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

<table>
<thead>
<tr>
<th>SPN</th>
<th>FMI</th>
<th>Description</th>
<th>Possible Causes</th>
</tr>
</thead>
</table>
| 609 | 11  | Torque Security Module Communication Invalid | • Open serial data link circuit  
• Open/short in power or ground circuits  
• Torque security module |
| 639 | 11  | Communication Bus is Passive     | • CAN HI shorted to ground  
• CAN LO shorted to battery  
• Malfunctioning terminating resistor  
• Malfunctioning control module |
| 970 | 19  | Remote Shut Down Module Communication Invalid | • Open serial data link circuit  
• Open/short in power or ground circuits  
• Bulk head module  
• Remote shutdown control module |
| 2003| 19  | Transmission Control Module Communication Invalid | • Open serial data link circuit  
• Open/short in power or ground circuits  
• Transmission control module |
| 2011| 19  | ABS Module Communication Invalid  | • Open serial data link circuit  
• Open/short in power or ground circuits  
• ABS module |
| 2023| 19  | PTO Control Communication Invalid | • Open serial data link circuit  
• Open/short in power or ground circuits  
• Bulk head module  
• PTO controller |
### Circuit Description

The SAE J1939 controller area network (CAN) data link allows the engine control module (ECM), torque security module (TSM), EVAP control module, and other modules to communicate information digitally by means of a low current circuit network. This data link consists of a shielded twisted pair wiring, referred to as CAN HI and CAN LO. There are also two 120 Ohm terminating resistors on each end of the data link.

Each control module sends a state of health message to the other modules when the ignition is turned ON. If a particular module does not provide a state of health message, a DTC may set in one or more of the other modules on the data link. The data link also provides diagnostic information that can be retrieved using the electronic service tool (EST). The data link is accessed inside the cab of the vehicle at the data link connector.

The diagnostic troubleshooting information in this section is limited to the ECM, TSM, and EVAP module. Refer to the Vehicle Manufacturer’s Electrical Troubleshooting Guide for vehicle side electrical diagnostic information related to the data link.

### Conditions to Run SPN

The SPN runs continuously when the ignition is ON.

<table>
<thead>
<tr>
<th>Code</th>
<th>Module</th>
<th>Description</th>
<th>Conditions</th>
</tr>
</thead>
</table>
| 2033 | 19     | Bulk Head Module Communication Invalid | - Open serial data link circuit  
- Open/short in power or ground circuits  
- Bulk head module |
| 2119 | 19     | EVAP Module Communication Invalid | - Open serial data link circuit  
- Open/short in power or ground circuits  
- EVAP module |
Conditions to Set SPN

SPN 609–11 Torque Security Module Communication Invalid

The ECM did not receive a valid communication message from the torque security module.

SPN 639–11 Communication Bus is Passive

The state of the communication circuits cannot be determined.

SPN 970–19 Remote Shut Down Module Communication Invalid

The ECM did not receive a valid communication message from the remote shutdown module.

SPN 2003–19 Transmission Control Module Communication Invalid

The ECM did not receive a valid communication message from the transmission control module.

SPN 2011–19 ABS Module Communication Invalid

The ECM did not receive a valid communication message from the ABS module.

SPN 2023–19 PTO Control Communication Invalid

The ECM did not receive a valid communication message from the PTO module.

SPN 2033–19 Bulk Head Module Communication Invalid

The ECM did not receive a valid communication message from the bulk head module.

SPN 2019–19 EVAP Module Communication Invalid

The ECM did not receive a valid communication message from the EVAP control module for 3 consecutive drive cycles.
**Action Taken When SPN Sets**

**SPN 609–11 Torque Security Module Communication Invalid**
- The ECM will turn ON the check engine light (CEL)
- 609-11 is a Type A SPN

**SPN 639–11 Communication Bus is Passive**
- The ECM will turn ON the check engine light (CEL)
- 639-11 is a Type A SPN

**SPN 970–19 Remote Shut Down Module Communication Invalid**
- Remote shutdown feature will be disabled
- 970-19 will be stored as an active code

**SPN 2003–19 Transmission Control Module Communication Invalid**
- 2003-19 will be stored as an active code

**SPN 2011–19 ABS Module Communication Invalid**
- 2011-19 will be stored as an active code

**SPN 2023–19 PTO Control Communication Invalid**
- PTO control feature will be disabled
- 2023-19 will be stored as an active code

**SPN 2033–19 Bulk Head Module Communication Invalid**
- A/C inoperative
- Park brake switch inoperative
- Brake switch inoperative
- Brake switch conflict SPN may set

**SPN 2019–19 EVAP Module Communication Invalid**
- 2019-19 will be stored as pending after the first drive cycle and stored as active after three consecutive drive cycles.
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

- Attempt to communicate with each module connected to the serial data circuits, start testing at the module(s) that do not respond.
- Review the vehicle schematics to determine that most logical area to start testing the system.
- Verify the suspected module(s) have proper power and ground.
- Verify the terminating resistor(s) are good.
- Test for intermittent or poor connections.
- Verify the fuses are good.

