Exhaust Aftertreatment Fuel Injector Diagnosis

Diagnostic Instructions

- Perform the Diagnostic System Check - Vehicle prior to using this diagnostic procedure.
- Review Strategy Based Diagnosis for an overview of the diagnostic approach.
- Diagnostic Procedure Instructions provides an overview of each diagnostic category.

Circuit/System Description

The Q67 Exhaust Aftertreatment Fuel Injector is located on the right rear cylinder head. Fuel is supplied to the Q67 Exhaust Aftertreatment Fuel Injector from the low pressure side of the high pressure fuel pump. An outlet tube is connected between the Q67 Exhaust Aftertreatment Fuel Injector outlet and the exhaust down pipe. When the engine control module (ECM) commands the injector ON fuel is sprayed directly into the exhaust system. The fuel ignites in the exhaust in the DOC and produces the heat required for the exhaust aftertreatment regeneration.

Diagnostic Aids

Blockage or restriction in either banjo bolt for the Q67 Exhaust Aftertreatment Fuel Injector fuel feed line may cause DTC P0420 or P2463 to set. The banjo bolts are located in the Q67 Exhaust Aftertreatment Fuel Injector fuel feed line near the Fuel Injection Pump and where it attaches to the Fuel Injection Pump.

Reference Information

Schematic Reference

Engine Controls Schematics

Connector End View Reference

Component Connector End Views

Component View Reference

Powertrain Component Views

Description and Operation

Exhaust Aftertreatment System Description

Electrical Information Reference

- Circuit Testing
- Connector Repairs
- Testing for Intermittent Conditions and Poor Connections
- Wiring Repairs

Scan Tool Reference

Control Module References for scan tool information

Special Tools

- J-39021 Fuel Injector Coil and Balance Tester
- J-44602 Injector Test Adapter

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• J-45873 Fuel Return Volume Test Kit

**Circuit/System Testing**

**Note:**

- Verify that the Q67 Exhaust Aftertreatment Fuel Injector nozzle hole in the turbo downpipe is not plugged with soot.
- Do not kink the flexible fuel hose under the heat resistant sheath. The fuel hose is located between the injector’s electrically controlled valve and the nozzle. A hose kink may cause inaccurate test results.

1. Remove the Q67 Exhaust Aftertreatment Fuel Injector retaining bolts but leave the fuel supply line connected to the Q67 Exhaust Aftertreatment Fuel Injector control valve. Refer to Indirect Fuel Injector Replacement.

2. Place the outlet nozzle into a suitable container; a piece of hose may be connected to the outlet nozzle if necessary. Ensure the piece of hose stays below the outlet nozzle so fuel doesn’t accumulate in hose.

3. Disconnect the harness connector at the Q67 Exhaust Aftertreatment Fuel Injector.


5. Set the amperage supply selector switch on the J-39021 Fuel Injector Coil and Balance Tester to the Coil Test 2.5 amp position.

   **Note:** Commanding the J-39021 Fuel Injector Coil and Balance Tester ON prior to taking flow measurements may cause a faulty injector to test good.

6. Engine running, verify the Q67 Exhaust Aftertreatment Fuel Injector does not leak any fuel into the container.

   ⇒ If fuel is leaking from the outlet nozzle
   
   Replace the Q67 Exhaust Aftertreatment Fuel Injector.

   ⇓ If no fuel is leaking from the outlet nozzle

7. Place the outlet nozzle or rubber hose into a graduated cylinder from the J-45873 Fuel Return Volume Test Kit.

   **Note:** Each time the J-39021 Fuel Injector Coil and Balance Tester is commanded ON, the quantity of fuel that flows into the graduated cylinder must be recorded even if little or no fuel flows.

8. Command the J-39021 Fuel Injector Coil and Balance Tester 1 time and record the amount of fuel that flows into the graduated cylinder. Empty the graduated cylinder and repeat the fuel flow test 2 additional times for a total of 3 tests.

   ⇒ If no fuel flow is present on all 3 measurements

   8.1. Engine OFF

   8.2. Disconnect the fuel supply line from the Q67 Exhaust Aftertreatment Fuel Injector and connect a piece of hose to the fuel supply line and place the other end into a suitable container

   8.3. Engine Cranking

   8.4. Verify there is fuel flow from the Q67 Exhaust Aftertreatment Fuel Injector supply line.

   ⇒ If fuel flow is present, replace the Q67 Exhaust Aftertreatment Fuel Injector.

   ⇓ If no fuel flow is present

   8.4.1. Remove the fuel feed line and both banjo bolts. The first banjo bolt is located near the Fuel Injection Pump and the second banjo bolt attaches the fuel feed line to the Fuel Injection Pump.
8.4.2. Verify that there is no damage or blockage in the fuel supply line or either banjo bolt.

