

GROUP 15

INTAKE AND EXHAUST

CONTENTS

GENERAL INFORMATION.....	15-2	INTAKE MANIFOLD.....	15-8
SERVICE SPECIFICATION.....	15-2	REMOVAL AND INSTALLATION.....	15-8
		INSPECTION.....	15-11
ON-VEHICLE SERVICE.....	15-2	EXHAUST MANIFOLD.....	15-11
INTAKE MANIFOLD TUNING SYSTEM CHECK		REMOVAL AND INSTALLATION.....	15-11
.....	15-2	INSPECTION.....	15-15
INTAKE MANIFOLD TUNING SOLENOID			
CHECK.....	15-2	EXHAUST PIPE AND MAIN MUFFLER	
VACUUM TANK CHECK <6G7>.....	15-3		15-16
		REMOVAL AND INSTALLATION.....	15-16
INTAKE AND EXHAUST DIAGNOSIS			
.....	15-3		
INTRODUCTION.....	15-3		
TROUBLESHOOTING STRATEGY.....	15-4		
SYMPTOM CHART.....	15-4		
SYMPTOM PROCEDURES.....	15-4		
Inspection Procedure 1: Exhaust			
Leakage.....	15-4		
Inspection Procedure 2: Abnormal Noise			
.....	15-4		
SPECIAL TOOLS.....	15-5		
AIR CLEANER.....	15-6		
REMOVAL AND INSTALLATION.....	15-6		
INTAKE MANIFOLD PLENUM.....	15-7		
REMOVAL AND INSTALLATION.....	15-7		

GENERAL INFORMATION

M11501000001USA0000010000

The exhaust pipe is divided into four parts.

SERVICE SPECIFICATION

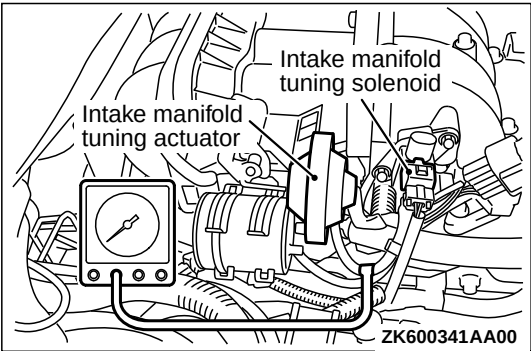
M11501000003USA0000010000

Item	Standard value	Limit
Intake manifold tuning solenoid coil resistance [at 20° C (68°F)] Ω	29 - 35	-
Intake manifold distortion of the installation surface mm (in)	0.15 (0.006) or less	0.20 (0.008)
Exhaust manifold distortion of the installation surface mm (in)	0.7 (0.028) or less	0.5 (0.020)

ON-VEHICLE SERVICE

INTAKE MANIFOLD TUNING SYSTEM CHECK

M11501000111USA0000010000



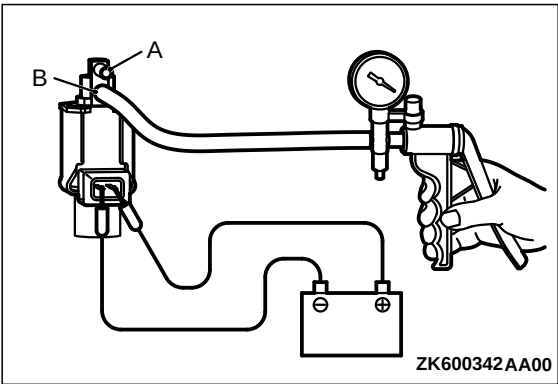
1. Warm up the engine.
2. Disconnect the vacuum hose from the intake manifold tuning (IMT) actuator, and then connect a vacuum gauge via the Tee-fitting.
3. Start the engine and verify that a vacuum is applied to the vacuum gauge.
4. As described in the chart below, vary the engine speed to inspect the vacuum conditions. During this inspection, verify that the rod of the IMT actuator is operating.

ENGINE SPEED	NORMAL CONDITION	CONTROL VALV
3,750 r/min or less	Vacuum maintained	Closed
Within 3,750 r/min or less, engine is suddenly raced	Vacuum not change	Closed
4,050 r/min or more	Vacuum leaks	Open

INTAKE MANIFOLD TUNING SOLENOID CHECK

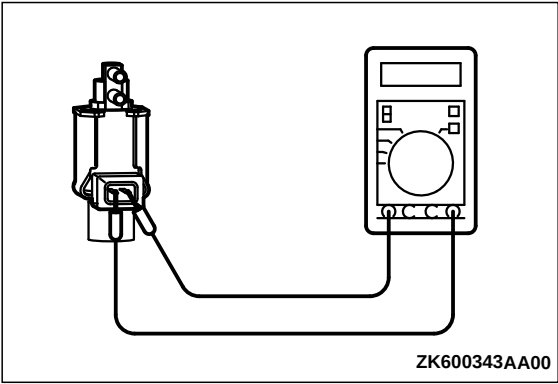
M11501000112USA0000010000

1. Disconnect the vacuum hoses from the intake manifold tuning (IMT) solenoid.
NOTE: When disconnecting the vacuum hose, always make sure that it can be reconnected at its original position.
2. Disconnect the harness connector.



3. Connect a hand vacuum pump to nipple (B) of the IMT solenoid.
4. As described in the chart below, check airtightness by applying a vacuum with voltage applied directly from the battery to the IMT solenoid, and without applying voltage.

BATTERY POSITIVE VOLTAGE	NIPPLE CONDITION (A)	NORMAL CONDITION
Applied	Open	Vacuum leaks
	Closed	Vacuum maintained
Not applied	Open	Vacuum leaks



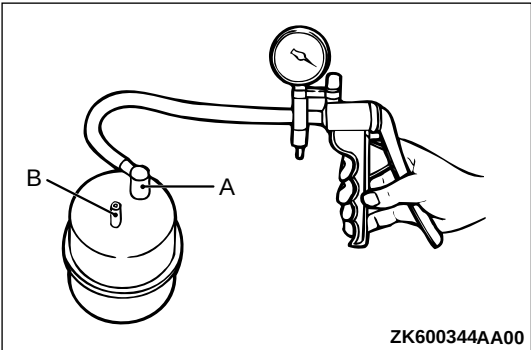
5. Measure the resistance between the terminals of the IMT solenoid.

