G03.01

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500 — Terms and Abbreviations

Cabin CAN—A proprietary datalink connecting certain ECUs on the vehicle, specifically the CGW, MSF, SAM Cab, and SAM Chassis.

CGW—Central Gateway

Datalink—A collection of wires, connecting system components, through which data is transmitted.

Diagnostic Connector—A 9-pin diagnostic connector used for troubleshooting the electrical system.

MSF—Modular Switch Field

Multiplexing—Sending multiple electronic messages through the same signal path at the same time—in this case, through the CAN buses.

Off-board tool—Typically refers to a PC-based application that communicates with the vehicle datalinks via a connection to the diagnostic connector.

PDM—Power Distribution Module

SAE—Society of Automotive Engineers

SAM—Signal Detect and Actuation Module

SAM Cab—Signal Detect and Actuation Module Cab ("SAM Cabin"); this ECU controls mainly cab-related functionality. See **G02.04 — SAM Cab** for more information.

SAM Chassis—Signal Detect and Actuation Module Chassis; this ECU controls mainly chassis-related functionality. See **G02.05 — SAM Chassis** for more information.

501 — Introduction to Multiplexing

The Cascadia electrical and electronic system is a multiplexing system that replaces traditional power distribution devices with ECUs that communicate over the vehicle datalink. The electronic control units control power distribution to the vehicle electrical loads by monitoring inputs—such as sensors and switches—and supplying power to outputs, such as lighting, displays, gauges, and indicators. Multiplexing reduces the number of interconnecting wires and allows for more precise control of the electrical system by allowing multiple control or diagnostic commands to communicate on a two-wire datalink or network. See **Fig. 1** for a schematic of the multiplexing system.
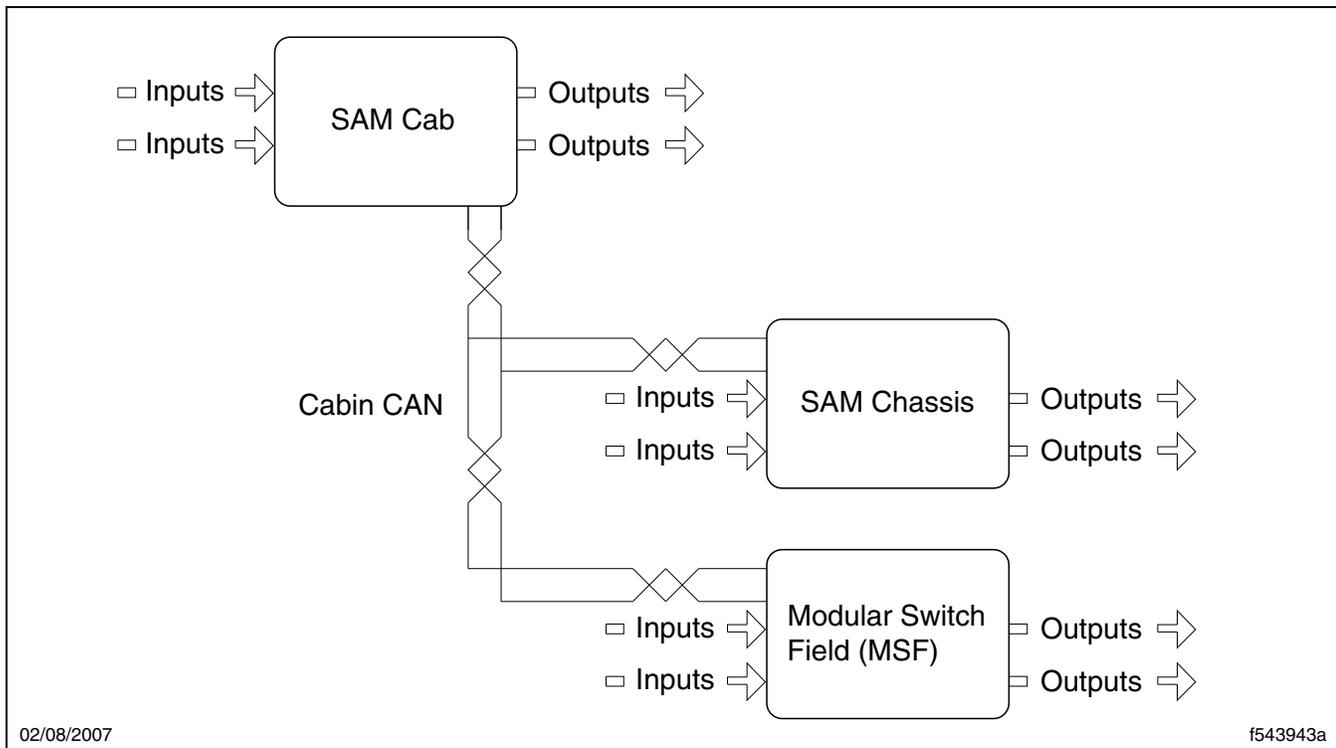
Fig. 1, Multiplexing System Controllers

