GM	WORLDWIDE ENGINEERING STANDARDS	General Specification	GMW8762

Platform to Powertrain Electrical Interface Specification

General Information, On-Board Diagnostics, Electrical, and GMLAN Serial Data Signal Definitions and Framing Requirements

1 Introduction

Note: Nothing in this standard supersedes applicable laws and regulations.

Note: In the event of conflict between the English and domestic language, the English language shall take precedence.

1.1 Scope. This document defines a standard electrical interface between Platform and Powertrain systems and components on all GM cars and light duty trucks equipped with internal combustion engines. It shall apply to all Platform Electrical or Vehicle Majors in Model Year 2005 and beyond. The applications for the GM Regions include:

- Global Powertrain (Brazil, Germany, Italy, Sweden, United States)
- GMAP (Holden)
- GME (Opel - ITDC (International Technical Development Center) and SAAB)
- GMLAAM - GM do Brazil
- GMNA (Canada, Mexico, United States)
- Global Electrical, Software & Controls Central Engineering

This document also may apply to other applications.

The requirements in this document are intended to be satisfied over the useful life of the vehicle.

This document has been generated to implement the interface standardization strategy endorsed by the Global Electrical Council in accordance with GEC-NOA 007.

1.2 Mission/Theme. Not applicable.

1.3 Classification. This document applies to all electrical interfaces between Powertrain and Platform systems and components.

It does not apply to electrical interfaces within Powertrain or within Platform systems, even though these signals may be routed through a Platform wiring harness. Wiring harnesses, normally a Platform responsibility, are not considered interface components for this document. Connector definition and pin assignments are also outside the scope of this document.

All GM Powertrain Groups must meet the requirements in this document that apply to “Powertrain”. All GM Platforms must meet the requirements in this document that apply to “Platform”.

Electromagnetic Compatibility (EMC) requirements apply to systems and components and do not directly apply to the interface level. They are therefore beyond the scope of this document. Refer to GMW3097 General Specification for Electrical/Electronic Components and Subsystems, Electromagnetic Compatibility Requirements.

1.4 General Information.

1.4.1 Applicability. The **GMW8762** Platform to Powertrain Electrical Interface (PPEI) Standard Specification includes: General Information, On-Board Diagnostics and Electrical Requirements and GM Local Area Network (GMLAN) Serial Data Signal Definitions and Framing for the following nineteen PPEI subsystems standard specifications:

- **GMW8763** Power and Ground
- **GMW8764** Four Wheel Drive/All Wheel Drive Controls
- **GMW8765** Displays and Gauges
- **GMW8766** Engine Power Management
- **GMW8767** Starter Control
- **GMW8768** Vehicle Theft Deterrent
- **GMW8769** Cruise Control
- **GMW8770** Cooling Fan Control
- **GMW8771** Air Conditioning Compressor Control
- **GMW8772** Serial Data Architecture
- **GMW8773** Brakes and Traction Control
- **GMW8774** Enhanced Evaporative Emissions and Fuel
- **GMW8775** Exhaust After-Treatment
- **GMW8776** Suspension Control
- **GMW8777** Transmission

- **GMW8778** Generator Control
- **GMW8779** Post Collision Operation
- **GMW8780** Power Take-Off and Fast Idle Control
- **GMW8781** Vehicle Speed and Rough Road Sensing

Each of the 19 PPEI subsystem standard specifications contains the hardware, serial data, algorithms and calibrations for the named subsystem.

The master PPEI document and all 19 PPEI subsystem standard specifications are required to define the complete set of PPEI requirements.

1.4.2 Document Format. The PPEI Subsystems Standard Specifications contain:

a. Section 3 Subsystem Requirements and
b. Section 4 Algorithm/Calibration Requirements (as applicable).

Each of the 19 PPEI Subsystem Standard Specifications has been assigned a General Motors Worldwide (GMW) Standard Specification number. Therefore, each subsystem may function as a stand-alone document that references the master PPEI Specification.

The interface is the only standard defined by PPEI standard specifications. Some of the functions are Platform optional, but if an interface signal or function is used, it shall be implemented according to this standard.

Section 3 uses the following format for consistent presentation of the information:

- 3 Subsystem Requirements
- 3.1 Functional Overview.
- 3.2 Hardware Overview.
- 3.3 Interface Description.
- 3.3.1 Serial Data Link.
- 3.4 Failure Modes and Diagnostics.
- 3.5 Electrical Characteristics.

Section 4 uses the following general format for consistent presentation of the information:

- 4. Algorithm
- 4.x PPEI Subsystem Algorithm/Calibration Requirements
- 4.x.1 General Overview
- Platform Interface Requirements
- Powertrain Interface Requirements
- Serial Data Requirements
- Context Diagram
- “PPEI Subsystem” Algorithm Requirements
- Diagnostic Action Requirements
- Execution/Activation Requirements
- System State Transitions Requirements
- Off Vehicle Communications
- Data Dictionary
- Calibrations
- Variables

1.4.3 Document Control. The PPEI Work Group has approved the final version of this document for publication and distribution by the document librarian. The document librarian is the Global Technical Engineering (586-596-4883), which is located at the GM Technical Center, Warren, MI. The Global PPEI Work Group is the corporate owner of this specification and shall be responsible for managing changes. Specification changes will be made as follows:

Anyone proposing an interface specification change shall first consult the PPEI Representative for his or her region (Global Powertrain, GMAP, GME, GMLAAM-GMB, and GMNA). The PPEI Representatives are responsible for generating a Change Request (CR). Once the CR is generated in the database, the PPEI Representative schedules the CR for a Global PPEI Team Initial Review. The PPEI Document Librarian will add the CR to the Global PPEI Core Team Meeting Agenda for Initial Review. The Global PPEI Core Team will review the proposed change and either accept or reject the requested CR as a valid request. If accepted, the CR will move from the Draft CR status to Review status; tasks will be assigned until the CR is resolved. If rejected, the CR will move from the Draft CR status to REJECTED status. Comments will be provided as to the reason for rejection for further clarification. This specification change process is depicted in the following flowchart (Figure 1).

- The PPEI Website and the CR Synergy can be found through the Electrical Center Home Page Website.
- For minor changes (i.e., a correction or clarification of existing mechanization detail), the librarian will revise the document text impacted by the CR and present it to the Global PPEI Work Group for review and approval.
- For major changes (i.e., those which reflect a significant increase in cost and complexity or a change in system design philosophy), the librarian will inform the Global PPEI Work Group. The work group will develop a recommendation, which the librarian will reflect in the proposed document text.

- Changes that impact other Engineering Centers' areas of responsibility will be coordinated by the Global Electrical Architecture workgroup.
- Once the Global PPEI Work Group approves a CR, it will be incorporated as approved document text into the specification and distributed to the Global PPEI Work Group representatives.

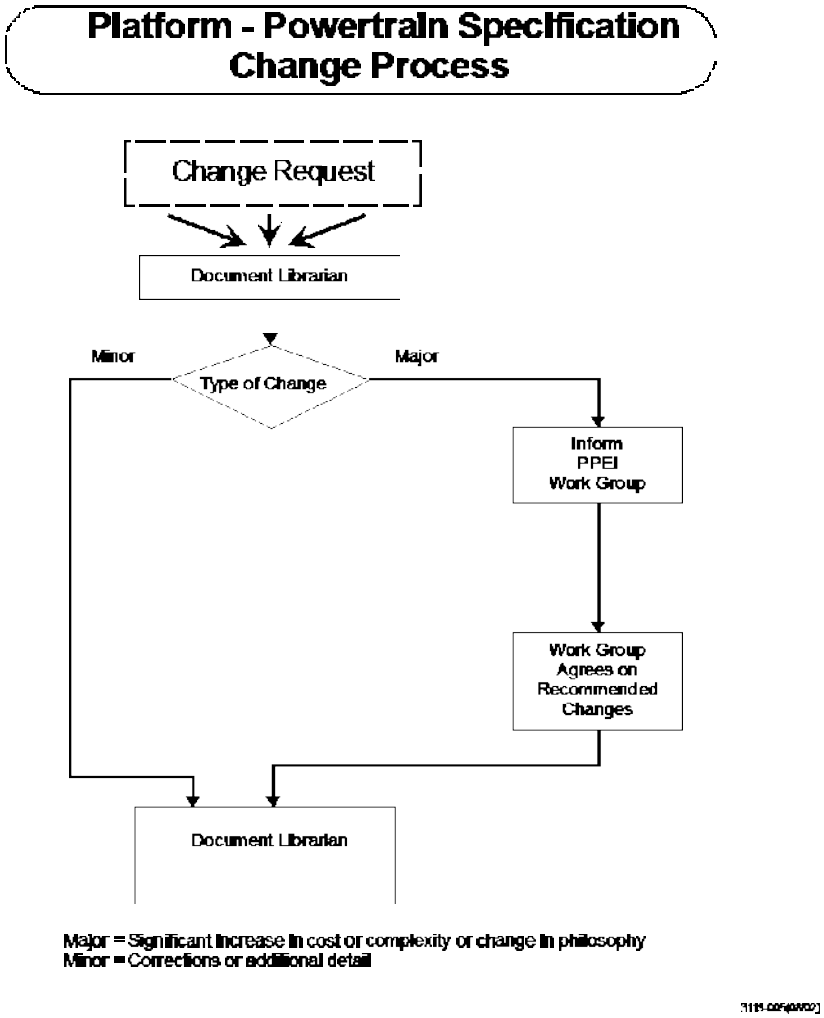


Figure 1: PPEI Specification Change Control Process

1.5 General Information on On-Board Diagnostics (OBD).

1.5.1 Overview. The purpose of this section is to explain how PPEI manages platform-owned emissions-related components. Platform needs to take special care in design when dealing with such components, and a background with some guidelines is given below.

1.5.2 Identification of Components. When new mechanizations are discussed, the PPEI work group also considers the OBD requirements. When potential emissions-related components are identified, the appropriate PPEI sections indicate that the interface may be emissions-related.

1.5.3 OBD Warranty and Defect Reporting. The following section provides a summary of the different warranty levels and required defect reporting associated with a component classified as emissions-related. Complete and official OBD regulations are found in the California Air Resources Board (CARB), Federal, and European OBD Regulations documents.

1.5.3.1 US Market, OBD II.

1.5.3.1.1 Californian Emission Warranty. Depending on the customer cost of repair there are three levels of legislated warranty:

- 3 years/50 000 miles, all emissions-related components, bumper-to-bumper.
- 7 years/70 000 miles, for all high-cost components. The cost threshold is index-based and is subject to change. (For Model Year (MY) 2000, the cost threshold is US$410, including fault tracing and repair.)
- 15 years/150 000 miles, Evaporative Emissions (EVAP) system components on vehicles certified to “Near-zero” or “Zero” standards. All emissions-related components, bumper-to-bumper, on vehicles certified to Partial Zero Emission Vehicle (PZEV) emissions standards.

1.5.3.1.2 US Federal Emission Warranty.

There are two levels of legislated warranty:

- 2 years/24 000 miles, all emissions-related components, bumper-to-bumper.
- 8 years/80 000 miles, some specified components; Catalyst including cover, hoses, heat shield and possible heating devices, Control Module including cover, SW, HW and connectors.

1.5.3.1.3 Californian Defect Reporting. The Useful Life of an emissions-related component is defined to be 10 years/100 000 miles. The Useful Life is increased to 120 000 miles with a phase-in starting at MY2004. Useful life for “Near-zero”, and “Zero” EVAP control systems, and PZEV vehicles is 15 years/150 000 miles.

Table 1 shows the various levels of reporting to CARB associated with field claims. Ultimately, CARB could decide a recall is necessary if the field situation is deemed unacceptable.

Table 1: Californian Defect Reporting

Action Triggers	Content
1% or 25 unscreened claims. EWIR – Emission Warranty Information Report	• Number of unscreened warranty claims per component within engine family in California. • Number of sold vehicles in engine family in California. • Description of component.
4% or 50 unscreened claims. FIR – Field Information Report	• EWIR information plus: • Problem with the component, reason for claims. • Number of defects. • Estimated number of defects within Useful Life. • Estimated date when 4% or 50 defects will be reached.
45 days after FIR, or after CARB request. EIR – Emission Information Report	• Description of component, problem and likely cause of failure. • Effect on emissions, driveability, fuel economy and startability with defect present. • Based on the information in EIR, CARB may order a recall

1.5.3.2 European Market, European On-Board Diagnostics (EOBD).

1.5.3.2.1 Emission Warranty and Useful Life. EOBD has no legislation on emissions warranty but Useful Life is defined to 5 years/ 80 000 km, or 100 000 km beginning with EURO IV. There is currently no further legislation on manufacturer obligations related to the Useful Life of the EOBD system.

1.5.3.2.2 Defect Reporting. EOBD has no legislation on defect reporting.

1.5.4 Platform Guidelines. The following guidelines should be considered when designing the electrical system. The platform owner of the emissions-related component is advised to negotiate the electrical architecture with OBD experts to ensure that it will not cause GM added cost in terms of OBD emissions warranty or a risk for recall.

- Care should be taken to ensure that when emissions-related components are to be integrated in modules that fall under the high-cost component clause, that this is supported with a business case study where the increased warranty cost is included.
- Care should be taken, to ensure that when emissions-related components are to be controlled locally through Platform electronics; this is supported with a business case study which includes the increased warranty cost.
- Emissions-related components should be designed so that a service replacement of the component could be filed under a unique labor code. This helps to isolate the component and keep the OBD warranty costs down.
- Minimize the amount of shared printed circuit board (PCB) traces with other components, e.g., supply lines or ground. A PCB trace is considered emissions-related if the trace is used for an emissions-related component.
- Use a fusing strategy that minimizes the OBD impact in case of an overcurrent situation in a non-emissions-related wire.
- Design of subsystems which allow the customer selection (e.g., Shift Mode Switch) or electronic selection (e.g., Trailering Detection) of an alternate mode of operation which may impact vehicle emissions shall follow one of the design criteria below:

a. All failure modes of an input result in the normal emission certified calibration (e.g., throttle progression, transmission shift points, etc.) No diagnostics are required for the input. An example of a mechanization which meets this requirement is a switch that functions like a momentary switch (activation requires two state transitions, e.g., 0-1-0) with each ignition cycle initializing into the normal emission certified progression. The failure impact can only last for one ignition cycle. No diagnostics are required.

b. All failure modes of an input are detected by an onboard diagnostic and the default value used results in the normal emission certified calibration (e.g., throttle progression, transmission shift points, etc). These diagnostics must fully conform to the requirements of the OBD regulation including disclosure in the emissions certification documentation. However, these "supplemental" onboard diagnostics are not required to illuminate the malfunction indicator lamp (MIL).

c. All failure modes of an input (or output if applicable) are detected by an onboard diagnostic and the default value used results in a calibration other than the normal emission certified calibration (e.g., throttle progression, transmission shift points, etc.). These inputs, and outputs if applicable, shall have diagnostics that fully conform to the requirements of the OBD regulation including disclosure in the emissions certification documentation. These diagnostics must illuminate the MIL.

2 References

Note: Only the latest approved standards are applicable unless otherwise specified.

2.1 External Standards/Specifications.

ISO 8855	SAE J2012

2.2 GM Standards/Specifications.

GMW3001	GMW8770
GMW3059	GMW8771
GMW3097	GMW8772
GMW3110	GMW8773
GMW7349	GMW8774
GMW8763	GMW8775
GMW8764	GMW8776
GMW8765	GMW8777
GMW8766	GMW8778
GMW8767	GMW8779
GMW8768	GMW8780
GMW8769	GMW8781

2.3 Additional References.

- Adaptive Cruise Control Subsystem Technical Specification (SSTS)
- Bosch Controller Area Network (CAN) Specification Version 2.0
- Distributed OBD Architecture Version 1.1
- GEC-NOA 007
- Global Occupant Protection Subsystem Technical Specification (SSTS)
- GM Powertrain (GMPT) CPPS (Clutch Pedal Position Sensing) Subsystem Technical Specification (SSTS) Revision 3.

- GMLAN Ignition Switch Power Moding Specification
- GMLAN Power Moding Specification Version 3.1 or later applicable version
- GMPT Cruise Control Subsystem Technical Specification (SSTS)
- GMPT GMLAN Diagnostic Test Mode Configuration Specification.
- Power Take-Off and Fast Idle Control Subsystem Technical Specification (SSTS)
- PR.18.1036

3 Electrical Requirements

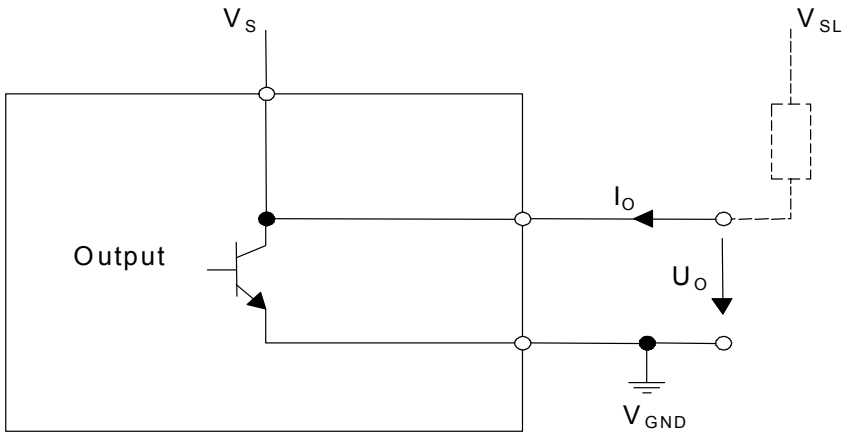
This section defines the electrical characteristics of signals that are utilized throughout the document. They are defined in detail here so that each functional area definition may reference the same characteristics. A bipolar transistor symbol is used only to represent low side and high side drivers and is not intended to be a restriction on the actual design. Components must provide internal protection against all traditional battery, switched battery, and ground transients per GMW3097 General Specification for Electrical/Electronic Components and Subsystems, Electromagnetic Compatibility.

The parameters specified in this section are valid over the normal operating voltage range for the component. For powertrain electronics, refer to GMW8763 PPEI Power and Ground Subsystem Requirements.

3.1 Low Side Driver. The low side driver (LSD) is a discrete, active low, solid state, low side driver output of the control system. The LSD1 and LSD2 drivers are typically used for relay control. The LSD3 driver is typically used for light emitting diode (LED) telltale control. Low side driver design may assume that inductive transients caused by relays will meet the conducted emission requirements of GMW3097.

Driver control shall exhibit characteristics defined in Tables 2 thru 5, under normal system conditions. For example, the output should remain constant even with a temporary negative voltage applied to the controller Run/Crank input and positive voltage applied to the controller Battery input.

Pulse width modulated (PWM) capability is only required when specified by the subsystem application. For low side drivers with PWM capability, the maximum frequency is dependent on the load. This maximum frequency is defined below where E is the load inductive energy. The inductive energy is measured via the Powertrain test procedure PR.18.1036.



Symbol	Parameter
I_o	Output Current
U_O	Output Voltage
V_S	Source Voltage of Controller
V_{SL}	Source Voltage of Load
V_{GND}	Ground Voltage

Figure 2: Low Side Driver Output Electrical Design

Table 2: Low Side Driver Output Electrical Characteristics (LSD1 to LSD3)

Low Side Driver Output Characteristics (LSD1 to LSD3)	
Parameter	**Value/Conditions**
Ground Difference	The receiving module must function with a ground difference between receiving module ground and the controller ground per GMW8763 PPEI Power and Ground Subsystem Requirements.
Leakage Current	1 mA max, Vout = 16.0 Vdc, control driver off, controller powered (LSD1 and LSD2) 100 μA max, Vout = 16.0 Vdc, control driver off, controller powered (LSD3) The parasitic current limit of GMW8763, PPEI Power and Ground Subsystem Requirements includes the combined leakage current of all low side drivers with the controller off.
Fall Time	15.0 μs maximum up to 2 kHz (load 3.0 kΩ to 16.0 V and 1300 pF to ground)

Table 3: Low Side Driver 1 Electrical Characteristics

LSD1 Driver Characteristics	
Parameter	**Value/Conditions**
U_O (V_{SAT})	1.2 V max at I_0 = 700 mA at 105°C
Load Resistance	15 Ω minimum at -40°C
Load Inductance	225 mH max at 20°C using the DC test method
Load Inductive Energy	30 mJoule [Note 1]
PWM Frequency (max)	PWM Frequency = 0.25/E, where E = Load Inductive Energy

Note 1: Relay coil loads shall include an internal resistive suppression device in parallel with the coil to achieve the required Load Inductive Energy.

Table 4: Low Side Driver 2 Electrical Characteristics

LSD2 Driver Characteristics	
Parameter	**Value/Conditions**
U_O (V_{SAT})	1.2 V max at I_0 = 250 mA at 105°C
Load Resistance	50 Ω minimum at -40°C
Load Inductance	450 mH max at 20°C using the DC test method
Load Inductive Energy	2.0 mJoule max at 18.0 V Battery [Note 1]
PWM Frequency (max)	PWM Frequency = 0.15/E, where E = Load Inductive Energy

Note 1: Relay coil loads shall include an internal resistive suppression device in parallel with the coil to achieve the required Load Inductive Energy.

Table 5: Low Side Driver 3 Electrical Characteristics

LSD3 Driver Characteristics	
Parameter	**Value/Conditions**
U_O (V_{SAT})	1.0 V max at I_0 = 50 mA at 105°C
I_0	50 mA max at V_{SL} = 16.0 V at 105°C
Load Resistance	300 Ω minimum
Load Capacitance	10 nF max
Load Inductive Energy	Not applicable
PWM Frequency (max)	Not applicable

3.1.1 Electronic Module Type Loads. LSD1 to LSD3 drivers are capable of driving an electronic module type loads. A pull-up resistor to a nominal 11 to 16 V source is required in the receiver module. A nominal 11 to 16 V source is required so that voltage levels are high enough for the low side driver fault detection feature to function properly. The recommended range for the resistor is 800 Ω to 10.0 kΩ nominal to prevent problems due to leakage current.

3.1.2 Protection. Low side drivers shall be protected from damage due to shorts up to 16 V. One method of protection is by current limiting. Overvoltage protection shall be provided to satisfy the voltage operating requirements defined in GMW8763 PPEI Power and Ground Subsystem Requirements. Low side drivers shall return to their previous output state when the protection is no longer required, unless changed by the software.

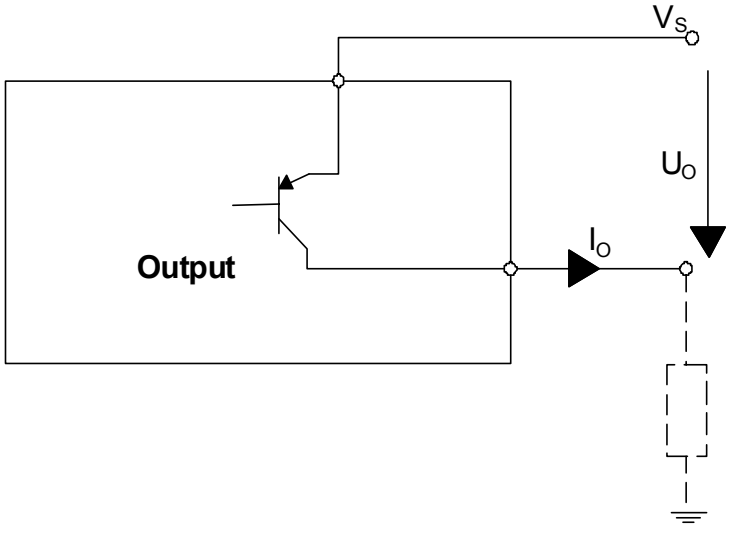
3.2 High Side Driver. This high side driver is an output of the Powertrain system typically used for relay control. The output is pulled high (energized) by the Powertrain system (See Figure 3).

The high side driver shall have the characteristics listed in Table 6.

3.2.1 Protection. For battery voltages up to 16 V, high-side drivers shall be protected from damage due to shorts to ground and shorts to battery.

One method of protection is by current limiting. Overvoltage protection shall be provided to satisfy the voltage operating requirements defined in GMW8763, PPEI Power and Ground Subsystem Requirements.

High-side drivers shall return to their previous output state when the protection is no longer required, unless changed by the software.



Symbol	Parameter
I_o	Output Current
U_O	Device Output Voltage Drop
V_S	Source Voltage

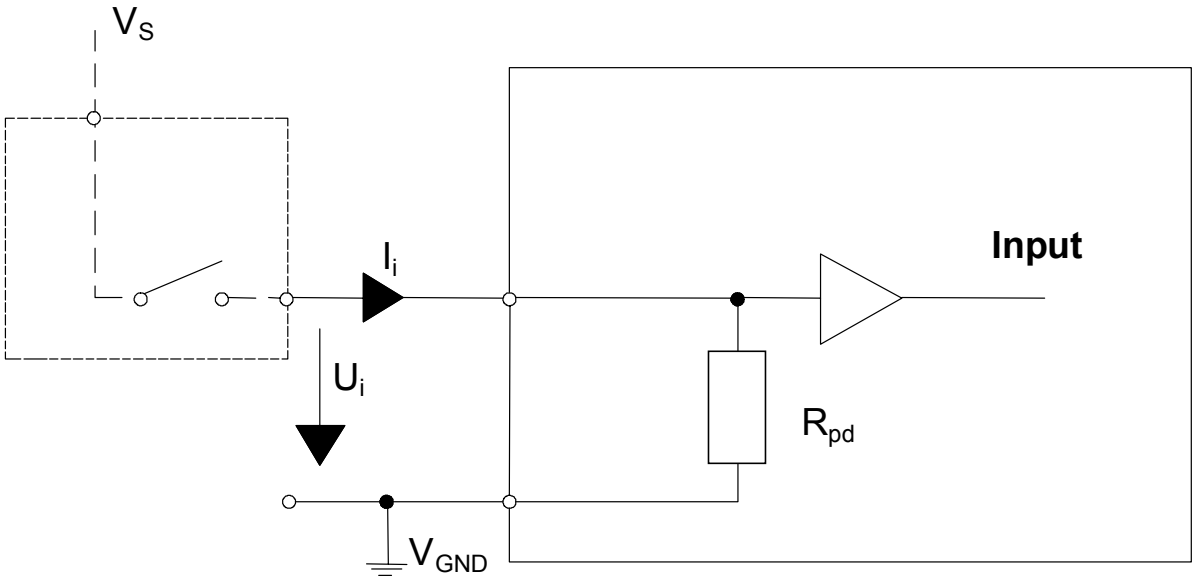
Figure 3: High Side Driver Electrical Output Design

Table 6: High Side Driver Output Electrical Characteristics

High Side Driver Output Characteristics	
Parameter	**Value/Conditions**
U_O (V_{SAT})4	1.2 V max at I_0 = 300 mA, V_S = 16.0 V at 105°C 0.9 V max at I_0 = 100 mA, V_S = 6.0 V at 0°C Note 1
Leakage Current	1.0 mA max at V_S = 16.0 V with Vout = 0 Vdc, control driver off, controller powered. Refer to GMW8763, PPEI Power and Ground Subsystem Requirements for controller off leakage current.
Overcurrent Limit	1.0 A minimum
Maximum Load	50 Ω (minimum) and 450 mH (maximum) at -40°C or 800 Ω (minimum), 10 nF (maximum) at 132 Hz (maximum)
Load Inductive Energy	2.0 mJ maximum at 18.0 V Battery Note 2

Note 1: Reference GMW8763, PPEI Power and Ground Subsystem Requirements for voltage drop requirements during low voltage start conditions.
Note 2: Relay coil loads shall include an internal resistive suppression device in parallel with the coil to achieve the required Load Inductive Energy.

3.3 Discrete Inputs (Switched High).



Symbol	Parameter
Rpd	Pull-down Resistance
Vs	Source Voltage of Switch
Ui	Input Voltage
Ii	Input Current
V_{GND}	Ground Voltage

Figure 4: Discrete Inputs (Switched High) Electrical Design

3.3.1 Input Discrete Low 1 (IDL1). This discrete input accepts switch closures to 5.5 V or greater, or similar low frequency state change indicators. The open circuit state is a logic 0 (low).

Table 7: Input Discrete Low 1 (IDL1) Input and Switch Electrical Requirements Input Requirements

Parameter	Condition	Minimum	Typical	Maximum
Rpd Note 1		2775 Ω	3000 Ω	3225 Ω
Input Low-state U_{il}	11.0 V ≤ Vs ≤ 16.0 V	-1.0 V	0 V	2.0 V
Input High-state U_{ih}	11.0 V ≤ Vs ≤ 16.0 V	5.5 V	V_{nom}	V_s +1 V
Input Current High I_{ih}	U_{ih} = 12.0 V	3.8 mA	4 mA	4.2 mA
Input Time Constant			1 ms	

Note 1: The Rpd requirement is for implementations utilizing a pull-down resistor to provide the switch current and the Input Current High requirement is for implementations utilizing a current source. Only the relevant requirement for the actual circuit shall be applied.

Switch Requirements:

Open Resistance: 50 kΩ minimum

Closed Resistance: 50 Ω maximum

The pull-up current is sourced from the voltage feed of the switch**.**

3. .2 Input Discrete Low 2 (IDL2). This discrete input accepts switch closures to 5.5 Vor greater. The open ci uit state is a logic 0 (Low).

able 8: Input Discrete Low 2 (IDL2) Input and Switch Electrical Requirements Input Requirements:

Parameter	Condition	Minimum	Typical	Maximum
Rpd Note 1		1100 Ω	1200 Ω	1290 Ω
Input Low-state U_{il}	11.0 V ≤ Vs ≤ 16.0 V	-1.0 V	0 V	2.0 V
Input High-state U_{ih}	11.0 V ≤ Vs ≤ 16.0 V	5.5 V	V_{nom}	V_s +1.0 V
Input Current High I_{ih}	U_{ih} = 12.0 V	9.5 mA	10 mA	10.5 mA
Input Time Constant			1 ms	

Note 1: The Rpd requirement is for implementations utilizing a pull-down resistor to provide the switch current and the Input Current High requirement is for implementations utilizing a current source. Only the relevant requirement for the actual circuit shall be applied.

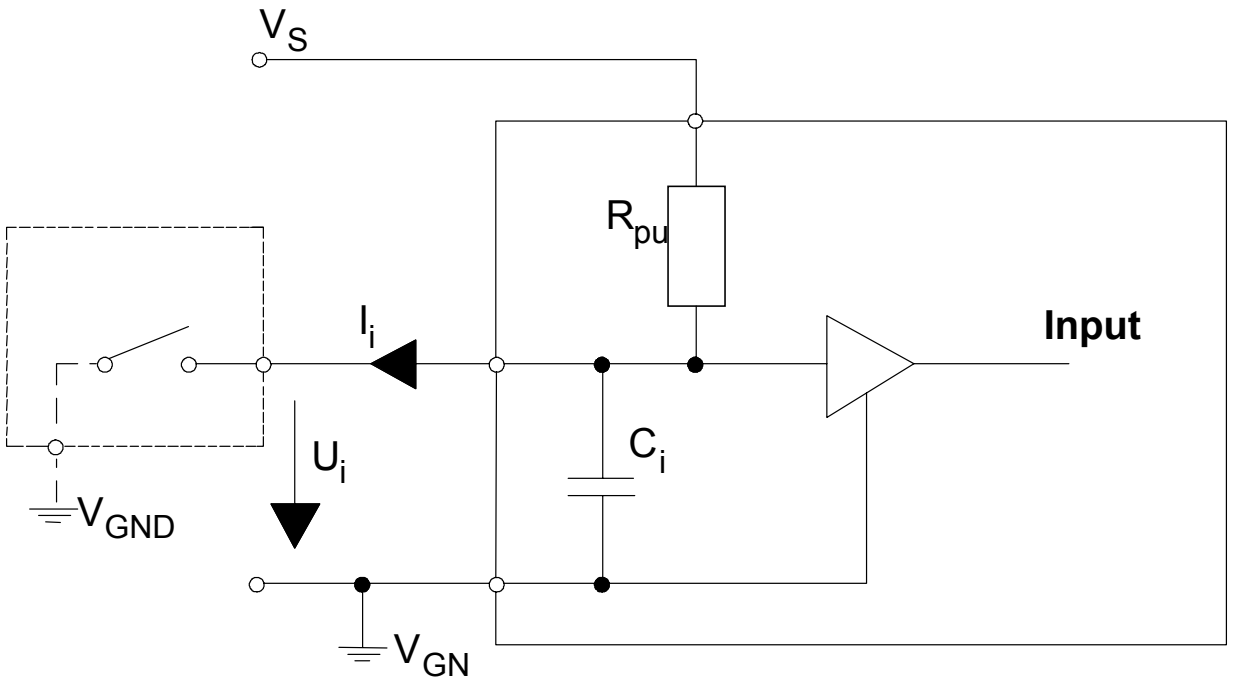
Switch Requirements:

Open Resistance: 50 kΩ minimum

Closed Resistance: 50 Ω maximum

The pull-up current is sourced from the voltage feed of the switch**.**

3.4 Discrete Input (Switched Low). This discrete input accepts switch closures to Ground, or similar low frequency state change indicators. The open circuit state is a logic 1 (high).



Symbol	Parameter
Rpu	Pull-up Resistance
V_S	Source Voltage of Controller
Ui	Input Voltage
Ii	Input Current
V_{GND}	Ground Voltage
V_{GNDS}	Switch Ground Voltage

Figure 5: Discrete Input (Switched Low) Electrical Design

Table 9: Discrete Input (Switched Low) and Switch Electrical Requirements Input Requirements:

Parameter	Condition	Minimum	Typical	Maximum
Rpu [Note 1]		2775 Ω	3000 Ω	3225 Ω
Input Low-state U_{il}	11.0 V ≤ Vs ≤ 16.0 V	-1.0 V	0 V	2.0 V
Input High-state U_{ih}	11.0 V ≤ Vs ≤ 16.0 V	5.5 V	V_{nom}	V_S +1.0 V
Input Current Low I_{il}	U_{il} = 0 V V_S = 12.0 V	3.8 mA	4 mA	4.2 mA
Input Time Constant			1 ms	

Note 1: The Rpu requirement is for implementations utilizing a pull-up resistor to provide the switch current and the Input Current Low requirement is for implementations utilizing a current source. Only the relevant requirement for the actual circuit shall be applied.

Switch Requirements:

Open Resistance: 50 kΩ minimum

Closed Resistance: 50 Ω maximum

The pull-down current is sinked to the ground side of the switch.

3.5 Analog Inputs.

3.5.1 Pressure.

3.5.1.1 Pressure/Vacuum Sensor Supply Reference Output. This interface may be emissions-related. Refer to 1.5.4 for platform design guidelines.

This reference output may be shared with other +5 V devices. See Table 10.

Table 10: Pressure/Vacuum Sensor Supply Reference Output

Parameter	Value
Supply Voltage Nominal	5.0 ± 0.5 V
Supply Current Maximum	7.0 mA
Maximum supply to ground capacitance	10 µF

3.5.1.2 Pressure/Vacuum Output.

3.5.1.2.1 Platform Sensor Output.

Output Voltage Range: 0.0 V to Supply Voltage (proportional to the input pressure).

Transfer Function:

$$Vout = Vcc (\mathbf{K\_Sensor\_Slope} \times P + \mathbf{K\_Sensor\_Offset})$$

Where:

Vout = sensor output voltage (V)

Vcc = sensor supply voltage (V)

P = input pressure or vacuum (kPa)

3.5.1.2.2 K_Sensor_Slope. Calibration defines the slope of the sensor voltage transfer function.

Minimum Range: 0.0000 to 0.002100 (1/kPa)

Minimum Resolution: 0.00005 (1/kPa)

Typical Value: 0.000273

Location: Powertrain

Owner: Platform

3.5.1.2.3 K_Sensor_Offset. Calibration defines the sensor offset voltage of the pressure or vacuum sensor transfer function.

Minimum Range: 0.0000 to 0.2100 V

Minimum Resolution: 0.0001 V

Typical Value: 0.0228 V

Location: Powertrain

Owner: Platform

3.5.1.2.4 K_Sensor_Pressure_Max.

Pressure/Vacuum at full scale Vout. Used controller to convert the Air Conditioning (A/C) voltage to Pressure (or the full scale range of the sensor output).

Engineering Unit: kPa

Range: 80 to 140

Resolution: 2

Typical Value: 120

Owner: Platform

Location: Powertrain

3.5.1.2.5 Maximum Source Resistance. Supply to output ≤ 9 kΩ.

Note: This requirement is intended to ensure that an open ground shall result in an output voltage within the (electrical fault) diagnostic deadband on the Controller. If the pressure sensing function does not need the full output voltage range of the pressure sensor (e.g., the A/C High-Side Pressure Sensor), the sensor may have a higher impedance so long as an acceptable functional deadband can be defined.

3.5.1.2.6 Output Electrical Deadband. Sensor shall not exceed the range of 5% to 95% of Supply Voltage under any non-faulted operating conditions.

3.5.1.2.7 Sensor Load. The sensor shall be capable of driving a 51 kΩ load.

3.5.1.2.8 Sensor Error. The allowed sensor Error shall be determined by the Platform application.

3.5.1.2.9 Powertrain Pressure Input. This interface may be emissions-related. Refer to 1.5.4 OBD for platform design guidelines. See Table 11.

3.5.1.2.10 Powertrain Pressure/Vacuum Sensor Return. This signal is a ground reference that is tied to the ECM ground, internal to the ECM. This may be a shared supply line with other +5 V devices.

Refer to GMW8763, Power and Ground Electrical Characteristics.

Table 11: Powertrain Pressure Input Characteristics

Parameters	Value
Pull Down Resistance	470 kΩ ± 7.5%
Input Range	0.0 V to Supply Voltage
Accuracy	± 0.90% of the Supply Voltage over the full input range
Electrical Time Constant	1.0 ms typical
Leakage Current	An external input impedance of 1000 MΩ (hard open input circuit) shall result in an A/D output indication that is less than 3% of the A/D input range.

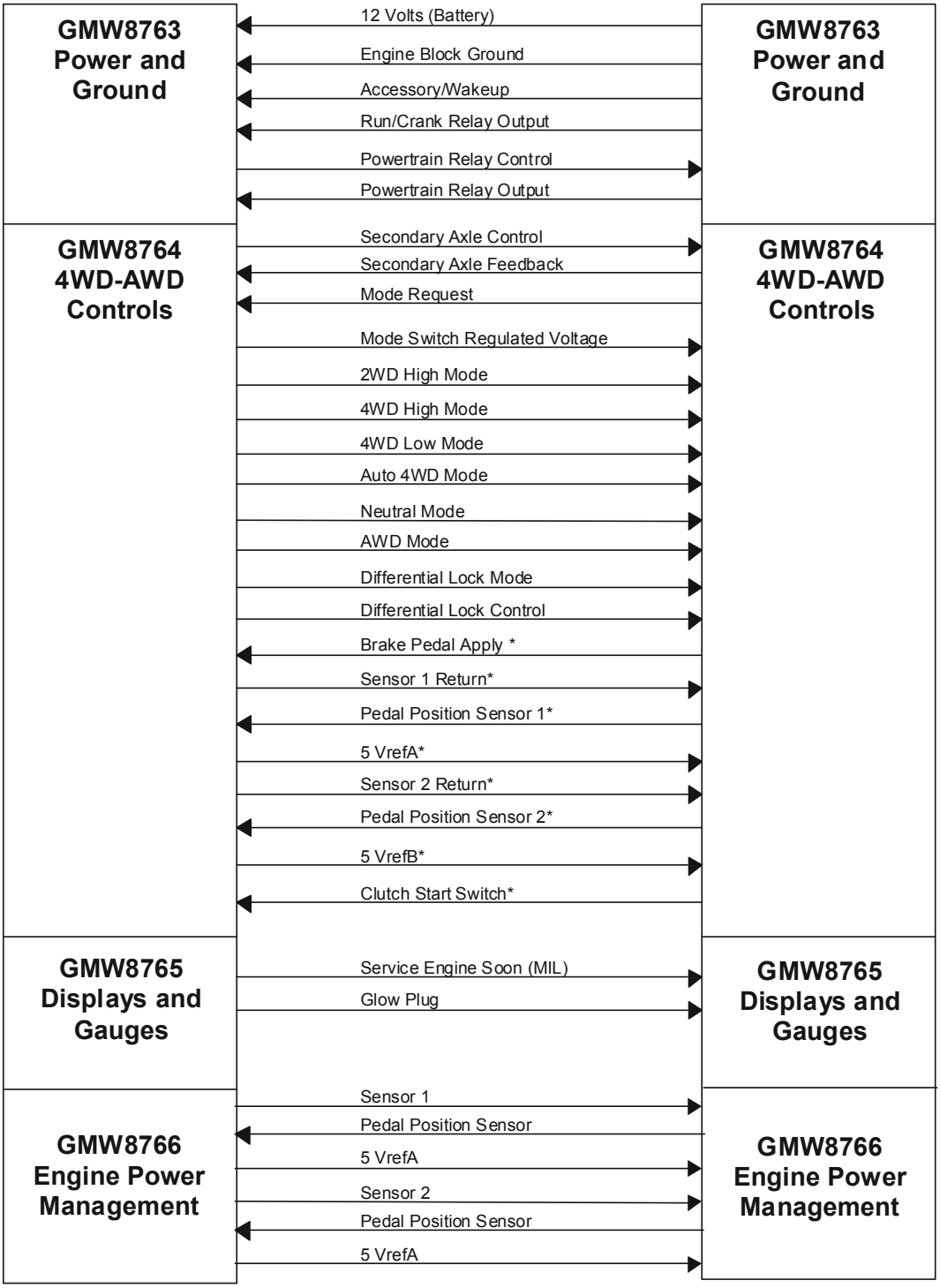
4 PPEI Hard-wire and GMLAN Serial Data Signal Requirements

This section provides the following information on hardwire and serial data information used in the PPEI Subsystems:

PPEI Macro Block Diagram of the defined hard-wire for PPEI Subsystems, and GMLAN Serial Data Signals that utilize space within the PPEI GMLAN Frames: (a) definition of terms, (b) signal summary list, (c) signal definitions, (d) CAN Identifier Allocations, and (e) signal framing.

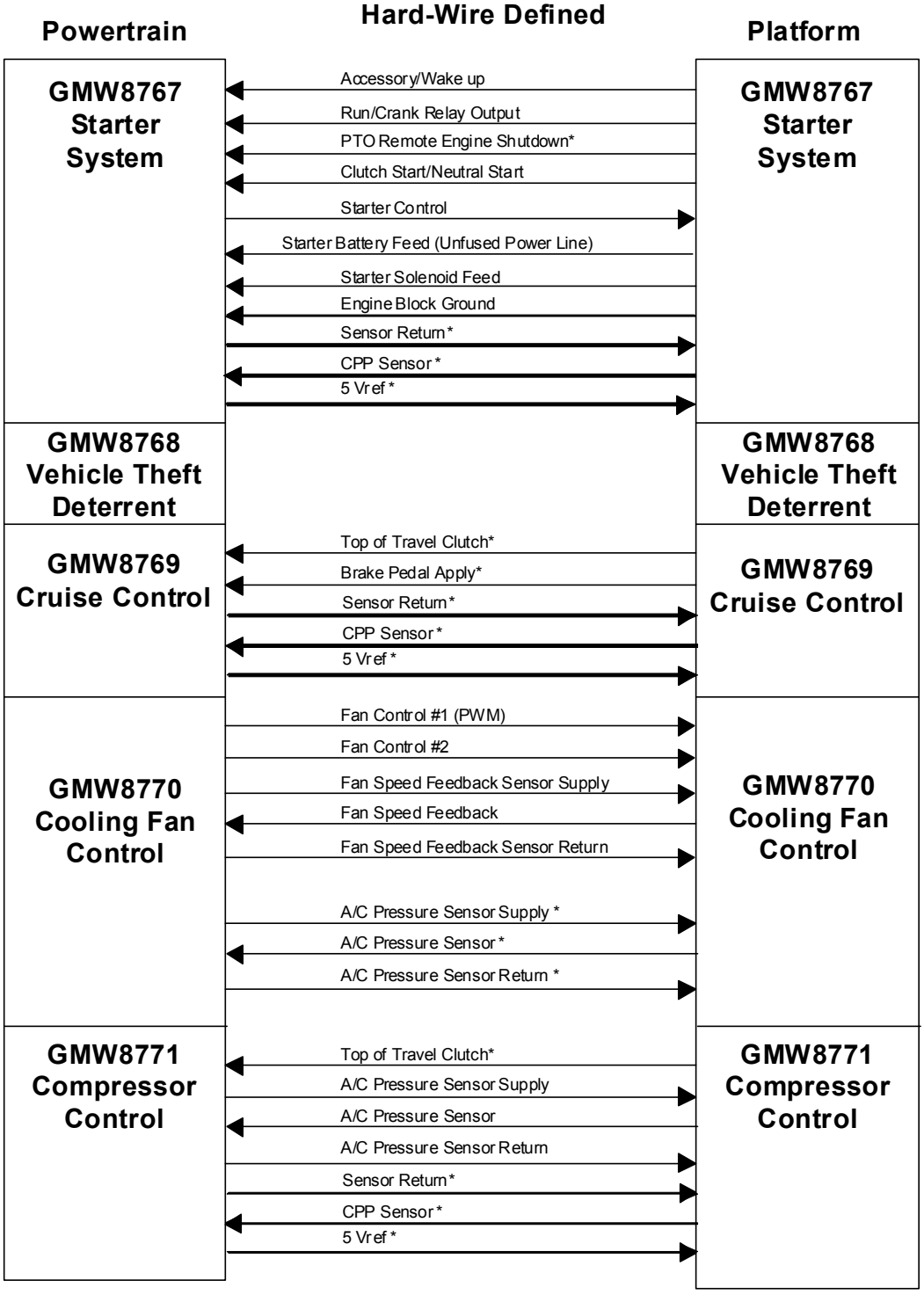
4.1 PPEI Macro Block Diagram. The macro block diagram shows one possible mechanization, and is not intended to specify a standard design on either side of the interface. The dotted items in the macro block diagram indicate optional functions.