Standard value: 29 - 35 Ω [at 20°C (68°F)]

6. Replace solenoid resistance is out of specification.

VACUUM TANK CHECK <6G7>

M11501000101USA0000010000



1. Disconnect the vacuum hoses from the vacuum tank.
NOTE: When disconnecting the vacuum hose, always make sure that it can be reconnected at its original position.
2. Connect a hand vacuum pump to nipple "A" of the vacuum tank, apply a vacuum of 67 kPa (19.7 in.Hg), and verify that the vacuum is maintained.
3. Disconnect the hand vacuum pump from nipple "A" and connect it to nipple "B".
4. Block nipple "A" with your finger and apply a vacuum of 67 kPa (19.7 in.Hg) to nipple "B". Release your finger from nipple "A" and verify that the vacuum leaks immediately.
5. Replace the vacuum tank if it is faulty.

INTAKE AND EXHAUST DIAGNOSIS

INTRODUCTION

M11501000069USA0000010000

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

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.

M11501000070USA0000010000

SYMPTOM CHART

M11501000071USA0000010000

Symptom	Inspection procedure	Reference page
Exhaust leakage	1	P.15-4
Abnormal noise	2	P.15-4

SYMPTOM PROCEDURES

Inspection Procedure 1: Exhaust Leakage

M11501000073USA0000010000

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

M11501000074USA0000010000

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 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.

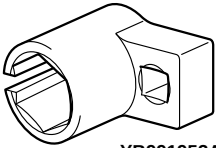
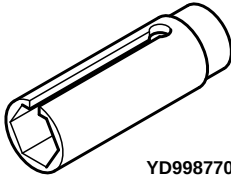
Q: Are the pipes and muffler damaged?

YES: Replace, then go to Step 1.

NO: There is no action to be taken.

SPECIAL TOOLS

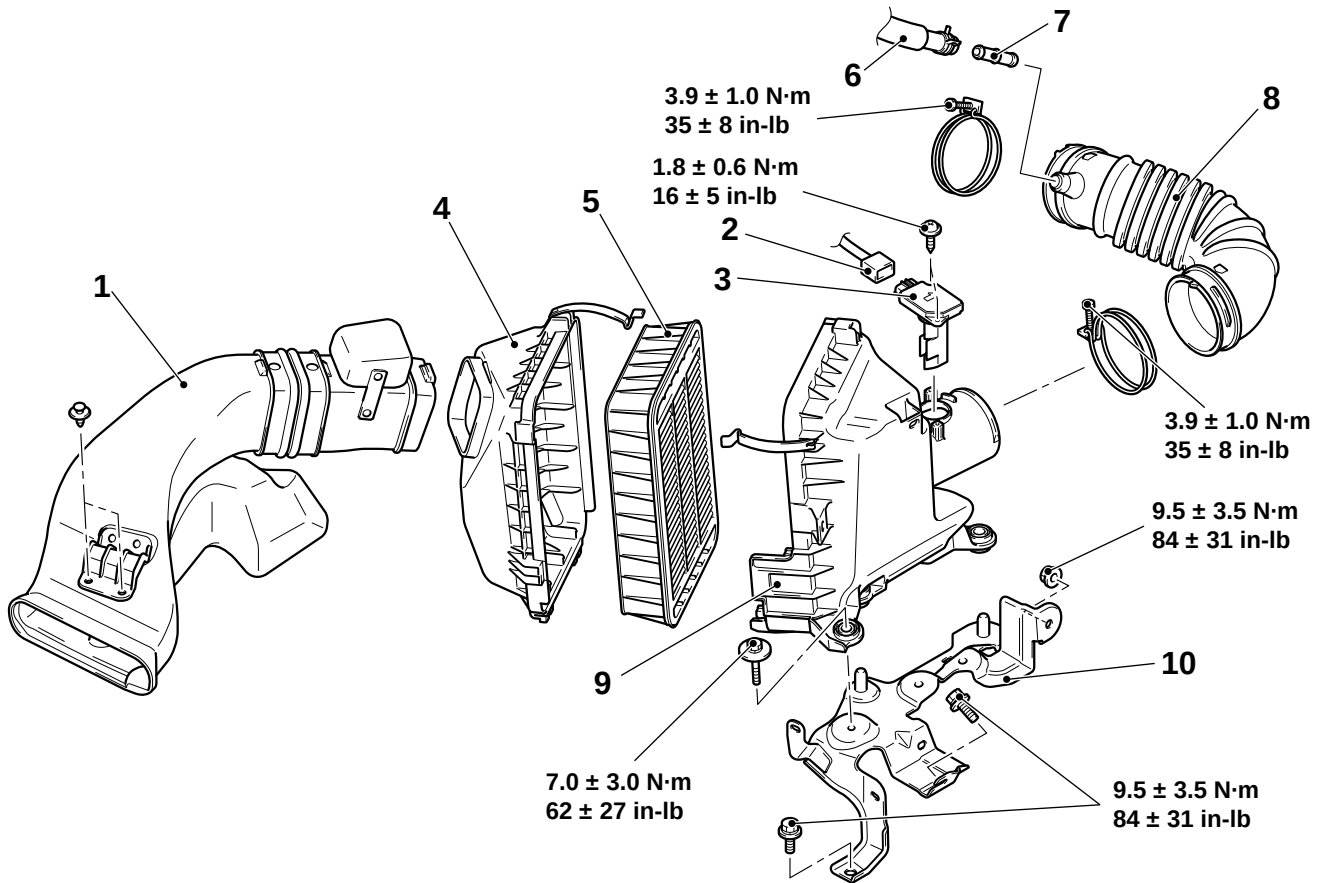
M11501000006USA0000010000

Tool	Tool number and name	Supersession	Application
 YB991953AA01	MB991953 Oxygen sensor wrench	MB991953-01	Removal and installation of heated oxygen sensor
 YD998770AA01	MD998770 Oxygen sensor wrench	MD998770-01 or General service tool	

AIR CLEANER

REMOVAL AND INSTALLATION

M11501000021USA0000010000



ZC600332AA00

Removal steps

1. Air cleaner intake duct
2. Mass airflow sensor connector
3. Mass airflow sensor
4. Air cleaner body
5. Air cleaner element
6. Breather hose connection
- >>A<< 7. Nipple

Removal steps

8. Air cleaner to throttle body duct
- Engine control module (ECM) [Refer to GROUP 13Aa, Engine Control Module (ECM) P.13Aa-37].
9. Air cleaner cover
10. Air cleaner bracket

INSTALLATION SERVICE POINT

>>A<< NIPPLE INSTALLATION



Securely install the nipple to the air cleaner to throttle body duct.