Required Tools

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

System Testing Procedure

This diagnostic is broken down into sub sections to eliminate portions of the communication system.

Start by verifying the DLC connector voltages in **DLC Connector Testing** below.
DLC Connector Testing

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

1. Ignition ON, verify that a test lamp illuminates between the data link connector voltage circuit terminal B and ground.
   - If test lamp does not illuminate, refer to the Vehicle Manufacturer’s Electrical Troubleshooting Guide.
   - If test lamp illuminates, go to Step 2

2. Verify that a test lamp illuminates between the data link connector voltage circuit terminal B and data link connector ground circuit terminal A.
   - If test lamp does not illuminate, refer to the Vehicle Manufacturer’s Electrical Troubleshooting Guide.
   - If test lamp illuminates, go to Step 3

3. Ignition ON, verify 1.0-4.0 V between data link connector CAN HI circuit terminal C and ground.
   - If greater than 4.0 V, ignition OFF, disconnect the ECM, TSM, and EVAP control modules one at a time, verify the voltage is less than 4.0 V with ignition ON.
     - If 4.0V or greater with the modules disconnected, refer to Vehicle Manufacturer’s Electrical Troubleshooting Guide.
     - If less than 4.0 V, connect the ECM, TSM and EVAP control modules one at a time, ignition ON, verify the voltage is less than 4.0 V, replace the appropriate module when the voltage increases greater than 4.0 V.
If less than 1.0 V, ignition OFF, disconnect the ECM, TSM, and EVAP modules one at a time, verify the voltage is greater than 1.0 V with ignition ON.

- If less than 1.0 V, ignition OFF, with the modules disconnected, refer to Vehicle Manufacturer’s Electrical Troubleshooting Guide.
- If greater than 1.0 V, connect the ECM, TSM, and EVAP control modules one at a time, ignition ON, verify the voltage is less than 1.0 V, replace the appropriate module when the voltage decreases below 1.0 V.

If between 1.0-4.0 V, go to Step 4

4. Ignition ON, verify 1.0-4.0 V between data link connector CAN LO circuit terminal D and ground.

- If greater than 4.0 V, ignition OFF, disconnect the ECM, TSM, and EVAP control modules one at a time, verify the voltage is less than 4.0 V with ignition ON.

  - If 4.0V or greater with the modules disconnected, refer to Vehicle Manufacturer’s Electrical Troubleshooting Guide.
  - If less than 4.0 V, connect the ECM, TSM and EVAP control modules one at a time, ignition ON, verify the voltage is less than 4.0 V, replace the appropriate module when the voltage increases greater than 4.0 V.

- If less than 1.0 V, ignition OFF, disconnect the ECM, TSM, and EVAP modules one at a time, verify the voltage is greater than 1.0 V with ignition ON.

  - If less than 1.0 V with the modules disconnected, refer to Vehicle Manufacturer’s Electrical Troubleshooting Guide.
  - If greater than 1.0 V, connect the ECM, TSM, and EVAP control modules one at a time, ignition ON, verify the voltage is less than 1.0 V, replace the appropriate module when the voltage decreases below 1.0 V.
If between 1.0-4.0 V, go to **Module Communication Verification** in this diagnostic.

### Module Communication Verification

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

Attempt to establish communications with the modules listed in the table below:

<table>
<thead>
<tr>
<th>Module</th>
<th>Communicates</th>
<th>Does Not Communicate</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABS Control Module</td>
<td>Test next module</td>
<td>Refer to Vehicle Manual</td>
</tr>
<tr>
<td>Body Control Module</td>
<td>Test next module</td>
<td>Refer to Vehicle Manual</td>
</tr>
<tr>
<td>Brake Switch Module</td>
<td>Test next module</td>
<td>Refer to Vehicle Manual</td>
</tr>
<tr>
<td>Engine Control Module</td>
<td>Clear SPN and verify SPN does not reset.</td>
<td>Go to <strong>Engine Control Module Testing</strong> in this Diagnostic</td>
</tr>
<tr>
<td>EVAP Control Module</td>
<td>Test next module</td>
<td>Go to <strong>EVAP Control Module Testing</strong> in this Diagnostic</td>
</tr>
<tr>
<td>Park Brake Module</td>
<td>Test next module</td>
<td>Refer to Vehicle Manual</td>
</tr>
<tr>
<td>Remote PTO Module</td>
<td>Test next module</td>
<td>Refer to Vehicle Manual</td>
</tr>
<tr>
<td>Remote Shutdown Module</td>
<td>Test next module</td>
<td>Refer to Vehicle Manual</td>
</tr>
<tr>
<td>Torque Security Module</td>
<td>Test next module</td>
<td>Go to <strong>Torque Security Module Testing</strong> in this Diagnostic</td>
</tr>
<tr>
<td>Transmission Control Module</td>
<td>Test next module</td>
<td>Refer to Vehicle Manual</td>
</tr>
<tr>
<td>Two Speed Axle Module</td>
<td>Test next module</td>
<td>Refer to Vehicle Manual</td>
</tr>
</tbody>
</table>

### Engine Control Module Communication Testing

1. Ignition OFF, disconnect the ECM harness connector J1-C, test for less than 10 Ω between the ECM ground circuit terminal G1 and ground.

