

2017 ACCESSORIES AND EQUIPMENT

Data Communications - Description and Operation - Sierra, Silverado

DESCRIPTION AND OPERATION

BODY CONTROL SYSTEM DESCRIPTION AND OPERATION

The body control system consists of the body control module (BCM), communications, and various input and outputs. Some inputs, outputs and messages require other modules to interact with the BCM. The BCM also has discrete input and output terminals to control the vehicle's body functions. The BCM is wired to the high speed GMLAN serial data bus, low speed GMLAN serial data bus and Multiple LIN buses and acts as a gateway between them.

Power Mode Master

This vehicle body control module (BCM) functions as the power mode master (PMM). The ignition switch is a low current switch with multiple discrete ignition switch signals to the PMM for determining the power mode that will be sent over the serial data circuits to the other modules that need this information; the PMM will activate relays and other direct outputs of the PMM as needed. Refer to [Power Mode Description and Operation](#) for a complete description of power mode functions.

Gateway

The body control module (BCM) in this vehicle functions as a gateway or translator. The purpose of the gateway is to translate serial data messages between the GMLAN high speed bus and the GMLAN low speed bus for communication between the various modules. The gateway will interact with each network according to that network's transmission protocol.

All communication between the BCM and a scan tool is on the high speed GMLAN serial data circuits. A lost communication DTC typically is set in modules other than the module with a communication failure.

Body Control

The various body control module (BCM) input and output circuits are illustrated in the corresponding functional areas on the BCM electrical schematics. Refer to the [Body Control System Schematics](#) for more detailed information.

DATA LINK COMMUNICATIONS DESCRIPTION AND OPERATION

NOTE: This is an overview of different serial data buses used by GM devices to communicate with each others. Use [Data Communication Schematics](#) to find out which serial data buses are configured for a specific vehicle.

Circuit Description

There are many components in a vehicle that rely on information from other sources, transmit information to other sources, or both. Serial data communication networks provide a reliable, cost effective, way for various components of the vehicle to "talk" to one another and share information.

GM uses a number of different communication buses to insure the timely and efficient exchange of information between devices. When compared to each other, some of these buses are different in nature as far as speed,

signal characteristics, and behavior. An example of this is the High Speed GMLAN and Low Speed GMLAN buses.

On the other hand, when other buses are compared to each other they have similar characteristics and simply operate in parallel. In this case they are used to group together components which have high interaction. Examples are the High Speed GMLAN, Powertrain Expansion, and Chassis Expansion buses. This allows them to communicate with each other on a bus with reduced message congestion insuring faster and the more timely exchange of information than if all vehicle devices were on a single bus.

The majority of information that exists within a given network generally stays local; however some information will have to be shared on other networks. Control modules designated as Gateway's perform the function of transferring information between the various buses. A Gateway module is connected to at least 2 buses and will interact with each network according to its message strategy and transmission models.

GMLAN provides the capability for a receiving device to monitor message transmissions from other devices in order to determine if messages of interest are not being received. The primary purpose is to allow reasonable default values to be substituted for the information no longer being received. Additionally, a device may set a Diagnostic Trouble Code to indicate that the device it is expecting information from is no longer communicating.

High Speed GMLAN Circuit Description

A High Speed GMLAN Bus is used where data needs to be exchanged at a high enough rate to minimize the delay between the occurrence of a change in sensor value and the reception of this information by a control device using the information to adjust vehicle system performance.

The High Speed GMLAN serial data network consists of two twisted wires. One signal circuit is identified as GMLAN-High and the other signal circuit is identified as GMLAN-Low. At each end of the data bus there is a 120 Ω termination resistor between the GMLAN-High and GMLAN-Low circuits.

Data symbols (1's and 0's) are transmitted sequentially at a rate of 500 Kbit/s. The data to be transmitted over the bus is represented by the voltage difference between the GMLAN-High signal voltage and the GMLAN-Low signal voltage.

When the two wire bus is at rest the GMLAN-High and GMLAN-Low signal circuits are not being driven and this represents a logic "1". In this state both signal circuits are at the same voltage of 2.5 V. The differential voltage is approximately 0 V.

When a logic "0" is to be transmitted, the GMLAN-High signal circuit is driven higher to about 3.5 V and the GMLAN-Low circuit is driven lower to about 1.5 V. The differential voltage becomes approximately 2.0 (+/- 0.5) V.

Chassis High Speed GMLAN Circuit Description

The GMLAN Chassis Expansion Bus is basically a copy of the High Speed GMLAN Bus except that its use is reserved for chassis components. This implementation splits message congestion between two parallel buses helping to insure timely message transmission and reception. Sometimes communication is required between the Chassis Expansion Bus and the primary High Speed GMLAN Bus. This is accomplished by using the K17 Electronic Brake Control Module (EBCM) as the Gateway module. Since the High Speed GMLAN Chassis Expansion Bus and primary High Speed GMLAN Bus operate in the same manner, the diagnostics for each are similar.

Powertrain High Speed GMLAN Circuit Description

The GMLAN Powertrain Expansion Bus is basically a copy of the High Speed GMLAN Bus except that its use is reserved for Powertrain components. The bus is optional based upon feature content. Sometimes communication is required between the Powertrain Expansion Bus and the primary High Speed GMLAN Bus. This is accomplished by using the K20 Engine Control Module (ECM) as the Gateway module. Since the High Speed GMLAN Powertrain Expansion Bus and the primary High Speed GMLAN Bus operate in the same manner, the diagnostics for each are similar.

Media Oriented Systems Transport (MOST) Circuit Description

The MOST Infotainment network is a dedicated high speed multimedia streaming data bus independent from GMLAN. The MOST bus will be configured in a physical hardwired loop with each device within the bus sends and receives data on an assigned MOST addresses in a set order. Each device on the MOST bus will be required to have twisted pair copper wires (2 transmit TX, 2 receive RX, and 1 electronic control line which is a 12 V wakeup signal line). The A11 Radio is the MOST Master and will monitor the bus for vehicle configuration, Infotainment data messages and errors on the bus. The MOST initialization consists of a short 100 ms low voltage pulse on the electronic control line (or MOST control line) connected to all devices contained on the MOST ring. This wakeup message once received by each device, will first respond with a generic device response. Once these initial responses on the MOST bus are reported successfully without error to the A11 Radio, the second data request will record the MOST device addresses, their functionality requirements and capabilities within. The A11 Radio will learn this information and also record the address node sequence on the MOST bus at this point. This node address list will now be stored within the A11 Radio as the MOST bus configuration (called "Last Working MOST ID of Node 1 - 9" on scan tool data display).

When MOST receive, transmit, or control line faults are detected, transmit/receive messages will not be received as expected from the wakeup request. The A11 Radio and the K74 Human Machine Interface Control Module will then perform diagnostics to isolate these MOST faults. If the MOST control line is shorted low to 0 V for an excess amount of time, the A11 Radio will set a U2098 DTC and K74 Human Machine Interface Control Module will set a U0029 02 DTC. At this point the MOST bus will be unable to communicate until the shorted MOST control line is repaired.

Once the shorted MOST control line diagnostics pass, the A11 Radio will attempt to resend the initial short pulse attempts up to 3 times on the MOST control line. If the expected responses are not received, the A11 Radio continues into a failure mode setting a U0028 DTC and will continue on to send one 300 ms long pulse, which will enable the furthest upstream transmitting device to become the surrogate MOST Master in this MOST fault/diagnostic mode. When the A11 Radio receives this new MOST Master identity, the surrogate MOST master device can be identified based on scan tool data parameter "Surrogate MOST Master Node Upstream Position". The scan tool should be used to determine the MOST bus configuration and direction by utilizing the "Last Working MOST ID of Node 1 - 9" parameters from the A11 Radio data display. When a fault is present, it will indicate the newly enabled "Surrogate MOST Master Node Upstream Position" from the A11 Radio. This will assist in determining where the MOST bus/control is at fault. The MOST device upstream from the surrogate MOST master device, transmit, receive, or control lines will be the suspect areas for diagnostics at this point. These faults can be associated with any of the MOST transmit, receive, or control line twisted copper wires or possibly an internal device fault.

The K74 Human Machine Interface Control Module will set a U0029 00 DTC when it diagnoses a MOST bus not communicating properly after one attempt. When the DTC U0029 00 is set by the K74 Human Machine Interface Control Module without the corresponding DTC U0028 from the A11 Radio, it will be an indication of an intermittent wiring/device condition.

Low Speed GMLAN Circuit Description

Low Speed GMLAN Bus is used in applications where a high data rate is not required which allows for the use

of less complex components. It is typically used for operator controlled functions where the response time requirements are slower than those required for dynamic vehicle control.

The Low Speed GMLAN Serial Data Network consists of a single wire, ground referenced bus with high side voltage drive. During on road vehicle operation data symbols (1's and 0's) are transmitted sequentially at the normal rate of 33.3 Kbit/s. For component programming only, a special high speed data mode of 83.3 Kbit/s may be used.

Unlike the high speed dual wire networks, the single wire low speed network does not use terminating resistors at either end of the network.

The data symbols to be transmitted over the bus are represented by different voltage signals on the bus. When the Low Speed GMLAN Bus is at rest and is not being driven, there is a low signal voltage of approximately 0.2 V. This represents a logic "1". When a logic "0" is to be transmitted, the signal voltage is driven higher to around 4.0 V or higher.

Local Interconnect Network (LIN) Circuit Description

The Local Interconnect Network (LIN) Bus consists of a single wire with a transmission rate of 10.417 Kbit/s. This bus is used to exchange information between a master control module and other smart devices which provide supporting functionality. This type of configuration does not require the capacity or speed of either a High Speed GMLAN Bus or Low Speed GMLAN Bus and is thus relatively simpler.

The data symbols (1's and 0's) to be transmitted are represented by different voltage levels on the communication bus. When the LIN Bus is at rest and is not being driven, the signal is in a high voltage state of approximately V_{batt} . This represents a logic "1". When a logic "0" is to be transmitted, the signal voltage is driven low to about ground (0.0 V).

Communication Enable Circuit Description

Devices on High Speed GMLAN Bus enable or disable communication based on the voltage level of the communication enable circuit. When the circuit voltage is high (around 12 V), communications are enabled. When the circuit is low, communications are disabled.

Data Link Connector (DLC)

The X84 Data Link Connector (DLC) is a standardized 16-cavity connector. Connector design and location is dictated by an industry wide standard, and is required to provide the following:

- Terminal 1 Low speed GMLAN communications terminal
- Terminal 4 Scan tool power ground terminal
- Terminal 5 Common signal ground terminal
- Terminal 6 High speed GMLAN serial data bus (+) terminal
- Terminal 12 Chassis high speed GMLAN serial bus (+) terminal
- Terminal 13 Chassis high speed GMLAN serial bus (-) terminal
- Terminal 14 High speed GMLAN serial data bus (-) terminal
- Terminal 16 Scan tool power, battery positive voltage terminal

Serial Data Reference

The scan tool communicates over the various buses on the vehicle. When a scan tool is installed on a vehicle,

the scan tool will try to communicate with every device that could be optioned into the vehicle. If an option is not installed on the vehicle, the scan tool will display No Comm (or Not Connected) for that optional device. In order to avert misdiagnoses of No Communication with a specific device, refer to [Data Link References](#) for a list of devices and the buses they communicate with. Use schematics and specific vehicle build RPO codes to determine optional devices.

SERIAL DATA GATEWAY MODULE DESCRIPTION AND OPERATION

The K56 Serial Data Gateway Module is used to handle communications between multiple GMLAN busses and functions as a gateway to isolate the secure networks from the unsecured networks. It was created to mitigate bus loading to support cyber security and new active/advanced safety features like Limited Ability Autonomous Driving and Enhanced Collision Avoidance (if equipped). The K56 Serial Data Gateway Module is used as a frame-to-frame gateway for all functional messages.

Depending on the vehicle contents, the K56 Serial Data Gateway Module is gating between primary High Speed GMLAN Bus, Gateway Expansion High Speed GMLAN Bus, Gateway Isolated High Speed GMLAN Bus, and Chassis High Speed GMLAN Bus. The K56 Serial Data Gateway Module is also gating between primary Low Speed GMLAN Bus and Gateway Isolated Low Speed GMLAN Bus.

Communication between the K56 Serial Data Gateway Module and a scan tool is done through the primary High Speed GMLAN Bus.

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2017 ACCESSORIES AND EQUIPMENT

Data Communications - Fastener Specifications - Sierra, Silverado

SPECIFICATIONS

FASTENER SPECIFICATIONS

Reusable Threaded Fastener Tightening Specifications

NOTE:

All fasteners listed in this table can be reused after removal.