PPEI Macro Block Diagram
Hard-Wire Defined



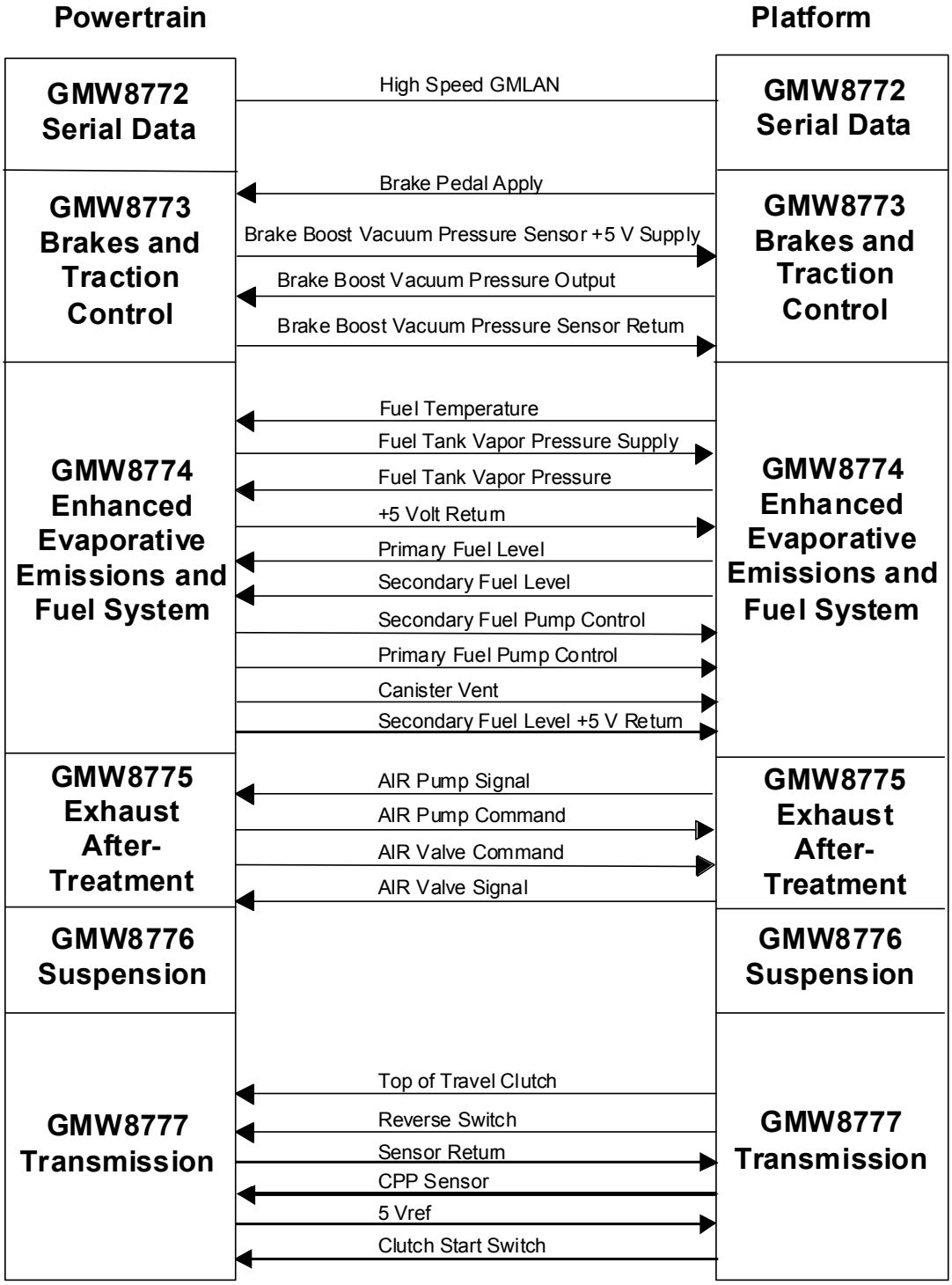
Note: * = Redundant signals

PPEI Macro Block Diagram
Hard-Wire Defined

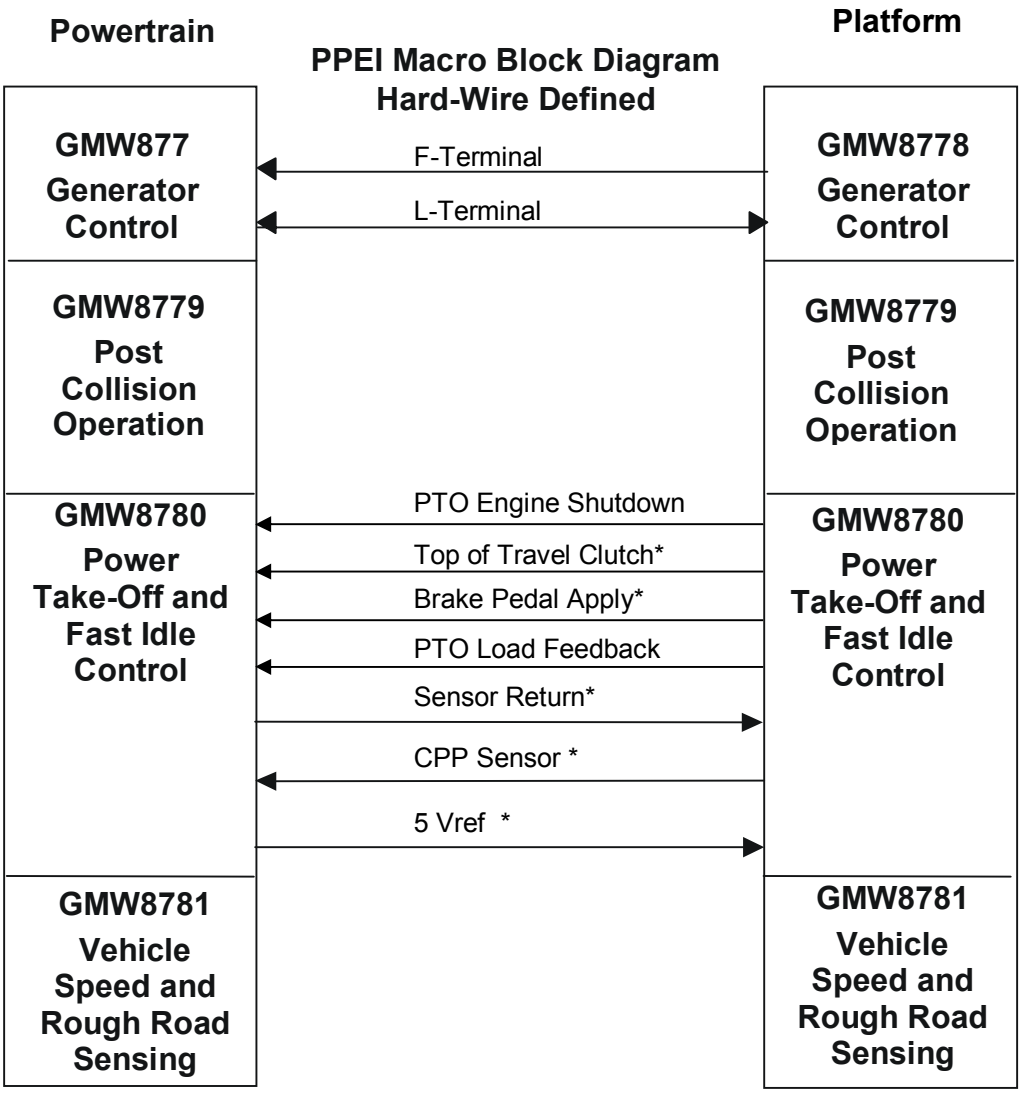


Note: * = Redundant signals

PPEI Macro Block Diagram
Hard-Wire Defined



Note: * = Redundant signals



4.2 GMLAN Serial Data Signals.

4.2.1 Definition of Terms.

4.2.1.1 Periodic Interval. The maximum fixed periodic (plus allowable tolerance) interval at which a frame is transmitted (in the absence of event triggers). The frames may be transmitted faster than the periodic interval if the time base supported by the application does not allow for transmission at the exact documented interval.

4.2.1.2 Update Time. The Update Time is the minimum interval between successive transmissions of a frame. Update time holds for both periodic and event-triggered transmissions of a particular frame.

4.2.1.3 Supervision Timeout. A communication failure is detected when a periodic frame has not been received within this interval, which must be more than twice its Periodic Interval.

4.2.1.4 Accuracy Requirement. The Accuracy Requirement is a requirement for a signal that is imposed upon the transmitter of the signal by the receiver of the signal. It is the maximum allowable difference between the true value of a quantity and the value transmitted for the quantity in its associated serial data signal. Accuracy requirements generally only apply to numerical signals, and may not apply to all numeric signals.

4.2.1.5 Power-Up Default. The Power-Up Default is the value to be used for the signal prior to its initial receipt. In general, this value cannot be specified, as different receivers (or even different information consumers within a single receiver) may have different requirements for Power-Up Defaults. In certain situations, however, proper operation of a function may require that some or all receivers use a specific Power-Up Default value. In

these limited situations, the transmitter of a signal is placing behavioral requirements on the receiver.

4.2.1.6 Communication Failure Value. The Communication Failure Value is the value to be used for the signal upon detection of a communication failure (see definition of Supervision Timeout above). In general, this value cannot be specified, as different receivers (or even different information consumers within a single receiver) may have different requirements for Communication Failure Value. In certain situations, however, proper operation of a function may require that some or all receivers use a specific Communication Failure value. In these limited situations, the transmitter of a signal is placing behavioral requirements on the receiver.

4.2.1.7 Timing Parameters. The following parameters may not be specified for every GMLAN signal.

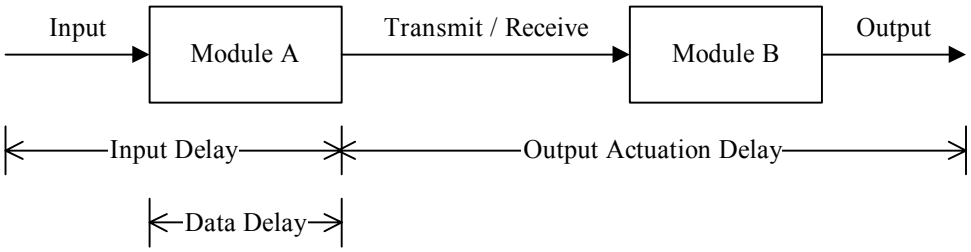


Figure 6: Timing Parameters

4.2.1.7.1 Input Delay. The Input Delay is a latency requirement for a signal that is imposed upon the transmitter of the signal by the receiver of the signal. It is the maximum time delay from the change of state of a switch or sensor at the input of the controller to the completion of transmission of the serial data signal. This delay includes debounce time (if applicable), application loop time, serial data handler loop time, and serial data arbitration time. It does not include any timing associated with the reception of a signal, or any times associated with the transference of a signal through a gateway.

This requirement influences the selection of the periodic interval at which the input is sampled and processed, the Periodic Interval for the frame containing the signal, the possible use of an event trigger and the associated Update Time for the frame containing the signal, and the periodic interval at which the transmit processing of the GMLAN handler is scheduled.

4.2.1.7.2 Data Delay. The Data Delay is a latency requirement for a signal that is imposed upon the transmitter of the signal by the receiver of the signal. It is the maximum time delay from an input that causes an algorithm decision to change the state of a variable to the transmission of the serial data signal. This delay includes the application and serial data handler loop times as well as the serial data arbitration time.

This requirement influences the selection of the periodic interval at which the algorithm is scheduled, the Periodic Interval for the frame containing the signal, the possible use of an event trigger and the associated Update Time for the frame containing the signal, and the periodic interval at which the transmit processing of the GMLAN handler is scheduled.

4.2.1.7.3 Output Actuation Delay. The Output Actuation Delay is a latency requirement for a signal that is imposed upon the receiver of the signal by the transmitter of the signal and is typically applied to control requests and displays. It is the time delay from the completion of the transmission of a serial data message by the original transmitter to the change of state at the output of the controller. This delay includes the receiver serial data handler loop time, application loop time, and output driver actuation time, and any time associated with the transference of information across one or more gateways.

This requirement influences the selection of the periodic interval at which the Receive processing of the GMLAN handler is scheduled and the periodic interval at which the algorithm which asserts the output is scheduled. It also affects the use and/or design of serial data gateways that lie between the original transmitter and the device that ultimately controls an output.

4.2.1.7.4 Pulse. A pulse consists of one complete cycle of a waveform and consists of both the signal low and high time.

4.2.2 Signal Summary. Table 12 lists the devices in PPEI, while Table 13 summarizes the signals in

PPEI. Table 13 indicates the name of the signal, the PPEI sections that define and refer to the signal, and which device transmits the signal.

Powertrain electronics shall transmit all normal (non-diagnostic) serial data signals whenever Accessory/Wakeup or Run/Crank Virtual Network (VN) is active.

Powertrain electronics will expect to receive all signals when the Run/Crank VN is active, and few (if any) signals when only the Accessory/Wakeup VN is active.

The details of which signals are required in which VNs are shown in the PPEI Signal Summary Table and the Powertrain Expansion Bus Signal Summary (Table 14).

Also refer to GMW8772.

Signals that list more than one transmitter may possibly come from any of the devices listed, although it will only come from one of the devices on any given vehicle. Specifically, a transmitter that is shown as “TCCM, TCM, ECM” should be interpreted as “The signal comes from the Transfer Case Control Module if it is present, otherwise it comes from the Transmission Control Module if it is present, otherwise it comes from the Engine Control Module”.

The devices in PPEI are:

Table 12: PPEI Devices

PPEI Devices	
Device	**Description**
APM	Accessory Power Module
ACC	Adaptive Cruise Control
APM	Accessory Power Module
BSM	Brake Sensing Module
BPIM	BAS Power Inverter Module
CNG	Compressed Natural Gas
EBCM	Electronic Brake Control Module
ECM	Engine Control Module
EFV	Exhaust Flapper Valve
EFVM	Exhaust Flapper Valve Module
EPS	Electronic Power Steering
FSCM	Fuel System Control Module
GW	Gateway
HVAC	Heating, Ventilation, and Air Conditioning Module
LPG	Liquefied Petroleum Gas
PCFS	Post Collision Fuel Shutdown
PTO	Power Take-Off Module
SGCM	Starter Generator Control Module
TCCM	Transfer Case Control Module
TCM	Transmission Control Module
TPIM	Traction Power Inverter Module
VICM	Vehicle Integration Control Module
VITM	Voltage Current Temperature Module
VSS	Vehicle Speed Signal

Table 13: PPEI Signal Summary List

PPEI Signal Summary List						
Signal	**Defining Subsystems**	**PT TX**	**PF TX**	**Frame**	**ACC VN**	**Run/Crk VN**
Accelerator Actual Position	• FWD/AWD • Electric Power Management (EPM) • Brakes and Traction Control • Suspension Control • Post Collision Operation	ECM		$0C9	X	X
Accelerator Actual Position Validity	• FWD/AWD • EPM • Brakes and Traction Control • Suspension Control • Post Collision Operation	ECM		$0C9	X	X
Accelerator Effective Position	• Brakes and Traction Control	ECM		$1C3		X
Accelerator Effective Position Validity	• Brakes and Traction Control	ECM		$1C3		X
Accelerator Pedal Override Active	• Cruise Control • Engine Power Management	ECM		$1C4		X
Accelerator Pedal Override Active Alive Rolling Count	• Cruise Control • Engine Power Management	ECM		$1C4		X
Accelerator Pedal Override Active Protection Value	• Cruise Control • Engine Power Management	ECM		$1C4		X
Accelerator Pedal Power Take Off Override Active	• PTO and Fast Idle Control		PTO	$1F9		X
Adaptive Cruise Control Active	• Cruise Control		ACC	$2CB		X
Adaptive Cruise Control Axle Torque Command	• Cruise Control		ACC	$2CB		X
Adaptive Cruise Control Axle Torque Command Protection	• Cruise Control		ACC	$2CB		X
Adaptive Cruise Control Axle Torque Command Status	• Cruise Control	ECM		$1C4		X
Adaptive Cruise Control Braking Active	• Cruise Control • Brakes and Traction Control • Transmission • Post Collision Operation		EBCM	$1E9		X
Adaptive Cruise Control Command Alive Rolling Count	• Cruise Control • Brakes and Traction Control		ACC	$2CB		X
Advanced Fuel Flow Estimate	• Enhanced Evaporative Emissions and Fuel	ECM		$1ED		X

PPEI Signal Summary List						
Signal	**Defining Subsystems**	**PT TX**	**PF TX**	**Frame**	**ACC VN**	**Run/Crk VN**
Air Conditioning Compressor Command	• Air Conditioning Compressor Control	ECM		$3D1		X
Air Conditioning Compressor Engine Run Request	• TBD		GW	$3F1		X
Air Conditioning Compressor Failed On	• Air Conditioning Compressor Control		GW	$1F1		X
Air Conditioning Compressor Mode Request	• Air Conditioning Compressor Control		GW	$1F1		X
Air Conditioning Compressor Normalized Load	• Air Conditioning Compressor Control		GW	$1F1		X
Air Conditioning Compressor Normalized Load Gradient Allowed	• Air Conditioning Compressor Control	ECM		$3D1	X	X
Air Conditioning Compressor Normalized Load Validity	• Air Conditioning Compressor Control		GW	$1F1		X
Air Conditioning Compressor System Virtual Device Availability	• Air Conditioning Compressor Control		GW	$1F1		X
Air Conditioning Compressor Type	• Air Conditioning Compressor Control		GW	$4E9	X	X
Air Conditioning Off Indication On	• Air Conditioning Compressor Controls • Displays and Gauges	ECM		$4D1		X
Air Conditioning Refrigerant High Side Fluid Pressure	• Cooling Fan Control • Air Conditioning Compressor Control	ECM		$3F9		X
Air Conditioning Refrigerant High Side Fluid Pressure Validity	• Cooling Fan Control • Air Conditioning Compressor Control	ECM		$3F9		X
Airbag Deployed	• Serial Data Signal Definition • Post Collision Operation		GW	$1F1		X
Airbag Virtual Device Availability	• Serial Data Signal Definition • Post Collision Operation		GW	$1F1		X
Alternative Fuel Acceleration Warning Active	• Displays and Gauges • Enhanced Evaporative Emissions and Fuel	ECM		$1EA	X	X
Alternative Fuel Level Low	• Displays and Gauges • Enhanced Evaporative Emissions and Fuel	ECM		$1EA	X	X

PPEI Signal Summary List						
Signal	**Defining Subsystems**	**PT TX**	**PF TX**	**Frame**	**ACC VN**	**Run/Crk VN**
Alternative Fuel Mode Request Denied Indication On	• Displays and Gauges • Enhanced Evaporative Emissions and Fuel	ECM		$1EA	X	X
Alternative Fuel Pre-heating Active	• Displays and Gauges • Enhanced Evaporative Emissions and Fuel	ECM		$1EA	X	X
Antilock Brake System Active	• FWD/AWD • Brakes and Traction Control • Vehicle Speed and Rough Road Sensing		EBCM	$1E9		X
Antilock Brake System Failed	• Brakes and Traction Control • Post Collision Operation		EBCM	$1E9		X
Antilock Brake System Present	• Brakes and Traction Control		GW	$4E9	X	X
Apply Brake Before Cruise Indication On	• Displays and Gauges • Cruise Control	ECM		$3D1	X	X
Automatic Transmission Commanded Gear	• Displays and Gauges • Cruise Control • Brakes and Traction Control • Transmission	TCM ECM		$1F5	X	X
Automatic Transmission Gear Shift Direction	• Brakes and Traction Control • Transmission	TCM ECM		$1F5	X	X
Backup Power Mode Master Virtual Device Availability	• Power and Ground • Starter Control		GW	$1F1	X	X
Barometric Pressure Absolute	• Displays and Gauges • Enhanced Evaporative Emissions and Fuel	ECM		$4C1	X	X
Barometric Pressure Absolute Validity	• Displays and Gauges • Enhanced Evaporative Emissions and Fuel	ECM		$4C1	X	X
Brake Apply Sensor Home Position Learned	• Cruise Control		GW	$0F1	x	x
Brake Pedal Driver Applied Pressure	• Transmission		EBCM	$2F9		X
Brake Pedal Driver Applied Pressure Detected	• FWD/AWD • Cruise Control • Brakes and Traction Control		EBCM	$1E9		X

PPEI Signal Summary List						
Signal	**Defining Subsystems**	**PT TX**	**PF TX**	**Frame**	**ACC VN**	**Run/Crk VN**
Brake Pedal Driver Applied Pressure Detected Validity	• FWD/AWD • Cruise Control • Brakes and Traction Control		EBCM	$1E9		X
Brake Pedal Driver Applied Pressure Validity	• Transmission		EBCM	$2F9		X
Brake Pedal Initial Travel Achieved Protection	• FWD/AWD • Cruise Control • Brakes and Traction Control • PTO and Fast Idle Control		BSM GW	$0F1		X
Brake Pedal Initial Travel Achieved Status	• FWD/AWD • Cruise Control • Brakes and Traction Control • Transmission • PTO and Fast Idle Control		BSM GW	$0F1		X
Brake Pedal Moderate Travel Achieved	• Engine Power Management • Brakes and Traction Control • Transmission		BSM GW	$0F1		X
Brake Pedal Moderate Travel Achieved Validity	• Engine Power Management • Brakes and Traction Control • Transmission		BSM GW	$0F1		X
Brake Pedal Position	• Brakes and Traction Control		BSM GW	$0F1		X
Brake Pedal Position Alive Rolling Count	• FWD/AWD • Cruise Control • Brakes and Traction • PT and Fast Idle Control		BSM GW	$0F1		X
Brake System Transmission Gear Request	• Brakes and Traction Control • Transmission		EBCM	$1E9		X
Brake Temperature	• Brakes and Traction Control • Transmission		EBCM	$2F9		X
Charge Assist Gauge Percent	• TBD	BPIM		3E1	X	X
Chassis Braking Load	• Brakes and Traction Control • Transmission		EBCM	$2F9		X
Chassis System Engine Torque Request Extended Range	• Brakes and Traction Control		EBCM	$1C7		X
Chassis System Engine Torque Request Protection	• Brakes and Traction Control		EBCM	$1C7		X

PPEI Signal Summary List						
Signal	**Defining Subsystems**	**PT TX**	**PF TX**	**Frame**	**ACC VN**	**Run/Crk VN**
Check Fuel Filler Cap Indication On	• Displays and Gauges • Enhanced Evaporative Emissions and Fuel System	ECM		$4D1	X	X
Climate Control Front Blower Fan Speed	• TBD		GW	$451	X	X
Clutch Pedal Actual Position	• Transmission Controls	ECM		$1F5	X	X
Clutch Pedal Actual Position Validity	• Transmission Controls	ECM		$1F5	X	X
Clutch Start Switch Active	• Power and Ground • Transmission	TCM ECM		$1F5	X	X
Clutch Start Switch Active Validity	• Power and Ground • Transmission	TCM ECM		$1F5	X	X
Commanded Air Fuel Ratio	• Enhanced Evaporative Emissions and Fuel	ECM		$1ED		X
Cruise Control Active	• Displays and Gauges • Cruise Control • Post Collision Operation • PTO and Fast Idle Control	ECM		$0C9	X	X
Cruise Control Cancel Request	• Cruise Control		GW	$1E1		X
Cruise Control Driver Selected Speed	• Displays and Gauges • Cruise Control	ECM		$3D1	X	X
Cruise Control Driver Selected Speed Active	• Displays and Gauges • Cruise Control	ECM		$3D1	X	X
Cruise Control Enabled	• Displays and Gauges • Cruise Control	ECM		$0C9	X	X
Cruise Control Switch Status	• Cruise Control		GW	$1E1		X
Cruise Control Switch Status Alive Rolling Count	• Cruise Control		GW	$1E1		X
Cruise Control Switch Status Protection Value	• Cruise Control		GW	$1E1		X
Diagnostic Trouble Code Information Extended	• Serial Data Architecture	ECM TCM TCCM		$772 $77F $77A	X	X
Diesel Exhaust Fluid Remaining Distance	• Displays and Gauges • Exhaust After-Treatment	ECM		$4C1	X	X
Diesel Exhaust Fluid Remaining Distance Validity	• Displays and Gauges • Exhaust After-Treatment	ECM		$4C1	X	X
Diesel Exhaust Fluid Warning Indication Request	• Displays and Gauges • Exhaust After-Treatment	ECM		$4C1	X	X

PPEI Signal Summary List						
Signal	**Defining Subsystems**	**PT TX**	**PF TX**	**Frame**	**ACC VN**	**Run/Crk VN**
Diesel Glow Plug Indication On	• Displays and Gauges	ECM		$4D1	X	X
Display Measurement System	• Cruise Control		GW	$1F1		X
Distance Rolling Count Average Driven	• Displays and Gauges • Vehicle Speed and Rough Road Sensing	ECM		$3E9	X	X
Distance Rolling Count Average Driven Reset Occurred	• Displays and Gauges • Vehicle Speed and Rough Road Sensing	ECM		$3E9	X	X
Distance Rolling Count Average Driven Source	• Displays and Gauges • Vehicle Speed and Rough Road Sensing	ECM		$3E9	X	X
Distance Rolling Count Average Driven Validity	• Displays and Gauges • Vehicle Speed and Rough Road Sensing	ECM		$3E9	X	X
Distance Rolling Count Average Non Driven	• Displays and Gauges • Vehicle Speed and Rough Road Sensing	ECM		$3E9	X	X
Distance Rolling Count Average Non Driven Reset Occurred	• Displays and Gauges • Vehicle Speed and Rough Road Sensing	ECM		$3E9	X	X
Distance Rolling Count Average Non Driven Validity	• Displays and Gauges • Vehicle Speed and Rough Road Sensing	ECM		$3E9	X	X
Driveline Final Axle Ratio	• Brakes and Traction Control • Vehicle Speed and Rough Road Sensing	ECM		$4F1		X
Driver Independent Brake Pedal Apply Active	• Brakes and Traction Control • Transmission		EBCM	$1E9		X
Driver Intended Axle Torque	• Cruise Control	ECM		$1C5		X
Driver Intended Axle Torque Maximum	• Cruise Control	ECM		$1C5		X
Driver Intended Axle Torque Maximum Validity	• Cruise Control	ECM		$1C5		X
Driver Intended Axle Torque Minimum	• Cruise Control	ECM		$1C5		X
Driver Intended Axle Torque Minimum Validity	• Cruise Control	ECM		$1C5		X
Driver Intended Axle Torque Validity	• Cruise Control	ECM		$1C5		X
Driver Shift Control Request Denied Indication On	• Displays and Gauges • Transmission	TCM ECM		$1F5	X	X

PPEI Signal Summary List						
Signal	**Defining Subsystems**	**PT TX**	**PF TX**	**Frame**	**ACC VN**	**Run/Crk VN**
Driver Shift Control Target Gear	• Displays and Gauges • Transmission	TCM ECM		$1F5	X	X
Driver Throttle Override Detected	• Engine Power Management • Cruise Control • Brakes and Traction Control • PTO and Fast Idle Control	ECM		$0C9	X	X
Driver Throttle Override Detected Protection Value	• Engine Power Management • Cruise Control • Brakes and Traction Control	ECM		$0C9	X	X
Driver Throttle Override Detection Alive Rolling Count	• Engine Power Management • Cruise Control • Brakes and Traction Control	ECM		$0C9	X	X
Economy Mode Active Indication On	• Displays and Gauges • Engine Power Management	ECM		$1C3		X
Economy Mode Request Denied Indication On	• Displays and Gauges • Engine Power Management	ECM		$1C3		X
Elapsed Time Count	• Displays and Gauges		GW	$4E9	X	X
Elapsed Time Count Reset Occurred	• Displays and Gauges		GW	$4E9	X	X
Emissions Related Fuel Level Low	• Enhanced Evaporative Emissions and Fuel		FSCM	$3FB		X
Engine Boost Pressure Indication	• Displays and Gauges	ECM		$3D1	X	X
Engine Boost Pressure Indication Validity	• Displays and Gauges	ECM		$3D1	X	X
Engine Coast Fuel Cut Off Active	• Displays and Gauges	ECM		$3D1	X	X
Engine Coolant Temperature	• Displays and Gauges • Air Conditioning Compressor Control • Brakes and Traction Control • Enhanced Evaporative Emissions and Fuel	ECM		$4C1	X	X
Engine Coolant Temperature Validity	• Displays and Gauges • Air Conditioning Compressor Control • Brakes and Traction Control • Enhanced Evaporative Emissions and Fuel	ECM		$4C1	X	X

PPEI Signal Summary List						
Signal	**Defining Subsystems**	**PT TX**	**PF TX**	**Frame**	**ACC VN**	**Run/Crk VN**
Engine Cooling Fan Speed	• Cooling Fan Control • Generator Control	ECM		$3F9	X	X
Engine Cooling Fan Speed Adjustment	• Cooling Fan Control		GW	$3F1		X
Engine Cylinder Deactivation Event Pending	• Exhaust After-Treatment	ECM		$1ED		X
Engine Cylinder Deactivation Mode	• Displays and Gauges	ECM		$0C9	X	X
Engine Diagnostic Trouble Code Present Indication On	• Displays and Gauges	ECM		$4D1	X	X
Engine Driver Preference Mode Switch 1 Active	• Engine Power Management		GW	$1E1		X
Engine Driver Preference Mode Switch 1 Alive Rolling Count	• Engine Power Management		GW	$1E1		X
Engine Driver Preference Mode Switch 1 Enabled	• Engine Power Management	ECM		$1C3		X
Engine Driver Preference Mode Switch 1 Status	• Engine Power Management	ECM		$1C3		X
Engine Emissions Related Malfunction Active	• Displays and Gauges	ECM		$3D1	X	X
Engine Emissions Related Malfunction Indication Request	• Displays and Gauges	ECM		$3D1	X	X
Engine Fuel Control State	• Enhanced Evaporative Emissions and Fuel	ECM		$3FB		X
Engine Hot/Stop Engine Indication On	• Displays and Gauges	ECM		$4D1	X	X
Engine Hot Fuel Enrichment Indication On	• Displays and Gauges	ECM		$4D1	X	X
Engine Idle Active	• Displays and Gauges • Brakes and Traction Control	ECM		$0C9	X	X
Engine Intake Air Boost Pressure	• Displays and Gauges	ECM		$0C9	X	X
Engine Intake Air Boost Pressure Validity	• Displays and Gauges	ECM		$0C9	X	X
Engine Intake Air Temperature	• FWD/AWD • Air Conditioning Compressor Control • Brakes and Traction Control • Suspension Control • Generator Control	ECM		$4C1	X	X
Engine Intake Air Temperature Validity	• FWD/AWD • Air Conditioning Compressor Control • Brakes and Traction Control • Suspension Control • Generator Control	ECM		$4C1	X	X

PPEI Signal Summary List						
Signal	**Defining Subsystems**	**PT TX**	**PF TX**	**Frame**	**ACC VN**	**Run/Crk VN**
Engine Manifold Absolute Pressure	• Brakes and Traction Control	ECM		$2C3	X	X
Engine Manifold Absolute Pressure Validity	• Brakes and Traction Control	ECM		$2C3	X	X
Engine Non Emissions Related Malfunction Active	• Displays and Gauges	ECM		$3D1	X	X
Engine Off Time Extended Range	• FWD/AWD		GW	$3F1		X
Engine Off Time Extended Range Validity	• FWD/AWD		GW	$3F1		X
Engine Off Time Virtual Device Availability	• FWD/AWD		GW	$3F1		X
Engine Oil Change Indication On	• Displays and Gauges	ECM		$4D1	X	X
Engine Oil Hot Indication On	• Displays and Gauges	ECM		$4C1	X	X
Engine Oil Level Low Indication On	• Displays and Gauges	ECM		$4D1	X	X
Engine Oil Life Reset Performed	• Displays and Gauges	ECM		$3D1		X
Engine Oil Life Reset Request	• Displays and Gauges		GW	$1F1		X
Engine Oil Pressure	• Displays and Gauges	ECM		$4D1	X	X
Engine Oil Pressure Low Indication On	• Displays and Gauges	ECM		$4D1	X	X
Engine Oil Pressure Validity	• Displays and Gauges	ECM		$4D1	X	X
Engine Oil Remaining Life	• Displays and Gauges	ECM		$3F9	X	X
Engine Oil Starvation Indication On	• Displays and Gauges • Engine Power Management	ECM		$3D1	X	X
Engine Oil Temperature	• Displays and Gauges	ECM		$4D1	X	X
Engine Oil Temperature Validity	• Displays and Gauges	ECM		$4D1	X	X
Engine Performance Identifier	• Engine Power Management		GW	$4E9	X	X
Engine Recommended Upshift Indication On	• FWD/AWD • Displays and Gauges • Transmission	TCM ECM		$1F5	X	X
Engine Run Active	• Power and Ground • Displays and Gauges • Starter Control • Brakes and Traction Control • Exhaust After-Treatment • Generator Control • PTO and Fast Idle Control	ECM		$0C9	X	X
Engine Shutdown Active	• Engine Power Management • Generator Control	ECM		$4D1		X

PPEI Signal Summary List						
Signal	**Defining Subsystems**	**PT TX**	**PF TX**	**Frame**	**ACC VN**	**Run/Crk VN**
Engine Shutdown Pending Indication On	• Engine Power Management • Displays and Gauges	ECM		$4D1		X
Engine Speed	• Displays and Gauges • Cruise Control • Air Conditioning Compressor • Brakes and Traction Control • Suspension Control • Generator Control • Enhanced Evaporative Emissions and Fuel • Post Collision Operation • PTO and Fast Idle Control	ECM		$0C9	X	X
Engine Speed Limitation Mode Active	• Displays and Gauges • Engine Power Management	ECM		$3F9	X	X
Engine Speed Maximum Limit	• Displays and Gauges • Engine Power Management	ECM		$4D1		X
Engine Speed Status	• Displays and Gauges • Cruise Control • Air Conditioning Compressor Control • Brakes and Traction Control • Suspension • Generator Control • Enhanced Evaporative Emissions and Fuel • Post Collision Operation • PTO and Fast Idle Control	ECM		$0C9	X	X
Engine Torque Actual Extended Range	• Cruise Control • Brakes and Traction Control • Suspension Control • Post Collision Operation	ECM		$1C3	X	X
Engine Torque Actual Extended Range Validity	• Cruise Control • Brakes and Traction Control • Suspension Control • Post Collision Operation	ECM		$1C3	X	X
Engine Torque Driver Requested Extended Range	• Brakes and Traction Control	ECM		$1C3	X	X

PPEI Signal Summary List						
Signal	**Defining Subsystems**	**PT TX**	**PF TX**	**Frame**	**ACC VN**	**Run/Crk VN**
Engine Torque Driver Requested Extended Range Validity	• Brakes and Traction Control	ECM		$1C3	X	X
Engine Torque Maximum Extended Range	• Brakes and Traction Control	ECM		$2C3	X	X
Engine Torque Maximum Extended Range Validity	• Brakes and Traction Control	ECM		$2C3	X	X
Engine Torque Minimum Extended Range	• Cruise Control • Brakes and Traction Control	ECM		$2C3	X	X
Engine Torque Minimum Extended Range Validity	• Cruise Control • Brakes and Traction Control	ECM		$2C3	X	X
Engine Torque Reduction Failure Status	• Brakes and Traction Control	ECM		$1C3	X	X
Engine Warm Up Cycle Achieved	• Enhanced Evaporative Emissions and Fuel	ECM		$4C1	X	X
Engine Water In Fuel Indication On	• Displays and Gauges	ECM		$4D1	X	X
Enhanced Services Vehicle Top Speed Limit Password	• Engine Power Management		OnStar	$3ED	X	X
Enhanced Services Vehicle Top Speed Limit Request	• Engine Power Management		OnStar	$3ED	X	X
Enhanced Services Vehicle Top Speed Limit Value	• Engine Power Management		OnStar	$3ED	X	X
Enhanced Services Vehicle Top Speed Limit Value Alive Rolling Count	• Engine Power Management		OnStar	$3ED	X	X
Exhaust Pressure Regulator Valve Position	• Exhaust After-Treatment		FSCM	$1EB		X
Exhaust Pressure Regulator Valve Position Validity	• Exhaust After-Treatment		FSCM	$1EB		X
Fast Idle Mode Active	• Vehicle Speed and Rough Road Sensing		PTO	$1F9		X
Front Axle Operational Mode	• FWD/AWD • Brakes and Traction Control	TCCM	FeLSD	$1D0	X	X
Fuel Alcohol Composition	• Enhanced Evaporative Emissions and Fuel	ECM		$3FB		X
Fuel Alcohol Composition Adaptation in Progress	• Enhanced Evaporative Emissions and Fuel	ECM		$3FB		X
Fuel Alcohol Composition Validity	• Enhanced Evaporative Emissions and Fuel	ECM		$3FB		X
Fuel Control System Fault Present	• Enhanced Evaporative Emissions and Fuel	ECM		$1ED		X
Fuel Delivery Pressure Requested	• Enhanced Evaporative Emissions and Fuel	ECM		$1ED		X
Fuel Filter Change Now Indication On	• Displays and Gauges	ECM		$4D1	X	X

PPEI Signal Summary List						
Signal	**Defining Subsystems**	**PT TX**	**PF TX**	**Frame**	**ACC VN**	**Run/Crk VN**
Fuel Filter Life Reset Performed	• Displays and Gauges	ECM		$3D1	X	X
Fuel Filter Life Reset Requested	• Displays and Gauges		GW	$1F1	X	X
Fuel Filter Remaining Life	• Displays and Gauges	ECM		$1C3	X	X
Fuel Injected Rolling Count	• Displays and Gauges	ECM		$3F9	X	X
Fuel Injected Rolling Count Reset Occurred	• Displays and Gauges	ECM		$3F9	X	X
Fuel Level Emissions Related Status	• Enhanced Evaporative Emissions and Fuel System	ECM		$3FB	X	X
Fuel Level Percent	• Displays and Gauges • Enhanced Evaporative Emissions and Fuel System	ECM		$4D1	X	X
Fuel Level Percent Validity	• Displays and Gauges • Enhanced Evaporative Emissions and Fuel System	ECM		$4D1	X	X
Fuel Level Tank 2 Percent	• Displays and Gauges	ECM		$1EA	X	X
Fuel Level Tank 2 Percent Validity	• Displays and Gauges	ECM		$1EA	X	X
Fuel Mode Status	• Enhanced Evaporative Emissions and Fuel	ECM		$1EA	X	X
Fuel Mode Switch Active	• Enhanced Evaporative Emissions and Fuel		GW	$1E1	X	X
Fuel Mode Switch Active Validity	• Enhanced Evaporative Emissions and Fuel		GW	$1E1	X	X
Fuel Pump Enabled Discrete Output Commanded Status	• Enhanced Evaporative Emissions and Fuel System	ECM		$1ED	X	X
Fuel System Emissions Related DTC	• Enhanced Evaporative Emissions and Fuel		FSCM	$4D9		X
Fuel System Emissions Related Malfunction Active	• Enhanced Evaporative Emissions and Fuel		FSCM	$4D9		X
Fuel System Estimated Pressure Delivered	• Enhanced Evaporative Emissions and Fuel		FSCM	$1EB		X
Fuel System Estimated Pressure Delivered Validity	• Enhanced Evaporative Emissions and Fuel		FSCM	$1EB		X
Fuel Total Capacity	• Displays and Gauges • Enhanced Evaporative Emissions and Fuel System	ECM		$4D1	X	X
Fuel Total Capacity Tank 2	• Displays and Gauges	ECM	GW	$1EA	X	X

PPEI Signal Summary List						
Signal	**Defining Subsystems**	**PT TX**	**PF TX**	**Frame**	**ACC VN**	**Run/Crk VN**
Generator Current	• Generator Control	ECM		$1C3		X
Generator Current Validity	• Generator Control	ECM		$1C3		X
Generator Failed	• Displays and Gauges • Generator Control	ECM		$3F9	X	X
Generator Field Duty Cycle	• Generator Control	ECM		$3F9	X	X
Generator Field Duty Cycle Validity	• Generator Control	ECM		$3F9	X	X
Generator Regulator Setpoint Duty Cycle Request	• Generator Control		GW	$3F1		X
Generator Setpoint Duty Cycle Powertrain Override Active	• Generator Control	ECM		$3F9		X
High Voltage Battery Balancing Request Matrix	• TBD	BPIM		$1D9	X	X
High Voltage Battery Current Extended Range	• TBD		VITM	$1DE	X	X
High Voltage Battery Current Extended Range Validity	• TBD		VITM	$1DE	X	X
High Voltage Battery Side Voltage	• TBD		VITM	$1DE	X	X
High Voltage Battery Temperature Sensor 1	• TBD		VITM	$3F7	X	X
High Voltage Battery Temperature Sensor 1 Validity	• TBD	BPIM		$1D9	X	X
High Voltage Battery Temperature Sensor 2	• TBD		VITM	$3F7	X	X
High Voltage Battery Temperature Sensor 2 Validity	• TBD	BPIM		$1D9	X	X
High Voltage Battery Temperature Sensor 3	• TBD		VITM	$3F7	X	X
High Voltage Battery Temperature Sensor 3 Validity	• TBD	BPIM		$1D9	X	X
High Voltage Battery Temperature Sensor 4	• TBD		VITM	$3F7	X	X
High Voltage Battery Temperature Sensor 4 Validity	• TBD	BPIM		$1D9	X	X
High Voltage Battery Temperature Sensor 5	• TBD		VITM	$3F7	X	X
High Voltage Battery Temperature Sensor 5 Validity	• TBD	BPIM		$1D9	X	X
High Voltage Battery Temperature Sensor 6	• TBD		VITM	$3F7	X	X

PPEI Signal Summary List						
Signal	**Defining Subsystems**	**PT TX**	**PF TX**	**Frame**	**ACC VN**	**Run/Crk VN**
High Voltage Battery Temperature Sensor 6 Validity	• TBD	BPIM		$1D9	X	X
Hybrid Vehicle High Voltage Inverter Disable Requested	• TBD		GW	$451	X	X
Hybrid Vehicle High Voltage System Disabled	• TBD	BPIM	VICM	$3E1	X	X
Immobilizer Information	• Vehicle Theft Deterrent		GW	$3C9	X	X
Immobilizer Pre Release Password	• Vehicle Theft Deterrent		GW	$1F1	X	X
Immobilizer Pre Release Password Status	• Vehicle Theft Deterrent		GW	$1F1	X	X
Instantaneous Fuel Consumption Rate	• Displays and Gauges	ECM		$3D1	X	X
Instantaneous Fuel Flow Estimate	• Enhanced Evaporative Emissions and Fuel	ECM		$1ED		X
Interior Dimming Display Level	• Displays and Gauges • Four Wheel Drive/ All Wheel Drive		GW	$3F1	X	X
Legislated Diagnostics Standard Conditions Fault Present	• Enhanced Evaporative Emissions and Fuel • Exhaust After-Treatment	ECM		$4C1	X	X
Legislated Diagnostics Standard Conditions Met	• Enhanced Evaporative Emissions and Fuel • Exhaust After-Treatment	ECM		$4C1	X	X
Mass Air Flow	• Exhaust After-Treatment	ECM		$1EF		X
Mass Air Flow Validity	• Exhaust After-Treatment	ECM		$1EF		X
Notification Event Severity Status	• Post Collision		GW	$451	X	X
Outside Air Temperature Corrected Value	• Engine Power Management		GW	$3F1	X	X
Outside Air Temperature Corrected Value Validity	• Engine Power Management		GW	$3F1	X	X
Outside Air Temperature Powertrain Estimated	• Generator Control • Enhanced Evaporative Emissions and Fuel	ECM		$4C1	X	X
Outside Air Temperature Powertrain Estimated Mask	• Generator Control • Enhanced Evaporative Emissions and Fuel	ECM		$4C1	X	X
Outside Air Temperature Powertrain Estimated Validity	• Generator Control • Enhanced Evaporative Emissions and Fuel	ECM		$4C1	X	X

PPEI Signal Summary List						
Signal	**Defining Subsystems**	**PT TX**	**PF TX**	**Frame**	**ACC VN**	**Run/Crk VN**
Outside Air Temperature Virtual Device Availability	• Engine Power Management		GW	$3F1	X	X
Overdrive Disable Request Granted	• Displays and Gauges • Transmission	TCM ECM		$1F5	X	X
Overdrive Disable Requested	• Transmission		GW	$1F3		X
Park Brake Switch Active	• FWD/AWD • Engine Power Management • Cruise Control • Brakes and Traction Control		GW	$1F1		X
Park Brake Virtual Device Availability	• FWD/AWD • Engine Power Management • Cruise Control • Brakes and Traction Control		GW	$1F1		X
Platform Engine Speed Command	• PTO and Fast Idle Control		PTO	$1F9		X
Platform Engine Speed Command Alive Rolling Count	• PTO and Fast Idle Control		PTO	$1F9		X
Platform Engine Speed Command Inhibit Request	• PTO and Fast Idle Control	ECM		$0C9	X	X
Platform Engine Speed Command On Switch Active	• Starter Control • PTO and Fast Idle Control		PTO	$1F9		X
Platform Engine Speed Command Protection Value	• PTO and Fast Idle Control		PTO	$1F9		X
Platform Engine Speed Command Speed Decrease Switch Active	• PTO and Fast Idle Control		PTO	$1F9		X
Platform Engine Speed Command Speed Increase Switch Active	• PTO and Fast Idle Control		PTO	$1F9		X
Platform Engine Speed Command Superceded	• PTO and Fast Idle Control	ECM		$0C9	X	X
Platform Engine Speed Command Switch Data Integrity	• PTO and Fast Idle Control		PTO	$1F9		X
Platform Engine Speed Command System Type	• PTO and Fast Idle Control		GW	$4E9	X	X
Platform Minimum Idle Boost Level Request	• Engine Power Management • Generator Control		GW	$3F1		X
Platform Transmission Tap Up/Down Enable Switch State	• Transmission		GW	$1F3		X
Platform Transmission Tap Up/Down Secondary Switch State	• Transmission		GW	$1F3		X
Platform Transmission Tap Up/Down Switch State	• Transmission		GW	$1F3		X
Platform Transmission Tap Up/Down Switch Status Alive Rolling Count	• Transmission		GW	$1F3		X

PPEI Signal Summary List						
Signal	**Defining Subsystems**	**PT TX**	**PF TX**	**Frame**	**ACC VN**	**Run/Crk VN**
Power Mode Master Accessory Terminal Status	• Power and Ground		GW	$1F1	X	X
Power Mode Master Run Crank Terminal Status	• Power and Ground		GW	$1F1	X	X
Power Pack Fan Afterrun Time	• TBD	BPIM		$3F3	X	X
Power Take Off Engine Torque Limit Requested	• PTO and Fast Idle Control		PTO	$1F9		X
Power Take Off Engine Torque Limit Value Extended Range	• PTO and Fast Idle Control		PTO	$1F9		X
Power Take Off Mode Active	• PTO and Fast Idle Control		PTO	$1F9		X
Power Take Off Powertrain Run Aborted	• Starter Control • PTO and Fast Idle Control	ECM		$0C9	X	X
Power Take Off Remote Engine Shutdown Requested	• Starter Control • PTO and Fast Idle Control		PTO	$1F9		X
Power Take Off Remote Start Master Engine Shutdown Requested	• Starter Control • PTO and Fast Idle Control		GW	$1F1	X	X
Power Take Off Remote Start Master Engine Start Request	• Starter Control • Vehicle Theft Deterrent • PTO and Fast Idle Control		GW	$1F1	X	X
Power Take Off Transmission Gear Request	• Transmission • PTO and Fast Idle Control		PTO	$1F9		X
Powertrain Brake Pedal Discrete Input Status	• Cruise Control • Brakes and Traction Control • PTO and Fast Idle Control	ECM		$0C9	X	X
Powertrain Brake Pedal Discrete Input Status Validity	• Cruise Control • Brakes and Traction Control • PTO and Fast Idle Control	ECM		$0C9	X	X
Powertrain Crank Aborted	• Starter Control • PTO and Fast Idle Control	ECM		$0C9	X	X
Powertrain Crank Active	• Starter Control • PTO and Fast Idle Control	ECM		$0C9	X	X
Powertrain Exhaust Particle Filter Warning Indication On	• Displays and Gauges • Engine Power Management • Exhaust After-Treatment	ECM		$4D1		X
Powertrain High Electrical Load Requested	• Displays and Gauges • Engine Power Management • Exhaust After-Treatment	ECM		$4D1		X

PPEI Signal Summary List						
Signal	**Defining Subsystems**	**PT TX**	**PF TX**	**Frame**	**ACC VN**	**Run/Crk VN**
Powertrain Immobilizer Information	• Displays and Gauges • Vehicle Theft Deterrent	ECM		$3C1	X	X
Powertrain Regulated Generator Control Active	• Generator Control	ECM		$1C3		X
Powertrain Run Aborted	• Starter Control	ECM		$0C9	X	X
Powertrain Shift Pattern Override Active	• Transmission		GW	$1F3	X	X
Powertrain Top Speed Limit Reduced	• Displays and Gauges • Engine Power Management	ECM		$3F9	X	X
Rear Axle Operational Mode	• FWD/AWD • Brakes and Traction Control	TCCM	RDCM	$1D1	X	X
Reduced Power Indication On	• Displays and Gauges • Engine Power Management • Cooling Fan Control • Post Collision Operation	ECM		$4D1	X	X
Remote Vehicle Start Engine Running	• Starter Control	ECM		$0C9	X	X
Remote Vehicle Start Request	• Starter Control • Vehicle Theft Deterrent		GW	$1F1	X	X
Road Load Nominal Axle Torque	• Cruise Control	ECM		$1C4		X
Secondary Axle Control Mode	• FWD/AWD • Brakes and Traction Control	TCCM ECM	RDCM	$1CC	X	X
Secondary Axle Estimated Torque	• FWD/AWD • Brakes and Traction Control	TCCM ECM	RDCM	$1CC	X	X
Secondary Axle Estimated Torque Validity	• FWD/AWD • Brakes and Traction Control	TCCM ECM	RDCM	$1CC	X	X
Secondary Axle Malfunction Indication On	• FWD/AWD • Brakes and Traction Control	TCCM	RDCM	$1CF		X
Secondary Axle Maximum Differential Velocity Allowed Active	• FWD/AWD • Brakes and Traction Control	TCCM ECM	RDCM	$1CC	X	X
Secondary Axle Maximum Differential Velocity Allowed Request	• FWD/AWD • Brakes and Traction Control	TCCM ECM	RDCM	$1CC	X	X
Secondary Axle Operational Mode	• FWD/AWD • Brakes and Traction Control	TCCM	RDCM	$1CF	X	X
Secondary Axle Status	• FWD/AWD • Brakes and Traction Control	TCCM ECM	RDCM	$1CC	X	X

PPEI Signal Summary List						
Signal	**Defining Subsystems**	**PT TX**	**PF TX**	**Frame**	**ACC VN**	**Run/Crk VN**
Secondary Axle Temporary Inhibit Indication On	• FWD/AWD • Brakes and Traction Control	TCCM	RDCM	$1CF	X	X
Secondary Axle Torque Request	• FWD/AWD • Brakes and Traction Control		EBCM	$1CE		X
Secondary Axle Torque Request Alive Rolling Count	• FWD/AWD • Brakes and Traction Control		EBCM	$1CE		X
Secondary Axle Torque Request Protection Value	• FWD/AWD • Brakes and Traction Control		EBCM	$1CE		X
Service Hybrid System Indication On	• TBD	BPIM	VICM	$3E1	X	X
Spare Tire Status	• FWD/AWD • Brakes and Traction Control		EBCM	$2F9		X
Starter Generator Speed	• TBD	BPIM		$2B0	X	X
Starter Generator Speed Validity	• TBD	BPIM		$2B0	X	X
Starting Disabled Indication On	• Displays and Gauges • Starter Control	ECM		$4D1	X	X
Steering Wheel Angle	• FWD/AWD • Brakes and Traction Control		EBCM	$1E5		X
Steering Wheel Angle Gradient	• FWD/AWD • Brakes and Traction Control		EBCM	$1E5		X
Steering Wheel Angle Sensor Calibration Status	• FWD/AWD • Brakes and Traction Control		EBCM	$1E5		X
Steering Wheel Angle Validity	• FWD/AWD • Brakes and Traction Control		EBCM	$1E5		X
System Backup Power Mode	• Power and Ground • Starter Control • Vehicle Theft Deterrent		GW	$1F1	X	X
System Backup Power Mode Enabled	• Power and Ground • Starter Control • Vehicle Theft Deterrent • PTO and Fast Idle Control		GW	$1F1	X	X
System Power Mode	• Power and Ground • Starter Control • Vehicle Theft Deterrent • Exhaust After-Treatment • PTO and Fast Idle Control		GW	$1F1	X	X

