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500 — Terms and Abbreviations

CAN—Controller Area Network

CGW—Central Gateway

Communication Protocol—A set of rules governing communication between electronic devices.

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

Diagnostic CAN—Datalink that runs from the diagnostic connector to the CGW.

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

ECU—Electronic Control Unit, typically connected to a datalink.

MID—Message Identifier. Indicates numeric assignment for a device that communicates on J1587.

MSF—Modular Switch Field

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

Parameter—A parameter is a specific value that is assigned to a feature or function of the vehicle, and allows the customer to choose how that particular feature or function will work on the vehicle.

SA—Source Address; indicates numeric assignment for a device that communicates on J1939 or CAN.

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 — General Information

This subject contains a master list of all known possible J1939 faults for the Cascadia. For engine faults (SA 0), refer to the engine manufacturer’s diagnostic tools and documentation.

Fault codes appearing on either the ICU or ServiceLink J1587 fault screens must be verified as faults from a J1939 ECU, and not a "routed fault." A routed fault is a fault that the Central Gateway routed from another protocol to the ICU or the J1939 fault screen.

502 — Routed Faults

The Central Gateway (CGW) routes and translates messages between the J1939, J1708, Cabin CAN, and Diagnostic CAN datalinks.

To verify whether a J1939 fault is routed, perform one of the following steps:

- Use **Table 1** to confirm that the ECU MID is for an ECU that is physically connected to J1939.
- Connect to ServiceLink. In ServiceLink, routed faults appear in grey text. Select a different protocol until ECU faults appear in black text. Seeing a fault in ServiceLink’s J1939 fault screen in black text verifies that the fault is from a J1939 ECU, and verifies that J1939 is the correct protocol to view for troubleshooting that fault or ECU.

The CGW has the following wiring connections:

- Each datalink on the vehicle: J1708, J1939, Cabin CAN, and Diagnostic CAN.
- On the Diagnostic CAN, the CGW has a direct connection to the diagnostic connector.
- On the Cabin CAN, the CGW is directly connected to the starpoint connector.

The CGW has the following main functions:

- Routes and translates messages between datalinks.
- Interfaces between off-board tools and Cabin CAN ECUs.
- Provides faults for any missing Cabin CAN ECUs.

In some cases, the Cabin CAN ECUs need information from J1939 or J1708 ECUs. Information sent by the J1939 or J1708 ECU is picked up by the CGW and passed to the appropriate Cabin CAN ECU. The reverse occurs when a J1939 or J1708 ECU needs information from a CAN ECU.

Routing Active CAN Faults

If a CAN ECU generates an active fault, the CGW will route up to one active fault for that ECU on to J1939 and J1708 for display on the instrument cluster (ICU) message center, which does not have a direct connection to CAN. This is to alert the driver that the ECU has an active fault.

NOTE: On the Cascadia, the ICU4M simply reads the faults on the datalink and will display 2 messages (a J1708 and a J1939) for the same fault, since the fault is transmitted on both the J1708 and J1939 datalink.

When a CAN ECU generates an active fault:

- J1939 displays up to one active fault for that CAN ECU under the J1939 source address for that CAN ECU. SAM Cab, for example, is SA 33. Accurate SPN and FMI information for that fault is also displayed.
- J1708 displays up to one active fault for that CAN ECU under the MID for that CAN ECU. SAM Cab, for example, is MID 249. Accurate SID/PID or FMI information is not displayed for that fault. It appears under the generic SID of "254", and the FMI may or may not be accurate.