Application	Specification
	Metric (English)
Body Control Module Bracket Fastener	2 N.m (18 lb in)
Serial Data Gateway Module Bolt	2.5 N.m (22 lb in)

Article GUID: A00854674

2017 ACCESSORIES AND EQUIPMENT

Data Communications - Repair Instructions - Sierra, Silverado

REPAIR INSTRUCTIONS

BODY CONTROL MODULE REPLACEMENT

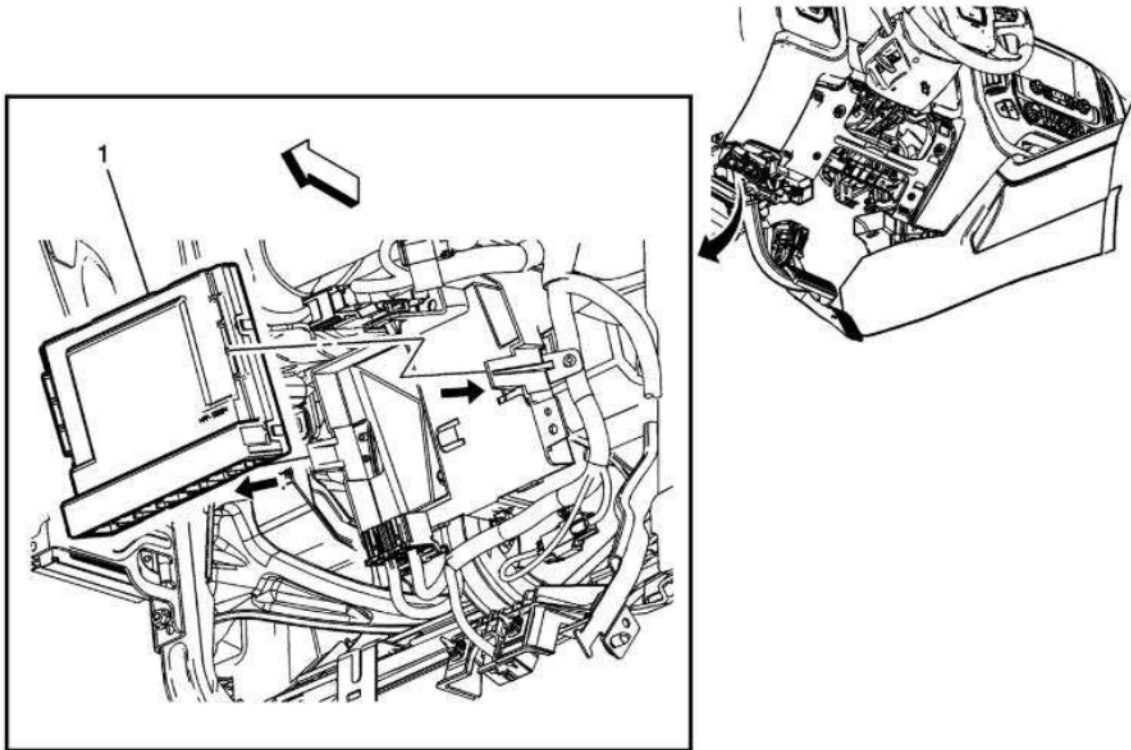


Fig. 1: Body Control Module

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove the instrument panel knee bolster. Refer to Instrument Panel Knee Bolster Replacement .	
1	Body Control Module
	Procedure 1. Disconnect the electrical connectors. 2. Press on the tabs to release the body control module. 3. If a replacement module is installed, program the module. Refer to Control Module References .

BODY CONTROL MODULE BRACKET REPLACEMENT

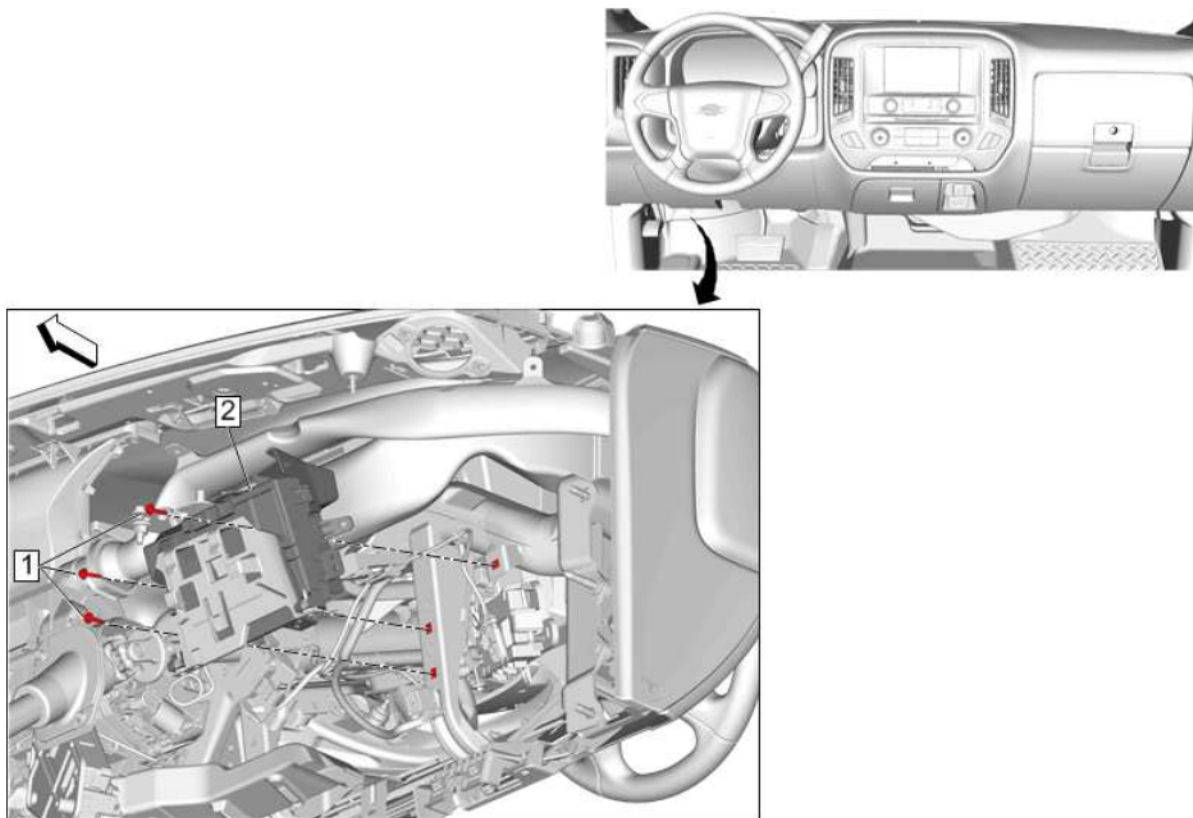


Fig. 2: Body Control Module Bracket
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Body Control Module Replacement	
1	Body Control Module Bracket Bolt CAUTION: <u>Fastener</u> <u>Caution</u> Tighten 2 N.m (18 lb in)
2	Body Control Module Bracket Procedure 1. Release the instrument panel harness retainer, disconnect and unclip the airbag wiring harness connector from the plastic retainer on the body control module bracket. 2. Transfer components as necessary.

SERIAL DATA GATEWAY MODULE REPLACEMENT

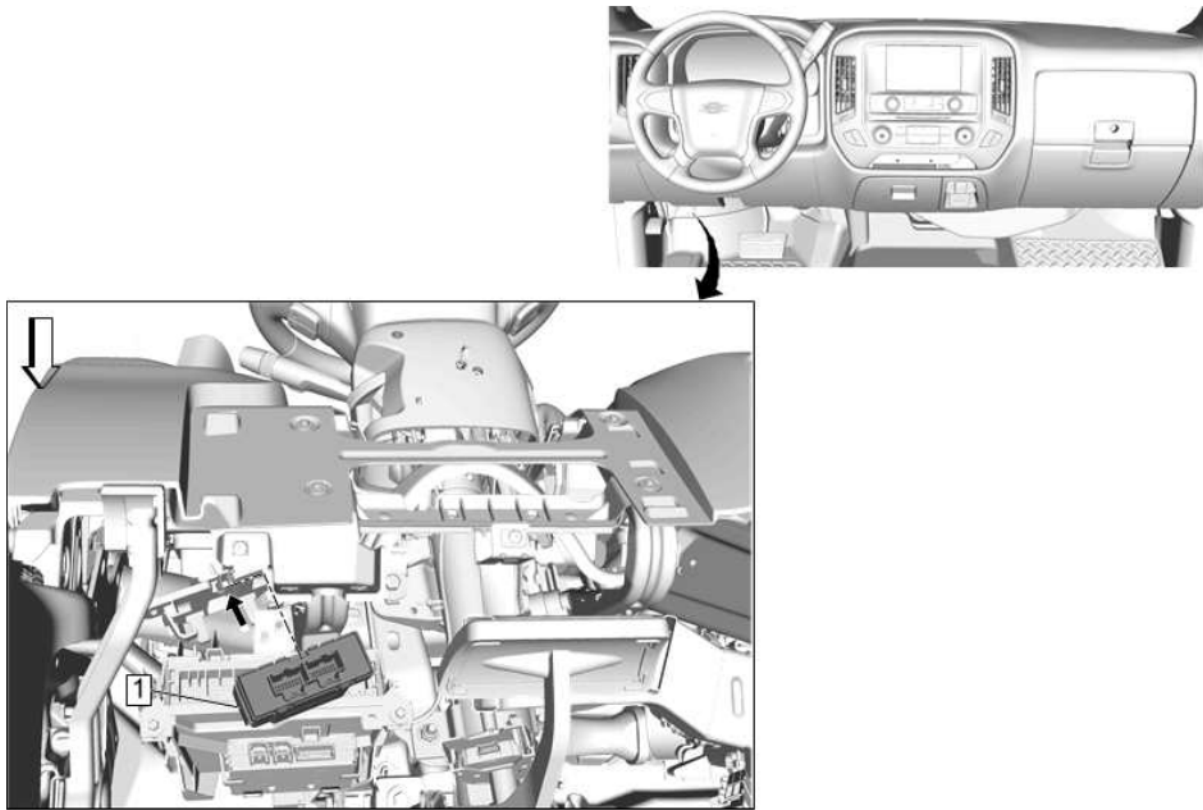


Fig. 3: Serial Data Gateway Module
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Instrument Panel Knee Bolster Replacement	
1	Serial Data Gateway Module Procedure 1. Disconnect the electrical connectors. 2. Release the retaining tab. 3. Perform the necessary programming and setup procedure: Control Module References

SERIAL DATA GATEWAY BRACKET REPLACEMENT

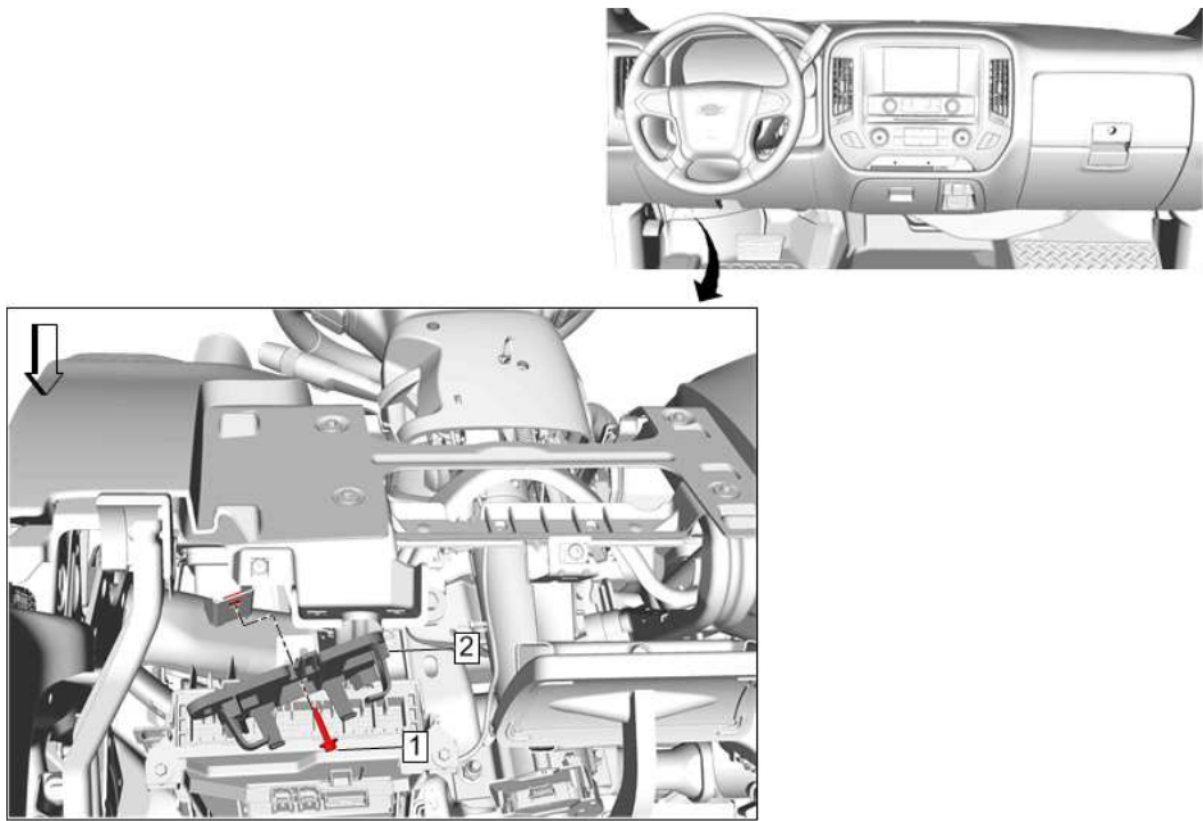


Fig. 4: Serial Data Gateway Bracket
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Serial Data Gateway Module Replacement	
1	Serial Data Gateway Module Bolt CAUTION: Fastener Caution Tighten 2.5 N.m (22 lb in)
2	Serial Data Gateway Bracket