PPEI Signal Summary List						
Signal	**Defining Subsystems**	**PT TX**	**PF TX**	**Frame**	**ACC VN**	**Run/Crk VN**
Throttle Position	• Engine Power Management • Post Collision Operation	ECM		$3D1	X	X
Throttle Position Validity	• Engine Power Management • Post Collision Operation	ECM		$3D1	X	X
Throttle Progression Request	• Engine Power Management		GW	$1F1		X
Throttle Progression Status	• Displays and Gauges • Engine Power Management	ECM		$3D1	X	X
Top of Travel Clutch Switch Active	• Cruise Control • Brakes and Traction Control • Transmission • PTO and Fast Idle Control	TCM ECM		$1F5	X	X
Top of Travel Clutch Switch Active Validity	• Cruise Control • Brakes and Traction Control • Transmission • PTO and Fast Idle Control	TCM, ECM		$1F5	X	X
Traction Control Alive Rolling Count	• Brakes and Traction Control		EBCM	$1C9		X
Traction Control Maximum Torque Increase Rate	• Brakes and Traction Control		EBCM	$1C7		X
Traction Control System Active	• Cruise Control • Brakes and Traction Control • Transmission • Vehicle Speed and Rough Road Sensing		EBCM	$1E9		X
Traction Control System Driver Intent	• Engine Power Management • Brakes and Traction Control		EBCM	$1E9		X
Traction Control System Enabled	• Engine Power Management • Brakes and Traction Control		EBCM	$1E9		X
Traction Control System Operating Mode	• TBD		EBCM	$17D		X
Traction Control System Present	• Engine Power Management • Cruise Control • Brakes and Traction Control • Transmission		GW	$4E9	X	X
Transmission Brake System Clutch Release Requested	• FWD/AWD • Brakes and Traction Control • Transmission		EBCM	$1E9		X

PPEI Signal Summary List						
Signal	**Defining Subsystems**	**PT TX**	**PF TX**	**Frame**	**ACC VN**	**Run/Crk VN**
Transmission Change Oil Now Indication On	• Displays and Gauges • Transmission	TCM ECM		$4C9	X	X
Transmission Creep Mode Active	• Transmission	TCM ECM		$1F5		X
Transmission Emissions Related Malfunction Active	• Displays and Gauges • Transmission	TCM ECM		$4C9	X	X
Transmission Engaged State	• Transmission	TCM ECM		$1F5	X	X
Transmission Engaged State Validity	• Transmission	TCM ECM		$1F5	X	X
Transmission Estimated Gear	• FWD/AWD • Cruise Control • Air Conditioning Compressor Control • Brakes and Traction Control • Transmission • PTO and Fast Idle Control	TCM ECM		$1F5	X	X
Transmission Estimated Gear Validity	• FWD/AWD • Cruise Control • Air Conditioning Compressor Control • Brakes and Traction Control • Transmission • PTO and Fast Idle Control	TCM ECM		$1F5	X	X
Transmission Non Emissions Related Malfunction Active	• Displays and Gauges • Transmission	TCM ECM		$4C9	X	X
Transmission Oil Life Reset Request	• Displays and Gauges • Transmission		GW	$1F3		X
Transmission Oil Temperature	• Displays and Gauges • Transmission	TCM ECM		$4C9	X	X
Transmission Oil Temperature Sensor Present	• Displays and Gauges • Transmission	TCM ECM		$4C9	X	X
Transmission Oil Temperature Validity	• Displays and Gauges • Transmission	TCM ECM		$4C9	X	X
Transmission Output Rotational Status	• TBD	TCM		$0C7	X	X
Transmission Output Shaft Angular Velocity	• FWD/AWD • Brakes and Traction Control • Transmission	TCM ECM		$0F9	X	X

PPEI Signal Summary List						
Signal	**Defining Subsystems**	**PT TX**	**PF TX**	**Frame**	**ACC VN**	**Run/Crk VN**
Transmission Output Shaft Angular Velocity Sensor Present	• FWD/AWD • Brakes and Traction Control • Transmission	TCM ECM		$0F9	X	X
Transmission Output Shaft Angular Velocity Validity	• FWD/AWD • Brakes and Traction Control • Transmission	TCM ECM		$0F9	X	X
Transmission Overall Estimated Torque Ratio	• FWD/AWD • Cruise Control • Brakes and Traction Control • Transmission	TCM ECM		$0F9	X	X
Transmission Overall Estimated Torque Ratio Validity	• FWD/AWD • Cruise Control • Brakes and Traction Control • Transmission	TCM ECM		$0F9	X	X
Transmission Platform Shift Pattern Switch 1 Active	• Transmission		GW	$1F3		X
Transmission Platform Shift Pattern Switch 2 Active	• Transmission		GW	$1F3		X
Transmission Platform Shift Pattern Switch 3 Active	• Transmission		GW	$1F3		X
Transmission Platform Shift Pattern Switch 4 Active	• Transmission		GW	$1F3		X
Transmission Platform Shift Pattern Switch Alive Rolling Count	• Transmission		GW	$1F3		X
Transmission Power Take Off Clutch Release Requested	• FWD/AWD • Transmission • PTO and Fast Idle Control		PTO	$1F9		X
Transmission Range Inhibit Status	• Displays and Gauges	TCM ECM		$1F5	X	X
Transmission Shift Lever Lock Requested	• Transmission	ECM		$1F5	X	X
Transmission Shift Lever Position	• Displays and Gauges • Suspension Control • Transmission	TCM ECM		$1F5	X	X
Transmission Shift Lever Position Validity	• Displays and Gauges • Suspension Control • Transmission	TCM ECM		$1F5	X	X
Transmission Shift Mode Status	• Displays and Gauges • Transmission	TCM ECM		$1F5	X	X

PPEI Signal Summary List						
Signal	**Defining Subsystems**	**PT TX**	**PF TX**	**Frame**	**ACC VN**	**Run/Crk VN**
Transmission Shift Pattern Active Status	• Displays and Gauges • Transmission	TCM ECM		$1F5	X	X
Transmission Shifts Delayed	• Transmission • Displays and Gauges	TCM ECM		$1F5	X	X
Transmission Skip Shift Indication On	• Displays and Gauges • Transmission	TCM ECM		$1F5	X	X
Transmission Tap Up/Tap Down Mode Status	• Displays and Gauges • Transmission	TCM ECM		$1F5	X	X
Transmission Thermal Management Status	• Displays and Gauges • Transmission	TCM ECM		$4C9	X	X
Transmission Torque Converter Clutch Commanded Mode	• Brakes and Traction Control • Transmission • PTO and Fast Idle Control	TCM ECM		$1F5	X	X
Vehicle Dynamics Control System Status	• FWD/AWD • Brakes and Traction Control		EBCM	$1E9		X
Vehicle Dynamics Over Under Steer	• FWD/AWD • Brakes and Traction Control		EBCM	$1E9		X
Vehicle Dynamics Over Under Steer Validity	• FWD/AWD • Brakes and Traction Control		EBCM	$1E9		X
Vehicle Dynamics Yaw Rate	• FWD/AWD • Brakes and Traction Control		EBCM	$1E9		X
Vehicle Dynamics Yaw Rate Validity	• FWD/AWD • Brakes and Traction Control		EBCM	$1E9		X
Vehicle Identification Number Digits 10 to 17	• FWD/AWD • Vehicle Theft Deterrent		GW	$4E1	X	X
Vehicle Mass Nominal	• Cruise Control	ECM		$4F3		X
Vehicle Speed Average Driven	• Displays and Gauges • Cruise Control • Post Collision Operation • PTO and Fast Idle Control • Vehicle Speed and Rough Road Sensing	ECM		$3E9		X

PPEI Signal Summary List						
Signal	**Defining Subsystems**	**PT TX**	**PF TX**	**Frame**	**ACC VN**	**Run/Crk VN**
Vehicle Speed Average Driven Source	• Displays and Gauges • Cruise Control • Post Collision Operation • PTO and Fast Idle Control • Vehicle Speed and Rough Road Sensing	ECM		$3E9		X
Vehicle Speed Average Driven Validity	• Displays and Gauges • Cruise Control • Post Collision Operation • PTO and Fast Idle Control • Vehicle Speed and Rough Road Sensing	ECM		$3E9		X
Vehicle Speed Average Non Driven	• Displays and Gauges • Cruise Control • Post Collision Operation • PTO and Fast Idle Control • Vehicle Speed and Rough Road Sensing	ECM		$3E9		X
Vehicle Speed Average Non Driven Validity	• Displays and Gauges • Cruise Control • Post Collision Operation • PTO and Fast Idle Control • Vehicle Speed and Rough Road Sensing	ECM		$3E9		X
Vehicle Speed Control System Type	• Cruise Control		GW	$4E9	X	X
Vehicle Stability Enhancement Lateral Acceleration	• FWD/AWD • Brakes and Traction Control • Transmission		EBCM	$1E9		X
Vehicle Stability Enhancement Lateral Acceleration Validity	• FWD/AWD • Brakes and Traction Control • Transmission		EBCM	$1E9		X
Vehicle Stability Enhancement Mode	• TBD		EBCM	$17D		X
Vehicle Stability Enhancement System Active	• FWD/AWD • Cruise Control • Brakes and Traction Control • Vehicle Speed and Rough Road Sensing		EBCM	$1E9		X

PPEI Signal Summary List						
Signal	**Defining Subsystems**	**PT TX**	**PF TX**	**Frame**	**ACC VN**	**Run/Crk VN**
Vehicle Stability Enhancement System Present	• FWD/AWD • Cruise Control • Brakes and Traction Control • Transmission		GW	$4E9	X	X
Vehicle Top Speed Limit Arbitrated Value	• Displays and Gauges • Engine Power Management • Brakes and Traction Control • PTO and Fast Idle Control	ECM		$3F9	X	X
Vehicle Top Speed Limit Mode Active	• Displays and Gauges • Engine Power Management • Brakes and Traction Control • PTO and Fast Idle Control	ECM		$3F9	X	X
Vehicle Top Speed Limit Request	• Engine Power Management • Brakes and Traction Control • PTO and Fast Idle Control		GW	$3F1		X
Wheel Distance Per Revolution Driven	• Engine Power Management • Brakes and Traction Control • Vehicle Speed and Rough Road Sensing	ECM		$4F1		X
Wheel Distance Per Revolution Non Driven	• Engine Power Management • Brakes and Traction Control • Vehicle Speed and Rough Road Sensing	ECM		$4F1		X
Wheel Rotational Status Left Driven	• FWD/AWD • Engine Power Management • Starter Control • Cruise Control • Brakes and Traction • Transmission • Vehicle Speed and Rough Road Sensing		EBCM	$0C1		X

PPEI Signal Summary List						
Signal	**Defining Subsystems**	**PT TX**	**PF TX**	**Frame**	**ACC VN**	**Run/Crk VN**
Wheel Rotational Status Left Non Driven	• FWD/AWD • Engine Power Management • Starter Control • Cruise Control • Brakes and Traction • Transmission • Vehicle Speed and Rough Road Sensing		EBCM	$0C5		X
Wheel Rotational Status Right Driven	• FWD/AWD • Engine Power Management • Starter Control • Cruise Control • Brakes and Traction • Transmission • Vehicle Speed and Rough Road Sensing		EBCM	$0C1		X
Wheel Rotational Status Right Non Driven	• FWD/AWD • Engine Power Management • Starter Control • Cruise Control • Brakes and Traction • Transmission • Vehicle Speed and Rough Road Sensing		EBCM	$0C5		X
Wheel Speed Sensing Legislated Diagnostic Status	• Vehicle Speed and Rough Road Sensing		EBCM	$2F9		X

Table 14: Powertrain Expansion Bus Signal Summary List

Powertrain Expansion Bus Signal Summary List						
Signal	**Defining Subsystems**	**PT TX**	**PF TX**	**Frame**	**ACC VN**	**Run/Crk VN**
Power Pack Fan Afterrun Time	TBD	BPIM		$3F3		
High Voltage Battery Temperature Sensor 6 Validity	TBD		VITM	$3F7		
High Voltage Battery Temperature Sensor 5 Validity	TBD		VITM	$3F7		
High Voltage Battery Temperature Sensor 4 Validity	TBD		VITM	$3F7		
High Voltage Battery Temperature Sensor 3 Validity	TBD		VITM	$3F7		
High Voltage Battery Temperature Sensor 2 Validity	TBD		VITM	$3F7		
High Voltage Battery Temperature Sensor 1 Validity	TBD		VITM	$3F7		
High Voltage Battery Temperature Sensor 1	TBD		VITM	$3F7		
High Voltage Battery Temperature Sensor 2	TBD		VITM	$3F7		
High Voltage Battery Temperature Sensor 3	TBD		VITM	$3F7		
High Voltage Battery Temperature Sensor 4	TBD		VITM	$3F7		
High Voltage Battery Temperature Sensor 5	TBD		VITM	$3F7		
High Voltage Battery Temperature Sensor 6	TBD		VITM	$3F7		
High Voltage Battery Balancing Request Matrix	TBD	BPIM		$1D9		
High Voltage Battery Side Voltage Validity	TBD		VITM	$1DE		
High Voltage Battery Current Extended Range Validity	TBD		VITM	$1DE		
High Voltage Battery Current Extended Range	TBD		VITM	$1DE		
High Voltage Battery Side Voltage	TBD		VITM	$1DE		

4.2.3 GMLAN Signal Definitions.

4.2.3.1 Accelerator Actual Position, Accelerator Actual Position Validity. See Table 15.

Table 15: Accelerator Actual Position, Accelerator Actual Position Validity Signal Detail

Signal	Length	Data Type [Note 1]	Range	Conversion
Accelerator Actual Position	8	UNM	0 to 100%	E = N × 100/255
Accelerator Actual Position Validity	1	ENM	N/A	$0 = Valid; $1 = Invalid

Note 1: ENM = Enumerated, UNM = Unsigned Numeric

4.2.3.1.1 Powertrain Interface Definition. Accelerator Actual Position is transmitted by the ECM. It represents a driver intended request for power or acceleration via driver depressing the accelerator pedal only. It is the accelerator pedal position sensor interpretation, after scaling, zeroing, noise filtering, diagnosis, and failsofting. It does not include cruise control effects, nor the effect of any other driver-like inputs such as Throttle Progression Switches, driver learning, or mass/grade learning. It also does not include any filtering required for driveability or emissions. 0% shall reflect the idle or coast requested state (0% driver accelerator pedal only request). 100% shall represent a driver request for full available power, but full available power may or may not be provided. In all cases: **It is not an indication of actual power or acceleration.**

- The effects of all engine, transmission and vehicle – throttle, spark retard, or fuel shutoff torque management/limit functions (e.g., idle control, traction control, drag control, all torque management, vehicle speed governing/limiting and engine speed governing/limiting) are not reflected in this parameter.
- Throttle adjustment for engine combustion efficiency torque losses (e.g., due to Exhaust Gas Recirculation (EGR), Air-fuel ratio, and certain spark retards) is also not reflected in this parameter.
- Throttle adjustment to compensate for engine, transmission or vehicle friction, accessory loads, and torque swaps (e.g., gear losses, idle friction, a/c compensation, individual cylinder deactivation/shutoff) is not included in this parameter.
- This parameter must not vary unless the driver requests a change. It should not change with Engine speed. This parameter shall not change due to gear ratio change.

Powertrain shall capture and then calculate this parameter at a nominal rate between 10 and 20 ms with a variation of ± 2.5% and transmit every new calculation and only new calculations at the same capture/calculation rate ± 20%. By doing such, receivers of this parameter can calculate the rate of change of this parameter with an accuracy of ± 2.5%. The actual nominal rate must be defined in supplier specific section.

This parameter will always represent the actual torque output of the engine during failure mode operation. and therefore shall not ever be indicated as failed. When the accelerator pedal sensors are failed, the engine will operate in a Forced Idle Limited Authority Limp Home Mode, where Accelerator Actual Position is forced to 0, Accelerator Actual Position Validity is “Valid”, and Reduced Power Indication On is “True”. Cruise control is disabled. The vehicle is expected to remain at idle.

Input Delay: 30 ms

4.2.3.1.2 Platform Interface Definition. Accelerator Actual Position is received by Platform and is used by the Sensing and Diagnostic Module (SDM) as part of the Event Data Recorder (EDR) functionality. It may also be used by the traction control algorithms, Auto Start, Occupant Information, Belt Alternator Starter Hybrid System (BAS+) Hill Start Assist, Base Brake Control, BAS+ Auto Start, BAS+ Auto Stop and BAS+ Regenerative Brake Control.

The SDM requires this be updated at least every 1 s.

This Parameter cannot be included in any Frame that includes a send on change parameter.

4.2.3.2 Accelerator Effective Position, Accelerator Effective Position Validity. See Table 16.

Table 16: Accelerator Effective Position, Accelerator Effective Position Validity Signal Detail

Signal	Length	Data Type	Range	Conversion
Accelerator Effective Position	8	UNM	0 to 100%	E = N × 100/255
Accelerator Effective Position Validity	1	ENM	N/A	$0 = Valid; $1 = Invalid

4.2.3.2.1 Powertrain Interface Definition. Accelerator Effective Position/Validity is transmitted by the ECM and represents the larger of the driver request via the accelerator pedal (pedal position, mode switches, and other parameters as well as filtering) and the cruise control request. In addition, it may reflect alternate modes such as PTO, increases due to vehicle stability system requests, and decreases due to vehicle speed governing.

Accelerator Effective Position is a normalized 0 to 100% driver intent “vehicle response”. Zero percent (0%) shall reflect the idle or coast response. One hundred percent (100%) shall represent driver desire for maximum vehicle acceleration (with the possible exception of any transmission detent mode). Accelerator Effective Position can be generated by normalizing (at current vehicle speed) one of the following: air mass, throttle effective area, throttle position, axle torque, engine torque, diesel fuel rate, acceleration, depending on the Powertrain application.

This parameter and associated Accelerator Effective Position Validity shall always be Valid:

- When the accelerator pedal sensors have failed, the engine will operate in a Forced Idle Limited Authority Limp Home Mode, where Accelerator Actual Position is forced to zero, Accelerator Effective Position is forced to zero, Accelerator Actual Position Validity is “Valid”, Accelerator Effective Position Validity is

"Valid" and Reduced Engine Power Mode Active is "True". Cruise control and PTO are disabled. The vehicle is expected to remain stationary at idle.

- When the engine is operating in any other Limited Authority Limp Home Mode due to other system failures, Accelerator Effective Position will continue to represent the driver intended vehicle response. Under this operating mode, Accelerator Actual Position Validity is "Valid", Accelerator Effective Position Validity is "Valid" and Reduced Engine Power Mode Active is "True". Cruise control and PTO are disabled.

This is a shared PPEI/PTEI signal. Refer to the latest Powertrain Electrical Interface (PTEI) documentation for further information.

Input Delay: 25 ms

4.2.3.2.2 Platform Interface Definition. Accelerator Effective Position/Validity is received by Platform. This signal is used by the Traction control and Electronic Stability Control subsystems when alternate throttle progressions are available. This signal represents an indication of the driver's intended request for torque or acceleration.

4.2.3.3 Accelerator Pedal Override Active. See Table 17.

Table 17: Accelerator Pedal Override Active Signal Detail

Signal	Length	Data Type [Note 1]	Range	Conversion
Accelerator Pedal Override Active	1	BLN	N/A	$0 = False; $1=True

Note 1: BLN = Boolean

4.2.3.3.1 Powertrain Interface Definition. Accelerator Pedal Override Active signal is transmitted by the ECM. Accelerator Pedal Override Active shall be set to "True" when the request associated with the accelerator pedal position exceeds the current request associated with all of the following: Conventional Cruise Control, Adaptive Cruise Control Axle Torque Command: Axle Torque Request and the Platform Engine Speed Command: Engine Speed Request (used for Power Take-Off and Fast Idle systems). The Conventional Cruise Control, Adaptive Cruise Control (ACC) and Power Take-Off (PTO)/Fast Idle Control are mutually exclusive subsystems in that only one of these subsystems can be active at a time. Internal to the ECM, commands associated with inactive subsystems shall be set to reflect minimum commands, for example the lowest axle torque possible for that subsystem. This allows this signal to be properly determined regardless of which system is active. Appropriate hysteresis shall be applied to the threshold to prevent toggling of the signal during steady state conditions. Because ACC automatic braking will be released in ACC systems when Accelerator Pedal Override Active is "True", the threshold shall be selected such that the "True" state shall only be indicated when the command associated with the pedal is definitely greater than the command associated with Conventional Cruise Control, ACC or PTO/Fast Idle Control, whichever system is active. Whenever the determination is ambiguous, for example, when the accelerator pedal is released, Accelerator Pedal Override Active shall be reported as "False".

Any conditions, which would prevent the ECM from being able to properly determine the state of the Accelerator Pedal Override Active signal, shall cause the ECM to set Adaptive Cruise Control Axle Torque Command Status: Request Status to "Request Denied" and Platform Engine Speed Command Inhibit Request to "Inhibit Platform Engine Speed Control". While the ECM is unable to properly determine the state of the Accelerator Pedal Override Active signal, Accelerator Pedal Override Active shall be set to the last known valid state.

Applications that do not support any of the following subsystems: Conventional Cruise Control, ACC or Power Take-Off may still elect to send this signal. The value of the signal would be determined by comparing the command associated with the accelerator pedal against the equivalent of minimum commands associated with the unsupported subsystems.

Data Delay: 50 ms

4.2.3.3.2 Platform Interface Definition. Accelerator Pedal Override Active is received by Platform.

- **ACC Operation:** The ACC and/or EBCM modules use this information to stop ACC automatic braking operation whenever this signal is "True". This signal may also be used in its logic for illumination of brake

lights. Upon detection of a communication failure, automatic braking shall phase out and ACC shall disengage as appropriate.

- The ACC may also use this information to suspend learning during an accelerator pedal override when ACC is active.
- **Conventional Cruise Control Operation:** The Conventional Cruise Control resides entirely within the Powertrain (i.e., not used by Platform). The reason behind adding conventional cruise to the Powertrain Interface Definition was to allow the conventional cruise (within the ECM) to make use of the information to determine an accelerator pedal override. This eliminates having to create two different accelerator pedal override variables, one dedicated for conventional cruise and one relating to ACC and PTO.
- **PTO Operation:** If Accelerator Pedal Override Active is "True", the Platform uses this information to determine if a PTO engine speed override is being requested by the PTO/Fast Idle Control operator. The Platform may use this information to suspend learning during an accelerator pedal override when PTO or Fast Idle Control is active. Upon detection of a communication failure, the PTO/Fast Idle subsystem shall disengage.

4.2.3.4 Accelerator Pedal Override Active Alive Rolling Count. See Table 18.

Table 18: Accelerator Pedal Override Active Alive Rolling Count Signal Detail

Signal	Length	Data Type	Range	Conversion
Accelerator Pedal Override Active Alive Rolling Count	2	UNM	0 to 3	E = N × 1

4.2.3.4.1 Powertrain Interface Definition. Accelerator Pedal Override Active Alive Rolling Count signal is transmitted by the ECM. This Alive Rolling Count is associated with the Accelerator Pedal Override Active signal. Refer to GMW8772, PPEI Serial Data Architecture for Alive Rolling Count and Protection Value Requirements.

Input Delay: 50 ms

4.3.2.4.2 Platform Interface Definition. Accelerator Pedal Override Active Alive Rolling Count is received by Platform. When an Alive Rolling Count error is detected, the corresponding Accelerator Pedal Override Active signal shall be ignored. During this condition the receiving module(s) shall use the value of the most recent received signal accompanied by appropriate rolling count and protection value. A sliding window x of y strategy shall comprehend both Alive Rolling Count errors and Protection Value errors as defined in GMW8769, PPEI Cruise Control Algorithm Requirements. Refer to GMW8772, PPEI Serial Data Architecture for Alive Rolling Count and Protection Value Requirements.

Note: The PTO/Fast Idle subsystems do not use this signal (i.e., they consume the Accelerator Pedal Override Active signal, but do not use the Alive Rolling Count Value).

4.2.3.5 Accelerator Pedal Override Active Protection Value. See Table 19.

Table 19: Accelerator Pedal Override Active Protection Value Signal Detail

Signal	Length	Data Type	Range	Conversion
Accelerator Pedal Override Active Protection Value	2	UNM	0 to 3	E = N × 1

4.2.3.5.1 Powertrain Interface Definition. Accelerator Pedal Override Active Protection Value is transmitted by the ECM. This protection is associated with the Accelerator Pedal Override Active signal. Refer to GMW8772, PPEI Serial Data Architecture for Alive Rolling Count and Protection Value Requirements.

Data Delay: 50 ms

4.2.3.5.2 Platform Interface Definition. Accelerator Pedal Override Active Protection Value is received by Platform. When a Protection Value error is detected, the corresponding Accelerator Pedal Override Active signal shall be ignored. During this condition the receiving module(s) shall use the value of the most recent

received signal accompanied by appropriate rolling count and protection value. A sliding window x of y strategy shall comprehend both Alive Rolling Count errors and Protection Value errors as defined in GMW8769, PPEI Cruise Control Algorithm Requirements. Refer to GMW8772, PPEI Serial Data Architecture for Alive Rolling Count and Protection Value Requirements.

Note: The PTO/Fast Idle subsystems do not use this signal (i.e., they will consume the Accelerator Pedal Override Active signal without using the Protection Value).

4.2.3.6 Accelerator Pedal Power Take Off Override Active. See Table 20.

Table 20: Accelerator Pedal Power Take Off Override Active Signal Detail

Signal	Length	Data Type	Range	Conversion
Accelerator Pedal Power Take Off Override Active	1	BLN	N/A	$0 = False; $1 = True

4.2.3.6.1 Powertrain Interface Definition. Accelerator Pedal Power Take Off Override Active is received by Powertrain.

- When this signal is equal to “True”, Powertrain shall ignore the “in-cab” accelerator pedal and limit the throttle to the most recent value of the signal Platform Engine Speed Command: Platform Engine Speed Request.
- When this signal is equal to “False”, Powertrain shall allow the “in-cab” accelerator pedal to have authority over the signal Platform Engine Speed Command: Platform Engine Speed Request.

Power-up Default: “False”

Communication Failure Value: “False”

Output Actuation Delay: 38 ms (with respect to changing Powertrain internal engine control parameters)

4.2.3.6.2 Platform Interface Definition. Accelerator Pedal Power Take Off Override Active is transmitted by the PTO module when the PTO module is present, and is not transmitted when the PTO module is not present.

Note: On Fast Idle applications, the Gateway module assumes the role of the PTO module only for Fast Idle functionality; PTO functionality is not supported. Accelerator Pedal Power Take Off Override Active as follows:

- “True”, is a request to Powertrain that shall ignore the “in-cab” accelerator pedal and limit the throttle to the most recent value of the signal Platform Engine Speed Command: Platform Engine Speed Request.
- “False” is a request to Powertrain to allow any driver throttle override request via the “in-cab” accelerator pedal to have authority over the signal Platform Engine Speed Command: Platform Engine Speed Request.

4.2.3.7 Adaptive Cruise Control Active. See Table 21.

Table 21: Adaptive Cruise Control Active Signal Detail

Signal	Length	Data Type	Range	Conversion
Adaptive Cruise Control Active	1	BLN	N/A	$0 = False; $1 = True

4.2.3.7.1 Powertrain Interface Definition. Adaptive Cruise Control Active is received by Powertrain. Adaptive Cruise Control Active allows a receiving module to monitor the status of the adaptive cruise control subsystem without having to process the entire Adaptive Cruise Control Axle Torque Command signal.

Note: There is no Alive Rolling Count or protection value associated with this signal. Critical users of this information (such as the ACC Supervisory function) should instead use the Adaptive Cruise Control Axle Torque Command: Adaptive Cruise Control Active signal.

Output Actuation Delay: 50 ms

Power-Up Default: “False”

Communication Failure Value: “False”

4.2.3.7.2 Platform Interface Definition. Adaptive Cruise Control Active is transmitted by the ACC module when the ACC module is present, and is not transmitted when the ACC module is not present. This signal indicates the status of adaptive cruise control and is identical to the GMLAN signal Adaptive Cruise Control Axle Torque Command: Adaptive Cruise Control Active. This signal is "True" when ACC is active and controlling distance and/or speed. Adaptive Cruise Control Active shall be set to "False" if a failure exists in the ACC subsystem.

Data Delay: 100 ms

4.2.3.8 Adaptive Cruise Control Axle Torque Command. See Table 21a.

Table 21a: Adaptive Cruise Control Axle Torque Command Signal Detail

Signal	Length	Data Type [Note 1]	Range	Conversion
Adaptive Cruise Control Axle Torque Command	25	PKT	N/A	N/A
Adaptive Cruise Control Active	1	BLN	N/A	$0 = False; $1 = True
Adaptive Cruise Control Type	2	ENM	N/A	$0 = Adaptive Cruise Control $1 = Full Speed Range Adaptive (FSRA) Cruise Control $2 = Unused $3 = Unused
Driver Assisted Go State	2	ENM	N/A	$0 = Not Stopped $1 = Apply Accel Pedal to Go $2 = Apply Accel Pedal or Resume Switch to Go $3 = Unused
Special Re-engagement Input Required	1	BLN	N/A	$0 = False; $1 = True
Axle Torque Request	19	UNM	-22534 to 43000 N·m	E = (N/8) - 22534

Note 1: PKT = Packet, BLN = Boolean, ENM = Enumerated, UNM = Unsigned Numeric

4.2.3.8.1 Powertrain Interface Definition. Adaptive Cruise Control Axle Torque Command is received by the Powertrain.

- **B The ECM shall respond to Adaptive Cruise Control Axle Torque Command:** Axle Torque Request when Adaptive Cruise Control Active is "True" and Adaptive Cruise Control Braking Active signal is "False". The ECM shall respond, to the extent possible, to both positive and negative axle torque values transmitted in this request. Potential measures may include throttle, spark, fuel, etc. If powertrain is temporarily unable to provide the requested axle torque due to limiting or arbitration to another requesting source, this shall be communicated via the GMLAN signal Adaptive Cruise Control Axle Torque Command Status. If the Adaptive Cruise Control Braking Active signal is "True", the ECM shall respond as though ACC is requesting the minimum axle torque possible, independent of the actual value of Adaptive Cruise Control Axle Torque Command: Axle Torque Request. This minimum axle torque possible is reflected in the GMLAN signal Driver Intended Axle Torque Minimum.

  Upon detection of a communication failure, application software shall stop responding to the Adaptive Cruise Control Axle Torque Command: Axle Torque Request and disengage ACC if active by setting Adaptive Cruise Control Axle Torque Command Status: Request Status to "Request Denied" and shall not

allow ACC to be activated (by keeping Adaptive Cruise Control Axle Torque Command Status: Request Status to "Request Denied") until the following recovery conditions are satisfied. Recovery requires valid messages to be received consistently for a calibratable period of (1 to 10 s).

Note: Consistently requires no missing messages, no rolling count errors and no Protection Value errors.

- **Adaptive Cruise Control Active:** The ECM shall respond to Adaptive Cruise Control Axle Torque Command: Axle Torque Request when Adaptive Cruise Control Active is "True" and Adaptive Cruise Control Braking Active signal is "False". The ECM shall ignore Adaptive Cruise Control Axle Torque Command: Axle Torque Request when Adaptive Cruise Control Active is "False".

  Note: The subsignal Adaptive Cruise Control Active is replicated as a stand alone GMLAN signal Adaptive Cruise Control Active. This allows a receiving module to identify if ACC is active without having to process the entire Adaptive Cruise Control Axle Torque Command Signal.
- **Adaptive Cruise Control Type:** Adaptive Cruise Control Type specifies the type of ACC present on the vehicle. Full Speed Range ACC extends the operating range of conventional ACC down to a stopped vehicle condition. Full Speed Range ACC also allows resumption of control from a stopped condition following driver intervention. Refer to GMW8769, PPEI Cruise Control algorithm section for the effects of this signal on ECM operation.
- Driver Assisted Go State:
- **Not Stopped:** The ECM should respond as normal to the ACC axle torque request provided the ECM has not detected a stopped vehicle condition.
- **Apply Accel Pedal to Go:** The ECM shall ignore ACC axle torque requests until an accelerator pedal apply has been detected. This can be achieved by the ECM treating the ACC axle torque request equivalent to a request associated with a fully released accelerator pedal until an accelerator pedal apply has been detected.
- **Apply Accel Pedal or Resume Switch to Go:** The ECM shall ignore ACC axle torque requests until either an accelerator pedal or Resume Switch apply has been detected. This can be achieved by the ECM treating the ACC axle torque request equivalent to a request associated with a fully released accelerator pedal until an accelerator pedal or Resume Switch apply has been detected.
- Special Re-engagement Input Required: When this subsignal is "True", powertrain shall only allow re-engagements via the Set Switch. Re-engagements via the Resume Switch shall be ignored.

  Note: This functionality is part of the supervisory function within the powertrain.

This subsignal shall be set the "False" for all non-FSRA applications.

Power-Up Default:	Adaptive Cruise Control Active:	"False"
	Adaptive Cruise Control Type:	Adaptive Cruise Control
	Axle Torque Request:	0 N·m
	Driver Assisted Go State:	Not Stopped
	Special Re-engagement Input Required:	"False"

Communication Failure Value: Notify Application, refer to GMW8769, PPEI Cruise Control algorithm section.

Output Actuation Delay: 50 ms

4.2.3.8.2 Platform Interface Definition. Adaptive Cruise Control Axle Torque Command is transmitted by the ACC module when the ACC module is present, and is not sent when the ACC module is not present. There is no dedicated validity signal in the Adaptive Cruise Control Axle Torque Command packet. Instead if the ACC module is not able to calculate a valid value for the signals within the packet, the ACC module is expected to substitute appropriate values when a validity bit would have been set.

- Axle Torque Request: This subsignal represents a request from the ACC module to adjust the current vehicle speed when Adaptive Cruise Control Active is set to $1 = "True". This request applies only to the powertrain delivered axle torque and will be biased by the ACC module's closed loop control to account for external disturbances such as road grade, changes in vehicle mass, etc.
- Adaptive Cruise Control Active: This subsignal is "True" when ACC is active and controlling distance and/or speed. Note this subsignal is replicated in the GMLAN signal Adaptive Cruise Control Active.

- Adaptive Cruise Control Type: This subsignal defines which Adaptive Cruise Control type is present, conventional ACC or Full Speed Range Adaptive (FSRA).
- Driver Assisted Go State:
- **Not Stopped:** The ACC module believes the ACC vehicle is not stopped and the ECM should respond as normal to the ACC axle torque request.
- **Apply Accel Pedal to Go:** The ACC module believes the ACC vehicle is stopped and requires the ECM seeing an accelerator pedal apply prior to honoring ACC axle torque request.
- **Apply Accel Pedal or Resume Switch to Go:** The ACC module believes the ACC vehicle is stopped and requires the ECM seeing either an accelerator pedal or Resume Switch apply prior to honoring ACC axle torque request.
- **Special Re-engagement Input Required**: This subsignal is "True" when FSRA requires a special driver input to re-engage. Currently, special re-engagement is defined as requiring Set Switch input.
- This subsignal shall be set to "False" for all non-FSRA applications.

Data Delay: 100 ms

4.2.3.9 Adaptive Cruise Control Axle Torque Command Protection. See Table 22.

Table 22: Adaptive Cruise Control Axle Torque Command Signal Detail

Signal	Length	Data Type	Range	Conversion
Adaptive Cruise Control Axle Torque Command Protection	25	UNM	0 to 335 544 31	E = N × 1

4.2.3.9.1 Powertrain Interface Definition. Adaptive Cruise Control Axle Torque Command Protection is received by Powertrain. When a Protection Value error is detected, the corresponding Adaptive Cruise Control Axle Torque Command shall be ignored, i.e., the previously accepted data shall be used. A sliding window x of y strategy shall comprehend both Alive Rolling Count errors and Protection Value errors as defined in GMW8769, PPEI Cruise Control Algorithm Requirements. Refer to GMW8772, PPEI Serial Data Architecture Alive Rolling Count and Protection Value Requirements.

4.2.3.9.2 Platform Interface Definition. Adaptive Cruise Control Axle Torque Command Protection is transmitted by the ACC module when the ACC module is present, and is not sent when the ACC module is not present. This protection is associated with the Adaptive Cruise Control Axle Torque Command signal. Refer to GMW8772, PPEI Serial Data Architecture Alive Rolling Count and Protection Value Requirements.

Data Delay: 100 ms

4.2.3.10 Adaptive Cruise Control Axle Torque Command Status. See Table 23.

Table 23: Adaptive Cruise Controm Axle Torque Command Status Signal Detail

Signal	Length	Data Type	Range	Conversion
Adaptive Cruise Control Axle Torque Command Status	5	PKT	N/A	N/A
Request Status	3	ENM	N/A	$0 = No Request $1 = Request Honored $2 = Lost Arbitration $3 = Request Denied $4 = Request Suspended Until Driver Input $5 = Unused $6 = Unused $7 = Unused
Limiting Status	2	ENM	N/A	$0 = Request Not Limited $1 = Request Value Limited Minimum $2 = Request Value Limited Maximum $3 = Request Rate Limited

4.2.3.10.1 Powertrain Interface Definition. Adaptive Cruise Control Axle Torque Command Status is transmitted by Powertrain. This signal provides feedback to the requesting function indicating how Powertrain is responding to the GMLAN signal Adaptive Cruise Control Axle Torque Command.

4.2.3.10.1.1 Request Status. This subsignal indicates the status of the axle torque request from the ACC module. The meanings of the various states are:

- **No Request:** Powertrain does not recognize ACC (type of ACC indicated in GMLAN signal Adaptive Cruise Control Axle Torque Command: Adaptive Cruise Control Type) as being active therefore any axle torque request from ACC is being ignored.
- **Request Honored:** Powertrain recognizes a valid axle torque request from ACC and is responding to it. Note that Powertrain may not be delivering the requested axle torque value due to various limiting functions. Examples of limiting functions are idle or the accelerator pedal. Any limiting will be conveyed in the Limiting Status subsignal defined below.
- **Lost Arbitration:** This state indicates the axle torque request has lost arbitration to another source. Lost arbitration represents interventions of a brief nature, e.g., traction control, VSES, Drag control, transmission shifts, etc. Arbitration can be lost to both torque increasing and torque decreasing functions. This signal does not indicate whether arbitration was lost to an increasing or decreasing function. It is recommended ACC freeze an associated integral function while this Lost Arbitration is active, since Powertrain is not currently controlling to GMLAN signal Adaptive Cruise Control Axle Torque Command.
- **Request Denied:** This state indicates when Powertrain is not honoring the ACC axle torque request and believes ACC should not be engaged disengaging or preventing engagement of ACC. While this signal is active, Powertrain will ignore any axle torque request from ACC/FSRA. The criteria monitored by the ECM determining this state related disengagement criteria are defined in the applicable ACC Subsystem Technical Specification as well as PPEI. Any related ACC disengagement criteria associated with the TCM is to be recognized by the ECM and reflected through this state signal.
- **Request Suspended Until Driver Input:** This state indicates the ECM is ignoring ACC axle torque requests until a valid driver input has been detected.

4.2.3.10.1.2 Limiting Status. This subsignal indicates whether the axle torque request is being limited and provides information as to how any limit is applied. The Limiting Status subsignal is only applicable when Adaptive Cruise Control Axle Torque Command Status: Request Status is set to “Request Honored”. When Adaptive Cruise Control Axle Torque Command Status: Request Status is not set to “Request Honored”, Adaptive Cruise Control Axle Torque Command Status: Limiting Status shall be set to “Request Not Limited”.

- **Request Not Limited:** No limit is currently applied to the request. When Adaptive Cruise Control Axle Torque Command Status: Request Status is “Request Honored” and Adaptive Cruise Control Axle Torque Command Status: Limited Status is set to “Request Not Limited”, Powertrain is expected to deliver the requested axle torque.
- **Request Value Limited “Minimum”:** The request is currently being limited to a minimum value. An example of this would be when the adaptive cruise control axle torque request drops below the equivalent axle torque request associated with idle. Another example is the adaptive cruise control axle torque request dropping below the axle torque request associated with the accelerator pedal. Providing this feedback allows the requesting subsystem to recognize when the system response is limited. ACC/FSRA can then prevent the closed loop integral term from learning down since no further response is available in that direction. However the integral term could still be allowed to learn up while Adaptive Cruise Control Axle Torque Command Status: Limiting Status is set to “Request Value Limited Minimum”.
- **Request Value Limited “Maximum”:** The request is currently being limited to a maximum value. An example of this would be when the adaptive cruise control axle torque request goes above the threshold for axle protection or the threshold for transmission protection. Providing this feedback allows the requesting subsystem, ACC/FSRA, to recognize when the system response is limited. ACC/FSRA can then prevent the closed loop integral term from learning up since no further response is available in that direction. However the integral term could still be allowed to learn down while Adaptive Cruise Control Axle Torque Command Status: Limiting Status is set to “Request Value Limited Maximum”.
- **Request Rate Limited:** The request is currently being rate limited by Powertrain. The rate limiting function only applies to an increasing torque. The rate limiting function prevents overly abrupt increases in the axle torque delivered. The rate limiting function offers protection from certain failure modes and should not become active during normal ACC/FSRA operation.

4.2.3.10.2 Platform Interface Definition. Adaptive Cruise Control Axle Torque Command Status is received by the ACC module. This signal provides feedback indicating how Powertrain is responding to the GMLAN signal Adaptive Cruise Control Axle Torque Command. This feedback can be used by ACC to adjust its closed loop control.

4.2.3.10.2.1 Request Status. This subsignal indicates the status of the axle torque request from the ACC module. The meanings of the various states are:

- **No Request:** This state indicates Powertrain does not recognize ACC as being active. Refer to GMW8769, PPEI Cruise Control algorithm for the ACC reaction if this signal is received as “No Request” while ACC is indicating that ACC is active as indicated by GMLAN signal Adaptive Cruise Control Axle Torque Command: Adaptive Cruise Control Active being “True”.
- **Request Honored:** This state indicates ACC needs to look at Adaptive Cruise Control Axle Torque Command Status: Limited Status to determine if Powertrain is delivering the requested torque or applying any limiting.
- **Lost Arbitration:** This state indicates Powertrain is not responding to the ACC requested axle torque because another requestor has won arbitration. The ACC module shall determine whether to disengage ACC potentially based on Request Status being “Lost Arbitration” for a calibratable period of time. ACC may also use this information for its control, for example, to freeze any integral term.
- **Request Denied:** This state indicates Powertrain believes ACC should not be engaged. ACC shall not allow engagement if Request Status is “Request Denied” and shall disengage ACC if ACC is active when Request Status becomes “Request Denied”.
- **Request Suspended Until Driver Input:** This state indicates the ECM is ignoring ACC axle torque requests because the vehicle is considered stopped and the ECM is waiting for a valid driver input.

4.2.3.10.2.2 Limiting Status. This subsignal indicates whether the axle torque request is being limited and provides information to help ACC decide how to respond to the limiting.

- **Request Not Limited:** This state indicates that no limiting is being applied. When Adaptive Cruise Control Axle Torque Command Status: Request Status is ‘Request Honored” and Adaptive Cruise Control Axle Torque Command Status: Limited Status is set to “Request Not Limited”, Powertrain is expected to deliver the requested axle torque.
- **Request Value Limited “Minimum”:** This state indicates that the ACC request is currently being limited to a minimum value. While Adaptive Cruise Control Axle Torque Command Status: Limiting Status is set to

"Request Value Limited Minimum": ACC may want to prevent the closed loop integral term from learning down since no further response is available in that direction. However the integral term could still be allowed to learn up while Adaptive Cruise Control Axle Torque Command Status: Limiting Status is set to "Request Value Limited Minimum".

- **Request Value Limited "Maximum":** This state indicates that the ACC request is currently being limited to a maximum value. While Adaptive Cruise Control Axle Torque Command Status: Limiting Status is set to "Request Value Limited Maximum". ACC may want to prevent the closed loop integral term from learning up since no further response is available in that direction. However the integral term could still be allowed to learn down while Adaptive Cruise Control Axle Torque Command Status: Limiting Status is set to "Request Value Limited Maximum".
- **Request Rate Limited:** This state indicates that the ACC request is currently being rate limited by the Powertrain. The rate limiting function offers protection from certain failure modes and should not become active during normal ACC operation. The ACC module shall determine whether to disengage ACC potentially based on Limiting Status being "Request Rate Limited" for a calibratable period of time.

Failsoft Action: TBD.

Actuation Delay: TBD.

4.2.3.11 Adaptive Cruise Control Braking Active. See Table 24.

Table 24: Adaptive Cruise Control Braking Active Signal Detail

Signal	Length	Data Type	Range	Conversion
Adaptive Cruise Control Braking Active	1	BLN	N/A	$0 = False; $1 = True

4.2.3.11.1 Powertrain Interface Definition. Adaptive Cruise Control Braking Active is received by Powertrain. If the signal is set to "True", ECM shall be in a released throttle state, relative to any ACC request. This is necessary to avoid a condition where the ECM might begin opening throttle while the brakes are applied, causing the two systems to fight each other. The TCM may use this signal in the TCC release algorithm. The TCM may activate the downgrade braking function (if available) during an automatic braking event (Adaptive Cruise Control Braking Active is "True").

Output Actuation Delay (for ECM throttle release): 50 ms

4.2.3.11.2 Platform Interface Definition. Adaptive Cruise Control Braking Active is transmitted by the EBCM if that module is present, otherwise it is not transmitted. This signal is set to "True" when the EBCM takes control of achieving the Adaptive Cruise Control Acceleration Request.

On vehicles that do not support Adaptive Cruise Control this signal shall always be sent with a data value of "False".

Data Delay: 30 ms

4.2.3.12 Adaptive Cruise Control Command Alive Rolling Count. See Table 25.

Table 25: Adaptive Cruise Control Command Alive Rolling Count Signal Detail

Signal	Length	Data Type	Range	Conversion
Adaptive Cruise Control Command Alive Rolling Count	2	UNM	0 to 3	E = N × 1

4.2.3.12.1 Powertrain Interface Definition. Adaptive Cruise Control Command Alive Rolling Count is received by Powertrain. When an Alive Rolling Count error is detected, the corresponding Adaptive Cruise Control Axle Torque Command shall be ignored, i.e., the previously accepted data shall be used. A sliding window x of y strategy shall comprehend both Alive Rolling Count errors and Protection Value errors as defined in GMW8769, PPEI Cruise Control Algorithm Requirements. Refer to GMW8772, PPEI Serial Data Architecture Alive Rolling Count and Protection Value Requirements.

4.2.3.12.2 Platform Interface Definition. Adaptive Cruise Control Command Alive Rolling Count is transmitted by the ACC module when it is present, and is not sent when the ACC module is not present. This Alive Rolling Count is associated with the Adaptive Cruise Control Axle Torque Command signal. Refer to GMW8772, PPEI Serial Data Architecture Alive Rolling Count and Protection Value Requirements.

Data Delay: 100 ms

4.2.3.13 Advanced Fuel Flow Estimate. See Table 26.

Table 26: Advanced Fuel Flow Estimate Signal Detail

Signal	Length	Data Type	Range	Conversion
Advanced Fuel Flow Estimate	16	UNM	0 to 63.999 023 g/s	E = N/1024

4.2.3.13.1 Powertrain Interface Definition. Advanced Fuel Flow Estimate is transmitted by the ECM. It is an estimate of fuel flow derived from a prediction of future engine airflow requirements and the most recent calculated A/F ratio. The airflow estimate in this case is based on the desired (not actual) throttle area. The Advanced Fuel Flow Estimate is intended to provide an indication of engine fuel flow consumption roughly 50 to 100 ms sooner than the Instantaneous Fuel Flow Estimate can provide. This is possible as the “desired” throttle positions (with Electronic Throttle Control (ETC) systems) “leads” actual throttle blade movement.

Data Delay: 12.5 ms

4.2.3.13.2 Platform Interface Definition. Advanced Fuel Flow Estimate is received by the FSCM. This signal is a throttle position based advance estimate of fuel flow. Fuel system latency (i.e., the time it takes for the fuel system to react to changes in fuel flow) requires the use of an Advanced Fuel Flow Estimate to adjust the fuel pump duty cycle in anticipation of changes in fuel flow demand.

4.2.3.14 Airbag Deployed. See Table 27.

Table 27: Airbag Deplayed Signal Detail

Signal	Length	Data Type	Range	Conversion
Airbag Deployed	1	BLN	N/A	$0 = False; $1 = True

4.2.3.14.1 Powertrain Interface Definition. Airbag Deployed is received by Powertrain. This signal is used in the Post Collision Fuel Shut Off algorithm and for the disengagement of cruise control. The source of this signal shall be monitored by the Airbag Virtual Device Availability signal.

This signal may also be used for BAS+ High Voltage Contactor Control.

Power-Up Default: “False”

Communication Failure Value: “False”

4.2.3.14.2 Platform Interface Definition. Airbag Deployed is transmitted by Platform. Platform reports to Powertrain the state of the first airbag deployment. This signal Airbag Deployed is set to “True” upon physical deployment of airbag(s) and remains “True” as specified by the Global Occupant Protection Subsystem Technical Specification.

Data Delay: TBD.

