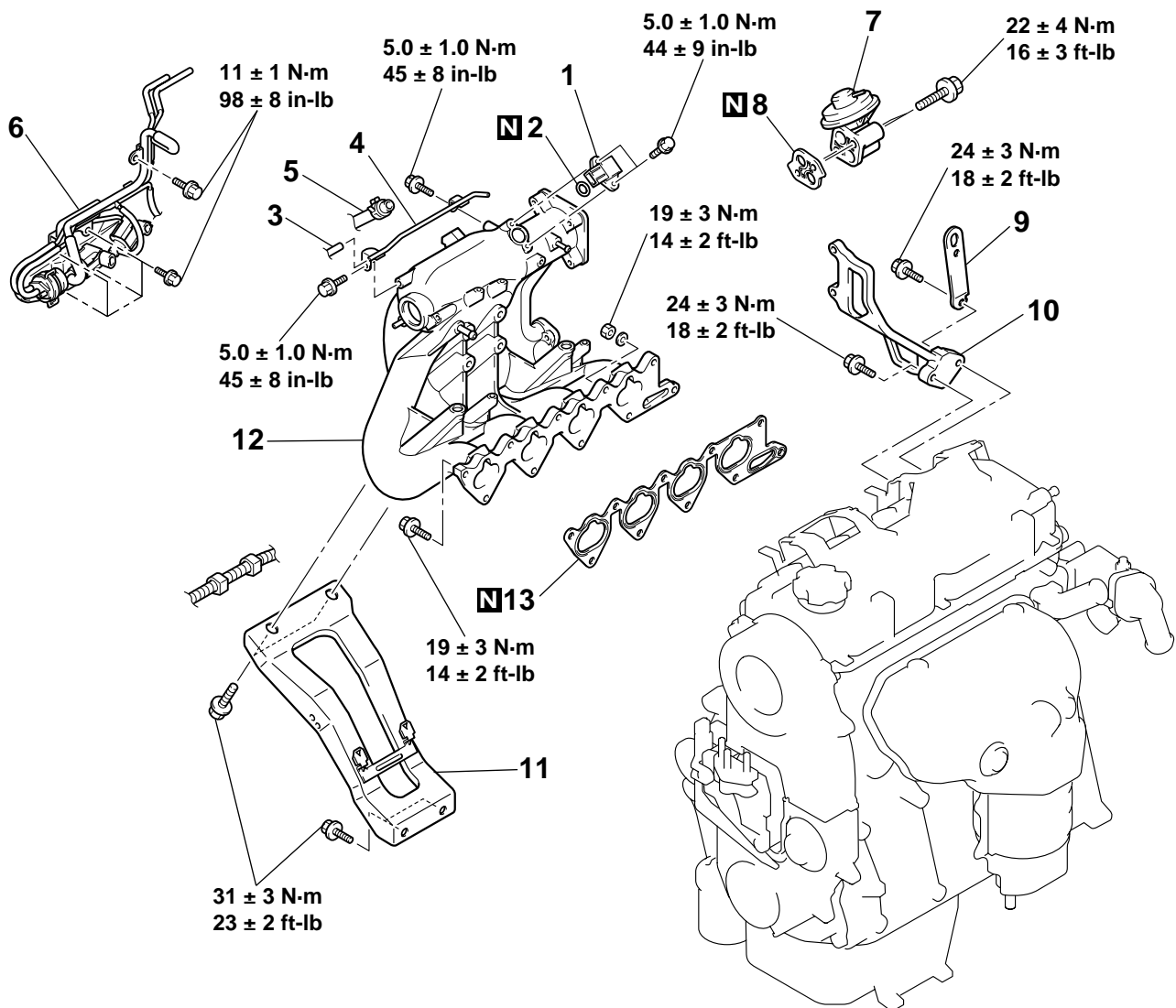
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### Pre-removal Operation

- Fuel Discharge Prevention (Refer to GROUP 13A, On-vehicle Service [P.13A-908.](#))
- Engine Coolant Draining (Refer to GROUP 14, On-vehicle Service [P.14-25.](#))
- Air Cleaner Removal (Refer to [P.15-4.](#))
- Throttle Body Removal (Refer to GROUP 13A, Throttle Body [P.13A-921.](#))
- Fuel Rail and Injector Assembly Removal (Refer to GROUP 13A, Injector [P.13A-919.](#))

### Post-installation Operation

- Fuel Rail and Injector Assembly Installation (Refer to GROUP 13A, Injector [P.13A-919.](#))
- Throttle Body Installation (Refer to GROUP 13B, Throttle Body [P.13B-917.](#))
- Air Cleaner Installation (Refer to [P.15-4.](#))
- Engine Coolant Refilling (Refer to GROUP 14, On-vehicle Service [P.14-25.](#))
- Accelerator Cable Adjustment (Refer to GROUP 17, On-vehicle Service [P.17-6.](#))



AC100800AC

**REMOVAL STEPS**

1. MANIFOLD ABSOLUTE PRESSURE  
SENSOR
2. O-RING
3. AUTO CRUISE VACUUM HOSE  
CONNECTION
4. VACUUM PIPE
5. BRAKE BOOSTER VACUUM HOSE  
CONNECTION