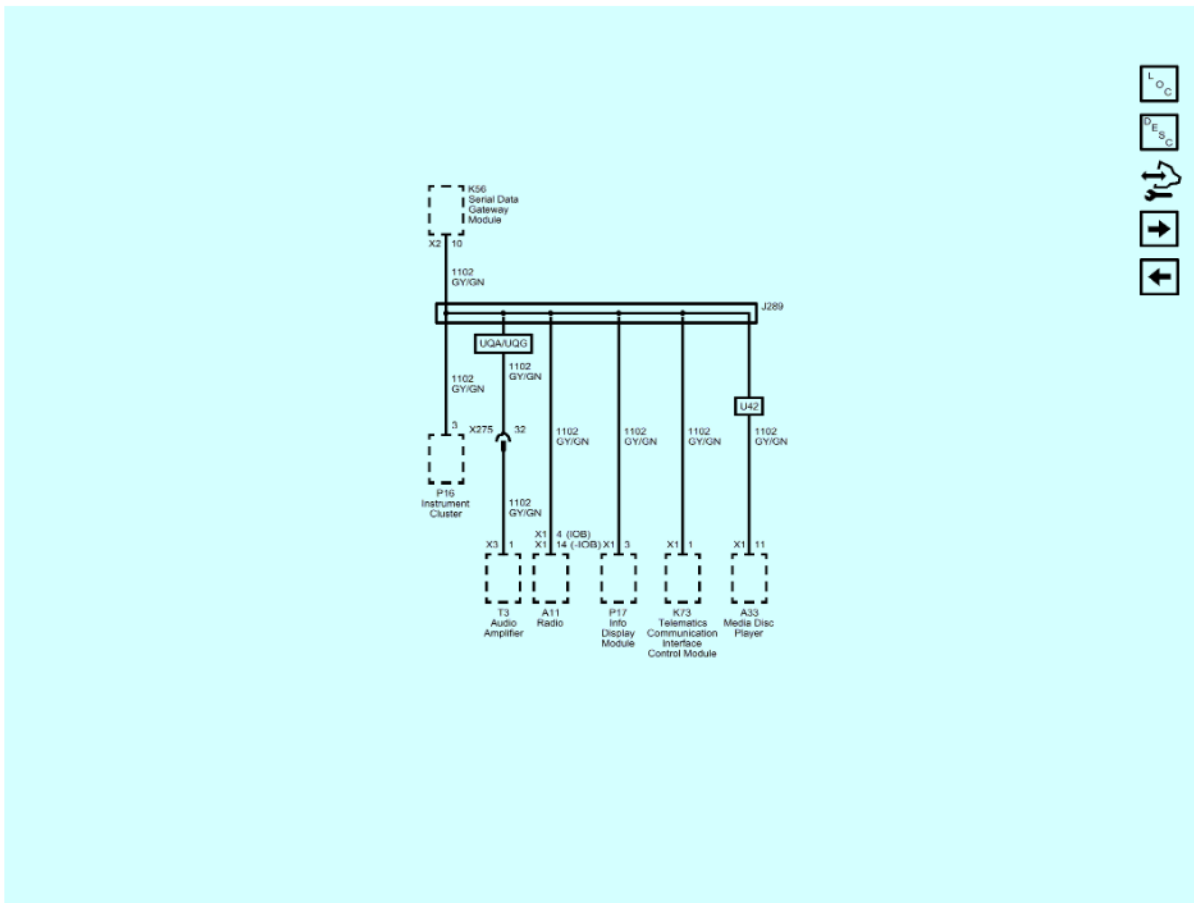


Fig. 2: Gateway Isolated Low Speed GMLAN
 Courtesy of GENERAL MOTORS COMPANY

High Speed GMLAN (1500 except E29 and HP5)

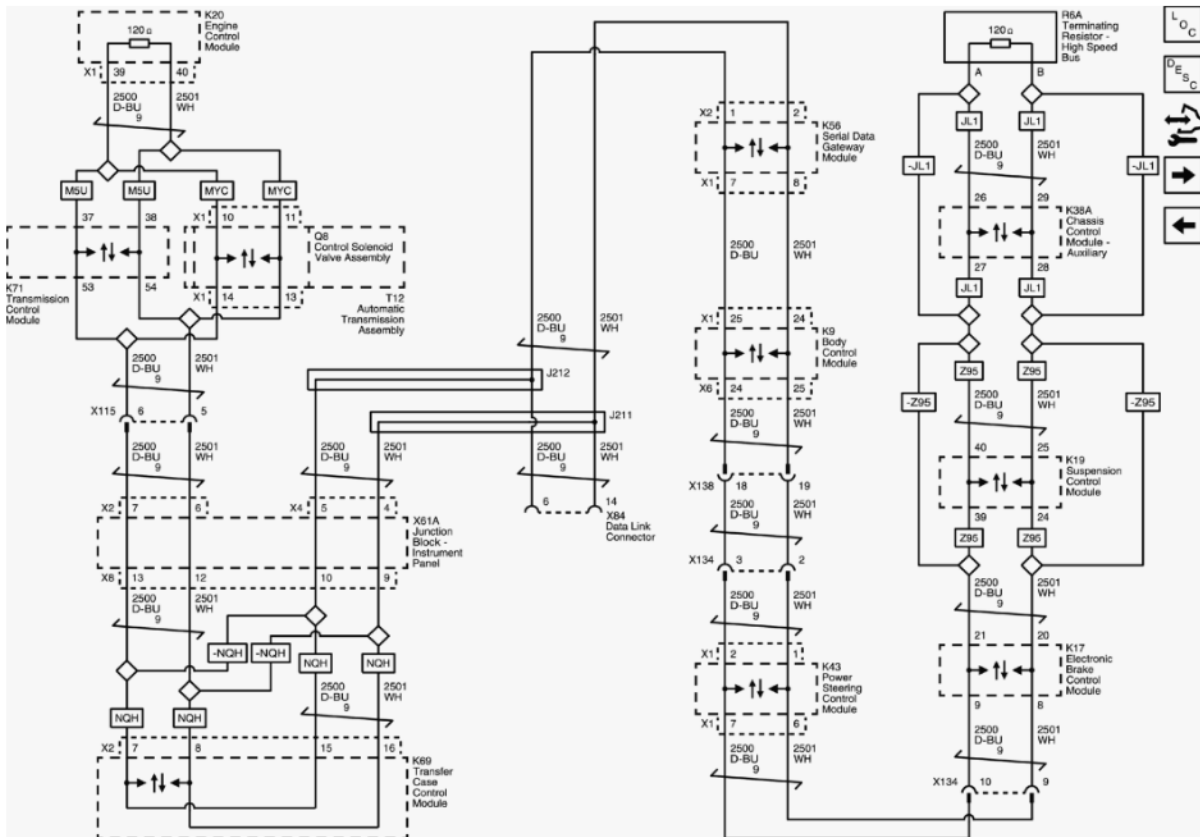


Fig. 3: High Speed GMLAN (1500 except E29 and HP5)
 Courtesy of GENERAL MOTORS COMPANY

High Speed GMLAN (1500 with HP5)

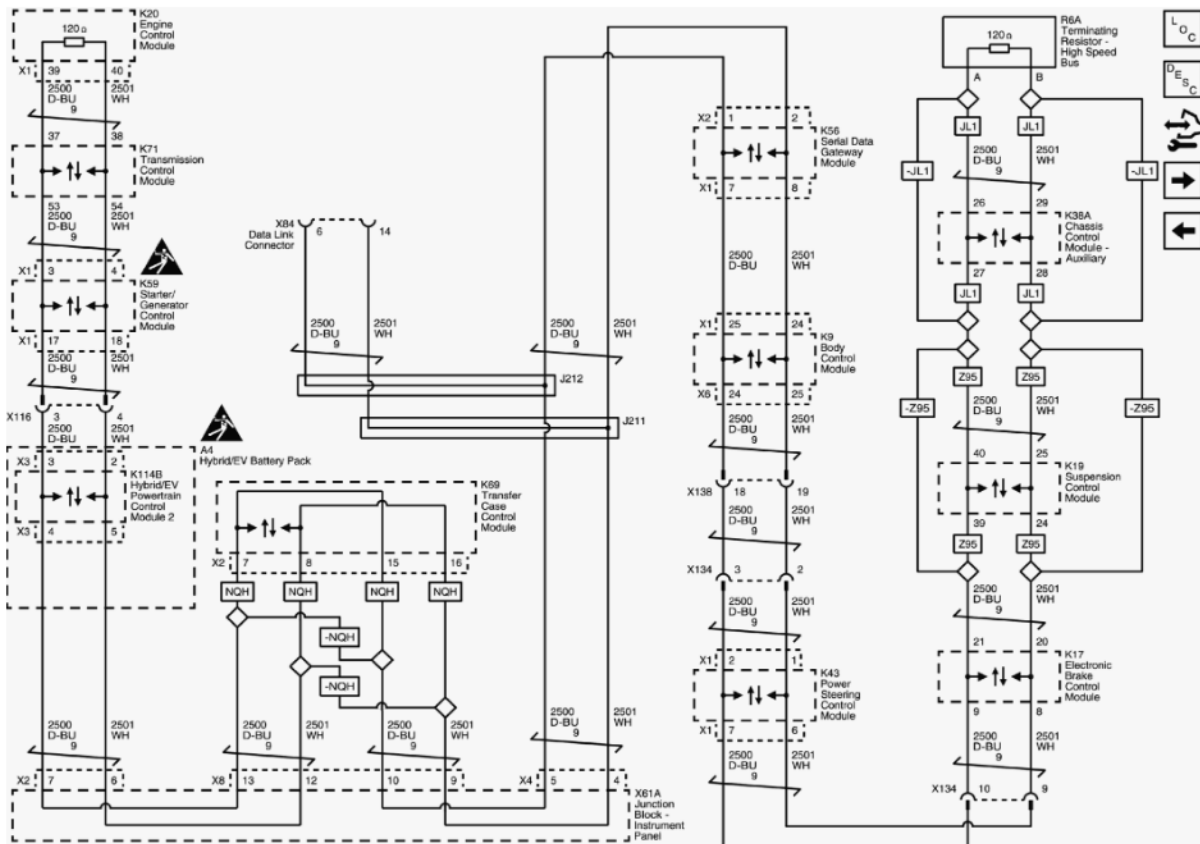


Fig. 4: High Speed GMLAN (1500 with HP5)
Courtesy of GENERAL MOTORS COMPANY

High Speed GMLAN (2500/3500 except E29 or L5P)

