2.7 Exhaust System JL4G18-D

2.7.1 Specifications

2.7.1.1 Fastener Tightening Specifications

Applications	Model	Specifications	
		Metric (Nm)	US English (lb-ft)
Exhaust Manifold Retaining Nut	M8	20-30	14.8-22.2
Exhaust Manifold Bracket Bolts	M12 × 1.25 × 28	28-42	20.7-31.1
Heat Insulator Bolts	M8 × 25	14-22	10.4-16.3
Three-Way Catalytic Converter and Exhaust Manifold Connecting Bolts	M10 × 1.25 × 65	35-45	25.8-33.2
Three-Way Catalytic Converter With Front Muffler Connecting Bolt	M12 × 1.25 × 45	47-57	34.8-42.2
Three-Way Catalytic Converter With Front Muffler Connection Nut	M12	47-57	34.8-42.2
Front and Rear Muffler Connecting Bolt	M12 × 1.25 × 45	47-57	34.8-42.2
Front and Rear Muffler Connection Nut	M12	47-57	34.8-42.2

2.7.2 Description and Operation

2.7.2.1 Exhaust Manifold

Exhaust manifold used in this engine is a monolithic four-port manifold, which can be removed from the rear. The function of exhaust manifold is to exhaust gases after combustion with the minimum back-pressure. Pre-Oxygen sensors (HO_2S) are installed in the three-way catalytic converter front end.

2.7.2.2 Three-Way Catalytic Converter

Three-Way catalytic converter is similar to the appearance of the muffler, however, inside the stainless steel shell there is honeycomb-like ceramic substrate in the direction of the exhaust gas. Ceramic liner carriers have been surrounded by the liner, which is used to retain the ceramic carrier and prevent any contact or collision. Each end of the converter has a mesh seals to prevent air pollution and the pad corrosion.

2.7.3 System Working Principle

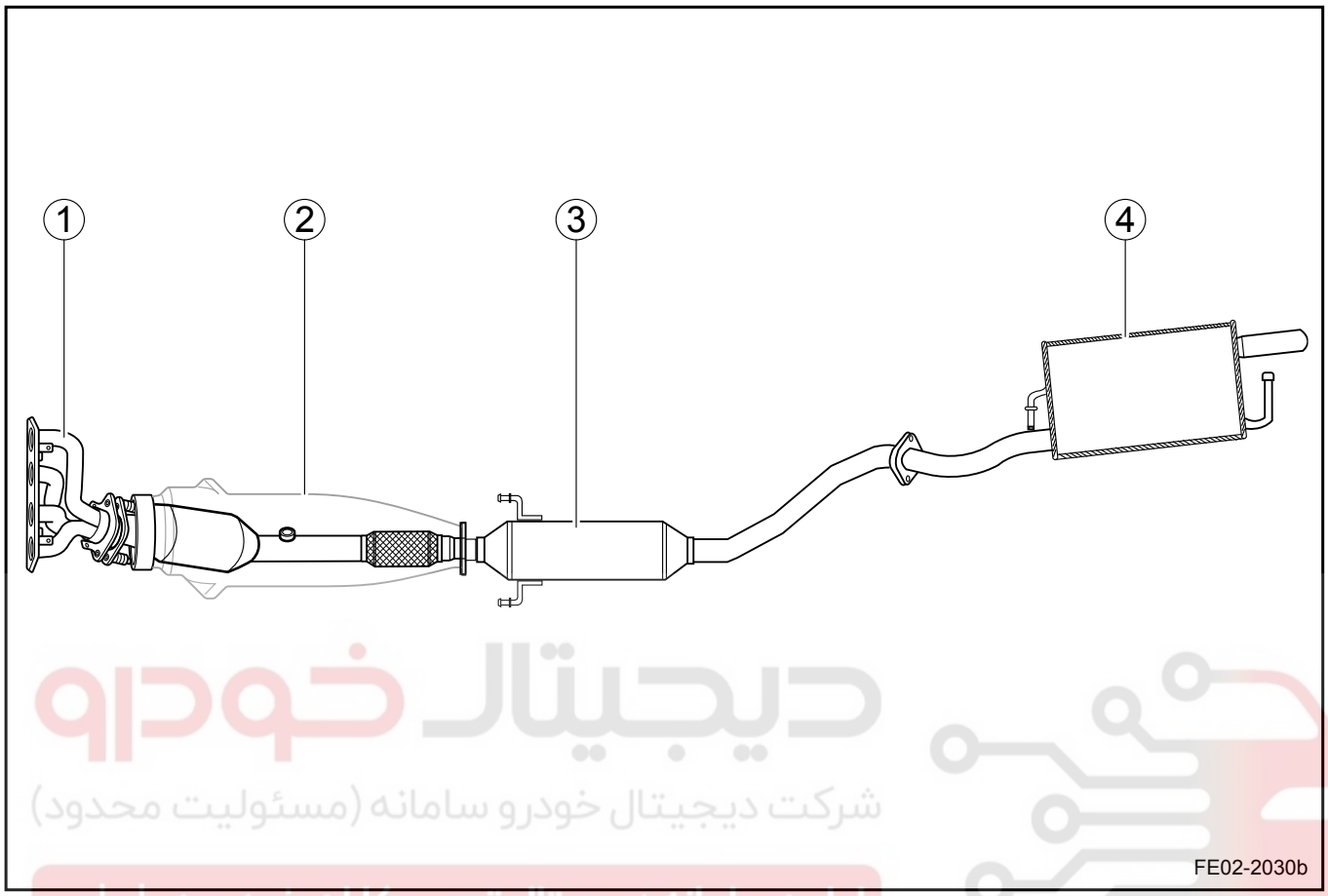
2.7.3.1 System Working Principle

Inside the three-way catalytic converter, the ceramic substrate exposed to emissions is coated with a catalyst. Catalysts containing platinum, palladium and rhodium, three kinds of precious metals. These catalysts promote chemical reactions.

Catalyst is to accelerate the chemical reaction while remain unchanged itself. Engine exhaust contains carbon monoxide (CO), hydrocarbons (HC) and nitrogen oxides (NO_X). When the exhaust gas flows through the ceramic substrate, the chemical reactions in the three-way catalytic converter occur. Carbon monoxide and hydrocarbons is oxidized by the oxygen in the exhaust gas (O_2) and turned into carbon dioxide (CO_2) and water vapor (H_2O). Nitrogen oxides and carbon monoxide through the reduction reaction, was converted into nitrogen (N_2). This three-way catalytic converter is called three-way type, because it turns the three components (CO, HC and NO_X) into harmless neutral gas at the same time.