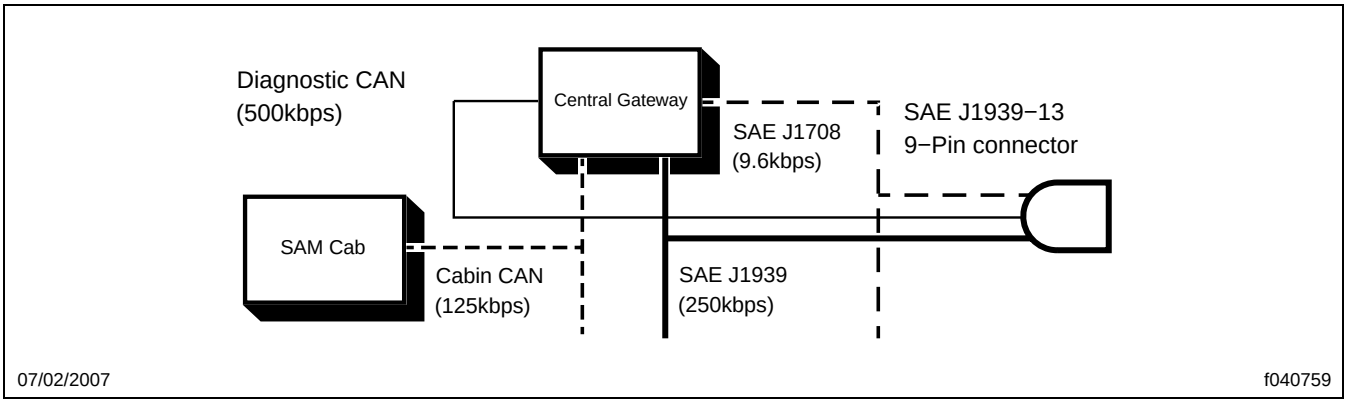

Fig. 1, Central Gateway, Diagnostic Connector, and Vehicle Datalinks

Routing Active J1939 Faults

If a J1939 ECU generates an active fault, the CGW will route up to one active fault for that ECU onto J1708, for display on the instrument cluster (ICU) message center. This is to alert the driver that the ECU has an active fault, especially if the ICU has a J1708 connection only. When a J1939 ECU generates an active fault, there may be up to one active fault on J1708 for that CAN ECU under the MID for that CAN ECU. HVAC Front Control Unit, for example, is MID 146. Accurate information for SID/PID or FMI is not displayed for that fault. It appears under the generic SID of "254", and the FMI may or may not be accurate.

For more information regarding message routing behavior by the CGW, refer to **G02.03 – Central Gateway**.

503 — ECU Identification on Datalinks

The information in **Table 1** identifies which ECU is reporting the fault, and which datalink protocol to load in ServiceLink to get accurate fault information for troubleshooting that ECU.

NOTE: Items in parenthesis indicate a routed message from an ECU that is not physically connected, but reported by the CGW.

ECU Identification on Datalinks

ECU Description	CAN ID	J1939 SA	J1587 MID	Comments
SAM Cab	33	(33)	(249)	—
SAM Chassis	71	(71)	(216)	—
Modular Switch Field (MSF)	49	(49)	(164)	—
Central Gateway (CGW)	37	(37)	(206)	—
Engine Control 1	—	0	128	—
Engine Control 2	—	1	175	—
Transmission	—	3	130	—
ABS	—	11	136	—
Retarder, Engine	—	15	173	—
Instrument Cluster	—	23*	140	—
Navigation	—	28	162	—
Engine Display	—	40	171	—
HVAC, Front	—	25	(146)	CGW reporting MID 146; there is no physical J1708 connection.
HVAC, Rear	—	58	(200)	CGW reporting MID 200; there is no physical J1708 connection.
Radio	—	76	(221)	CGW reporting MID 221; there is no physical J1708 connection.
Collision Warning	—	42	(219)	CGW reporting MID 219; there is no physical J1708 connection.
Qualcomm	—	75	181	—

ECU Identification on Datalinks				
ECU Description	**CAN ID**	**J1939 SA**	**J1587 MID**	**Comments**
Lane Guidance	—	232	—	—
Front Airbag Sensor	—	—	232	—
Roll Sensor Module	—	—	254	—

* ICU4M Only.