INTAKE MANIFOLD PLENUM

REMOVAL AND INSTALLATION

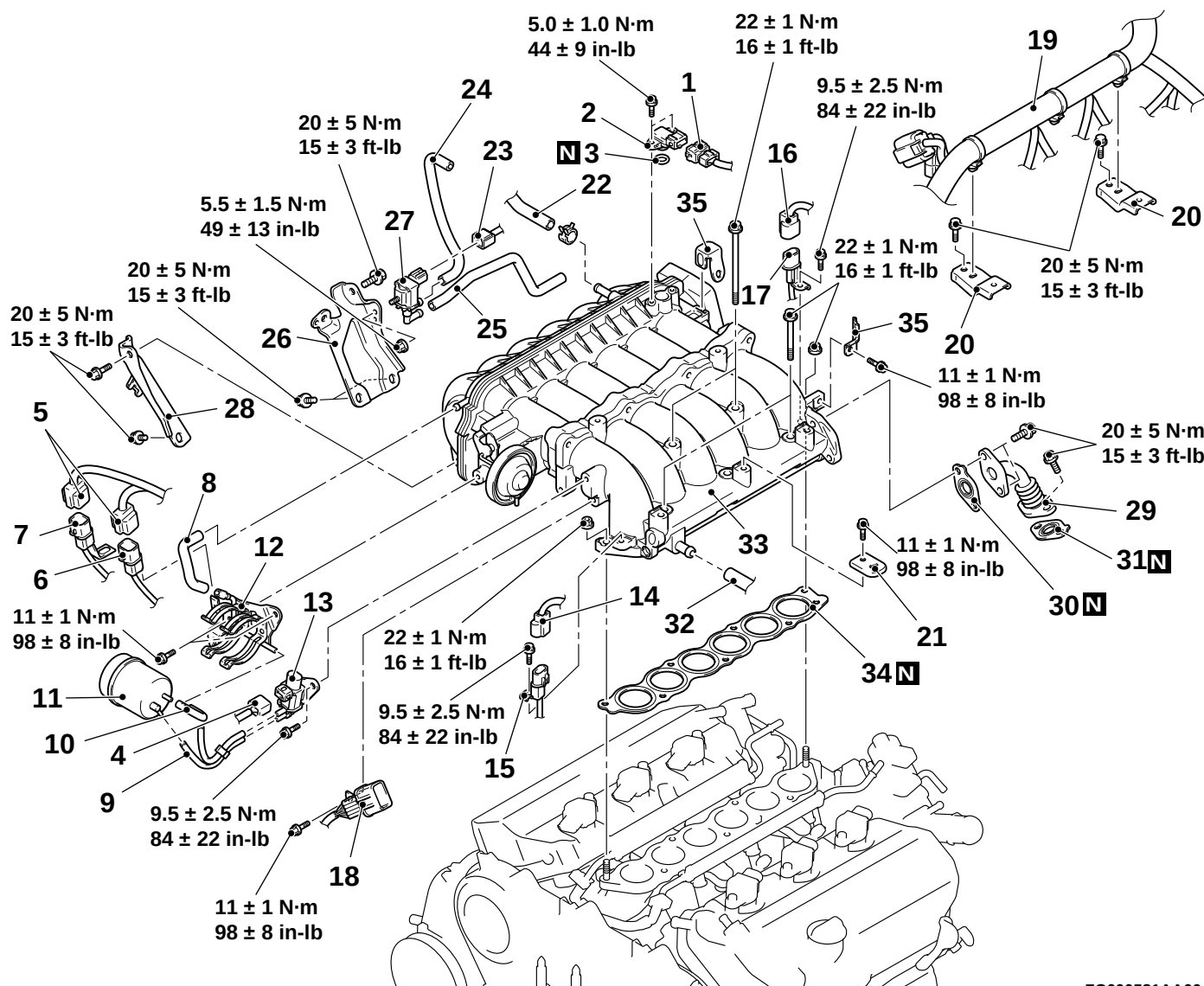
M11501000027USA0000010000

Pre-removal Operation

- Engine Coolant Draining (Refer to GROUP 14, On-vehicle Service P.14-15).
- Engine Cover Removal (Refer to GROUP 16c, Ignition coil P.16c-6).
- Strut Tower Bar Removal (Refer to GROUP 42Aa, Strut Tower Bar P.42Aa-11).
- Air Cleaner Assembly Removal (Refer to P.15-6).
- Throttle Body Removal (Refer to GROUP 13Aa, Throttle Body P.13Aa-36).

Post-installation Operation

- Throttle Body Installation (Refer to GROUP 13Aa, Throttle Body P.13Aa-36).
- Air Cleaner Assembly Installation (Refer to P.15-6).
- Strut Tower Bar Installation (Refer to GROUP 42Aa, Strut Tower Bar P.42Aa-11).
- Engine Cover Installation (Refer to GROUP 16c, Ignition coil P.16c-6).
- Engine Coolant Refilling (Refer to GROUP 14, On-vehicle Service P.14-15).



ZC600581AA00

Removal steps

1. Manifold absolute pressure sensor connector

Removal steps

2. Manifold absolute pressure sensor
3. O-ring

INTAKE AND EXHAUST
INTAKE MANIFOLD

Removal steps	Removal steps
4. Variable intake air control solenoid valve connector	19. Control wiring harness
5. Right bank heated oxygen sensor connector	20. Engine cover bracket
6. Right bank heated oxygen sensor (Rear)	21. Harness bracket
7. Right bank heated oxygen sensor (Front)	22. Vacuum hose connection
8. Purge hose	23. Evaporative emission purge solenoid connector
9. Vacuum hose assembly	24. Purge hose
10. Vacuum hose	25. Purge hose
11. Vacuum tank	26. Intake manifold plenum stay, rear
12. Vacuum tank bracket	27. Evaporative emission purge solenoid
13. Variable intake air control solenoid valve	28. Intake manifold plenum stay, front
14. Left bank knock sensor connector	29. Exhaust gas recirculation pipe
15. Left bank knock sensor	30. Gasket
16. Right bank knock sensor connector	31. Gasket
17. Right bank knock sensor	32. Blow-by hose connection
18. Control wiring harness and injector wiring harness combination connector	33. Intake manifold plenum
	34. Intake manifold plenum gasket
	35. Harness bracket