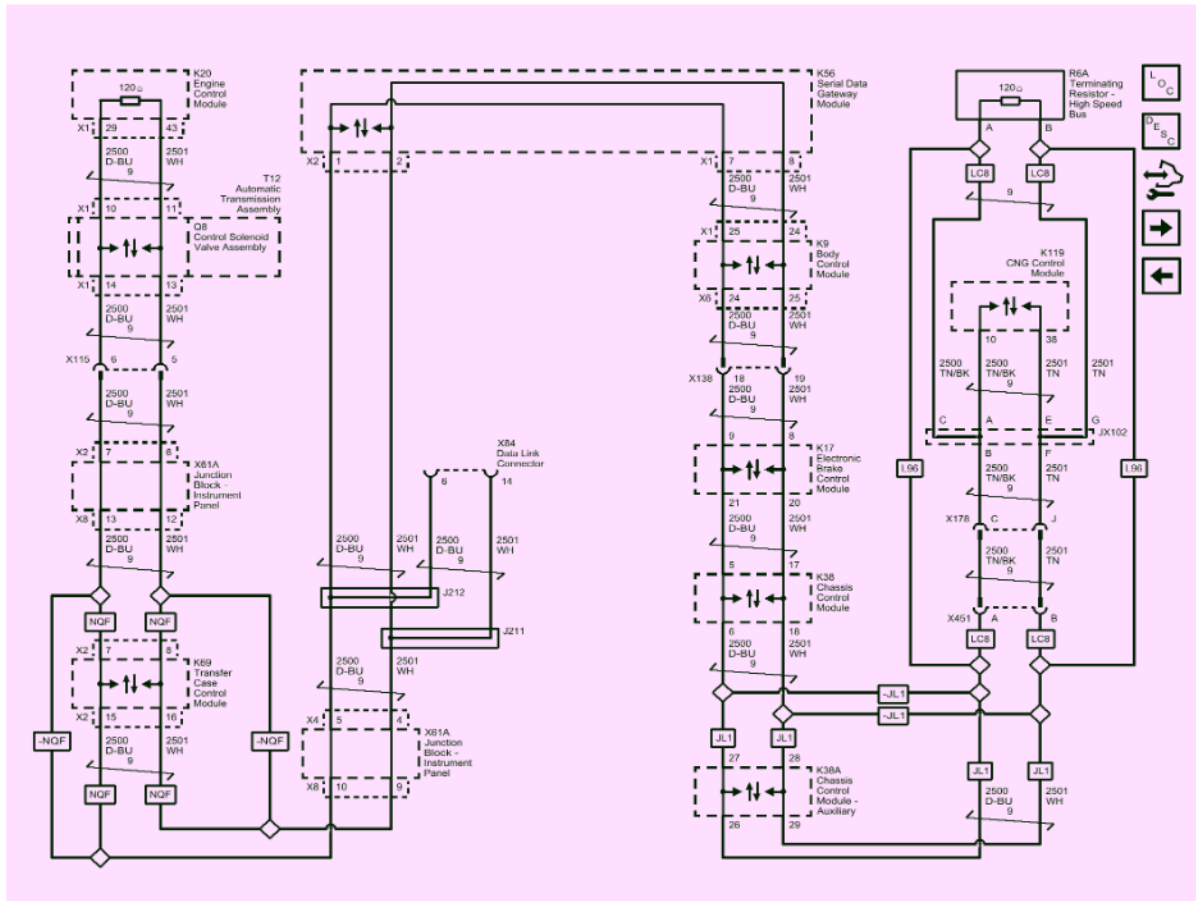


Fig. 5: High Speed GMLAN (2500/3500 except E29 or L5P)
Courtesy of GENERAL MOTORS COMPANY

High Speed GMLAN (L5P)

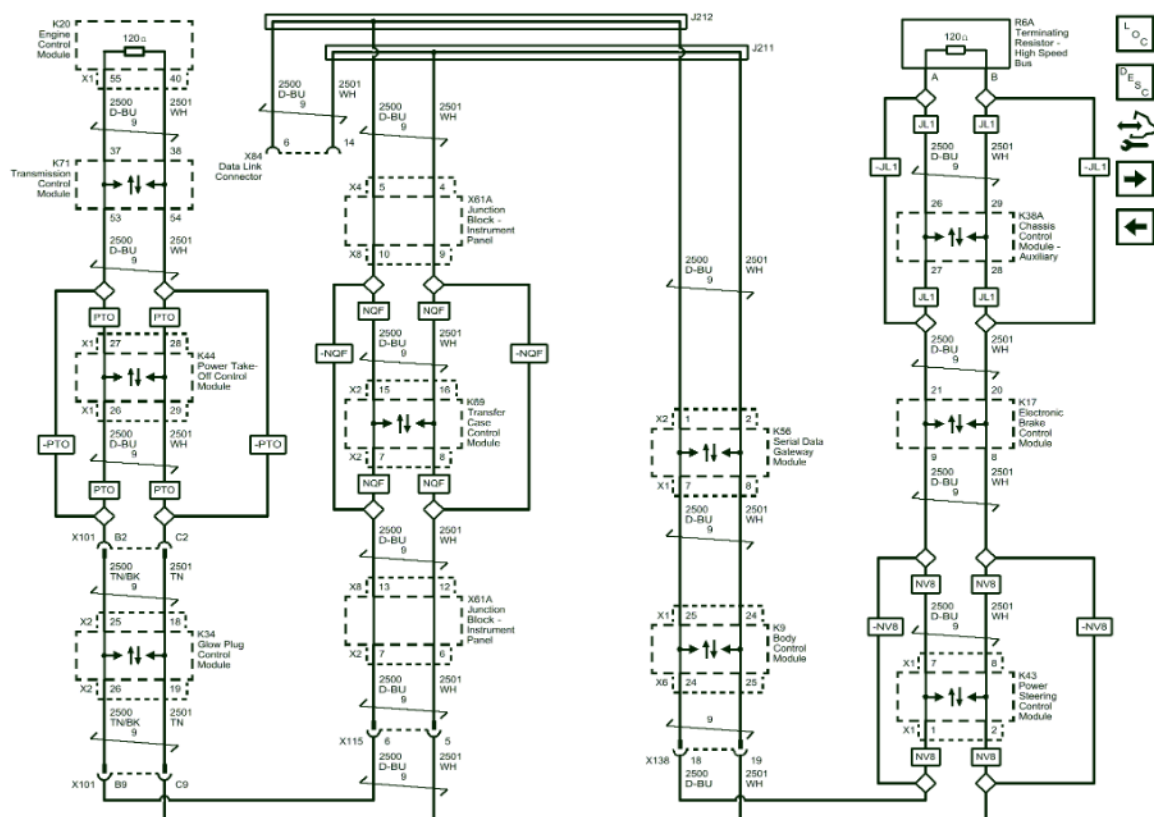


Fig. 6: High Speed GMLAN (L5P)
Courtesy of GENERAL MOTORS COMPANY

High Speed GMLAN (E29)

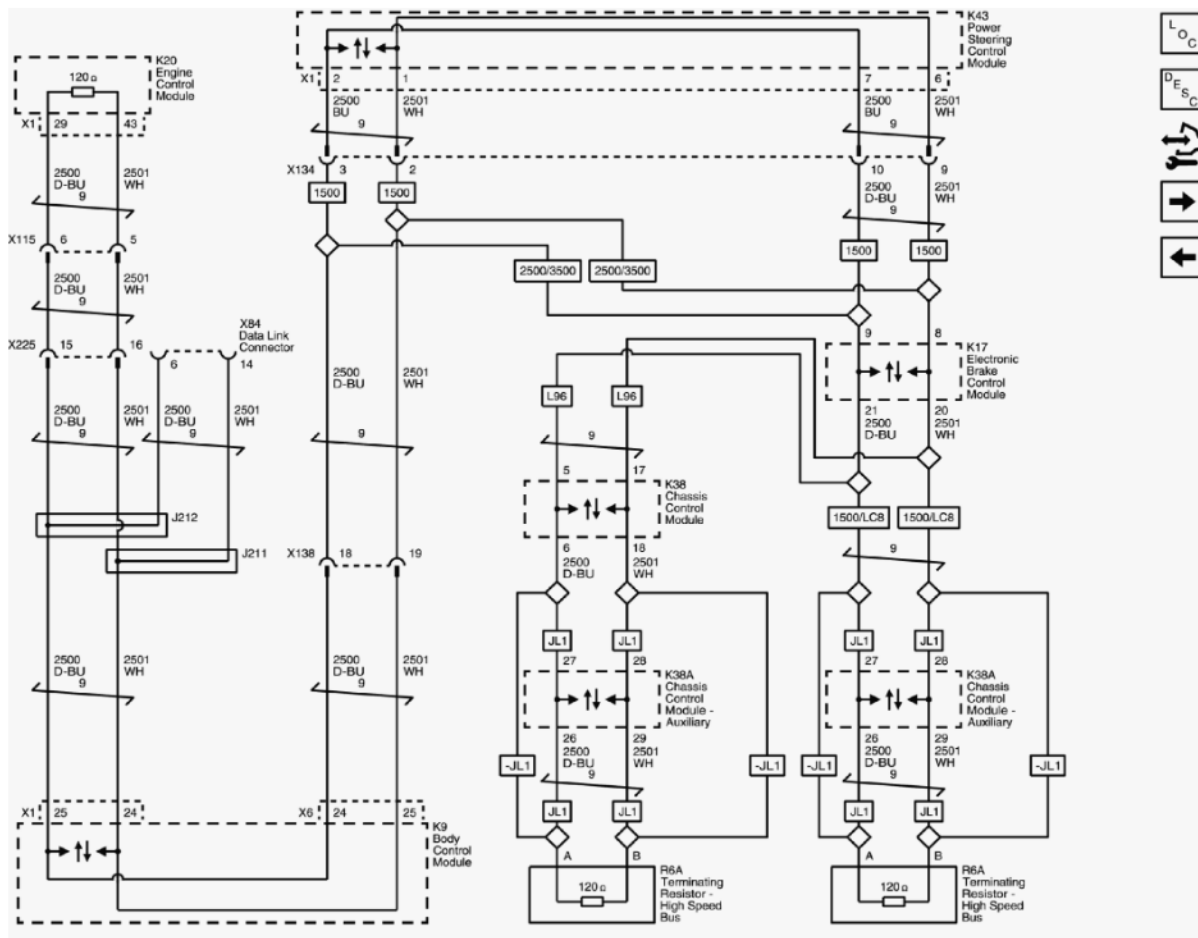


Fig. 7: High Speed GMLAN (E29)

Courtesy of GENERAL MOTORS COMPANY

Gateway Expansion High Speed GMLAN

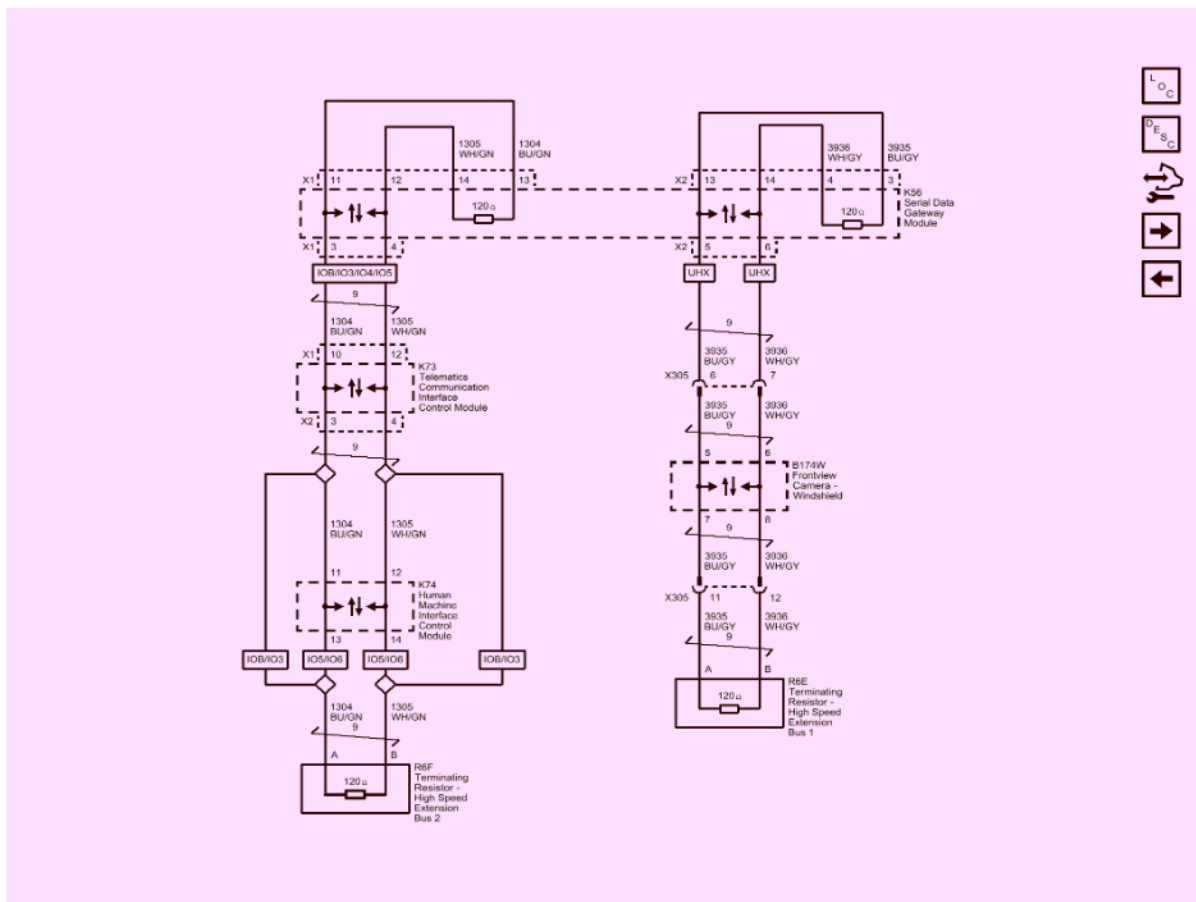


Fig. 8: Gateway Expansion High Speed GMLAN
 Courtesy of GENERAL MOTORS COMPANY

Chassis Expansion Bus (except E29)

