

ENGINE

Exhaust System

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EGR System

Service Precautions

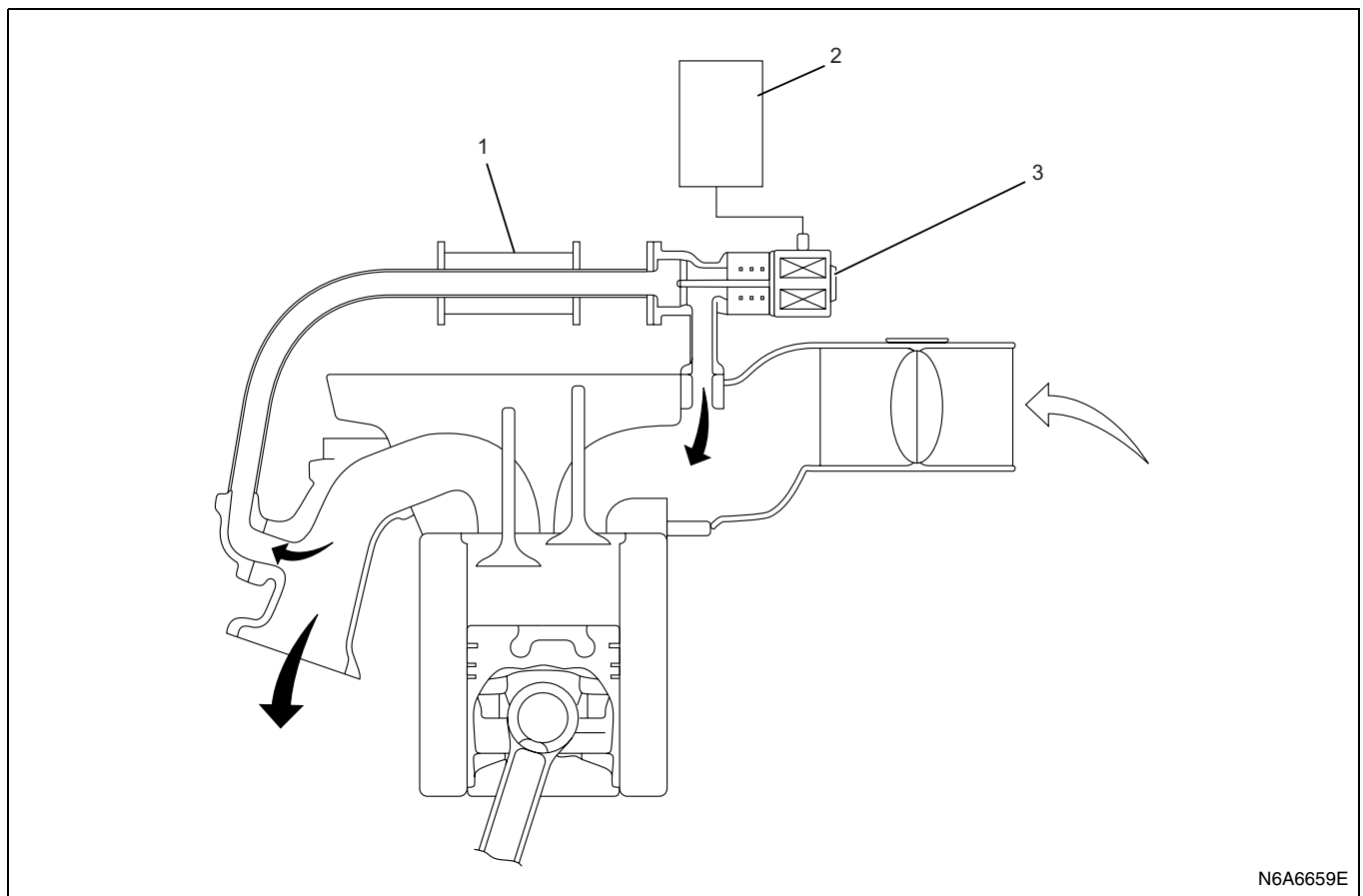
Perform EGR related assembly according to the usual procedure of temporarily fitting and then permanently tightening the parts so that unnecessary stresses are not applied on the parts.

Explanations on Functions and Operation

The EGR system recirculates a part of exhaust gas back into the intake manifold, which results in reducing nitrogen oxide (NOx) emissions. The EGR control system uses an electronic control system to ensure both driveability and low emission. The control current from the engine control module (ECM) operates the motor to control the lift amount of EGR valve. Also, an EGR position sensor is provided at the rear of the motor to feed actual valve lift amount back to the ECM for more precision control of the EGR amount.

The EGR control starts when the conditions for engine speed, engine coolant temperature and barometric pressure are satisfied. Then, the valve opening is calculated according to the engine speed, and target fuel injection quantity. Based on this valve opening, the drive duty of the motor is determined and the motor is driven accordingly.

A potentiometer type EGR valve position sensor is employed and installed on the EGR valve body. The EGR valve position sensor is supplied with reference voltage (5V) and ground at all times from the ECM. The ECM reads the EGR position sensor voltage input and determines the EGR lift position.