**REMOVAL STEPS (Continued)**

6. VACUUM HOSE AND PIPE  
ASSEMBLY
7. EGR VALVE
8. EGR VALVE GASKET
9. ENGINE HANGER
10. THROTTLE BODY STAY
11. INTAKE MANIFOLD STAY
12. INTAKE MANIFOLD
13. INTAKE MANIFOLD GASKET

## REMOVAL AND INSTALLATION &lt;2.4L ENGINE&gt;

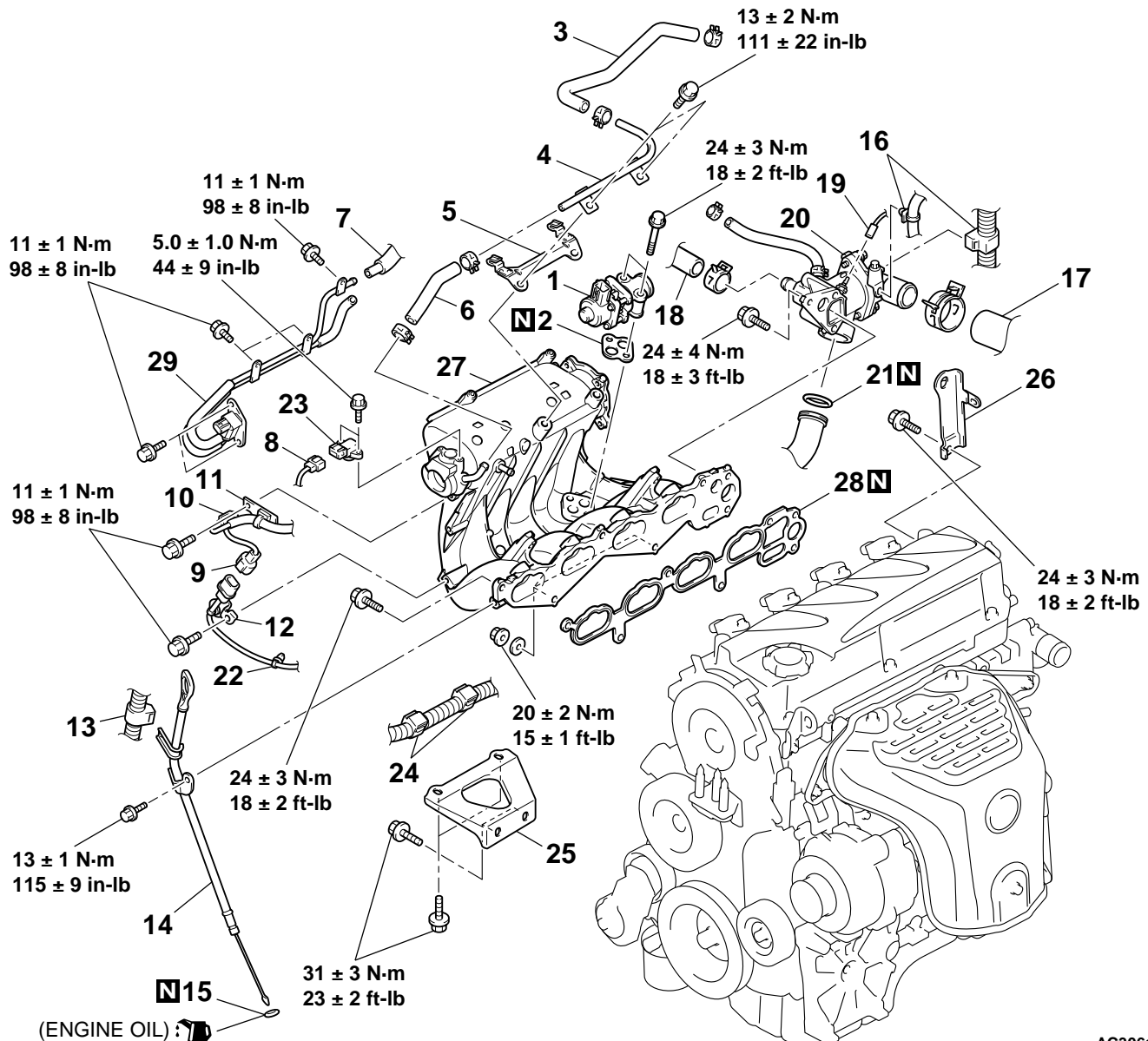
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**Pre-removal Operation**

- Fuel Discharge Prevention (Refer to GROUP 13B, On-vehicle Service [P.13B-906](#)).
- Engine Coolant Draining (Refer to GROUP 14, On-vehicle Service [P.14-25](#)).
- Engine Cover Removal (Refer to GROUP 11C, Camshaft and Valve Stem Seal [P.11C-27](#)).
- Air Cleaner Removal (Refer to [P.15-4](#)).
- Strut Tower Bar Removal (Refer to GROUP 42, Strut Tower Bar [P.42-12](#)). <Vehicles with Strut Tower Bar>
- Throttle Body Removal (Refer to GROUP 13B, Throttle Body [P.13B-917](#)).
- Fuel Rail and Injector Assembly Removal (Refer to GROUP 13B, Injector [P.13B-915](#)).