Fig. 10: Chassis Expansion Bus (E29)
Courtesy of GENERAL MOTORS COMPANY

Powertrain Expansion Bus (1500)

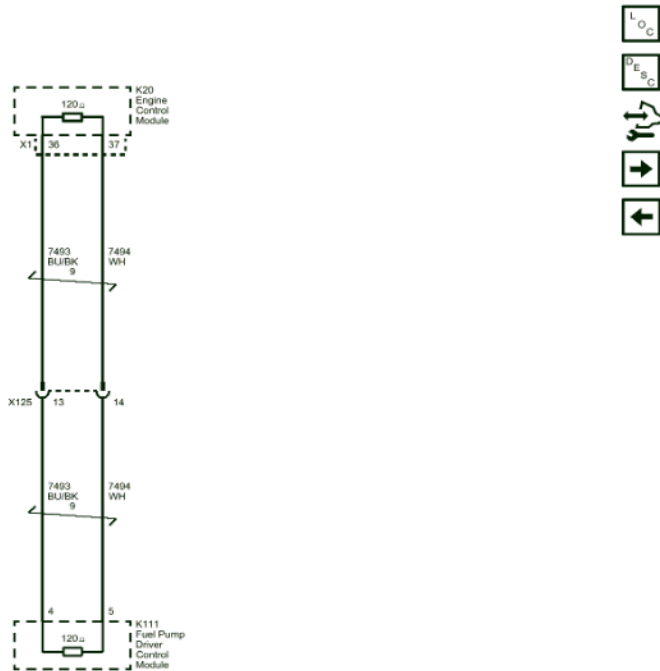


Fig. 11: Powertrain Expansion Bus (1500)
Courtesy of GENERAL MOTORS COMPANY

Powertrain Expansion Bus (L5P)

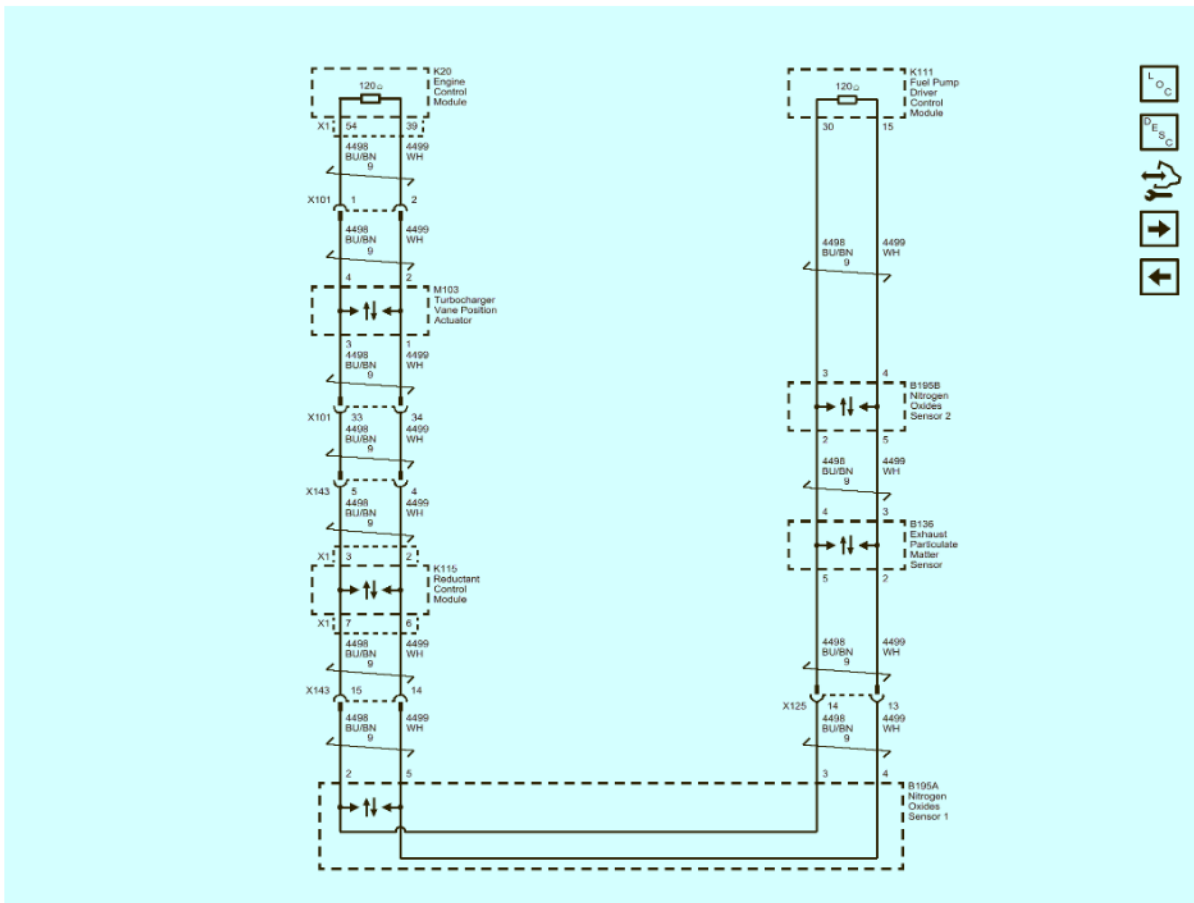


Fig. 12: Powertrain Expansion Bus (L5P)
 Courtesy of GENERAL MOTORS COMPANY

Powertrain Expansion Bus (HP5)