4.2.3.15 Airbag Virtual Device Availability. See Table 28.

Table 28: Airbag Virtual Device Availablilty Signal Detail

Signal	Length	Data Type	Range	Conversion
Airbag Virtual Device Availability	1	ENM	N/A	$0 = Virtual Device Unavailable $1 = Virtual Device Available

4.2.3.15.1 Powertrain Interface Definition. Airbag Virtual Device Availability is received by Powertrain. If the value of this signal is "Virtual Device Unavailable", then the Airbag Deployed signal shall be defaulted to "False" within the powertrain controller for the Post Collision Fuel Shut Off Algorithm. Refer to GMW8779 for further definition of this algorithm.

This signal may also be used for BAS+ High Voltage Contactor Control.

Power-Up Default: "Virtual Device Available"

Communication Failure Value: "Virtual Device Unavailable"

4.2.3.15.2 Platform Interface Definition. Airbag Virtual Device Availability is transmitted by Platform. If the Airbag Deployed signal is transmitted to Powertrain through a gateway, then the Airbag Virtual Device Availability signal indicates the availability of the source of the Airbag Deployed and Notification Event Severity Status signals based on signal supervision. Refer to GMW8772, PPEI Serial Data Architecture Requirements for additional information on Virtual Device Availability signals.

Data Delay: TBD.

4.2.3.16 Air Conditioning Compressor Command. See Table 29.

Table 29: Air Conditioning Compressor Command Signal Detail

Signal	Length	Data Type	Range	Conversion
Air Conditioning Compressor Command	1	ENM	N/A	$0 = Off; $1 = On

4.2.3.16.1 Powertrain Interface Definition. Air Conditioning Compressor Command is transmitted by Powertrain. For A/C systems with an A/C relay, Powertrain reports to Platform the final commanded state of the A/C Compressor relay output driver. For systems without an A/C relay, this signal shall serve as a command or a permission to the HVAC controller to turn "Off" or "On" the compressor. Refer to GMW8771, PPEI Air Conditioning Compressor Control Algorithm for more detailed algorithm information.

On vehicles equipped with fixed displacement compressors, the A/C Compressor Relay may be enabled by Powertrain to engage the A/C clutch during engine crank for A/C Slugging prevention.

On all compressor system types with an A/C compressor relay, Powertrain shall de-energize the A/C relay to protect the compressor for high engine speed, low or high A/C pressures and low or high voltages. The A/C compressor relay may also be de-energized by Powertrain to disengage the compressor due to high coolant temperature to improve cooling system performance, to disengage the compressor during emission diagnostic tests and to disengage the compressor for engine performance reasons. For the above reasons, on A/C systems without an A/C compressor (i.e., electronically controlled variable displacement (ECVD) compressor systems), Powertrain shall also use this signal to request Platform to disengage and engage the A/C compressor. Refer to GMW8771, PPEI Air Conditioning Compressor Control Algorithm for more information.

Data Delay: 300 ms

4.2.3.16.2 Platform Interface Definition. Air Conditioning Compressor Command is received by the Gateway. If an A/C relay is present, this signal is used as feedback to indicate any differences between the desired and actual state of the A/C relay. Knowing the actual state of the A/C relay will avoid potential out of synchronization conditions (e.g., Platform assuming the A/C Relay is commanded "On" when it is actually commanded "Off"). If the relay is not present, the signal is a permission/command to Platform. Platform is requested to follow the state of the signal to turn off the compressor with the signal is equal to "Off". If the signal is equal "On", the Platform is allowed to enable the compressor. Refer to GMW8771, PPEI Air Conditioning Compressor Control Algorithm for more detailed algorithm information.

The Gateway Power-up Default Value shall be "Off".

4.2.3.17 Air Conditioning Compressor Engine Run Request. See Table 30.

Table 30: Air Conditioning Compressor Engine Run Request Signal Detail

Signal	Length	Data Type	Range	Conversion
Air Conditioning Compressor Engine Run Request	2	ENM	N/A	$0 = No Action $1 = Engine Run Requested

4.2.3.17.1 Powertrain Interface Definition. Air Conditioning Compressor Engine Run Request is received by Powertrain. This signal is used for BAS+ Air Conditioning Compressor Control, BAS+ Auto Start, BAS+ Auto Stop.

4.2.3.17.2 Platform Interface Definition. Air Conditioning Compressor Engine Run Request is transmitted by the Gateway. Air Conditioning Compressor Engine Run Request is a gatewayed signal from the ECC to inform Powertrain that the engine is needed to run the compressor. This signal is typically used in hybrid applications.

4.2.3.18 Air Conditioning Compressor Failed On. See Table 31.

Table 31: Air Conditioning Compressor Failed On Signal Detail

Signal	Length	Data Type	Range	Conversion
Air Conditioning Compressor Failed On	1	BLN	N/A	$0 = False; $1 = True

4.2.3.18.1 Powertrain Interface Definition. Air Conditioning Compressor Failed On is received by Powertrain. This signal is used by Powertrain to determine whether the compressor has failed to the “On” state. If this signal is “True”, Powertrain shall take action to disable the compressor by deactivating the output “A/C Compressor Control”.

The Default Data Value of “False” shall be assumed by Powertrain electronics if the following conditions are present:

- Serial data failure detected.
- When Air Conditioning Compressor System Virtual Device Availability = “Virtual Device Unavailable”.

4.2.3.18.2 Platform Interface Definition. Air Conditioning Compressor Failed On is transmitted by the Gateway. If the vehicle is not equipped with an Electronically Controlled Variable Displacement compressor, this signal shall be transmitted with a value of “False”. The signal provides the status of whether the compressor has failed to the “On” state, and when set to “True” shall indicate a related HVAC Diagnostic Trouble Code (DTC) has been set.

The source of this signal shall be monitored by the Air Conditioning Compressor System Virtual Device Availability signal when electronic climate control is available on the vehicle.

Gateway Power-up Default Value shall be “False”. If Platform has not determined the presence of an A/C compressor system or if no A/C compressor system is present on the vehicle, this signal shall be transmitted with the default value.

Note: The initial transmissions of this signal may contain the default value during the vehicle power-up sequence.

Refer to GMW8771, PPEI Air Conditioning Compressor Control Algorithm for details of the operation of this signal.

Data Delay: 130 ms

4.2.3.19 Air Conditioning Compressor Mode Request. See Table 32.

Table 32: Air Conditioning Compressor Mode Request Signal Detail

Signal	Length	Data Type	Range	Conversion
Air Conditioning Compressor Mode Request	2	ENM	N/A	$0 = Disengage Immediately $1 = Disengage $2 = Engage

4.2.3.19.1 Powertrain Interface Definition. Air Conditioning Compressor Mode Request is received by Powertrain. Powertrain uses the request from the Platform to determine the state of the Air Conditioning Compressor Control, reference GMW8771, PPEI Air Conditioning Compressor Control Algorithm Requirements.

4.2.3.19.2 Platform Interface Definition. Air Conditioning Compressor Mode Request is transmitted by the Gateway. Platform reports to Powertrain a request to engage the A/C Compressor Relay by using the state encoded data byte values below. If air conditioning is not present on the vehicle, the data value of the Air Conditioning Compressor Mode Request shall always be set to "Disengage Immediately".

- **$0:Disengage Immediately:** This state indicates the A/C Compressor must be disengaged due to compressor protections (high side pressure spike) (Platform-optional). Powertrain may not delay this disengage for more than 300 ms after receipt of this message. Powertrain does not do any load management upon receipt of this state and will immediately disengage the compressor (this could lead to engine speed flares).
- **$1:Disengage:** This state indicates that Platform has determined the compressor should be disengaged due to: 1) Occupant request or 2) Climate control (evaporator temperature control) or low priority compressor protection (coolant overtemperature, low refrigerant charge, ambient undertemperature) Powertrain may delay compressor disengage during transmission shifts for no longer than 2.5 s.
- **$2:Engage:** This state indicates that Platform has determined that A/C Compressor operation is allowed. This request is determined from: 1) Occupant request, 2) Climate control (when present), and 3) Platform-executed compressor protections (Platform Optional).

Power-Up Default: "Disengage Immediately".

Low Speed Communication or Hardwire Request Input Failure Value: "Disengage Immediately".

4.2.3.20 Air Conditioning Compressor Normalized Load, Air Conditioning Compressor Normalized Load Validity. See Table 33.

Table 33: Air Conditioning Compressor Normalized Load, Air Conditioning Compressor Normalized Load Validity Signal Detail

Signal	Length	Data Type	Range	Conversion
Air Conditioning Compressor Normalized Load	8	UNM	0.0 to 25.5 dm^3/minute	E = N × 0.1
Air Conditioning Compressor Normalized Torque Validity	1	ENM	N/A	$0 = Valid; $1 = Invalid

4.2.3.20.1 Powertrain Interface Definition. Air Conditioning Compressor Normalized Load is received by Powertrain. Air Conditioning Compressor Normalized Load is used as an input to the idle and engine speed control system in order to calculate total engine output torque requirements. Refer to GMW8771, PPEI Air Conditioning Compressor Control Algorithm Requirements for more information.

In case of Air Conditioning Compressor Normalized Load Validity equal to "Invalid", Powertrain shall transmit Air Conditioning Compressor Normalized Load Gradient Allowed equal to a "minimum" value (which will not affect engine performance) until the validity bit recovers to "Valid".

This signal is also used for BAS+ Regenerative Brake Control.

The source of these signals shall be monitored by the Air Conditioning Compressor System Virtual Device Availability signal when electronic climate control is available on the vehicle.

The Default Data Values of 0.0 dm^3/minute and "Valid" respectively, shall be assumed by Powertrain electronics if either of the following conditions is present:

- Serial Data Failure detected
- When Air Conditioning Compressor System Virtual Device Availability = "Virtual Device Unavailable"

4.2.3.20.2 Platform Interface Definition. Air Conditioning Compressor Normalized Load and Air Conditioning Compressor Normalized Load Validity are transmitted by the Gateway. These signals are used to calculate the component of engine torque output (crankshaft) resulting from the A/C compressor. Air Conditioning Compressor Normalized Load Validity shall be set to "Invalid" if a system failure exists, such that needed information required for the normalized load calculation is missing. For all other conditions (i.e., A/C compressor engagement transition), the Air Conditioning Compressor Normalized Load Validity shall be set to "Valid".

For details of the operation of this signal refer to GMW8771, PPEI Air Conditioning Compressor Control Algorithm Requirements.

Gateway Power-up Default Values shall be 0 and "Valid", respectively. If Platform has not determined the presence of an A/C compressor system, or if no A/C compressor system is present on the vehicle, these signals shall be transmitted with their default values.

Note: The initial transmissions of these signals may contain the default states during the vehicle power-up sequence.

Data Delay: 30 ms

4.2.3.21 Air Conditioning Compressor Normalized Load Gradient Allowed. See Table 34.

Table 34: Air Conditioning Compressor Normalized Load Gradient Allowed Signal Detail

Signal	Length	Data Type	Range	Conversion
Air Conditioning Compressor Normalized Load Gradient Allowed	8	UNM	0 to 25.5 (dm^3/minute)/s	E = N × 0.1

4.2.3.21.1 Powertrain Interface Definition. Air Conditioning Compressor Normalized Load Gradient Allowed is always transmitted by the ECM. Calculation of this signal is required only for Electronically Controlled Variable Displacement (ECVD) A/C compressor systems. For non-ECVD A/C system, a default data value of 0.0 (dm^3/minute)/s shall be transmitted. For normal ECVD compressor operation, this signal shall reflect the maximum rate in AC compressor load change. A signal value of near the maximum range (i.e., 25.5 (dm^3/minute)/s) shall reflect a request by the ECM to disable the compressor load as quickly as possible.

For details of the operation of this signal, refer to GMW8771, PPEI Air Conditioning Compressor Control Algorithm Requirements.

Data Delay: 300 ms

4.2.3.21.2 Platform Interface Definition. Air Conditioning Compressor Normalized Load Gradient Allowed is received by the Gateway. This signal is used by Platform ECVD A/C compressor systems. The ECVD compressor Platform electronics shall control the A/C compressor stroke signal, such that the compressor normalized load never exceeds the value provided by this signal.

4.2.3.22 Air Conditioning Compressor System Virtual Device Availability. See Table 35.

Table 35: Air Conditioning Compressor System Virtual Device Availability Signal Detail

Signal	Length	Data Type	Range	Conversion
Air Conditioning Compressor System Virtual Device Availability	1	ENM	N/A	$0 = Virtual Device Unavailable $1 = Virtual Device Available

4.2.3.22.1 Powertrain Interface Definition. Air Conditioning Compressor System Virtual Device Availability is received by Powertrain. Powertrain uses this signal to determine proper operation of A/C compressor in the event of a failure with the original source of the signal: Air Conditioning Compressor Mode Request.

Data Delay: 150 ms

4.2.3.22.2 Platform Interface Definition. Air Conditioning Compressor System Virtual Device Availability is transmitted by the Gateway. This signal represents the availability from the original source of the information provided by Air Conditioning Compressor Mode Request. This signal is always transmitted by the Gateway. This requirement applies to electronic climate control, manual climate control or when no climate control is present on the vehicle.

For electronic climate control, the Gateway module determines the availability of the Air Conditioning Compressor Mode Request based on signal supervision. When the Gateway module reads the climate control switches for manual climate control systems, Air Conditioning Compressor System Virtual Device Availability shall default to “Virtual Device Available”.

When no climate control is present on the vehicle, Air Conditioning Compressor System Virtual Device Availability shall default to “Virtual Device Unavailable”.

Refer to GMW8772, PPEI Serial Data Architecture requirements for more information on Virtual Device Availability signals.

4.2.3.23 Air Conditioning Compressor Type. See Table 36.

Table 36: Airconditioning Compressor Type Signal Detail

Signal	Length	Data Type	Range	Conversion
Air Conditioning Compressor Type	3	ENM	N/A	$0 = None $1 = Fixed Displacement Clutched $2 = Variable Displacement Mechanical $3 = Variable Displacement Electronic $4 = Electric Motor Driven $5 = Reserved $6 = Reserved $7 = Reserved

4.2.3.23.1 Powertrain Interface Definition. Air Conditioning Compressor Type is received by Powertrain. The signal is used to determine the compressor system type present on the vehicle and the expected messaging.

Refer to GMW8771, PPEI Air Conditioning Compressor Control Algorithm Requirements – Air Conditioning Compressor Type for more information.

4.2.3.23.2 Platform Interface Definition. Air Conditioning Compressor Type is transmitted by the Gateway module. Platform uses this signal to indicate the type of air conditioning compressor present on the vehicle.

Power-Up Default: “None”.

Reference GMW8771, PPEI Air Conditioning Compressor Control Algorithm Requirements – Air Conditioning Compressor Type for more information.

Data Delay: 1030 ms

4.2.3.24 Air Conditioning Off Indication On. See Table 37.

Table 37: Air Conditioning Off Indication On Signal Detail

Signal	Length	Data Type	Range	Conversion
Air Conditioning Off Indication On	1	BLN	N/A	$0 = False: $1 = True

4.2.3.24.1 Powertrain Interface Definition. Air Conditioning Off Indication On is transmitted by Powertrain. The data value of this signal is set to "True" if the Compressor Control Algorithm is commanding the compressor off (i.e., Air Condition Compressor Command equal to "Off") due to high coolant temperature. Refer to GMW8770, PPEI Cooling Fan Control Algorithm Requirements. For ECVD systems, the Air Conditioning Compressor Command equal "Off" and Air Conditioning Off Indication On equal to "True" indicates the Powertrain controller is requesting that the HVAC Platform controller disable the compressor. Refer to GMW8771, PPEI Air Conditioning Compressor Control Algorithm Requirements.

Data Delay: 1000 ms

4.2.3.24.2 Platform Interface Definition. Air Conditioning Off Indication On is used for display purposes to indicate when Air Conditioning has been turned off for compressor protection due to high engine coolant temperature.

4.2.3.25 Air Conditioning Refrigerant High Side Fluid Pressure, Air Conditioning Refrigerant High Side Fluid Pressure Validity. See Table 38.

Table 38: Air Conditioning Refrigerant High Side Fluid Pressure, Air Conditioning Refrigerant High Side Fluid Pressure Validity Signal Detail

Signal	Length	Data Type	Range	Conversion
Air Conditioning Refrigerant High Side Fluid Pressure	8	UNM	0 to 3570 kPa·g	E = N × 14
Air Conditioning Refrigerant High Side Fluid Pressure Validity	1	ENM	N/A	$0 = Valid; $1 = Invalid

4.2.3.25.1 Powertrain Interface Definition. Air Conditioning Refrigerant High Side Fluid Pressure is transmitted by Powertrain. It is the filtered pressure read from the high pressure side of the refrigerant system. Air Conditioning Refrigerant High Side Fluid Pressure Validity shall be set to "Invalid" if the sensor providing the data has failed and a backup value cannot be determined and a corresponding DTC has been set.

Data Delay: 1025 ms

Accuracy Requirement: Refer to GMW8771, PPEI Air Conditioning Compressor Control Subsystem Requirements.

4.2.3.25.2 Platform Interface Definition. Air Conditioning Refrigerant High Side Fluid Pressure is received by the Gateway.

The data in Air Conditioning Refrigerant High Side Fluid Pressure shall be ignored if Air Conditioning Refrigerant High Side Fluid Pressure Validity is set to "Invalid".

4.2.3.26 Alternative Fuel Acceleration Warning Active. See Table 39.

Table 39: Alternative Fuel Acceleration Warning Active Signal Detail

Signal	Bit Length	Data Type	Range	Conversion
Alternative Fuel Acceleration Warning Active	1	BLN	N/A	$0 = False; $1 = True

4.2.3.26.1 Powertrain Interface Definition. Alternative Fuel Acceleration Warning Active is transmitted by Powertrain. Alternative Fuel stands for Compressed Natural Gas (CNG) and Liquefied Petroleum Gas (LPG). The signal shall be set on "True" as long as the acceleration warning is active. The acceleration warning is depending on the engine coolant temperature (e.g., <+50°C).

4.2.3.26.2 Platform Interface Definition. Alternative Fuel Acceleration Warning Active is received by Platform. It is used to warn the driver that the expected Powertrain response might currently not be achievable and that misfire might occur, if the driver ignores the warning and the accelerator pedal is fully depressed.

4.2.3.27 Alternative Fuel Level Low. See Table 40.

Table 40: Alternative Fuel Level Low Signal Detail

Signal	Bit Length	Data Type	Range	Conversion
Alternative Fuel Level Low	1	BLN	N/A	$0 = False; $1 = True

4.2.3.27.1 Powertrain Interface Definition. Alternative Fuel Level Low is transmitted by Powertrain. Alternative Fuel stands for CNG and LPG. The signal shall be "True" when Powertrain has determined that the corresponding low fuel level threshold was exceeded.

4.2.3.27.2 Platform Interface Definition. Alternative Fuel Level Low is received by Platform. It is used for indication of a low fuel level.

4.2.3.28 Alternative Fuel Mode Request Denied Indication On. See Table 41.

Table 41: Alternative Fuel Mode Request Denied Indication On Signal Detail

Signal	Bit Length	Data Type	Range	Conversion
Alternative Fuel Mode Request Denied Indication On	1	BLN	N/A	$0 = False; $1 = True

4.2.3.28.1 Powertrain Interface Definition. Alternative Fuel Mode Request Denied Indication On is transmitted by Powertrain. Alternative Fuel stands for CNG and LPG. The data value of this signal shall be set to "True" when the driver requests a fuel mode that cannot be granted due to current fuel resources or pending fuel supply/fuel injection malfunctions. The following scenarios that may result in a denied request, but are not limited to:

- Selecting the alternative fuel mode, but the alternative fuel tank is empty.
- Selecting the alternative fuel mode, but a pending malfunction is detected in the alternative fuel path.
- Selecting the gasoline fuel mode, but the gasoline fuel tank is empty.
- Selecting the gasoline fuel mode, but a pending malfunction is detected in the gasoline fuel path.

Once "True", this parameter shall remain "True" for at least 500 ms. Applications that do not support Alternative Fuel Modes shall always send this signal with a data value of "False".

4.2.3.28.2 Platform Interface Definition. Alternative Fuel Mode Request Denied Indication On is received by Platform. It is the intended signal to be used as a mechanism to provide visual or audible feedback to the driver that an Alternative Fuel Mode request will not be executed.

4.2.3.29 Alternative Fuel Pre-heating Active. See Table 42.

Table 42: Alternative Fuel Pre-heating Active Signal Detail

Signal	Bit Length	Data Type	Range	Conversion
Alternative Fuel Pre-heating Active	1	BLN	N/A	$0 = False; $1 = True

4.2.3.29.1 Powertrain Interface Definition. Alternative Fuel Pre-heating Active is transmitted by Powertrain. Alternative Fuel stands for CNG and LPG. The signal shall be set on "True" as long as fuel pre-heating is active. Fuel pre-heating activity is depending on the engine coolant temperature (e.g., < +10°C) and the actual gas tank pressure.

4.2.3.29.2 Platform Interface Definition. Alternative Fuel Pre-heating Active is received by Platform. It is used for indication when fuel pre-heating is active.

4.2.3.30 Antilock Brake System Active. See Table 43.

Table 43: Antilock Brake System Active Signal Detail

Signal	Length	Data Type	Range	Conversion
Antilock Brake System Active	1	BLN	N/A	$0 = False; $1 = True

4.2.3.30.1 Powertrain Interface Definition. Antilock Brake System Active is received by Powertrain. Powertrain may use this signal to modify operation of Powertrain diagnostics and to modify the operation of features that may be affected by driveline disturbances caused by the pulsing of brakes. For example, Powertrain may reset some brake switch diagnostic tests if the vehicle is equipped with anti-lock brakes and anti-lock braking is active. The brake switch diagnostics measure deceleration rates that may be inconsistent if anti-lock braking is active. 4WD/AWD systems may use this signal to change operating modes to disable slip correction and decouple clutch packs when the Anti-lock Brake System (ABS) is active. Powertrain may also use this signal to temporarily disable the misfire detection diagnostic to prevent the setting of false codes during ABS events.

4.2.3.30.2 Platform Interface Definition. Antilock Brake System Active is transmitted by the EBCM when it is present, otherwise it is not transmitted.

Platform transmits Antilock Brake System Active to indicate whether anti-lock braking is active. Following an ABS event, platform may keep this signal “True” for up to 500 ms after the ABS event has been completed.

For OBD II compliance, Platform must not indicate an active condition when the anti-lock brakes are not active for more than 60 s.

Data Delay: 30 ms

4.2.3.31 Antilock Brake System Failed. See Table 44.

Table 44: Antilock Brake System Failed Signal Detail

Signal	Length	Data Type	Range	Conversion
Antilock Brake System Failed	1	BLN	N/A	$0 = False; $1 = True

4.2.3.31.1 Powertrain Interface Definition. Antilock Brake System Failed is received by Powertrain. Powertrain disables some brake switch diagnostics if the vehicle is equipped with antilock brakes and antilock braking is not functional because of a failure with the ABS system. The brake switch diagnostics measure deceleration rates that may be inconsistent if anti-lock braking is not functional.

4.2.3.31.2 Platform Interface Definition. Antilock Brake System Failed is transmitted by the EBCM if it is present, otherwise it is not transmitted. Platform transmits Antilock Brake System Failed to indicate whether there is a failure in the ABS system that prevents anti-lock braking from functioning.

Data Delay: 30 ms

4.2.3.32 Antilock Brake System Present. See Table 45.

Table 45: Antilock Brake System Present Signal Detail

Signal	Length	Data Type	Range	Conversion
Antilock Brake System Present	1	BLN	N/A	$0 = False; $1 = True

4.2.3.32.1 Powertrain Interface Definition. Antilock Brake System Present is received by Powertrain. Powertrain monitors this signal to determine if ABS is present in order to enable the diagnostics that rely on ABS information. In addition, this signal is used by Powertrain to determine if Wheel Speed signals can be used to calculate a vehicle speed. The ABS present status is stored in non-volatile memory in the Powertrain electronics in case communications is lost with the platform controller sending this signal.

4.2.3.32.2 Platform Interface Definition. Antilock Brake System Present is transmitted by the Gateway. This signal indicates the presence or absence of an anti-lock brake system on the vehicle.

Data Delay: 1025 ms

4.2.3.33 Apply Brake Before Cruise Indication On. See Table 46.

Table 46: Apply Brake Before Cruise Indication On

Signal	Length	Data Type	Range	Conversion
Apply Brake Before Cruise Indication On	1	BLN	N/A	$0 = False; $1 = True

4.2.3.33.1 Powertrain Interface Definition. Apply Brake Before Cruise Indication On is transmitted by the ECM. It is used to trigger a one-shot display message to instruct the driver to press the brake pedal before cruise control can be engaged. At system startup the signal shall be initialized to “False”.

The signal shall transition to “True” when all of the following conditions are fulfilled:

- Both brake inputs have been detected as inactive at least once since system startup (to protect from the display message being shown due to a permanent failure on either of the brake inputs).
- All the conditions for allowing cruise to be engaged, except Brake-Before-Cruise, are present (speed range, brakes, clutch, etc.)
- The Brake-Before-Cruise test has not passed during the current drive cycle.
- The signal Cruise Control Switch Status: On Switch Active received from Platform is “True”.

Once the signal has been set to “True” the signal shall transition to “False” if at least one of the following conditions is fulfilled:

- The Brake-Before-Cruise test has passed.
- The Accessory/Wake Up input transitions from “Active” to “Inactive”.

Applications that do not support cruise control shall always send this signal with a data value of “False”.

Data Delay: 525 ms

4.2.3.33.2 Platform Interface Definition. Apply Brake Before Cruise Indication On is received by Platform. It is used by platform to indicate, through a message, that the driver must press the brakes before cruise control can be engaged. Platform display support for this condition is optional. At the discretion of Platform, a chime can accompany the visual indication. The display message shall be shown as long as the signal is “True”, and a calibratable timeout has not expired. The timer starts when Apply Brake Before Cruise Indication On transitions to “True” and the display is active.

4.2.3.34 Automatic Transmission Commanded Gear. See Table 47.

Table 47: Automatic Transmission Commanded Gear Signal Detail

Signal	Length	Data Type	Range	Conversion
Automatic Transmission Commanded Gear	4	ENM	N/A	$0 = Not Supported $1 = First Gear $2 = Second Gear $3 = Third Gear $4 = Fourth Gear $5 = Fifth Gear $6 = Sixth Gear $7 = Seventh Gear $8 = Eighth Gear $C = CVT Forward Gear $D = Neutral Gear $E = Reverse Gear $F = Park Gear

4.2.3.34.1 Powertrain Interface Definition. Automatic Transmission Commanded Gear is transmitted by the TCM on vehicles that have a TCM, otherwise it is sent by the ECM.

Automatic Transmission Commanded Gear is used to indicate the gear that the combination of the Powertrain controller and the transmission range selection system is currently commanding. Typically, this signal is set to Park Gear, Reverse Gear and Neutral Gear when Transmission Shift Lever Position is indicating Park Range, Reverse Range or Neutral Range. It represents the current forward gear (First Gear through Eighth Gear) when Transmission Shift Lever Position is indicating Forward A through Forward F. Automatic Transmission Commanded Gear will change state at the beginning of a transmission gear shift event. As such, it should be considered a leading indicator of gear changes.

Note: For changes between Forward gears (First Gear through Eighth Gear), Automatic Transmission Gear Shift Direction will be updated synchronously with changes in Automatic Transmission Commanded Gear.

Jump-shifts (gear shifts involving a change of more than one gear) are allowed in this signal (for example, the signal may change from First Gear to Third Gear in subsequent messages).

Note: If the Powertrain Controls are executing a Reverse Lockout by commanding a neutral state to the solenoids in the Transmission, this signal is set to Neutral Gear even though Transmission Shift Lever Position is signaling Reverse Range.

For Continuously Variable Transmissions (CVT), states First Gear through Eighth Gear may be used if the CVT is emulating Step Gear Operation. If this emulation is not active, Automatic Transmission Commanded Gear will be limited to Park Gear, Reverse Gear, Neutral Gear, and CVT Forward Gear. CVT Forward Gear is used for CVTs since the terminology of First Gear through Eighth Gear is not valid for CVTs operating in a continuous mode.

Automatic Transmission Commanded Gear shall be set to “Not Supported” for manual transmission applications.

Data Delay: 60 ms

4.2.3.34.2 Platform Interface Definition. Automatic Transmission Commanded Gear is received by Platform.

Automatic Transmission Commanded Gear is intended for use as a control signal for functions that want a leading indicator of transmission gear (the gear the transmission “is going to” or “will be going to”). Functions wanting solely Park, Reverse, Neutral or Forward information should use Transmission Estimated Gear since that information is available for all types of transmissions (Transmission Estimated Gear will be the same as Automatic Transmission Commanded Gear when Automatic Transmission Commanded Gear is indicating Park Gear, Reverse Gear or Neutral Gear).

If Platform wishes to display transmission gear information to the driver, Automatic Transmission Commanded Gear may be used. Driver Shift Control Target Gear should be used for display of the gear selected by driver actuation of Tap Up and Tap Down signals. Automatic Transmission Commanded Gear may not initially reflect the Driver Shift Control selected gear since some shifts may result in a sequencing in Automatic Transmission Commanded Gear (e.g., First Gear to Second Gear to Third Gear). If the desire is to still display gear information even when Transmission Tap Up/Tap Down Mode Status is a value other than “Driver Shift Control Active”, then Automatic Transmission Commanded Gear should be used (Driver Shift Control Target Gear is not applicable when Transmission Tap Up/Tap Down Mode Status in not “Driver Shift Control Active”).

Adaptive Cruise Control systems may use this signal to comprehend transmission interaction with ACC system performance.

Note: Automatic Transmission Commanded Gear is NOT to be the source of Reverse information for Reverse Lamp Control (see Transmission Engaged State).

This signal may also be used for BAS+ Regenerative Braking.

4.2.3.35 Automatic Transmission Gear Shift Direction. See Table 48.

Table 48: Automatic Transmission Gear Shift Direction Signal Detail

Signal	Length	Data Type	Range	Conversion
Automatic Transmission Gear Shift Direction	2	ENM	N/A	$0 = No Shift in Progress $1 = Upshift in Progress $2 = Downshift in Progress

4.2.3.35.1 Powertrain Interface Definition. Automatic Transmission Gear Shift Direction is transmitted by the TCM if the vehicle has a TCM; otherwise it is transmitted by the ECM.

Automatic Transmission Gear Shift Direction is used to indicate what type of transmission shift (changes from one gear to another) is in progress. This signal only refers to shifts between forward gears. Typically this signal indicates that a shift is in progress ("Upshift in Progress" or "Downshift in Progress") at the same time that Automatic Transmission Commanded Gear indicates a change in gear. It will change back to "No Shift in Progress" when the Transmission Estimated Gear is the same as Automatic Transmission Commanded Gear.

Automatic Transmission Gear Shift Direction is set to "No Shift in Progress" for Garage Shifts (Shifts from Forward and Reverse gears to/from Park or Neutral Gears).

Automatic Transmission Gear Shift Direction is set to "No Shift in Progress" at all times for applications with Manual Transmissions.

For CVTs, the Automatic Gear Shift Direction, states "Upshift in Progress" and "Downshift in Progress" may be used if the CVT is emulating Step Gear Operation. If this emulation is not active, Automatic Transmission Gear Shift Direction will be set to "No Shift in Progress".

Data Delay: 60 ms

4.2.3.35.2 Platform Interface Definition. Automatic Transmission Gear Shift Direction is received by the Platform. Platform typically uses Automatic Transmission Gear Shift Direction as a control signal to indicate when the transmission may be causing a driveline disturbance caused by the mechanical dynamics of changing from one gear to another. It is not intended to be used as a display to the Driver.

4.2.3.36 Backup Power Mode Master Virtual Device Availability. See Table 49.

Table 49: Backup Power Mode Master Virtual Device Availability Signal Detail

Signal	Length	Data Type	Range	Conversion
Backup Power Mode Master Virtual Device Availability	1	ENM	N/A	$0 = Virtual Device Unavailable $1 = Virtual Device Available

4.2.3.36.1 Powertrain Interface Definition. Backup Power Mode Master Virtual Device Availability (VDA) is received by Powertrain. Powertrain uses this data as part of the Backup Power Moding strategy for starter control. Refer to GMW8767, PPEI Starter Control Algorithm Requirements for details.

4.2.3.36.2 Platform Interface Definition. Backup Power Mode Master Virtual Device Availability is transmitted by the Gateway Module. The Gateway module determines the availability of the Backup Power Mode Master based on signal supervision. If the platform does not use a Backup Power Mode Master, this signal shall always be set to "Virtual Device Unavailable". Refer to GMW8772, PPEI Serial Data Architecture Requirements for additional information on Virtual Device Availability signals.

Data Delay: TBD ms

4.2.3.37 Barometric Pressure Absolute, Barometric Pressure Absolute Validity. See Table 50.

Table 50: Barometric Pressure Absolute, Barometric Pressure Absolute Validity Signal Detail

Signal	Length	Data Type	Range	Conversion
Barometric Pressure Absolute	8	UNM	0.0 to 127.5 kPa	E = N × 0.5
Barometric Pressure Absolute Validity	1	ENM	N/A	$0 = Valid; $1 = Invalid

4.2.3.37.1 Powertrain Interface Definition. Barometric Pressure Absolute is transmitted by the ECM. Powertrain determines barometric pressure by using the manifold absolute pressure sensor prior to the engine cranking. Prior to engine rotation, the pressure within the manifold is equal to the barometric pressure. It may also be updated under certain conditions during the driving cycle. Barometric Pressure Absolute Validity shall be set to “Invalid” if the sensor providing the data has failed and a corresponding DTC has been set.

The ECM shall continue to send its best estimate of the Barometric Pressure Absolute even when the validity bit is set to “Invalid”.

Input Delay: 1025 ms

Accuracy Requirement: TBD

4.2.3.37.2 Platform Interface Definition. Barometric Pressure Absolute is received by Platform. It is used for the Tire Pressure Monitor system.

It is also used by the FSCM for conversion between gauge and absolute pressures.

The data in Barometric Pressure Absolute shall be ignored if Barometric Pressure Absolute Validity is set to “Invalid”. The FSCM will continue to use the Barometric Pressure Absolute even when the validity bit is set to “Invalid”.

4.2.3.38 Brake Apply Sensor Home Position Learned. See Table 51.

Table 51: Brake Apply Sensor Home Position Learned Signal Detail

Signal	Length	Data Type	Range	Conversion
Brake Apply Sensor Home Position Learned	1	BLN	N/A	$0 = False; $1 = True

4.2.3.38.1 Powertrain Interface Definition. Brake Apply Sensor Home Position Learned is received by Powertrain. The signal is used by Powertrain with conventional cruise control. The value of Brake Pedal Initial Travel Achieved cannot be determined until the “learn” occurs. Consequently, Cruise Control shall not allow engagement until the “learn” is successfully completed as indicated by this signal. Conventional cruise control shall be inhibited when this signal is “False”.

4.2.3.38.2 Platform Interface Definition. Brake Apply Sensor Home Position Learned is transmitted by the Gateway. This signal identifies whether a successful learn has occurred for an analog Brake Position Sensor. The “learn” determines the pedal sensor value associated with the fully released brake pedal. The “learn” must be completed prior to calculating any brake pedal position for example: Brake Pedal Initial Travel Achieved.

Note: Applications using discrete brake switches shall transmit “Brake Apply Sensor Home Position Learned” as “True”.

Data Delay: 10 ms

4.2.3.39 Brake Pedal Driver Applied Pressure, Brake Pedal Driver Applied Pressure Validity. See Table 52.

Table 52: Brake Pedal Driver Applied Pressure, Brake Pedal Driver Applied Pressure Validity Signal Detail

Signal	Length	Data Type	Range	Conversion
Brake Pedal Driver Applied Pressure	8	UNM	0 to 19 125 kPa	E = N × 75
Brake Pedal Driver Applied Pressure Validity	1	ENM	N/A	$0 = Valid; $1 = Invalid

4.2.3.39.1 Powertrain Interface Definition. Brake Pedal Driver Applied Pressure is received by Powertrain. It is used by the transmission Neutral Control function as an input signal for non-OBD II markets only. Neutral Control deactivation requires this signal to provide a smooth transition if the vehicle is moving, when the brake force was not sufficient to stop the vehicle, although the brake switch/sensor has indicated the brake is being applied. Brake Pedal Driver Applied Pressure enables Neutral Control deactivation reliably only when the brake force is sufficient to hold the vehicle.

When the Brake Pedal Driver Applied Pressure signal indicates “Invalid”, the Neutral Control function shall use other brake information.

Since no further accompanying GMLAN signals are available, the TCM shall implement a self-detection algorithm in order to recognize if a brake pressure sensor is present in a vehicle or not. The results should not be stored between driving cycles.

4.2.3.39.2 Platform Interface Definition. Brake Pedal Driver Applied Pressure is transmitted by the EBCM if that module is present, otherwise it is not transmitted. This signal shall be based upon the value of a brake pressure sensor within the EBCM system.

On vehicles that have EBCM but do not have such a pressure sensor, this signal shall always be sent with a data value of $00.

4.2.3.40 Brake Pedal Driver Applied Pressure Detected, Brake Pedal Driver Applied Pressure Detected Validity. See Table 53.

Table 53: Brake Pedal Driver Applied Pressure Detected, Brake Pedal Driver Applied Pressure Detected Validity Signal Detail

Signal	Length	Data Type	Range	Conversion
Brake Pedal Driver Applied Pressure Detected	1	BLN	N/A	$0 = False; $1 = True
Brake Pedal Driver Applied Pressure Detected Validity	1	ENM	N/A	$0 = Valid; $1 = Invalid

4.2.3.40.1 Powertrain Interface Definition. Brake Pedal Driver Applied Pressure Detected is received by Powertrain. The signal is used by Powertrain with conventional cruise control. Conventional cruise control shall disengage when this signal is “True” and the validity signal is “Valid”.

These signals are also used by the Transfer Case Control Module as a redundant indication of vehicle braking. If the vehicle is braking, the Transfer Case Control Module changes its control strategy to not interfere with brake stability. The Transfer Case Control Module will consider the vehicle braking if Brake Pedal Driver Applied Pressure Detected is “True”.

When the validity signal is “Invalid”, conventional cruise control will not use Brake Pedal Driver Applied Pressure Detected as a disengagement criterion and the Transfer Case Control Module will not use the information in its control strategy.

4.2.3.40.2 Platform Interface Definition. Brake Pedal Driver Applied Pressure Detected is transmitted by the EBCM if that module is present, otherwise it is not transmitted. This signal shall be based upon the value of a brake pressure sensor within the ABS system. This signal is set to “True” when the EBCM determines the driver has applied the brake pedal based on the pressure exceeding a predefined threshold with hysteresis.

Note: On vehicles with ACC, this threshold may be set to provide a smooth transition from automatic braking to manual braking. On applications where ACC is an option, the ACC defined threshold can be used in conventional cruise vehicles. On vehicles that have ABS but do not have such a pressure sensor, this signal shall always be sent with a data value of "False" and the validity signal shall be sent as "Valid".

The validity bit will be set to "Invalid" when diagnostics indicate failure of the sensor and a DTC has been stored. If the output of the sensor is not determinant but a DTC has not been set, Brake Pedal Driver Applied Pressure Detected shall be set as "False".

Input Delay: 30 ms

4.2.3.41 Brake Pedal Initial Travel Achieved Protection. See Table 54.

Table 54: Brake Pedal Initial Travel Achieved Protection Signal Detail

Signal	Length	Data Type	Range	Conversion
Brake Pedal Initial Travel Achieved Protection	2	UNM	0 to 3	E = N × 1

4.2.3.41.1 Powertrain Interface Definition. Brake Pedal Initial Travel Achieved Protection is received by Powertrain. The signal is a protection value for Brake Pedal Initial Travel Achieved Status. Refer to GMW8772, PPEI Serial Data Architecture Requirements for Alive Rolling Count and Protection Value Requirements.

Appropriate action related to failure of brake pedal application information shall be taken by Powertrain if the calculated protection value does not match the protection value received from Platform.

4.2.3.41.2 Platform Interface Definition. Brake Pedal Initial Travel Achieved Protection is transmitted by the Brake Sensing Module. The signal is a protection value for Brake Pedal Initial Travel Achieved Status. Refer to GMW8772, PPEI Serial Data Architecture Requirements for Alive Rolling Count and Protection Value Requirements.

Data Delay: 15 ms

4.2.3.42 Brake Pedal Initial Travel Achieved Status. See Table 55.

Table 55: Brake Pedal Initial Travel Achieved Status Signal Detail

Signal	Length	Data Type	Range	Conversion
Brake Pedal Initial Travel Achieved Status	2	PKT	N/A	N/A
Brake Pedal Initial Travel Achieved	1	BLN	N/A	$0 = False; $1 = True
Brake Pedal Initial Travel Achieved Validity	1	ENM	N/A	$0 = Valid; $1 = Invalid

4.2.3.42.1 Powertrain Interface Definition. Brake Pedal Initial Travel Achieved Status is received by Powertrain. The signal packet is used by Powertrain for all functions requiring knowledge of an initial indication of the application of brakes (e.g., cruise control and torque converter clutch release). The Powertrain will failsoft algorithms as appropriate when the Invalid bit is set.

When the Validity signal is set to "Valid", conventional cruise applications shall disengage immediately upon receipt of a valid Brake Pedal Initial Travel Achieved set to "True". In ACC applications, the ECM should delay setting "Adaptive Cruise Control Powertrain Inhibit Request" sufficiently to allow the ACC module time to recognize and initiate the disengagement. The delay time shall be a calibratable time **K_AccDisengageDelay** as defined in GMW8769, PPEI Cruise Control Algorithm Requirements.

The ECM shall disable/inhibit cruise control based upon the state and duration of the Brake Pedal Initial Travel Achieved Validity signal being set to "Invalid". Refer to GMW8769, PPEI Cruise Control Algorithm Requirements for specific details.

4.2.3.42.2 Platform Interface Definition. Brake Pedal Initial Travel Achieved Status packet is transmitted by the Brake Sensing Module. Brake Pedal Initial Travel Achieved is set equal to "True" when the Brake Pedal

Position as sensed by the Brake Apply Sensing System (BASS) has passed a threshold (calibratable) for release of cruise control and stop lamp activation, or when the Redundant Brake Switch has been actuated.

The Brake Sensing Module shall be on the high-speed serial data link and shall read the Brake Apply Sensor or Redundant Brake Switch and transmit this signal. The validity bit will be set "Invalid" when diagnostics indicate failure of this signal and a DTC has been stored.

Input Delay: 35 ms

4.2.3.43 Brake Pedal Moderate Travel Achieved, Brake Pedal Moderate Travel Achieved Validity. See Table 56.

Table 56: Brake Pedal Moderate Travel Achieved, Brake Pedal Moderate Travel Achieved Validity Signal Detail

Signal	Length	Data Type	Range	Conversion
Brake Pedal Moderate Travel Achieved	1	BLN	N/A	$0 = False; $1 = True
Brake Pedal Moderate Travel Achieved Validity	1	ENM	N/A	$0 = Valid; $1 = Invalid

4.2.3.43.1 Powertrain Interface Definition. Brake Pedal Moderate Travel Achieved is received by Powertrain. The signal is used by Powertrain for optional Brake Torque Management. It may also be used in performance shift algorithms. When the message is set to "Invalid", Powertrain will failsoft algorithms as appropriate.

4.2.3.43.1 Platform Interface Definition. Brake Pedal Moderate Travel Achieved is transmitted by the Brake Sensing Module. On vehicles with BASS this signal is set to "True" when the Brake Pedal Position has passed a threshold (calibratable). For non-BASS vehicles, Brake Pedal Moderate Travel Achieved is set to "False" and Validity is set to "Valid". This signal is used for brake torque management and some 2-channel Vehicle Stability Enhancement Systems.

The Brake Sensing Module shall be on the high-speed serial data link and shall read the Brake Apply Sensor and transmit this signal. The validity bit will be set when diagnostics indicate failure of this signal and a DTC has been stored.

Input Delay: 35 ms

4.2.3.44 Brake Pedal Position. See Table 57.

Table 57: Brake Pedal Position Signal Detail

Signal	Length	Data Type	Range	Conversion
Brake Pedal Position	8	UNM	0 to 100%	E = N × 100/255

4.2.3.44.1 Powertrain Interface Definition. Brake Pedal Position is received by Powertrain. This signal is used to "smooth" transitions out of Neutral Idle. This signal shall only be used in non-OBD II markets, and on vehicles equipped with a Brake Pedal Position Sensor as determined by calibration. Refer to GMW8773.

Input Delay: 10 ms

4.2.3.44.2 Platform Interface Definition. Brake Pedal Position is transmitted by the Gateway. It represents the position of the brake pedal as determined by the brake pedal position sensor. It is the brake pedal position sensor interpretation, after scaling, zeroing and noise filtering. 0% shall reflect the brake pedal position when the brake pedal is at rest. 100% shall reflect the brake pedal position of fully depressed brake pedal (mechanical stop of pedal due to bracket or failed booster).

On discrete brake switch implementations, this signal shall be sent with a data value of 0% when the brake switch indicates that the brake pedal is not applied and a data value of 100% when the brake switch indicates that the brake pedal is depressed.

4.2.3.45 Brake Pedal Position Alive Rolling Count. See Table 58.

Table 58: Brake Pedal Position Alive Rolling Count Signal Detail

Signal	Length	Data Type	Range	Conversion
Brake Pedal Position Alive Rolling Count	2	UNM	0 to 3	E = N × 1

4.2.3.45.1 Powertrain Interface Definition. Brake Pedal Position Alive Rolling Count is received by Powertrain. This signal is associated with Brake Pedal Initial Travel Achieved. Refer to GMW8772, PPEI Serial Data Architecture Alive Rolling Count and Protection Value Requirements.

4.2.3.45.2 Platform Interface Definition. Brake Pedal Position Alive Rolling Count is transmitted by the Brake Sensing Module. Refer to GMW8772, PPEI Serial Data Architecture Alive Rolling Count and Protection Value Requirements.

Data Delay: 15 ms

4.2.3.46 Brake System Transmission Gear Request. See Table 59.

Table 59: Brake System Transmission Gear Request Signal Detail

Signal	Length	Data Type	Range	Conversion
Brake System Transmission Gear Request	6	PKT	N/A	N/A
Request Type	2	ENM	N/A	$0 = No Action $1 = Max Gear Request $2 = Min Gear Request $3 = Hold Gear
Requested Gear	4	ENM	N/A	$0 = No Action $1 = First Gear $2 = Second Gear $3 = Third Gear $4 = Fourth Gear $5 = Fifth Gear $6 = Sixth Gear $7 = Seventh Gear $8 = Eighth Gear $9 to $F = Unused and Reserved

4.2.3.46.1 Powertrain Interface Definition. Brake System Transmission Gear Request is received by Powertrain.

Powertrain shall maintain transmission operation in a gear greater than or equal to the value reported in the Requested Gear whenever Request Type is “Min Gear Request”. Powertrain shall maintain transmission operation in a gear less than or equal to the value reported in the Requested Gear whenever Request Type is “Max Gear Request”. Powertrain shall maintain transmission operation in a gear equal to the value reported in the Requested Gear whenever Request Type is “Hold Gear”.

Powertrain shall prioritize this signal with the other transmission gear requests and act on the winner of the arbitration. This signal shall have higher priority than other similar platform requests. Powertrain may need to override the Brake System Transmission Gear Request in order to respond to diagnostic events, provide powertrain protection, and/or respond to safety/stability requests.

When the Request Type is “No Action” the gear request shall be ignored. If the Request Type is other than “No Action” and the Requested Gear is either “No Action” or any of the Unused and Reserved” states the signal is considered invalid and shall be ignored.

Power-up Default Value:	Request Type:	“No Action”
	Requested Gear:	“No Action”
Communication Failure Value:	Request Type:	“No Action”
	Requested Gear:	“No Action”
Output Actuation Delay:	50 ms	

4.2.3.46.2 Platform Interface Definition. Brake System Transmission Gear Request is transmitted by the EBCM, and is not sent when the EBCM is not present. The EBCM shall arbitrate all of its internal gear requests and transmit the gear request of the winner of its arbitration to Powertrain via this signal.

The signal is a packet consisting of two subsignals:

a. **Request Type:** This subsignal indicates the type of gear intervention that is requested from Powertrain. The meanings of the various states are:

- **No Action:** This state is used when the subsystem is not requesting any intervention on the part of powertrain. Any information in the Requested Gear subsignal is ignored.
- **Max Gear Request:** This state is used to request the transmission to operate at or below the gear indicated in the Requested Gear subsignal.
- **Min Gear Request:** This state is used to request the transmission to operate at or above the gear indicated in the Requested Gear subsignal.
- **Hold Gear:** This state is used to request the transmission to operate at exactly the gear indicated in the Requested Gear subsignal.

b. **Requested Gear:** This subsignal indicates the specific gear that is applicable to the gear request. The data in the Request Type subsignal determines how the requested gear information is interpreted (i.e., whether it is a max gear request, minimum gear request, or a specific gear request).

On ABS applications not requiring explicit transmission shift control, the EBCM shall transmit this signal with Request Type = “No Action” and Requested Gear = “No Action”.

This signal may be emissions related. The implementer of the signal shall ensure that the OBD requirements in 1.5 PPEI General Information on On-Board Diagnostics are fulfilled for a design intended for an OBD II market.