The multiplexing system serves three main functions:

- Transmits multiple electronic messages through the same wire at the same time;

- Performs tasks and monitors components simultaneously;

- Uses electronic control units (ECU) to operate the system, such as interpreting different messages being transmitted on the same wire.

502 — Vehicle Datalinks

The Cascadia uses the following four datalinks:

- SAE J1587/J1708 datalink

- SAE J1939 datalink

- Cabin CAN datalink

- Diagnostic CAN datalink (mainly used for off-board tool interaction with Cabin CAN ECUs)

On this vehicle, Cabin CAN is the primary datalink for communicating control signals for most cab and chassis features such as interior and exterior lighting, comfort features, and optional features. Some of the Cabin CAN signals are routed to the J1939 and J1587/J1708 datalinks via the central gateway.

J1939 and J1587/J1708 remain the primary datalinks for chassis and powertrain control.

503 — SAE J1587/J1708 Datalink

The J1587 datalink is a low-speed vehicle datalink that communicates information between the electronic control units (ECU) on the vehicle. The J1587 datalink is also referred to as J1708.

J1708 refers to the SAE standard for the physical part of the datalink, such as the wiring and electronic components. J1587 refers to the SAE standard for the messaging protocol that communicates on the J1708 network. In the context of vehicle repair, the terms J1708 and J1587 are used interchangeably.

The J1587 datalink uses a twisted pair of wires to reduce interference from the digital messages being sent on the wires. Wire colors for the J1587 datalink are:

- orange J1587–

- dark green J1587+

504 — Datalink Network Topology

Cascadia Network Topology

Diagnostic CAN
(500kbps)

Central Gateway

SAE J1708
(9.6kbps)

SAE J1939–13
9–Pin connector

SAM Cab

Cabin CAN
(125kbps)

SAE J1939
(250kbps)

Engine Control
Module

SAM Chassis

Pneumatic ABS
Module

Modular Switch
Field (Master)

Transmission
Control Module

Sub Bus

Instrument
Cluster

Slave Switch
Control Panels

Steering Wheel
Switches

HVAC Control
Switches Front

Head Lamp
Switch

Stalk Switch
(Steering
Column)

HVAC Control
Switches Rear

■ Standard

▒ Optional

Radio

VORAD

Engine Display

Qualcomm

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Fig. 2, Datalink Network Topology