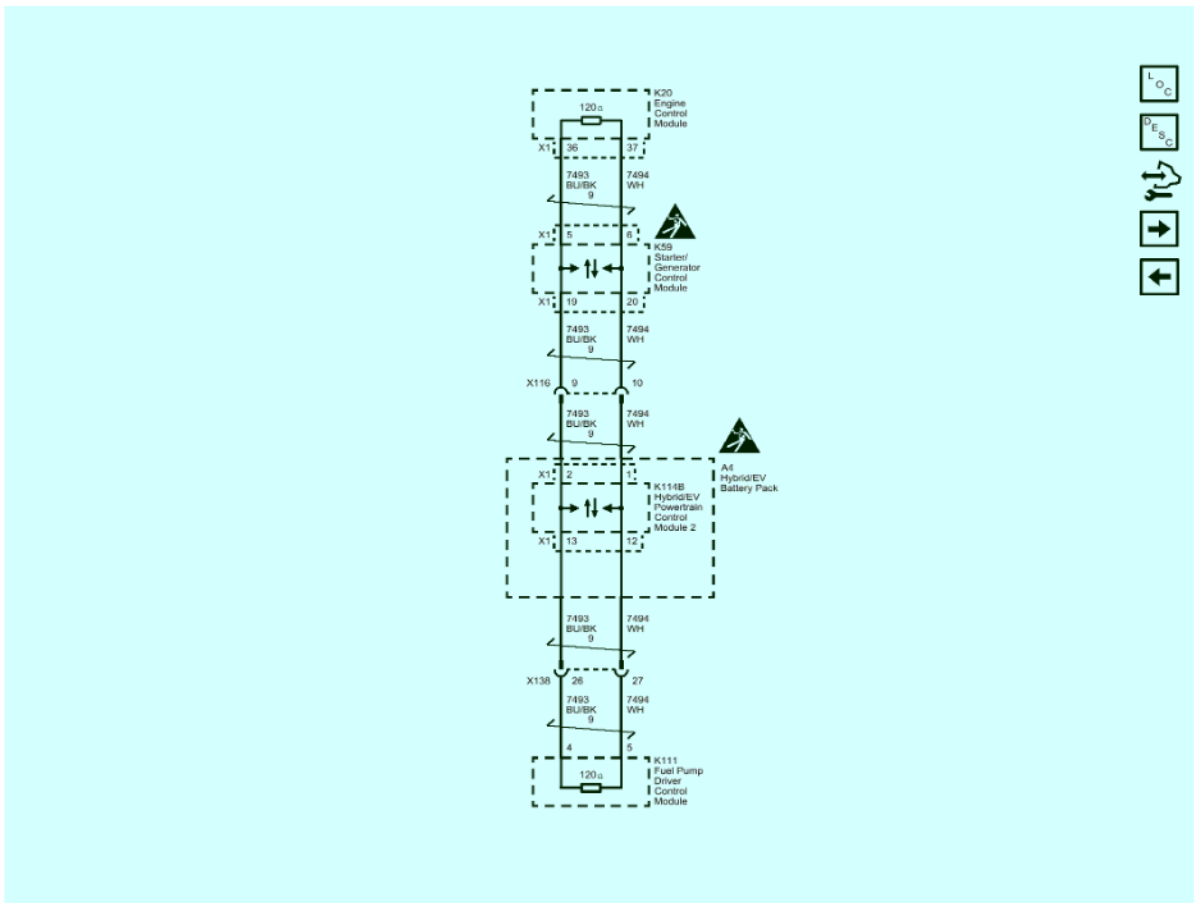


Fig. 13: Powertrain Expansion Bus (HP5)
 Courtesy of GENERAL MOTORS COMPANY

MOST Communication Bus

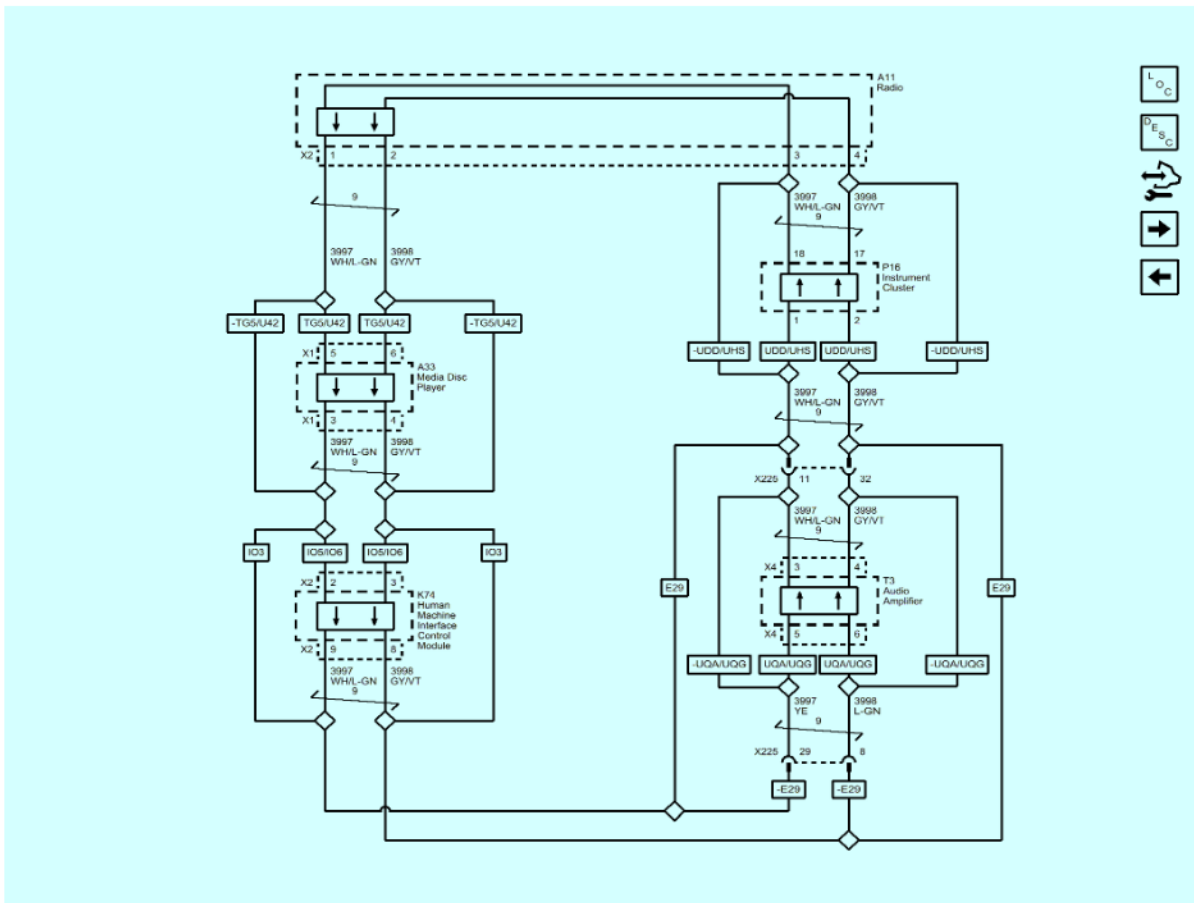


Fig. 14: MOST Communication Bus
 Courtesy of GENERAL MOTORS COMPANY

MOST Communication Enable

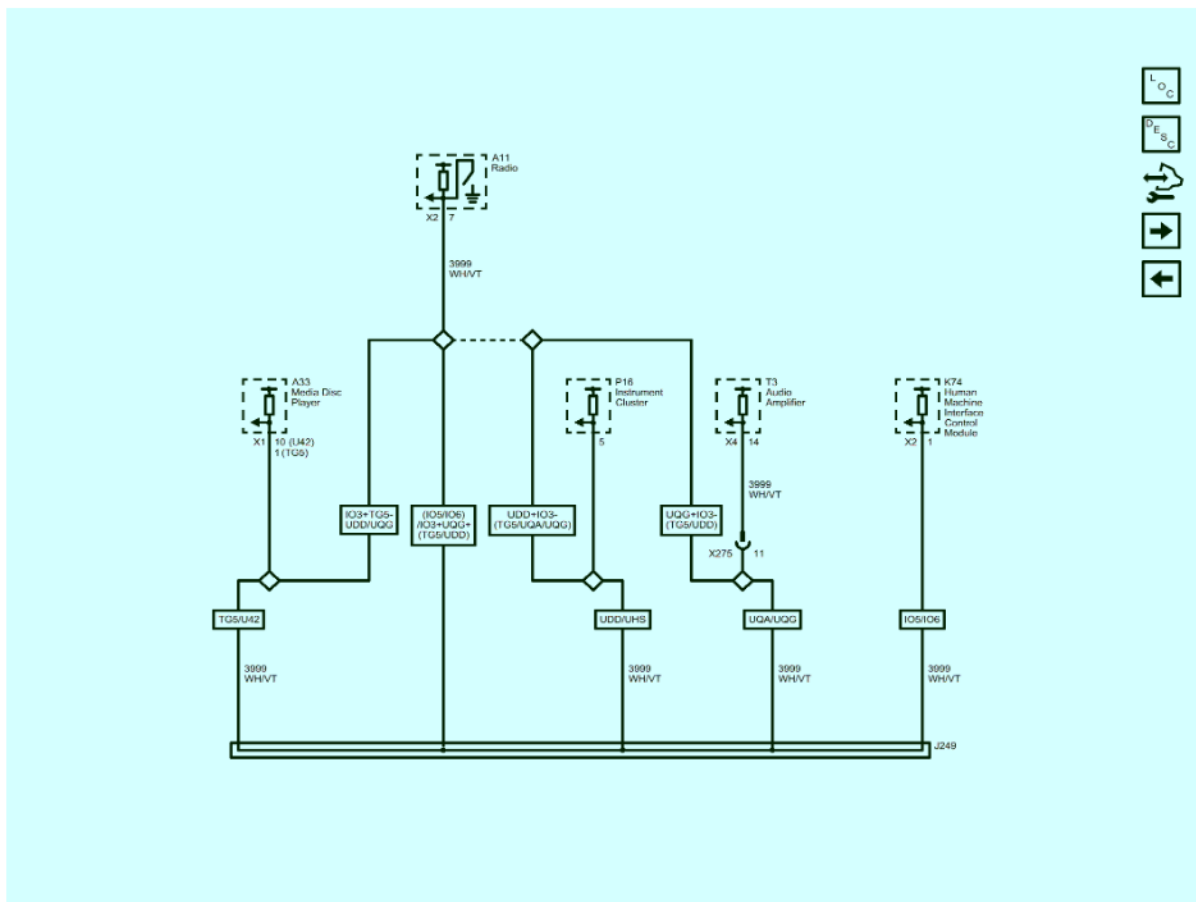


Fig. 15: MOST Communication Enable
 Courtesy of GENERAL MOTORS COMPANY

Accessory Wakeup and Communications Enable

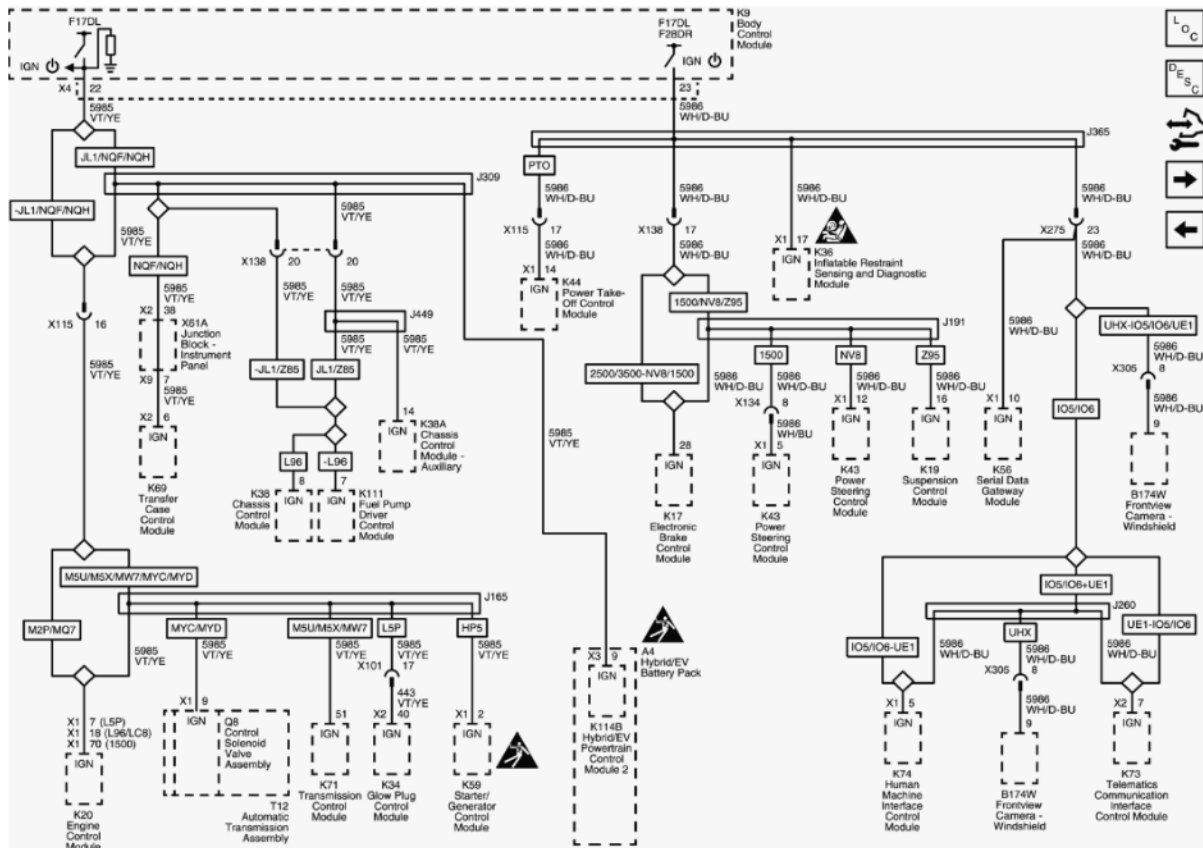


Fig. 16: Accessory Wakeup and Communications Enable
 Courtesy of GENERAL MOTORS COMPANY

Linear Interconnect Network

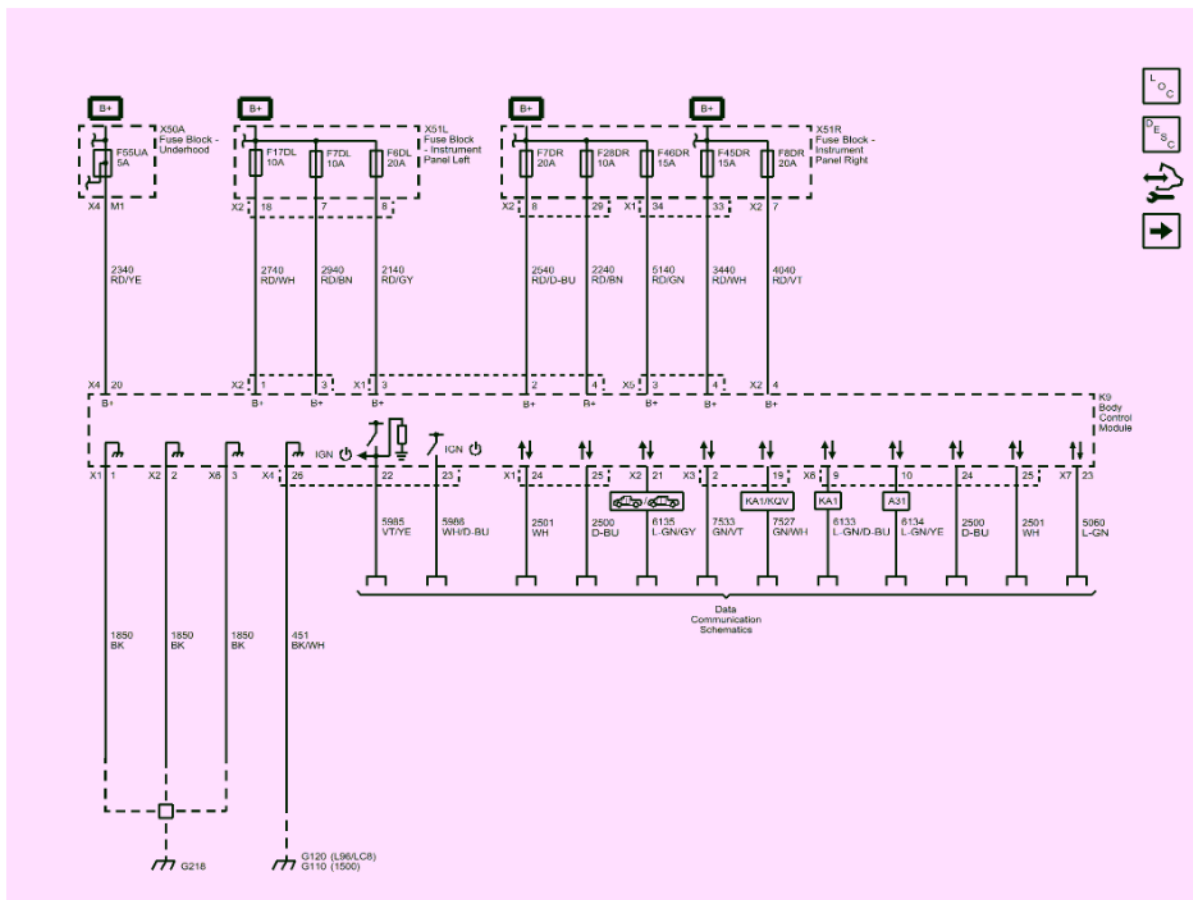


Fig. 18: Module Power, Ground and Serial Data
 Courtesy of GENERAL MOTORS COMPANY

Subsystem References (1 of 3)