Data Delay: 30 ms

4.2.3.47 Brake Temperature. See Table 60.

Table 60: Brake Temperature Signal Detail

Signal	Length	Data Type	Range	Conversion
Brake Temperature	8	UNM	-40 to 980°C	E = (N × 4) - 40

4.2.3.47.1 Powertrain Interface Definition. Brake Temperature is received by Powertrain. It is used by Powertrain for auto grade braking and other functions.

4.2.3.47.2 Platform Interface Definition. Brake Temperature is transmitted by the EBCM on vehicles with ABS, and is not transmitted when an EBCM is not present. It is an estimated value based on wheel speed and brake load information and represents the peak temperature of the brakes that are at the highest temperature. This estimation also includes cooling effects.

Data Delay: 125 ms

4.2.3.48 Charge Assist Gauge Percent. See Table 61.

Table 61: Charge Assist Gauge Percent Signal Detail

Signal	Length	Data Type	Range	Conversion
Charge Assist Gauge Percent	8	UNM	-100.787 456 to 100.000 054%	E = N × 0.787 402

4.2.3.48.1 Powertrain Interface Definition. Charge Assist Gauge Percent is transmitted by Powertrain. Charge Assist Gauge Percent indicates the percent of gauge deflection required for the charge assist gauge.

4.2.3.48.2 Platform Interface Definition. Charge Assist Gauge Percent is received by Gateway. It is used for display purposes to display charge assist in percentage for hybrid vehicle applications.

4.2.3.49 Chassis Braking Load. See Table 62.

Table 62: Chassis Braking Load Signal Detail

Signal	Length	Data Type	Range	Conversion
Chassis Braking Load	8	UNM	0 to 100%	E = N × 100/255

4.2.3.49.1 Powertrain Interface Definition. Chassis Braking Load is received by Powertrain. It is used by Powertrain for auto grade braking and for other miscellaneous functions.

4.2.3.49.2 Platform Interface Definition. Chassis Braking Load is transmitted by the EBCM on vehicles with ABS, and is not transmitted when an EBCM is not present. It is the percentage of maximum vehicle braking currently being demanded by the driver or by any automatic braking that is currently in effect. It may be based on brake pedal position or other information and a vehicle mass estimate.

Data Delay: 125 ms

4.2.3.50 Chassis System Engine Torque Request Extended Range. See Table 63.

Table 63: Chassis System Engine Torque Request Extended Range Signal Detail

Signal	Length	Data Type	Range	Conversion
Chassis System Engine Torque Request Extended Range	14	PKT	N/A	N/A
Torque Intervention Type	2	ENM	N/A	$0 = No Intervention $1 = Reduce Torque $2 = Increase Torque
Torque Request Value	12	UNM	-848 to 1199.5 N·m	E = (N × 0.50) - 848

4.2.3.50.1 Powertrain Interface Definition. Chassis System Engine Torque Request Extended Range is received by Powertrain. Torque Request Value shall be ignored if Torque Intervention Type = “No Intervention”. The Powertrain electronics shall limit torque increases by value and/or time to insure that no undesired vehicle acceleration occurs. A torque reduction or increase is defined with respect to the value of “Engine Torque Driver Requested Extended Range”. Actuator reaction should be as fast as possible.

Powertrain must receive Vehicle Stability Enhancement System Active with a data value of “True” and/or Traction Control System Active with a data value of “True” before it will respond to Chassis System Engine Torque Request Extended Range requests to increase engine torque above Engine Torque Driver Requested Extended Range.

Power-Up Default: “No Intervention”

Communication Failure Value: “No Intervention”

Output Actuation Delay: 70 ms

4.2.3.50.2 Platform Interface Definition. Chassis System Engine Torque Request Extended Range is transmitted by the EBCM on vehicles with an EBCM, and is not sent on vehicles without an EBCM. The signal is a packet that consists of the following subsignals:

- **Torque Request Value:** This subsignal is the requested torque at the engine output. It can be smaller than Engine Torque Actual Extended Range e.g. when wheels are spinning or during gearshifts. It can be greater than Engine Torque Actual Extended Range (e.g., for drag torque control). Intervention type (reduction/increase) has to be commanded by Torque Intervention Type.
- **Torque Intervention Type:** This subsignal indicates the type of the requested torque intervention. A torque reduction or increase is defined with respect to the value of "Engine Torque Driver Requested Extended Range". Engine Drag control will always set this value to "Increase Torque".

Applications which do not support Traction Control or Vehicle Stability Enhancement shall always send this signal with the Torque Intervention Type subsignal set to "No Intervention".

Data Delay: 30 ms

4.2.3.51 Chassis System Engine Torque Request Protection. See Table 64.

Table 64: Chassis System Engine Torque Request Protection Signal Detail

Signal	Length	Data Type	Range	Conversion
Chassis System Engine Torque Request Protection	14	UNM	0 to 16 383	E = N × 1

4.2.3.51.1 Powertrain Interface Definition. Chassis System Engine Torque Request Protection is received by Powertrain. When a Protection Value error is detected, the corresponding Chassis System Engine Torque Request Extended Range shall be ignored, i.e., the previously accepted data shall be used. A sliding window x of y strategy shall comprehend both Alive Rolling Count errors and Protection Value errors as defined in GMW8773, PPEI Brakes and Traction Control Algorithm Requirements. Refer to GMW8772, PPEI Serial Data Architecture Alive Rolling Count and Protection Value Requirements.

4.2.3.51.2 Platform Interface Definition. Chassis System Engine Torque Request Protection is transmitted by the EBCM when the EBCM is present, and is not sent when the EBCM is not present. This protection is associated with the Chassis System Engine Torque Request Extended Range Message. Refer to GMW8772, PPEI Serial Data Architecture Alive Rolling Count and Protection Value Requirements.

Data Delay: 30 ms

4.2.3.52 Check Fuel Filler Cap Indication On. See Table 65.

Table 65: Check Fuel Filler Cap Indication On Signal Detail

Signal	Length	Data Type	Range	Conversion
Check Fuel Filler Cap Indication On	1	BLN	N/A	$0 = False; $1 = True

4.2.3.52.1 Powertrain Interface Definition. Check Fuel Filler Cap Indication On is transmitted by the ECM. The data value of this signal is set to "True" if the Evaporative Emissions Diagnostic has determined that the gas cap may not be installed completely due to a leak detected within the EVAP system. The data value will be set to "False" if the leak condition is not or is no longer detected. If the Evaporative Emissions Diagnostic is not required, or is disabled, the data value shall always be set to "False".

Data Delay: 1025 ms

4.2.3.52.2 Platform Interface Definition. Check Fuel Filler Cap Indication On is received by the Platform and is used by platform to indicate, through a telltale or message, that a leak has been detected in the EVAP system, when the data value is "True". Platform display support for this condition is optional. When implemented as a telltale, platform shall provide a "bulb check" of the telltale. At the discretion of Platform, a chime can accompany the visual indication.

4.2.3.53 Climate Control Front Blower Fan Speed. See Table 66.

Table 66: Climate Control Front Blower Fan Speed Signal Detail

Signal	Length	Data Type	Range	Conversion
Climate Control Front Blower Fan Speed	8	UNM	0 to 100%	E = N × 100/255

4.2.3.53.1 Powertrain Interface Definition. Climate Control Front Blower Fan Speed is received by Powertrain.

4.2.3.53.2 Platform Interface Definition. Climate Control Front Blower Fan Speed is transmitted by the Gateway. Climate Control Front Blower Fan Speed is the speed of the blower fan in the front of the vehicle.

4.2.3.54 Clutch Pedal Actual Position, Clutch Pedal Actual Position Validity. See Table 67.

Table 67: Clutch Pedal Actual Position, Clutch Pedal Actual Position Validity Signal Detail

Signal	Length	Data Type	Range	Conversion
Clutch Pedal Actual Position	8	UNM	0 to 100%	E = N × 100/255
Clutch Pedal Actual Position Validity	1	ENM	N/A	$0 = Valid; $1 = Invalid

4.2.3.54.1 Powertrain Interface Definition. Clutch Pedal Actual Position and Clutch Actual Position Validity are transmitted by the ECM. It represents the position of the clutch pedal as determined by the Clutch Pedal Position (CPP) sensor. It is the CPP sensor interpretation, after scaling, zeroing and noise filtering. 0% shall reflect the clutch pedal position when the clutch pedal is at rest. 100% shall reflect the clutch pedal position of fully depressed clutch pedal.

Automatic transmission applications shall always send this signal with a data value of “0%”.

Clutch Pedal Actual Position Validity shall be set to “Invalid” if the sensor providing the data has failed and a corresponding DTC has been set.

Input Delay: 30 ms

4.2.3.54.2 Platform Interface Definition. Clutch Pedal Actual Position and Clutch Actual Position Validity is received by Electric Park Brake (EPB) module and is used by the EPB to release the park brake when the system is being used for a hill hold feature.

4.2.3.55 Clutch Start Switch Active, Clutch Start Switch Active Validity. See Table 68.

Table 68: Clutch Start Switch Active, Clutch Start Switch Active Validity

Signal	Length	Data Type	Range	Conversion
Clutch Start Switch Active	1	BLN	N/A	$0 = False; $1 = True
Clutch Start Switch Active Validity	1	ENM	N/A	$0 = Valid; $1 = Invalid

4.2.3.55.1 Powertrain Interface Definition. Clutch Start Switch Active and Clutch Start Switch Active Validity are transmitted by the ECM with manual transmission applications; otherwise they are transmitted by the TCM. This signal indicates whether the manual transmission clutch pedal is applied beyond a Bottom of Travel Threshold (clutch pedal depressed to “close” the “normally open” clutch start switch). Note that two methods exist to detect the clutch pedal apply. One method uses a discrete clutch start switch. The second method uses a Clutch Pedal Position (CPP) sensor and compares the position against the threshold associated with the Bottom of Travel position. Either method provides the same functionality for the signal. The Bottom of Travel Threshold is typically set near the end of the full travel pedal position so the state will change relatively late in the pedal travel. Clutch Start Switch Active Validity shall be set to “Invalid” if the switch or sensor providing the data has failed and a corresponding DTC has been set.

Applications that do not have a clutch start switch or CPP sensor (e.g., vehicles with automatic transmissions) shall send Clutch Start Switch Active and Clutch Start Switch Active Validity signals with data values of “False” and “Valid”, respectively.

Input Delay: 48 ms

4.2.3.55.2 Platform Interface Definition. Clutch Start Switch Active and Clutch Start Switch Active Validity are received by Platform. Platform functions utilizing these signals will include Passive Start Keyless Power Moding. The data in Clutch Start Switch Active shall be ignored if Clutch Start Switch Active Validity is set to “Invalid”.

4.2.3.56 Commanded Air Fuel Ratio. See Table 69.

Table 69: Commanded Air Fuel Ratio Signal Detail

Signal	Length	Data Type	Range	Conversion
Commanded Air Fuel Ratio	16	UNM	0 to 31.999 512	E = N/2048

4.2.3.56.1 Powertrain Interface Definition. Commanded Air Fuel Ratio is transmitted by the ECM. It represents the Air Fuel Ratio commanded by the ECM.

Data Delay: 12.5 ms

4.2.3.56.2 Platform Interface Definition. Commanded Air Fuel Ratio is received by the FSCM. This signal is used by the FSCM to calculate the advanced airflow estimate from the Advanced Fuel Flow Estimate. The advanced airflow estimate is used in the anticipatory adjustment to the open loop fuel pump duty cycle.

4.2.3.57 Cruise Control Active. See Table 70**.**

Table 70: Cruise Control Active Signal Detail

Signal	Length	Data Type	Range	Conversion
Cruise Control Active	1	BLN	N/A	$0 = False; $1 = True

4.2.3.57.1 Powertrain Interface Definition. Cruise Control Active is transmitted by the ECM. The data value of the signal is set based on when the vehicle enters or exits an active mode in conventional Cruise Control, where the vehicle speed is being controlled by Powertrain. The data value of the signal will be set to “True” when the Cruise Control system enters an active cruise control mode. The value “True” shall then be maintained; as long as no cruise control disengage condition occurs (e.g., pressing brake pedal, pressing clutch pedal, turning cruise control switch to off, or other conditions which cause Powertrain to disable cruise, etc.) The data value of the signal will be set to “False” when the Cruise Control system is not or no longer in an active mode. The signal Cruise Control Active shall transition to “False” within the below defined data delay when the Cruise Control Switch Status - Cancel Switch Active = “True” or Cruise Control Switch Status - On Switch Active = “False” or when the Cruise Control Cancel Request = “Cancel” is received.

This signal may also used for BAS+ Regenerative Brake Control in hybrid vehicle applications.

Applications, which do not support conventional cruise control, shall send this signal with a value of “False”.

Data Delay: 65 ms

4.2.3.57.2 Platform Interface Definition. Cruise Control Active is received by Platform. It is used by platform to indicate, through a telltale or message, that the Cruise system is engaged when the data value is “True”. This signal may be used by the SDM as part of the Event Data Recorder function. Platform display support for this condition is optional. When implemented as a telltale, platform shall provide a “bulb check” of the telltale. A chime can accompany the visual indication at Platform’s discretion.

This signal is also used by the PTO subsystem to inhibit the activation of PTO while cruise control is active.

4.2.3.58 Cruise Control Cancel Request. See Table 71.

Table 71: Cruise Control Cancel Request Signal Detail

Signal	Length	Data Type	Range	Conversion
Cruise Control Cancel Request	1	ENM	N/A	$0 = Do Not Cancel $1 = Cancel

4.2.3.58.1 Powertrain Interface Definition. Cruise Control Cancel Request is received by Powertrain. Powertrain will cancel conventional cruise control when the signal is received with a value of "Cancel". The value of driver-selected speed stored in memory will remain unchanged. This signal does not affect the operation of Adaptive Cruise Control systems.

4.2.3.58.2 Platform Interface Definition. Cruise Control Cancel Request is transmitted by the Gateway module. The Platform communicates Cruise Control Cancel Request as Cancel to request a disengagement of conventional cruise control for any criteria monitored by the platform. One criterion to be included is an airbag being deployed.

On applications that do not support conventional Cruise Control, this signal shall always be transmitted with the value "Cancel".

Data Delay: 28 ms

4.2.3.59 Cruise Control Driver Selected Speed. See Table 72.

Table 72: Cruise Control Driver Selected Speed Signal Detail

Signal	Length	Data Type	Range	Conversion
Cruise Control Driver Selected Speed	12	UNM	0 to 255.9375 km/h	E = N × 1/16

4.2.3.59.1 Powertrain Interface Definition. Cruise Control Driver Selected Speed is transmitted by the ECM to report the conventional cruise control driver-selected speed. The fractional part of the signal avoids display discrepancies in North American applications when displaying in units of miles per hour (mph) while employing tap-up or tap-down commands that are in increments of whole units of mph.

The data value contained in this message is always a direct reflection of the cruise set speed in the ECM's memory.

This value will be reset to a data value of zero when the cruise control system has been shut off or when the ECM experiences a power up reset or when the vehicle is not equipped with conventional cruise control.

On applications where conventional cruise control is not present, the signal packet Cruise Control Switch Status is received from the gateway with data values of "False" for data bits 1 thru 6, and a data value of "Data Valid" for bits 7 and 8. Receipt of these signals with these values will result in the driver-selected speed stored in memory being set to zero.

The signal Cruise Control Cancel Request has no impact on the driver selected speed value stored in the ECM, and will therefore have no impact on the data value contained in this message.

Data Delay: 113 ms

4.2.3.59.2 Platform Interface Definition. Cruise Control Driver Selected Speed is received by Platform and is used optionally for display purposes on vehicles equipped with conventional cruise control.

4.2.3.60 Cruise Control Driver Selected Speed Active. See Table 73.

Table 73: Cruise Control Driver Selected Speed Active Signal Detail

Signal	Length	Data Type	Range	Conversion
Cruise Control Driver Selected Speed Active	1	BLN	N/A	$0 = False; $1 = True

4.2.3.60.1 Powertrain Interface Definition. Cruise Control Driver Selected Speed Active is transmitted by Powertrain. This signal determines when the driver selected speed has been set (Cruise Control Driver Selscted Speed Active = “True”), thus communicating to platform that the new Cruise Control Driver Selected Speed should be used immediately.

Data Delay: 113 ms

4.2.3.60.2 Platform Interface Definition. Cruise Control Driver Selected Speed Active is received by Platform. When this signal transitions from “False” to “True” (inactive to active), the platform shall immediately use the new Cruise Control Driver Selected Speed value. The use of Cruise Control Driver Selected Speed Active in conjunction with Cruise Control Driver Selected Speed avoids potential display discrepancy.

4.2.3.61 Cruise Control Enabled. See Table 74.

Table 74: Cruise Control Enabled Signal Detail

Signal	Length	Data Type	Range	Conversion
Cruise Control Enabled	1	BLN	N/A	$0 = False; $1 = True

4.2.3.61.1 Powertrain Interface Definition. Cruise Control Enabled is transmitted by the ECM. The data value of this signal shall be set to “True” when all the conditions for allowing cruise are present (no inhibit conditions exist that would prevent cruise engagement) and the Cruise Control Switch Status: On Switch Active signal is “True”.

Note: Cruise Control Enabled is non-latching, i.e., any temporary inhibit conditions (braking, de-clutching, etc.) as well as permanent failures, would set the signal to “False”.

Applications which do not support Cruise Control shall transmit this signal with a value of “False”.

Data Delay: 65 ms

4.2.3.61.2 Platform Interface Definition. Cruise Control Enabled is received by Platform. It is used by platform to indicate, through a telltale or message that all the conditions necessary to allow cruise exist. Any latching of the data value must be performed by the Platform since the signal from Powertrain is non-latched. Platform display support for this condition is optional. At the discretion of Platform, a chime can accompany the visual indication.

This signal is an indication to the driver that all cruise control enabled conditions have been satisfied. This signal is not used for cruise control active indication.

4.2.3.62 Cruise Control Switch Status. See Table 75.

Table 75: Cruise Control Switch Status Signal Detail

Signal	Length	Data Type	Range	Conversion
Cruise Control Switch Status	8	PKT	N/A	N/A
Cancel Switch Active	1	BLN	N/A	$0 = False; $1 = True
On Switch Active	1	BLN	N/A	$0 = False; $1 = True
Resume Switch Active	1	BLN	N/A	$0 = False; $1 = True
Set Switch Active	1	BLN	N/A	$0 = False; $1 = True
Speed Increase Switch Active	1	BLN	N/A	$0 = False; $1 = True
Speed Decrease Switch Active	1	BLN	N/A	$0 = False; $1 = True
Switch Data Integrity	2	ENM	N/A	$0 = Data Valid $1 = Data Invalid $2 = Failure Detected $3 = Illegal Range

4.2.3.62.1 Powertrain Interface Definition. Cruise Control Switch Status is received by Powertrain. Powertrain shall ensure that the OBD requirements are fulfilled for a design intended for an OBD II market. Refer to GMW8769, Powertrain Resident Diagnostics.

Note: The diagnostics shall reside in the Powertrain for both Conventional Cruise and Adaptive Cruise Control applications.

The ECM uses Cruise Control Switch Status signal in conventional cruise control applications to determine the cruise control mode as well as any impact on driver-selected speed.

- Latched On/Off Switch: For a latched switch, this signal represents the state of the Cruise Control On switch.
- Momentary On/Off Switch: In conventional Cruise Control Applications, the ON switch state shall be set to "True" (On) when the current switch state is "False" (Off) and the GMLAN signal Cruise Control Switch Status: On Switch Active transitions from "False" to "True" and back to "False" based on the Cruise Control On Switch being applied and released. The ON switch state shall be set to "False" (Off) when the current switch state is "True" (On) and the GMLAN signal Cruise Control Switch Status: On Switch Active transitions from "False" to "True" and back to "False" based on the Cruise Control On Switch being applied and released.
- Adaptive Cruise Control applications do not currently support a momentary On/Off switch.

In ACC applications, the ECM monitors the Cruise Control Switch Status signal as part of a high level supervisory function. The switch states shall be monitored along with other inputs to verify key enable/disengagement criteria before responding to ACC request. If, for any reason, the ECM, based upon the supervisory function, determines ACC should not be operating, the ECM shall ignore the Adaptive Cruise Control Axle Torque Command signal and initiate a disengagement by transmitting Adaptive Cruise Control Axle Torque Command Status: Request Status as "Request Denied". More detailed information regarding this supervisory function is located in GMW8769, PPEI Cruise Control Algorithm Requirements.

The cruise control application software shall implement a timer that maintains the elapsed time since the last valid received signal. Received signals are considered valid if the signal has no rolling count error, no Protection Value error and the Cruise Control Switch Status: Switch Data Integrity is "Data Valid". If this timer exceeds a calibratable time (e.g., 500 ms), conventional cruise control shall disengage if engaged and prevent engagement. In ACC applications, if this timer exceeds a calibratable time (e.g., 800 ms), the ECM shall initiate a disengagement by transmitting Adaptive Cruise Control Axle Torque Command Status: Request Status as "Request Denied". The additional time for ACC is to allow the ACC module an opportunity to first recognize and respond to the condition. For detailed information including recovery conditions, refer to GMW8769, PPEI Cruise Control Algorithm Requirements.

The ECM shall use the "Illegal Range" state as part of a cruise switch diagnostic. For more detailed information, refer to GWM8769, PPEI Cruise Control Algorithm Requirements.

Output Actuation Delay: 38 ms

4.2.3.62.2 Platform Interface Definition. Cruise Control Switch Status is transmitted by the Gateway. This signal represents the state of each of the Cruise Control switches.

This signal shall be transmitted in the same frame as the other Cruise Control Mode Switch signals, Cruise Control Switch Status Protection Value and Cruise Control Switch Status Alive Rolling Count. More detailed information regarding relaying the states of the physical cruise control mode switches through the GMLAN mode switch signals is located in GMW8769, PPEI Cruise Control Subsystem Requirements for Cruise Control Mode Switches.

Note: This signal is also received by the ACC module in ACC applications.

The platform module that the switches are hardwired to shall perform any required debouncing of the switches. For conventional cruise and adaptive cruise applications these signals represent the undiagnosed switch states. The ECM will perform any required diagnostics associated with the switches including setting appropriate DTCs and defaulting cruise switch states.

Refer to GMW8769, PPEI Cruise Control Subsystem Requirements – Failure Mode and Diagnostics for more information regarding cruise mode switches diagnostics.

- Cruise Control Cancel switch.

This switch is optional by platform. In applications where the Cancel switch is not present, this signal shall be set to “False”.

- On Switch Active: Reflects the current state of the Cruise Control On switch. Two implementations are available for the On/Off switch: Latched or Momentary.
  1. Latched On/Off Switch: For a latched switch, this signal represents the state of the Cruise Control On switch.
  2. Momentary On/Off Switch: For conventional Cruise Control, this signal represents the current state of the Cruise Control On switch. Any determination of a latched On/Off switch state shall be performed in the ECM.

  Note: Adaptive Cruise Control applications do not currently support a Momentary On/Off switch.
- **Resume Switch Active:** Reflects the undiagnosed state of the Cruise Control Resume switch.
- **Set Switch Active:** Reflects the undiagnosed state of the Cruise Control Set switch.
- **Speed Increase Switch Active:** Reflects the undiagnosed state of the Cruise Control Speed Increase switch. When the Resume/Accel switch is applied, Cruise Control Switch Status: Resume Switch Active = “True” and Cruise Control Switch Status: Speed Increase Switch Active = “True”
- **Speed Decrease Switch Active:** Reflects the undiagnosed state of the Cruise Control Speed Decrease switch. When the Set/Coast switch is applied, Cruise Control Switch Status: Set Switch Active = “True” and Cruise Control Switch Status: Speed Decrease Switch Active = “True”
- **Switch Data Integrity:** This signal indicates the status of the cruise switch information.
- **Data Valid:** When no faults are present and the switch states are determinant, the signal shall be set to “Data Valid”.
- **Data Invalid:** When the platform is unable to determine the state of the switches (e.g., ignition voltage out of range) the signal shall be set to “Data Invalid”. This state does not indicate a pending failure, only the switch state cannot be determined due to the ignition voltage being excessively low or high. When the signal state is “Data Invalid”, the platform shall communicate the last valid set of switch states.
- **Failure Detected:** (No longer supported).
- **Illegal Range:** When the input for analog Cruise switches resides in an “Invalid” voltage range, this signal shall be set to “Illegal Range”, in other words not within a voltage range associated with a valid On, Off, Set, Resume or Cancel switch apply.

On applications that do not support either conventional or adaptive cruise control, all switch active subsignals in this packet shall be set to “False”, and the Data Integrity subsignal shall be set to “Data Valid”.

Input Delay: 48 ms

4.2.3.63 Cruise Control Switch Status Alive Rolling Count. See Table 76.

Table 76: Cruise Control Switch Status Alive Rolling Count Signal Detail

Signal	Length	Data Type	Range	Conversion
Cruise Control Switch Status Alive Rolling Count	2	UNM	0 to 3	E = N × 1

4.2.3.63.1 Powertrain Interface Definition. Cruise Control Switch Status Alive Rolling Count is received by Powertrain. Powertrain shall ensure that the OBD requirements are fulfilled for a design intended for an OBD II market. When an Alive Rolling Count error is detected, the corresponding Cruise Control Switch Status shall be ignored, i.e., the previously accepted data shall be used. A sliding window x of y strategy shall comprehend both Alive Rolling Count errors and Protection Value errors as defined in GMW8769, PPEI Cruise Control Algorithm Requirements. Refer to GMW8772, PPEI Serial Data Architecture for Alive Rolling Count and Protection Value Requirements.

4.2.3.63.2 Platform Interface Definition. Cruise Control Switch Status Alive Rolling Count is transmitted by the Gateway module. This Alive Rolling Count is associated with the Cruise Control Switch Status signal. Refer to GMW8772, PPEI Serial Data Architecture for Alive Rolling Count and Protection Value Requirements.

Data Delay: 28 ms

4.2.3.64 Cruise Control Switch Status Protection Value. See Table 77.

Table 77: Cruise Control Switch Status Protection Value Signal Detail

Signal	Length	Data Type	Range	Conversion
Cruise Control Switch Status Protection Value	8	UNM	0 to 255	E = N × 1

4.2.3.64.1 Powertrain Interface Definition. Cruise Control Switch Status Protection Value is received by the Powertrain. Powertrain shall ensure that the OBD requirements are fulfilled for a design intended for an OBD II market. When a Protection Value error is detected, the corresponding Cruise Control Switch Status shall be ignored, i.e., the previously accepted data shall be used. A sliding window x of y strategy shall comprehend both Alive Rolling Count errors and Protection Value errors as defined in GMW8769, PPEI Cruise Control Algorithm Requirements. Refer to GMW8772, PPEI Serial Data Architecture for Alive Rolling Count and Protection Value Requirements.

4.2.3.64.2 Platform Interface Definition. Cruise Control Switch Status Protection Value is transmitted by the Gateway. This protection is associated with the Cruise Control Switch Status signal. Refer to GMW8772, PPEI Serial Data Architecture for Alive Rolling Count and Protection Value Requirements.

Data Delay: 28 ms

4.2.3.65 Diagnostic Trouble Code Information Extended. See Table 78.

Table 78: Diagnostic Trouble Code Information Extended Signal Detail

Signal	Length	Data Type	Range	Conversion
Diagnostic Trouble Code Information Extended	56	PKT	N/A	N/A
Unused1	1	BLN	N/A	$0 = False; $1 = True
Unused2	1	BLN	N/A	$0 = False; $1 = True
Unused3	1	BLN	N/A	$0 = False; $1 = True
Unused4	1	BLN	N/A	$0 = False; $1 = True
Unused5	1	BLN	N/A	$0 = False; $1 = True
Unused6	1	BLN	N/A	$0 = False; $1 = True
Unused7	1	BLN	N/A	$0 = False; $1 = True
Diagnostic Trouble Code Triggered	1	BLN	N/A	$0 = False; $1 = True
Diagnostic Trouble Code Source	8	UNM	0 to 255	E = N × 1
Diagnostic Trouble Code Number	16	UNM	0 to 65 535	E = N × 1
Diagnostic Trouble Code Failure Type	8	UNM	0 to 255	E = N × 1
Warning Indicator Requested Status	1	BLN	N/A	$0 = False; $1 = True
Test Failed Since Power Up Status	1	BLN	N/A	$0 = False; $1 = True
Test Not Passed Since Power Up Status	1	BLN	N/A	$0 = False; $1 = True
History Status	1	BLN	N/A	$0 = False; $1 = True

Signal	Length	Data Type	Range	Conversion
Test Failed Since Code Cleared Status	1	BLN	N/A	$0 = False; $1 = True
Test Not Passed Since Code Cleared Status	1	BLN	N/A	$0 = False; $1 = True
Current Status	1	BLN	N/A	$0 = False; $1 = True
Code Supported	1	BLN	N/A	$0 = False; $1 = True
Diagnostic Trouble Code Fault Type	8	ENM		$00 = Not Supported $01 = Type A $02 = Type B $03 = Type C $04 to $FF = Reserved

4.2.3.65.1 Powertrain Interface Definition. Diagnostic Trouble Code Information Extended is transmitted by Powertrain when a diagnostic trouble code is present. The trigger is linked to the Diagnostic Status Code. When a DTC status becomes current the DTC trigger is transmitted. Once a code has been transmitted, that specific code shall not trigger again until its algorithm has passed and failed again. For example, if a code becomes current while ignition on and at ignition off the ECU clears the current bit (even though the algorithm has not passed), do not transmit the trigger again if at ignition on the code once again becomes current before the algorithm passed.

The signal is a packet consisting of the following 20 subsignals:

Unused 1 thru Unused 7 These seven subsignals are unused and shall be set to “False”.

Diagnostic Trouble Code Triggered This subsignal defines when a DTC is triggered.

Diagnostic Trouble Code Source This subsignal shall be the Node Physical Address/Diagnostic Address of the device reporting the current DTC.

Diagnostic Trouble Code Number This subsignal shall be the specific DTC code that is currently active.

Diagnostic Trouble Code Failure Type Assigned per GMW3110 GMLAN Enhanced Diagnostic Test Mode Specification, Appendix E. Devices that do not support Failure Type information shall set this byte to $00.

Warning Indicator Requested Status Unused bits shall be set to “False”.

Test Failed Since Power Up Status Unused bits shall be set to “False”.

Test Not Passed Since Power Up Status Unused bits shall be set to “False”.

History Status Unused bits shall be set to “False”.

Test Failed Since Code Cleared Status Unused bits shall be set to “False”.

Test Not Passed Since Code Cleared Status Unused bits shall be set to “False”.

Current Status Unused bits shall be set to “False”.

Code Supported Unused bits shall be set to “False”.

Diagnostic Trouble Code Fault Type This subsignal defines the fault type.

4.2.3.65.2 Platform Interface Definition. Diagnostic Trouble Code Information Extended is received by the Platform. The purpose of the trigger is to support Telematic Notification (e.g., OnStar) and Vehicle DTC Record. Telematic Notification is a process that will notify a remote server of DTC activity. Vehicle DTC Record is a snapshot of selected parameters that describe the vehicle operating conditions at the time a fault is detected.

4.2.3.66 Diesel Exhaust Fluid Warning Indication Request. See Table 79.

Table 79: Diesel Exhaust Fluid Warning Indication Request Signal Detail

Signal	Length	Data Type	Range	Conversion
Diesel Exhaust Fluid Warning Indication Request	3	ENM	N/A	$0 = No Indication $1 = Warning Level 1 $2 = Warning Level 2 $3 = Warning Level 3 $4 = Warning Level 4 $5 = Warning Level 5 $6 = Reserved $7 = Reserved

4.2.3.66.1 Powertrain Interface Definition. Diesel Exhaust Fluid Warning Indication Request is transmitted by the ECM. The ECM shall process the level of the diesel exhaust fluid reserve and calculate the remaining distance the vehicle can travel before the diesel exhaust fluid is expended. This signal shall be transmitted with one of the following data values:

- **No Indication:** The diesel exhaust fluid reserve is above an acceptable driving range.
- **Warning Level 1:** The diesel exhaust fluid reserve has a calibratable minimum range (e.g., 1609 km or less).
- **Warning Level 2:** The diesel exhaust fluid reserve has a calibratable minimum range (e.g., 644 km or less).
- **Warning Level 3:** The diesel exhaust fluid reserve has a calibratable minimum range (e.g., 121 km or less).
- **Warning Level 4:** The diesel exhaust fluid tank is empty. The value “Warning Level 4” shall be transmitted from the time the ECM determines that the diesel exhaust fluid is empty up to 322 km (calibratable) driven. Powertrain may also limit vehicle speed (e.g., 89 km/h).
- **Warning Level 5:** This value shall be transmitted after the vehicle has traveled more than 322 km after the ECM has determined that the diesel exhaust fluid tank is empty. Powertrain may also limit vehicle speed (e.g., 56 km/h).

For applications that do not support diesel exhaust fluid level sensing, this signal shall be sent with a data value of “No Indication”.

Data Delay: 1000 ms

4.2.3.66.2 Platform Interface Definition. Diesel Exhaust Fluid Warning Indication Request is received by Platform and is used for display purposes. This signal is used to control the diesel exhaust fluid level telltale or Driver Information Center (DIC) message. When a telltale is implemented, Platform shall provide a “bulb check” of the telltale. At the discretion of Platform, a chime may accompany the visual indication.

4.2.3.67 Diesel Exhaust Fluid Remaining Distance, Diesel Exhaust Fluid Remaining Distance Validity. See Table 80.

Table 80: Diesel Exhaust Fluid Remaining Distance, Diesel Exhaust Fluid Remaining Distance Validity Signal Detail

Signal	Length	Data Type	Range	Conversion
Diesel Exhaust Fluid Remaining Distance	10	UNM	0 to 102 300 km	E = N × 100 km
Diesel Exhaust Fluid Remaining Distance Validity	1	ENM	N/A	$0 = Valid; $1 = Invalid

4.2.3.67.1 Powertrain Interface Definition. Diesel Exhaust Fluid Remaining Distance is transmitted by Powertrain. Powertrain determines Diesel Exhaust Fluid Remaining Distance based on the Diesel Exhaust Fluid Distance determination algorithm that resides in the Powertrain electronics. The algorithm is based on diesel exhaust fluid level and exhaust fluid injector counts.

Diesel Exhaust Fluid Remaining Distance Validity shall be set to “Invalid” if the diesel exhaust fluid level sensor or the diesel exhaust fluid injector has failed and a corresponding DTC has been set.

For applications that do not support diesel exhaust fluid injection, Diesel Exhaust Fluid Remaining Distance shall be sent with a data value of “0” and Diesel Exhaust Fluid Remaining Distance Validity with a data value of “Valid”.

Data Delay (Diesel Exhaust Fluid Remaining Distance): 1 s

4.2.3.67.2 Platform Interface Definition. Diesel Exhaust Fluid Remaining distance is received by the platform and is used for display purposes.

4.2.3.68 Diesel Glow Plug Indication On. See Table 81.

Table 81: Diesel Glow Plug Indicaiton On Signal Detail

Signal	Length	Data Type	Range	Conversion
Diesel Glow Plug Indication On	1	BLN	N/A	$0 = False; $1 = True

4.2.3.68.1 Powertrain Interface Definition. Diesel Glow Plug Indication On is transmitted by the ECM. It is set to “True” if glowing before engine start is recommended (preglowing). It is set to “False” at the end of preglowing even if the glow plugs may still be activated. Preglowing duration is determined by the ECM at ignition on, and is dependent on ECM internal parameters (e.g., engine coolant temperature). It is prohibited to use this signal for a bulb check by Powertrain. This signal shall be supported by Powertrain on all Diesel applications. On non-diesel applications, this signal shall always be sent with a data value of “False”.

Data Delay: 525 ms

4.2.3.68.2 Platform Interface Definition. Diesel Glow Plug Indication On is received by Platform.

This signal is used in non-OBD II markets only, to indicate through a telltale or message, that the diesel glow plug is on and the driver should wait before starting the engine, when the data value is “True”. This signal shall not be used for display in OBD II markets. Platform shall support a display for this condition on all diesel applications via hardware or this signal, based on OBD II market requirements. When implemented as a telltale, and using this signal, Platform shall not perform a bulb check. At the diescrtion of Platform, a chime can accompany the visual indication.

4.2.3.69 Display Measurement System. See Table 82.

Table 82: Display Measurement System Signal Detail

Signal	Length	Data Type	Range	Conversion
Display Measurement System	1	ENM	N/A	$0 = Metric $1 = English

4.2.3.69.1 Powertrain Interface Definition. Display Measurement System is received by Powertrain. This signal may be used in determining the set speed increment/decrement for tap ups/tap downs in conventional cruise control if the calibration **K_MetricTapIncrementEnable** is “True”. For example, when Display Measurement System is set to “English”, the set speed increment/decrement will be 1 mph. When set to “Metric”, the set speed increment/decrement will be 1 or 2 km/h.

4.2.3.69.2 Platform Interface Definition. Display Measurement System is transmitted by the Gateway module. The driver selecting English or Metric units for display determines the Display Measurement System. The Adaptive Cruise Control module in determining the set speed increment may use this signal. For example,

when Display Measurement System is set to “English”, the set speed increment/decrement will be 1 mph. When set to “Metric”, the set speed increment/decrement will be 1 or 2 km/h.

Data Delay: TBD

4.2.3.70 Distance Rolling Count Average Driven, Distance Rolling Count Average Driven Reset Occurred, Distance Rolling Count Average Driven Validity, Distance Rolling Count Average Driven Source, Distance Rolling Count Average Non Driven, Distance Rolling Count Average Non Driven Reset Occurred, Distance Rolling Count Average Non Driven Validity. See Table 83.

Table 83: Distance Rolling Count Average Driven, Distance Rolling Count Average Driven Reset Occurred, Distance Rolling Count Average Driven Validity, Distance Rolling Count Average Driven Source, Distance Rolling Count Average Non Driven, Distance Rolling Count Average Non Driven Reset Occurred, Distance Rolling Count Average Non Driven Validity Signal Detail

Signal	Length	Data Type	Range	Conversion
Distance Rolling Count Average Driven	13	UNM	0.0 to 1023.875 m	E = N × 1/8
Distance Rolling Count Average Driven Reset Occurred	1	BLN	Not Applicable	$0 = False; $1 = True
Distance Rolling Count Average Driven Source	1	ENM	Not Applicable	$0 = Transmission Output Speed $1 = Wheel Speed
Distance Rolling Count Average Driven Validity	1	ENM	Not Applicable	$0 = Valid; $1 = Invalid
Distance Rolling Count Average Non Driven	13	UNM	0.0 to 1023.875 m	E = N × 1/8
Distance Rolling Count Average Non Driven Reset Occurred	1	BLN	Not Applicable	$0 = False; $1 = True
Distance Rolling Count Average Non Driven Validity	1	ENM	Not Applicable	$0 = Valid; $1 = Invalid

4.2.3.70.1 Powertrain Interface Definition. Distance Rolling Count Average Driven and Non Driven, Distance Rolling Count Average Driven Source, Distance Rolling Count Average Driven and Non Driven Reset Occurred and Distance Rolling Count Average Driven and Non Driven Validity are transmitted by the ECM.

For AWD, the primary (high torque) axle will be designated as the driven and the other axle as the non-driven.

The Distance Rolling Count Average Driven is transmitted by the ECM. The ECM calculates Distance Rolling Count Average Driven from the Distance Rolling Count sensor information that is obtained via serial data.

The Distance Rolling Count Average Driven shall be calculated based on available information, in the following order of precedence:

1. **TOSS:** Transmission Output Shaft Angular Velocity Sensor (TOSS) Present signal indicates available and “Valid”. TOSS is required on all automatic and manual transmissions in the OBD II market.
2. **Average of Driven Wheels:** Transmission Output Shaft Angular Velocity Sensor Present signal indicates unavailable or “Invalid”, and Antilock Brake System Present indicates available or “True”, and **K_WheelSpeedSensorsPresent = “**Driven and Non Driven” or “Driven” and Wheel Rotational Status Left Driven and Wheel Rotational Status Right Driven indicate “Valid”.
3. **Single Driven Wheel:** Antilock Brake System Present indicates available or “True” and One driven wheel rotational status signal will indicate “Invalid” and one will indicate “Valid”.
4. **Invalid:** Transmission Output Shaft Angular Velocity Sensor Present signal indicates unavailable or “Invalid”, and Both Wheel Rotational Status Left Driven and Wheel Rotational Status Right Driven indicate “Invalid”.

In the case of “Invalid”, the Distance Rolling Count Average Driven Validity = “Invalid”. In all other cases, Distance Rolling Count Average Driven Validity = “Valid”.

Upon recovery from a state where Validity was transmitted as “Invalid,” the ECM shall set Distance Rolling Count Average Driven Validity = “Valid”,” Distance Rolling Count Average Driven Reset Occurred signal set = “True”, and the Distance Rolling Count Average Driven value will start incrementing beginning at $0. The Distance Rolling Count Average Driven Reset Occurred is to be held “True” for 2 s (calibrateable) to ensure detection across Gateway while Distance Rolling Count Average Driven value continues to be incremented and transmitted normally.

Distance Rolling Count Average Driven Source shall be set to “Transmission Output Speed” when the Transmission Output Shaft Angular Velocity Sensor is used to determine the Distance Rolling Count Average Driven, and shall be set to “Wheel Speed” for all other calculation methods.

Distance Rolling Count Average Non Driven is transmitted by the ECM. The ECM calculates Distance Rolling Count Average Non Driven from the Distance Rolling Count sensor information that is obtained via serial data.

The Distance Rolling Count Average Non Driven shall be calculated based on available information, in the following order of precedence:

1. **Average of Non Driven Wheels:** Antilock Brake System Present indicates available or “True”, and Wheel Rotational Status Left Non Driven and Wheel Rotational Status Right Non Driven indicate “Valid”.
2. **Single Non Driven Wheel:** Antilock Brake System Present indicates available or “True”, and one wheel rotational status non-driven signal will indicate “Invalid”.
3. **Non-Driven Wheel Speed Sensors are Not on Vehicle:** Antilock Brake System Present indicates unavailable or “False”. Distance Rolling Count Average Non Driven will be transmitted with a value of zero (“0”) and Distance Rolling Count Average Non Driven Validity will be transmitted with a value of “Valid”.
4. **Both WSS Invalid:** In the case of Invalid, the Distance Rolling Count Average Non Driven Validity = “Invalid”. In all other cases, Distance Rolling Count Average Non Driven Validity = “Valid”.

Upon recovery from a state where Validity was transmitted as “Invalid,” the ECM shall set Distance Rolling Count Average Non Driven Validity = “Valid,” Distance Rolling Count Average Non Driven Reset Occurred signal set = “True”, and the Distance Rolling Count Average Non Driven value will start incrementing beginning at $0. The Distance Rolling Count Average Non Driven Reset Occurred is to be held “True” for 2 s (calibrateable) to ensure detection across Gateway while Distance Rolling Count Average Non Driven value continues to be incremented and transmitted normally.

The Presence and validity of all inputs to the Distance Rolling Count Average Driven/Non Driven calculations are available in GMLAN signals defined elsewhere in this section.

Powertrain shall allow the counters to roll over (start over) when the signal exceeds its maximum defined value of 1023.875 m. For example, 1022 m in current counter + 6 m additionally traveled since last computation = 4.00 m in current counter.

Upon first Virtual Network activation, the ECM shall set Distance Rolling Count Driven and Non Driven Reset Occurred signal equal to “True” and Distance Rolling Count values will start incrementing beginning at $0. Distance Rolling Count Average Driven and Non Driven Reset Occurred shall be held “True” for 2 s (calibrateable) to ensure detection across Gateway while Distance Rolling Count Average Driven and Non Driven values continue to be incremented and transmitted normally. On Distance Rolling Count memory reset detection by ECM, the ECM shall set Distance Rolling Count Average Driven and Non Driven Reset Occurred signals equal to “True” and Distance Rolling Count values will start incrementing beginning at $0. Distance Rolling Count Average Driven and Non Driven Reset Occurred to be held “True” for 2 s (calibrateable) to ensure detection across gateway while Distance Rolling Count Average Driven and Non Driven values continue to be incremented and transmitted normally.

Data Delay: 100 ms

4.2.3.70.2 Platform Interface Definition. Distance Rolling Count Average Driven and Non Driven, Distance Rolling Count Average Driven Source, Distance Rolling Count Average Driven and Non Driven Reset Occurred and Distance Rolling Count Average Driven and Non Driven are received by Platform. These signals or a subset of these signals are used for calculating the odometer. Typically, some GMNA applications will use the Distance Rolling Count Average Driven for odometer display. Saab applications typically use the Distance

Rolling Count Average Non Driven for odometer display to avoid accumulation of non-driven odometer counts on low coefficient of friction surfaces.

Upon receipt of the Distance Rolling Count Reset Occurred equal to “True”, the Platform module shall accumulate the distance assuming the Powertrain Module reset its accumulator to zero.

All OBD modules/devices that support legislated Paramter Identifier Data (PIDs) $21 and/or $31 shall use these signals or a subset of these signals for calculating distance traveled.

The data in Distance Rolling Count Average shall be ignored if Distance Rolling Count Average Validity is set to “Invalid”.

4.2.3.71 Driveline Final Axle Ratio. See Table 84.

Table 84: Driveline Final Axle Ratio Signal Detail

Signal	Length	Data Type	Range	Conversion
Driveline Final Axle Ratio	9	UNM	2.00 to 7.11	E = (N × 0.01) + 2

4.2.3.71.1 Powertrain Interface Definition. Driveline Final Axle Ratio is transmitted by Powertrain. This signal defines the driveline final axle ratio, which reflects the ECM calibration value **K_FinalAxleRatio.**

4.2.3.71.2 Platform Interface Definition. Driveline Final Axle Ratio is used by the Gateway and the EBCM. This signal represents the driveline axle ratio from the output of the transmission or transfer case to wheel axle. This signal is used by the EBCM to calculate driveline torque and also in conjunction with the signal Wheel Distance Per Revolution Driven on TOSS equipped vehicles to calculate vehicle distance and speed. This signal is also used in conjunction with the signal Wheel Distance Per Revolution Driven on TOSS equipped vehicles are mandatory in automatic and manual transmissions in the OBDII market, by the BCM to calculate propshaft vehicle speed limit.

Input Delay: 1000 ms

4.2.3.72 Driver Independent Brake Apply Active. See Table 85.

Table 85: Driver Independent Brake Apply Active Signal Detail

Signal	Length	Data Type	Range	Conversion
Driver Independent Brake Apply Active	1	BLN	N/A	$0 = False; $1 = True

4.2.3.72.1 Powertrain Interface Definition. Driver Independent Brake Apply Active is received by Powertrain. The signal is used to recognize additional driving resistance due to EBCM intended brake pressure.

4.2.3.72.2 Platform Interface Definition. Driver Independent Brake Apply Active is transmitted by the EBCM if it is present, otherwise it is not transmitted. The Driver Independent Brake Apply Active signal is used to indicate that the Brake system is applying hydraulic pressure to the brake corners without the driver applying the brake pedal, (examples may include, but are not limited to: Hill Start Assist, Rollover Mitigation, Stop and Go Driving, Adaptive Cruise Control, Brake Disc Cleaning).

Applications which do not support Driver Independent Brake Apply Active shall always send this signal with a data value of “False”.

Data Delay: 10 ms

4.2.3.73 Driver Intended Axle Torque, Driver Intended Axle Torque Validity. See Table 86.

Table 86: Driver Intended Axle Torque, Driver Intended Axle Torque Validity

Signal	Length	Data Type	Range	Conversion
Driver Intended Axle Torque	15	UNM	-22 534 to 43 000 N·m	E = (N × 2) - 22 534
Driver Intended Axle Torque Validity	1	ENM	N/A	$0 = Valid; $1 = Invalid

4.2.3.73.1 Powertrain Interface Definition. Driver Intended Axle Torque is transmitted by Powertrain. This signal is the interpreted driver requested axle torque after axle torque shaping, response filtering, driveline clunk management, and other torque modifiers. Driver requested axle torque results from driver initiated systems such as accelerator pedal, cruise control, adaptive cruise control, full speed range ACC and power take off. This value shall also include axle torque powertrain braking requests and shall not include torque requests from any non-driver initiated vehicle systems, e.g., traction control.

A positive value represents torque in the driver intended movement direction. This means that a positive value while the vehicle is in a drive range is a request for a torque that would move the vehicle forward. A positive value while the vehicle is in a reverse range is a request for a torque that would move the vehicle backwards.

4.2.3.73.2 Platform Interface Definition. Driver Intended Axle Torque is received by Platform. This signal may be used as an indication of driver intent for powertrain operation. It does not necessarily reflect the actual torque to be requested from the powertrain, as it does not include torque requests from non-driver initiated vehicle systems.

Data Delay: TBD

4.2.3.74 Driver Intended Axle Torque Maximum, Driver Intended Axle Torque Maximum Validity. See Table 87.

Table 87: Driver Intended Axle Torque Maximum, Driver Intended Axle Torque Maximum Validity Signal Detail

Signal	Length	Data Type	Range	Conversion
Driver Intended Axle Torque Maximum	15	UNM	-22 534 to 43 000 N·m	E = (N × 2) - 22 534
Driver Intended Axle Torque Maximum Validity	1	ENM	N/A	$0 = Valid; $1 = Invalid

4.2.3.74.1 Powertrain Interface Definition. Driver Intended Axle Torque Maximum is transmitted by Powertrain. This signal represents the highest axle torque that can be delivered in response to an ACC (type of ACC indicated in GMLAN signal Adaptive Cruise Control Axle Torque Command: Adaptive Cruise Control Type) request. Driver Intended Axle Torque Maximum also reflects the highest possible axle torque available to other driver requests, such as the accelerator pedal or conventional cruise control. Any request from the ACC module that is higher than Driver Intended Axle Torque Maximum value will be limited to this value as indicated by GMLAN signal Adaptive Cruise Control Axle Torque Command Status: Request Status set to "Request Honored" and Adaptive Cruise Control Axle Torque Command Status: Limiting Status set to "Request Value Limited Maximum".