600 — Component Locations

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1. Diagnostic   2. J1587/J1708
   Connector   Junction Block
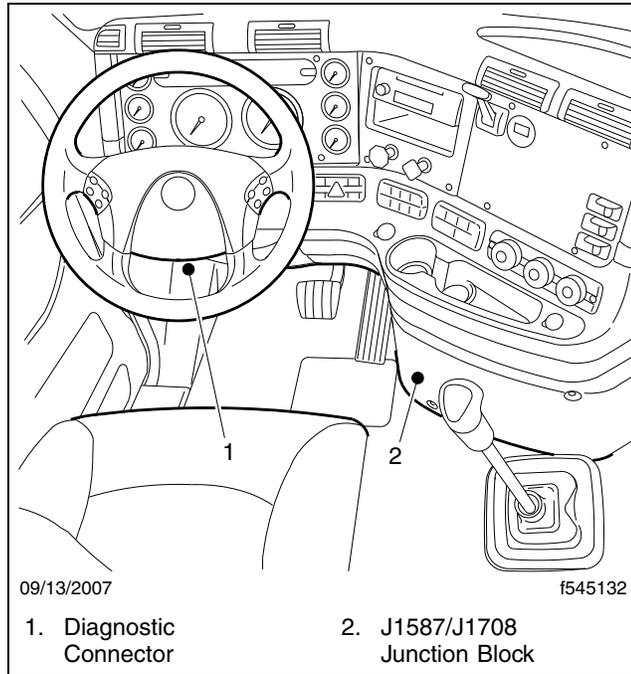
Fig. 3, Component Locations

601 — Component Details

09/13/2007   f545133
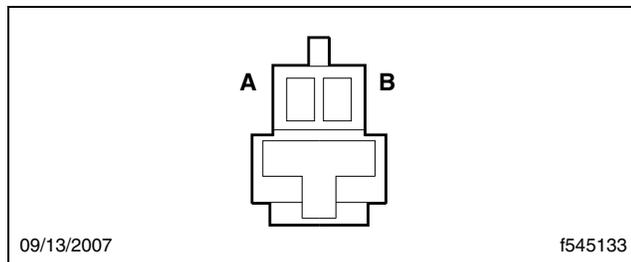
Fig. 4, J1587 Junction Block Connector

J1587 Connector		
Pin	**Color**	**Function**
A	Dark Green	J1587 (+)
B	Orange	J1587 (−)

Table 1, J1587 Connector
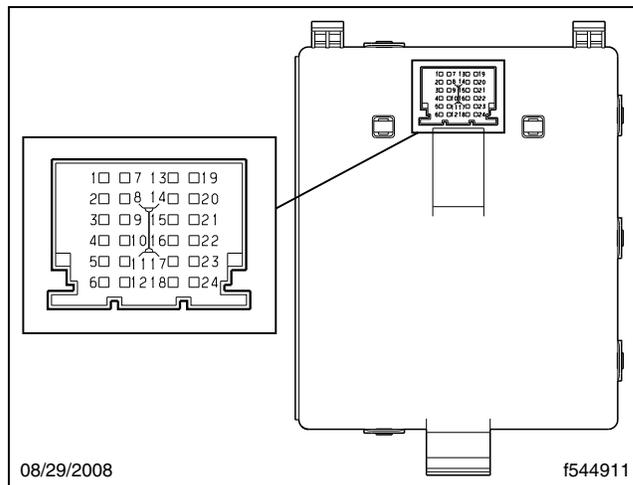
Fig. 5, Central Gateway Module, Cabin CAN Pins

CGW ECU (single connector)	
Pin	**Function**
1	Battery Power
2	J1708/J1587 (+)
7	Ground
8	J1708/J1587 (−)
14	Cabin CAN Low (−)
16	J1939 Low (−)
18	Diagnostic CAN Low (−)
19	Cabin CAN High (+)
21	J1939 High (+)
23	Diagnostic CAN High (+)

Table 2, CGW ECU (single connector)

700 — Symptoms of a Malfunctioning J1587 Datalink

Symptoms of a malfunctioning J1587 datalink may include the following conditions:

- Gauges are not working.

- ICU displays no J1587, no EnG, or no AbS.

- Warning lamps, such as ABS and CHECK ENGINE, are on.

- Cannot retrieve fault codes from an ECU.

