

2017 ACCESSORIES & EQUIPMENT

Data Communications - Description and Operation - Encore, Trax

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 \(Buick\)](#) [Body Control System Schematics \(Chevrolet\)](#) 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 \(Buick\)](#) [Data Communication Schematics \(Chevrolet\)](#) 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 terminating resistor between the GMLAN-High and GMLAN-Low circuits. One terminating resistor is inside the K20 Engine Control Module (ECM). The other external terminating resistor (R6A) is located near the X84 Data Link Connector (DLC). Right hand drive vehicles with FHA option will have a third terminating resistor inside the K9 Body Control Module (BCM).

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.

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 control modules and the buses they communicate with. Use schematics and specific vehicle build RPO codes to determine optional control modules.

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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