4.2.3.74.2 Platform Interface Definition. Driver Intended Axle Torque Maximum is received by Platform. Any request from the ACC module, Adaptive Cruise Control Axle Torque Command higher than Driver Intended Axle Torque Maximum will be limited to this value.

Data Delay: TBD

4.2.3.75 Driver Intended Axle Torque Minimum, Driver Intended Axle Torque Minimum Validity. See Table 88.

Table 88: Driver Intended Axle Torque Minimum, Driver Intended Axle Torque Minimum Validity Signal Detail

Signal	Length	Data Type	Range	Conversion
Driver Intended Axle Torque Minimum	15	UNM	-22 534 to 43 000 N·m	E = (N × 2) - 22 534
Driver Intended Axle Torque Minimum Validity	1	ENM	N/A	$0 = Valid; $1 = Invalid

4.2.3.75.1 Powertrain Interface Definition. Driver Intended Axle Torque Minimum is transmitted by Powertrain. This signal represents the lowest axle torque that can be delivered in response to an ACC request (type of ACC indicated in GMLAN signal Adaptive Cruise Control Axle Torque Command: Adaptive Cruise Control Type). Driver Intended Axle Torque Minimum also reflects the lowest possible axle torque available to other driver requests, such as the accelerator pedal or conventional cruise control. Any request from the ACC module that is lower than Driver Intended Axle Torque Minimum value will be limited to this value as indicated by GMLAN signal Adaptive Cruise Control Axle Torque Command Status: Request Status set to "Request Honored" and Adaptive Cruise Control Axle Torque Command Status: Limiting Status set to "Request Value Limited Minimum".

A positive value represents torque in the driver intended movement direction. This means that a positive value while the vehicle is in a drive range is a request for a torque that would move the vehicle forward. A positive value while the vehicle is in a reverse range is a request for a torque that would move the vehicle backwards.

4.2.3.75.2 Platform Interface Definition. Driver Intended Axle Torque Minimum is received by Platform. Any request from the ACC module in Adaptive Cruise Control Axle Torque Command lower than Driver Intended Axle Torque Minimum will be limited to this value.

Data Delay: TBD

4.2.3.76 Driver Shift Control Request Denied Indication On. See Table 89.

Table 89: Driver Shift Control Request Denied Indication On Signal Detail

Signal	Length	Data Type	Range	Conversion
Driver Shift Control Request Denied Indication On	1	BLN	N/A	$0 = False; $1 = True

4.2.3.76.1 Powertrain Interface Definition. Driver Shift Control Request Denied Indication On is transmitted by the TCM if the vehicle has a TCM; otherwise it is transmitted by the ECM.

The data value of this signal shall be set to "True" when a Tap Up/Down Switch Status transition occurs requesting a target gear that cannot be allowed in the current operating conditions.

When a new Tap Up/Down Switch Status transition occurs, Powertrain shall determine if the requested gear is allowed given current operating conditions. If the requested gear is NOT allowed the Driver Shift Control Request Denied Indication On parameter shall be set to "True". Scenarios that may result in a denied request include but are not limited to:

- Selecting too low of a gear that would result in engine overspeed.
- Selecting too high of a gear that would result in engine lugging.
- Selecting a gear that would result in detrimental Powertrain cooling performance.
- Selecting a gear that would result in degraded Powertrain lubrication.
- Selecting a gear outside of the allowable limits currently invoked by the Platform Gear Request signal.

C ce "True", this parameter shall remain "True" until any of the following occurs:

- A subsequent Tap Up/Down Switch Status transition is received that results in an allowed change to the Driver Shift Control Target Gear parameter.
- The Transmission Tap Up/Tap Down Mode Status parameter becomes a value other than "Driver Shift Control Active".
- More than 500 ms has elapsed since the Tap Up/Down Switch Status transition occurred which resulted in the most recent denied request.

Note: This signal shall only provide feedback in response to driver-initiated gear change requests. It shall not indicate automatic shifts or limited operation necessary to protect the powertrain.

Applications that do not support Driver Shift Control (including all manual transmission applications) shall always send this signal with a data value of "False".

Data Delay: 50 ms

4.2.3.76.2 Platform Interface Definition. Driver Shift Control Request Denied Indication On is received by Platform. It is the intended signal to be used as a mechanism to provide visual or audible feedback to the driver that a Driver Shift Control request will not be executed. The value of this parameter should be ignored by Platform when the Transmission Tap Up/Tap Down Mode Status signal is a value other than "Driver Shift Control Active".

Output Actuation Delay: 250 ms

4.2.3.77 Driver Shift Control Target Gear. See Table 90.

Table 90: Driver Shift Control Target Gear Signal Detail

Signal	Length	Data Type	Range	Conversion
Driver Shift Control Target Gear	4	ENM	N/A	\$0=Not Supported \$1=First Gear \$2=Second Gear \$3=Third Gear \$4=Fourth Gear \$5=Fifth Gear \$6=Sixth Gear \$7=Seventh Gear \$8=Eighth Gear

4.2.3.77.1 Powertrain Interface Definition. Driver Shift Control Target Gear is transmitted by the TCM if the vehicle has a TCM; otherwise it is transmitted by the ECM.

When the Transmission Tap Up/Tap Down Mode Status signal first becomes "Driver Shift Control Active", this parameter shall reflect the current commanded transmission gear. Afterward, it shall be updated to represent the gear that is selected via the tap up/tap down switches.

When a new Tap Up/Down Switch Status transition occurs, Powertrain shall determine if the requested gear is allowed given current operating conditions. If the requested gear is allowed, the Driver Shift Control Target Gear message shall be updated to reflect the new request. This parameter shall change before the transmission actually shifts into the new gear and as such, it should be considered a leading indicator of a shift. It will be followed by associated changes to the Automatic Transmission Commanded Gear, Automatic Transmission Gear Shift Direction, and Transmission Estimated Gear signals.

Note: In situations where the transmission must execute multiple shifts to obtain the target gear, the Driver Shift Control Target Gear parameter will temporarily have a different value than the Automatic Transmission Commanded Gear parameter.

If the requested gear is NOT allowed, the Driver Shift Control Target Gear parameter shall not change but instead the Driver Shift Control Request Denied Indication On parameter will be updated to reflect this result.

For examples of scenarios that could result in a denied request, reference the Driver Shift Control Request Denied Indication On signal description.

In general, the target gear value that is reported shall remain constant until another allowed Tap Up/Down Switch Status transition occurs. However, if Powertrain determines that an automatic shift is necessary to protect the powertrain (i.e., upshift near fuel cutoff or downshift to prevent engine lugging), or respond to diagnostic events, or respond to safety/stability requests, the Driver Shift Control Target Gear parameter shall be updated to reflect this new gear and therefore it will no longer equal the original driver selection.

The Driver Shift Control Target Gear parameter shall be set to "Not Supported" when the Transmission Tap Up/Tap Down Mode Status parameter is a value other than "Driver Shift Control Active".

Applications which do not support Driver Shift Control (including all manual transmission applications) shall always send this signal with a data value of "Not Supported".

Data Delay: 50 ms

4.2.3.77.2 Platform Interface Definition. Driver Shift Control Target Gear is received by Platform. It is the intended signal to be used for updating gear displays when in Driver Shift Control mode. The value of this parameter should be ignored by Platform when the Transmission Tap Up/Tap Down Mode Status signal is a value other than "Driver Shift Control Active".

Output Actuation Delay: 250 ms (with respect to display activation)

4.2.3.78 Driver Throttle Override Detected. See Table 91.

Table 91: Driver Throttle Override Detected Signal Detail

Signal	Length	Data Type	Range	Conversion
Driver Throttle Override Detected	1	BLN	N/A	$0 = False; $1 = True

4.2.3.78.1 Powertrain Interface Definition. Driver Throttle Override Detected signal is transmitted by the ECM. Driver Throttle Override Detected shall be set to "True" when the throttle command associated with the accelerator pedal position exceeds the current throttle command associated with all of the following: Conventional Cruise Control, Adaptive Cruise Control Acceleration Request and the Platform Engine Speed Command: Engine Speed Request (used for Power Take-Off and Fast Idle systems). The Conventional Cruise Control, ACC and PTO/Fast Idle Control are mutually exclusive subsystems in that only one of these subsystems can be active at a time. Internal to the ECM, throttle commands associated with inactive subsystems shall be set to reflect closed throttle commands. This allows this signal to be properly determined regardless of which system is active. Appropriate hysteresis shall be applied to the threshold to prevent toggling of the signal during steady state conditions. Because ACC automatic braking will be released in ACC systems when Driver Throttle Override Detected is "True", the threshold shall be selected such that the "True" state shall only be indicated when the throttle command associated with the pedal is definitely greater than the command associated with Conventional Cruise Control, ACC or PTO/Fast Idle Control, whichever system is active. Whenever the determination is ambiguous, for example, when the accelerator pedal is released, Driver Throttle Override Detected shall be reported as "False".

This signal shall be communicated at all times regardless of Conventional Cruise Control, ACC or PTO/Fast Idle Control engagement status. Being continuously transmitted allows this signal to be used to detect a driver command input after cruise, PTO, or Fast Idle Control has been disengaged (e.g., in ACC transition mode).

Any conditions, which would prevent the ECM from being able to properly determine the state of the Driver Throttle Override Detected signal, shall cause the ECM to set Adaptive Cruise Control Powertrain Inhibit Request to "Inhibit Adaptive Cruise Control" and Platform Engine Speed Command Inhibit Request to "Inhibit Platform Engine Speed Control". While the ECM is unable to properly determine the state of the Driver Throttle Override Detected signal, Driver Throttle Override Detected shall be set to the last known valid state.

Applications that do not support any of the following subsystems: Conventional Cruise Control, ACC or Power Take-Off may still elect to send this signal. The value of the signal would be determined by comparing the throttle command associated with the accelerator pedal against the equivalent of closed throttle commands associated with the unsupported subsystems.

Data Delay: 50 ms

4.2.3.78.2 Platform Interface Definition. Driver Throttle Override Detected is received by Platform.

- **ACC Operation:** The ACC and/or EBCM modules use this information to stop ACC automatic braking operation whenever this bit is "True". This signal may also be used in its logic for illumination of brake lights. Upon detection of a communication failure, automatic braking shall phase out and ACC shall disengage as appropriate.

  The ACC module may use this signal as one of several driver actions that terminate ACC Transition Mode. Additionally, the ACC may also use this information to suspend learning during a driver throttle override when ACC is active.
- **Conventional Cruise Control Operation:** The Conventional Cruise Control resides entirely within the Powertrain (i.e., not used by Platform). The reason behind adding conventional cruise to the Powertrain Interface Definition was to allow the conventional cruise (within the ECM) to make use of the information to determine a throttle override. This eliminates having to create two different throttle override variables, one dedicated for conventional cruise and one relating to ACC and PTO.

- **PTO Operation:** If Driver Throttle Override is “True”, the Platform uses this information to determine if a PTO engine speed override is being requested by the PTO/Fast Idle Control operator. The Platform may use this information to suspend learning during a driver throttle override when PTO or Fast Idle Control is active. Upon detection of a communication failure, the PTO/Fast Idle subsystem shall disengage.

4.2.3.79 Driver Throttle Override Detected Protection Value. See Table 92.

Table 92: Driver Throttle Override Detected Protection Value Signal Detail

Signal	Length	Data Type	Range	Conversion
Driver Throttle Override Detected Protection Value	2	UNM	0 to 3	E = N × 1

4.2.3.79.1 Powertrain Interface Definition. Driver Throttle Override Detected Protection Value is transmitted by the ECM. This protection is associated with the Driver Throttle Override Detected signal. Refer to GMW8772, PPEI Serial Data Architecture for Alive Rolling Count and Protection Value Requirements.

Data Delay: 50 ms

4.2.3.79.2 Platform Interface Definition. Driver Throttle Override Detected Protection Value is received by Platform. When a Protection Value error is detected, the corresponding Driver Throttle Override Detected signal shall be ignored. During this condition the receiving module(s) shall use the value of the most recent received signal accompanied by appropriate rolling count and protection value. A sliding window x of y strategy shall comprehend both Alive Rolling Count errors and Protection Value errors as defined in GMW8769, PPEI Cruise Control Algorithm Requirements. Refer to GMW8772, PPEI Serial Data Architecture for Alive Rolling Count and Protection Value Requirements.

Note: The PTO/Fast Idle subsystems do not use this signal (i.e., they will consume the Driver Throttle Override Detected signal without using the Protection Value).

4.2.3.80 Driver Throttle Override Detection Alive Rolling Count. See Table 93.

Table 93: Driver Throttle Override Detection Alive Rolling Count Signal Detail

Signal	Length	Data Type	Range	Conversion
Driver Throttle Override Detection Alive Rolling Count	2	UNM	0 to 3	E = N × 1

4.2.3.80.1 Powertrain Interface Definition. Driver Throttle Override Detection Alive Rolling Count signal is transmitted by the ECM. This Alive Rolling Count is associated with the Driver Throttle Override Detected signal. Refer to GMW8772, PPEI Serial Data Architecture for Alive Rolling Count and Protection Value Requirements.

Input Delay: 50 ms

4.2.3.80.2 Platform Interface Definition. Driver Throttle Override Detection Alive Rolling Count is received by Platform. When an Alive Rolling Count error is detected, the corresponding Driver Throttle Override Detected signal shall be ignored. During this condition the receiving module(s) shall use the value of the most recent received signal accompanied by appropriate rolling count and protection value. A sliding window x of y strategy shall comprehend both Alive Rolling Count errors and Protection Value errors as defined in GMW8769, PPEI Cruise Control Algorithm Requirements. Refer to GMW8772, PPEI Serial Data Architecture for Alive Rolling Count and Protection Value Requirements.

Note: The PTO/Fast Idle subsystems do not use this signal (i.e., they consume the Driver Throttle Override Detected signal, but do not use the Alive Rolling Count Value).

4.2.3.81 Economy Mode Active Indication On. See Table 94.

Table 94: Economy Mode Active Indication On Signal Detail

Signal	Length	Data Type	Range	Conversion
Economy Mode Active Indication On	1	BLN	N/A	$0 = False; $1 = True

4.2.3.81.1 Powertrain Interface Definition. Economy Mode Active Indication On is transmitted by the ECM. The Economy Mode Active Indication On data value shall be set to “True” when the ECM enters Fuel Saver Mode as defined in GMW8766.

For engine applications that do not require the Fuel Saver Mode, the Economy Mode Active Indication On signal shall be sent with a default value of “False”.

Data Delay: 50 ms

4.2.3.81.2 Platform Interface Definition. Economy Mode Active Indication On is used by platform to indicate, through a telltale or DIC message, that Fuel Saver Mode is active. When implemented as a telltale, platform shall provide a “bulb check” of the telltale.

4.2.3.82 Economy Mode Request Denied Indication On. See Table 95.

Table 95: Economy Mode Request Denied Indication On Signal Detail

Signal	Length	Data Type	Range	Conversion
Economy Mode Request Denied Indication On	1	BLN	N/A	$0 = False; $1 = True

4.2.3.82.1 Powertrain Interface Definition. Economy Mode Request Denied Indication On is transmitted by the ECM. The ECM shall set the data value of the signal Economy Mode Request Denied Indication On to “True” to indicate that the signal Economy Mode Active Indication On cannot transition to a data value of “True”.

The value of this signal will be set to “False” after a calibratable time, **K_ECOModeReqDeniedResetTime**.

For engine applications that do not require Economy Mode Request Denied Indication On, this signal shall be sent with a default value of “False”.

Data Delay: 50 ms

4.2.3.82.2 Platform Interface Definition. Economy Mode Request Denied Indication On is used by platform to indicate, through a telltale or DIC message, that Fuel Saver Mode cannot be entered. When implemented as a telltale, platform shall provide a “bulb check” of the telltale.

.2.3.83 Elapsed Time Count, Elapsed Time Count Reset Occurred. See Table 96.

Table 96: Elapsed Time Count, Elapsed Time Count Reset Occurred Signal Detail

Signal	Length	Data Type	Range	Conversion
lapsed Time Count	24	UNM	0 to 16 777 215 minutes	E = N × 1
Elapsed Time Count Reset Occurred	1	BLN	N/A	$0 = False; $1 = True

4.2.3.83.1 Powertrain Interface Definition. Elapsed Time Count and Elapsed Time Count Reset Occurred are received by the ECM. This information is needed by Powertrain for part of an oil life algorithm. In this specific part of the oil life algorithm, the absolute oil age in minutes is supervised. Even if the vehicle is not driven, an engine oil change request will be indicated to the driver after exceeding a calibratable engine oil age threshold. The counter may be used for other functions, for example, diesel particulate filter replacement supervision.

Upon receipt of the Elapsed Time Count Reset Occurred equal to “True”, the ECM shall accumulate the absolute time assuming the Platform Module reset its Elapsed Time Count value to zero.

4.2.3.83.2 Platform Interface Definition. Elapsed Time Count and Elapsed Time Count Reset Occurred are transmitted by the Platform. The value is incremented by one for each 1-minute elapsed time period. The information shall be stored in a non-volatile part of the memory, preferably in Electronically Erasable Programmable Read Only Memory (EEPROM), between ignition cycles. Platform is not required to continue accumulating time when the vehicle battery is disconnected.

Platform will send the Elapsed Time Count Reset Occurred signal with a value of "True" whenever the Platform memory that maintains the elapsed calendar time information has been reset due to a memory failure or other reasons with the same effect. If the reset occurred while ignition is off this signal is set to "True" and it shall remain "True" for the next key cycle. Or if the reset occurred during the current ignition cycle, the signal Elapsed Time Count Reset Occurred shall be set to "True" and remain "True" for the remainder of the current ignition cycle.

4.2.3.84 Emissions Related Fuel Level Low. See Table 97.

Table 97: Emissions Related Fuel Level Low Signal Detail

Signal	Length	Data Type	Range	Conversion
Emissions Related Fuel Level Low	1	BLN	N/A	$0 = False; $1 = True

4.2.3.84.1 Powertrain Interface Definition. Emissions Related Fuel Level Low is transmitted by the ECM. This signal is used by FSCM diagnostics to determine if the total fuel level in the tanks is considered too low to execute certain diagnostics. Emissions Related Fuel Level Low is set to "True" by the ECM if the emission related fuel level is below a threshold for a calibrated period of time, and there are no emission related fuel level diagnostic faults present.

Data Delay: 525 ms

4.2.3.84.2 Platform Interface Definition. Emissions Related Fuel Level Low is received by the FSCM. The FSCM uses the Emissions Related Fuel Level Low to determine if the fuel level is too low to allow execution of the fuel system rationality and fuel pressure sensor performance diagnostics.

4.2.3.85 Engine Boost Pressure Indication, Engine Boost Pressure Indication Validity. See Table 98.

Table 98: Engine Boost Pressure Indication, Engine Boost Pressure Indication Validity Signal Detail

Signal	Length	Data Type	Range	Conversion
Engine Boost Pressure Indication	8	UNM	0 to 100%	E = N × 0.392 157
Engine Boost Pressure Indication Validity	1	ENM	N/A	$0 = Valid; $1 = Invalid

4.2.3.85.1 Powertrain Interface Definition. Engine Boost Pressure Indication is transmitted by the ECM. It represents the normalized engine load on vehicles using boosted aspirated engines. Engine Boost Pressure Indication Validity shall be set to "Invalid" if the sensor providing the data has failed and a backup value cannot be determined and a corresponding DTC has been set.

Data Delay: 125 ms

4.2.3.85.2 Platform Interface Definition. Engine Boost Pressure Indication is received by Platform. It is used for display purposes to display boost pressure in percentage**.**

The data in Engine Boost Pressure Indication shall be ignored if Engine Boost Pressure Indication Validity is set to "Invalid".

4.2.3.86 Engine Coast Fuel Cut Off Active. See Table 99.

Table 99: Engine Coast Fuel Cut Off Active Signal Detail

Signal	Length	Data Type	Range	Conversion
Engine Coast Fuel Cut Off Active	1	BLN	N/A	$0 = False; $1 = True

4.2.3.86.1 Powertrain Interface Definition. Engine Coast Fuel Cut Off is transmitted by the ECM. It shall be set to “True” if the engine controller cuts off fuel during a coast condition. It shall be set to “False” under all other operating conditions.

Data Delay: 125 ms

4.2.3.86.2 Platform Interface Definition. Engine Coast Fuel Cut Off is received by Platform. The Platform uses this signal for fuel consumption display purposes.

4.2.3.87 Engine Coolant Temperature, Engine Coolant Temperature Validity. See Table 100.

Table 100: Engine Coolant Temperature, Engine Coolant Temperature Validity Signal Detail

Signal	Length	Data Type	Range	Conversion
Engine Coolant Temperature	8	UNM	-40 to 215°C	E = (N × 1) - 40
Engine Coolant Temperature Validity	1	ENM	N/A	$0 = Valid; $1 = Invalid

4.2.3.87.1 Powertrain Interface Definition. Engine Coolant Temperature is transmitted by the ECM. It represents the temperature of the engine coolant. This signal must have a high internal Powertrain electronics scheduling priority for the first transmission because the Platform requires this data to perform the A/C compressor anti-slugging algorithm. Engine Coolant Temperature Validity shall be set to “Invalid” if the sensor providing the data has failed and a corresponding DTC has been set.

The ECM shall continue to send its best estimate of the Engine Coolant Temperature even when the validity bit is set to “Invalid”.

Input Delay: 1025 ms (first transmission prior to commencement of engine crank).

Accuracy Requirement: TBD

4.2.3.87.2 Platform Interface Definition. Engine Coolant Temperature is received by Platform. It is used for the calculation and display of Outside Air Temperature and display of coolant temperature. It is also used in the A/C compressor anti-slugging algorithm. It may also be used for BAS+ Auto Start, BAS+ Auto Stop, BAS+ Heater Core Coolant Pump Control and BAS+ Regenerative Brake Control.

The FSCM uses Engine Coolant Temperature as an enabling criterion for update of the fuel pump duty cycle long term adaptives and in the estimated fuel temperature model.

The data in Engine Coolant Temperature shall be ignored if Engine Coolant Temperature Validity is set to “Invalid”. The FSCM will continue to use the Engine Coolant Temperature even when the validity bit is set to “Invalid”.

4.2.3.88 Engine Cooling Fan Speed. See Table 101.

Table 101: Engine Cooling Fan Speed Signal Detail

Signal	Length	Data Type	Range	Conversion
Engine Cooling Fan Speed	8	UNM	0 to 100%	E = N × 100/255

4.2.3.88.1 Powertrain Interface Definition. Engine Cooling Fan Speed is transmitted by the ECM. Powertrain reports the percentage of fan power commanded. This command is based on parameters such as coolant temperature, transmission temperature, engine oil temperature, radiator outlet temperature, radiator delta temperature (across the radiator), intake air temperature and A/C pressure. On discrete fan systems, this percentage represents a discrete fan speed based on the calibrations in the cooling fan control algorithm. On PWM fan systems this percentage represents the PWM duty cycle commanded.

Data Delay: 1025 ms

Accuracy Requirement: TBD

4.2.3.88.2 Platform Interface Definition. Engine Cooling Fan Speed is received by Platform. It is used in electrical load management and other algorithms to determine if a reduction in fan speed should be requested.

4.2.3.89 Engine Cooling Fan Speed Adjustment. See Table 102.

Table 102: Engine Cooling Fan Speed Adjustment Signal Detail

Signal	Length	Data Type [Note 1]	Range	Conversion
Engine Cooling Fan Speed Adjustment	8	SNM	-100 to 99.2188%	E = N × 200/256

Note 1: SNM = Signed Numeric

4.2.3.89.1 Powertrain Interface Definition. Engine Cooling Fan Speed Adjustment is received by Powertrain. The cooling fan control algorithm uses this information to adjust the fan speed as defined in GMW8770, PPEI Cooling Fan Control Algorithm Requirements.

4.2.3.89.2 Platform Interface Definition. Engine Cooling Fan Speed Adjustment is transmitted by the Gateway. This signal is used to request Powertrain to modify the cooling fan speed. The fan speed may be requested to be lowered for electric power management purposes. If the cooling fan is not already running, the fan speed may be requested to be increased during extended engine idle periods in order to ventilate the engine compartment.

Data Delay: 2000 ms

4.2.3.90 Engine Cylinder Deactivation Event Pending. See Table 103.

Table 103: Engine Cylinder Deactivation Event Pending Signal Detail

Signal	Length	Data Type	Range	Conversion
Engine Cylinder Deactivation Event Pending	1	BLN	N/A	$0 = False; $1 = True

4.2.3.90.1 Powertrain Interface Definition. Engine Cylinder Deactivation Event Pending is transmitted by Powertrain. The data is set to “True” when the ECM has determined that conditions are correct for deactivation or reactivation of half of the engine’s cylinders (after the handshaking with the TCM, per Engine Transmission Electrical Interface (ETEI). It will remain “True” until the deactivation or reactivation event has either completed or aborted. This signal is used in the Exhaust Pressure Regulator Valve Algorithm to control the position of the Exhaust Pressure Regulator Valve.

Data Delay: 12.5 ms

4.2.3.90.2 Platform Interface Definition. Engine Cylinder Deactivation Event Pending is received by Platform. Platform uses this signal in the Exhaust Pressure Regulator Valve Algorithm**.**

When this signal is received with a value of “True” and the signal Engine Cylinder Deactivation Mode has the value of “Deactivation In Progress”, the Exhaust Pressure Regulator Valve Algorithm shall attempt to close the valve. When the value of Engine Cylinder Deactivation Event Pending transitions to “False” and the signal Engine Cylinder Deactivation Mode equals “Half of Total Cylinders Active”, the cylinder deactivation has been successful and the Exhaust Pressure Regulator Valve should be in the closed position. If the value of Engine Cylinder Deactivation Event Pending transitions to “False” and the signal Engine Cylinder Deactivation Mode does not equal “Half of Total Cylinders Active”, the cylinder deactivation has been unsuccessful and the Exhaust Pressure Regulator Valve should be opened.

When this signal is received with a value of “True” and the signal Engine Cylinder Deactivation Mode has the value of “Reactivation In Progress”, the Exhaust Pressure Regulator Valve Algorithm shall attempt to open the valve. When the value of Engine Cylinder Deactivation Event Pending transitions to “False” and the signal Engine Cylinder Deactivation Mode equals “All Cylinders Active”, the cylinder reactivation has been successful and the Exhaust Pressure Regulator Valve should be in the opened position. If the value of Engine Cylinder Deactivation Event Pending transitions to “False” and the signal Engine Cylinder Deactivation Mode does not equal “All Cylinders Active”, the cylinder reactivation has been unsuccessful and the Exhaust Pressure Regulator Valve should be closed.

4.2.3.91 Engine Cylinder Deactivation Mode. See Table 104.

Table 104: Engine Cylinder Deactivation Mode Signal Detail

Signal	Length	Data Type	Range	Conversion
Engine Cylinder Deactivation Mode	2	ENM	N/A	$0 = All Cylinders Active $1 = Deactivation In Progress $2 = Half of Total Cylinders Active $3 = Reactivation In Progress

4.2.3.91.1 Powertrain Interface Definition. Engine Cylinder Deactivation Mode is transmitted by the ECM. This signal shall provide the status of the engine Displacement on Demand (DoD) function.

The enumeration definitions are as follows:

- **All Cylinders Active:** This mode implies that all of the cylinders in the engine are active. This is the default mode for a vehicle that does not have cylinder deactivation.
- **Deactivation In Progress:** This mode is set at the start of the cylinder deactivation process, before any cylinders have been turned off. While this mode is in effect, the cylinders will be deactivated. Once all of the desired cylinders have been deactivated, this signal shall transition to the next mode.
- **Half of Total Cylinders Active:** This mode indicates that the engine is operating in cylinder deactivation and that half of the cylinders are currently active.
- **Reactivation In Progress:** This mode indicates that the engine is reactivating the cylinders that were turned off. This mode shall be entered at the start of the reactivation process before any cylinders have been turned back on. When the reactivation is complete, this signal shall transition to the $0 mode.

If the engine is not running Powertrain shall transmit this signal with a value of “All Cylinders Active”.

Data Delay: 125 ms

4.2.3.91.2 Platform Interface Definition. Engine Cylinder Deactivation Mode is received by Platform. This signal is used to display to the vehicle operator when the engine control system (if equipped with the DoD function) is operating with all cylinders active or with half of all cylinders active.

Additionally, on vehicles equipped with an Exhaust Pressure Regulator Valve controlled by Platform, this signal shall be used in conjunction with Engine Cylinder Deactivation Event Pending to coordinate opening and closing of the Exhaust Pressure Regulator Valve. See the definition of the Engine Cylinder Deactivation Event Pending signal for algorithm requirements.

4.2.3.92 Engine Diagnostic Trouble Code Present Indication On. See Table 105.

Table 105: Engine Diagnostic Trouble Code Present Indication On Signal Detail

Signal	Length	Data Type	Range	Conversion
Engine Diagnostic Trouble Code Present Indication On	1	BLN	N/A	$0 = False; $1 = True

4.2.3.92.1 Powertrain Interface Definition. Engine Diagnostic Trouble Code Present Indication On is transmitted by the ECM. It is used to indicate presence of a diagnostic trouble code in the ECM, whether emissions related or not.

- At system startup the signal shall be initialized to “False”.
- After switching the ignition on, the engine controller shall check the content of the ECM failure memory. If no errors are stored, independent whether emissions related or not, the signal shall be set to “False”. If one (or more) errors are stored in the failure memory, independent whether emissions related or not, the engine controller shall set the signal to “True”.

- After the signal has been set to “True”, the ECM shall set the signal to “False” if either of the following two conditions is true:
  1. The starter relay output is activated, i.e., engine cranking is initiated.
  2. The signal has been “True” for a calibratable time. On OBD II applications, the calibration data value shall be synchronized with the MIL bulb check. On European applications, the calibration data value shall be distinguishable from the bulb check owned by platform.
- No specific treatment applies after an engine stall, i.e., the signal shall remain “False” after an engine stall.

It must be possible to deactivate the function via a calibration set, if the function is prohibited in a carline (e.g., when a dot matrix display is used instead of a dedicated telltale). ECMs that do not support the signal shall always send this signal with a data value of “False”.

Data Delay: 525 ms

4.2.3.92.2 Platform Interface Definition. Engine Diagnostic Trouble Code Present Indication On is received by Platform. It is used to indicate through a telltale that there is a diagnostic trouble code stored in the engine controller. The use of a telltale avoids the need to hook up a diagnostic tester to confirm that there are no DTCs present in the ECM at pre-delivery inspection or during service.

On European applications, the typical implementation will use the Service Vehicle Soon (SVS) indicator as the telltale. At the discretion of Platform, other telltales may be used.

Any bulb check performed by Platform shall be defined in cooperation with Powertrain, such that the Engine Diagnostic Trouble Code Present Indication On is distinguishable from the bulb check.

4. .3.93 Engine Emissions Related Malfunction Active. See Table 106.

Table 106: Engine Emissions Related Malfunction Active Signal Detail

Signal	Length	Data Type	Range	Conversion
Engine Emissions Related Malfunction Active	1	BLN	N/A	$0 = False; $1 = True

4.2.3.93.1 Powertrain Interface Definition. Engine Emissions Related Malfunction Active is transmitted by the ECM.

Powertrain shall determine the state of Engine Emissions Related Malfunction Active based on the status of the ECM diagnostic monitors. If no emissions related ECM DTCs are active, the value of Engine Emissions Related Malfunction Active will be set to “False”. If one or more emissions related ECM DTCs are active, Engine Emissions Related Malfunction Active shall be set to “True”.

Data Delay: 1025 ms

4.2.3.93.2 Platform Interface Definition. Engine Emissions Related Malfunction Active is received by Platform. It is used for any display purposes desired beyond that provided by the MIL. This signal shall not be used by the Platform to directly control the MIL indication.

This display indication is intended to inform the vehicle operator that emissions related anomalous conditions within the engine controller have been detected and that the ECM may need to be serviced. The existence of an additional telltale is a Platform decision. When implemented as a telltale, platform shall provide a “bulb check” of the telltale Platform may also choose to combine this signal with Engine Non Emissions Related Malfunction Active to provide a combined indication of any engine controller malfunction – emissions related or not.

This signal may also be used by the SDM as part of its Event Data Recorder functionality.

4.2.3.94 Engine Emissions Related Malfunction Indication Request. See Table 107.

Table 107: Engine Emissions Related Malfunction Indication Request Signal Detail

Signal	Length	Data Type	Range	Conversion
Engine Emissions Related Malfunction Indication Request	3	ENM	N/A	$0 = Continuous Indication $1 = No Indication $2 = Flashing 1 Hz Indication $3 = Flashing 2 Hz Indication $4 = Flashing 0.5 Hz Indication

4.2.3.94.1 Powertrain Interface Definition. Engine Emissions Related Malfunction Indication Request is transmitted by the ECM. This signal is used to control the service engine soon (Malfunction Indication Lamp) indication. This signal is sent with a data value of “Continuous Indication” for bulb check, service device control, or when failures are detected by Powertrain that require a MIL indication. This signal is sent with a data value of “Flashing 1 Hz Indication” when catalyst damage is detected or OBD readiness status is incomplete. This signal is sent with a data value of “Flashing 0.5 Hz Indication” in the vehicle assembly plant during fuel pump prime. Additional flashing rates are reserved for future OBD II regulations. When the signal is used for service device control, only the “Continuous Indication” and “No Indication” states are used. The Powertrain controller will control the bulb check.

Data Delay: 125 ms

4.2.3.94.2 Platform Interface Definition. Engine Emissions Related Malfunction Indication Request is received by Platform. The signal is used only to control the Service Engine Soon (Malfunction Indication Lamp) indication in the cluster. This signal does not always indicate that an emission related fault is present (e.g., bulb check and service device control) and therefore cannot be used for fault status. If this signal is used to control an OBD II regulated display, it should only be used on the GMLAN high-speed communication link, as any other communication link and any additional gateways using this signal to control the MIL display would be subject to OBD II regulations, thereby including all controllers on that link.

The Platform display system shall always power-up in a default state that commands the “Continuous Indication” state until a valid signal is received commanding a different state. When a valid “Flashing x Hertz Indication” state is received, the indication flash rate duty cycle shall be 50%.

The Platform display system shall default to the “Continuous Indication” state when communications between the Platform high-speed receiver and the Powertrain is interrupted (i.e. continuous loss of frame containing this signal) for more than 5 s. The Platform high-speed controller shall resume normal display control within 5 s of the resumption of valid serial data messages.

Although the Platform display system may store diagnostic trouble codes upon detecting loss of serial communications, those communication trouble codes are not required by OBD regulations and shall not directly invoke illumination of the MIL.

The Platform display system must not take hardware or software action to prevent MIL illumination when the vehicle battery voltage is below 18.0 V.

During crank, the Platform display system shall attempt to follow the Powertrain controlled state. With any reset or loss of communication during crank, the Platform display system shall recover into a default state that commands the “Continuous Indication” state until a valid signal is received commanding a different state. This is based on the Powertrain bulb check logic that commands the MIL on during crank until engine running occurs.

Power-Up Default: “Continuous Indication”

Communication Failure Value: “Continuous Indication”

4.2.3.95 Engine Fuel Control State. See Table 108.

Table 108: Engine Fuel Control State Signal Detail

Signal	Length	Data Type	Range	Conversion
Engine Fuel Control State	2	ENM	N/A	$0 = Open Loop $1 = Non-Stoichiometric Closed Loop $2 = Stoichiometric Closed Loop

4.2.3.95.1 Powertrain Interface Definition. Engine Fuel Control State is transmitted by the ECM. It indicates the allowed level of closed loop fuel capability.

The term “Open Loop” indicates that Oxygen sensor feedback is not yet allowed for fuel control.

The term “Non-Stoichiometric Closed Loop” indicates that Oxygen sensor feedback is allowed to correct fuel delivery, but the commanded Air/Fuel ratio may not be at stoichiometric. When the engine is cold, not all of the fuel injected actually participates in combustion. In such instances, Air/Fuel ratios significantly richer than true stoichiometric must be commanded to actually achieve a stoichiometric burn in the combustion chamber.

The term “Stoichiometric Closed Loop” indicates that Oxygen sensor feedback is allowed to correct fuel delivery, and the commanded Air/Fuel ratio is at stoichiometric.

Note: This parameter only conveys the level of closed loop fuel control that the engine is “ready” to use. It is not an indication of whether or not closed loop fuel control is truly active. For example, when fuel enrichment protection is active (i.e., catalyst protection) this parameter may remain at “Stoichiometric Closed Loop” even though at that particular time Oxygen sensor feedback is ignored and the commanded Air/Fuel ratio is not at stoichiometric.

Data Delay: 250 ms

4.2.3.95.1 latform Interface Definition. Engine Fuel Control State is received by the FSCM. This signal is used to inhibit update of the long term adaptives to the fuel pump duty cycle.

4.2.3.96 Engine Hot/Stop Engine Indication On. See Table 109.

Table 109: Engine Hot/Stop Engine Indication On Signal Detail

Signal	Length	Data Type	Range	Conversion
Engine Hot/Stop Engine Indication On	1	BLN	N/A	$0 = False; $1 = True

4.2.3.96.1 Powertrain Interface Definition. Engine Hot/Stop Engine Indication On is transmitted by the ECM. This signal shall be supported for all applications. When Powertrain determines that an extreme engine hot condition is present based on coolant temperature being greater than a calibratable temperature threshold, the Powertrain electronics will set the data value of the signal to “True” to command the Engine Hot/Stop Engine display. The data value of this signal will be set to “False” if the coolant sensor does not detect or no longer detects coolant temperature exceeding the threshold value.

Note: The coolant temperature calibration thresholds for this signal shall always be greater than the thresholds for the Engine Hot Fuel Enrichment Indication On signal. Refer to GMW8765, Data Dictionary.

Data Delay: 1025 ms

4.2.3.96.2 Platform Interface Definition. Engine Hot/Stop Engine Indication On is used by platform to indicate, through a gage, telltale or message, that an extremely hot engine condition has been detected. Platform shall support a display for this condition on all applications. Possible display implementations include “red zone” coolant indication of the temperature gage (independent of engine coolant temperature value), activation or flashing of the coolant temperature telltale or a dedicated message. A chime is recommended to accompany the visual indication, but is included at the discretion of Platform. When implemented as a telltale, Platform shall provide a “bulb check” of the telltale.

4.2.3.97 Engine Hot Fuel Enrichment Indication On. See Table 110.

Table 110: Engine Hot Fuel Enrichment Indication On Signal Detail

Signal	Length	Data Type	Range	Conversion
Engine Hot Fuel Enrichment Indication On	1	BLN	N/A	$0 = False; $1 = True

4.2.3.97.1 Powertrain Interface Definition. Engine Hot Fuel Enrichment Indication On is transmitted by the ECM. Powertrain shall set the data value of the signal to "True" if either of the following conditions are satisfied: the Powertrain is enriching fuel-air mixture to cool the engine during excessive hot engine conditions or engine coolant temperature is greater than a calibration. Refer to GMW8765. Enriching the fuel-air mixture may cause increased vehicle emissions. The CARB has ruled per MO 95-20 that a hot coolant display indication will preclude the need to illuminate the MIL due to increased emissions during hot engine fuel enrichment conditions. If hot fuel enrichment control is not enabled, the state of Engine Hot Fuel Enrichment Indication On shall be based on engine coolant temperature only. Refer to GMW8765.

Note: The engine coolant temperature calibration thresholds for this signal shall be less than the thresholds for the Engine Hot/Stop Engine Indication On signal. Refer to GMW8765, Data Dictionary.

Data Delay: 500 ms

4.2.3.97.2 Platform Interface Definition. Engine Hot Fuel Enrichment Indication On is received by Platform and is used for display purposes. Any hot engine display indication (e.g., "Hot" light, "red" hot zone on temperature gauge, DIC message, etc.) must be controlled by this signal for the reasons stated above. The display indication may also be controlled by other engine coolant temperature signals. If an analog temperature gage is used without another engine hot indicator, the temperature gauge must be driven into at least the lowest temperature of the "red" hot zone or higher if other engine coolant temperature signals require a higher temperature reading. Gauge movement delay into the "red" zone of up to 15 s is allowed.

4.2.3.98 Engine Idle Active. See Table 111.

Table 111: Engine Idle Active Signal Detail

Signal	Length	Data Type	Range	Conversion
Engine Idle Active	1	BLN	N/A	$0 = False; $1 = True

4.2.3.98.1 Powertrain Interface Definition. Engine Idle Active is transmitted by the ECM. It is an indication of the idle status of the engine. Engine Idle Active is set to "True" when the engine is running in an idle state based on air idle. Engine Idle Active is set to "False" when the engine is not running, or when the engine is running outside of an idle state.

Data Delay: 125 ms

4.2.3.98.2 Platform Interface Definition. Engine Idle Active is received by Platform. It is used on some platforms for the cluster tachometer displays that require a higher damping rate during engine idle conditions.

4.2.3.99 Engine Intake Air Boost Pressure, Engine Intake Air Boost Pressure Validity. See Table 112.

Table 112: Engine Intake Air Boost Pressure, Engine Intake Air Boost Pressure Validity Signal Detail

Signal	Length	Data Type	Range	Conversion
Engine Intake Air Boost Pressure	8	SNM	-128 to 127 kPa·g	E = N × 1
Engine Intake Air Boost Pressure Validity	1	ENM	N/A	$0 = Valid; $1 = Invalid

4.2.3.99.1 Powertrain Interface Definition. Engine Intake Air Boost Pressure is transmitted by the ECM. It represents the boost pressure on vehicles using boosted aspirated engines. Engine Intake Air Boost Pressure Validity shall be set to "Invalid" if the sensor providing the data has failed, and a backup value cannot be determined and a corresponding DTC has been set.

Data Delay: 125 ms

4.2.3.99.2 Platform Interface Definition. Engine Intake Air Boost Pressure is received by Platform. It is used for display purposes on applications where a gauge reading in kPa is desired to meet customer expectations of a specific market segment.

The data in Engine Intake Air Boost Pressure shall be ignored if Engine Intake Air Boost Pressure Validity is set to “Invalid”.

4.2.3.100 Engine Intake Air Temperature, Engine Intake Air Temperature Validity. See Table 113.

Table 113: Engine Intake Air Temperature, Engine Intake Air Temperature Validity Signal Detail

Signal	Length	Data Type	Range	Conversion
Engine Intake Air Temperature	8	UNM	-40 to 215°C	E = (N × 1) - 40
Engine Intake Air Temperature Validity	1	ENM	N/A	$0 = Valid; $1 = Invalid

4.2.3.100.1 Powertrain Interface Definition. Engine Intake Air Temperature is transmitted by the ECM. It represents the air temperature in the fresh air inlet, either between the air cleaner and throttle body, or in the intake manifold. The placement of the temperature sensor, referred to as the Manifold Air Temperature (MAT) sensor, is application dependent and could result in significant variation in temperature readings between applications. The temperature reading could be extremely high after extended idles and hot soaks. Engine Intake Air Temperature Validity shall be set to “Invalid” if the sensor providing the data has failed and a corresponding DTC has been set.

This signal must have a high internal Powertrain electronics scheduling priority for the first transmission because the Platform requires this data to perform the A/C compressor anti-slugging algorithm.

Input Delay: 525 ms (first transmission prior to commencement of engine crank)

Accuracy Requirement: TBD

4.2.3.100.2 Platform Interface Definition. Engine Intake Air Temperature is received by Platform. The Traction Control System (TCS) Brake Thermal Model uses the intake air temperature as an estimate for ambient temperature. Platform may also use this for HVAC fan afterblow (running the HVAC blower motor after the engine is turned off), A/C compressor anti-slugging, and in the battery temperature estimate.

The data in Engine Intake Air Temperature shall be ignored if Engine Intake Air Temperature Validity is set to “Invalid”.

4.2.3.101 Engine Manifold Absolute Pressure, Engine Manifold Absolute Pressure Validity. See Table 114.

Table 114: Engine Manifold Absolute Pressure, Engine Manifold Absolute Pressure Validity Signal Detail

Signal	Length	Data Type	Range	Conversion
Engine Manifold Absolute Pressure	8	UMN	0.0 to 127.5 kPa	E = N × 0.5
Engine Manifold Absolute Pressure Validity	1	ENM	N/A	$0 = Valid; $1 = Invalid

4.2.3.101.1 Powertrain Interface Definition. Engine Manifold Absolute Pressure is transmitted by the ECM. It represents the engine manifold absolute pressure at the intake manifold (unboosted).

Engine Manifold Absolute Pressure Validity shall be set to “Invalid” if the Manifold Absolute Pressure (MAP) sensor providing the data has failed and a backup value cannot be determined and a corresponding DTC has been set.

Data Delay: 50 ms

4.2.3.101.2 Platform Interface Definition. Engine Manifold Absolute Pressure is received by EBCM. The EBCM requires this signal to calculate engine manifold vacuum.

The data in Engine Manifold Absolute Pressure shall be ignored if Engine Manifold Absolute Pressure Validity is set to “Invalid”.

4.2.3.102 Engine Non Emissions Related Malfunction Active. See Table 115.

Table 115: Engine Non Emissions Related Malfunction Active Signal Detail

Signal	Length	Data Type	Range	Conversion
Engine Non Emissions Related Malfunction Active	1	BLN	N/A	$0 = False; $1 = True

4.2.3.102.1 Powertrain Interface Definition. Engine Non Emissions Related Malfunction Active is transmitted by the ECM.

Powertrain shall determine the state of Engine Non Emissions Related Malfunction Active based on the status of the ECM diagnostic monitors for diagnostics that are not emission related but require operator notification. If no such ECM DTCs are active, then Engine Non Emissions Related Malfunction Active will be set to “False”. If one or more of the non-emissions related DTCs in the ECM are active, the ECM shall set the value of Engine Non Emissions Related Malfunction Active to “True”.

Data Delay: 1025 ms

4.2.3.102.2 Platform Interface Definition. Engine Non Emissions Related Malfunction Active is received by Platform and is used for display purposes.

This display indication is intended to inform the vehicle operator that non-emissions related anomalous conditions within the engine controller have been detected and that the engine may need to be serviced. A SVS telltale or DIC message shall be used to provide indication to the operator when this signal is “True”.

This signal may also be used by the SDM as part of its Event Data Recorder functionality.

4.2.3.103 Engine Off Time Extended Range, Engine Off Time Extended Range Validity. See Table 116.

Table 116: Engine Off Time Extended Range, Engine Off Time Extended Range Validity Signal Detail

Signal	Length	Data Type	Range	Conversion
Engine Off Time Extended Range	8	UNM	0 to 1020 minutes	E = N × 4
Engine Off Time Extended Range Validity	1	ENM	N/A	$0 = Valid; $1 = Invalid

4.2.3.103.1 Powertrain Interface Definition. Engine Off Time Extended Range is received by Powertrain. The Engine Off Time Extended Range is used at Ignition on to update the various thermal models. Engine Off Time Extended Range is not to be used for emissions functions that comply with OBD II.

The data in Engine Off Time Extended Range shall be ignored if Engine Off Time Extended Range Validity is set to “Invalid”.

4.2.3.103.2 Platform Interface Definition. Engine Off Time Extended Range is transmitted by the Gateway. This signal represents the time from Engine Run = “False” to Engine Run = “True”. The Engine Off Time Extended Range is set to zero upon the change of state of the signal Engine Run Active from “True” to “False”. The Engine Off Time Extended Range stops incrementing upon the change of state of the signal Engine Run Active from “False” to “True”. The Gateway shall stop incrementing the timer when it reaches its maximum value (i.e., no rollover).

Engine Off Time Extended Range Validity shall be set to “Invalid” if the calculation has failed due to loss of power in the Gateway.

Data Delay: 1025 ms

4.2.3.104 Engine Off Time Virtual Device Availability. See Table 117.

Table 117: Engine Off Time Virtual Device Availability Signal Detail

Signal	Length	Data Type	Range	Conversion
Engine Off Time Virtual Device Availability	1	ENM	N/A	$0 = Virtual Device Unavailable $1 = Virtual Device Available

4.2.3.104.1 Powertrain Interface Definition. Engine Off Time Virtual Device Availability is received by Powertrain. Powertrain uses this signal to determine proper operation of engine off time calculation in the event of a failure with the original source of Engine Off Time Extended Range.

4.2.3.104.2 Platform Interface Definition. Engine Off Time Virtual Device Availability is transmitted by the Gateway. This signal represents the availability from the original source of the information provided by the GMLAN signals Engine Off Time Extended Range and Engine Off Time Extended Range Validity.

This signal is always transmitted by the Gateway. The Gateway module determines the availability of the Engine Off Time Extended Range based on signal supervision. If the platform does not use an Engine Off Time Extended Range, this signal shall be set to “Virtual Device Unavailable”.

If the vehicle is not equipped with an Electronically Controlled Variable Displacement compressor, this signal shall be transmitted with a data value of “Virtual Device Unavailable”. Refer to GMW8772, PPEI Serial Data Architecture for more information on Virtual Device Availability signals.