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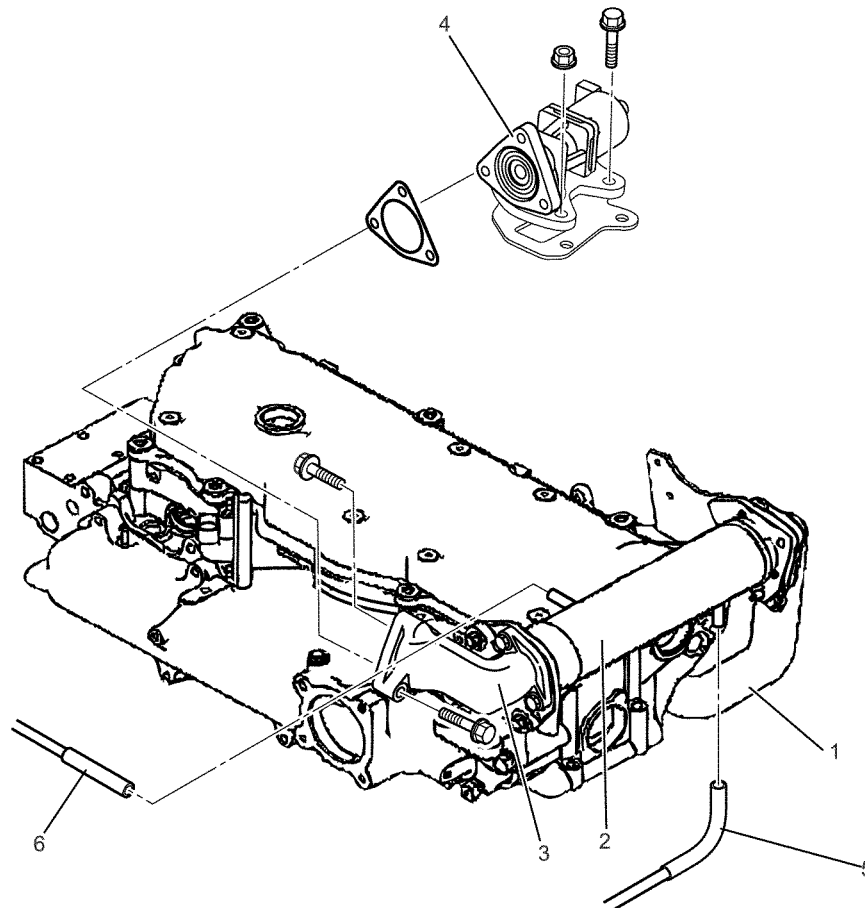
Legend

- 1. EGR Cooler
- 2. ECM

- 3. EGR Valve

EGR Valve and EGR Cooler

Components



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Legend

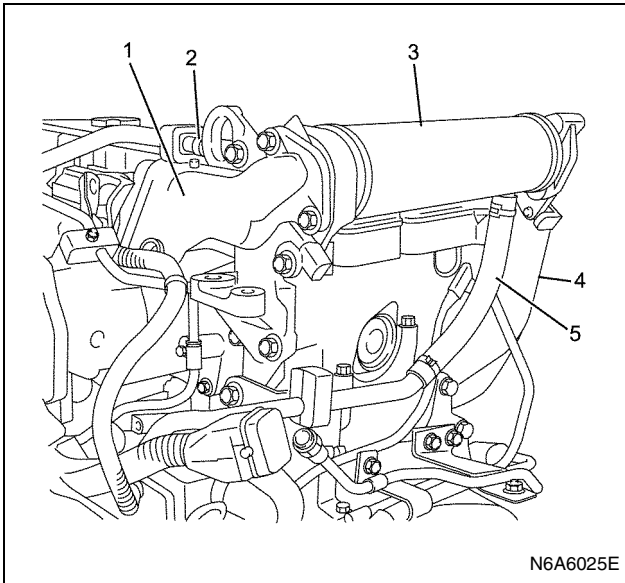
- | | |
|----------------|-----------------------------|
| 1. EGR Pipe | 4. EGR Valve |
| 2. EGR Cooler | 5. Cooling Water Pipe (IN) |
| 3. EGR Adapter | 6. Cooling Water Pipe (OUT) |

Removal

1. Drain engine coolant. Refer to Engine Cooling System section.
2. Remove the EGR valve connector.

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3. Remove the EGR pipe.