2.7.4 Component Locator

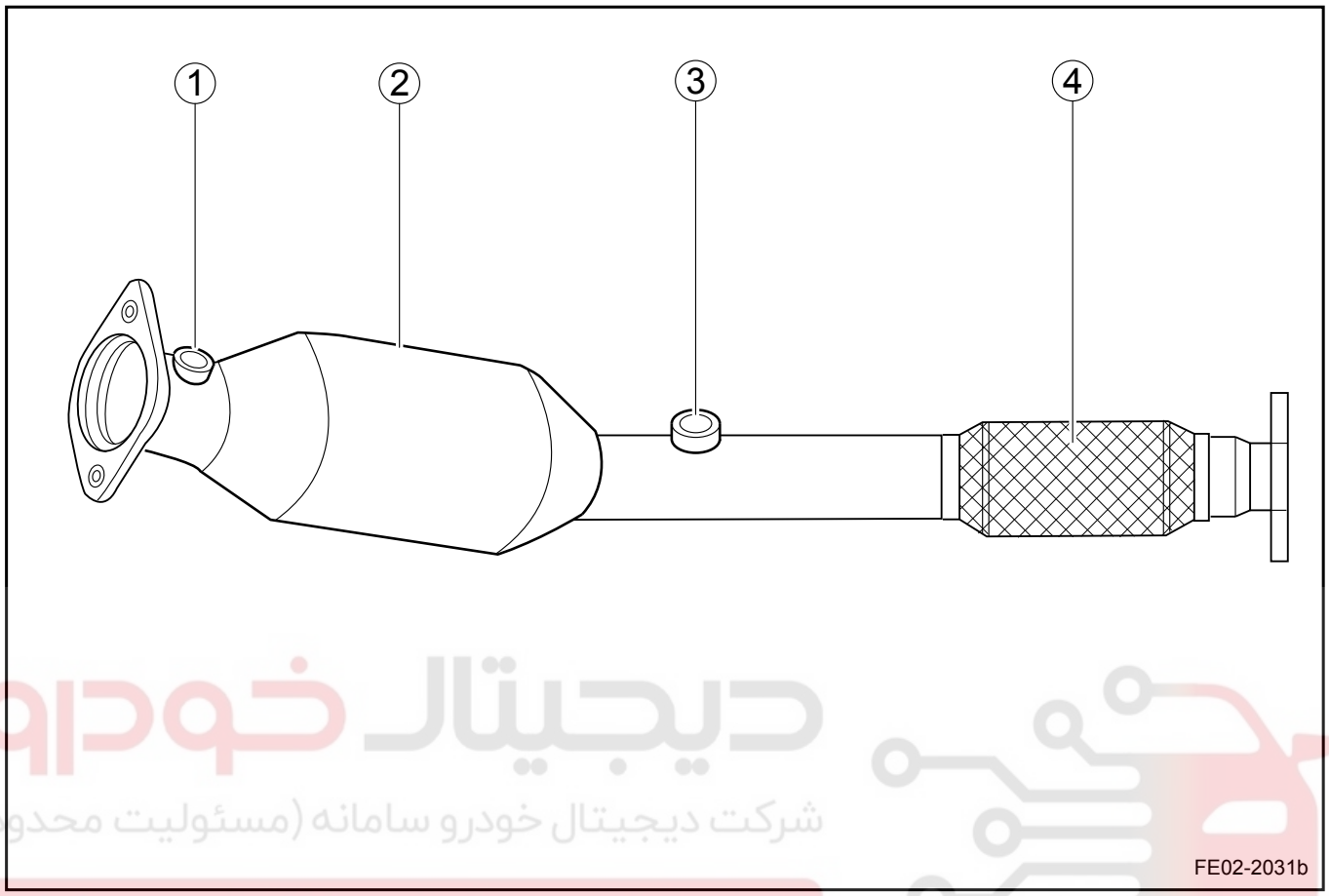
2.7.4.1 Exhaust



Legend

1. Exhaust Manifold
2. Three-Way Catalytic Converter Assembly
3. Front Muffler
4. Rear Muffler

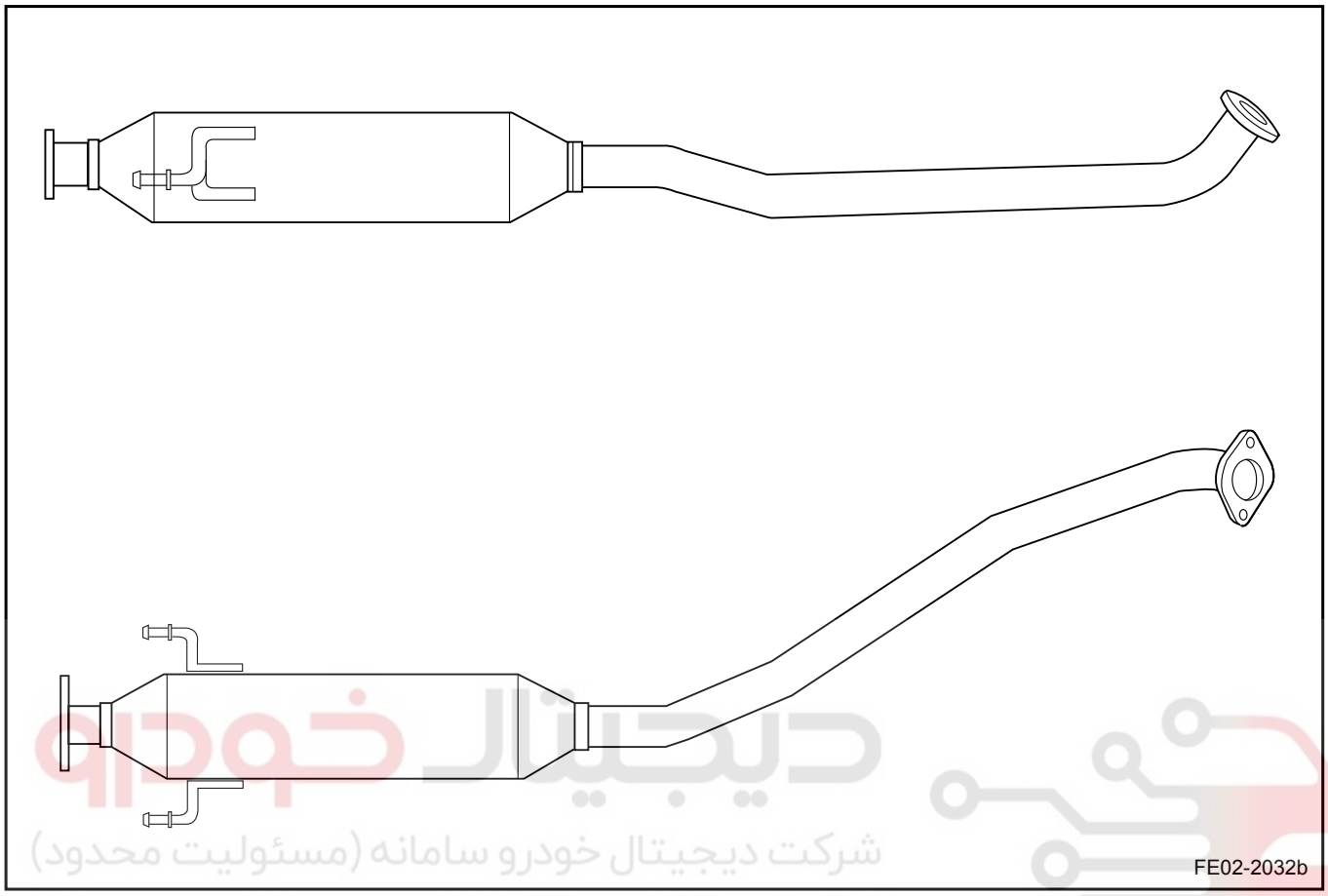
2.7.4.2 Three-Way Catalytic Converter Assembly



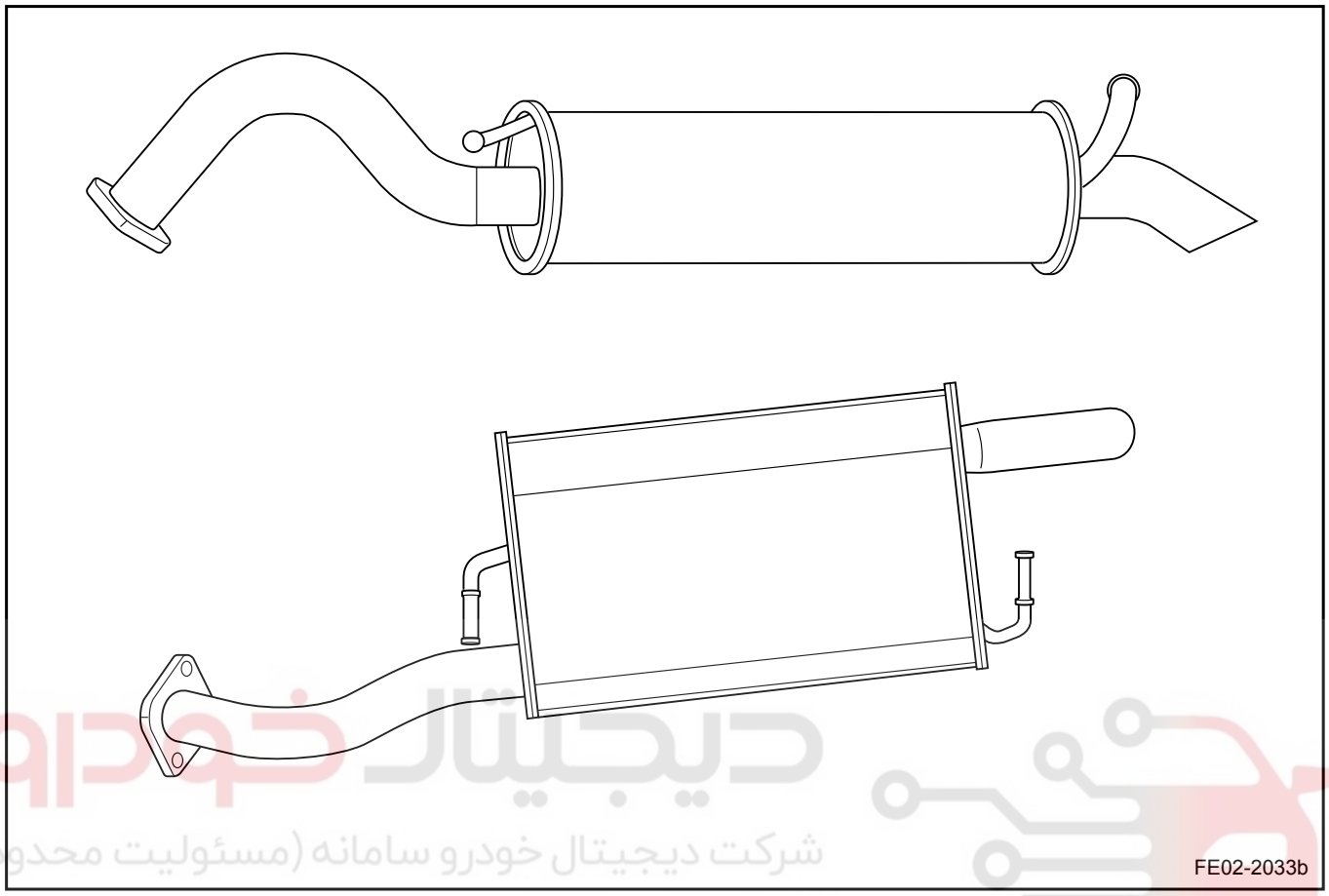
Legend

1. Pre-Catalytic Oxygen Sensor Mounting Hole
2. Three-Way Catalytic Converter Assembly
3. Post-Catalytic Oxygen Sensor Mounting Hole
4. Immunity Section