4.2.3.105 Engine Oil Change Indication On. See Table 118.

Table 118: Engine Oil Change Indication On Signal Detail

	Signal	Length	Data Type	Range	Conversion
En	ne Oil Change Indication On	1	BLN	N/A	$0 = False; $1 = True

4.2 .105.1 Powertrain Interface Definition. Engine Oil Change Indication On is transmitted by the ECM. The state of Engine Oil Change is based on the engine oil life determination algorithm that resides in the Powertrain electronics. The algorithm is based on the principle that engine operation will decrease oil life especially at non-optimal oil temperatures. Once the oil life is reduced to a specific calibratable level, Powertrain will set the data value of the signal to True to command the Engine Oil Change display.

When an engine oil condition sensor is present, the signal Engine Oil Change Indication On will be determined based on Table 119.

Table 119: Engine Oil Change Sensor State vs. Indication On

Engine Oil Condition Sensor State	Engine Oil Change Indication On
Oil OK	“False”
Change Oil Soon	“True”
Change Oil Now	“True”
Contamination	“True”
All Other States	“False”

Data Delay: 1025 ms

4.2.3.105.2 Platform Interface Definition. Engine Oil Change Indication On is received by Platform. It is optionally used by the cluster or DIC to indicate, through a telltale or message, when the data value is “True”, that the engine oil needs to be changed. When implemented as a telltale, platform shall provide a “bulb check” of the telltale. At the discretion of Platform, a chime can accompany the visual indication.

4.2.3.106 Engine Oil Hot Indication On. See Table 120.

Table 120: Engine Oil Hot Indication On Signal Detail

Signal	Length	Data Type	Range	Conversion
Engine Oil Hot Indication On	1	BLN	N/A	$0 = False; $1 = True

4.2.3.106.1 Powertrain Interface Definition. Engine Oil Hot Indication On is transmitted by the ECM. When Powertrain determines that an extreme engine oil hot condition is present based on engine oil temperature being greater than a calibratable temperature threshold, the Powertrain electronics will set the data value of the signal to “True” to command the Engine Oil Hot Indication On. The data value of this signal will be set to “False” if the engine oil temperature sensor or modeled engine oil temperature does not detect or no longer detects engine oil temperature exceeding the threshold value.

For engine applications that do not require engine oil hot indication, this signal shall be sent with a default value of “False”.

Data Delay: 1025 ms

4.2.3.106.2 Platform Interface Definition. Engine Oil Hot Indication On is used by platform to indicate, through a telltale or DIC message, that an extremely hot engine oil condition has been detected. When implemented as a telltale, platform shall provide a “bulb check” of the telltale. At the discretion of Platform, a chime can accompany the visual indication.

4.2.3.107 Engine Oil Level Low Indication On. See Table 121.

Table 121: Engine Oil Level Low Indication On Signal Detail

Signal	Length	Data Type	Range	Conversion
Engine Oil Level Low Indication On	1	BLN	N/A	$0 = False; $1 = True

4.2.3.107.1 Powertrain Interface Definition. Engine Oil Level Low Indication On is transmitted by the ECM. The state of Engine Oil Low Level Indication On is based on either a static or dynamic algorithm that determines whether the engine oil level is low. This determination algorithm resides in the Powertrain electronics. The signal Engine Oil Low Level Indication On is set to “True” when a low engine oil level has been detected. Once the signal Engine Oil Low Level Indication On is set to “True”, it shall remain latched for the remainder of the ignition cycle.

For applications that do not support low oil level sensing, this signal shall be sent with a data value of “False”.

Data Delay: 1025 ms

4.2.3.107.2 Platform Interface Definition. Engine Oil Level Low Indication On is received by platform. It is optionally used by the cluster or DIC to indicate, through a telltale or message, that a low engine oil level condition has been detected. When implemented as a telltale, platform shall provide a “bulb check” of the telltale. At the discretion of Platform, a chime can accompany the visual indication.

4.2.3.108 Engine Oil Life Reset Performed. See Table 122.

Table 122: Engine Oil Life Reset Performed Signal Detail

Signal	Length	Data Type	Range	Conversion
Engine Oil Life Reset Performed	1	BLN	N/A	$0 = False; $1 = True

4.2.3.108.1 Powertrain Interface Definition. Engine Oil Life Reset Performed is transmitted by the ECM. Platform will indicate a reset to Powertrain via the Engine Oil Life Reset Request signal or by the throttle pedal stomp maneuver. The data value of this signal will be set to “True” when Powertrain has reset the engine oil remaining life.

The data value of this signal will be set to “False” after a calibratable time, **K_OilLifeResetOccurredTime**.

When an engine oil condition sensor is present, the signal Engine Oil Life Reset Performed shall always be set to “False”.

Output Actuation Delay: 300 ms (with respect to updating the Engine Oil Remaining Life Signal information).

4.2.3.108.2 Platform Interface Definition. Engine Oil Life Reset Performed is received by Platform, and is used for display purposes. When implemented as a telltale, platform shall provide a “bulb check” of the telltale. At the discretion of Platform, a chime can accompany the visual indication.

Data Delay: 125 ms

4.2.3.109 Engine Oil Life Reset Request. See Table 123.

Table 123: Engine Oil Life Reset Request Signal Detail

Signal	Length	Data Type	Range	Conversion
Engine Oil Life Reset Request	1	BLN	N/A	$0 = False; $1 = True

4.2.3.109.1 Powertrain Interface Definition. The Engine Oil Life Reset Request is received by Powertrain. Upon receipt of this signal with a data value of “True”, Powertrain shall reset its engine oil life estimation algorithm, resulting in a data value of the Engine Oil Remaining Life signal of 100%.

Oil life estimation systems utilizing an oil condition sensor shall not be affected by this signal.

Output Actuation Delay: 300 ms (with respect to updating the Engine Oil Remaining Life Signal information).

4.2.3.109.2 Platform Interface Definition. Engine Oil Life Reset Request is transmitted by the Gateway. For the platform-optional reset switch or mechanism, the Platform will indicate a reset via the Engine Oil Life Reset Request signal to Powertrain. Platform sets the data value of the Engine Oil Life Reset Request to “True” to request a reset of the Engine Oil Remaining Life algorithm.

Applications that do not support a reset of engine oil life shall always transmit this signal with a data value of “False”.

Data Delay: 125 ms

4.2.3.110 Engine Oil Pressure, Engine Oil Pressure Validity. See Table 124.

Table 124: Engine Oil Pressure, Engine Oil Pressure Validity Signal Detail

Signal	Length	Data Type	Range	Conversion
Engine Oil Pressure	8	UNM	0 to 1020 kPa	E = N × 4
Engine Oil Pressure Validity	1	ENM	N/A	$0 = Valid; $1 = Invalid

4.2.3.110.1 Powertrain Interface Definition. Engine Oil Pressure is transmitted by the ECM. It is the filtered fluid pressure read from the oil pressure sensor in the Powertrain electronics. Engine Oil Pressure Validity shall be set to “Invalid” if the sensor providing the data has failed and a corresponding DTC has been set. When an engine oil pressure switch is being used, the signals Engine Oil Pressure and Engine Oil Pressure Validity will be set to 0 kPa and “Valid”, respectively.

Input Delay: 525 ms

Accuracy Requirement: TBD

4.2.3.110.2 Platform Interface Definition. Engine Oil Pressure is received by Platform. It is optionally used for display purposes.

For Platforms that use engine oil pressure sensors, the display device(s) shall delay moving the engine oil pressure gauge to the warning section of the gauge until the signal Engine Oil Pressure Low Indication On is set to “True”, when the engine is running and Engine Oil Pressure Validity = “Valid”. When the engine oil pressure gauge moves to the warning section as a result of Engine Oil Pressure Low Indication On=“True”, the check gauges or Low Oil Pressure indicator in the cluster shall be illuminated as applicable.

The data in Engine Oil Pressure shall be ignored if Engine Oil Pressure Validity is set to “Invalid”.

4.2.3.111 Engine Oil Pressure Low Indication On. See Table 125.

Table 125: Engine Oil Pressure Low Indication On Signal Detail

Signal	Length	Data Type	Range	Conversion
Engine Oil Pressure Low Indication On	1	BLN	N/A	$0 = False; $1 = True

4.2.3.111.1 Powertrain Interface Definition. Engine Oil Pressure Low Indication On is transmitted by the ECM. This signal is required on all applications. The state of Engine Oil Pressure Low Indication On is based on the value of the oil pressure sensor or the state of the oil pressure switch. In order to avoid transmitting false indications of low oil pressure, Powertrain will not indicate a low oil pressure condition unless the engine is running, no failure has been detected with the oil pressure sensor or switch, and the oil pressure has been low for a calibratable, continuous period of time. The data value of this signal will be set to “True” when the Oil Pressure is determined to be low. The data value of this signal will be set to “False” if the Oil Pressure is not detected or is no longer detected as being low.

Data Delay: 1025 ms

4.2.3.111.2 Platform Interface Definition. Engine Oil Pressure Low Indication On is received by platform. It is used to indicate, through a gauge, telltale or message, that a low engine oil pressure condition has been detected. Display of this signal shall be supported on all applications. When implemented as a telltale, platform shall provide a “bulb check” of the telltale. At the discretion of Platform, a chime can accompany the visual indication.

4.2.3.112 Engine Oil Remaining Life. See Table 126.

Table 126: Engine Oil Remaining Life Signal Detail

Signal	Length	Data Type	Range	Conversion
Engine Oil Remaining Life	8	UNM	0 to 100%	E = N × 100/255

4.2.3.112.1 Powertrain Interface Definition. Engine Oil Remaining Life is transmitted by the ECM. Powertrain determines Engine Oil Remaining Life based on the engine oil life determination algorithm that resides in the Powertrain electronics. The algorithm is based on the principle that engine operation will decrease oil life especially at non-optimal oil temperatures. The Engine Oil Remaining Life may be reset by either utilizing the throttle pedal stomp procedure or a platform-optional reset switch. For the platform-optional reset switch, the Platform will indicate a reset via the Engine Oil Life Reset Request signal to Powertrain. Upon detection of any reset of Engine Oil Remaining Life, Powertrain will set the data value of the Engine Oil Remaining Life signal to 100%.

When an engine oil condition sensor is present, the signal Engine Oil Remaining Life shall always be set to 0%.

Data Delay: 275 ms

4.2.3.112.2 Platform Interface Definition. Engine Oil Remaining Life is received by Platform. It is optionally used for display purposes. Platform is responsible for determining the proper display on vehicles that feature an oil condition sensor.

4.2.3.113 Engine Oil Starvation Indication On. See Table 127.

Table 127: Engine Oil Starvation Indication On Signal Detail

Signal	Length	Data Type	Range	Conversion
Engine Oil Starvation Indication On	1	BLN	N/A	$0 = False; $1 = True

4.2.3.113.1 Powertrain Interface Definition. Engine Oil Starvation Indication On is transmitted by the ECM. The data value of this signal will be set to "True" if the vehicle is currently operating in a high lateral acceleration maneuver and Powertrain activates the Oil Starvation Protection mode. The data value of this signal will be set to "False" in all other circumstances.

Applications that do not support an Oil Starvation Protection mode shall always transmit this signal with a data value of "False".

Data Delay: 275 ms

4.2.3.113.2 Platform Interface Definition. Engine Oil Starvation Indication On is received by Platform, and is used for display purposes. When implemented as a telltale, platform shall provide a "bulb check" of the telltale. At the discretion of Platform, a chime can accompany the visual indication.

4.2.3.114 Engine Oil Temperature, Engine Oil Temperature Validity. See Table 128.

Table 128: Engine Oil Temperature, Engine Oil Temperature Validity

Signal	Length	Data Type	Range	Conversion
Engine Oil Temperature	8	UNM	-40 to 215°C	E = (N × 1) - 40
Engine Oil Temperature Validity	1	ENM	N/A	$0 = Valid; $1 = Invalid

4.2.3.114.1 Powertrain Interface Definition. Engine Oil Temperature and Engine Oil Temperature Validity are transmitted by the ECM. This signal represents the oil temperature read from an engine oil temperature sensor; it shall not be based on modeled oil temperature.

Engine Oil Temperature Validity shall be set to "Invalid" if the sensor providing the data has failed and a corresponding DTC has been set.

Applications with no engine oil temperature sensor shall transmit Engine Oil Temperature with a value of -40°C and Engine Oil Temperature Validity with a value of "Valid".

Input Delay: 1025 ms

Accuracy Requirement: TBD

4.2.3.114.2 Platform Interface Definition. Engine Oil Temperature is received by Platform: It is used for display purposes. The data in Engine Oil Temperature shall be ignored if Engine Oil Temperature Validity is set to "Invalid".

4.2.3.115 Engine Performance Identifier. See Table 129.

Table 129: Engine Performance Identifier Signal Detail

Signal	Length	Data Type	Range	Conversion
Engine Performance Identifier	8	UNM	0 to 510 kW	E = N × 2

4.2.3.115.1 Powertrain Interface Definition. Engine Performance Identifier is received by Powertrain. The Engine Performance Identifier contains the nominal engine power in kilowatts, rounded up to the next even value (e.g., from 147 to 148 kW), if the engine data sheet states an odd value. The signal shall be used to prevent an engine power and engine torque upgrade of hardware-identical engines that are offered in two or more performance stages. Engine Performance Identifier is used by the ECM to compare the received value with the internal engine performance, stored in the ECM EEPROM. If the values do not match, the engine power will be reduced and the corresponding DTC will be set.

4.2.3.115.2 Platform Interface Definition. Engine Performance Identifier is transmitted by Platform. This signal represents the engine performance of the factory installed engine, one-time-programmable into the Platform controller non-volatile memory.

4.2.3.116 Engine Driver Preference Mode Switch 1 Active. See Table 130.

Table 130: Engine Driver Preference Mode Switch 1 Active Signal Detail

Signal	Length	Data Type	Range	Conversion
Engine Driver Preference Mode Switch 1 Active	1	BLN	N/A	$0 = False $1 = True

4.2.3.116.1 Powertrain Interface Definition. Engine Driver Preference Mode Switch 1 Active signal is received by Powertrain. This signal is received by the ECM. Powertrain shall ensure that the OBD requirements are fulfilled for a design intended for an OBD II market.

When the switch contacts are closed, the corresponding "Engine Driver Preference Mode Switch 1 Active" serial data signal shall equal $1 = "True" and when the switch contacts are open, the corresponding serial data signal shall equal $0 = "False".

Refer to the algorithm description in the algorithm section of GMW8766 for a description of how the system shall perform based on the ECM calibration(s) selected.

When Powertrain does not interpret that any driver requests has been made from the individual switch state, Powertrain shall operate in the default operating mode as defined by the algorithm described in GMW8766.

When Powertrain accepts the Platform switch request, Powertrain shall indicate the state of the last requested in the signals Engine Driver Preference Mode Switch 1 Enabled and Engine Driver Preference Mode Switch 1 Status.

Power-Up Default: Engine Driver Preference Mode Switch 1 Active = "False"

Communication Failure Value: Engine Driver Preference Mode Switch 1 Active = "False"

4.2.3.116.2 Platform Interface Definition. Engine Driver Preference Mode Switch 1 Active is transmitted by the Gateway module.

This request is used primarily to request a particular engine function based on driver preferences.

Examples of driver preference may be (but are not limited to): Diesel exhaust braking.

Powertrain and Platform shall agree to a definition of the requirements for a given engine function for each application.

This signal is used primarily to request an alternative engine function based on driver preferences. The mechanization used to activate the engine function in the Platform electronics are explicitly specified in GMW8766.

If there is a communication failure with the source of this information, the Platform gateway module on the high speed data link shall transmit the following values: Engine Driver Preference Mode Switch 1 Active = "False".

Applications that do not support Engine Driver Preference Mode Switch 1 Active shall always transmit Engine Driver Preference Mode Switch 1 Active = "False".

Input Delay: 50 ms

4.2.3.117 Engine Driver Preference Mode Switch 1 Status. See Table 131.

Table 131: Engine Driver Preference Mode Switch 1 Status Signal Detail

Signal	Length	Data Type	Range	Conversion
Engine Driver Preference Mode Switch 1 Status	1	BLN	N/A	$0 = Inactive $1 = Active

4.2.3.117.1 Powertrain Interface Definition. Engine Driver Preference Mode Switch 1 Status is transmitted by the ECM. Powertrain shall set the data value to "Active" when Powertrain is actively performing the alternative engine function as agreed upon between Platform and Powertrain and defined in GMW8766.

Applications, which do not support an alternative engine function, shall transmit this signal with a value of "Inactive".

Data Delay: 1025 ms

4.2.3.117.2 Platform Interface Definition. Engine Driver Preference Mode Switch 1 Status is received by Platform. This signal may be used by platform to indicate, through a telltale or message, when the data value is “Active”, and that the engine function, as agreed upon between Platform and Powertrain, is currently active. When implemented as a telltale, platform shall provide a “bulb check” of the telltale. At the discretion of Platform, a chime can accompany the visual indication.

4.2.3.118 Engine Driver Preference Mode Switch 1 Enabled. See Table 132.

Table 132: Engine Driver Preference Mode Switch 1 Enabled Signal Detail

Signal	Length	Data Type	Range	Conversion
Engine Driver Preference Mode Switch 1 Enabled	1	BLN	N/A	$0 = False; $1 = True

4.2.3.118.1 Powertrain Interface Definition. Engine Driver Preference Mode Switch 1 Enabled is transmitted by the ECM. The data value of this signal shall be set to “True” when all the conditions for allowing an alternative engine function are present (no inhibit conditions exist that would prevent the engine function from enabling).

Applications, which do not support an alternative engine function, shall transmit this signal with a value of “False”.

Data Delay: 65 ms

4.2.3.118.2 Platform Interface Definition. Engine Driver Preference Mode Switch 1 Enabled is received by Platform. It is used by platform to indicate, through a telltale or message that all the conditions necessary for an alternative engine function exist. Platform display support for this condition is optional. At the discretion of Platform, a chime can accompany the visual indication.

This signal is an indication to the driver that all Engine Driver Preference Mode Switch 1 Enabled conditions have been satisfied.

4.2.3.119 Engine Driver Preference Mode Switch 1 Alive Rolling Count. See Table 132a.

Table 132a: Engine Driver Preference Mode Switch 1 Alive Rolling Count Signal Detail

Signal	Length	Data Type	Range	Conversion
Engine Driver Preference Mode Switch 1 Alive Rolling Count	2	UNM	0 to 3	E = N × 1

4.2.3.119.1 Powertrain Interface Definition. Engine Driver Preference Mode Switch 1 Alive Rolling Count is received by Powertrain. When an Alive Rolling Count error is detected, the Engine Driver Preference Mode Switch 1 Active shall be ignored, i.e., the previously accepted data shall be used. Refer to GMW8772, PPEI Serial Data Architecture for Alive Rolling Count.

4.2.3.119.2 Platform Interface Definition. Engine Driver Preference Mode Switch 1 Alive Rolling Count is transmitted by the Gateway module. This Alive Rolling Count is associated with the signal Engine Driver Preference Mode Switch 1 Active. Refer to GMW8772, PPEI Serial Data Architecture for Alive Rolling Count.

Data Delay: 50 ms

4.2.3.120 Engine Recommended Upshift Indication On. See Table 133.

Table 133: Engine Recommended Upshift Indication On Signal Detail

Signal	Length	Data Type	Range	Conversion
Engine Recommended Upshift Indication On	1	BLN	N/A	$0 = False $1 = True

4.2.3.120.1 Powertrain Interface Definition. Engine Recommended Upshift Indication On is transmitted by the ECM. This signal indicates the Powertrain recommendation that the driver should change the gear. Powertrain sets the value of the signal to "True" when the Shift-Up algorithm desires this state to improve fuel consumption. It is only used with manual transmissions.

Automatic transmissions applications shall always send this signal with a data value of "False".

Data Delay: 100 ms

4.2.3.120.2 Platform Interface Definition. Engine Recommended Upshift Indication On is received by Platform. The signal is used for display purposes.

Output Actuation Delay: 250 ms (with respect to delay application)

4.2.3.121 Engine Run Active. See Table 134.

Table 134 : Engine Run Active Signal Detail

Signal	Length	Data Type	Range	Conversion
Engine Run Active	1	BLN	N/A	$0 = False; $1 = True

4.2.3.121.1 Powertrain Interface Definition. Engine Run Active is transmitted by the ECM. It is an indication of the running status of the engine. Typically, the transition of Engine Run Active from "False" to "True" occurs when the engine speed has been greater than a calibratable threshold for a consecutive calibratable number of cylinder events. The transition of Engine Run Active from "True" to "False" occurs when the engine speed drops below a calibratable threshold to indicate that the engine is no longer running. This signal is enabled in any power mode and is sent whenever the engine run flag changes state. However, the signal can only be sent when the Powertrain electronics are powered.

This signal indicates the actual running status of the engine regardless of the reason (for example, this signal would be "True" when the engine is running as a result of a Remote Vehicle Start operation).

Note: For Hybrid Vehicles, Engine Run Active is transmitted by the ECM. This signal shall be set to "True" when vehicle traction power is available from either the internal combustion engine or the electric drivetrain. Under non-failure mode conditions, 12 V accessory power is available when Engine Run Active is "True".

Engine Run Active shall be set "False" when traction power is not available from both the electric drivetrain and the internal combustion engine. A failure mode resulting in a loss of 12 V charging power will not be reflected in Engine Run Active (equivalent to an accessory drive belt breaking on a non-hybrid vehicle). For hybrid vehicles, this signal is no longer a direct indication of the operational status of the internal combustion engine.

Data Delay: 125 ms

4.2.3.121.2 Platform Interface Definition. Engine Run Active is received by Platform. It is used for miscellaneous functions. Platform modules on hybrid vehicles may need to monitor the GMLAN signal Engine Speed to determine if the engine is actually rotating.

4.2.3.122 Engine Shutdown Active. See Table 135.

Table 135: Engine Shutdown Active Signal Detail

Signal	Length	Data Type	Range	Conversion
Engine Shutdown Active	1	BLN	N/A	$0 = False; $1 = True

4.2.3.122.1 Powertrain Interface Definition. Engine Shutdown Active is transmitted by the ECM. The signal is set to "True" when the engine is in shutdown mode because of extended idling, low engine oil pressure, low coolant level or high coolant temperature. For engines that do not support this feature, this signal shall be sent with a data value of "False".

Data Delay: 1025 ms

4.2.3.122.2 Platform Interface Definition. Engine Shutdown Active is received by the Platform. Platform may use this signal to control the electrical load to prevent battery drain after engine shutdown or Platform function.

4.2.3.123 Engine Shutdown Pending Indication On. See Table 136.

Table 136: Engine Shutdown Pending Indication On Signal Detail

Signal	Length	Data Type	Range	Conversion
Engine Shutdown Pending Indication On	1	BLN	N/A	$0 = False; $1 = True

4.2.3.123.1 Powertrain Interface Definition. The Engine Shutdown Pending Indication On is transmitted by the ECM. The signal is set to "True" when the engine is going to shutdown due to extended idling, low engine oil pressure, low coolant level or high coolant temperature. For engines that do not support this feature, this signal shall be sent with a data value of "False".

Data Delay: 1025 ms

4.2.3.123.2 Platform Interface Definition. The Engine Shutdown Pending Indication On is received by Platform. Platform shall activate the Reduced Engine Power telltale and optionally a chime or other audible alert to notify the driver that engine will be shut down soon, typically within 30 s.

4.2.3.124 Engine Speed, Engine Speed Status. See Table 137.

Table 137: Engine Speed, Engine Speed Status Signal Detail

Signal	Length	Data Type	Range	Conversion
Engine Speed	16	UNM	0.0 to 16 383.8 rpm	E = N × 0.25
Engine Speed Status	2	ENM	N/A	$0 = Normal Operation $1 = Degraded Operation $3 = Invalid

4.2.3.124.1 Powertrain Interface Definition. Engine Speed and Engine Speed Status are transmitted by the ECM. Engine Speed represents the unfiltered, high-resolution engine speed in revolutions per minute determined from the engine speed sensors available for the engine. Engine Speed Status shall be set to "Degraded Operation" if the primary sensor providing the data has failed, setting a DTC, and a backup value is being used. If the primary sensor has failed and a backup value is being used, the engine speed accuracy will be reduced to TBD.

If the primary sensor has failed and no backup value is available, Engine Speed Status shall be set to "Invalid."

Engine Speed and Engine Speed Status are used by the Transmission control system. Engine Speed Status is needed to enable or disable certain functions based on Engine Speed information accuracy.

Data Delay: TBD ms

Input Delay: 100 ms

Accuracy Requirement: 50 ms

Normal Operation: ± 50 rpm

Degraded Operation: ± TBD rpm

4.2.3.124.2 Platform Interface Definition. Engine Speed and Engine Speed Status are received by Platform. Engine Speed is used for tachometer display and for miscellaneous body functions. Enhanced Traction System (ETS) uses Engine Speed as an override for upshift command in torque management. ETS also requires Engine Speed on manual transmission applications. TCS uses Engine Speed to detect that the engine is being started and that the TCS diagnostic initialization can be performed. Diagnostics are performed during crank on some systems such that the noise from exercising the hydraulic modulator can be masked by the engine noise for customer satisfaction. TCS also requires Engine Speed on manual transmission applications.

This signal may also be used for BAS+ Auto Start, BAS+ Heater Core Coolant Pump Control and BAS+ Regenerative Brake Control for hybrid vehicle applications.

Some Adaptive Cruise Control applications may use the Engine Speed signal as part of a determination of transmission gear request.

The FSCM uses the Engine Speed for management of engine run timer and engine off timer.

4.2.3.125 Engine Speed Limitation Mode Active. See Table 138.

Table 138: Engine Speed Limitation Mode Active Signal Detail

Signal	Length	Data Type	Range	Conversion
Engine Speed Limitation Mode Active	1	BLN	N/A	$0 = False; $1 = True

4.2.3.125.1 Powertrain Interface Definition. Engine Speed Limitation Mode Active is transmitted by the ECM. Powertrain shall set the data value to “True” when Powertrain is actively limiting the engine speed. Powertrain may limit engine speed to protect the engine as necessary.

Data Delay: 1025 ms

4.2.3.125.2 Platform Interface Definition. Engine Speed Limitation Mode Active is received by Platform. This signal may be used by platform to indicate, through a telltale or message that the engine speed is being limited, when the data value is “True”. Platform shall support a display for this condition on all diesel applications. When implemented as a telltale, platform shall provide a “bulb check” of the telltale. At the discretion of Platform, a chime can accompany the visual indication.

This signal may be used by any other platform device as deemed necessary.

4.2.3.126 Engine Speed Maximum Limit. See Table 139.

Table 139: Engine Speed Maximum Limit Signal Detail

Signal	Length	Data Type	Range	Conversion
Engine Speed Maximum Limit	8	UNM	0 to 8160 rpm	E = N × 32

4.2.3.126.1 Powertrain Interface Definition. Engine Speed Maximum Limit is transmitted by the Powertrain. The engine management system has several diagnoses which lead to a limitation of maximum engine speed if such a malfunction is active and recognized (e.g., crankshaft sensor failure or ETC malfunction). If no malfunction-related engine speed limit is currently active, the standard engine overspeed protection value shall be transmitted (e.g., 6500 rpm).

4.2.3.126.2 Platform Interface Definition. Engine Speed Maximum Limit is received by the Platform. Platform uses this information to display the current engine speed maximum limit to the driver.

4.2.3.127 Engine Torque Actual Extended Range, Engine Torque Actual Extended Range Validity. See Table 140.

Table 140: Engine Torque Actual Extended Range, Engine Torque Actual Extended Range Validity Signal Detail

Signal	Length	Data Type	Range	Conversion
Engine Torque Actual Extended Range	12	UNM	-848.0 to 1199.5 N·m	E = (N × 0.50) - 848
Engine Torque Actual Extended Range Validity	1	ENM	N/A	$0 = Valid $1 = Invalid

4.2.3.127.1 Powertrain Interface Definition. Engine Torque Actual Extended Range is transmitted by the ECM. This signal provides information about the actual engine torque at the crankshaft. The basis of torque calculation is characteristic maps within the ECM calibration set. The content of the maps is measured at an engine dynamometer. The basic engine friction is considered as a function of cooling temperature, oil temperature, engine speed and load. This includes the torque losses of water and oil pump and the variable portion of A/C compressor torque losses (every component that is connected at an engine dynamometer, i.e., the content of a base engine). Variable torque losses of the generator (depending on the electrical load) and the hydraulic power steering torque losses may be only partially included. Therefore the actual torque signal does not fully represent the effective torque at the clutch.

Engine Torque Actual Extended Range Validity shall be set to "Invalid" if the inputs for determining the data value is failed or unavailable with the appropriate DTC set, and a backup value exceeds the accuracy requirements.

Data Delay: 30 ms

Accuracy Requirement (Steady State):

Absolute Value (Engine Torque Actual Extended Range) > 50 N·m: ± 10%

Absolute Value (Engine Torque Actual Extended Range) ≤ 50 N·m: ± 5 N·m

4.2.3.127.2 Platform Interface Definition. Engine Torque Actual Extended Range is received by Platform. This signal is used as an input to the traction control system in order to calculate the required torque for traction control. This signal may also be used for Event Data Recorder purposes. The data in Engine Torque Actual Extended Range may be ignored if Engine Torque Actual Extended Range Validity is set to "Invalid".

4.2.3.128 Engine Torque Driver Requested Extended Range, Engine Torque Driver Requested Extended Range Validity. See Table 141.

Table 141: Engine Torque Driver Requested Extended Range, Engine Torque Driver Requested Extended Range Validity Signal Detail

Signal	Length	Data Type	Range	Conversion
Engine Torque Driver Requested Extended Range	12	UNM	-848.0 to 1199.5 N·m	E = (N × 0.50) - 848
Engine Torque Driver Requested Extended Range Validity	1	ENM	N/A	$0 = Valid $1 = Invalid

4.2.3.128.1 Powertrain Interface Definition. Engine Torque Driver Requested Extended Range is transmitted by the ECM.

The transmitted value shall be based on the Analog to Digital (A/D) converted pedal value, including an evaluation of the pedal characteristics. During cruise control operation (conventional or adaptive) a corrected value, including the required torque by cruise control function, shall be provided. External requests (Transmission inputs, Traction Control/Vehicle Stability Enhancement, etc.) are not included.

Engine Torque Driver Requested Extended Range Validity shall be set to "Invalid" if the inputs for determining the data value have failed or are unavailable and a backup value exceeds the accuracy requirements.

Data Delay: 60 ms

Accuracy Requirement (Steady State):

Absolute Value (Engine Torque Driver Requested Extended Range) >50 N·m: ± 10%

Absolute Value (Engine Torque Driver Requested Extended Range) ≤ 50 N·m: ± 5 N·m

4.2.3.128.2 Platform Interface Definition. Engine Torque Driver Requested Extended Range is received by Platform. This signal is used as an input to the traction control system in order to calculate the required torque for traction control.

The data in Engine Torque Driver Requested Extended Range may be ignored if Engine Torque Driver Requested Extended Range Validity is set to "Invalid".

4.2.3.129 Engine Torque Maximum Extended Range, Engine Torque Maximum Extended Range Validity. See Table 142.

Table 142: Engine Torque Maximum Extended Range, Engine Torque Maximum Extended Range Validity Signal Detail

Signal	Length	Data Type	Range	Conversion
Engine Torque Maximum Extended Range	12	UNM	-848.0 to 1199.5 N·m	E = (N × 0.50) - 848
Engine Torque Maximum Extended Range Validity	1	ENM	N/A	$0 = Valid $1 = Invalid

4.2.3.129.1 Powertrain Interface Definition. Engine Torque Maximum Extended Range is transmitted by the ECM. This signal is the calculated maximum torque that the engine can provide under the current circumstances (altitude, temperature, etc.), based on wide-open throttle conditions. Engine Torque Maximum Extended Range Validity shall be set to "Invalid" if the inputs for determining the data value have failed or are unavailable with the appropriate DTC set, and a backup value exceeds the accuracy requirements.

Data Delay: 125 ms

Accuracy Requirement (Steady State):

Absolute Value (Engine Torque Maximum Extended Range) >50 N·m: ± 10%

Absolute Value (Engine Torque Maximum Extended Range) ≤ 50 N·m: ± 5 N·m

4.2.3.129.2 Platform Interface Definition. Engine Torque Maximum Extended Range is received by Platform. This signal may be utilized by the traction control system to improve performance at high altitudes.

The data in Engine Torque Maximum Extended Range shall be ignored if Engine Torque Maximum Extended Range Validity is set to "Invalid".

4.2.3.130 Engine Torque Minimum Extended Range, Engine Torque Minimum Extended Range Validity. See Table 143.

Table 143: Engine Torque Minimum Extended Range, Engine Torque Minimum Extended Range Validity Signal Detail

Signal	Length	Data Type	Range	Conversion
Engine Torque Minimum Extended Range	12	UNM	-848.0 to 1199.5 N·m	E = (N × 0.50) - 848
Engine Torque Minimum Extended Range Validity	1	ENM	N/A	$0 = Valid $1 = Invalid

4.2.3.130.1 Powertrain Interface Definition. Engine Torque Minimum Extended Range is transmitted by the ECM. The signal is the lowest value of torque which powertrain will allow for the Chassis System Engine Torque Request Extended Range. This value encompasses all powertrain imperatives such as driveability, stalls, etc. Engine Torque Minimum Extended Range Validity shall be set to "Invalid" if the inputs for determining the data value have failed or are unavailable, with the appropriate DTC set and a backup value exceeds the accuracy requirement.

Data Delay: 125 ms

Accuracy Requirement (Steady State):

Absolute Value (Engine Torque Minimum Extended Range) >50 N·m: ± 10%

Absolute Value (Engine Torque Minimum Extended Range) ≤ 50 N·m: ± 5 N·m

4.2.3.130.2 Platform Interface Definition. Engine Torque Minimum Extended Range is received by Platform. This signal is utilized by the traction control system to improve performance in very low coefficient of friction

surfaces. This signal is the value that will be imposed regardless of the state of the Engine Torque Minimum Extended Range Validity.

4.2.3.131 Engine Torque Reduction Failure Status. See Table 144.

Table 144: Engine Torque Reduction Failure Status Signal Detail

Signal	Length	Data Type	Range	Conversion
Engine Torque Reduction Failure Status	3	ENM	N/A	$0 = Torque Reduction OK $1 = Torque Reduction Temporarily Failed $2 = Torque Reduction Permanently Failed $3 = Torque Reduction Limited $4 = Torque Reduction Communication Failed

4.2.3.131.1 Powertrain Interface Definition. Engine Torque Reduction Failure Status is transmitted by the ECM. This signal is used on all traction (ETS or TCS) equipped vehicles to convey Powertrain failure status in response to the Chassis System Engine Torque Request Extended Range signal from Platform. On vehicles that do not have Traction Control this signal shall always be sent with a data value of "Torque Reduction OK".

- **Torque Reduction OK:** This state indicates that powertrain is performing torque reduction as requested by Platform. Platform "Chassis System Engine Torque Request Extended Range: Torque Request Value" and Powertrain "Engine Torque Actual Extended Range" value match to within TBD percent at steady state conditions.
- **Torque Reduction Temporarily Failed:** This state indicates that powertrain is temporarily unable to perform its powertrain torque reduction due to a temporary failure condition such as coolant, catalyst, or transmission oil in an over-temperature condition that may ultimately result in damage and an OBD II diagnostic. It is considered temporary because the conditions, which have disabled torque reductions, may possibly recover within the ignition cycle. Powertrain either stops torque reduction when no reduction is present to avoid an abrupt change, or slowly reduces powertrain torque reduction. When this temporary situation is over, powertrain torque reduction is resumed.
- **Torque Reduction Permanently Failed:** This state indicates that Powertrain has diagnosed a permanent latched failure such as ETC failed, backup fuel, or spark, such that Powertrain is unable to reduce torque. It is considered permanent because the conditions that have disabled torque reduction will not recover within the ignition cycle.
- **Torque Reduction Limited:** This state indicates that Powertrain is temporarily unable to perform full authority torque reduction due to a condition such as cold engine or transmission operation. Powertrain will attempt torque reduction during this condition but the Powertrain actual delivered torque may not match the Platform requested torque reduction. As the engine and transmission approach normal operating temperatures, torque reduction allowed is increased until normal operating temperatures are reached to allow full authority torque reduction.
- **Torque Reduction Communication Failure:** This state indicates that Powertrain has ceased processing Platform torque requests due to an Alive Rolling Count error, Protection Value error, or signal supervision error.

In the event of state conflicts the following priority will be adhered to:

1. "Torque Reduction Communication Failure".
2. "Torque Reduction Permanently Failed".
3. "Torque Reduction Temporarily Failed".
4. "Torque Reduction Limited".
5. "Torque Reduction OK".

Data Delay: 125 ms

4.2.3.131.2 Platform Interface Definition. Engine Torque Reduction Failure Status is received by Platform. This signal is used on all traction (ETS or TCS) equipped vehicles to understand Powertrain's failure status in response to the Chassis System Engine Torque Request Extended Range signal from Platform. This information will then be used by Platform in the following manner.

- **Torque Reduction OK:** This state indicates that Powertrain is providing what has been requested by the Platform (chassis).

  Platform: "Chassis System Engine Torque Request Extended Range Torque Request Value" and Powertrain: "Engine Torque Actual Extended Range" value match to within TBD percent at steady state conditions.

- **Torque Reduction Temporarily Failed:** This state indicates that Powertrain has encountered a failure (or series of failures) that prevents them from providing any traction torque reduction for chassis use. Powertrain has determined that the factor(s) that caused this suspension may be recoverable within the current ignition cycle. If the vehicle is not able or designed (option contented) to allow "Reduced Functionality", the EBCM will set a DTC. If the vehicle is able to allow "Reduced Functionality", the Platform will decide upon the manner and extent to which it is implemented.

  Note: Some platforms will treat this state as the same as Torque Reduction Permanently Failed. (This is the current state for many TCS or Vehicle Stability Enhancement System (VSES) systems).

- **Torque Reduction Permanently Failed:** This state indicates that Powertrain has encountered a failure (or series of failures) that prevents providing any traction torque reduction for chassis use. Powertrain has determined that the factor(s) that caused this suspension is not recoverable within the current ignition cycle. If the vehicle is not able (not option contented) to allow "Reduced Functionality", the EBCM will set a DTC. If the vehicle is able to allow "Reduced Functionality", the Platform will decide upon the manner and extent to which it is implemented.

- **Torque Reduction Limited:** This state indicates that Powertrain has encountered a limitation (or series of limitations) that prevent them from matching Platform: "Chassis System Engine Torque Request Extended Range Torque Request Value" and Powertrain: "Engine Torque Actual Extended Range" value to within TBD percent at steady state conditions. Powertrain will provide some amount of traction torque reduction, however less than what Platform requested. The vehicle, regardless of option content, will continue to perform traction control – it just may take longer to achieve the same end.

  Note: Some platforms will treat this state as the same as Torque Reduction OK.

Some Traction algorithms do not care whether the suspension is temporary (recoverable within the current ignition cycle) or permanent (suspension at least for the current ignition cycle). The algorithm will react accordingly based upon the type of traction system implemented (ETS versus TCS), the torque reduction value being provided (if any), and the manner in which the Platform prescribes "Reduced Functionality" (if applicable).

While the traction algorithm doesn't care whether the suspension is temporary or permanent, the diagnostic algorithms and reporting scheme do. A unique fault code and history is set depending upon temporary versus permanent suspension (failures) of torque reduction requests.

An example of "Reduced Functionality" would be if the vehicle was equipped with TCS (engine and brake intervention) and only engine intervention was lost due to a Powertrain failure. This vehicle may still be able to provide some limited or reduced traction capability by means of brake intervention alone, possibly only for a short period of time.

Before any torque reduction value within the GMLAN message: "Engine Torque Actual Extended Range" is reviewed, the validity flag within the GMLAN message: "Engine Torque Actual Extended Range Validity" must be verified to be "Valid". An invalid validity flag means the actual values are suspect.

An "Invalid" torque would also lead to a traction control shutdown with a unique DTC.

4.2.3.132 Engine Warm Up Cycle Achieved. See Table 145.

Table 145: Engine Warm Up Cycle Achieved Signal Detail

Signal	Length	Data Type	Range	Conversion
Engine Warm Up Cycle Achieved	1	BLN	N/A	$0 = False; $1 = True

4.2.3.132.1 Powertrain Interface Definition. Engine Warm Up Cycle Achieved is transmitted by the ECM. Warm up cycle information is necessary in order to determine when DTCs can be erased from memory without using a scan tool. When a DTC has not reported a failure for 40 warm up cycles, the DTC can be erased. This type of event is commonly referred to as a natural code clear. This function is necessary in order to ensure that intermittent DTCs (those which are detected extremely rarely) are eventually erased. A fair estimate of how much time it takes to accumulate 40 warm up cycles is two weeks. However, this depends heavily on driving habits. Warm up cycle information is determined by the ECM and is sent to all other emission related controllers (e.g., TCM, FSCM). The ECM determines this signal by monitoring engine coolant temperature. The other external emission related controllers monitor the Engine Warm Up Cycle Achieved signal to control their internal 40 warm up cycle counter or counters.

This signal shall be initialized to a value of “False” when the ECM is powered up. The signal shall only be set to “True” when the following conditions have been met. First, the engine coolant temperature must be greater than 71°C (160°F). Second, the change in coolant temperature (present engine coolant temperature – startup engine coolant temperature) must be greater than 22°C (71°F). When the signal becomes “True”, it shall be latched until the next power up. If a stall occurs or the engine is turned off briefly and then the ignition is turned back on without starting the engine, the value shall not be set to false. The engine coolant temperature may be calculated using a failsoft value if the sensor has been determined to be faulty.

4.2.3.132.2 Platform Interface Definition. Engine Warm Up Cycle Achieved is received by the FSCM.

The other OBD controllers shall monitor the Engine Warm Up Cycle Achieved signal continuously throughout the ignition cycle. When the signal changes from “False” to “True”, the other OBD controllers can consider that a warm-up cycle has been met. If, during an entire ignition cycle, the value of this signal was “True” and was never “False”, the receiver cannot consider that a warm-up cycle has been met. Only a transition from “False” to “True” indicates that an engine warm up cycle has been completed. The receiver shall assume that a warm up cycle has not occurred if this signal has never been received on any given ignition cycle.

Upon loss of communication with the ECM, the receiver shall hold the last value of this signal. If a warm up cycle was not completed before the loss of communication, then this ignition cycle will not show a warm up cycle completed unless communication is restored.

4.2.3.133 Engine Water In Fuel Indication On. See Table 146.

Table 146: Engine Water In Fuel Indication On Signal Detail

Signal	Length	Data Type	Range	Conversion
Engine Water In Fuel Indication On	1	BLN	N/A	$0 = False $1 = True

4.2.3.133.1 Powertrain Interface Definition. Engine Water In Fuel Indication On is transmitted by the ECM. This signal shall be supported on all diesel applications. The data value of this signal will be set to “True” if the fuel sensor detects water in the diesel fuel. The data value of this signal will be set to “False” if the fuel sensor does not detect or no longer detects water in the diesel fuel.

Non-diesel applications shall always transmit this signal with a data value of “False”.

Data Delay: 1025 ms

4.2.3.133.2 Platform Interface Definition. Engine Water In Fuel Indication On is received by Platform. It is used by the display device(s) to indicate, through a telltale or message, when the data value is “True”, that water has been detected in the diesel fuel. Platform shall support a display for this condition on all diesel applications. When implemented as a telltale, platform shall provide a “bulb check” of the telltale. At the discretion of Platform, achime can accompany the visual indication.

4.2.3.134 Enhanced Services Vehicle Top Speed Limit Request. See Table 147.

Table 147: Enhanced Services Vehicle Top Speed Limit Request Signal Detail

Signal	Length	Data Type	Range	Conversion
Enhanced Services Vehicle Top Speed Limit Request	2	ENM	N/A	$0 = No action $1 = Active $2 = Inactive

4.2.3.134.1 Powertrain Interface Definition. Enhanced Services Vehicle Top Speed Limit Request is received by Powertrain. Enhanced Services Vehicle Top Speed Limit Request allows a receiving module to monitor the status of the Vehicle Limit Speed control subsystem without having to process the entire Vehicle Limit Speed Control Command signal. Therefore, if this signal is set to "No Action", the remaining signals in the Vehicle Limit Speed Control Command shall be ignored and the current status of the Vehicle Limit Speed Control shall not be affected. If this signal is set to "Inactive" the Vehicle Limit Speed Control shall be reset to normal operations.

Output Actuation Delay (High Speed, when Active): 25 ms

Power-Up Default: "No Action"

Communication Failure Value: "No Action"

4.2.3.134.2 Platform Interface Definition. Enhanced Services Vehicle Top Speed Limit Request is transmitted by the OnStar module when the OnStar module is present, and is not transmitted when the OnStar module is not present. This signal indicates the status of Vehicle Limit Speed control. This signal is "Active" when Vehicle Limit Speed control is requesting a limiting speed value. Enhanced Services Vehicle Top Speed Limit Request shall be set to "No Action" upon initialization and the current state of the Vehicle Limit Speed control has not been determined. Enhanced Services Vehicle Top Speed Limit Request shall be set to "Inactive" when Vehicle Limit speed control is not be requested.

Data Delay: 100 ms

4.2.3.135 Enhanced Services Vehicle Top Speed Limit Value Alive Rolling Count. See Table 148.

Table 148: Enhanced Services Vehicle Top Speed Limit Value Alive Rolling Count Signal Detail

Signal	Length	Data Type	Range	Conversion
Enhanced Services Vehicle Top Speed Limit Value Alive Rolling Count	2	UNM	0 to 3	E = N × 1

4.2.3.135.1 Powertrain Interface Definition. Enhanced Services Vehicle Top Speed Limit Value Alive Rolling Count is received by Powertrain. When an Alive Rolling Count error is detected, the corresponding Vehicle Limit Speed Control Command shall be ignored, i.e., the previously accepted data shall be used. If Alive Rolling Count errors are detected with sufficient frequency for a sufficient duration, a DTC shall be set, and future requests shall be ignored as described in the Enhanced Services Vehicle Top Speed Limit Request and Enhanced Services Vehicle Top Speed Limit Value signal descriptions.

4.2.3.135.2 Platform Interface Definition. Enhanced Services Vehicle Top Speed Limit Value Alive Rolling Count is transmitted by the OnStar module when the OnStar module is present, and is not sent when the OnStar module is not present. This Alive Rolling Count is associated with the Vehicle Limit Speed Control Command signal and shall only be active when the Enhanced Services Vehicle Top Speed Limit Request is "Active".

Data Delay: 100 ms

4.2.3.136 Enhanced Services Vehicle Top Speed Limit Password. See Table 149.

Table 149: Enhanced Services Vehicle Top Speed Limit Password Signal Detail

Signal	Length	Data Type	Range	Conversion
Enhanced Services Vehicle Top Speed Limit Password	32	UNM	N/A	4 ASCII Characters

4.2.3.136.1 Powertrain Interface Definition. Enhanced Services Vehicle Top Speed Limit Password is received by Powertrain. When a password value error is detected, the corresponding Vehicle Limit Speed Control Command signal shall be ignored, i.e. the previously accepted data shall be used. If password errors are detected with sufficient frequency for a sufficient duration, a DTC shall be set, and future requests shall be ignored as described in the Enhanced Services Vehicle Top Speed Limit Request and Enhanced Services Vehicle Top Speed Limit Value signal descriptions.

4.2.3.136.2 Platform Interface Definition. Enhanced Services Vehicle Top Speed Limit Password is transmitted by the OnStar module when it is present, and is not sent when the OnStar module is not present. This signal shall provide a valid password only when the Enhanced Services Vehicle Top Speed Limit Request is “Active”.

Enhanced Services Vehicle Top Speed Limit Password is defined as follows (Most Significant Byte (MSB) = Byte 4 to Least Significant Byte (LSB) = Byte 1):

- Byte 4 = (2’s complement of 14th digit of learned VIN) + current Enhanced Services Vehicle Top Speed Limit Value Alive Rolling Count value
- Byte 3 = (2’s complement of 15th digit of learned VIN) + current Enhanced Services Vehicle Top Speed Limit Value Alive Rolling Count value
- Byte 2 = (2’s complement of 16th digit of learned VIN) + current Enhanced Services Vehicle Top Speed Limit Value Alive Rolling Count value
- Byte 1 = (2’s complement of 17th digit of learned VIN) + current Enhanced Services Vehicle Top Speed Limit Value Alive Rolling Count value

Note: If the addition of Enhanced Services Vehicle Top Speed Limit Value Alive Rolling Count value results in a value greater than $FF, the 2 least significant nibbles shall be utilized as the value (i.e., bit overflow is ignored).