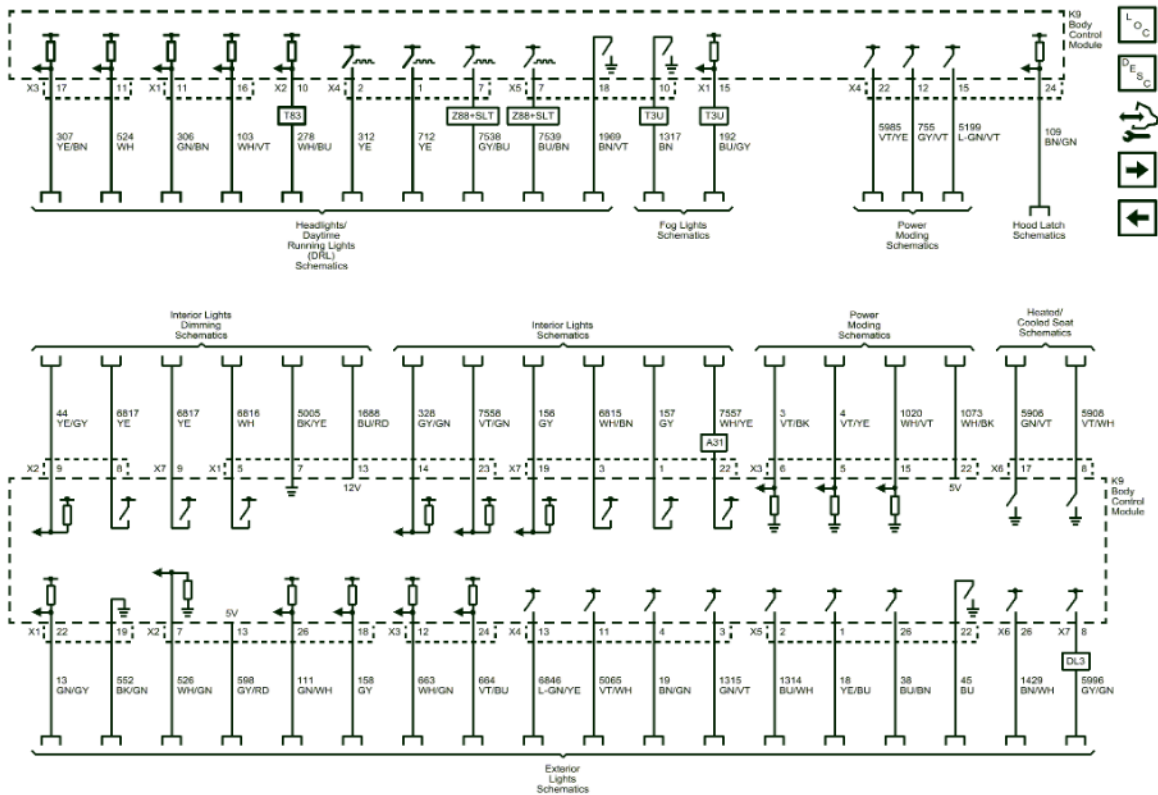


Fig. 19: Subsystem References (1 of 3)
 Courtesy of GENERAL MOTORS COMPANY

Subsystem References (2 of 3)

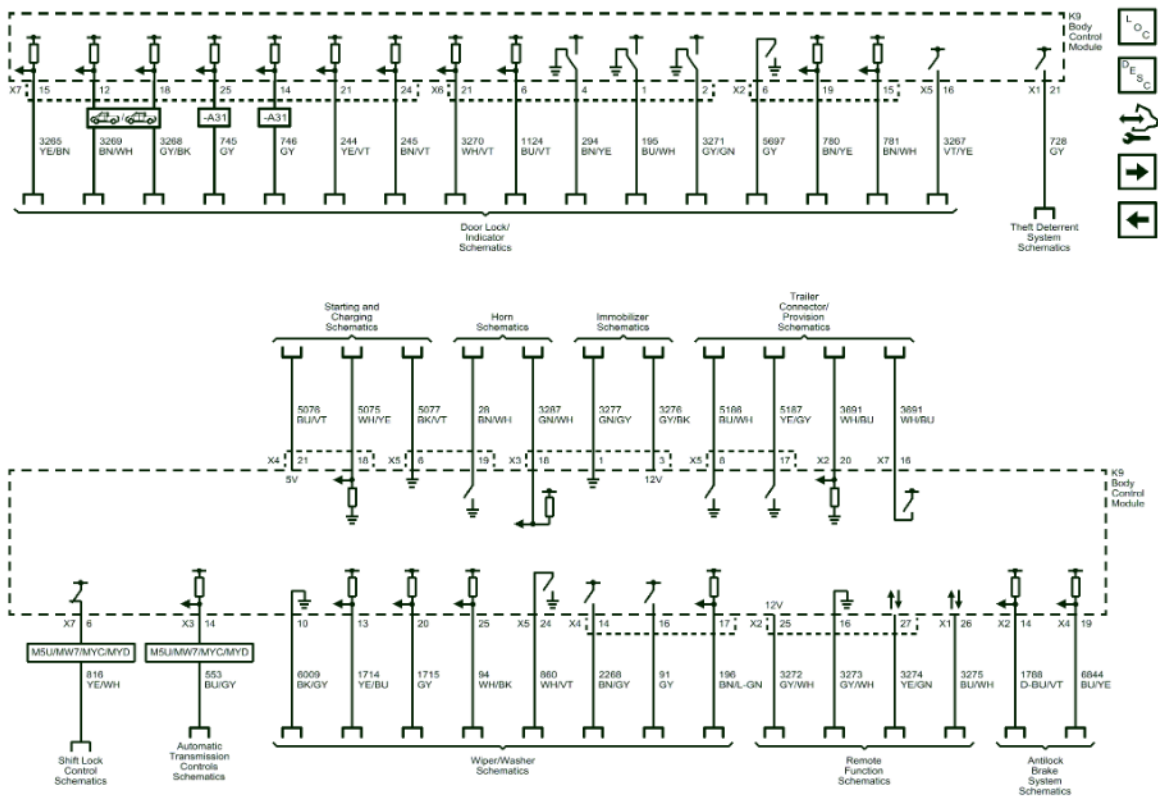


Fig. 20: Subsystem References (2 of 3)
Courtesy of GENERAL MOTORS COMPANY

Subsystem References (3 of 3)

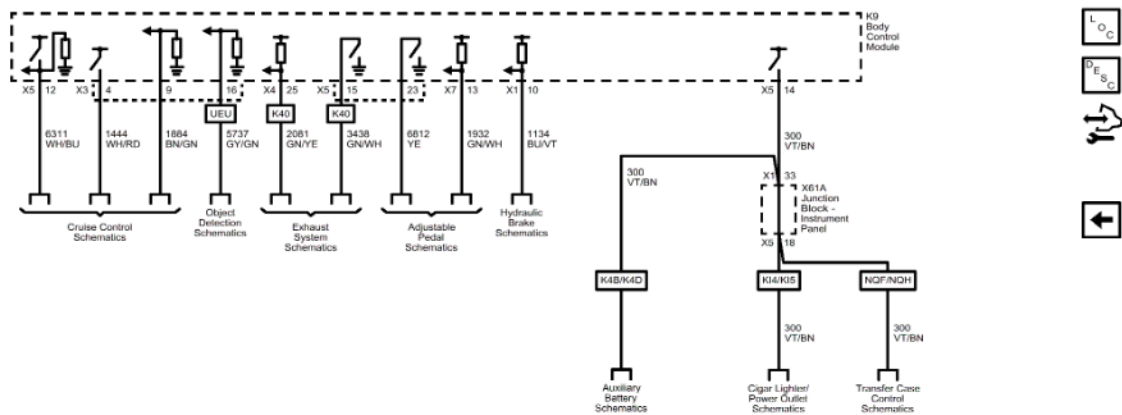


Fig. 21: Subsystem References (3 of 3)
 Courtesy of GENERAL MOTORS COMPANY

Article GUID: A00854558

2017 ACCESSORIES AND EQUIPMENT

Data Communications - Special Tools and Equipment - Sierra, Silverado

SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

Illustration	Tool Number/Description
	EL-51578 MOST Bus Diagnostic Tool Kit

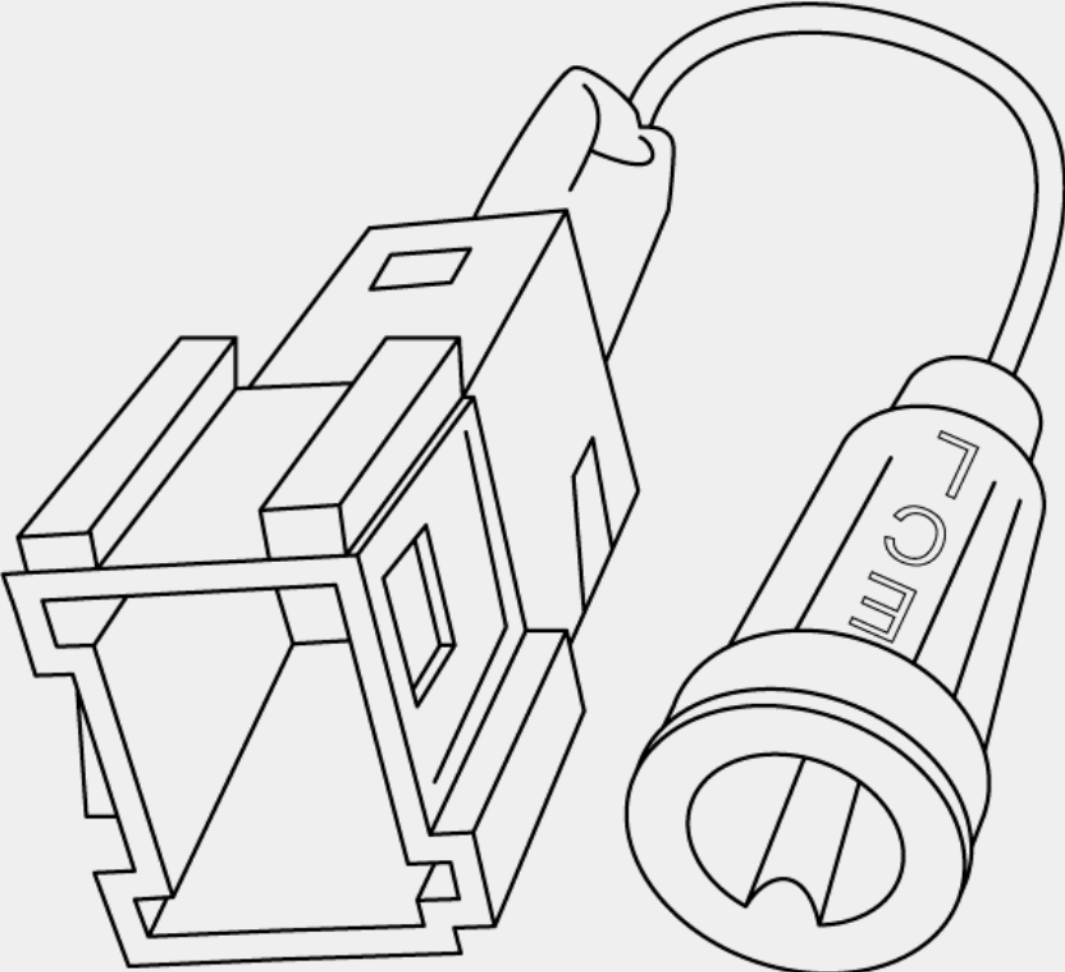
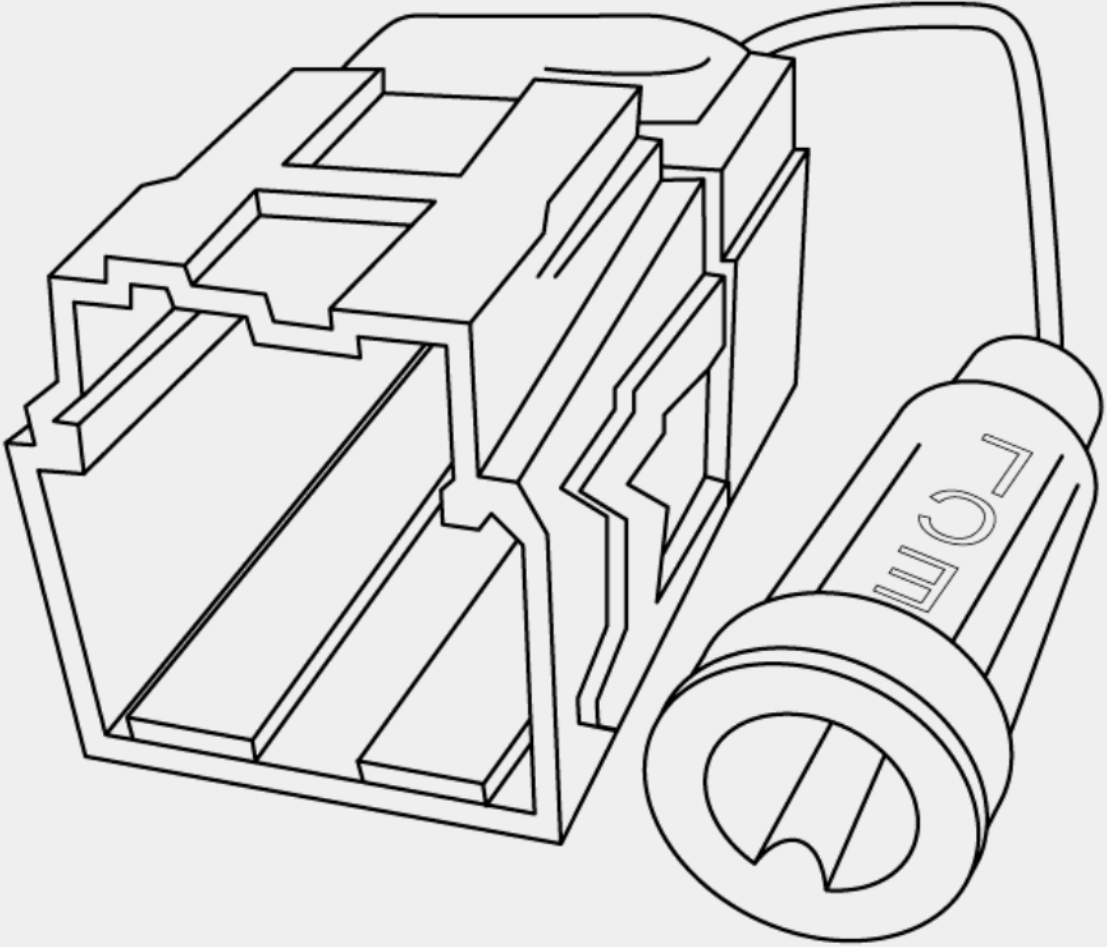
Illustration	Tool Number/Description
	EL-51578-1 8-Pin Black Connector Touch Pad