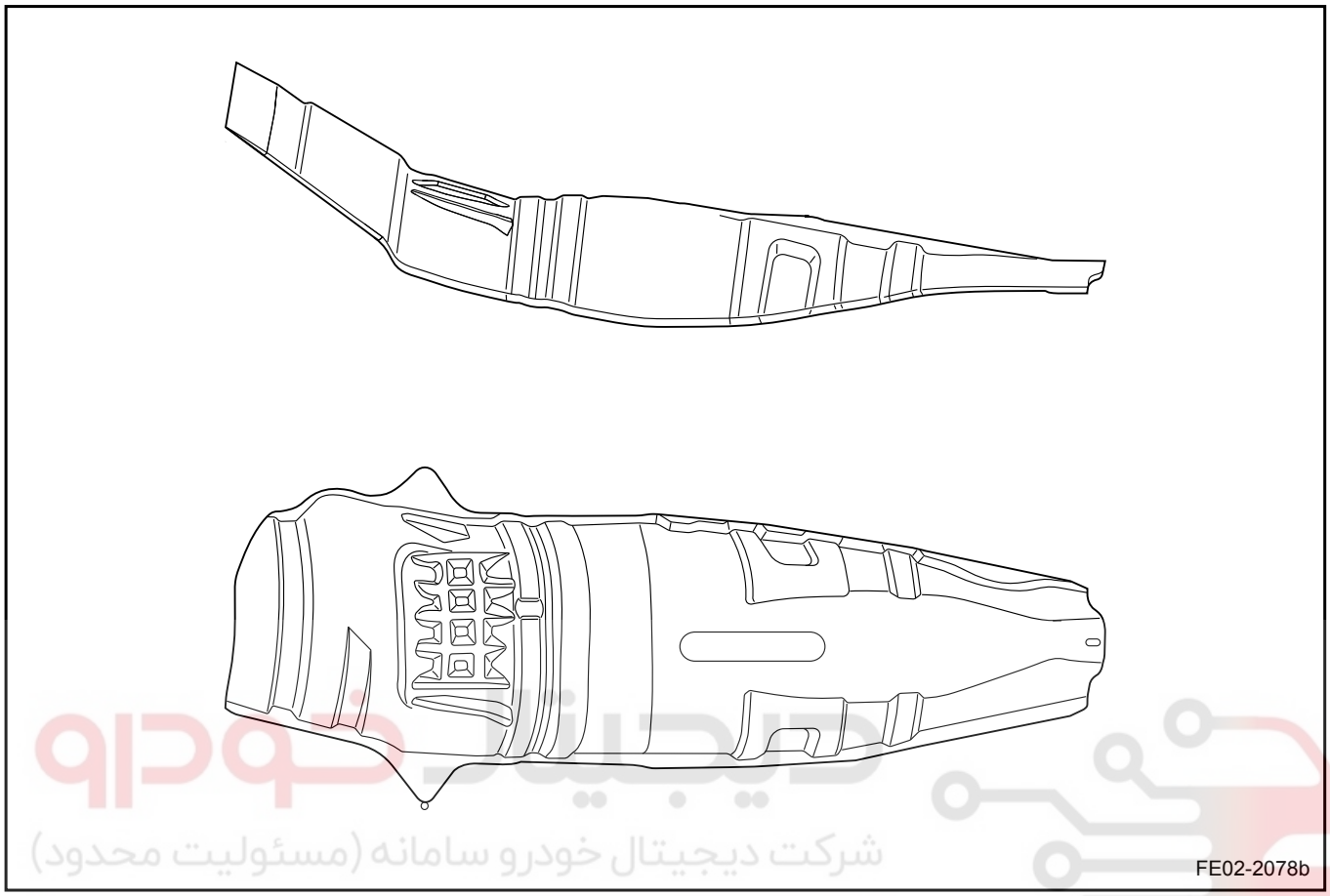
2.7.4.3 Front Muffler Assembly



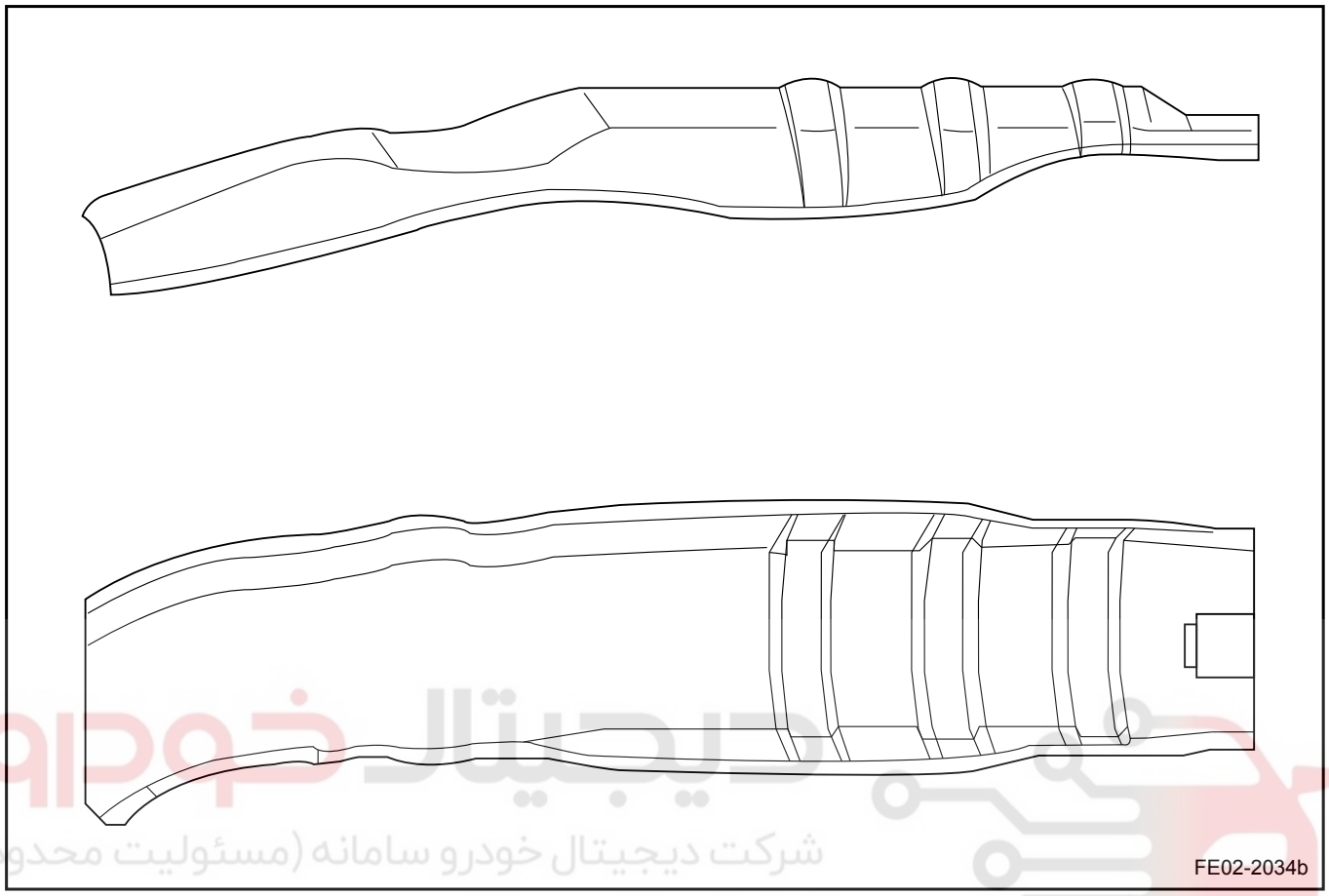
2.7.4.4 Rear Muffler Assembly



2.7.4.5 Front Exhaust Insulation Panel



2.7.4.6 Front Muffler Heat Shield



2.7.5 Diagnostic Information and Procedures

2.7.5.1 Diagnostic Description

Refer to "Description and Operation" in the2.7.2.1 Exhaust ManifoldGet familiar with the system functions and operation before start system diagnostics, as this will help with the correct diagnostic steps, more importantly, it will also help to determine whether the customer described situation is normal.

2.7.5.2 Visual Inspection

- Check installed after market equipment that may affect the operation of the exhaust system.
- Check the easy to access system components to identify whether there are significant blockages or leakage.
- Check whether the color of the exhaust gas is normal.

2.7.5.3 Exhaust System Blockage

When the engine loses power, fuel economy becomes worse or acceleration performance is poor, check whether there is "exhaust system blockage" fault, use the exhaust back-pressure to monitor whether the back-pressure is more than 50 kPa to confirm the fault. The fault may be caused by following reasons:

- Exhaust pipe is damaged.
- There are debris in exhaust pipes.
- Muffler or resonator internal faults.
- Exhaust pipe internal corrosion blocks the rear exhaust port.

2.7.5.4 Exhaust System Leakage

If the engine has "hiss" or a burst sound sound when running, check whether there is "Exhaust System Leakage" fault, as shown in the following table:

Exhaust system components misaligned or incorrectly installed	- Position and tighten the exhaust system components to the specified torque. Refer to "Engine Exhaust System" in the2.7.1.1 Fastener Tightening Specifications. - Make sure that the exhaust pipe hook is in the right place and is not loose.
Exhaust leak at the following connections: - Exhaust manifold and the three-way catalytic converter - Flange	Tighten the related components to the specified torque. Refer to the "Engine Exhaust System" in the2.7.1.1 Fastener Tightening Specifications.
Seal or Gasket Leak: - Exhaust Manifold and Cylinder Head Cover - Exhaust Manifold and The Three-Way Catalytic Converter - Three-Way Catalytic Converter and Front Muffler - Front Muffler and Rear Muffler	Replace the leaking seals or gasket.

Flange Irregular Joints	If necessary, repair or replace the associated components.
Exhaust Manifold Cracked or Broken	Replace the exhaust manifold. Refer to 2.7.6.1 Exhaust Manifold Replacement.
Exhaust system components welded joints leakage	Replace the leaking parts.

2.7.5.5 Exhaust System Noise

When the engine is running, exhaust has noise or unusual sound. Check whether there is "Exhaust System Noise" fault, as shown in the following table:

Crack sound or hiss	Exhaust system leaking. Refer to 2.7.5.4 Exhaust System Leakage.
Exhaust sound too big	1. Compare with a vehicle known in good conditions. 2. Check the muffler for damage or malfunction. Replace the faulty muffler. 3. Refer to 2.7.6.3 Front Muffler Replacement or 2.7.6.4 Rear Muffler Replacement.
External Noise or Vibration Noise	1. Check whether the hook is bent or loose or whether shrouds fasteners are loose. 2. Check whether the exhaust pipe is interfered.
Internal Noise	1. With a rubber hammer knock these parts to confirm the noise. 2. Replace the faulty three-way catalytic converter or muffler. Refer to 2.7.6.2 Three-way Catalytic Converter Replacement or 2.7.6.3 Front Muffler Replacement or 2.7.6.4 Rear Muffler Replacement.

