Component Procedures: Exhaust System

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Component Procedures: Exhaust System

Parts and Labor (itype_189)

Labor

Operation	Qualifier Path	Skill	Std Hrs	Wty Hrs
Remove & Replace	Exhaust System > Catalytic Converter, R&R > L?	B	0.5	0.4
Remove & Replace	Exhaust System > Catalytic Converter, R&R > R?	B	0.6	0.5
Remove & Replace	Exhaust System > Complete Exhaust System, R&R	C	1.5	0.0
Remove & Replace	Exhaust System > Flange Gasket, R&R > One Side	C	0.9	0.0
Remove & Replace	Exhaust System > Flange Gasket, R&R > Both Si?	C	1.4	0.0
Remove & Replace	Exhaust System > Muffler & Pipe Assembly, R&R?	B	1.3	0.0

Exhaust System Description (Article 11968)

The exhaust system carries exhaust gases, treated by the catalytic converter , through a resonator , if applicable and into the exhaust muffler where exhaust noise is lessened.
In order to secure the exhaust pipe to the exhaust manifold, a flange and seal-joint coupling is utilized. The exhaust system may utilize a slip-joint coupling design with a clamp and a U-bolt or a flange connection with a gasket.
Exhaust hangers and rubber insulators help to support the weight of the exhaust pipe along with insulating any exhaust system vibration, rattle, or noise.
Exhaust hangers also space the exhaust system away from the underbody of the vehicle and allows the exhaust system to expand as the exhaust system warms up.
Exhaust heat shield s are used to protect the body and other components from damage due to the heat from the exhaust system.
The exhaust system may be comprised of the following components:
- Exhaust manifold
- Exhaust pipes
- Catalytic converters
- Exhaust muffler
- Exhaust resonator, if equipped
- Exhaust tail pipe, if equipped
- Exhaust hangers
- Exhaust heat shields

Resonator
Some exhaust systems are equipped with a resonator. The resonator, located either before or after the muffler, allows the use of mufflers with less back pressure. Resonators are used when vehicle characteristics require specific exhaust tuning.

Catalytic Converter
The catalytic converter is an emission control device added to the engine exhaust system in order to reduce hydrocarbons (HC), carbon monoxide (CO), and oxides of nitrogen (NOx) pollutants from the exhaust gas.
The catalytic converter is comprised of a ceramic monolith substrate, supported in insulation and housed within a sheet metal shell. The substrate may be washcoated with 3 noble metals:
- Platium (Pt)
- Palladium (Pd)
- Rhodium (Rh)

The catalyst in the converter is not serviceable.

Muffler
The exhaust muffler reduces the noise levels of the engine exhaust by the use of tuning tubes. The tuning tubes create channels inside the exhaust muffler that lower the sound levels created by the combustion of the engine.

Exhaust Tail Pipe Flow Control System (Article 11969)

Figure 1: Exhaust Flow Control System Block Diagram
The following components are involved in the operation of the above system:
- Engine control module
- Chassis control module
- Exhaust flow control valve

The exhaust tailpipe flow control system is used to tune the exhaust note for high performance vehicles. The

vehicle is equipped with two tailpipe exhaust valves – a left one and a right one. Each exhaust tailpipe valve is installed in the low restriction exhaust path of a dual outlet muffler , near the exhaust tip. When a tailpipe exhaust valve is open, the low restriction exhaust path is exposed to atmosphere, and the exhaust note becomes more characteristically high performance.
An output circuit from the fuel pump control module is used to operate a relay-controlled solenoid valve that regulates vacuum to the left and right exhaust tailpipe valves. When the exhaust flow control valve relay is energized (turned on), the exhaust flow control valve solenoid opens and applies vacuum to the exhaust tailpipe valves, causing them to close. When the exhaust flow control valve relay is de-energized (turned off), the exhaust flow control valve solenoid closes, which isolates the exhaust tailpipe valves from vacuum and causes them to open.
To provide a more aggressive exhaust note when the vehicle is started, the exhaust tailpipe valves are opened during an engine cranking event. Once the engine is running, accelerator pedal position, transmission gear and engine speed are used to determine the commanded state (open or closed) of the exhaust tailpipe valves.