INTAKE MANIFOLD

REMOVAL AND INSTALLATION

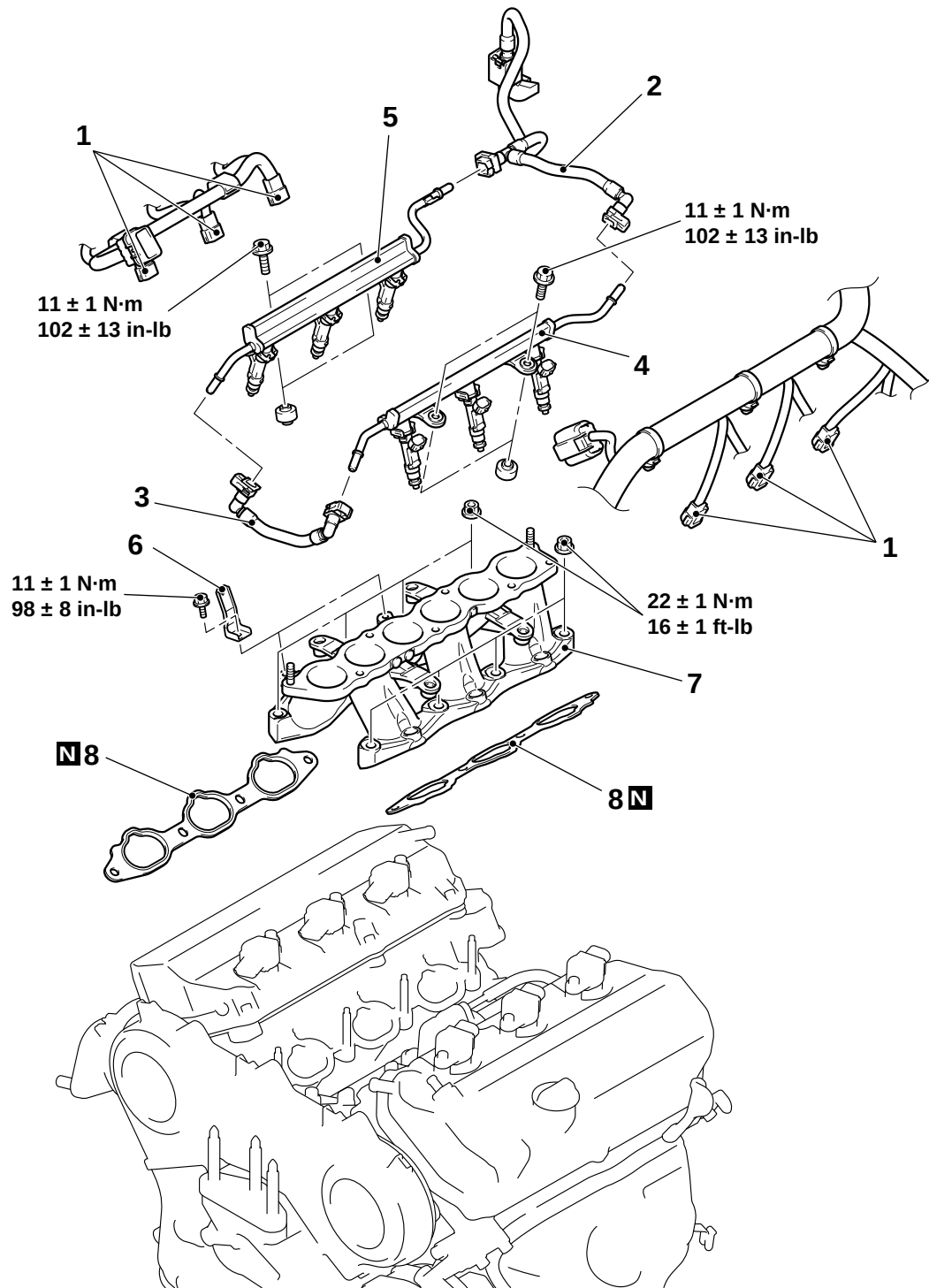
M11501000030USA0000010000

Pre-removal Operation

- Fuel Discharge Prevention [Refer to GROUP 13Aa, On-vehicle Service - Fuel Pump Connector Disconnection (How to Reduce Pressurized Fuel Lines) P.13Aa-20].
- Intake Manifold Plenum Removal (Refer to P.15-7).

Post-installation Operation

- Intake Manifold Plenum Installation (Refer to P.15-7).
- Fuel Leakage Inspection



ZC600585AA00

Removal steps

<<A>> >>B<<
<<A>> >>B<<
<>
<>

1. Injector connector
2. Fuel high-pressure hose connection
3. Fuel high-pressure hose connection
4. Left fuel rail and fuel injector assembly
5. Right fuel rail and fuel injector assembly

Removal steps

>>A<<

6. Harness bracket
7. Intake manifold
8. Intake manifold gasket

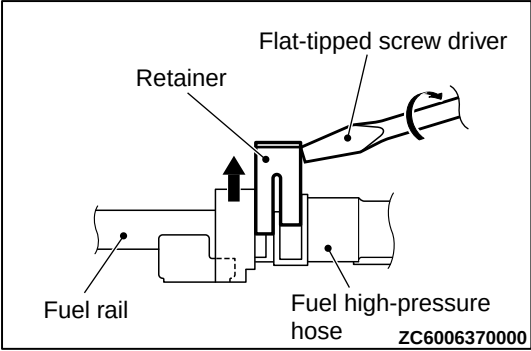
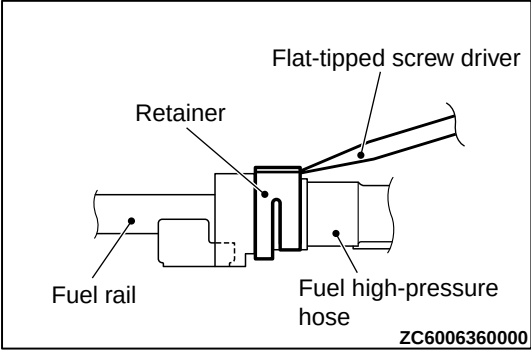
REMOVAL SERVICE POINTS

<<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

Do not drop the fuel injector.

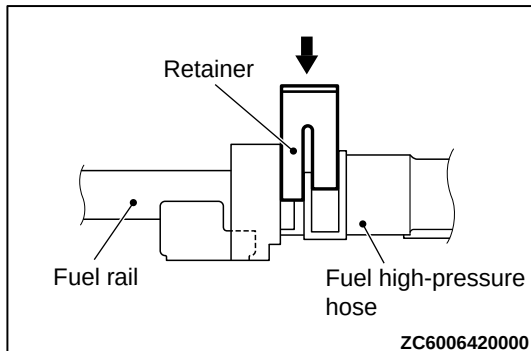
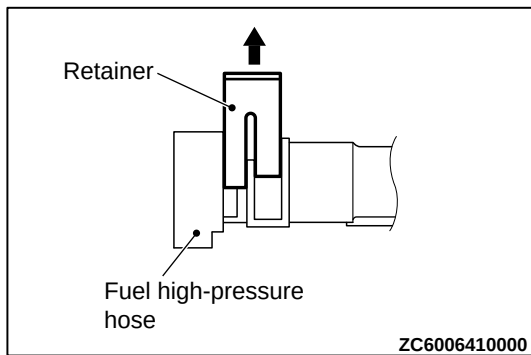
Remove the fuel rail with the fuel injectors attached to it.