2.7.5.6 Exhaust System Repair Notes

Warning!

Refer to "Exhaust System Service Warning" in "Warnings and Notices".

Warning!

The broken three-way catalytic converter must be replaced. It is not allowed to remove three-way catalytic converter exhaust system, otherwise there will be serious air pollution.

Note

In the following conditions, three-way catalytic converter may be damaged or malfunction:

- Work outside the closed-loop mixture control system.
- Engine burns a large amount of engine oil.
- If the three-way catalytic converter exhaust temperature is too high, at more than 840°C (1544 ºF).

Note

- Vehicles with three-way catalytic converter can not use leaded petrol. Lead will pollute the three-way catalytic converter.
- Do not drop the three-way catalytic converter, as this may damage the ceramic carrier.
- Do not allow water, engine oil or fuel enter into the converter, because this may contaminate the ceramic substrate.

- Do not start the vehicle when there is engine misfire or the spark plug wire is disconnected.

2.7.6 Removal and Installation

2.7.6.1 Exhaust Manifold Replacement

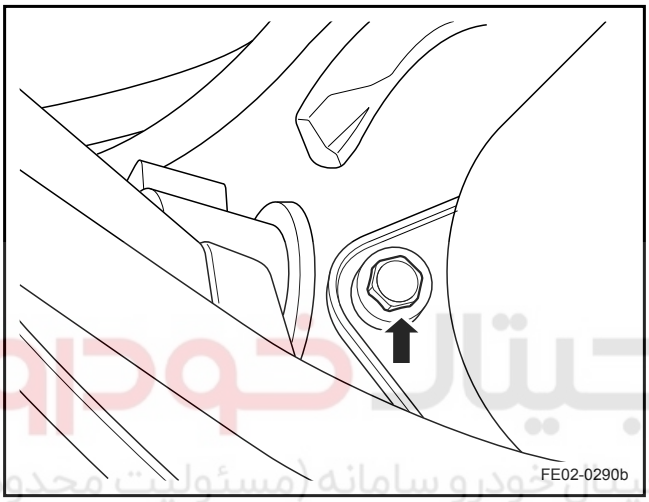
Removal Procedure:

Warning!

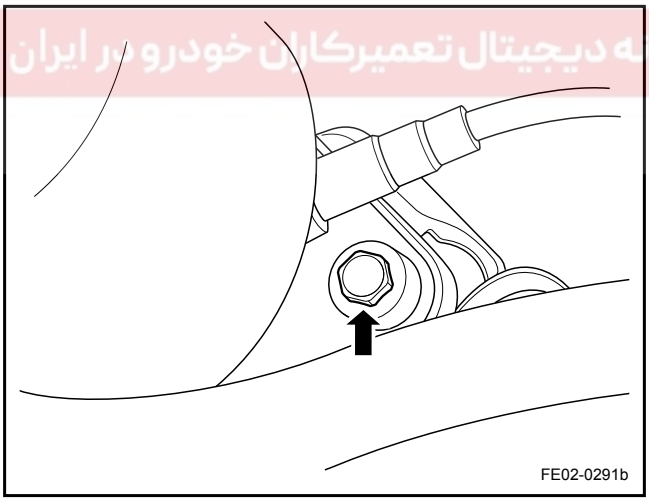
Refer to "Battery Disconnection Warning" in "Warnings and Notices".

Note

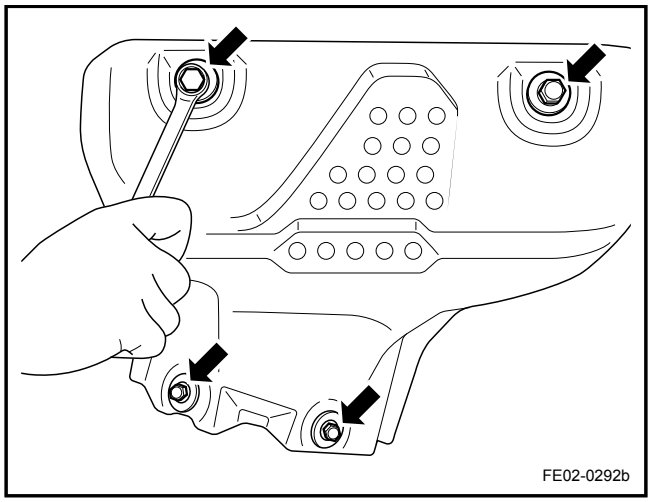
Removing the bolt when it is hot is likely to damage the bolt or flange nuts weld on the exhaust manifold. Remove the bolt when the engine is cooled down.



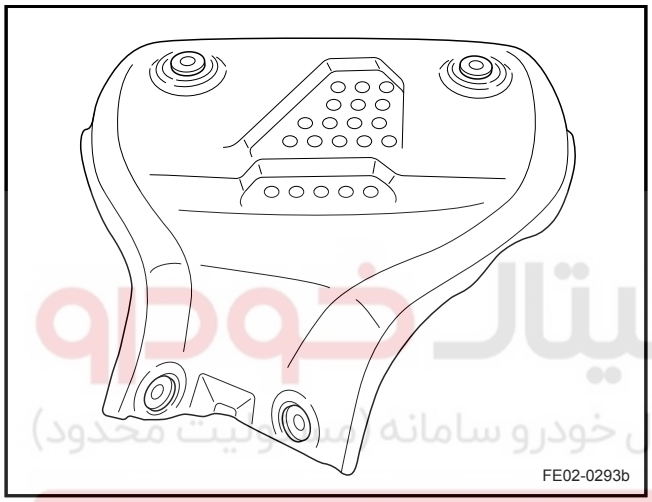
1. Disconnect the battery negative cable. Refer to 2.11.8.1 Battery Disconnection.
2. Remove the three-way catalytic converter left connecting bolt.



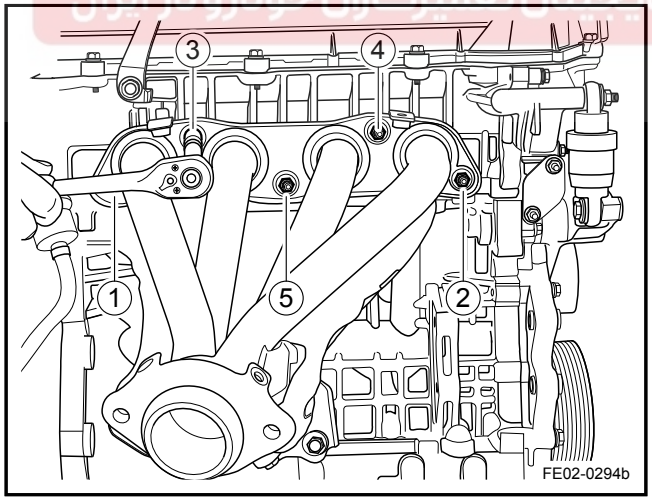
3. Remove the three-way catalytic converter right connecting bolt.



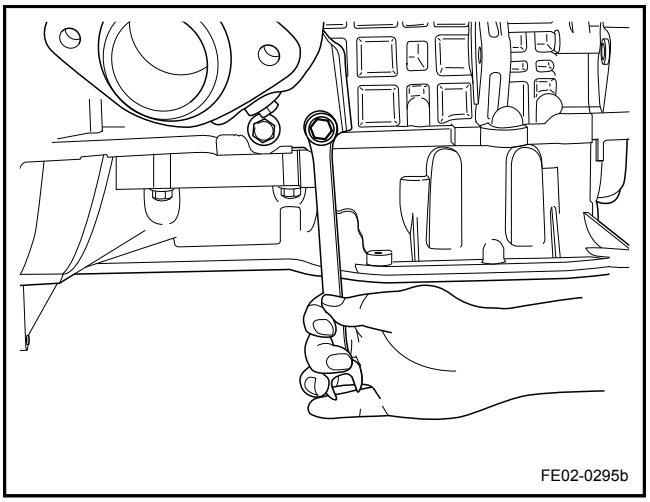
4. Remove heat shield to the exhaust manifold retaining bolts.



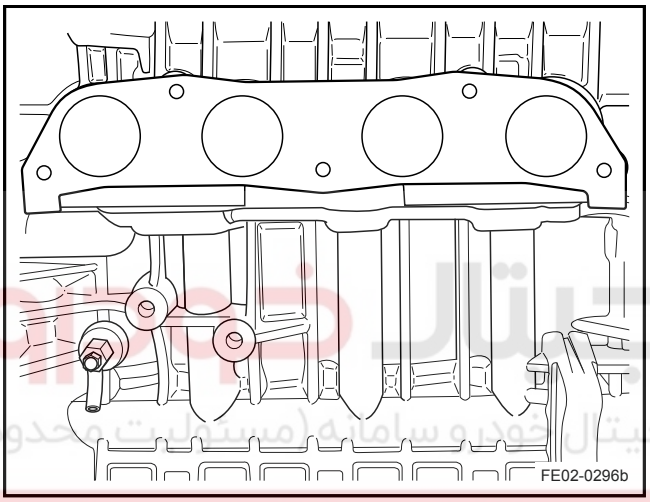
5. Remove the heat shield on the exhaust manifold.



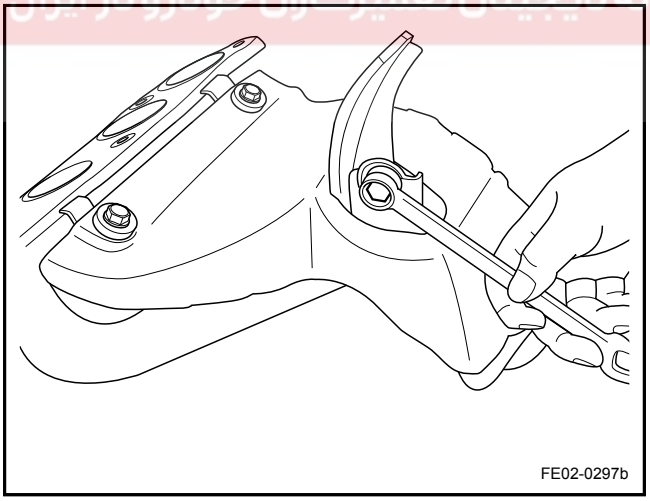
6. Remove the exhaust manifold bolts and nuts according to the sequence in the graphic.