Exhaust System Schematics (Article 12004)

Figure 1: Exhaust System Schematic

Exhaust Tail Pipe Flow Control Vacuum System (NPP) (Article 12005)

Figure 1: Exhaust Tail Pipe Flow Control Vacuum System NPP

Exhaust Service Warning (Article 13047)

Document ID: 2064129
Warning:
In order to avoid being burned, do not service the
exhaust system
while it is still hot. Service the system when it is cool.

Hot Exhaust System Warning (Article 13062)

Document ID: 2061964
Warning:
While engine is operating, the
exhaust system
will become extremely hot. To prevent burns avoid contacting a hot exhaust system.

Engine Exhaust - Fastener Specifications (Article 12007)

Application Specification
Metric English
Catalytic Converter to Cylinder Block Fastener (LFX)-First Pass Catalytic Converter to Cylinder Block Fastener (LFX)-Final Pass 20 Nm 15 lb ft
46 Nm 34 lb ft
Exhaust Manifold to Cylinder Head Fasteners (L99,LS3)-First Pass Exhaust Manifold to Cylinder Head Fasteners (L99,LS3)-Second Pass 15 Nm 11 lb ft
20 Nm 15 lb ft
Exhaust Muffler (H Pipe) Clamps 48 Nm 35 lb ft
Exhaust Hanger Mounting Bracket Fasteners 22 Nm 16 lb ft
Exhaust Manifold Heat Shield Bolt 10 Nm 89 lb in
Underbody Brace 25 Nm 18 lb ft

All Technical Service Bulletins (itype_100)

Tsbs
- Information on Malfunction Indicator Lamp (MIL) Illuminated with Multiple Fuel Trim and/or Oxygen Sensor Codes Set (20-NA-065, 2022/08/15)
- Exhaust System - Rattle Noise From The Exhaust System (PIC6006, 2014/06/13)
- Premature Catalytic Converter Failures (PIP5232C, 2016/03/04)

Repair Tips (itype_110)

Tsbs
- Exhaust System - Rattle Noise From The Exhaust System (PIC6006, 2014/06/13)

Exhaust Tail Pipe Flow Valve Mechanical System Diagnosis (Article 11973)

Diagnostic Aids

System diagnosis includes reviewing the system Exhaust Tail Pipe Flow Control System Description and Operation . Reviewing the information will help determine when a malfunction exists. It will also help to determine if the condition described by the customer is a normal system operation. Refer to Symptoms - Engine Exhaust in order to identify the correct procedure for diagnosing the system.

A Scan Tool can be used to command the vacuum solenoid On or Off.

- Vacuum solenoid commanded OFF
- Engine vacuum is blocked to the exhaust flow control valves mechanically by the position of the solenoid valve.
- Exhaust flow control valve vacuum diagrams are vented to the atmosphere mechanically due to the position of the solenoid valve.
- Exhaust flow control valves are OPEN.
- Exhaust gases flow through the least restrictive passage in the mufflers.
- Exhaust gases exit all muffler tail pipes.
- Vacuum solenoid commanded ON
- Engine vacuum is sent to the exhaust flow control valve.
- Both exhaust flow control valves CLOSE.
- Exhaust gases must flow through a more restrictive passage within the mufflers.
- Exhaust gases exit only the outboard tail pipe of each muffler.

Step Action Values Yes No

Schematic Reference: Exhaust Tail Pipe Flow Control Vacuum System

1 Note: Engine is NOT running. Looking into the inboard tail pipes, verify that the exhaust flow control valves are both in the OPEN position. Manually rotate each valve to the closed position. Release the valves and allow spring tension to return the valves to the OPEN position. Do both valves rotate CLOSED smoothly, without binding, and then return to the OPEN position when manual force is removed? — Go to Step 2 Go to Step 27

- Looking into the inboard tail pipes, verify that the exhaust flow control valves are both in the OPEN position.
- Manually rotate each valve to the closed position.
- Release the valves and allow spring tension to return the valves to the OPEN position.