**Post-installation Operation**

- Engine Coolant Refilling (Refer to GROUP 14, On-vehicle Service [P.14-25](#)).
- Fuel Rail and Injector Assembly Installation (Refer to GROUP 13B, Injector [P.13B-915](#)).
- Throttle Body Installation (Refer to GROUP 13B, Throttle Body [P.13B-917](#)).
- Strut Tower Bar Installation (Refer to GROUP 42, Strut Tower Bar [P.42-12](#)). <Vehicles with Strut Tower Bar>
- Air Cleaner Installation (Refer to [P.15-4](#)).
- Engine Cover Installation (Refer to GROUP 11C, Camshaft and Valve Stem Seal [P.11C-27](#)).

**REMOVAL STEPS**

1. EGR VALVE
2. EGR VALVE GASKET
3. BRAKE BOOSTER VACUUM HOSE
4. BRAKE BOOSTER VACUUM PIPE

**REMOVAL STEPS (Continued)**

5. ENGINE COVER BRACKET
6. BRAKE BOOSTER VACUUM HOSE



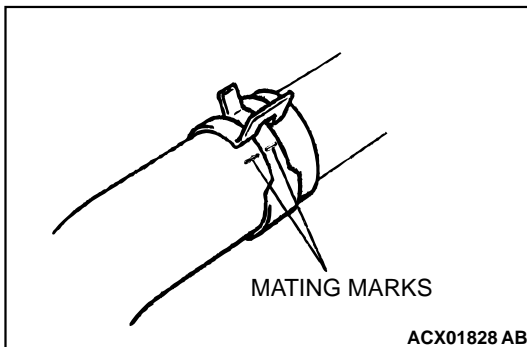
**REMOVAL STEPS (Continued)**

7. EVAPORATIVE EMISSION  
CANISTER VACUUM HOSE  
CONNECTION
8. MANIFOLD ABSOLUTE PRESSURE  
SENSOR CONNECTOR
9. KNOCK SENSOR CONNECTOR
10. EVAPORATIVE EMISSION PURGE  
SOLENOID VALVE CONNECTOR
11. HARNESS CRAMP
12. KNOCK SENSOR CONNECTOR  
CRAMP
13. HARNESS CRAMP
14. OIL DIPSTICK GUIDE
15. O-RING
16. HARNESS CRAMP
- <<A>> >>B<< 17. RADIATOR LOWER HOSE  
CONNECTION
18. HEATER HOSE CONNECTION
19. ENGINE COOLANT TEMPERATURE  
GAUGE UNIT CONNECTOR
- >>A<< 20. THERMOSTAT CASE ASSEMBLY
21. O-RING
22. KNOCK SENSOR HARNESS  
CRAMP
23. MANIFOLD ABSOLUTE PRESSURE  
SENSOR
24. HARNESS CRAMP
25. INTAKE MANIFOLD STAY
26. ENGINE HANGER
27. INTAKE MANIFOLD
28. INTAKE MANIFOLD GASKET
29. 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.

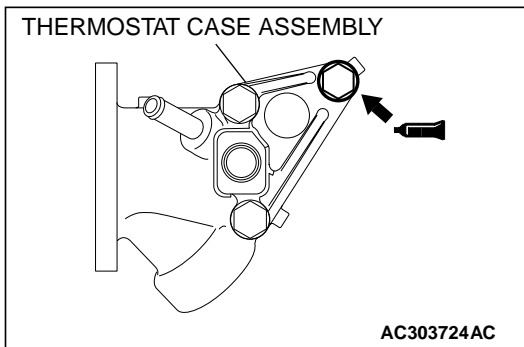
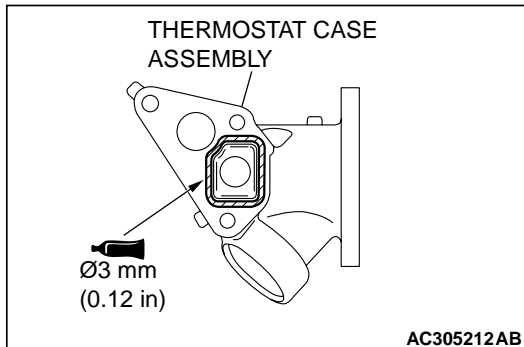


## INSTALLATION SERVICE POINTS

## &gt;&gt;A&lt;&lt; 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 as shown.

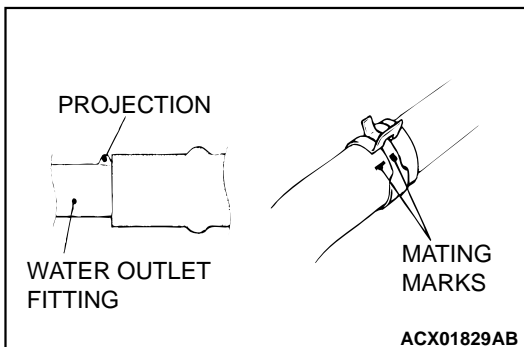
**Specified Sealant: 3M™ AAD part No.8672, 3M™ AAD part No.8679/8678 or equivalent**



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

**Specified Sealant: 3M™ AAD part No.4170 or equivalent**

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



## &gt;&gt;B&lt;&lt; RADIATOR LOWER HOSE CONNECTION

1. Insert each hose as far as the projection of the water inlet fitting.
2. Align the mating marks on the radiator hose and hose clamp, and then connect the radiator hose.