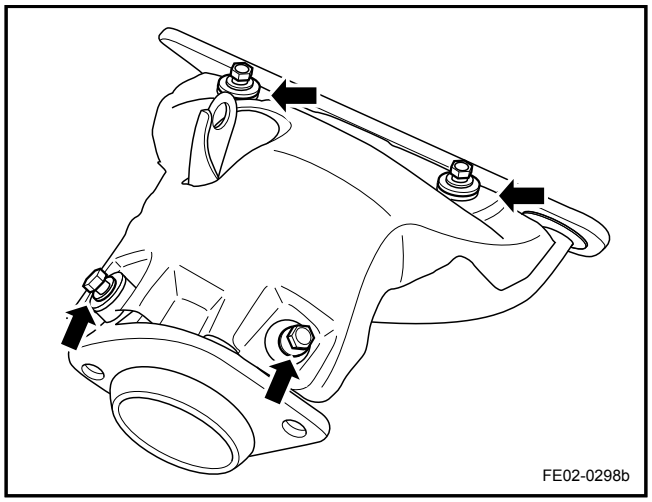
7. Remove the exhaust manifold bracket bolts.



8. Remove the exhaust manifold and exhaust manifold gasket.

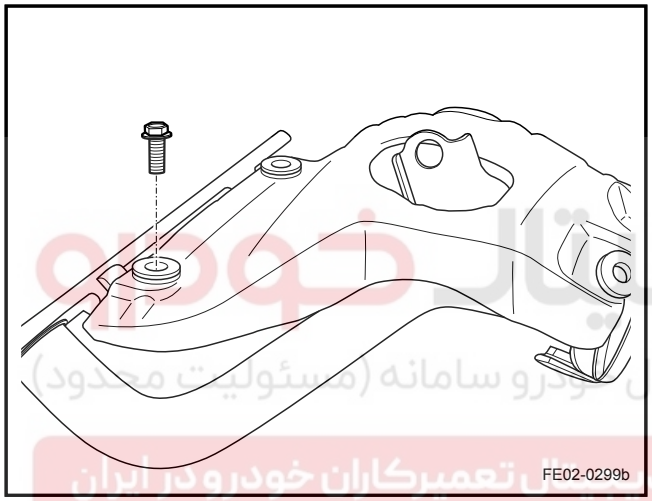


9. Remove the exhaust manifold bracket bolts.



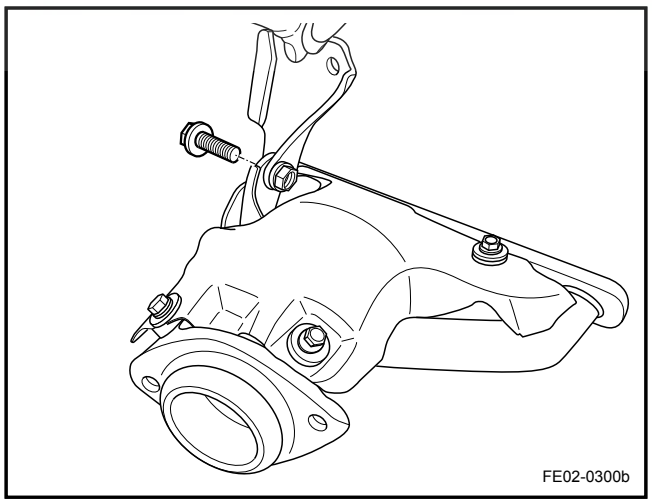
10. Remove the exhaust manifold lower heat shield retaining bolts.

Installation Procedure:



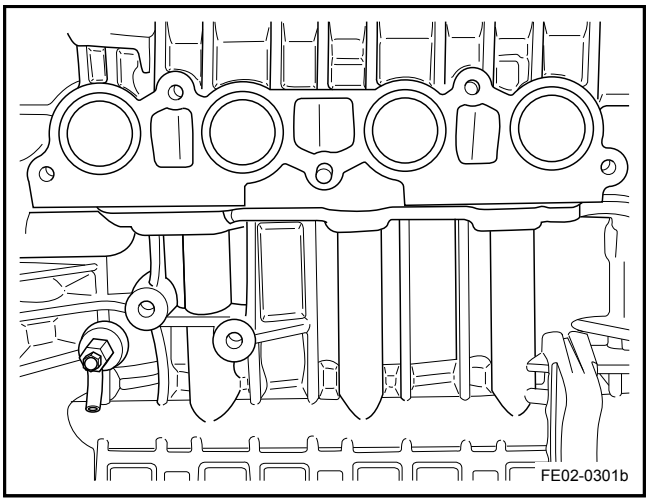
1. Install and tighten the exhaust manifold lower heat shield retaining bolts.

   Torque: 10 Nm (Metric) 7.4 lb-ft (US English)

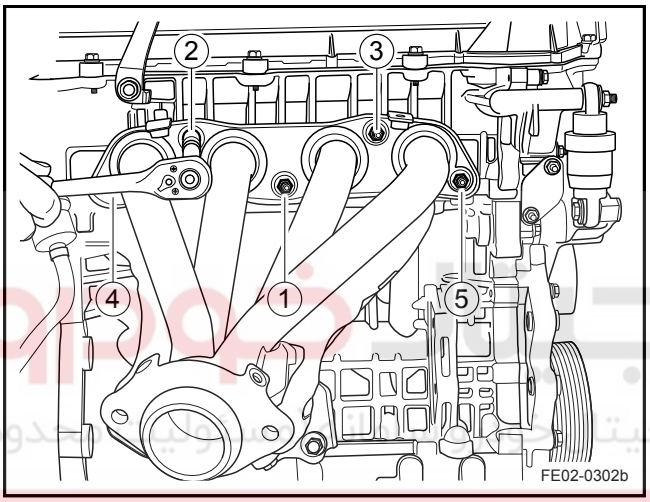


2. Install the exhaust pipe to engine bracket bolts.

   Torque: 35 Nm (Metric) 25.9 lb-ft (US English)

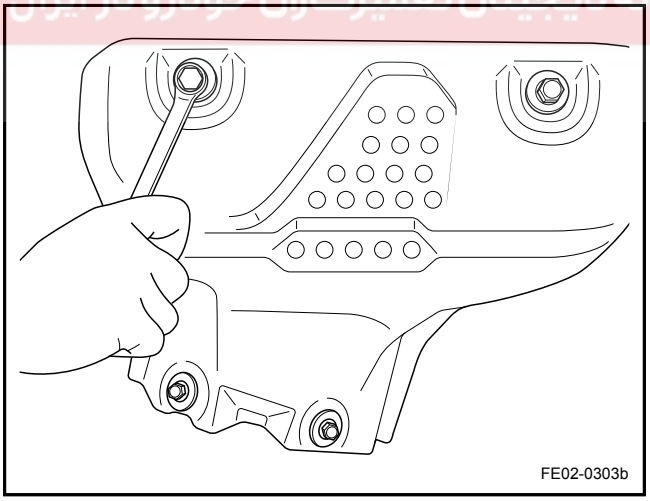


3. Clean the cylinder head cover and the exhaust manifold mating face.

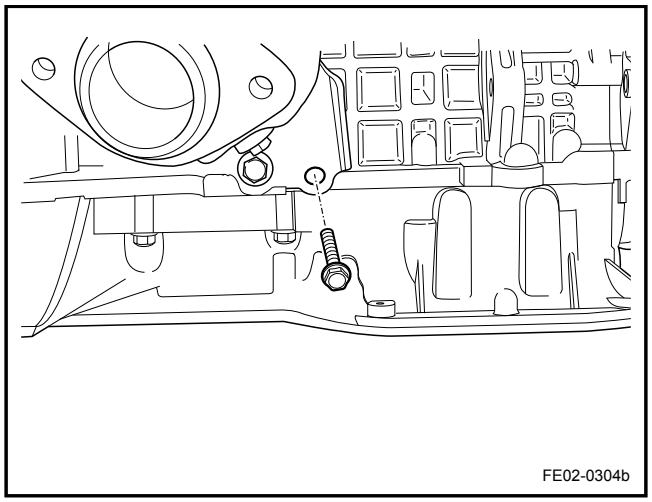


4. Install the exhaust manifold, install and tighten the bolts and nuts according to the sequence in the graphic.

   Torque: 25 Nm (Metric) 18.5 lb-ft (US English)

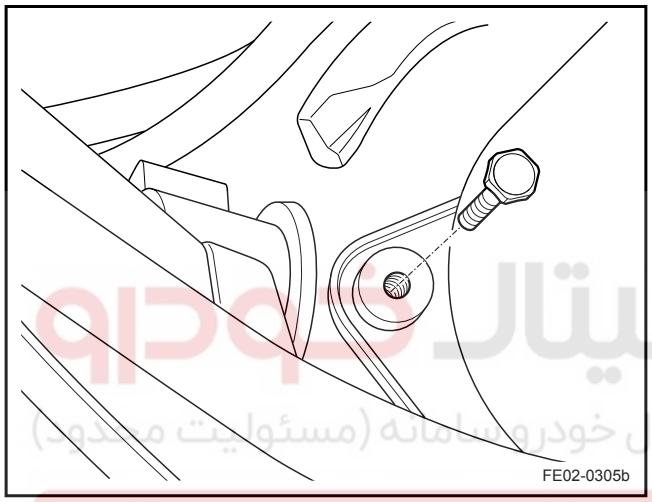


5. Install the exhaust manifold upper heat shield.



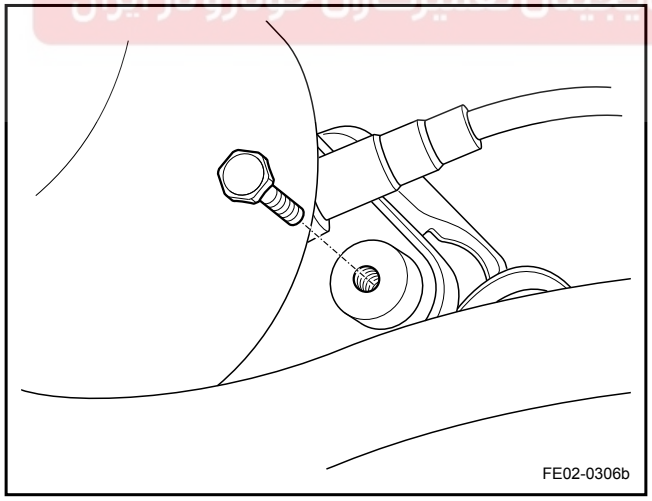
6. Install and tighten the exhaust manifold bracket retaining bolts.