   ➢ **If 10 Ω or greater,** repair the open/high resistance in the circuit.
If less than 10 Ω, go to step 2

2. Ignition ON, verify a test lamp illuminates between the ECM harness connector J1-C voltage supply circuit terminal F4 and ground.
   - If the test lamp does not illuminate, repair the open/high resistance in the circuit.
   - If the test lamp illuminates, go to step 3

3. Test the CAN HI circuit for less than 10 Ω between the ECM harness connector J1-B terminal C1 and the DLC connector terminal C.
   - If 10 Ω or greater, repair the open/high resistance in the circuit.
   - If less than 10 Ω, go to step 4

4. Test the CAN LO circuit for less than 10 Ω between the ECM harness connector J1-B terminal C2 and the DLC connector terminal D.
   - If 10 Ω or greater, repair the open/high resistance in the circuit.
   - If less than 10 Ω, go to step 5

5. Ignition OFF, disconnect the vehicle battery, verify 55-65 Ω between the ECM harness connector J1-B CAN HI circuit terminal C1 and CAN LO circuit terminal C2.
   - If not between 55-65 Ω, disconnect both terminating resistors, verify each resistor is 120 Ω +/-10%
     - If not 120 Ω +/-10%, replace the terminating resistor.
     - If 120 Ω +/-10%, locate and repair the short or open/high resistance in the serial data circuits.
   - If between 55-65 Ω, replace the ECM.
Torque Security Module Communication Testing

1. Ignition OFF, disconnect the harness connector at the TSM, test for less than 10 Ω between the TSM ground circuit terminal 14 and ground.
   - If 10 Ω or greater, repair the open/high resistance in the circuit.
   - If less than 10 Ω, go to step 2

2. Ignition ON, verify a test lamp illuminates between the TSM harness connector voltage supply circuit terminal 13 and ground.
   - If the test lamp does not illuminate, repair the open/high resistance in the circuit.
   - If the test lamp illuminates, go to step 3

3. Test the CAN HI circuit for less than 10 Ω between the TSM harness connector terminal 6 and the DLC connector terminal C.
   - If 10 Ω or greater, repair the open/high resistance in the circuit.
   - If less than 10 Ω, go to step 4

4. Test the CAN LO circuit for less than 10 Ω between the TSM harness connector terminal 19 and the DLC connector terminal D.
   - If 10 Ω or greater, repair the open/high resistance in the circuit.
   - If less than 10 Ω, go to step 4

5. Ignition OFF, disconnect the vehicle battery, verify 55-65 Ω between TSM harness connector CAN HI circuit terminal 6 and CAN LO circuit terminal 19.
   - If not between 55-65 Ω, disconnect both terminating resistors, verify each resistor is 120 Ω +/-10%
     - If not 120 Ω +/-10%, replace the terminating resistor.
     - If 120 Ω +/-10%, locate and repair the short or open/high resistance in the serial data circuits.
If between 55-65 Ω, replace the TSM.

**EVAP Control Module Communication Testing**

1. Ignition OFF, disconnect the harness connector at the EVAP control module, test for less than 10 Ω between the EVAP control module ground circuit terminal 14 and ground.
   - **If 10 Ω or greater,** repair the open/high resistance in the circuit.
   - **If less than 10 Ω,** go to step 2

2. Ignition ON, verify a test lamp illuminates between the EVAP control module voltage supply circuit terminal 16 and ground.
   - **If the test lamp does not illuminate,** repair the open/high resistance in the circuit.
   - **If the test lamp illuminates,** go to step 3

3. Test the CAN HI circuit for less than 10 Ω between the EVAP control module connector terminal 9 and the DLC connector terminal C.
   - **If 10 Ω or greater,** repair the open/high resistance in the circuit.
   - **If less than 10 Ω,** go to step 4

4. Test the CAN LO circuit for less than 10 Ω between the EVAP control module connector terminal 8 and the DLC connector terminal D.
   - **If 10 Ω or greater,** repair the open/high resistance in the circuit.
   - **If less than 10 Ω,** go to step 5

5. Ignition OFF, disconnect the vehicle battery, verify 55-65 Ω between EVAP control module CAN HI circuit terminal 9 and CAN LO circuit terminal 8.
➢ **If not between 55-65 Ω**, disconnect both terminating resistors, verify each resistor is 120 Ω +/-10%  
  ✓ If not 120 Ω +/-10%, replace the terminating resistor.  
  ✓ If 120 Ω +/-10%, locate and repair the short or open/high resistance in the serial data circuits.

➢ **If between 55-65 Ω**, replace the EVAP Control Module.