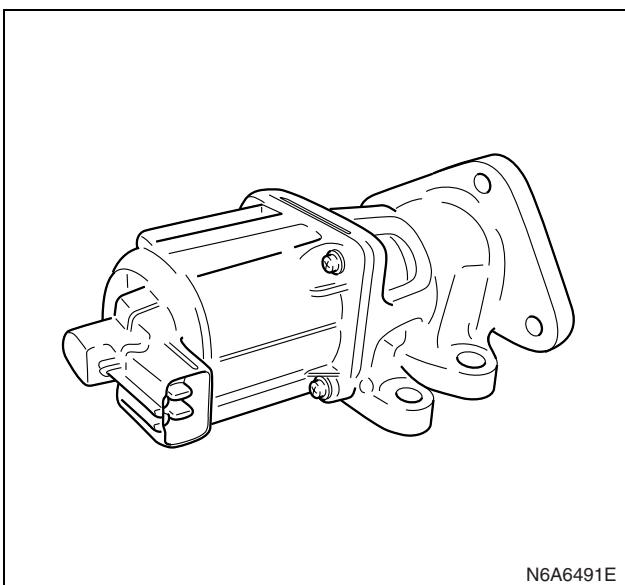
Legend

1. EGR Adapter
2. Water Return Pipe
3. EGR Cooler
4. EGR Pipe
5. Water Feed Pipe

4. Remove the cooling water pipes.
5. Remove the EGR adapter.
6. Remove the EGR cooler.
7. Remove the EGR valve.

Caution:

After removing the EGR valve and EGR adapter, seal the opening so that foreign matter does not enter.



Inspection

• Gas leak check

- Check for gas leak in various parts of the EGR gas line.
If the results of the check show abnormalities, repair or replace the defective parts.

• EGR valve check

Installation

1. Mount the EGR valve.

- Insert the gasket and temporarily fit the EGR valve.

Notice:

Temporarily tighten the bolts.

2. Install the EGR cooler.

- Temporarily fit the EGR cooler to the bracket.

Notice:

Temporarily tighten the bolts.

3. Install the EGR adapter.

- Temporarily fit the EGR adapter between the EGR cooler and exhaust manifold.

Notice:

Temporarily tighten the bolts.

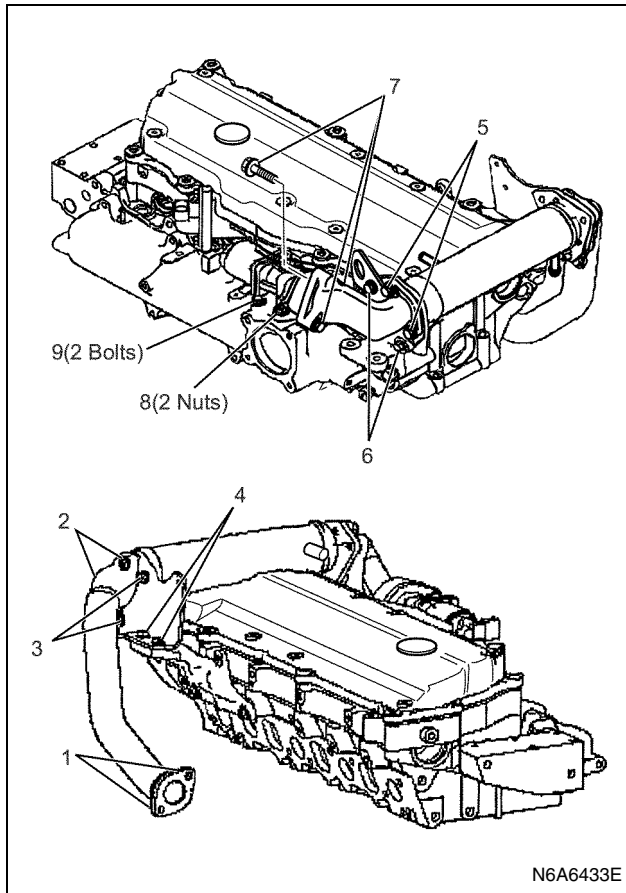
4. Install the EGR pipe.

- Insert the gasket between the two ends of the EGR pipe and temporarily fit it.

Notice:

Temporarily tighten the bolts.

During temporary assembly, tighten the nuts and bolts to the specified torque in the order shown in the illustration.