   Torque: 35 Nm (Metric) 25.9 lb-ft (US English)



7. Install the three-way catalytic converter left connecting bolt.

   Torque: 52 Nm (Metric) 38.5 lb-ft (US English)



8. Install the three-way catalytic converter right connecting bolt.

   Torque: 52 Nm (Metric) 38.5 lb-ft (US English)

9. Connect the battery negative cable.

2.7.6.2 Three-way Catalytic Converter Replacement

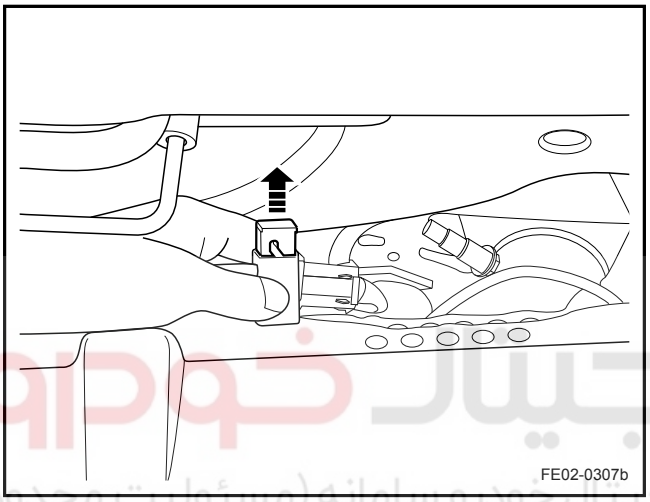
Removal Procedure:

Warning!

Refer to "Battery Disconnection Warning" in "Warnings and Notices".

Note

Removing the bolt when it is hot is likely to damage the bolt or flange nuts weld on the exhaust manifold. Remove the bolt when the engine is cooled down.

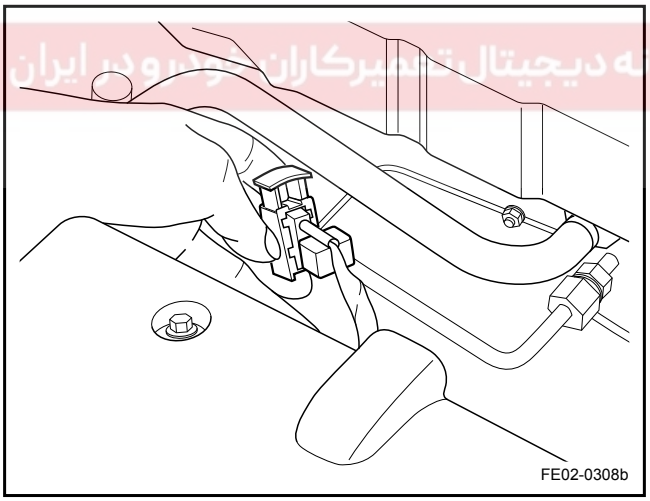


1. Disconnect the battery negative cable. Refer to 2.11.8.1 Battery Disconnection.

2. Disconnect the pre-catalytic oxygen sensor wiring harness connector.

   Note

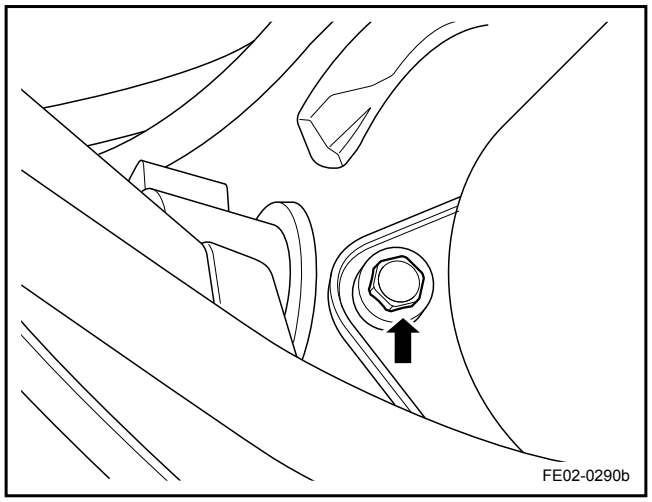
   Pull out the red plug to disconnect the harness connector.



3. Disconnect the post-catalytic oxygen sensor wiring harness connector.

   Note

   Pull out the red plug to Disconnect the harness connector.

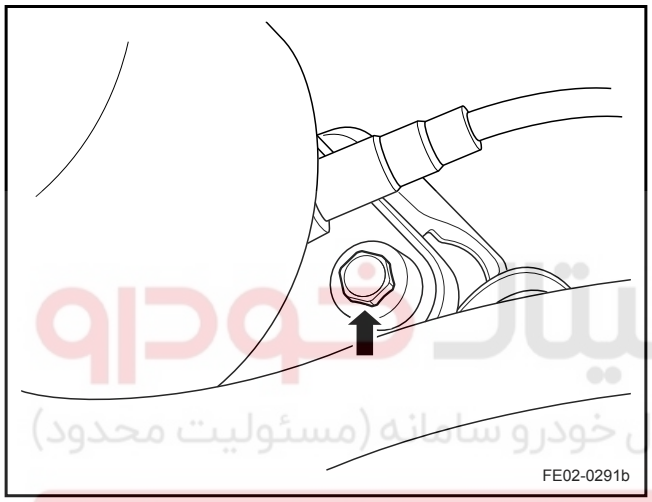


4. Lift the vehicle.

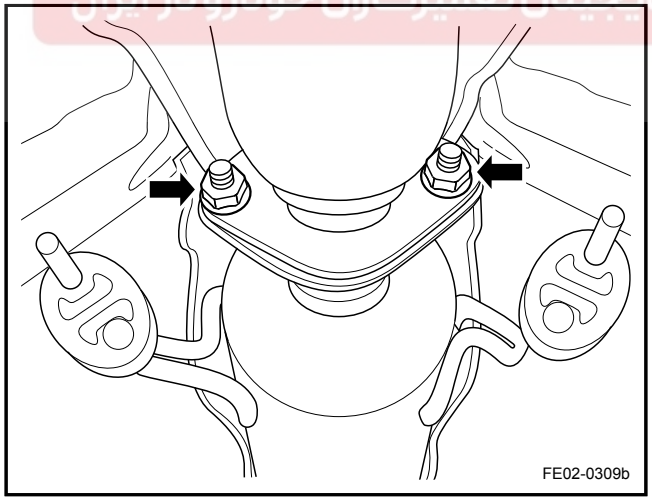
   Warning!

   Refer to "Vehicle Lifting Warning" in "Warnings and Notices".

5. Remove the three-way catalytic converter left connecting bolt.



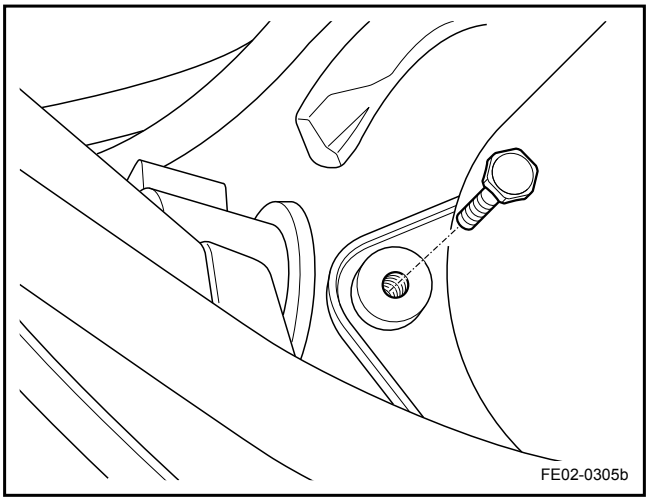
6. Remove the three-way catalytic converter right connecting bolt.



7. Remove the three-way catalytic exhaust converter connecting nuts, remove the exhaust pipe gaskets, remove the three-way catalytic converter and remove the exhaust outlet washers.

   Note

   Do not drop the three-way catalytic converter during removal.