⇒ If damage or blockage is found, Replace the Fuel Feed Line or the appropriate banjo bolt.

⇒ If no damage or blockage is found, replace the G18 High Pressure Fuel Pump.

⇒ **If any measurement is less than 16 mL**
   Replace the Q67 Exhaust Aftertreatment Fuel Injector.

⇒ **If any measurement is greater than 34 mL**
   Replace the G18 High Pressure Fuel Pump.

⇓ **If all measurements are between 16 mL and 34 mL**

  **Note:**
  - EGT temperatures from the scan tool Freeze Frame / Failure Records is the preferred method.
  - The EGT 2 temperature must be stabilized during the service regeneration before recording temperatures.
  - Do not record the EGT temperatures after the regeneration fails. Only record during active regeneration.

9. Observe the scan tool Freeze Frame/Failure Records data for EGT Sensors 1, 2, 3 and 4. If Freeze Frame/Failure Records data is not available, perform a [Diesel Particulate Filter (DPF) Service Regeneration](https://gsi.ext.gm.com/gsi/showDoc.do?docSyskey=2890789&cellId=226733&pubObjSyskey=61... 1/31/2018 13:59:03 PM) with a scan tool.

10. Verify with a scan tool that EGT Sensor 2, 3 and 4 is greater than EGT Sensor 1.

⇒ **If EGT Sensor 2, 3 and 4 is less than EGT Sensor 1**
   Replace the Q67 Exhaust Aftertreatment Fuel Injector.

⇓ **If EGT Sensor 2, 3 and 4 is greater than EGT Sensor 1**

11. Verify with a scan tool that EGT Sensor 4 is not greater than EGT Sensor 2 by more than 100°C (180°F).

⇒ **If EGT Sensor 4 is greater than EGT Sensor 2 by more than 100°C (180°F)**
   Replace the Diesel Oxidation Catalyst.

⇓ **If EGT Sensor 4 is not greater than EGT Sensor 2 by more than 100°C (180°F)**

12. From the scan tool Freeze Frame / Failure Records Data, compare EGT Sensors 1, 2, 3 and 4 to the EGT Sensor patterns in the table below.

⇒ **If a condition is found**
   Repair as necessary.

⇓ **If no condition is found**

13. All OK, Refer to Diagnostic Aids.

**Note:**
- The table below should only be used with EGT sensor temperatures taken from the scan tool Freeze Frame / Failure Records Data.
- The EGT temperatures in the table below were establishment from DTC P0420 scan tool Freeze Frame / Failure Records Data.
Possible Component Failures determined by Exhaust Gas Temperatures During a Diesel Particulate Filter Regeneration

The Following Temperatures are for Example Only

<table>
<thead>
<tr>
<th>EGT 1</th>
<th>Q67 Exhaust Aftertreatment Fuel Injector – Little or No Fuel Flow</th>
<th>Q67 Exhaust Aftertreatment Fuel Injector – Low Fuel Flow</th>
<th>Diesel Oxidation Catalyst – Damaged or Contaminated</th>
<th>Diesel Oxidation Catalyst – Damaged or Contaminated</th>
</tr>
</thead>
<tbody>
<tr>
<td>357°C (675°F)</td>
<td>332°C (630°F)</td>
<td>357°C (675°F)</td>
<td>182°C (360°F)</td>
<td></td>
</tr>
<tr>
<td>EGT 2</td>
<td>333°C (631°F)</td>
<td>566°C (1050°F)</td>
<td>549°C (1020°F)</td>
<td>302°C (575°F)</td>
</tr>
<tr>
<td>EGT 3</td>
<td>272°C (521°F)</td>
<td>471°C (880°F)</td>
<td>632°C (1170°F)</td>
<td>449°C (840°F)</td>
</tr>
<tr>
<td>EGT 4</td>
<td>254°C (490°F)</td>
<td>421°C (790°F)</td>
<td>666°C (1230°F)</td>
<td>416°C (780°F)</td>
</tr>
</tbody>
</table>

Repair Instructions

Perform the Diagnostic Repair Verification after completing the diagnostic procedure.

- Catalytic Converter Replacement for diesel oxidation catalyst replacement.
- Indirect Fuel Injector Replacement for Q67 Exhaust Aftertreatment Fuel Injector replacement.
- Fuel Injection Pump Replacement for G18 High Pressure Fuel Pump replacement.
- Perform the scan tool Diesel Particulate Filter (DPF) Regeneration Enable procedure if the scan tool DPF Soot Mass is less than 40 g. If the scan tool DPF Soot Mass is 40 g or greater, perform the Diesel Particulate Filter (DPF) Service Regeneration procedure.