## INSPECTION

M1151003100661

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.

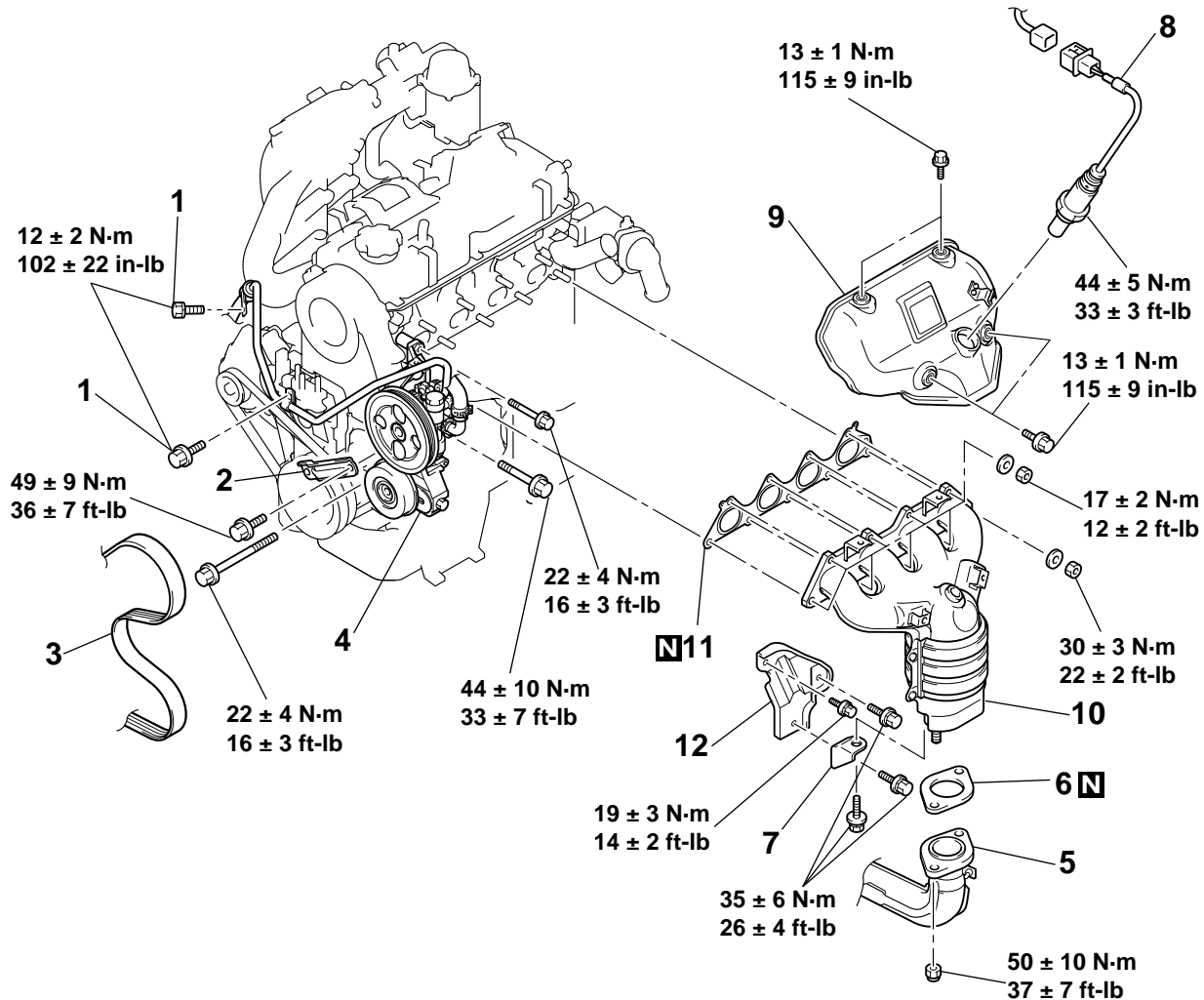
**Standard value: 0.15 mm (0.006 inch) or less**  
**Limit: 0.20 mm (0.008 inch)**

# EXHAUST MANIFOLD

## REMOVAL AND INSTALLATION <2.0L ENGINE>

M1151003300698

**Pre-removal and Post-installation Operation**  
Under Cover Removal and Installation



AC101474 AB

### REMOVAL STEPS

1. PRESSURE HOSE CLAMP BOLT
2. POWER STEERING PUMP BRACKET STAY BOLT
3. POWER STEERING PUMP AND A/C COMPRESSOR DRIVE BELT
4. POWER STEERING OIL PUMP AND BRACKET ASSEMBLY
5. FRONT EXHAUST PIPE CONNECTION