Table 1, ECU Identification on Datalinks

The following examples demonstrate how to diagnose faults using **Table 1**.

- J1708 Fault: MID 146, SID 254, FMI 03
  - – MID 146 is the Front HVAC.
  - – The Front HVAC is diagnosed using J1939.
  - – Load the J1939 fault screen in ServiceLink for diagnostic information.
- J1939 Fault: SA 49, SPN 168, FMI 03
  - – SA 49 is the Modular Switch Field (MSF).
  - – The MSF is diagnosed using the CAN protocol.
  - – Load the CAN fault screen in ServiceLink for diagnostic information.
- J1708 Fault: MID 216, SID 254, FMI 14
  - – MID 216 is the SAM Chassis.
  - – The SAM Chassis is diagnosed using the CAN protocol.
  - – Load the CAN fault screen in ServiceLink for diagnostic information.
- J1708 Fault: MID 136, SID 123, FMI 02
  - – MID 136 is the ABS module.
  - – The ABS is diagnosed using the J1708 protocol.
  - – Load the J1708 fault screen in ServiceLink for diagnostic information.

504 — J1939 Failure Mode Identifiers

Failure Mode Identifiers (FMIs)	
FMI	**Description**
00	Data valid but above normal operational range–Most severe level.
01	Data valid but below normal operational range–Most severe level.
02	Data erratic, intermittent, or incorrect.
03	Voltage above normal, or shorted high.
04	Voltage below normal, or shorted low.
05	Current below normal, or open circuit.

Failure Mode Identifiers (FMIs)	
FMI	**Description**
06	Current above normal, or grounded circuit.
07	Mechanical system not responding, or out of adjustment.
08	Abnormal frequency, pulse width, or period.
09	Abnormal update rate.
10	Abnormal rate of change.
11	Root cause not known.
12	Bad intelligent device or component.
13	Out of Calibration.
14	Special Instructions.
15	Data valid but above normal operational range–Least severe level.
16	Data valid but above normal operational range–Moderately severe level.
17	Data valid but below normal operational range–Least severe level.
18	Data valid but below normal operational range–Moderately severe level.
19	Received network data in error.
20-30	Reserved for future assignment by SAE.
31	Condition exists.

Table 2, Failure Mode Identifiers (FMIs)

505 — ICU4M J1939 Datalink Roll Call Faults

The ICU4M is programmed to learn several ECMs on the J1708 datalink. See **Table 3**. The ICU4M also learns and detects 2 ECUs on the J1939 datalink for roll call. These ECUs are the MSF (SA 49) and the Collision Warning System (VORAD - SA 42). Since the MSF is required to read faults, there is no way of displaying a roll call fault for SA 49

The ICU4M expects to detect these "learned" ECUs and the engine ECM on roll call at every subsequent power up. If the ICU does not detect an expected ECU on roll call, it reports the fault on the display. These faults are not displayed in ServiceLink. Typical ICU4M J1939 roll call faults are displayed as "SA – SPN 639 FMI 7", and J1708 faults are displayed as "MID s254 FMI 07". As with any fault reported on the ICU4M, the entire fault is shown on a single screen. All J1939 datalink roll call faults have a SPN 639 and FMI 7, and J1708 faults have SID 254 and FMI 07.

For more information on roll call faults, refer to **C01.02 — ICU4/ICU4M**.