2 Start the engine and allow it to idle. Verify that both exhaust flow control valves rotate to the fully OPEN position. Did both valves open? — Go to Step 3 Go to Step 5

- Start the engine and allow it to idle.
- Verify that both exhaust flow control valves rotate to the fully OPEN position.

3 Use a scan tool to command the exhaust flow control solenoid OFF. Do both exhaust flow control valves Open? — Go to Step 4 Go to Step 20

4 Use a scan tool to command the exhaust flow control solenoid ON. View both exhaust flow control valves from the rear of the vehicle. Have an assistant depress the accelerator pedal to the floor and immediately release the pedal. Did the exhaust flow control valves remain fully CLOSED? — Go to Step 35 Go to Step 23

- Use a scan tool to command the exhaust flow control solenoid ON.
- View both exhaust flow control valves from the rear of the vehicle.
- Have an assistant depress the accelerator pedal to the floor and immediately release the pedal.

5 Disconnect the quick connect between the vacuum check valve and the front chassis vacuum pipe, located near the brake booster. Note: If the O-ring is damaged, the exhaust tail pipe flow control vacuum check valve and hose will need to be replaced. Inspect the quick connect O-ring . Using a vacuum gauge at the vacuum check valve, measure and record the vacuum signal at engine Idle. Does the vacuum gauge read within the specified range? 9–30 in Hg (30–102 kPa) Go to Step 7 Go to Step 14

- Disconnect the quick connect between the vacuum check valve and the front chassis vacuum pipe, located near the brake booster.
- Inspect the quick connect O-ring .
- Using a vacuum gauge at the vacuum check valve, measure and record the vacuum signal at engine Idle.

6 With the engine running, clamp off the rubber vacuum hose forward of the vacuum check valve. Does the vacuum gauge read steady within the specified range for 30 seconds? 9–30 in Hg (30–102 kPa) Go to Step 7 Go to Step 28

7 Remove the clamp from the vacuum hose. Note: If the O-ring is damaged, the line reservoir tank to control valve solenoid pipe will need to be replaced. Disconnect the chassis rear vacuum pipe from the reservoir tank to valve solenoid pipe quick connect, located under the vehicle at the right side rail. Using a vacuum gauge at the chassis rear vacuum pipe, measure and record the vacuum signal at engine idle. Does the vacuum gauge