INSTALLATION SERVICE POINTS

>>A<< 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	Left bank nuts	6.5 ± 1.5 N·m (58 ± 13 in-lb)
2nd	Right bank nuts	22 ± 1 N·m (16 ± 1 ft-lb)
3rd	Left bank nuts	22 ± 1 N·m (16 ± 1 ft-lb)
4th	Right bank nuts	22 ± 1 N·m (16 ± 1 ft-lb)
5th	Left bank nuts	22 ± 1 N·m (16 ± 1 ft-lb)



>>B<< 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

M11501000031USA0000010000

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

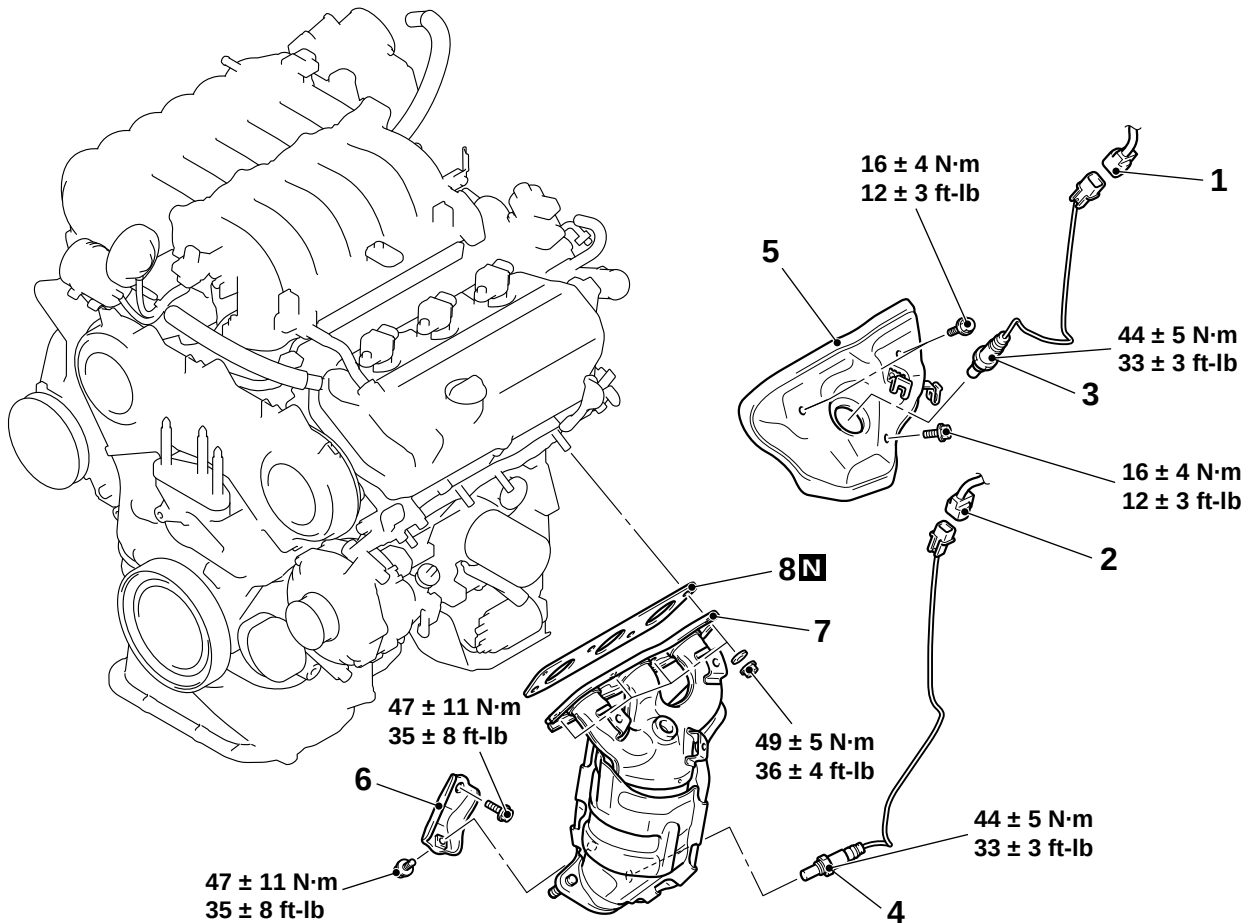
REMOVAL AND INSTALLATION

M11501000033USA0000010000

<LEFT BANK>

Pre-removal and Post-installation Operation

- Under Cover Removal and Installation (Refer to GROUP 51A, Under Cover P.51A-18).
- Air Duct Removal and Installation (Refer to P.15-6).
- Front Exhaust Pipe Removal and Installation (Refer to P.15-16).