**Tighten:**

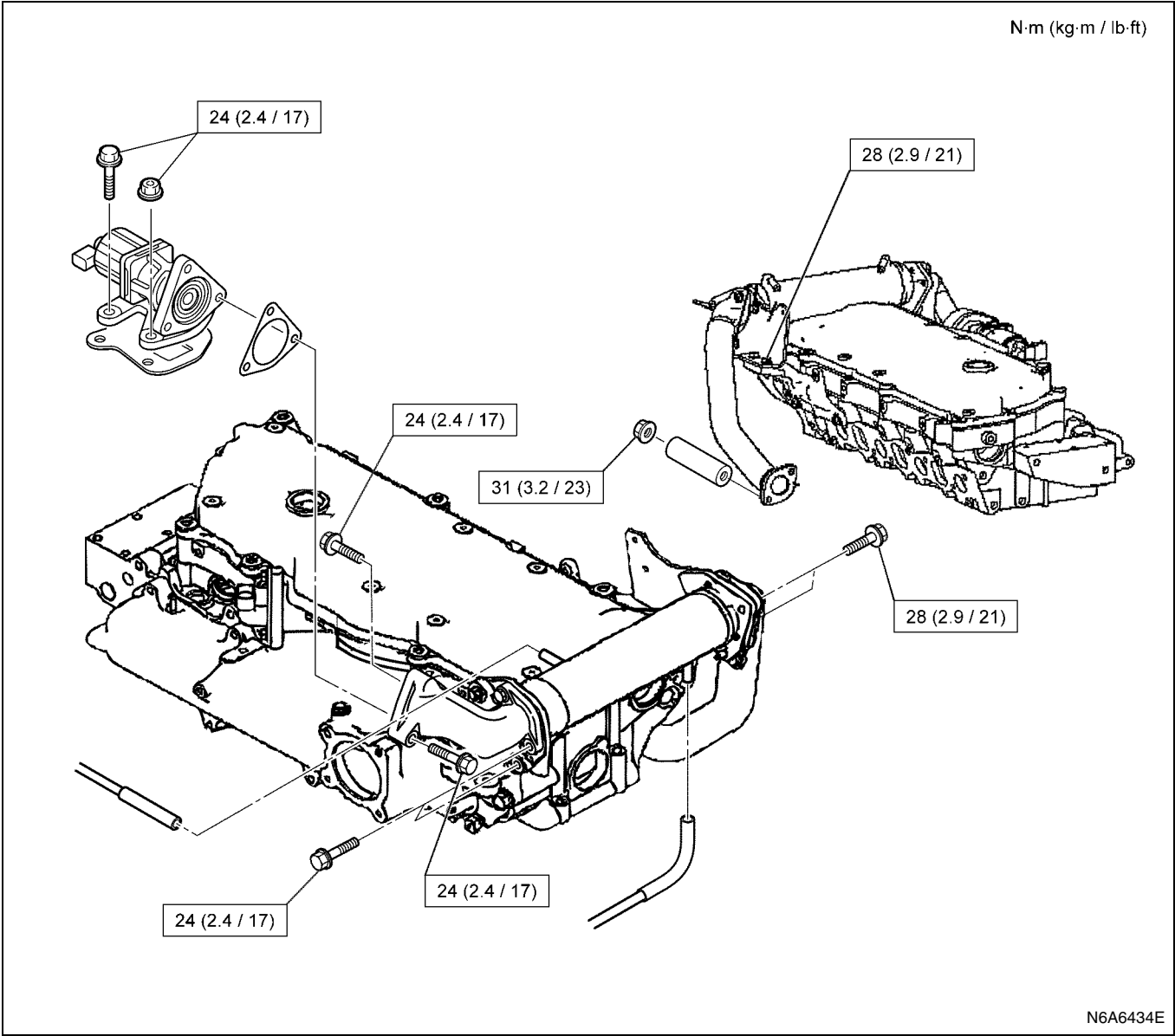
Bolts and nuts to

(1): 31 N·m (3.2 kg·m/23 lb·ft)

(2), (4): 28 N·m (2.9 kg·m/21 lb·ft)

(3), (5), (6), (7), (8), (9): 24 N·m (2.4 kg·m/17 lb·ft)

Torque Specifications



Exhaust System

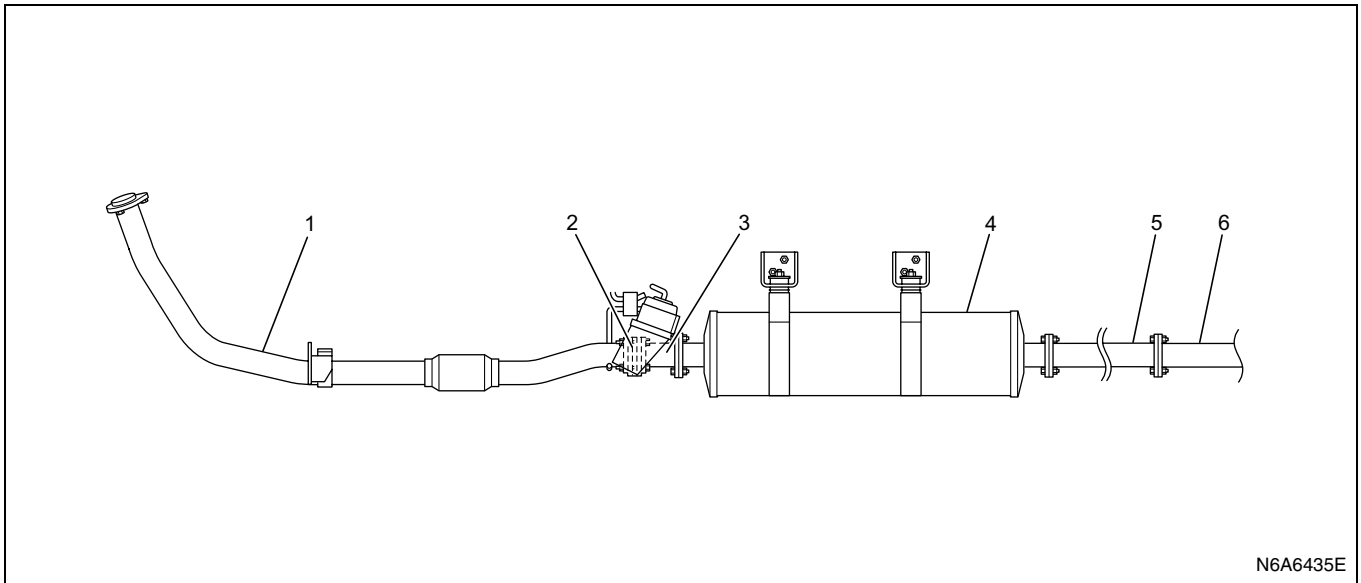
Service Precautions

Offset in position of the exhaust system during assembly may sometimes cause vibrations or rattling noise. Therefore, temporarily tighten the bolts until all the parts have been positioned, and sequentially tighten from the engine side to the rear pipe side.

