SPN 651-658

Suspect Parameter Number (SPN) and Failure Mode Indicator (FMI) Description

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Circuit Description

Ignition voltage is supplied though two 15 A fuses to the fuel injectors by the main power relay (MPR). The engine control module (ECM) supplies a ground path to open the injectors through a device called a driver. The ECM monitors the control circuits for open or shorts.

Conditions to Run SPN


The SPN runs continuously while the engine is running.

Conditions to Set SPN


The ECM detects the commanded state of the injector control circuit does not match the actual state of the driver for greater than 240 ms.
Action Taken When SPN Sets


- The ECM will turn ON the malfunction indicator light (MIL)
- 651-658 are Type B SPNs

Diagnostic Reference

- Review Strategy Based Diagnosis for an overview of the diagnostic approach.
- Diagnostic Procedure Instructions provides an overview of each diagnostic category.
- Perform the Diagnostic System Check prior to using this diagnostic.
- Test for intermittent or poor connections.
- Review Schematics and Connector End Views to locate test points.
- Review the SPN Type, Indicator Lamp Definitions, and Conditions to Clear the SPN/Indicator Lamp.

Diagnostic Tips

- The MIL may flash when there is an engine misfire.
- High resistance in the injector circuits may set a misfire SPN without setting an injector SPN.
- Injector resistance changes with temperature.

Required Tools:

- Terminal Test Probe Kit
- Fused Jumper
- Digital Multi-meter
- High Impedance Test Lamp
- Electronic Service Tool
**Circuit Diagnostics**

**WARNING!** To prevent bodily injury or death, stay away from hot engine surfaces and rotating engine components.

1. Ignition OFF, disconnect the appropriate fuel injector harness connector at the fuel injector, ignition ON, verify that a test lamp illuminates between the ignition voltage circuit terminal A and ground.

   - **If the test lamp does not illuminate and the circuit fuse is good**
     
     ✓ Ignition OFF, test for less than 5 Ω in the ignition circuit end to end.
     
     • If 5 Ω or greater, repair the open/high resistance in the circuit.
     • If less than 5 Ω, verify the fuse is not open and there is voltage at the fuse.

   - **If the test lamp does not illuminate and the circuit fuse is open**
     
     ✓ Ignition OFF, disconnect all components connected to the ignition voltage circuit, test for infinite resistance between the ignition circuit and ground.
     
     • If not infinite resistance, repair the short to ground on the circuit.
     • If infinite resistance, test all components connected to the ignition circuit for a short to ground and replace as necessary.

   - **If the test lamp illuminates, go to Step 2**

2. Connect the test lamp between the appropriate control circuit terminal B and the ignition voltage circuit terminal A, engine cranking, verify the test lamp flashes ON and OFF.

   - **If the test lamp is always ON**
     
     ✓ Ignition OFF, disconnect the harness connector J1-A at the ECM. Test for infinite resistance between the appropriate control circuit listed below and ground.
     
     • Cylinder 1 Injector Control Circuit J1-A Terminal H4
     • Cylinder 2 Injector Control Circuit J1-A Terminal H2
     • Cylinder 3 Injector Control Circuit J1-A Terminal G3
- Cylinder 4 Injector Control Circuit J1-A Terminal G4
- Cylinder 5 Injector Control Circuit J1-A Terminal G1
- Cylinder 6 Injector Control Circuit J1-A Terminal G2
- Cylinder 7 Injector Control Circuit J1-A Terminal F3
- Cylinder 8 Injector Control Circuit J1-A Terminal F4

  a) If not infinite resistance, repair the short to ground on the circuit.
  b) If infinite resistance, replace the ECM.

➤ If the test lamp is always OFF

  ✓ Ignition OFF, disconnect the harness connector J1-A at the ECM, ignition ON, test for less than 1 V between the appropriate control circuit listed below and ground.

  - Cylinder 1 Injector Control Circuit J1-A Terminal H4
  - Cylinder 2 Injector Control Circuit J1-A Terminal H2
  - Cylinder 3 Injector Control Circuit J1-A Terminal G3
  - Cylinder 4 Injector Control Circuit J1-A Terminal G4
  - Cylinder 5 Injector Control Circuit J1-A Terminal G1
  - Cylinder 6 Injector Control Circuit J1-A Terminal G2
  - Cylinder 7 Injector Control Circuit J1-A Terminal F3
  - Cylinder 8 Injector Control Circuit J1-A Terminal F4

  a) If 1 V or greater, repair the short to voltage in the circuit.
  b) If less than 1 V, ignition OFF, test for less than 5 Ω in the control circuit end to end.

    - If 5 Ω or greater, repair the open/high resistance in the circuit.
    - If less than 5 Ω, replace the ECM.

➤ If the test lamp flashes ON and OFF, all circuits test normal, test or replace the fuel injector.

Component Testing:

1. Ignition OFF, disconnect the harness connector at the appropriate fuel injector.

2. Test for 11–14 Ω between the terminals of the fuel injector.
If not between 11–14 Ω, replace the fuel injector.

If between 11–14 Ω, go to Step 3

3. Test for infinite resistance between each injector terminal and the injector housing/case.

   If not infinite resistance, replace the fuel injector.

   If infinite resistance, the injector tests OK at this time.