ZC600586AA00

Removal steps

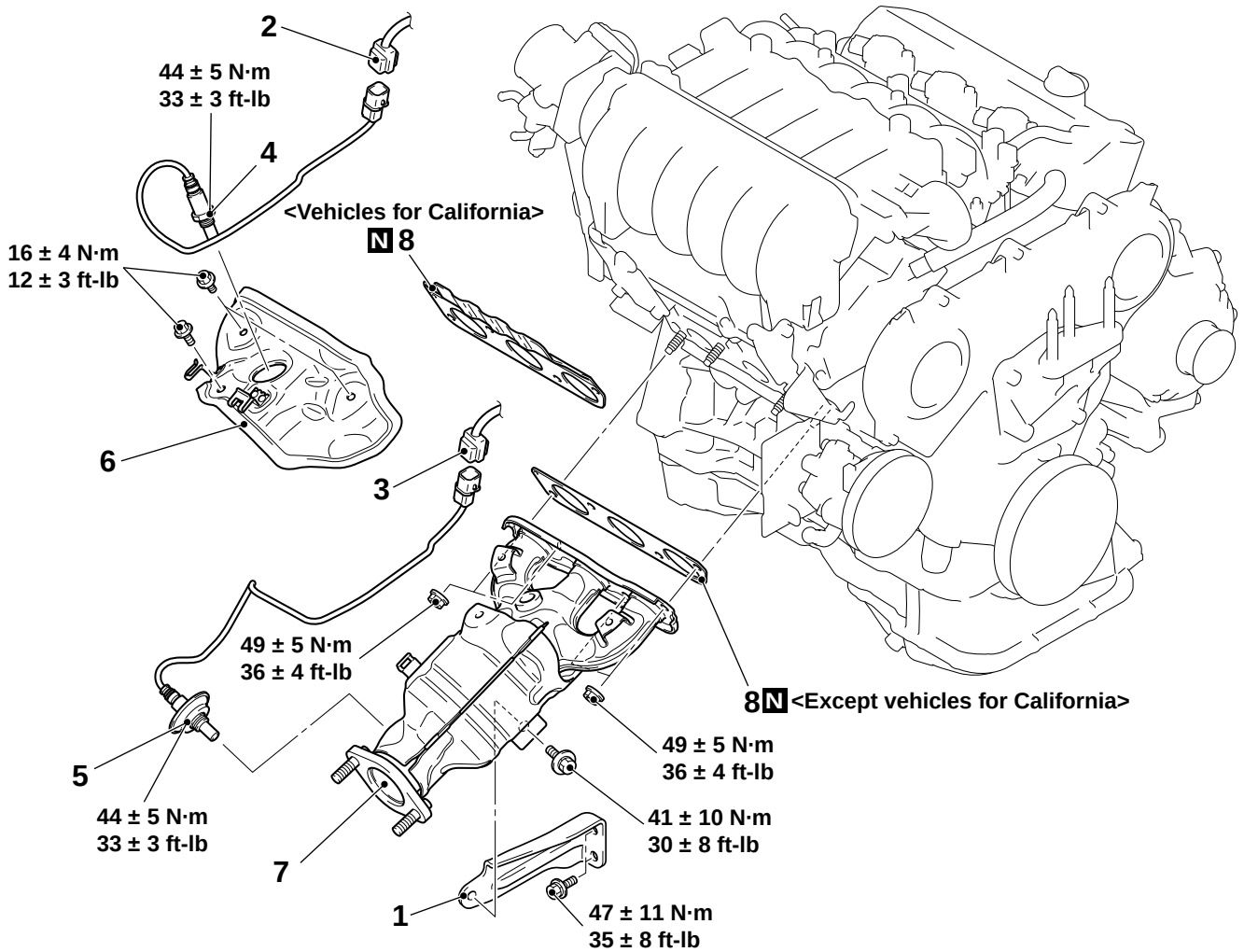
1. Left bank heated oxygen sensor <> >>A<<
2. Left bank heated oxygen sensor (Rear) connector
- <<A>> >>B<< 3. Left bank heated oxygen sensor (Front)

Removal steps

4. Left bank heated oxygen sensor (Rear)
5. Heat protector
6. Left exhaust manifold bracket
7. Exhaust manifold
8. Exhaust manifold gasket

<RIGHT BANK>**Pre-removal and Post-installation Operation**

- Air Cleaner Cover and Air Intake Duct Removal and Installation (Refer to P.15-6).
- Battery Removal and Installation
- Under Cover Removal and Installation (Refer to GROUP 51A, Under Cover P.51A-18).
- Front Exhaust Pipe, Center Exhaust Pipe and Front Floor Front Panel Heat Protector Removal and Installation (Refer to P. 15-16).
- Strut Tower Bar Removal and Installation (Refer to GROUP 42Aa, Strut Tower Bar P.42Aa-11).



ZC600587AA00

- | | | | | | |
|-------|---|-------|---|----|--|
| 1. | Right exhaust manifold bracket | <> | >>A<< | 5. | Right bank heated oxygen sensor (Rear) |
| 2. | Right bank heated oxygen sensor (Front) connector | | | 6. | Heat protector |
| 3. | Right bank heated oxygen sensor (Rear) connector | | | 7. | Exhaust manifold |
| <<A>> | >>B<< | 4. | Right bank heated oxygen sensor (Front) | 8. | Exhaust manifold gasket |

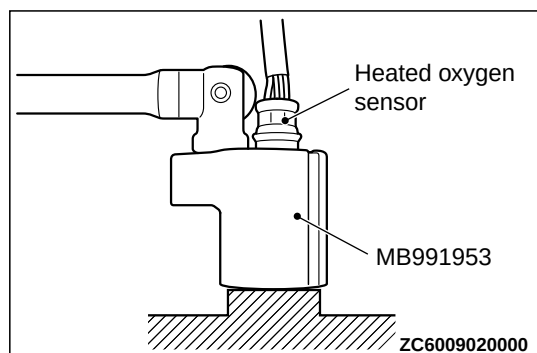
Required Special Tools:

•MB991953: Oxygen Sensor Wrench

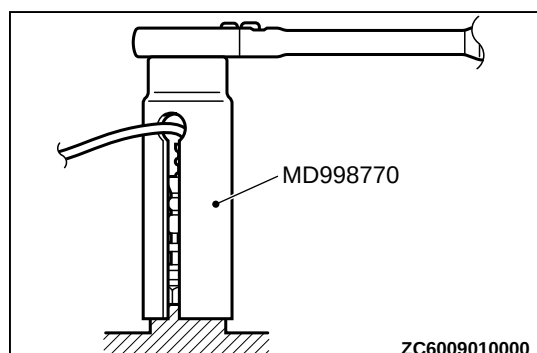
•MD998770: Oxygen Sensor Wrench

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

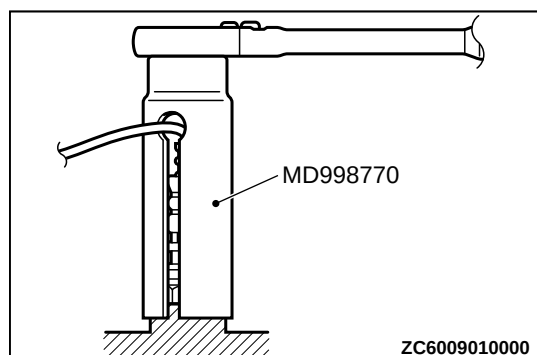
Use special tool MB991953 to remove the heated oxygen sensor.

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

Use special tool MD998770 to remove the heated oxygen sensor.