Explanations on Functions and Operation

The exhaust brake assembly operates the auxiliary brakes by adjusting the exhaust pressure. The tail pipe has a built-in post silencer. (S-spec only) This improves the silencing effect.

The main parts consist of the front exhaust pipe, center exhaust pipe, exhaust brake unit, silencer, extension pipe, and tail pipe.



Legend

- | | |
|---------------------------|-------------------|
| 1. Front Exhaust Pipe A | 4. Silencer |
| 2. Exhaust Brake Assembly | 5. Extension Pipe |
| 3. Front Exhaust Pipe B | 6. Tail Pipe |

Functional Check

- During check or repairs of the exhaust system, confirm that the clearance between the body and the floor is adequate.
- Adequate care should be taken to prevent damage due to heating or vibrations in the body panel as it may lead to exhaust gas entering the cabin.
- Check for loose or damaged connectors and leakage of exhaust gas.
- Check for degradation, cracks or damage to the clamp or rubber.
- If the pipe or silencer is damaged or has a dent then repair or replace it.
- Check for dents, damage, holes or cracks due to corrosion, and abnormal noise during operation.

List of Abnormal Phenomena

- Vibration or rattling noise from the exhaust system
- Clogging of the exhaust system
- Exhaust leakage or noise

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Trouble Shooting

Vibration or rattling noise from the exhaust system

Condition	Possible Cause	Correction
Vibration or rattling noise from the exhaust system	Loose or misaligned components	Match the joints and then re-tighten. Or, check for damage in the hanger, mounting brackets and clamps.

Clogging of the exhaust system

Condition	Possible Cause	Correction
Clogging of the exhaust system	The exhaust brake is in the ON status.	Refer to Section 6E, check the electric system and repair if there are abnormalities. Check if the shaft movement in the exhaust brake throttle valve moves is jerky and replace if there is an abnormality.
	Clogging or deformation of the exhaust piping	Repair or replace the exhaust piping.

Exhaust leakage or noise

Condition	Possible Cause	Correction
Exhaust leakage or noise	Defect or misalignment in mounting	Match the joints and then re-tighten.
	Damage or burn-out of exhaust piping or silencer	Replace the damaged parts.
	Defective components in the exhaust system (clamps, pipes, silencer)	Replace the defective parts.
	Internal damage to silencer	Replace the silencer.

Exhaust Pipe

Removal

1. Remove the silencer fixing nut.
2. Remove the silencer brackets.
3. Remove the silencer.
4. Remove the front exhaust pipe B.
5. Remove the exhaust brake assembly.
6. Remove the front exhaust pipe A.
 - Remove the clamps and then the front exhaust pipe.

Inspection

- Adequate care should be taken to prevent damage due to heating or vibrations in the body panel as it may lead to exhaust gas entering the cabin.
- Check for loose or damaged connectors and leakage of exhaust gas.
- Check for degradation, cracks or damage to the clamp or rubber.
- Check for dents in the pipes or silencer and also for cracks due to corrosion, and repair or replace in case of damage.

Installation

Caution:

- Offset in the position of the exhaust system during assembly may sometimes cause vibrations or rattling noise. Therefore, temporarily tighten the bolts until all the parts have been positioned and then tighten sequentially from engine side to the tail pipe side.
- Do not reuse the removed gasket or nuts.

1. Mount the front exhaust pipe A.
 - Assemble the gasket, mount the front exhaust pipe in the turbo charger, and tighten to the specified torque.

Tighten:

Nut to 67 N·m (6.8 kg·m/49 lb·ft)

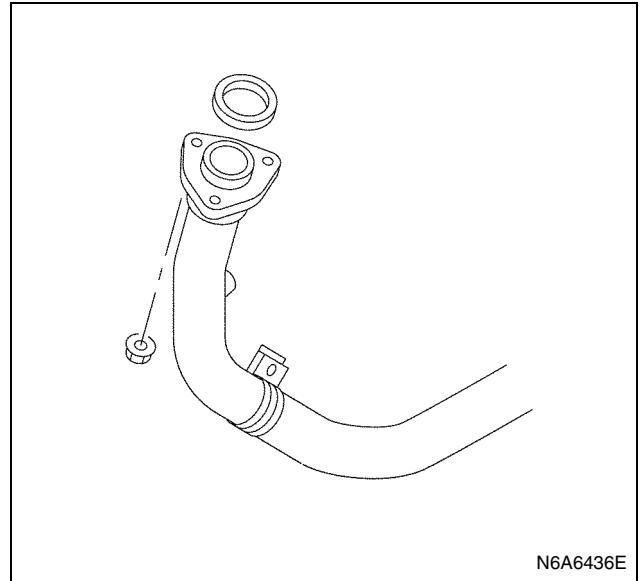
- Clamp the front exhaust pipe.