read within the specified range? 9–30 in Hg (30–102 kPa) Go to Step 8 Go to Step 14
- Remove the clamp from the vacuum hose.
- Disconnect the chassis rear vacuum pipe from the reservoir tank to valve solenoid pipe quick connect, located under the vehicle at the right side rail.
- Using a vacuum gauge at the chassis rear vacuum pipe, measure and record the vacuum signal at engine idle.
8 Connect chassis rear vacuum pipe from the reservoir tank to valve solenoid pipe quick connect . Note: If the O-ring is damaged, the line reservoir tank to control valve solenoid pipe will need to be replaced. Disconnect the vacuum pipe from the vacuum tank. Using a vacuum gauge at the pipe, measure and record the vacuum signal at engine Idle. Does the vacuum gauge read within the specified range? 9–30 in Hg (30–102 kPa) Go to Step 09 Go to Step 16
- Connect chassis rear vacuum pipe from the reservoir tank to valve solenoid pipe quick connect .
- Disconnect the vacuum pipe from the vacuum tank.
- Using a vacuum gauge at the pipe, measure and record the vacuum signal at engine Idle.
9 Disconnect the vacuum pipe from the left flow control valve. Using a vacuum gauge at the pipe, measure and record the vacuum signal at engine Idle. Does the vacuum gauge read within the specified range? 9–30 in Hg (30–102 kPa) Go to Step 11 Go to Step 18
- Disconnect the vacuum pipe from the left flow control valve.
10 Using a J-35555 - metal mityvac at the left flow control valve, apply at least 16 in Hg (54 kPa). Does the left flow control valve close? — Go to Step 12 Go to Step 28
11 Disconnect the vacuum pipe from the right flow control valve. Using a vacuum gauge at the pipe, measure and record the vacuum signal at engine Idle. Does the vacuum gauge read within the specified range? 9–30 in Hg (30–102 kPa) Go to Step 13 Go to Step 33
- Disconnect the vacuum pipe from the right flow control valve.
12 Using a J-35555 - metal mityvac at the right flow control valve, apply at least 16 in Hg (54 kPa). Does the right flow control valve close? — Go to Step 13 Go to Step 28
13 Connect the vacuum check valve and the front chassis vacuum pipe. Disconnect the vacuum hose at the vacuum check valve. Using a vacuum gauge at the vacuum hose , measure and record the vacuum signal at engine Idle. Does the vacuum gauge read within the specified range? 9–30 in Hg (30–102 kPa) Go to Step 29 Go to Step 19
- Connect the vacuum check valve and the front chassis vacuum pipe.
- Disconnect the vacuum hose at the vacuum check valve.
- Using a vacuum gauge at the vacuum hose , measure and record the vacuum signal at engine Idle.
14 Connect the vacuum hose to the vacuum check valve. Note: If the O-ring is damaged, the rear chassis vacuum pipe will need to be replaced. Disconnect the rear chassis pipe from the reservoir tank to valve solenoid pipe, located near the fuel tank. With the engine running, use a vacuum gauge at the front chassis pipe, measure and record the vacuum signal at engine Idle. Does the vacuum gauge read steady within the specified range? 9–30 in Hg (30–102 kPa) Go to Step 16 Go to Step 30
- Connect the vacuum hose to the vacuum check valve.
- Disconnect the rear chassis pipe from the reservoir tank to valve solenoid pipe, located near the fuel tank.
- With the engine running, use a vacuum gauge at the front chassis pipe, measure and record the vacuum signal at engine Idle.
15 Connect the pipes. Note: If the O-ring is damaged, the rear chassis vacuum pipe will need to be replaced. Disconnect the quick connect in the rear chassis vacuum pipe, located above the transmission. Using a vacuum gauge at the forward part of the rear chassis vacuum pipe, measure and record the vacuum signal at engine Idle. Does the vacuum gauge read within the specified range? 9–30 in Hg (30–102 kPa) Go to Step 31 Go to Step 36
- Connect the pipes.
- Disconnect the quick connect in the rear chassis vacuum pipe, located above the transmission.
- Using a vacuum gauge at the forward part of the rear chassis vacuum pipe, measure and record the vacuum signal at engine Idle.
16 Connect the quick connect. Disconnect the vacuum reservoir tank to valve solenoid from the vacuum valve solenoid. Does the vacuum gauge read within the specified range? 9–30 in Hg (30–102 kPa) Go to Step 34 Go to Step 32
- Connect the quick connect.
- Disconnect the vacuum reservoir tank to valve solenoid from the vacuum valve solenoid.
17 Disconnect the chassis rear vacuum pipe from the reservoir tank to valve solenoid pipe quick connect . Located under the vehicle at rear cradle. Disconnect the reservoir tank to valve solenoid pipe from the vacuum solenoid. Using a J-35555 - metal mityvac apply at least 16 in Hg to reservoir tank to valve solenoid pipe. Can 16 in Hg of vacuum be achieved? — Go to Step 32 Go to Step 23
- Disconnect the chassis rear vacuum pipe from the reservoir tank to valve solenoid pipe quick connect . Located under the vehicle at rear cradle.

- Disconnect the reservoir tank to valve solenoid pipe from the vacuum solenoid.
- Using a J-35555 - metal mityvac apply at least 16 in Hg to reservoir tank to valve solenoid pipe.