### REMOVAL STEPS (Continued)

6. FRONT EXHAUST PIPE GASKET
7. EXHAUST MANIFOLD BRACKET B
8. HEATED OXYGEN SENSOR
9. HEAT PROTECTOR
10. EXHAUST MANIFOLD
11. EXHAUST MANIFOLD GASKET
12. EXHAUST MANIFOLD BRACKET A

<<A>>

## REMOVAL SERVICE POINT

<<A>> POWER STEERING OIL PUMP AND BRACKET  
ASSEMBLY REMOVAL

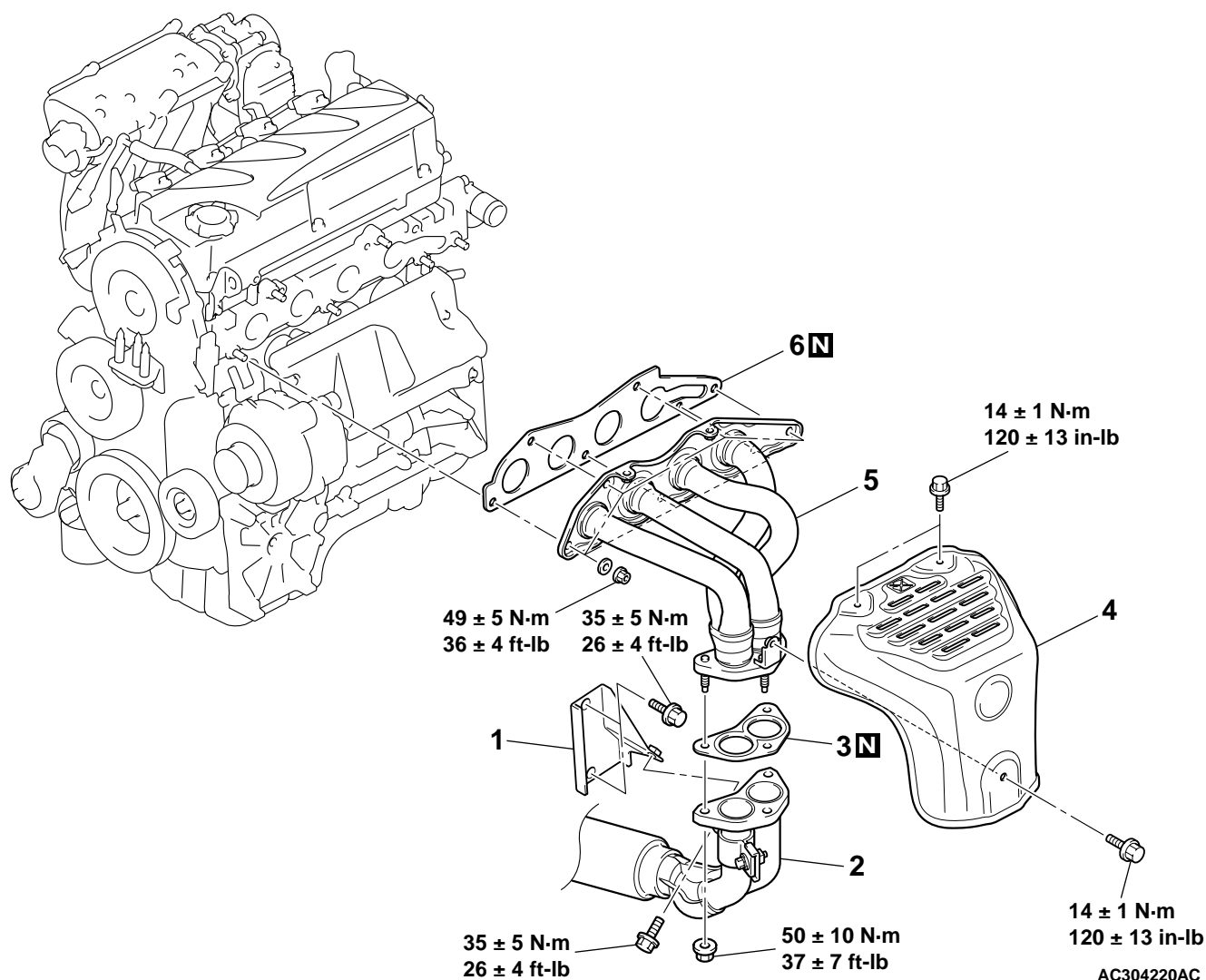
With the hose installed, remove power steering oil pump and bracket assembly.

