Applicable Vehicles:

Cascadia
New Cascadia vehicles have a different architecture, however similar concepts can be applied.

Purpose of Solution:

This supplemental troubleshooting guide is to provide additional information to the technical literature guides, and to offer some best practice guidelines to assist in diagnosing J1939 and CAN communication systems.

Solution:

J1939-CAN and H1939 are the same and both operate at a baud rate of 500k
• These communication busses are specifically for use by factory supplied modules
J1939 and J1939-OPEN are the same and operate at a baud rate of 250k
• These CAN busses are intended for third party module connection and interface
Checking Resistance

- To test resistance on any of the CAN circuits the truck should be in a state of **ignition OFF and batteries disconnected**.
- For termination resistor locations refer to SS 3920 J1939 Terminating Resistor Locations - Cascadia

Diagnostic "Truck" CAN network

Test the resistance between pins H & J at the diagnostic connector.

J1939/H1939 500k baud network

Test the resistance between pins C & D at the diagnostic connector.
Resistance Values for both networks should be 60ohms +/- 3ohms

Checking Voltages J1939/H1939

- To test the voltage the truck should be in the state of **ignition ON, engine OFF, and batteries connected**.

NOTE: Battery condition is important and should be in the range of 12.6V and 12.4V

1. Test the voltage at the diagnostic connector between pins A & C
2. Test the voltage at the diagnostic connector between pins A & D
Voltage readings between pins A & C should be 2.6V +/- 0.1V
Voltage readings between pins A & D should be 2.3V +/- 0.1V

Voltage Test Result Meaning

- If there is no voltage - There is likely a short in the J1939/H1939 backbone or one of the modules itself.
- If the voltage is fluctuating - There is likely a polarity problem at one of the modules or one of the inline harness connectors on the CAN bus.
- If the voltage is out of range (ie. 1.9V low side, or 2.8 high side) - There is likely a module on the network causing the issue
  - Start to unplug modules one at a time, starting with the ABS module, while monitoring the voltage reading
  - Once the voltage comes back into spec, the last module disconnected will need to be checked for proper voltage, ground and J1939/H1939 voltage.

Checking Continuity and Bandwidth of J1939/H1939

- Continuity and Bandwidth tests should be conducted with all modules and 120ohm terminating resistors removed
- Install a jumper wire across both legs of the network similar to the diagram below.
Continuity Test

If both resistance and voltage tests pass - check the continuity of the datalink using a basic continuity test.
Similar to the diagram below:

Bandwidth Test

If the datalink shows good continuity - perform a load test to check the network bandwidth
- Common to use a Sealed Beam Headlight under a 4.5amp load
- Use at maximum a 7.5amp fuse

Additional Info and Resources:

Network Architectures
Vehicle Network Architecture Cascadia 2016

Driver Information

Diagnostics-CAN

Cabin

Exterior

PT 3rd parties

Powertrain

Hybrid

Body & Trailer

Brake

Driver Assistance

Gauges

ECU(IS)

11009-CAN

J1939 CAN

Backbone

J1939 Open

J1939 CAN

3rd Party Telematics

CTB-FB

PLC/Track

SAD/2407

ABS

Trailer ABS

Trailer ABS

ABS

SAS

ESP

LDWS

TPMS

M/A/C

HVAC PCU

ECAH

ECAS

SRS

SAM CMI

SAM CMI

NVH

NVH

Solar

SSL

11539-CAN

CABIN-CAN

CABIN-CAN

CABIN-CAN

CABIN-CAN

CABIN-CAN

CABIN-CAN

CABIN-CAN

CABIN-CAN

CABIN-CAN

CABIN-CAN

CABIN-CAN

CABIN-CAN

CABIN-CAN

CABIN-CAN

CABIN-CAN

CABIN-CAN

CABIN-CAN

CABIN-CAN

CABIN-CAN

CABIN-CAN

CABIN-CAN

CABIN-CAN

CABIN-CAN

CABIN-CAN

CABIN-CAN

CABIN-CAN

CABIN-CAN
List of Possible Modules

(may not be comprehensive)
1. Predictive Cruise (Mod 149)
2. QualComm (Mod 786)
3. Virtual Technician (Mod 813)
4. SmartTire (Mod 489)
5. Rear HVAC (Mod 200)
6. OnGuard, Detroit Assurance (Mod 736)
7. Radio (Mod 221)
8. Lane Departure (Mod 73B)
9. ABS (Mod 49A)
10. Front HVAC (Mod 146)
Wire Colors & Pin Outs

Green Data Link Connector

J1939-CAN is the 500 baud rate. Wire colors:

H1939 High (+) – White with Yellow stripe
H1939 Low (-) – White with Green stripe

Black Data Link Connector (optional)

J1939 open is the old 250k baud rate. Wire colors:

J1939 High (+) - Yellow
J1939 Low (-) - Green

H1939-CAN (J1939-Open or 500k)

![Diagram of H1939-CAN](image)

<table>
<thead>
<tr>
<th>Pin</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Battery (−)</td>
</tr>
<tr>
<td>B</td>
<td>Battery (+)</td>
</tr>
<tr>
<td>C</td>
<td>J1939 CAN High (+)</td>
</tr>
<tr>
<td>D</td>
<td>J1939 CAN Low (−)</td>
</tr>
<tr>
<td>E</td>
<td>Reserved</td>
</tr>
<tr>
<td>F</td>
<td>Reserved</td>
</tr>
<tr>
<td>G</td>
<td>Reserved</td>
</tr>
<tr>
<td>H</td>
<td>Diagnostic CAN High (+)</td>
</tr>
<tr>
<td>J</td>
<td>Diagnostic CAN Low (−)</td>
</tr>
</tbody>
</table>

J1939 (J1939-Open or 250k)
Notes on the Cabin CAN Datalink

The Cabin CAN datalink uses a "star" network topology. The piece of hardware that connects the different components of the Cabin CAN datalink is called the "StarPoint Connector." Each leg of the Cabin CAN extends from the StarPoint Connector to an ECU, such as the SAM Cab, and a "star" is formed when multiple legs are connected.

- This is different from the J1939 datalink networks, which uses a "bus" network topology.
- The StarPoint Connector maintains an internal resistance value of 60 ohms for each leg of the network, similar to the terminating resistors on J1939.

<table>
<thead>
<tr>
<th>Pin</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Battery (−)</td>
</tr>
<tr>
<td>B</td>
<td>Battery (+)</td>
</tr>
<tr>
<td>C</td>
<td>J1939 CAN High (+)</td>
</tr>
<tr>
<td>D</td>
<td>J1939 CAN Low (−)</td>
</tr>
<tr>
<td>E</td>
<td>Reserved</td>
</tr>
<tr>
<td>F</td>
<td>J1708/J1587 (+)</td>
</tr>
<tr>
<td>G</td>
<td>J1708/J1587 (−)</td>
</tr>
<tr>
<td>H</td>
<td>Diagnostic CAN High (+)</td>
</tr>
<tr>
<td>J</td>
<td>Diagnostic CAN Low (−)</td>
</tr>
</tbody>
</table>