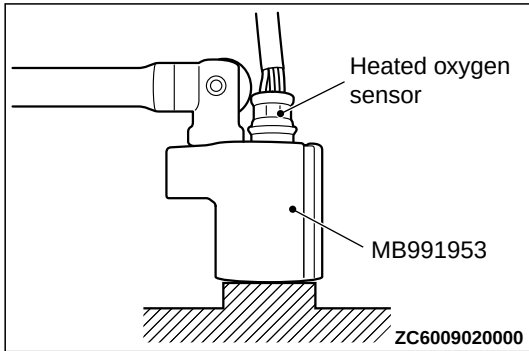
**INSTALLATION SERVICE POINTS****>>A<< RIGHT BANK HEATED OXYGEN SENSOR (REAR)/
LEFT BANK HEATED OXYGEN SENSOR (REAR)
INSTALLATION**

Use special tool MD998770 to install the heated oxygen sensor.



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

Use special tool MB991953 to install the heated oxygen sensor.



INSPECTION

M11501000034USA0000010000

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: 0.7 mm (0.028 inch) or less

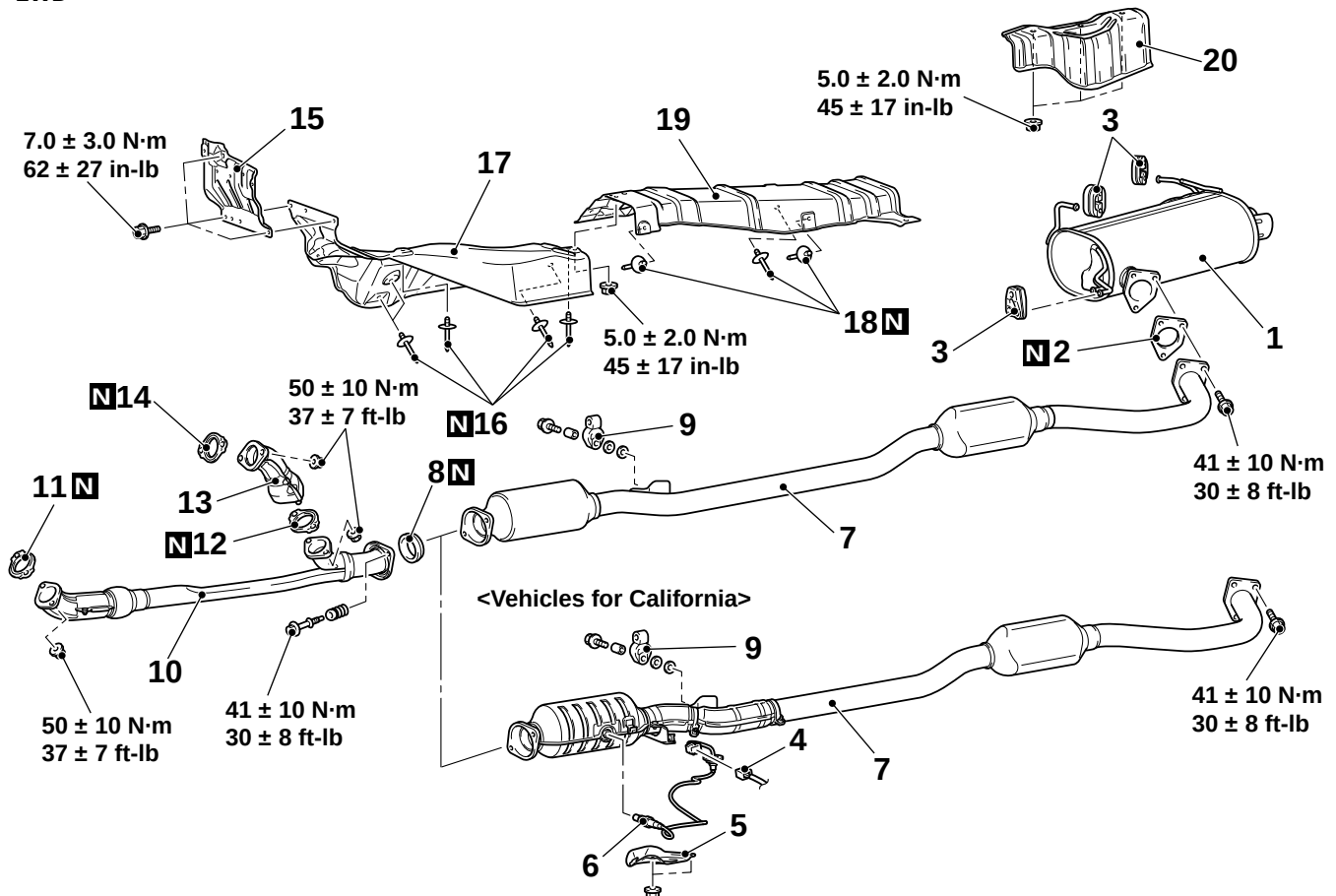
Limit: 0.5 mm (0.020 inch)