*NOTE: Tie the removed power steering oil pump and bracket assembly, with strings at a position where they will not interfere with the installation or removal of the exhaust manifold.*

## REMOVAL AND INSTALLATION &lt;2.4L ENGINE&gt;

M1151003300687

**Pre-removal and Post-installation Operation**  
Under Cover Removal and Installation.



## REMOVAL STEPS

1. FRONT EXHAUST PIPE BRACKET
2. FRONT EXHAUST PIPE CONNECTION
3. GASKET

## REMOVAL STEPS (Continued)

4. HEAT PROTECTOR
5. EXHAUST MANIFOLD
6. EXHAUST MANIFOLD GASKET

## INSPECTION

M1151003400576

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**

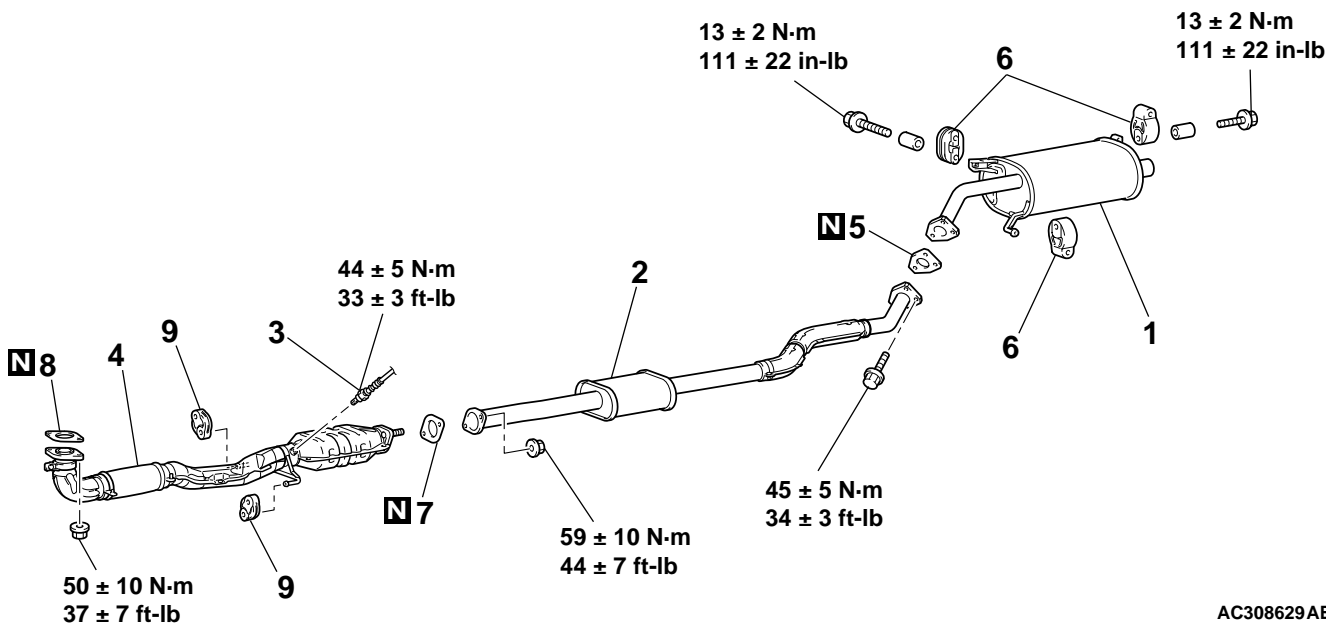
**Limit: 0.20 mm (0.008 inch)**

# EXHAUST PIPE AND MAIN MUFFLER

## REMOVAL AND INSTALLATION

M1151008700345

<2.0L ENGINE>



AC308629AB

### MAIN MUFFLER REMOVAL STEPS

1. MAIN MUFFLER
5. GASKET
6. HANGER

### CENTER EXHAUST PIPE REMOVAL STEPS

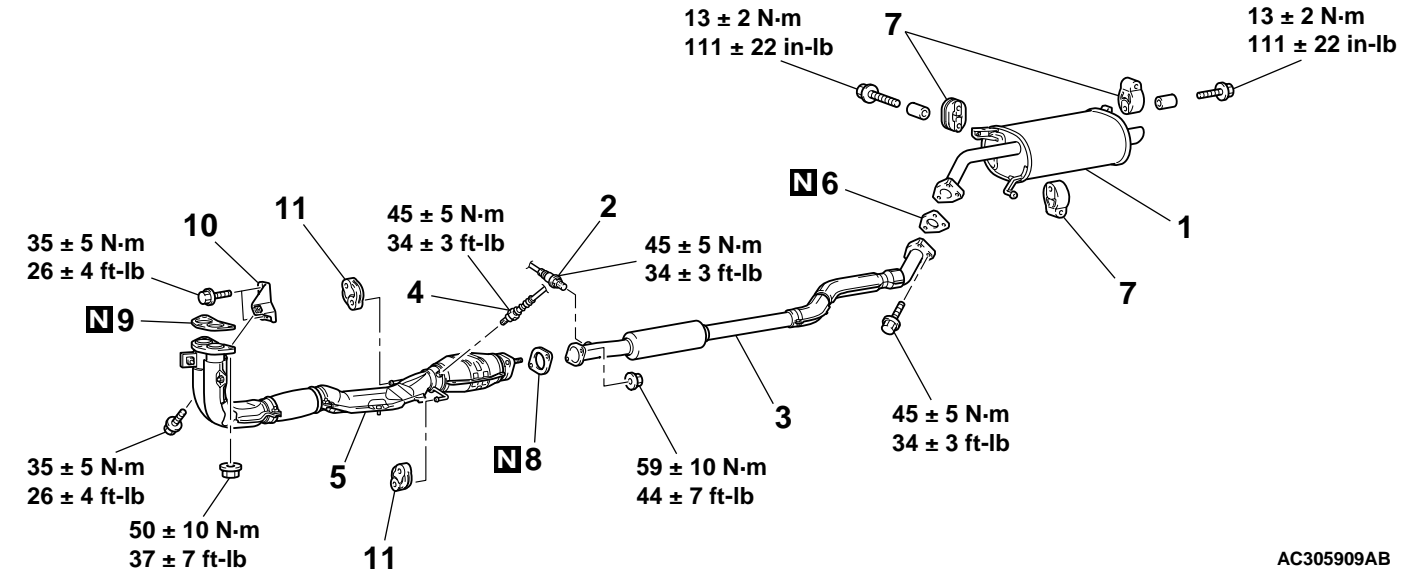
2. CENTER EXHAUST PIPE
5. GASKET
7. GASKET