18 Check for restrictions between the intake manifold port the vacuum check valve. Did you complete the repair? — Go to Step 35 Go to Step 20

19 Disconnect the vacuum hose at the intake manifold. Using a vacuum gauge at the intake manifold, measure and record the vacuum signal at engine Idle. Does the vacuum gauge read within the specified range? 9–30 in Hg (30–102 kPa) Go to Step 20 Go to Intake Manifold Removal

- Disconnect the vacuum hose at the intake manifold.
- Using a vacuum gauge at the intake manifold, measure and record the vacuum signal at engine Idle.

20 Disconnect the vacuum pipe from the left exhaust flow control valve . The left valve will open. Did the right exhaust flow control valve also fully OPEN? — Go to Step 34 Go to Step 22

21 Disconnect the vacuum pipe from the left exhaust flow control valve. Did both exhaust flow control valves fully OPEN? — Go to Step 33 Go to DTC P166A

22 Disconnect the reservoir tank to flow control valves pipe from the vacuum solenoid. Using a vacuum gauge , measure and record the vacuum signal at engine idle from the vacuum solenoid. Does the vacuum gauge read within the specified range? 9–30 in Hg (30–102 kPa) Go to Step 33 Go to Step 32

- Disconnect the reservoir tank to flow control valves pipe from the vacuum solenoid.
- Using a vacuum gauge , measure and record the vacuum signal at engine idle from the vacuum solenoid.

23 Disconnect the vacuum check valve from the front chassis vacuum pipe, located near the brake booster. Note: If the O-ring is damaged, the exhaust tail pipe flow control vacuum check valve and hose will need to be replaced. Inspect the O-ring. Using a vacuum gauge, measure and record the vacuum signal at engine Idle from the vacuum check valve. Clamp off the rubber hose forward of the vacuum check valve. Does the vacuum remain steady for 30 seconds? — Go to Step 25 Go to Step 29

- Disconnect the vacuum check valve from the front chassis vacuum pipe, located near the brake booster.
- Inspect the O-ring.
- Using a vacuum gauge, measure and record the vacuum signal at engine Idle from the vacuum check valve.
- Clamp off the rubber hose forward of the vacuum check valve.

24 Remove the clamp. Remove the vacuum gauge. Connect Quick the vacuum check valve to front chassis pipe. Disconnect the vacuum pipe from the reservoir tank. Using a J-35555 - metal mityvac apply vacuum to the reservoir tank. Does the vacuum gauge read within the specified range for 30 seconds? 9–30 in Hg (30–102 kPa) Go to Step 26 Go to Step 35

- Remove the clamp.
- Remove the vacuum gauge.
- Connect Quick the vacuum check valve to front chassis pipe.
- Disconnect the vacuum pipe from the reservoir tank.
- Using a J-35555 - metal mityvac apply vacuum to the reservoir tank.

25 Connect the vacuum line to the vacuum tank. Using a vacuum gauge, tee into the vacuum lines at the left exhaust flow control valve. Use a scan tool to command the exhaust flow control solenoid ON. View both exhaust flow control valves from the rear of the vehicle. Have an assistant depress the accelerator pedal to the floor and immediately release the pedal. Does the vacuum gauge read within the specified range? 9–30 in Hg (30–102 kPa) Go to DTC P166A Go to Step 2

- Connect the vacuum line to the vacuum tank.
- Using a vacuum gauge, tee into the vacuum lines at the left exhaust flow control valve.

26 Isolate a small leak in the following locations. Intake manifold to vacuum line connection Quick connect connectors Vacuum check valve line connectors Vacuum storage tank connection Vacuum solenoid connections Exhaust flow control valve connections Did you complete the repair? — Go to Step 35 —

- Intake manifold to vacuum line connection
- Quick connect connectors
- Vacuum check valve line connectors
- Vacuum storage tank connection
- Vacuum solenoid connections
- Exhaust flow control valve connections

27 Replace the exhaust flow control valve. Refer to Exhaust Muffler with Resonator, Exhaust, and Tail Pipe Replacement . Did you complete the repair? — Go to Step 35 —

28 Replace the engine vacuum line assembly. Refer to Exhaust Tail Pipe Flow Control Vacuum Check Valve and Hose Replacement . Did you complete the repair? — Go to Step 35 —