EXHAUST PIPE AND MAIN MUFFLER

REMOVAL AND INSTALLATION

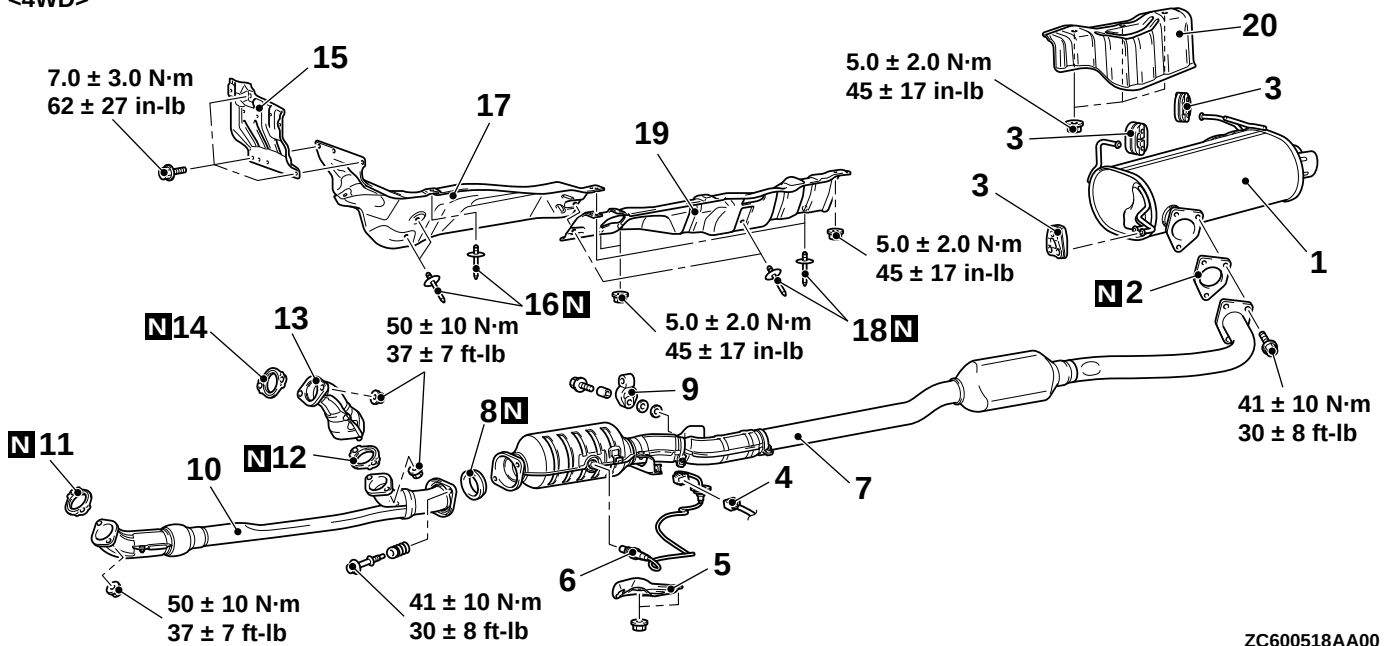
M11501000087USA0000010000

<2WD>



ZC600516AA00

<4WD>



ZC600518AA00

Exhaust main muffler and rear floor panel heat protector removal steps

1. Exhaust main muffler
2. Gasket
3. Hanger
20. Rear floor panel heat protector

Center exhaust pipe removal steps

- Footrest
- Lower side cover (Refer to GROUP 52A, Front Floor Console Assembly P. 52A-8).
- Turn up the driver's side floor carpet.
- 4. Center exhaust pipe heated oxygen sensor connector <Vehicles for California>
- 5. Harness cover <Vehicles for California>
- 6. Center exhaust pipe heated oxygen sensor <Vehicles for California>
- 7. Center exhaust pipe

Center exhaust pipe removal steps

8. Seal ring
2. Gasket
9. Hanger

Front exhaust pipe and front floor rear panel heat protector removal steps

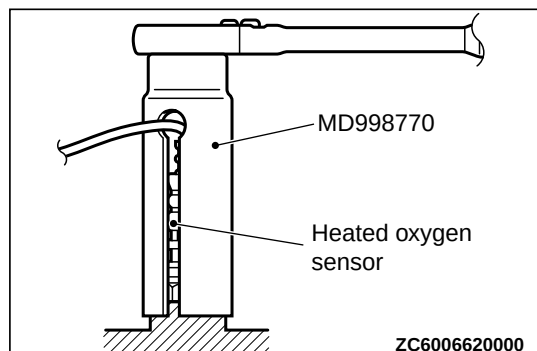
10. Front exhaust pipe
11. Gasket
12. Gasket
8. Seal ring
13. Front exhaust pipe RH
14. Gasket
15. Dash panel heat protector
16. Rivet
17. Front floor front panel heat protector
18. Rivet
19. Front floor rear panel heat protector

Required Special Tool:

*MD998770: Oxygen Sensor Wrench

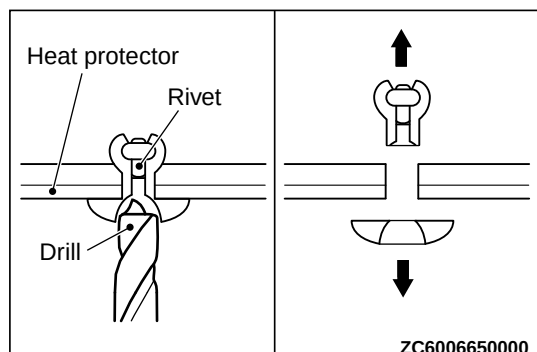
REMOVAL SERVICE POINTS**<<A>> CENTER EXHAUST PIPE HEATED OXYGEN
SENSOR REMOVAL <VEHICLES FOR CALIFORNIA>**

Use special tool MD998770 to remove the oxygen sensor.

**<> RIVET REMOVAL****⚠ CAUTION**

Be careful not to damage the heat protector with the drill.

Use a drill [6.0 mm (0.24 inch)] to make a hole in the rivet to break it, and then remove the rivet.

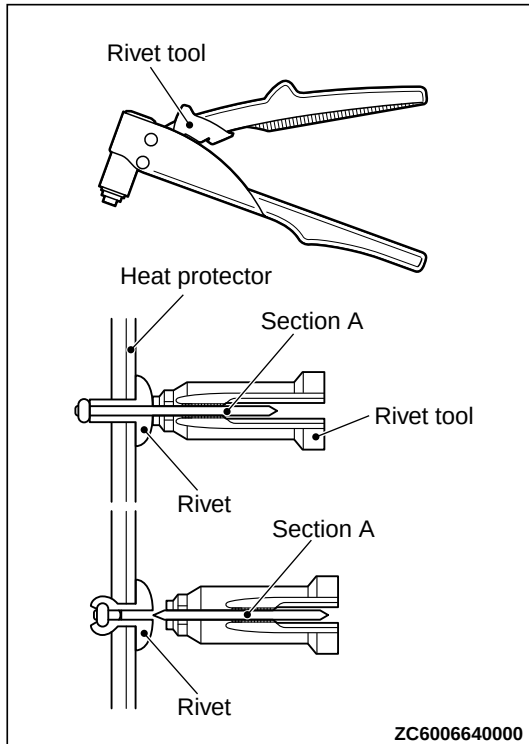


INSTALLATION SERVICE POINTS

>>A<< RIVET INSTALLATION

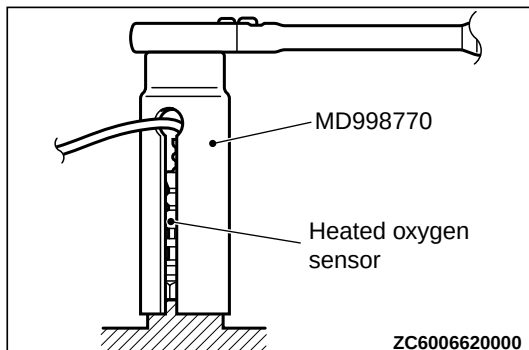
Use the rivet tool shown in the illustration to attach the rivet by the following procedure.

1. Place the recommended tool over section A of the rivet.
2. While pushing the flange surface of the rivet with the recommended tool, press the handle of the tool.
3. The thin part of section A of the rivet will break and the rivet will then be attached.



>>B<< CENTER EXHAUST PIPE HEATED OXYGEN SENSOR INSTALLATION <VEHICLES FOR CALIFORNIA>

Use special tool MD998770 to install the oxygen sensor.



MEMO