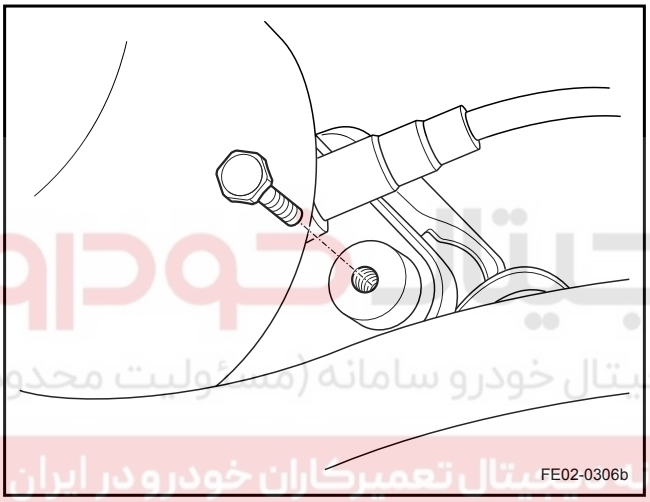
Installation Procedure:

1. Use a rubber hammer and a piece of wood, tapping the exhaust pipe exports to the exhaust manifold gasket, until the surfaces are even, and then install the three-way catalytic converter, tighten the left connecting bolt.

   Torque: 40 Nm (Metric) 29.6 lb-ft (US English)

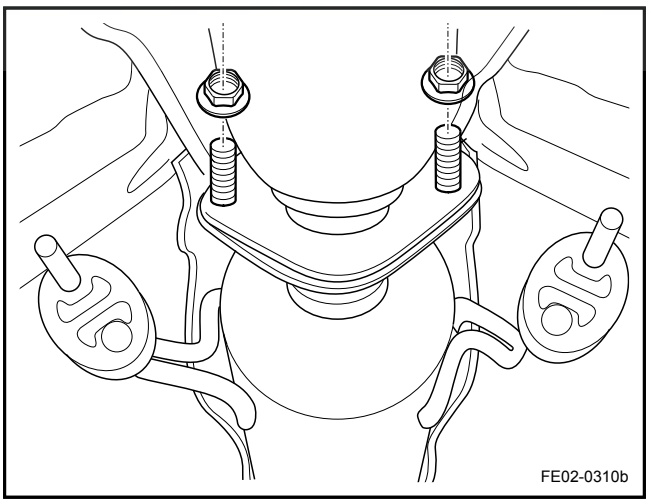
   Note

   Clean before installing the exhaust outlet gaskets and interface.



2. Install the three-way catalytic converter right connecting bolt.

   Torque: 40 Nm (Metric) 29.6 lb-ft (US English)



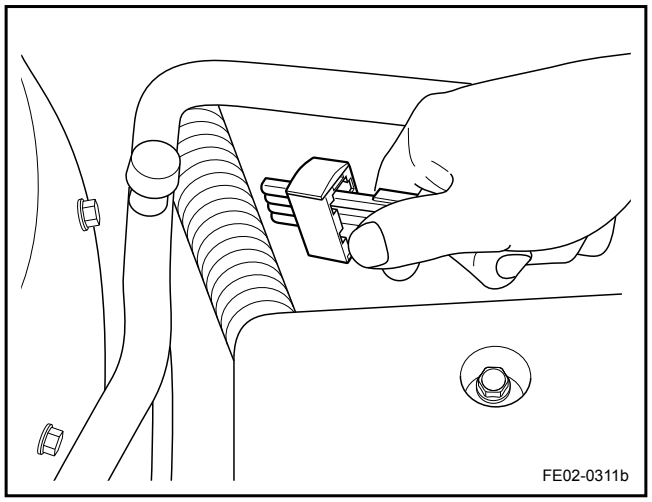
3. Install the exhaust pipe gasket.

   Note

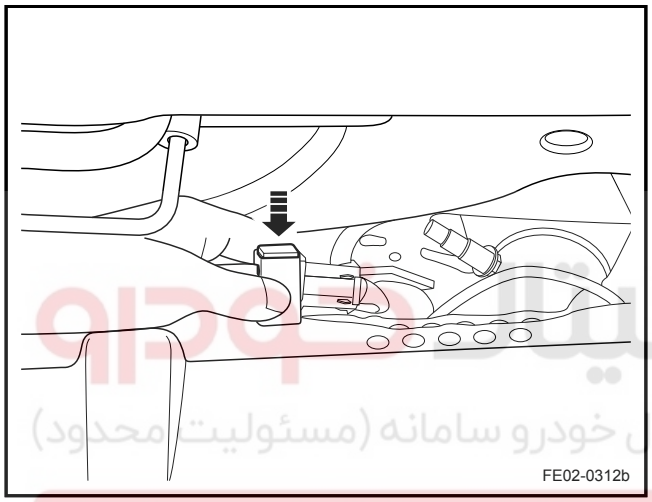
   Clean before installing the exhaust pipe gaskets and interface.

4. Clean the three-way catalytic exhaust pipe connecting nuts.

   Torque: 52 Nm (Metric) 38.5 lb-ft (US English)



5. Lower the vehicle.
6. Connect the post-catalytic oxygen sensor wiring harness connector.



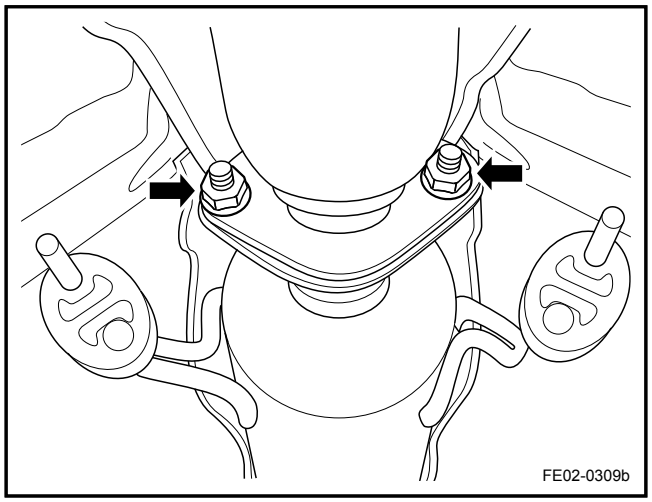
7. Connect the pre-catalytic oxygen sensor wiring harness connector.
8. Connect the battery negative cable.

2.7.6.3 Front Muffler Replacement

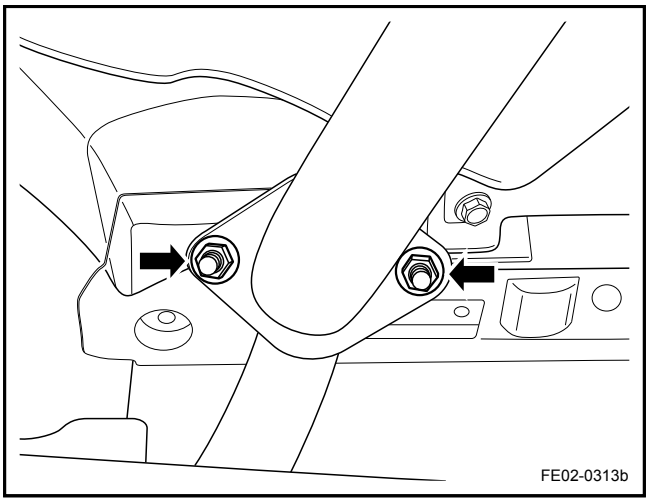
Removal Procedure:

Warning!

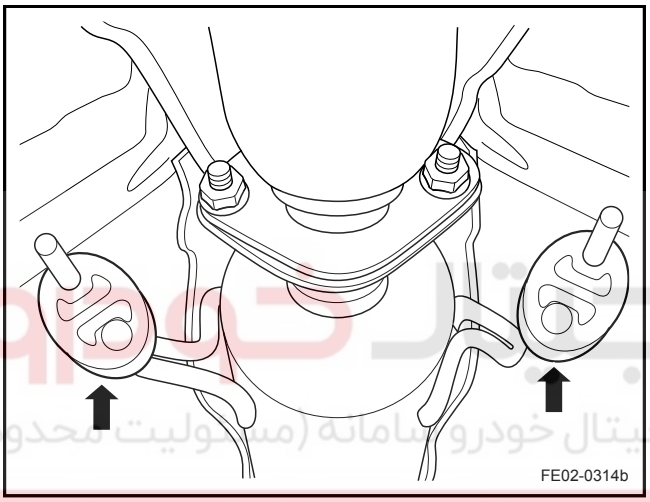
Refer to "Vehicle Lifting Warning" in "Warnings and Notices".



1. Lift the vehicle.
2. Remove the front muffler to the three-way catalytic converter retaining nuts and the exhaust pipe gasket.



3. Remove the front and rear muffler to the rear muffler retaining nuts and the exhaust pipe gasket.



4. Remove the rubber bearings from the front muffler.

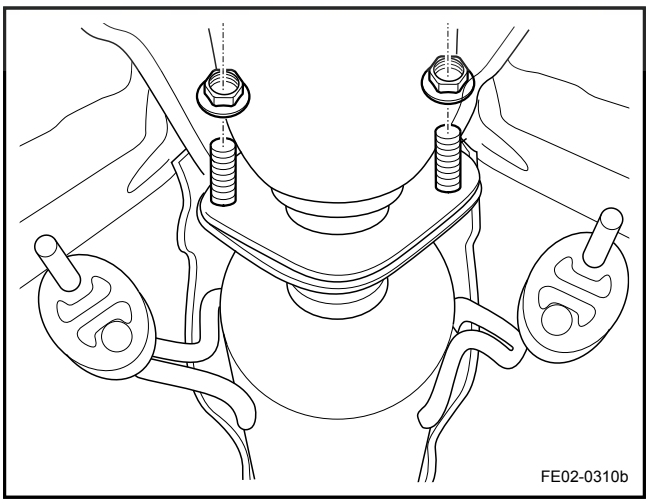
   Note

   Do not drop the front muffler during the removal.