29 Replace the forward chassis vacuum line. Refer to Exhaust Tail Pipe Flow Valve Vacuum Pipe Replacement - Chassis Front . Did you complete the repair? — Go to Step 35 —

30 Replace the vacuum line between quick connect 3 and quick connect 4. Refer to Exhaust Tail Pipe Flow Valve Vacuum Pipe Replacement - Chassis Rear . Did you complete the repair? — Go to Step 35 —

31 Replace the solenoid vacuum line. Refer to Exhaust Tail Pipe Flow Valve Vacuum Pipe Replacement - Reservoir Tank to Valve Solenoid . Did you complete the repair? — Go to Step 35 —
32 Replace the vacuum line between the vacuum solenoid and exhaust flow control valves. Refer to Exhaust Tail Pipe Flow Valve Vacuum Pipe Replacement - Valve Solenoid to Control Valves . Did you complete the repair? — Go to Step 35 —
33 Replace the vacuum solenoid. Refer to Exhaust Tail Pipe Flow Control Valve Solenoid Replacement Did you complete the repair? — Go to Step 35 —
34 Replace the vacuum storage tank. Refer to Exhaust Tail Pipe Flow Valve Vacuum Pipe Reservoir Tank Replacement . Did you complete the repair? — Go to Step 35 —
35 Operate the system in order to verify the repair. Did you correct the condition? — System OK Go to Step 2

Symptoms - Engine Exhaust (Article 11975)

- Review the Exhaust System Description and Operation in order to familiarize yourself with the system functions. Refer to Exhaust System Description .
- All diagnostics on a vehicle should follow a logical process. Strategy Based Diagnostics is a uniform approach for repairing all systems. The diagnostic flow is the place to start when repairs are necessary and may always be used in order to resolve a system problem. For a detailed explanation, refer to Strategy Based Diagnosis .

Visual/Physical Inspection

- Inspect for aftermarket or non-OEM devices such as, but not including; tailpipe extensions, headers, and exhaust cutouts. This could affect the operation and proper performance of the exhaust system.
- Verify the exact operating conditions under which the concern exists. Note factors such as engine RPM, engine temperature, engine load, and frequency of concern.
- Inspect the easily accessible or visible system components for obvious damage or conditions which could cause any symptom.

Intermittent

Test the vehicle under the same conditions that the customer reported in order to verify the system is operating as designed.

Symptom List

Refer to a symptom diagnostic procedure from the following list in order to diagnose the symptom:

- Loss of power—Refer to Restricted Exhaust .
- Poor acceleration—Refer to Restricted Exhaust .
- Poor fuel economy—Refer to Restricted Exhaust .
- Excessive smoke-diesel—Refer to Restricted Exhaust .
- Exhaust hissing noise—Refer to Exhaust Leakage .
- Exhaust popping noise—Refer to Exhaust Leakage .
- Exhaust rattle noise—Refer to Exhaust Noise .
- Loud exhaust noise—Refer to Exhaust Noise
- Exhaust buzz, groan, hum noise—Refer to Exhaust Noise .

Restricted Exhaust (Article 11974)

Special Tools

J 35314-A - Exhaust Back Pressure Gauge

Diagnostic Aids

For dual exhaust system s a quick check of exhaust flow will help determine which side of the exhaust system is restricted. The side that has less exhaust flow is the side that will be suspect, and diagnosis should begin there.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

- The exhaust system has very low back pressure under normal conditions. If the exhaust system is restricted, a significant increase in the exhaust pressure is noticed on the J 35314-A - Exhaust Back Pressure Gauge . Removing the HO2S sensor may set a DTC. When finishing this diagnostic table, be sure to clear all codes.
- This step will isolate the catalytic converter from the remainder of the exhaust system.
- Confirming that the condition has been fixed is essential. If the symptom still exists and the vehicle has a dual exhaust system, proceed to step 2 and repeat diagnostic procedure on the opposite exhaust pipe .