### FRONT EXHAUST PIPE REMOVAL STEPS

- UNDER COVER
- 3. HEATED OXYGEN SENSOR
- 4. FRONT EXHAUST PIPE (INCORPORATING CATALYTIC CONVERTER)
- 7. GASKET
- 8. GASKET
- 9. HANGER

<<A>> >>A<<

## &lt;2.4L ENGINE&gt;



AC305909AB

**MAIN MUFFLER REMOVAL STEPS**

1. MAIN MUFFLER
6. GASKET
7. HANGER

**CENTER EXHAUST PIPE  
REMOVAL STEPS**

- <<A>> >>A<<
2. HEATED OXYGEN SENSOR (REAR)
  3. CENTER EXHAUST PIPE
  6. GASKET
  8. GASKET

**FRONT EXHAUST PIPE REMOVAL  
STEPS**

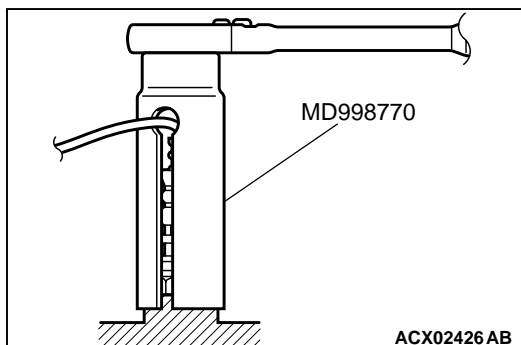
- UNDER COVER
- <<A>> >>A<<
4. HEATED OXYGEN SENSOR (FRONT)
  5. FRONT EXHAUST PIPE (INCORPORATING CATALYTIC CONVERTER)
  8. GASKET
  9. GASKET
  10. FRONT EXHAUST PIPE BRACKET
  11. HANGER

**Required Special Tool:**

- MD998770: Oxygen Sensor Wrench

**REMOVAL SERVICE POINT****<<A>> HEATED OXYGEN SENSOR (REAR)/HEATED OXY-  
GEN SENSOR (FRONT) REMOVAL**

Use special tool MD998770 to remove the oxygen sensor.

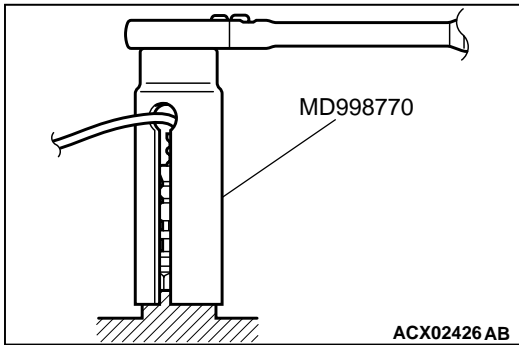


ACX02426 AB

## INSTALLATION SERVICE POINT

### >>A<< HEATED OXYGEN SENSOR (FRONT)/HEATED OXY- GEN SENSOR (REAR) INSTALLATION

Use special tool MD998770 to install the oxygen sensor.