Tighten:

M10 bolt to 41 N·m (4.2 kg·m/30 lb·ft)

Caution:

Tighten the front exhaust pipe evenly and take care to avoid gas leakage.



2. Mount the exhaust brake assembly.
 - Assemble the gasket, connect the front exhaust pipe and the front exhaust pipe B, and tighten.

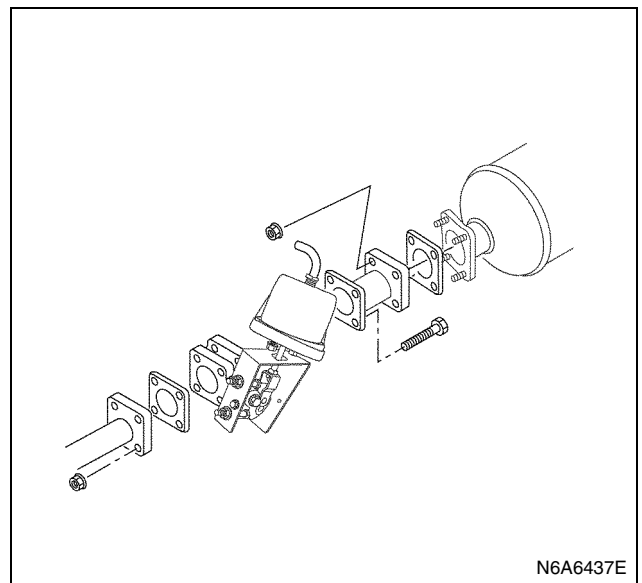
Tighten:

Bolt to 17 N·m (1.7 kg·m/12 lb·ft)

3. Mount the silencer.
 - Assemble the gasket, mount to the front exhaust pipe B, and tighten to the specified torque.

Tighten:

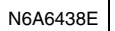
Nut to 24 N·m (2.4 kg·m/17 lb·ft)



4. Mount the silencer brackets.
 - Mount the silencer in the brackets.

Tighten:

Nut to 34 N·m (3.5 kg·m/25 lb·ft)

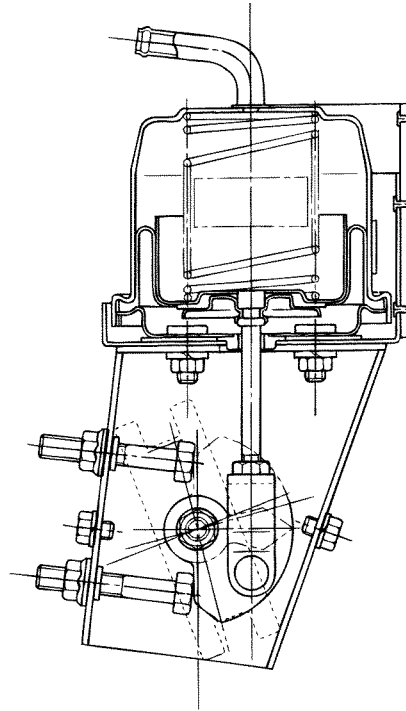


Exhaust Brake System

Service Precautions

During assembly and mounting, mount the parts appropriately at the specified tightening torque value.