Illustration	Tool Number/Description
	EL-51578-2 12-Pin Gray Header HMI Control

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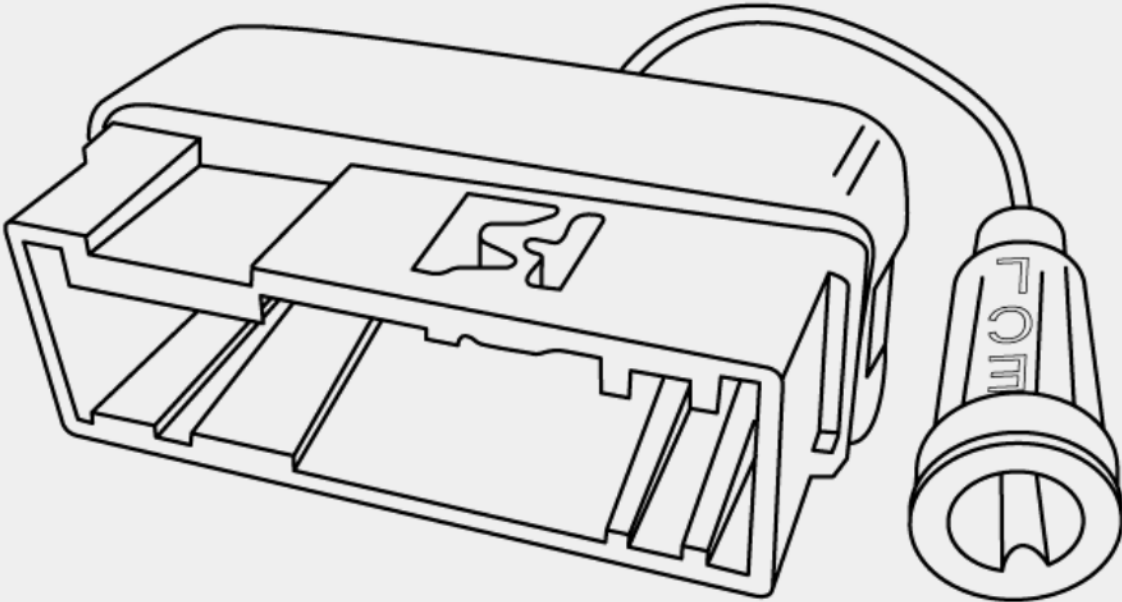
Illustration	Tool Number/Description
	EL-51578-3 32-Pin Gray Header IPC

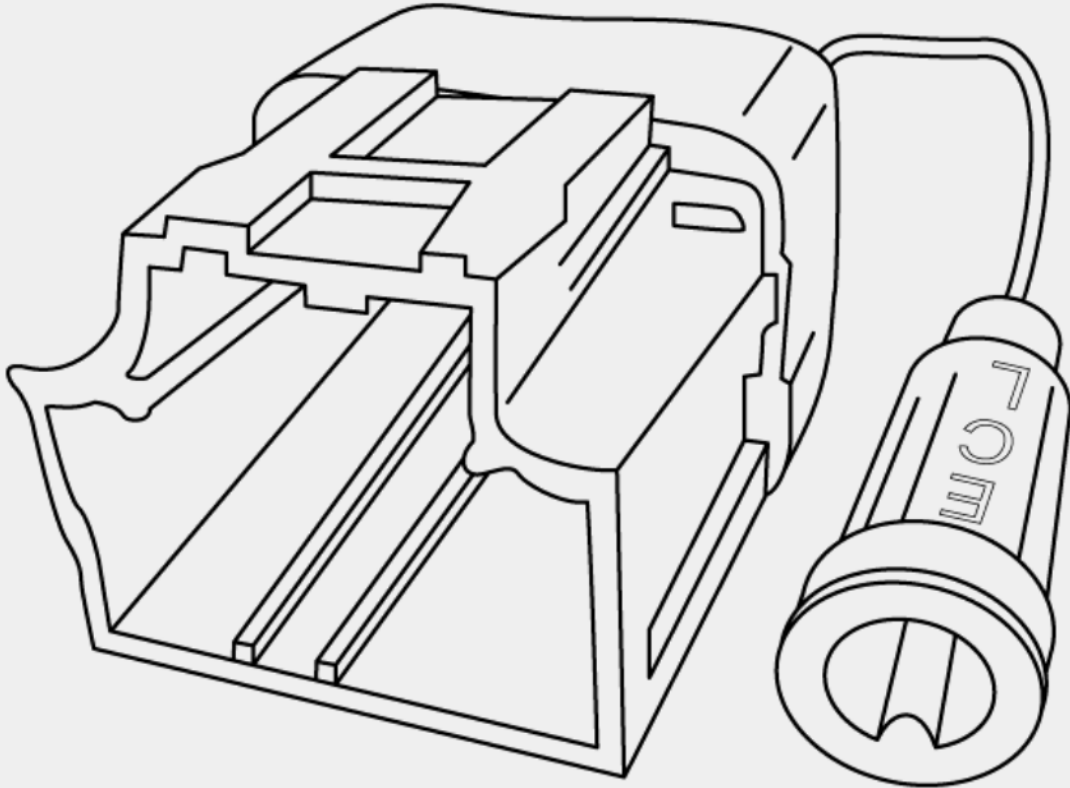
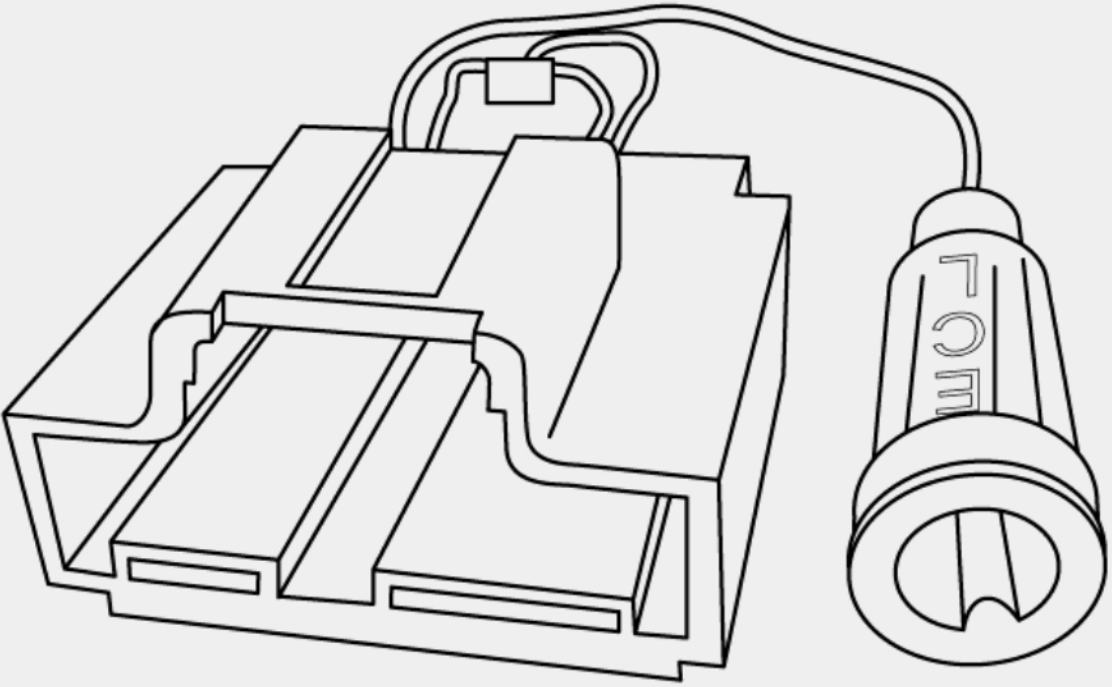
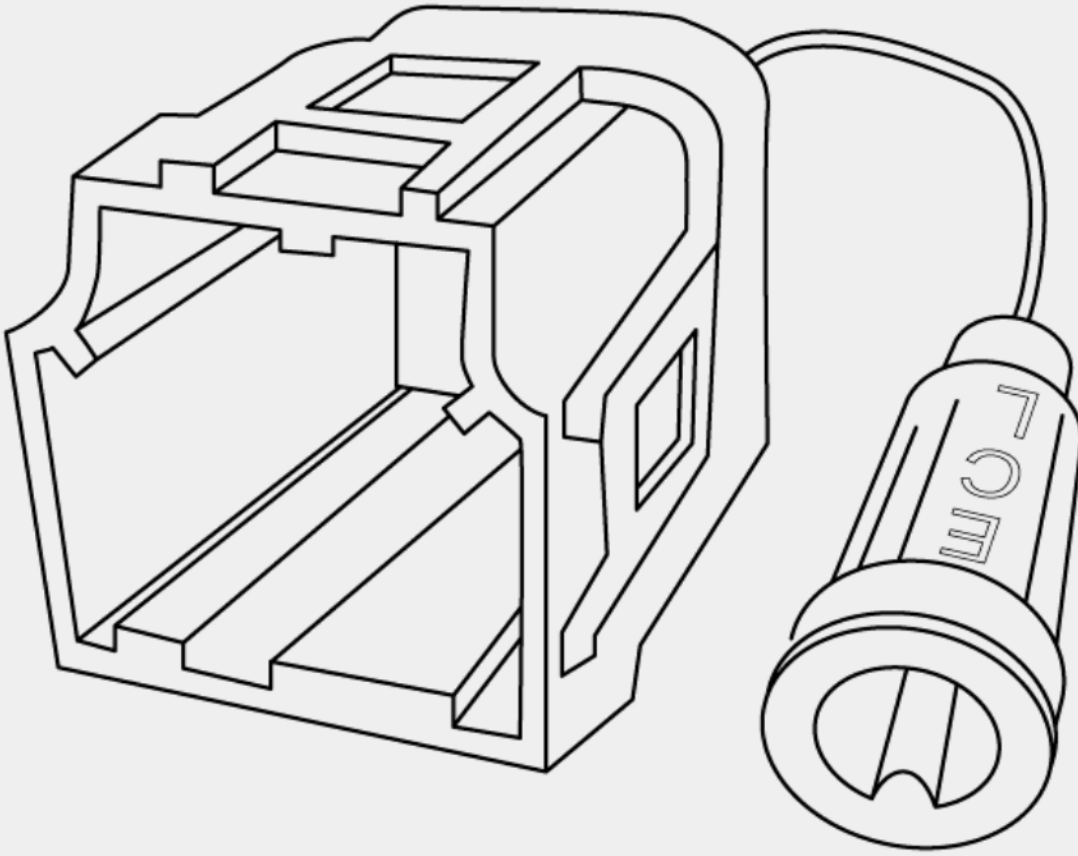
Illustration	Tool Number/Description
	EL-51578-4 16-Pin Brown Header AMP

Illustration	Tool Number/Description
	EL-51578-5 10-Pin Black Connector CD

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Illustration	Tool Number/Description
	EL-51578-6 12-Pin Black Header DVD

Article GUID: A00854560