## SPECIFICATIONS

## FASTENER TIGHTENING SPECIFICATIONS

M1151006800380

ITEM		SPECIFICATION
<b>Air cleaner &lt;2.0L ENGINE&gt;</b>		
Air cleaner bolt		$8.8 \pm 1.0$ N·m (78 ± 9 in-lb)
Air cleaner bracket bolt		$11 \pm 1$ N·m (97 ± 9 in-lb)
Air flow sensor assembly nut		$8.8 \pm 1.0$ N·m (78 ± 9 in-lb)
Air intake hose clamp bolt		$3.9 \pm 1.0$ N·m (35 ± 8 in-lb)
<b>Air cleaner &lt;2.4L ENGINE&gt;</b>		
Air cleaner bracket bolt		$11 \pm 1$ N·m (98 ± 8 in-lb)
Air cleaner housing assembly bolt		$8.8 \pm 1.0$ N·m (78 ± 9 in-lb)
Air intake hose clamp bolt		$3.9 \pm 1.0$ N·m (35 ± 8 in-lb)
Mass airflow sensor assembly bolt		$1.8 \pm 0.6$ N·m (16 ± 5 in-lb)
<b>Exhaust manifold &lt;2.0L ENGINE&gt;</b>		
Exhaust manifold bracket bolt	M8	$19 \pm 3$ N·m (14 ± 2 ft-lb)
	M10	$35 \pm 6$ N·m (26 ± 4 ft-lb)
Exhaust manifold nut	M8	$17 \pm 2$ N·m (12 ± 2 ft-lb)
	M10	$30 \pm 3$ N·m (22 ± 2 ft-lb)
Front exhaust pipe nut		$50 \pm 10$ N·m (37 ± 7 ft-lb)
Heat protector bolt		$13 \pm 1$ N·m (115 ± 9 in-lb)
Heated oxygen sensor		$44 \pm 5$ N·m (33 ± 3 ft-lb)
Power steering pump bracket stay bolt		$49 \pm 9$ N·m (36 ± 7 ft-lb)
Power steering oil pump and bracket assembly bolt	M8	$22 \pm 4$ N·m (16 ± 3 ft-lb)
	M10	$44 \pm 10$ N·m (33 ± 7 ft-lb)
Pressure hose clamp bolt		$12 \pm 2$ N·m (102 ± 22 in-lb)
<b>Exhaust manifold &lt;2.4L ENGINE&gt;</b>		
Exhaust manifold nut		$49 \pm 5$ N·m (36 ± 4 ft-lb)
Front exhaust pipe nut		$50 \pm 10$ N·m (37 ± 7 ft-lb)
Front exhaust pipe bracket bolt		$35 \pm 5$ N·m (26 ± 4 ft-lb)
Heat protector bolt		$14 \pm 1$ N·m (120 ± 13 in-lb)
<b>Exhaust pipe and main muffler &lt;2.0L ENGINE&gt;</b>		
Center exhaust pipe bolt		$45 \pm 5$ N·m (34 ± 3 ft-lb)
Center exhaust pipe nut		$59 \pm 10$ N·m (44 ± 7 ft-lb)
Front exhaust pipe nut		$50 \pm 10$ N·m (37 ± 7 ft-lb)
Hanger bolt		$13 \pm 2$ N·m (111 ± 22 in-lb)
Heated oxygen sensor		$44 \pm 5$ N·m (33 ± 3 ft-lb)
<b>Exhaust pipe and main muffler &lt;2.4L ENGINE&gt;</b>		
Center exhaust pipe bolt		$45 \pm 5$ N·m (34 ± 3 ft-lb)
Center exhaust pipe nut		$59 \pm 10$ N·m (44 ± 7 ft-lb)
Front exhaust pipe bracket bolt		$35 \pm 5$ N·m (26 ± 4 ft-lb)



ITEM	SPECIFICATION
Front exhaust pipe nut	50 ± 10 N·m (37 ± 7 ft-lb)
Hanger bolt	13 ± 2 N·m (111 ± 22 in-lb)
Heated oxygen sensor (front)	45 ± 5 N·m (34 ± 3 ft-lb)
Heated oxygen sensor (rear)	45 ± 5 N·m (34 ± 3 ft-lb)
<b>Intake manifold &lt;2.0L ENGINE&gt;</b>	
EGR valve bolt	22 ± 4 N·m (16 ± 3 ft-lb)
Engine hanger bolt	24 ± 3 N·m (18 ± 2 ft-lb)
Intake manifold bolt and nut	19 ± 3 N·m (14 ± 2 ft-lb)
Intake manifold stay bolt	31 ± 3 N·m (23 ± 2 ft-lb)
Manifold absolute pressure sensor bolt	5.0 ± 1.0 N·m (44 ± 9 in-lb)
Throttle body stay bolt	24 ± 3 N·m (18 ± 2 ft-lb)
Vacuum hose and pipe assembly bolt	11 ± 1 N·m (98 ± 8 in-lb)
Vacuum pipe bolt	5.0 ± 1.0 N·m (45 ± 8 in-lb)
<b>Intake manifold &lt;2.4L ENGINE&gt;</b>	
Brake booster vacuum pipe bolt	13 ± 2 N·m (111 ± 22 in-lb)
EGR valve bolt	24 ± 3 N·m (18 ± 2 ft-lb)
Engine hanger bolt	24 ± 3 N·m (18 ± 2 ft-lb)
Evaporative emission purge solenoid valve, evaporative emission vacuum hose and pipe assembly bolt	11 ± 1 N·m (98 ± 8 in-lb)
Exhaust gas recirculation valve bolt	24 ± 3 N·m (18 ± 2 ft-lb)
Harness cramp 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 cramp bolt	11 ± 1 N·m (98 ± 8 in-lb)
Manifold absolute pressure sensor bolt	5.0 ± 1.0 N·m (44 ± 9 in-lb)
Oil dipstick guide bolt	13 ± 1 N·m (115 ± 9 in-lb)
Thermostat case assembly bolt	24 ± 4 N·m (18 ± 3 ft-lb)

## SERVICE SPECIFICATION

M1151000300473

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

## SEALANTS

M1151000500198

ITEM	SPECIFIED SEALANT
Thermostat case assembly <2.4L ENGINE>	3M™ AAD Part No.8672, 3M™ AAD Part No.8679/8678 or equivalent
Thermostat case assembly bolt <2.4L ENGINE>	3M™ AAD Part No.4170 or equivalent

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## NOTES