Explanations on Functions and Operation



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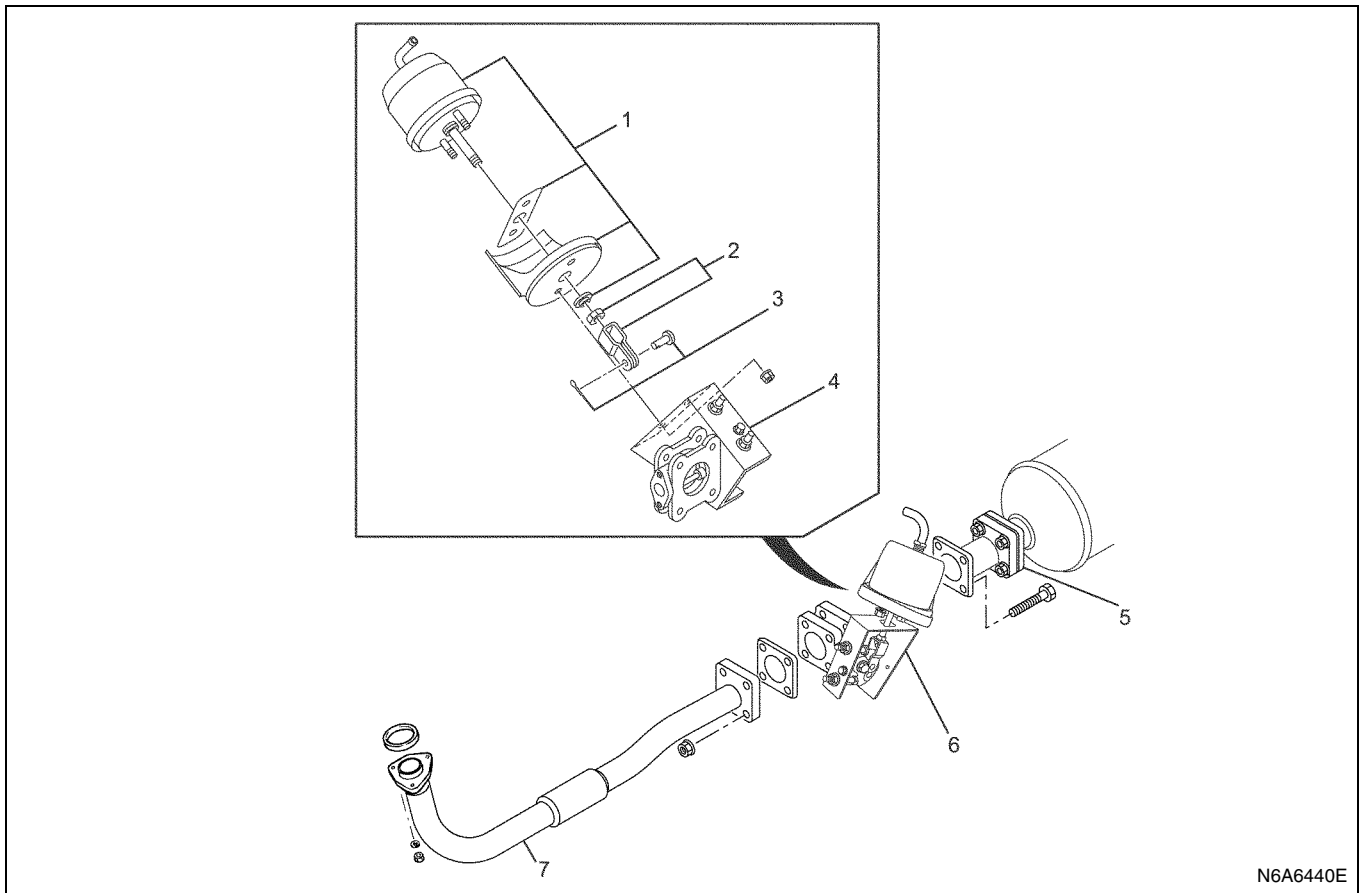
Functional Check

Operational check

- Confirm the sound of the valve touching the stopper when the exhaust brake is operated in the idling condition.

Exhaust Brake

Components



Legend

- | | |
|---|---------------------------|
| 1. Power Chamber, Insulator, Gasket and Bearing | 5. Front Exhaust Pipe B |
| 2. Lock Nuts and Clevis Joint | 6. Exhaust Brake Assembly |
| 3. Split Pin and Washer | 7. Front Exhaust Pipe A |
| 4. Exhaust Brake Valve | |

Removal

1. Remove the vacuum hose and clips.
2. Remove the nut.
3. Remove the exhaust pipe.
4. Remove the exhaust brake assembly.

Disassembly

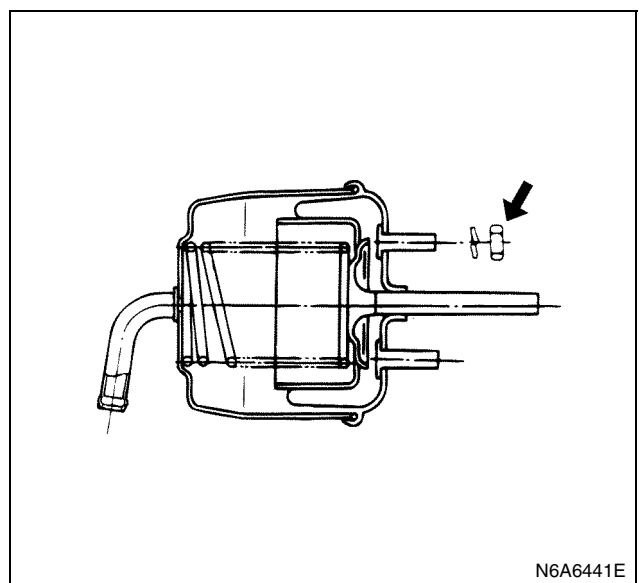
1. Remove the split pin.
2. Remove the lock nuts.
3. Remove the clevis joint.
4. Remove the power chamber.

Reassembly

1. Mount the power chamber.

Tighten:

Nut to 14 N·m (1.4 kg·m/122 lb·in)

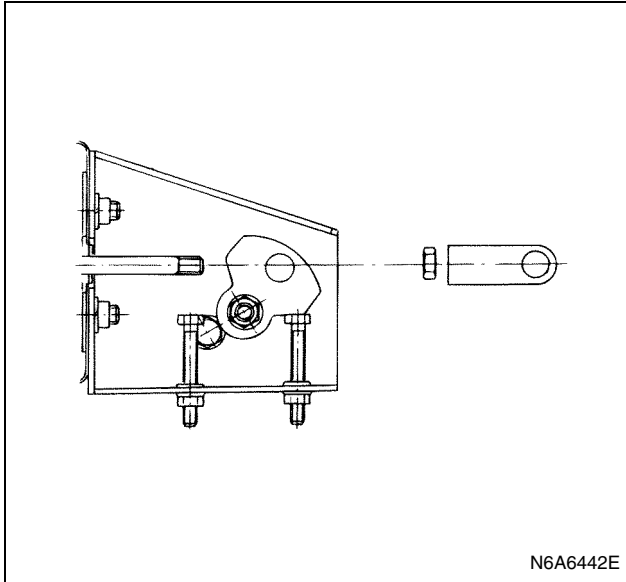


2. Mount the lock nuts.

- After mounting the clevis joint, tighten the lock nuts to the specified torque.