Step Action Value(s) Yes No
1 Did you verify the customers complaint? — Go to Step 2 —
2 Did you review the exhaust symptoms diagnostic information and perform the necessary inspections? — Go to Step 3 Go to Symptoms - Engine Exhaust

3 Is the system equipped with dual exhaust? — Go to Diagnostic Aids Go to Step 4
4 Remove the heated oxygen sensor (HO2S) that is in front of the catalytic converter. Refer Heated Oxygen Sensor Replacement - Bank 1 Sensor 1 or Heated Oxygen Sensor Replacement - Bank 2 Sensor 1 . Install the J 35314-A - exhaust back pressure gauge in place of the HO2S sensor. Start the engine. Increase and monitor the engine speed at 2,500 RPM. Observe the exhaust system back pressure reading on the gauge. Does the reading exceed the specified value? 9 kPa (1.25 psi) Go to Step 5 Go to Step 8
- Remove the heated oxygen sensor (HO2S) that is in front of the catalytic converter. Refer Heated Oxygen Sensor Replacement - Bank 1 Sensor 1 or Heated Oxygen Sensor Replacement - Bank 2 Sensor 1 .
- Install the J 35314-A - exhaust back pressure gauge in place of the HO2S sensor.
- Start the engine.
- Increase and monitor the engine speed at 2,500 RPM.
- Observe the exhaust system back pressure reading on the gauge.
5 Turn the engine off and place the ignition in the lock position. Remove the J 35314-A - exhaust back pressure gauge . Re-install the HO2S sensor. Refer to Heated Oxygen Sensor Replacement - Bank 1 Sensor 1 or Heated Oxygen Sensor Replacement - Bank 2 Sensor 1 . Remove the post- catalyst HO2S sensor. Refer to Heated Oxygen Sensor Replacement - Bank 1 Sensor 2 or Heated Oxygen Sensor Replacement - Bank 2 Sensor 2 . Install the J 35314-A - exhaust back pressure gauge in place of the post HO2S sensor. Start the engine. Increase and monitor the engine speed at 2,500 RPM. Observe the exhaust system back pressure reading on the gauge. Does the reading exceed the specified value? 9 kPa (1.25 psi) Go to Step 6 Go to Step 7
- Turn the engine off and place the ignition in the lock position.
- Remove the J 35314-A - exhaust back pressure gauge .
- Re-install the HO2S sensor. Refer to Heated Oxygen Sensor Replacement - Bank 1 Sensor 1 or Heated Oxygen Sensor Replacement - Bank 2 Sensor 1 .
- Remove the post- catalyst HO2S sensor. Refer to Heated Oxygen Sensor Replacement - Bank 1 Sensor 2 or Heated Oxygen Sensor Replacement - Bank 2 Sensor 2 .
- Install the J 35314-A - exhaust back pressure gauge in place of the post HO2S sensor.
6 Inspect the exhaust system for the following conditions: Secondary catalyst restricted Damage in the exhaust pipe Debris in the exhaust pipe Muffler or resonator internal failure Two-layer exhaust pipe separation Did you find and correct the condition? — Go to Step 8 —
- Secondary catalyst restricted
- Damage in the exhaust pipe
- Debris in the exhaust pipe
- Muffler or resonator internal failure
- Two-layer exhaust pipe separation
7 Replace the catalytic converter. Refer to Catalytic Converter Replacement - Left Side or Catalytic Converter Replacement - Right Side . Did you find and correct the condition? — Go to Step 8 —
8 Remove the J 35314-A - exhaust back pressure gauge . Reinstall the applicable HO2S sensor. Refer to Heated Oxygen Sensor Replacement - Bank 1 Sensor 2 or Heated Oxygen Sensor Replacement - Bank 2 Sensor 2 . Clear any codes. Road test the vehicle in order to verify the repair. Did you correct the condition? — System OK Go to Step 2
- Reinstall the applicable HO2S sensor. Refer to Heated Oxygen Sensor Replacement - Bank 1 Sensor 2 or Heated Oxygen Sensor Replacement - Bank 2 Sensor 2 .
- Clear any codes.
- Road test the vehicle in order to verify the repair.