- The off-board diagnostic tool does not connect to the vehicle.

- One or more ECUs do not show up on the diagnostic tool J1587 ECU list.

701 — Diagnosing the J1587/J1708 Datalink

NOTE: Before diagnosing the J1587/J1708 datalink, check the fuses and the battery voltage, and confirm that the ECU connectors are secure on the datalink.

1. **Make sure ServiceLink or DiagnosticLink connects to the J1587 Datalink.**

    1.1   Connect ServiceLink or DiagnosticLink to the vehicle.

    1.2   Review the ECU list and verify that all ECUs expected on the J1708 datalink are communicating.

    1.3   Review the Problem ECU list on the bottom of the ECU List General Info Screen.

Does the diagnostic tool connect to the J1587/J1708 datalink?

YES → Go to test 2.

NO → Check the cables between the computer and vehicle. Check the vehicle interface adapter, and check the PC settings. Repair as necessary, then repeat test 1.

NOTE: ECUs on other protocols may appear as a result of CGW message routing behavior. Routed ECUs are displayed in grey on the ECU list. For more information on CGW message routing behavior, refer to **G02.03 — Central Gateway**.

2. **Diagnose the problem ECU.**

    2.1   Check the connector on the problem ECU to verify that it is not loose.

    2.2   With the key in the OFF position, remove the connector for the problem ECU.

    2.3   Turn the key to the ON position.

    2.4   Measure the voltage between the positive (J1587+) and the negative (J1587−) terminals on the connector.

    2.5   Measure the voltage between the positive post on the battery and the J1587+ terminal.

    2.6   Measure the voltage between the positive post on the battery and J1587− terminal.

    2.7   Compare the results to **Table 3**.

J1587 Datalink Voltage Test		
Meter (+) Probe	**Meter (−) Probe**	**Acceptable Voltage Reading**
ECU Datalink (+) Terminal	ECU Datalink (−) Terminal	3 to 4 VDC (1 to 3 VAC)
Battery Positive Post	ECU Datalink (+) Terminal	6 to 11 VDC
Battery Positive Post	ECU Datalink (−) Terminal	9 to 13.5 VDC

Table 3, J1587 Datalink Voltage Test

If the voltage is not within the acceptable range, go to test 3.

3. **Perform a resistance test.**

    3.1   Turn the key to the OFF position.

    3.2   Remove the connector from the problem ECU.

    3.3   Measure the resistance between the J1587+ and J1587− terminals.

3.4   Measure the resistance between the J1587+ terminal and the vehicle ground.

3.5   Measure the resistance between the J1587– terminal and the vehicle ground.

3.6   Compare the values to **Table 4**.

J1587 Datalink Resistance Test		
Meter (+) Probe	**Meter (–) Probe**	**Acceptable Resistance Reading**
J1587/J1708 (+)	J1587/J1708 (–)	3k-18k
J1587/J1708 (+)	Vehicle Ground	More than 1k
J1587/J1708 (–)	Vehicle Ground	More than 1k

Table 4, J1587 Datalink Resistance Test

If the resistance is not in the acceptable range, go to test 4.

4. **Test the J1587 junction block.**

4.1   Remove the center dash lower trim panel.

4.2   Locate the J1587 junction block connector for the ECU.

4.3   Connect to the vehicle using ServiceLink or DiagnosticLink.

4.4   Navigate to the J1708 ECU list.

4.5   Disconnect a J1708 junction block connector. As a connector is removed, its ECU will drop off of the ECU list. If all ECUs drop off from the list, it means that the J1708 connection to the diagnostic connector is lost. If the CGW is disconnected from the junction block, the routed ECUs from other protocols (shared in the grey text) will drop off from the ECU list. When the connector with the datalink interruption is removed, no ECUs will drop off from the General Info screen.

4.6   Perform a continuity test to locate the wiring fault.

4.7   Repair the affected harness.