Tighten:

Lock nut to 13 N·m (1.3 kg·m/113 lb·in)



- Mount the split pin.

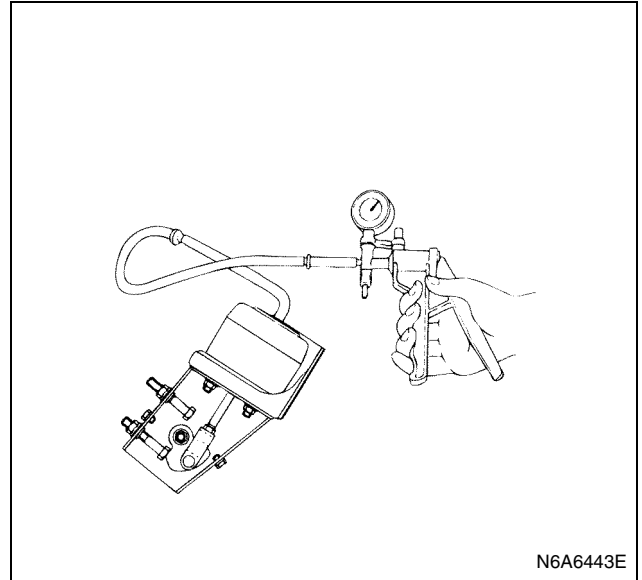
Inspection

Check for damage or degradation in the parts mentioned below.

- Exhaust brake valve
- Exhaust brake shaft
- Butterfly valve
- Bush
- Power chamber

Unit check

- Negative pressure in the power chamber caused by the vacuum pump
When a pressure of 53.3 - 93.3 kPa (0.54 - 0.95 kg/cm² / 7.7 - 13.5 psi) is applied, the exhaust brake valve should open or close smoothly.

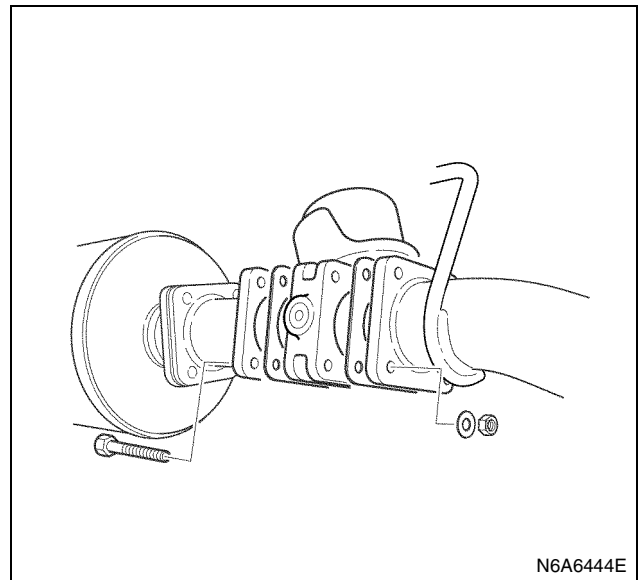


Installation

- Mount the exhaust brake assembly.

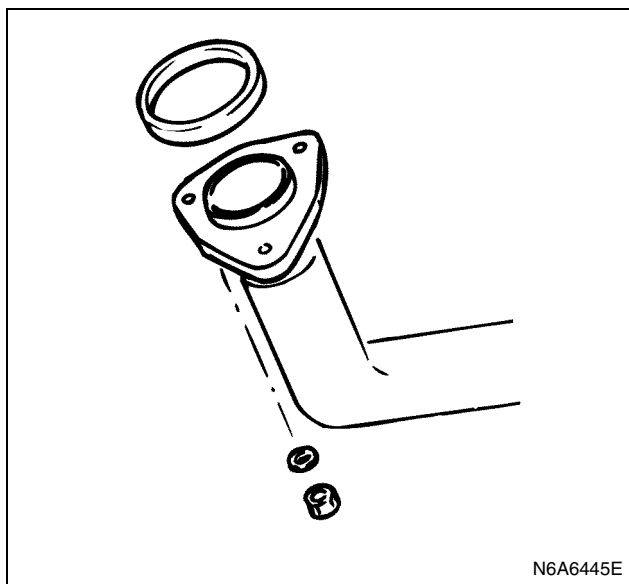
Tighten:

Bolt and nut to 17 N·m (1.7 kg·m/12 lb·ft)



6F-14 Exhaust System

2. Mount the exhaust pipe.



3. Mount the nuts.

Tighten:

Nut to 67 N·m (6.8 kg·m/49 lb·ft)

4. Mount the vacuum hose and the clips.

Torque Specifications