Exhaust Leakage (Article 11971)

Condition Action
Warning: Refer to Hot Exhaust System Warning . DEFINITION: An exhaust leak may show stains at the area of the leak. The leak may be felt by holding a hand close to the suspected areas or using a smoke pencil. The leak may make a popping or hissing noise. Refer to Symptoms - Engine Exhaust prior to beginning this table.
Misaligned or improperly installed exhaust system components Align and tighten the exhaust system components to the specifications. Refer to Fastener Specifications . Ensure the exhaust hangers are in the proper locations and not loose. Refer to Exhaust Muffler with Resonator, Exhaust, and Tail Pipe Replacement .
- Align and tighten the exhaust system components to the specifications. Refer to Fastener Specifications .
- Ensure the exhaust hangers are in the proper locations and not loose. Refer to Exhaust Muffler with Resonator, Exhaust, and Tail Pipe Replacement .
Exhaust leaks at the following connections: Exhaust manifold to pipe Flanges Pipe clamps Tighten the components to the specifications. Refer to Fastener Specifications .
- Exhaust manifold to pipe
- Flanges

- Pipe clamps
Seals or gaskets leaking; Exhaust manifold to cylinder head Exhaust pipe s to exhaust manifold Catalytic converter connection Replace the leaking seal or gasket. Refer to the affected components procedure for service.
- Exhaust manifold to cylinder head
- Exhaust pipe s to exhaust manifold
- Catalytic converter connection
Irregularities at the mating surfaces on the flange connections Repair as required or replace the affected component. Refer to the affected components procedure for service.
Exhaust manifold cracked or broken Replace the exhaust manifold. Refer to Exhaust Manifold Replacement - Left Side or Exhaust Manifold Replacement - Right Side .
Exhaust system component connection welds leaking Replace the leaking component. Refer to the affected component's procedure for service.
Muffler or resonator , if equipped, damaged or leaking at the seams Replace the affected muffler or resonator, if equipped. Refer to the affected component's procedure for service.

Exhaust Noise (Article 11972)

Condition Action
Warning: Refer to Hot Exhaust System Warning . DEFINITION: An audible or physical noise due to a faulty component or damaged components causing a loose or misaligned exhaust system resulting in a rattle or vibration noise, i.e. buzz, groan, hum. Refer to Symptoms - Engine Exhaust prior to beginning this table.
Popping or hissing noise Exhaust leak—Refer to Exhaust Leakage .
Loud exhaust Compare to a known good vehicle. Inspect for a damaged or failed muffler or resonator , if equipped. Replace the faulty muffler or resonator (if equipped). Refer to the affected component's procedure for service.
- Compare to a known good vehicle.
- Inspect for a damaged or failed muffler or resonator , if equipped.
- Replace the faulty muffler or resonator (if equipped). Refer to the affected component's procedure for service.
External rattle or vibration noise Inspect for a bent or loose hanger, loose heat shield , or loose clamp. Inspect for a exhaust pipe causing interference. Repair or replace the affected component. Refer to the affected component's service procedure.
- Inspect for a bent or loose hanger, loose heat shield , or loose clamp.
- Inspect for a exhaust pipe causing interference.
- Repair or replace the affected component. Refer to the affected component's service procedure.
Internal rattle Test the components by tapping with a rubber mallet to confirm a rattle. Replace the faulty catalytic converter , resonator, if equipped, or muffler. Refer to the affected component's procedure for service.
- Test the components by tapping with a rubber mallet to confirm a rattle.
- Replace the faulty catalytic converter , resonator, if equipped, or muffler. Refer to the affected component's procedure for service.

Engine Exhaust - Special Tools (Article 12006)

Illustration Tool Number/ Description
Click for full-size image EN 35314-A J 35314-A Exhaust Back Pressure Gauge
Click for full-size image GE 52250 High Pressure Leak Detector