5. Remove the front muffler.

6. Check whether the three-way catalytic muffler has holes, damage and cracks.

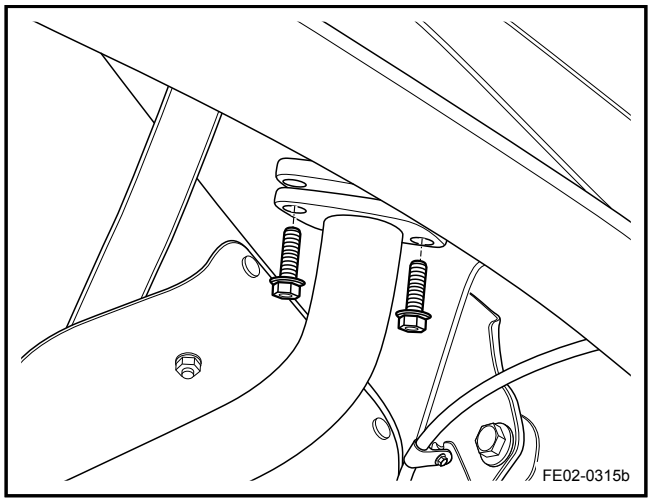
Installation Procedure:



1. Install the exhaust pipe gasket between the front muffler and the three-way catalytic converter.

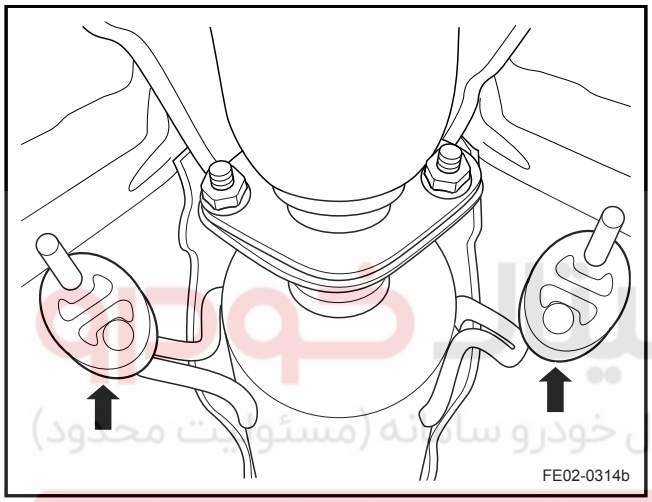
2. Install and tighten the front muffler to the three-way catalytic converter retaining nuts.

   Torque: 52 Nm (Metric) 38.4 lb-ft (US English)



3. Install the front muffler gasket.
4. Install and tighten the front and rear muffler retaining nuts.

   Torque: 52 Nm (Metric) 38.4 lb-ft (US English)



5. Install the rubber bearings on both sides of the front muffler.
6. Lower the vehicle.
7. Inspect the exhaust system leaks.

2.7.6.4 Rear Muffler Replacement

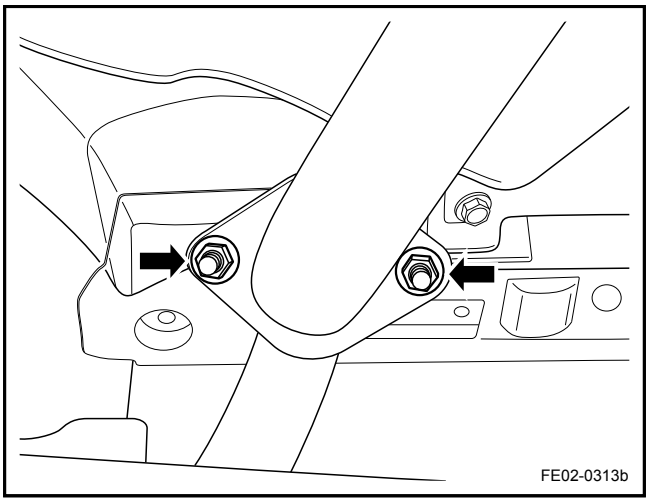
Removal Procedure:

Warning!

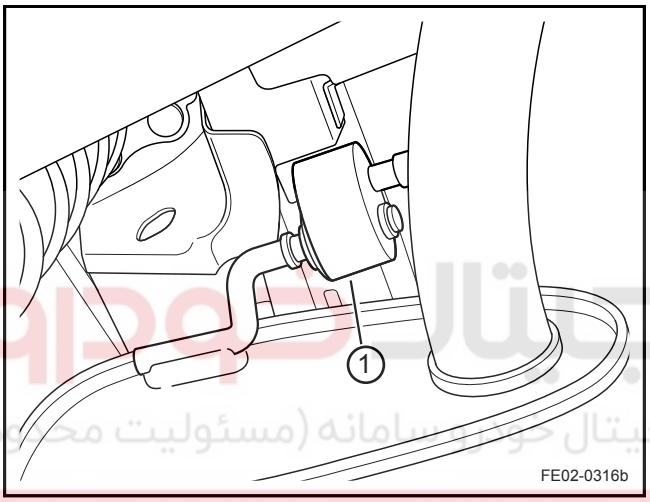
Refer to "Vehicle Lifting Warning" in "Warnings and Notices".

Warning!

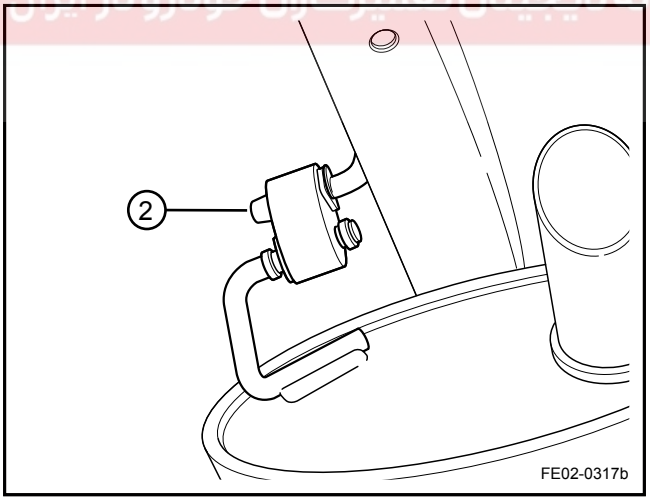
Do not carry out the removal procedure, as this may result in burns.



1. Lift the vehicle.
2. Remove the rear muffler to front muffler retaining nuts and the exhaust pipe gasket.

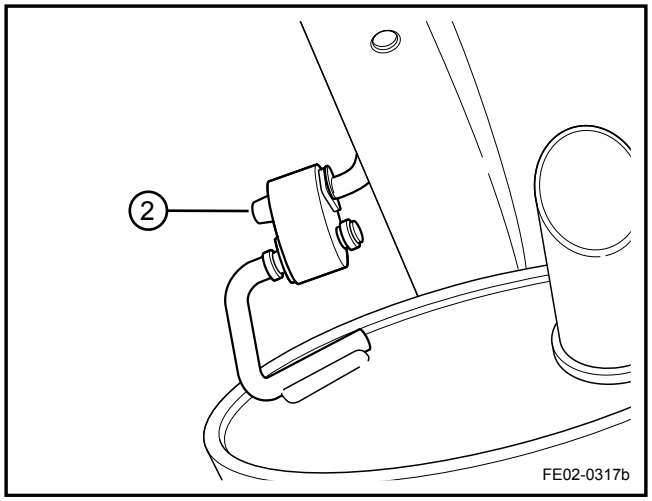


3. Remove the rear rubber bearing (1).

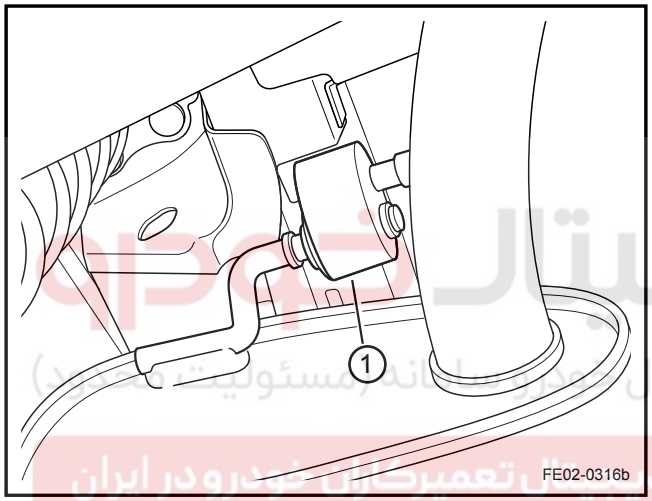


4. Remove the rear rubber bearing (2).
5. Remove rear muffler
6. Check whether there are holes, damage or cracks.

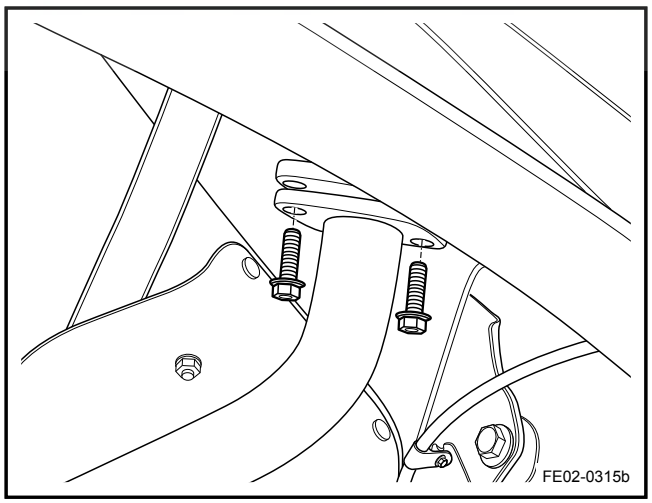
Installation Procedure:



1. Install the rear rubber bearing (2).



2. Install the rear rubber bearing (1).



3. Install the exhaust pipe gasket.
4. Install the rear muffler to front muffler retaining nuts.

   Torque: 52 Nm (Metric) 38.4 lb-ft (US English)
5. Lower the vehicle.
6. Inspect the exhaust system leaks.