J1708 Display Message	
Device	**Display Message**
Engine	ENG Controller NoRESP 128s254 07
Transmission	Trans Controller NoRESP 130s254 07
ABS	Brake Controller NoRESP 136s254 07

J1708 Display Message	
Device	**Display Message**
ACPU	A/C Controller NoRESP 190s254 07
SAM Chassis	CHASS Controller NoRESP 216s254 07
Transmission Shift Unit	TSU Controller NoRESP 223s254 07
Cellular	Phone Controller NoRESP 231s254 07
SPACE	SPACE Controller NoRESP 232s254 07
SDU 1	STEP1 Controller NoRESP 236s254 07
SDU 2	STEP2 Controller NoRESP 237s254 07
SAM Cab	SAM Controller NoRESP 249s254 07

Table 3, J1708 Display Message

J1939 Display Message	
Device	**Display Message**
MSF	SA 49*
Collision Warning System	Radar SA42 SPN000639 J1939 Network 07

* SA 49 roll call error cannot be displayed; a functional J1939 MSF message is required to navigate to the diagnostic errors.

Table 4, J1939 Display Message

506 — Related Subjects

- **G02.02 — Datalink Communication Structure**
- **G02.04 — SAM Cab**
- **G02.05 — SAM Chassis**
- **G02.06 — Modular Switch Field**
- **G03.01 — Datalink, J1587/J1708**
- **G03.02 — Datalink, J1939**
- **G03.03 — Datalink, Cabin CAN**
- **G03.04 — Datalink, Diagnostic CAN**
- **C01.02 — ICU4/ICU4M**

700 — J1939 Fault Codes

NOTE: Refer to **C07.09 — Collision Warning System** for more information.

J1939 Fault Codes			
SA	**SPN**	**FMI**	**Fault Description**
25	70	09	Parking brake switch status message – abnormal update rate.
25	84	09	Vehicle speed – abnormal update rate.
25	110	09	Engine coolant temperature message – abnormal update rate.
25	158	03	FCU – voltage above normal.
25	158	04	FCU – voltage below normal.
25	168	09	SAM Cab battery voltage message – abnormal update rate.
25	171	09	Ambient air temperature – abnormal update rate.
25	190	09	Engine speed message – abnormal update rate.
25	629	12	FCU – bad intelligent device or component.
25	639	02	J1939 Datalink, intermittent or incorrect data.
25	876	01	A/C Clutch – protection mode (voltage too low).
25	876	02	A/C Clutch – data erratic, intermittent, or incorrect.
25	876	09	A/C Clutch – abnormal update rate.
25	876	11	A/C Clutch – root cause not known.
25	1547	04	Evaporator sensor-short to ground.
25	1547	05	Evaporator sensor short to battery, or open circuit.
25	1548	04	COTC sensor short to ground.
25	1548	05	COTC Sensor short to battery, or open circuit.
25	522510	0	High pressure sensor – data valid, but above normal operating range.
25	522510	01	High pressure sensor – data valid, but below normal operating range.
25	522510	02	High pressure sensor – data erratic, intermittent, or incorrect.
25	522510	09	High pressure sensor – abnormal update rate.
25	522510	11	High pressure sensor – root cause not known.
25	523307	09	Low air pressure switch status message – abnormal update rate.
25	523315	04	Stepper motor voltage supply driver – voltage below normal, shorted to low source or open circuit.
25	523318	02	Blower motor protection mode (voltage out of range).
25	523318	06	Blower motor protection mode (overcurrent or thermal protection).

J1939 Fault Codes			
SA	**SPN**	**FMI**	**Fault Description**
25	523318	07	Blower motor protection mode (speed mismatch or blocked rotor).
25	523329	02	Defrost door actuator data mismatch.
25	523329	03	Vehicle speed – abnormal update rate.
25	523329	04	Defrost door actuator, voltage below normal, open circuit.
25	523330	02	Blend door actuator, data mismatch.
25	523330	03	Blend door actuator, voltage above normal, or shorted to battery.
25	523330	04	Blend door actuator, voltage below normal, open circuit.
25	523331	02	Recirc door actuator, data mismatch.
25	523331	03	Recirc door actuator, voltage above normal, or shorted to battery.
25	523331	04	Recirc door actuator, voltage below normal, open circuit.
25	523332	02	Floor door actuator, data mismatch.
25	523332	03	Floor door actuator, voltage above normal, or shorted to battery.
25	523332	04	Floor door actuator, voltage below normal, open circuit.
42	639	02	One or more required messages missing from datalink.
42	639	09	No messages being received from the datalink.
42	639	13	Device cannot claim source address on datalink.
42	639	19	Messages received with incorrect data or marked as error.
42	886	07	FLR misaligned.
42	886	12	FLR internally defective.
42	886	13	FLR not configured properly
42	886	14	FLR blocked
42	898	13	Engine not configured for SmartCruise operation.
42	898	14	Engine not supported for SmartCruise operation
42	1563	13	VS-400 component detects incompatibility issue with other VS-400 devices.
58	158	03	ACU – voltage above normal.
58	158	04	ACU – voltage below normal.
58	609	12	ACU – bad intelligent device or component.
58	639	02	J1939 Datalink, intermittent or incorrect data.
58	1548	04	COTC sensor, short to ground.
58	1548	05	COTC sensor, short to battery or open circuit

J1939 Fault Codes			
SA	**SPN**	**FMI**	**Fault Description**
58	523315	04	Stepper motor voltage supply driver – voltage below normal, shorted to low source or open circuit.
58	523318	02	Blower motor, protection mode (voltage out of range).
58	523318	06	Blower motor, protection mode (overcurrent or thermal protection).
58	523318	07	Blower motor, protection mode (speed mismatch or blocked rotor).
58	523330	02	Blend door actuator, data mismatch.
58	523330	03	Blend door actuator, voltage above normal or shorted to battery.
58	523330	04	Blend door actuator, voltage below normal, open circuit.
76	520192	03	Left front speaker – short to BAT.
76	520192	04	Left front speaker – short to GND.
76	520192	05	Left front speaker – open circuit detected.
76	520192	06	Left front speaker – short circuit detected.
76	520193	03	Right front speaker – short to BAT.
76	520193	04	Right front speaker – short to GND.
76	520193	05	Right front speaker – open circuit detected.
76	520193	06	Right front speaker – short circuit detected.
76	520194	03	Left rear speaker – short to BAT.
76	520194	04	Left rear speaker – short to GND.
76	520194	05	Left rear speaker – open circuit detected
76	520194	06	Left rear speaker – short circuit detected.
76	520195	03	Right rear speaker – short to BAT.
76	520195	04	Right rear speaker – short to GND.
76	520195	05	Right rear speaker – open circuit detected.
76	520195	06	Right rear speaker – short circuit detected.
76	520196	14	Radio Display Fault.
76	520197	14	Stuck Radio Button(s).
76	520199	14	Generic Radio Fault.
76	520200	14	CD Mechanism.
140	639	2	One or more required messages missing from datalink.
140	639	9	No messages being received from the datalink.
140	639	13	Device cannot claim source address on datalink.
140	639	19	Messages received with incorrect data or marked as error.

J1939 Fault Codes			
SA	**SPN**	**FMI**	**Fault Description**
140	893	12	DIU internally defective.
140	1563	13	VS-400 component detects incompatibility issue with other VS-400 devices.
140	1703	03	External right speaker shorted high.
140	1703	04	External right speaker shorted low.
140	1703	05	External right speaker open.
140	1704	03	External left speaker shorted high.
140	1704	04	External left speaker shorted low.
140	1704	05	External left speaker open.

Table 5, J1939 Fault Codes

NOTE: Refer to engine manufacturer documentation or diagnostic software for engine faults.

ICU4M J1939 Roll Call Faults	
Fault	**Fault Description**
SA25 SPN639 F19	Front HVAC
SA42 SPN639 F19	Collision Warning System (VORAD)
SA49 SPN639 F19	Modular Switch Field (MSF)
SA58 SPN639 F19	Rear HVAC

Table 6, ICU4M J1939 Roll Call Faults

NOTE: Refer to **C01.02 — ICU4/ICU4M** for roll call messages.