4.2.3.137 Enhanced Services Vehicle Top Speed Limit Value. See Table 150.

Table 150: Enhanced Services Vehicle Top Speed Limit Value Signal Detail

Signal	Length	Data Type	Range	Conversion
Enhanced Services Vehicle Top Speed Limit Value	8	UNM	0 to 510 km/h	E = N × 2

4.2.3.137.1 Powertrain Interface Definition. Enhanced Services Vehicle Top Speed Limit Value is received by Powertrain. If the Enhanced Services Vehicle Top Speed Limit Request is “Active”, the Enhanced Services Vehicle Top Speed Limit Value Alive Rolling Count and the Enhanced Services Vehicle Top Speed Limit Password are determined to be valid, the Enhanced Services Vehicle Top Speed Limit Value shall be utilized as follows:

- If the value equals 510 km/h, the Vehicle Limit Speed control shall be reset to normal operation and the “Reduced Power Indication On” signal shall be set to “False”. If the Powertrain system is speed limiting for reasons other than the Vehicle Limit Speed control, the “Reduced Power Indication On” signal shall continue to be set to “True”, however all other functions related to the Vehicle Limit Speed control shall be reset.
- If the value is less than 510 km/h, the Vehicle Limit Speed control shall be considered active and the requested Enhanced Services Vehicle Top Speed Limit Value shall be considered as a valid input into the Powertrain system Top Speed Limit arbitration scheme. The Powertrain system shall execute all other Vehicle Limit Speed control related functions even if the Enhanced Services Vehicle Top Speed Limit

Value is not the minimum arbitrated value. The 'Reduced Power Indication On" signal shall be set to "True" when the Powertrain system is limiting the vehicle's top speed.

Note: The OnStar module will continue to transmit the Vehicle Limit Speed Control Command with the reset data until a 'Reduced Power Indication On" signal is received indicating "False".

4.2.3.137.2 Platform Interface Definition. Enhanced Services Vehicle Top Speed Limit Value is transmitted by the OnStar module when it is present, and is not sent when the OnStar module is not present. This signal shall provide the request to limit the vehicle's top speed, as well as to reset the control to normal operation, to the Powertrain system. The Enhanced Services Vehicle Top Speed Limit Request must be set to "Active" and the Enhanced Services Vehicle Top Speed Limit Value Alive Rolling Count and the Enhanced Services Vehicle Top Speed Limit Password must be set to valid values for the Enhanced Services Vehicle Top Speed Limit Value to be considered as a valid request. The Enhanced Services Vehicle Top Speed Limit Value shall be transmitted as follows:

- Set the value equal to 510 km/h to reset the Vehicle Limit Speed control to normal operation, as well as when the Enhanced Services Vehicle Top Speed Limit Request signal is set to "Inactive". The OnStar module shall continue to transmit a valid reset request until the "Reduced Power Indication On" signal is received indicating "False" or a speed limit request message is received from the OnStar Center.
- Set the value to less than 510 km/h to request Vehicle Limit Speed control to the Enhanced Services Vehicle Top Speed Limit Value. The OnStar module shall transmit this request until a speed limit reset message is received from the OnStar Center.

4.2.3.138 Exhaust Pressure Regulator Valve Position, Exhaust Pressure Regulator Valve Position Validity. See Table 151.

Table 151: Exhaust Pressure Regulator Valve Position, Exhaust Pressure Regulator Valve Position Validity. Signal Detail

Signal	Length	Data Type	Range	Conversion
Exhaust Pressure Regulator Valve Position	1	ENM	N/A	$0 = Open $1 = Closed
Exhaust Pressure Regulator Valve Position Validity	1	ENM	N/A	$0 = Invalid $1 = Valid

4.2.3.138.1 Powertrain Interface Definition. Exhaust Pressure Regulator Valve Position is received by Powertrain. This signal is used in Powertrain Algorithms as an indication of the Exhaust Pressure Regulator Valve Position. For example, EGR Algorithm needs to use this information. Algorithms that use Exhaust Pressure Regulator Valve Position must take default action when the Exhaust Pressure Regulator Valve Validity is received as "Invalid".

4.2.3.138.2 Platform Interface Definition. Exhaust Pressure Regulator Valve Position is transmitted by the FSCM (Fuel System Control Module) if that module is present, otherwise it is not transmitted. This signal reports to Powertrain the commanded position of the Exhaust Pressure Regulator Valve. If the Exhaust Pressure Regulator Valve Diagnostics detect a fault then the Exhaust Pressure Regulator Valve Validity is transmitted with a value of "Invalid". If the Exhaust Pressure Regulator Valve Validity signal is transmitted as "Invalid", a default action should occur in the receiving Algorithms.

On vehicles that have a FSCM but do not have Exhaust Flapper Valve System, this signal shall always be sent with a data value of "Open" and the validity signal shall be sent as "Valid".

4.2.3.139 Fast Idle Mode Active. See Table 152.

Table 152: Fast Idle Mode Active Signal Detail

Signal	Length	Data Type	Range	Conversion
Fast Idle Mode Active	1	BLN	N/A	$0 = False; $1 = True

4.2.3.139.1 Powertrain Interface Definition. Fast Idle Mode Active is received by Powertrain. Fast Idle Mode Active allows a receiving module to monitor the status of the fast idle subsystem without having to process the entire Platform Engine Speed Command serial data signal.

Output Actuation Delay: 38 ms

Power-Up Default: False

Communication Failure Value: False

4.2.3.139.2 Platform Interface Definition. Fast Idle Mode Active is transmitted by the PTO module when the PTO module is present and is not transmitted when the PTO module is not present.

Note: On Fast Idle applications, the Gateway module assumes the role of the PTO module only for Fast Idle functionality; PTO functionality is not supported.

This signal indicates the status of fast idle and is identical to the GMLAN signal Platform Engine Speed Command: Platform Engine Speed Command Mode Active. Fast Idle Mode Active shall be set to “False” if a failure exists in the fast idle subsystem.

Input Delay: 48 ms

4.2.3.140 Front Axle Operational Mode. See Table 153.

Table 153: Front Axle Operational Mode Signal Detail

Signal	Length	Data Type	Range	Conversion
Front Axle Operational Mode	3	ENM	N/A	$0 = Open $1 = Active $2 = Locked $3 = Unknown

4.2.3.140.1 Powertrain Interface Definition. Front Axle Operational Mode is sent by the TCCM on vehicles equipped with a TCCM controlled front electronic locking differential, otherwise it is not sent.

The operational modes for the front electronic locking differential are defined as follows:

- **Open:** The front axle is open and slip is allowed between the left and right half shafts.
- **Active:** Not supported.
- **Locked:** The front left and front right half shafts are locked together.
- **Unknown:** Not supported.

Data Delay: 125 ms

4.2.3.140.2 Platform Interface Definition. Front Axle Operational Mode is received by Platform. It is used by the Anti-lock Brake System/Electronic Stability Control system.

4.2.3.141 Fuel Alcohol Composition, Fuel Alcohol Composition Validity. See Table 154.

Table 154: Fuel Alcohol Composition, Fuel Alcohol Composition Validity Signal Detail

Signal	Length	Data Type	Range	Conversion
Fuel Alcohol Composition	8	UNM	0 to 100%	E = N × (100/255)
Fuel Alcohol Composition Validity	1	ENM	N/A	$0 = Valid; $1 = Invalid

4.2.3.141.1 Powertrain Interface Definition. Fuel Alcohol Composition is transmitted by the ECM. It is the most recent estimate of the alcohol content (percentage) in the fuel. Alcohol content is determined in the ECM using a prediction algorithm.

Fuel Alcohol Composition Validity is transmitted by the ECM. It is set to “Invalid” whenever sensor inputs faults used to determine fuel alcohol composition are detected. Examples are O2 sensors, Coolant Temperature Sensor, Air Meter, and MAP Sensor.

Input Delay: 500 ms

4.2.3.141.2 Platform Interface Definition. Fuel Alcohol Composition is received by the FSCM where it is used in the determination of fuel density and viscosity. Both of these values are required inputs to the calculation of fuel line pressure loss. Fuel Alcohol composition is also used as an index into a calibration lookup table that compensates the open loop fuel pump duty cycle for changes in fuel composition and fuel temperature.

Fuel Alcohol Composition is received by the Gateway module and shall be used to display Fuel Alcohol Composition information if an ethanol display is required.

The Fuel Alcohol Composition Validity is received by the FSCM and/or the Gateway module. If the validity bit is set to Invalid it is assumed that ECM still transmits the best estimate of the Fuel Alcohol Composition. The validity bit information is used to inhibit update of the long term adaptives to the fuel pump duty cycle.

4.2.3.142 Fuel Alcohol Composition Adaptation in Progress. See Table 155.

Table 155: Fuel Alcohol Composition Adaptation in Progress Signal Detail

Signal	Length	Data Type	Range	Conversion
Fuel Alcohol Composition Adaptation in Progress	1	BLN	N/A	$0 = False $1 = True

4.2.3.142.1 Powertrain Interface Definition. Fuel Alcohol Composition Adaptation in Progress is transmitted by the ECM in applications where there is no ethanol sensor present. Fuel Alcohol Composition Adaptation in Progress shall be sent with a data value of “True” when an Alcohol Composition Adaptation is considered to be “in progress” when a refuel event has been detected. Fuel Alcohol Composition Adaptation in Progress shall be sent with a data value of “False” when Alcohol Composition Adaptation is considered “complete” when the final learn has been completed or if the estimate has been ended early because the estimated Alcohol Composition percent is no longer changing.

For applications with an ethanol sensor, the value shall be transmitted with a data value of “False”.

4.2.3.142.2 Platform Interface Definition. Fuel Alcohol Composition Adaptation in Progress is received by the Gateway module. Platform shall display this information if an ethanol display is required.

4.2.3.143 Fuel Control System Fault Present. See Table 156.

Table 156: Fuel Control System Fault Present Signal Detail

Signal	Length	Data Type	Range	Conversion
Fuel Control System Fault Present	1	BLN	N/A	$0 = False $1 = True

4.2.3.143.1 Powertrain Interface Definition. Fuel Control System Fault Present is transmitted by the ECM. This flag indicates a fault exists that compromises the accuracy of the ECM fuel flow estimates. This flag monitors all relevant ECM fault flags including those for Air Meter(s), MAP Sensor, Throttle Position Sensor(s), Coolant Sensor, Intake Air Temperature Sensor, Barometric Pressure Sensor/Estimate, Intake Flow Rationality Diagnostic, Fuel Trim Diagnostic(s), Fuel Injector Circuit Diagnostics, O2 Sensor(s) Diagnostic, and Misfire Diagnostic. When any of these faults are present, the fuel flow estimates provided by the ECM may have degraded accuracy. When the Fuel Control System Fault Present flag is “True”, the ECM continues to transmit its best fuel flow estimates.

Data Delay: 12.5 ms

4.2.3.143.2 Platform Interface Definition. Fuel Control System Fault Present is received by the Fuel System Control Module (FSCM). If Fuel Control System Fault Present is set to True, the FSCM expects the ECM will continue to transmit its best fuel flow estimates. The FSCM uses this flag to inhibit fuel pump duty cycle long term adaptive learning, and to limit the use feed-forward fuel pump duty cycle adjustments. These FSCM functions are highly dependant upon the fuel flow estimates provided by the ECM.

4.2.3.144 Fuel Delivery Pressure Requested. See Table 157.

Table 157: Fuel Delivery Pressure Requested Signal Detail

Signal	Length	Data Type	Range	Conversion
Fuel Delivery Pressure Requested	10	UNM	0 to 1023 kPa	E = N

4.2.3.144.1 Powertrain Interface Definition. Fuel Delivery Pressure Requested is transmitted by the ECM. It represents the most appropriate fuel rail gauge pressure as determined by the ECM. This pressure request may change as a function of current engine operating conditions. Separate fuel pressure set points may be needed for periods of engine cranking, cold engine operation, high fuel flow conditions, low fuel flow conditions, hot fuel handling, default operation, and device control overrides.

Data Delay: 12.5 ms

4.2.3.144.2 Platform Interface Definition. Fuel Delivery Pressure Requested is received by the FSCM module. It is the ECM requested gauge pressure at the fuel rail. It is used to determine the Target Fuel Pump Outlet Pressure by adding it to the calculated fuel line pressure loss. The Target Fuel Pump Outlet Pressure is then used as one of two inputs into a calibration lookup table to determine the base open loop fuel pump duty cycle. The Target Fuel Pump Outlet Pressure is also used along with battery voltage to lookup a multiplier that is used to compensate the open loop fuel pump duty cycle for changes in battery voltage.

This signal may also be used for Auto Start, Auto Stop, BAS+ Auto Start and BAS+ Auto Stop in hybrid vehicle applications.

4.2.3.145 Fuel Filter Change Now Indication On. See Table 158.

Table 158: Fuel Filter Change Now Indication On Signal Detail

Signal	Length	Data Type	Range	Conversion
Fuel Filter Change Now Indication On	1	BLN	N/A	$0 = False; $1 = True

4.2.3.145.1 Powertrain Interface Definition. Fuel Filter Change Now Indication On is transmitted by the transmitted by the ECM.

The Fuel Filter Change Now Indication On is based on the fuel filter life determination algorithm that resides in the Powertrain electronics. The algorithm is based on the principle that fuel flow will decrease fuel filter life over mileage. Once the fuel filter life is reduced to a specific calibratable level, Powertrain will set the data value of this signal to True to command the Change Fuel Filter Now display. Powertrain will set the data value of this signal to “False” when the algorithm does not or no longer determines that the fuel filter needs to be changed.

Applications that do not support the fuel filter life determination algorithm shall always send this signal with a data value of “False”.

Data Delay: 1025 ms

4.2.3.145.2 Platform Interface Definition. Fuel Filter Change Now Indication On is received by the Gateway. When the data value is “True”, he signal is used by platform to indicate to the driver, through a telltale or DIC message, that the Fuel Filter needs to be changed. Platform shall optionally support a display for this condition on all applications. When implemented as a telltale, platform shall provide a “bulb check” of the telltale. At the discretion of Platform, a chime can accompany the visual indication.

4.2.3.146 Fuel Filter Life Reset Performed. See Table 159.

Table 159: Fuel Filter Life Reset Performed Signal Detail

Signal	Length	Data Type	Range	Conversion
Fuel Filter Life Reset Performed	1	BLN	N/A	$0 = False; $1 = True

4.2.3.146.1 Powertrain Interface Definition. Fuel Filter Life Reset Performed is transmitted by the ECM. Platform will indicate a reset to Powertrain via the Fuel Filter Life Reset Requested signal. The data value of this signal will be set to "True" when Powertrain has reset the fuel filter remaining life.

The data value of this signal will be set to "False" after a calibratable time, **K_FuelFilterLifeResetPerformedTime**.

Output Actuation Delay: 300 ms (with respect to updating the information in the Fuel Filter Life Remaining signal).

4.2.3.146.2 Platform Interface Definition. Fuel Filter Life Reset Performed is received by Platform, and is used for display purposes. When implemented as a telltale, platform shall provide a "bulb check" of the telltale. At the discretion of Platform, a chime can accompany the visual indication.

Data Delay: 125 ms

4.2.3.147 Fuel Filter Life Reset Requested. See Table 160**.**

Table 160: Fuel Filter Life Reset Requested Signal Detail

Signal	Length	Data Type	Range	Conversion
Fuel Filter Life Reset Requested	1	BLN	N/A	$0 = False; $1 = True

4.2.3.147.1 Powertrain Interface Definition. The Fuel Filter Life Reset Requested is received by Powertrain. Upon receipt of this signal with a data value of "True", Powertrain shall reset its fuel filter life estimation algorithm, resulting in a data value of the Fuel Filter Remaining Life signal of 100%.

Powertrain shall also support an internal Fuel Filter Remaining Life reset by an Accelerator pedal and Brake pedal stomp procedure. The selection between the two methods shall be configurable.

Output Actuation Delay: 300 ms (with respect to updating the Fuel Filter Life Remaining signal information).

4.2.3.147.2 Platform Interface Definition. Fuel Filter Life Reset Requested is transmitted by the Gateway. For the platform-optional reset switch or mechanism, the Platform will indicate a reset via the Fuel Filter Life Reset Requested signal to Powertrain. Platform sets the data value of the Fuel Filter Life Reset Requested to "True" to request a reset of the Fuel Filter Life Remaining algorithm.

Applications that do not support a reset of fuel life shall always transmit this signal with a data value of "False".

Data Delay: 125 ms

4.2.3.148 Fuel Filter Remaining Life. See Table 161.

Table 161: Fuel Filter remaining Life Signal Detail

Signal	Length	Data Type	Range	Conversion
Fuel Filter Remaining Life	8	UNM	0 to 100%	E = N × 100/255

4.2.3.148.1 Powertrain Interface Definition. Fuel Filter Remaining Life is transmitted by the ECM. Powertrain determines Fuel Filter Remaining Life based on the fuel filter life determination algorithm that resides in the Powertrain electronics. The algorithm is based on the principle that fuel flow will decrease fuel filter life over mileage. The Fuel Filter Remaining Life may be reset by either utilizing the Accelerator/Brake pedal stomp procedure or a platform-optional reset switch. For the platform-optional reset switch, the Platform will indicate a reset via the Fuel Filter Life Reset Requested signal to Powertrain. Upon detection of any reset of Fuel Filter Remaining Life, Powertrain will set the data value of the Fuel Filter Remaining Life signal to 100%.

Data Delay: 275 ms

4.2.3.148.2 Platform Interface Definition. Fuel Filter Remaining Life is received by Platform. It is optionally used for display purposes.

4.2.3.149 Fuel Injected Rolling Count, Fuel Injected Rolling Count Reset Occurred. See Table 162.

Table 162: Fuel Injected Rolling Count, Fuel Injected Rolling Count Reset Occurred Signal Detail

Signal	Length	Data Type	Range	Conversion
Fuel Injected Rolling Count	16	UNM	0.0 to 1.999 97 L	E = N × 1/32 768
Fuel Injected Rolling Count Reset Occurred	1	BLN	N/A	$0 = False; $1 = True

4.2.3.149.1 Powertrain Interface Definition. Fuel Injected Rolling Count is transmitted by the ECM. It is the accumulated fuel amount that is delivered to the engine. The accuracy of Fuel Injected Rolling Count is subject to large errors from fuel system hardware variation. Powertrain allows the counter to roll over (start over). The Platform module must keep track of rollovers.

To avoid lost or inaccurate data used by Platform, Powertrain will set the data value of the Fuel Injected Rolling Count Reset Occurred signal to “True” and restart incrementing the Fuel Injected Rolling Count value at “0” whenever the Powertrain memory that maintains Fuel Injected Rolling Count is reset and upon the first Virtual Network (VN) activation. When the Fuel Injected Rolling Count Reset Occurred signal is set to “True”, it shall remain at this value for a calibratable duration of 2 s (This duration needs to be sufficiently long to ensure transmission through the Gateway but shorter than the time needed for a normal rollover of the Fuel Injected Rolling Count to occur), at which point it shall be set to “False”. The Fuel Injected Rolling Count value shall increment normally during the time that the Fuel Injected Rolling Count Reset Occurred signal is held at “True” unless addition memory resets occur, in which case the value shall again restart at “0” and the Fuel Injected Rolling Count Reset Occurred signal “True” timer be restarted.

Note: For Compressed Natural Gas (CNG) and Liquefied Petroleum Gas (LPG) applications, the ECM shall internally process two separate Fuel Injected Rolling Counts in bivalent engines, one for gasoline and one for Compressed Natural Gas/ Liquefied Petroleum Gas. A Fuel Injected Rolling Count must not be cleared by selection of another fuel mode. The previous Fuel Injected Rolling Count shall be obtained as the starting value for further fuel consumption processing after a $1-$2-$1 or a $2-$1-$2 selection of the Fuel Mode Status by the driver. The usual fuel consumption unit of Compressed Natural Gas is kilograms. The density of Compressed Natural Gas is 540 kg/m³ (in liquid condition). The ECM shall recalculate and transmit the consumed Compressed Natural Gas from kilograms to liters using the above defined density of 540 kg/m³ in the Compressed Natural Gas mode. The usual fuel consumption unit of Liquefied Petroleum Gas is liters; therefore recalculation is not required for Liquefied Petroleum Gas.

Data Delay: 525 ms

Accuracy Requirement: ± 5%

4.2.3.149.2 Platform Interface Definition. Fuel Injected Rolling Count is received by Platform. It is used to determine fuel used, average and instantaneous fuel economy, etc., by using or accumulating the delta (change) in the Fuel Injected Rolling Count data. Powertrain allows the counter to roll over (start over). The platform module must keep track of rollovers.

Upon initialization, Platform should reset its internal Fuel Injected Rolling Count reference value (typically the previously received rolling count value used to calculate the amount of change in the rolling count value) to the value received in the first Fuel Injected Rolling Count signal from Powertrain and assume Fuel Injected Rolling Count Reset Occurred was previously “False.”

When the data value of the Fuel Injected Rolling Count Reset Occurred signal transitions from “False” to “True” (that indicates that the Powertrain electronics memory has been reset), the Platform module should reset its internal Fuel Injected Rolling Count reference value to the data value within the Fuel Injected Rolling Count signal. Note that if the first received Fuel Injected Rolling Count and Fuel Injected Rolling Count Reset Occurred signal pair has Fuel Injected Rolling Count Reset Occurred “True”, the Platform module action is the same. After this reset, Platform shall continue to accumulate fuel normally until another “False” to “True” transition of the reset occurred signal is detected.

If Platform detects a restoration of serial data communications with Powertrain after a loss of communications with Powertrain, Platform should reset its internal Fuel Injected Rolling Count reference value to the value received in the Fuel Injected Rolling Count signal from Powertrain.

Platform may optionally employ strategies to limit the allowed amount of change internally accumulated or react to multiple resets of the Powertrain electronics memory during the time Fuel Injected Rolling Count Reset

Occurred is held at “True” by the transmitter (as indicated through the Powertrain Interface Definition above). Such strategies may provide for improved accuracy of the Platform determined data under specific serial data conditions when needed.

Note: For Compressed Natural Gas (CNG) applications, Platform shall recalculate and indicate the consumed Compressed Natural Gas from liters to kilograms by application of the above defined density of 540 kg/m³ in the Compressed Natural Gas mode.

Similar to the Powertrain related Interface definition, Platform shall maintain two separate counters for Fuel Injected Rolling Count (one for gasoline and one for CNG). Platform shall determine which of the two counters the Fuel Injected Rolling Count signal refers to based on the signal Fuel Mode Status transmitted by Powertrain.

4.2.3.150 Fuel Level Emissions Related Status. See Table 163**.**

Table 163: Fuel Level Emissions Related Status Signal Detail

Signal	Length	Data Type	Range	Conversion
Fuel Level Emissions Related Status	1	ENM	N/A	$0 = Valid; $1 = Invalid

4.2.3.150.1 Powertrain Interface Definition. Fuel Level Emissions Related Status shall be set to “Invalid” if the fuel level sensor providing the data has failed and a corresponding DTC has been set. This data value will not be set to “Invalid” when there is an active DTC set for a Fuel Transfer Pump failure.

Input Delay: 250 ms

4.2.3.150.2 Platform Interface Definition. Fuel Level Emissions Related Status is received by emissions related controllers requiring fuel level data. Emissions Related Controllers shall use this signal for determination of the validity of the signal Fuel Level Percent.

The data in Fuel Level Percent shall be ignored by all emissions-related controllers (e.g., FSCM) if Fuel Level Emissions Related Status is set to “Invalid”.

4.2.3.151 Fuel Level Percent, Fuel Level Percent Validity. See Table 164.

Table 164: Fuel Level Percent, Fuel Level Percent Validity Signal Detail

Signal	Length	Data Type	Range	Conversion
Fuel Level Percent	8	UNM	0 to 100%	E = N × 100/255
Fuel Level Percent Validity	1	ENM	N/A	$0 = Valid; $1 = Invalid

4.2.3.151.1 Powertrain Interface Definition. Fuel Level Percent is transmitted by the ECM. It is the filtered fuel level in percent of total fuel tank capacity as indicated in the Fuel Total Capacity signal. There are two calibratable filter coefficients that are available to allow for quicker filtering during a fuel fill operation. The slow filter will be used during normal operation. The fast filter will be used if the engine run time is less than a calibration, the fuel volume is less than a threshold or the transmission is in park or neutral. The calibratable engine run time period allows for the gauge to ramp to the fuel level quickly on each startup if desired. Refer to GMW8774, PPEI Fuel Volume Determination Algorithm Requirements for details.

Fuel Level Percent Validity shall be set to “Invalid” if the sensor providing the data has failed and a corresponding DTC has been set.

Input Delay: 525 ms

4.2.3.151.2 Platform Interface Definition. Fuel Level Percent is used to display the fuel level to the driver and for trip computer functions.

The FSCM uses the Fuel Level Percent as an enabling criterion for fuel pressure rationality diagnostics and update of fuel pump duty cycle long term adaptive. It is also used in conjunction with the fuel total capacity in the estimation of bulk liquid fuel temperature.

The data in Fuel Level Percent shall be ignored if Fuel Level Percent Validity is set to “Invalid”.

4.2.3.152 Fuel Level Tank 2 Percent, Fuel Level Tank 2 Percent Validity. See Table 165.

Table 165: Fuel Level Tank 2 Percent, Fuel Level Tank 2 Percent Validity Signal Detail

Signal	Length	Data Type	Range	Conversion
Fuel Level Tank 2 Percent	8	UNM	0 to 100%	E = N × 100/255
Fuel Level Tank 2 Percent Validity	1	ENM	N/A	$0 = Valid; $1 = Invalid

4.2.3.152.1 Powertrain Interface Definition. Fuel Level Tank 2 Percent is transmitted by Powertrain. The signal contains the fuel level in the Compressed Natural Gas or Liquefied Petroleum Gas tanks.

Fuel Level Tank 2 Percent Validity shall be set to “Invalid”, if the sensor has failed and the corresponding DTC has been set.

4.2.3.152.2 Platform Interface Definition. Fuel Level Tank 2 Percent is received by Platform. It is used for indication of the fuel level in the Compressed Natural Gas or Liquefied Petroleum Gas tanks.

Fuel Level Tank 2 Percent shall be ignored, if Fuel Level Tank 2 Percent Validity has been set to “Invalid”.

4.2.3.153 Fuel Mode Status. See Table 166.

Table 166: Fuel Mode Status Signal Detail

Signal	Length	Data Type	Range	Conversion
Fuel Mode Status	2	ENM	N/A	0 = Gasoline Mode 1 = Compressed Natural Gas 2 = Liquefied Petroleum Gas 3 = Alternative Fuel Cut-off Active

4.2.3.153.1 Powertrain Interface Definition. Fuel Mode Status is transmitted by Powertrain. Powertrain shall toggle between the fuel modes (CNG engines toggle between gasoline and Compressed Natural Gas, LPG engines toggle between Liquefied Petroleum Gas and fuel cut-off), when the signal Fuel Mode Switch Active transitions from “True” to “False” and the signal Fuel Mode Switch Active Validity is set to “Valid”.

4.2.3.153.2 Platform Interface Definition. Fuel Mode Status is received by Platform. The signal is used for indication of the current fuel mode and selection of the applicable fuel level signal.

4.2.3.154 Fuel Mode Switch Active, Fuel Mode Switch Active Validity. See Table 167.

Table 167: Fuel Mode Switch Active, Fuel Mode Switch Active Validity Signal Detail

Signal	Length	Data Type	Range	Conversion
Fuel Mode Switch Active	1	BLN	N/A	$0 = False; $1 = True
Fuel Mode Switch Active Validity	1	ENM	N/A	$0 = Valid $1 = Invalid

4.2.3.154.1 Powertrain Interface Definition. Fuel Mode Switch Active is received by Powertrain. Powertrain shall toggle between the fuel modes (CNG engines toggle between gasoline and Compressed Natural Gas, LPG engines toggle between Liquefied Petroleum Gas and fuel cut-off), at every “True” to “False” transition of Fuel Mode Switch Active. Fuel Mode Switch Active shall be ignored if Fuel Mode Switch Active Validity is set to “Invalid”.

4.2.3.154.2 Platform Interface Definition. Fuel Mode Switch Active is transmitted by Platform. The signal shall be set to “True” as long as the corresponding momentary switch is depressed. Otherwise the signal value shall be “False”. Fuel Mode Switch Active Validity shall be set to “Invalid” if the switch has failed and the corresponding DTC has been set.

4.2.3.155 Fuel Pump Enabled Discrete Output Commanded Status. See Table 168.

Table 168: Fuel Pump Enabled Discrete Output Commanded Status Signal Detail

Signal	Length	Data Type	Range	Conversion
Fuel Pump Enabled Discrete Output Commanded Status	1	ENM	N/A	$0 = Fuel Pump Disabled $1 = Fuel Pump Enabled

4.2.3.155.1 Powertrain Interface Definition. Fuel Pump Enabled Discrete Output Commanded Status is transmitted by the ECM. The ECM shall report the status of its discrete Primary Fuel Pump Control through this signal. This is a redundant GMLAN signal that indicates whether the primary fuel pump hardware is enabled or disabled.

Input Delay: 60 ms

4.2.3.155.2 Platform Interface Definition. Fuel Pump Enabled Discrete Output Commanded Status is received by the FSCM. The FSCM will perform rationality diagnostic when the commanded state of the Primary Fuel Pump Control high side driver output is different from this GMLAN signal.

4.2.3.156 Fuel System Emissions Related DTC. See Table 169.

Table 169: Fuel System Emissions Related DTC Signal Detail

Signal	Length	Data Type	Range	Conversion
Fuel System Emissions Related DTC	16	PKT	N/A	N/A
System Designator	4	ENM	N/A	$0 = P0-Powertrain Codes SAE Controlled $1 = P1-Powertrain Codes MFG Controlled $2 = P2-Powertrain Codes Reserved $3 = P3-Powertrain Codes Reserved $4 = C0-Chassis Codes SAE Controlled $5 = C1-Chassis Codes MFG Controlled $6 = C2-Chassis Codes Reserved $7 = C3-Chassis Codes Reserved $8 = B0-Body Codes SAE Controlled $9 = B1-Body Codes MFG Controlled $A = B2-Body Codes Reserved $B = B3-Body Codes Reserved $C = U0-Network Codes SAE Controlled $D = U1-Network Codes MFG Controlled $E = U2- Network Codes Reserved $F = U3-Network Codes Reserved
Code Number	12	UNM	0 to 4095	E = N × 1

4.2.3.156.1 Powertrain Interface Definition. Fuel System Emissions Related DTC is received by the ECM. The ECM uses this signal as input to a diagnostic monitor associated with the FSCM. Using this signal and the Fuel System Emissions Related Malfunction Active signal, the ECM will determine when to report a fail and/or pass for the Fuel System Control System MIL Request DTC. Criteria for this diagnostic monitor are based solely on the values of Fuel System Emissions Related DTC and Fuel System Emissions Related Malfunction Active. The failure criteria is the detection of a non-zero DTC within Fuel System Emissions Related DTC and a true value in Fuel System Emissions Related Malfunction Active. A failure for this DTC will only be reported once per ignition cycle (provided codes are not cleared). A pass for this DTC will only be reported once per ignition cycle (provided codes are not cleared). A fail will be reported whenever the value of the signal Fuel System Emissions Related DTC or Fuel System Emissions Related Malfunction Active changes such that Fuel

System Emissions Related DTC is anything other than $0000 and Fuel System Emissions Related Malfunction Active is true. A pass will be reported whenever Fuel System Emissions Related DTC is $0000 and Fuel System Emissions Related Malfunction Active is False and will be reported only once per ignition cycle (provided codes are not cleared). The ECM will then use this signal to determine the value of the exact DTC to be stored in the freeze frame when conditions are correct to capture it. The conditions for capturing a FSCM related freeze frame in the ECM are that the ECM freeze frame is empty, and this DTC is stored as a confirmed code (a History Code or a Mode $03 DTC). This DTC in the ECM shall be calibrated as a Type A diagnostic with no light request so that ECM shall not command the MIL on indirectly through this DTC.

The ECM can also use this signal to determine when and if any emission related FSCM faults have been detected and what they are. As such it could determine the state of the warm-up cycle counter within the ECM. This would allow the flexibility to have one warm-up cycle counter for the entire set of emission DTCs (as is GMNA practice). Alternatively, it could easily be made to work properly when the ECM contains a dedicated warm-up cycle counter for this DTC as may be the case in European diagnostic management systems.

4.2.3.156.2 Platform Interface Definition. Fuel System Emissions Related DTC is transmitted by the FSCM module. This signal is a two byte signal with the same format as an SAE J2012 DTC (four binary coded decimal digits). The signal shall be initialized to $0000 every power up. Each time an emissions related fault is detected within the FSCM, this signal is set to the value of the SAE J2012 DTC which has just been detected (e.g., $0741 for P0741). If multiple unique faults are detected within a single driving cycle, the value of this signal will change. It will always contain the J2012 DTC of the last FSCM emissions related diagnostic monitor that has failed on any driving cycle. If multiple faults are detected between CAN message transmissions, one DTC shall be selected to send, it does not matter which one. When multiple faults are detected between CAN message transmissions, it is possible that the ECM may not know the DTC of every FSCM fault, which has been detected. However, it is not required that the ECM knows the DTC of every fault which has been detected within the FSCM.

The FSCM shall create the Fuel System Emissions Related DTC signal in the following manner. When the FSCM is powered up and initialized, the signal shall be set to $0000. When any emissions related DTC reports a fail to the FSCM diagnostic system and the DTC has not already reported a failure this driving cycle, the Fuel System Emissions Related DTC signal shall be set to the SAE J2012 value of the failed DTC.

4.2.3.157 Fuel System Emissions Related Malfunction Active. See Table 170.

Table 170: Fuel System Emissions Related Malfunction Active Signal Detail

Signal	Length	Data Type	Range	Conversion
Fuel System Emissions Related Malfunction Active	1	BLN	N/A	$0 = False $1 = True

4.2.3.157.1 Powertrain Interface Definition. Fuel System Emissions Related Malfunction Active is received by the ECM. When the ECM receives a Fuel System Emissions Related Malfunction Active signal with a value of “True”, several actions shall occur in the ECM. The ECM shall command the MIL to turn on unless a MIL request command of higher priority is active (some examples of higher priority MIL commands are the misfire diagnostic request to flash the MIL at 1 Hz due to catalyst damaging misfire, ECM device control requesting MIL illumination, or fuel pump prime logic requesting the MIL to flash). The ECM shall use the Fuel System Emissions Related Malfunction Active signal in conjunction with the Fuel System Emissions Related DTC signal for freeze frame storage as described in the Fuel System Emissions Related DTC signal description. When the ECM receives a Fuel System Emissions Related Malfunction Active signal with a value of “False”, the MIL shall be commanded off unless the MIL is being requested on or is flashing for any other reason.

The state of the Fuel System Emissions Related Malfunction Active signal shall have no affect on the state of the ECM Mode $01 PID $01 Data A Bit 7 (MIL Status). This bit shall be a function of ECM DTCs and must not be a function of the Fuel System Emissions Related Malfunction Active signal or its associated DTC. The state of the Fuel System Emissions Related Malfunction Active signal will, however, have a one-to-one correspondence with the state of the FSCM Mode $01 PID $01 Data A Bit 7.

4.2.3.157.2 Platform Interface Definition. Fuel System Emissions Related Malfunction Active is transmitted by the FSCM module. The FSCM shall determine the state of Fuel System Emissions Related Malfunction Active based on the status of the FSCM diagnostic monitors. If no FSCM DTCs are requesting MIL

illumination, then the value of Fuel System Emissions Related Malfunction Active shall be set to “False”. If one or more DTCs in the FSCM are requesting MIL illumination, the FSCM shall request the MIL to illuminate by setting the value of Fuel System Emissions Related Malfunction Active to “True”.

The FSCM is responsible for counting driving cycles for MIL “off to on” and MIL “on to off” transitions for diagnostic monitors in the FSCM. The ECM shall NOT be responsible for counting driving cycles for either MIL illumination or for extinguishing the MIL for FSCM owned diagnostic monitors. The ECM shall be solely responsible for performing bulb check, and MIL illumination via device control.

4.2.3.158 Fuel System Estimated Pressure Delivered, Fuel System Estimated Pressure Delivered Validity. See Table 171.

Table 171: Fuel System Estimated Pressure Delivered, Fuel System Estimated Pressure Delivered Validity Signal Detail

Signal	Length	Data Type	Range	Conversion
Fuel System Estimated Pressure Delivered	10	UNM	0 to 1023 kPa	E = N
Fuel System Estimated Pressure Delivered Validity	1	ENM	N/A	$0 = Valid $1 = Invalid

4.2.3.158.1 Powertrain Interface Definition. Fuel System Estimated Pressure Delivered is received by the ECM. It is required to determine actual delivered fuel flow and for accurate fuel injector control. The flow rate across an injector is highly dependant upon the sum of fuel rail pressure and intake manifold vacuum. The non-ideal behavior of injectors is also altered by changes in the sum of fuel rail pressure and intake manifold pressure.

When the Fuel System Estimated Pressure Delivered Validity flag is set to “invalid”, the ECM will assume a default fuel rail pressure for fuel flow and injector control calculations.

4.2.3.158.2 Platform Interface Definition. Fuel System Estimated Pressure Delivered is transmitted by the FSCM module. This signal represents the measured fuel system pressure adjusted for fuel line pressure losses.

The Fuel System Estimated Pressure Delivered Validity is set to “Invalid” when the Fuel Pressure sensor fault is detected. The FSCM will continue to send its best estimate for the Fuel System Estimated Pressure Delivered.

Input Delay: 12.5 ms

4.2.3.159 Fuel Total Capacity. See Table 172.

Table 172: Fuel Total capacity Signal Detail

Signal	Length	Data Type	Range	Conversion
Fuel Total Capacity	12	UNM	0.0 to 511.875 L	E = N × 1/8

4.2.3.159.1 Powertrain Interface Definition. Fuel Total Capacity is transmitted by the ECM. It is the total fuel tank capacity in liters. Refer to GMW8774, PPEI Fuel Volume Determination Algorithm Requirements for details.

Data Delay: Not applicable

4.2.3.159.2 Platform Interface Definition. Fuel Total Capacity is received by Platform. It may be used in conjunction with the Fuel Level Percent signal to determine fuel volume for trip computer functions.

Fuel Total Capacity is received by the FSCM. It is used in conjunction with the fuel level percent in the estimation of bulk liquid fuel temperature.

4.2.3.160 Fuel Total Capacity Tank 2. See Table 173.

Table 173: Fuel Total Capacity Tank 2 Signal Detail

Signal	Length	Data Type	Range	Conversion
Fuel Total Capacity Tank 2	12	UNM	0.0 to 511.875 L	E = N × 1/8

4.2.3.160.1 Powertrain Interface Definition. Fuel Total Capacity Tank 2 is transmitted by Powertrain. The signal contains the total fuel tank capacity of the Compressed Natural Gas or Liquefied Petroleum Gas Fuel tank in liters.

Note: The density of Compressed Natural Gas is 540 kg/m³ (in liquid condition). The ECM shall recalculate and transmit the Fuel Total Capacity Tank 2 from kilograms to liters using the above defined density of 540 kg/m³.

4.2.3.160.2 Platform Interface Definition. Fuel Total Capacity Tank 2 is received by Platform. It is used in conjunction with Fuel Level Tank 2 Percent in order to determine and indicate the fuel level of the Compressed Natural Gas or Liquefied Petroleum Gas tanks.

4.2.3.161 Generator Current, Generator Current Validity. See Table 174.

Table 174: Generator Current, Generator Current Validity Signal Detail

Signal	Length	Data Type	Range	Conversion
Generator Current	7	UNM	0 to 127 A	E = N × 1
Generator Current Validity	1	ENM	N/A	$0 = Valid; $1 = Invalid

4.2.3.161.1 Powertrain Interface Definition. Generator Current is transmitted by the Powertrain. This signal represents the current in amperes the generator is sourcing to the vehicle electrical system.

On vehicles that do not support Regulated Torque Control this signal shall always be sent with a data value of zero (“0”).

Generator Current Validity shall be set to “Invalid” when a Generator current sensor input fault occurs and an associated DTC has been set.

Note: Applies to GMPT controllers with generator torque estimation

4.2.3.161.2 Platform Interface Definition. Generator Current is received by the Gateway module. The RVC algorithm uses this information for electric power management.

The data in Generator Current shall be ignored if Generator Current Validity is set to “Invalid”.

Data Delay: 500 ms

4.2.3.162 Generator Failed. See Table 175.

Table 175: Generator Failed Signal Detail

Signal	Length	Data Type	Range	Conversion
Generator Failed	1	BLN	N/A	$0 = False; $1 = True

4.2.3.162.1 Powertrain Interface Definition. Generator Failed is transmitted by the ECM. When a fault is detected with either the L–Terminal or F-Terminal circuits of the generator, Powertrain will set the data value of the signal to “True” to command the Charging System/Generator Fault display. Refer to GMW8778, PPEI Generator Status L-Terminal/F-Terminal Monitor Algorithm Requirements, for details on fault determination. When the fault is no longer detected, the Data value will be set to “False”.

Data Delay: 1025 ms

4.2.3.162.2 Platform Interface Definition. Generator Failed is received by Platform. It is used to indicate, through a telltale or message, that a generator fault has been detected. Platform shall support a display for this condition on all applications. At the discretion of Platform, a chime can accompany the visual indication.

4.2.3.163 Generator Field Duty Cycle, Generator Field Duty Cycle Validity. See Table 176.

Table 176: Generator Field Duty Cycle, Generator Field Duty Cycle Validity Signal Detail

Signal	Length	Data Type	Range	Conversion
Generator Field Duty Cycle	8	UNM	0 to 100%	E = N × 0.392157
Generator Field Duty Cycle Validity	1	ENM	N/A	$0 = Valid; $1 = Invalid

4.2.3.163.1 Powertrain Interface Definition. Generator Field Duty Cycle is transmitted by the ECM. It represents the duty cycle of the generator field as read and filtered by the Powertrain electronics. Generator Field duty cycle is used by the Powertrain electronics as an indication of generator load. Generator Field Duty Cycle Validity shall be set to “Invalid” when a generator field duty cycle input fault occurs and an associated DTC has been set.

If an application does not support generator field monitoring, this signal shall always be sent with a data value of 0% for the field duty cycle and “Valid” for the validity signal.

Input Delay: 275 ms

Accuracy Requirement: TBD

4.2.3.163.2 Platform Interface Definition. Generator Field Duty Cycle is received by Platform. Generator Field Duty Cycle is used for electric power management to determine when the generator is at full field. It may also be used on certain applications as part of the auxiliary electric heater control algorithm.

The data in Generator Field Duty Cycle shall be ignored if Generator Field Duty Cycle Validity is set to “Invalid”.

4.2.3.164 Generator Regulator Setpoint Duty Cycle Request. See Table 177.

Table 177: Generator Regulator Setpoint Duty Cycle Request Signal Detail

Signal	Length	Data Type	Range	Conversion
Generator Regulator Setpoint Duty Cycle Request	8	UNM	0 to 100%	E = N × 100/255

4.2.3.164.1 Powertrain Interface Definition. Generator Regulator Setpoint Duty Cycle Request is received by Powertrain. While the engine is running, Powertrain controls the generator L-terminal duty cycle equal to the value in this signal.

Communication Failure Value: Refer to GMW8778, PPEI Generator L-Terminal Control Algorithm Requirements, for details.

Output Actuation Delay: 75 ms

4.2.3.164.2 Platform Interface Definition. Generator Regulator Setpoint Duty Cycle Request is transmitted by the Gateway Module. Platform uses this signal to control the battery voltage as a function of its temperature and state of charge as part of it Regulated Voltage Control (RVC) function. This signal represents the actual duty cycle the platform is requesting that the Powertrain apply to the generator L-terminal.

Applications, which do not support Regulated Voltage Control, shall always send this signal with a data value of 100%.

Data Delay: 275 ms

4.2.3.165 Generator Setpoint Duty Cycle Powertrain Override Active. See Table 178.

Table 178: Generator Setpoint Duty Cycle Powertrain Override Active Signal Detail

Signal	Length	Data Type	Range	Conversion
Generator Setpoint Duty Cycle Powertrain Override Active	1	BLN	N/A	$0 = False $1 = True

4.2.3.165.1 Powertrain Interface Definition. Generator Setpoint Duty Cycle Powertrain Override Active is transmitted by the ECM. Powertrain shall set the data value to "True" when Powertrain is overriding the Platform L-terminal setpoint duty cycle request. Powertrain may increase the L-terminal setpoint duty cycle that will result in higher generator voltage during high fuel demand and/or high airflow events. Powertrain may decrease the L-terminal setpoint duty cycle to reduce engine loads during engine stall conditions. Powertrain may also control the L-terminal setpoint duty cycle due to device control (test tool) request. When Powertrain has determined that L-terminal override is no longer required, the value shall be set to "False". If this signal is set to "True" then it shall remain at this state for a calibratable amount of time before re-setting the value to "False". Refer to GMW8778.

Data Delay: 275 ms

4.2.3.165.2 Platform Interface Definition. Generator Setpoint Duty Cycle Powertrain Override Active is received by Platform. This signal is used by the RVC algorithm to suspend the RVC voltage calculations when the data value is set to "True".

4.2.3.166 High Voltage Battery Temperature Sensor 1. See Table 179.

Table 179: High Voltage Battery Temperature Sensor 1 Signal Detail

Signal	Length	Data Type	Range	Conversion
High Voltage Battery Temperature Sensor 1	8 bits	UNM	-40 to 215°C	E = (N × 1) - 40
High Voltage Battery Temperature Sensor 1 Validity	1 bit	ENM	N/A	$0 = Valid; $1 = Invalid

4.2.3.166.1 Powertrain Interface Definition. High Voltage Battery Temperature Sensor 1 is received by the BPIM.

4.2.3.166.2 Platform Interface Definition. High Voltage Battery Temperature Sensor 1 is transmitted by the VITM. High Voltage Battery Temperature Sensor 1 is the temperature reading of the battery pack temperature sensor 1.

High Voltage Battery Temperature Sensor 1 Validity is the validity of the temperature sensor.

4.2.3.167 High Voltage Battery Temperature Sensor 2. See Table 180.

Table 180: High Voltage Battery Temperature Sensor 2 Signal Detail

Signal	Length	Data Type	Range	Conversion
High Voltage Battery Temperature Sensor 2	8 bits	UNM	-40 to 215°C	E = (N × 1) - 40
High Voltage Battery Temperature Sensor 2 Validity	1 bit	ENM	N/A	$0 = Valid; $1 = Invalid

4.2.3.167.1 Powertrain Interface Definition. High Voltage Battery Temperature Sensor 2 is received by the BPIM.

4.2.3.167.2 Platform Interface Definition. High Voltage Battery Temperature Sensor 2 is transmitted by the VITM. High Voltage Battery Temperature Sensor 2 is the temperature reading of the battery pack temperature sensor 2.

High Voltage Battery Temperature Sensor 2 Validity is validity of the temperature sensor.

4.2.3.168 High Voltage Battery Temperature Sensor 3. See Table 181.

Table 181: High Voltage Battery Temperature Sensor 3 Signal Detail

Signal	Length	Data Type	Range	Conversion
High Voltage Battery Temperature Sensor 3	8 bits	UNM	-40 to 215°C	E = (N × 1) - 40
High Voltage Battery Temperature Sensor 3 Validity	1 bit	ENM	N/A	$0 = Valid; $1 = Invalid

4.2.3.168.1 Powertrain Interface Definition. High Voltage Battery Temperature Sensor 3 is received by the BPIM.

4.2.3.168.2. Platform Interface Definition. High Voltage Battery Temperature Sensor 3 is transmitted by the VITM. High Voltage Battery Temperature Sensor 3 is the temperature reading of the battery pack temperature sensor 3.

High Voltage Battery Temperature Sensor 3 Validity is the validity of the temperature sensor.

4.2.3.169 High Voltage Battery Temperature Sensor 4. See Table 182.

Table 182: High Voltage Battery Temperature Sensor 4 Signal Detail

Signal	Length	Data Type	Range	Conversion
High Voltage Battery Temperature Sensor 4	8 bits	UNM	-40 to 215°C	E = (N × 1) - 40
High Voltage Battery Temperature Sensor 4 Validity	1 bit	ENM	N/A	$0 = Valid; $1 = Invalid

4.2.3.169.1 Powertrain Interface Definition. High Voltage Battery Temperature Sensor 4 is received by the BPIM.

4.2.3.169.2. Platform Interface Definition. High Voltage Battery Temperature Sensor 4 is transmitted by the VITM. High Voltage Battery Temperature Sensor 4 is the temperature reading of the battery pack temperature sensor 4.

High Voltage Battery Temperature Sensor 4 Validity is the validity of the temperature sensor.

4.2.3.170 High Voltage Battery Temperature Sensor 5. See Table 183.

Table 183: High Voltage Battery Temperature Sensor 5 Signal Detail

Signal	Length	Data Type	Range	Conversion
High Voltage Battery Temperature Sensor 5	8 bits	UNM	-40 to 215°C	E = N × 1 - 40
High Voltage Battery Temperature Sensor 5 Validity	1 bit	ENM	N/A	$0 = Valid; $1 = Invalid

4.2.3.170.1 Powertrain Interface Definition. High Voltage Battery Temperature Sensor 5 is received by the BPIM.

4.2.3.170.2 Platform Interface Definition. High Voltage Battery Temperature Sensor 5 is transmitted by the VITM. High Voltage Battery Temperature Sensor 5 is the temperature reading of the battery pack temperature sensor 5.

High Voltage Battery Temperature Sensor 5 Validity is the validity of the temperature sensor.

4.2.3.171 High Voltage Battery Temperature Sensor 6. See Table 184.

Table 184: High Voltage Battery Temperature Sensor 6 Signal Detail

Signal	Length	Data Type	Range	Conversion
High Voltage Battery Temperature Sensor 6	8 bits	UNM	-40 to 215°C	E = N × 1 - 40
High Voltage Battery Temperature Sensor 6 Validity	1 bit	ENM	N/A	$0 = Valid; $1 = Invalid

4.2.3.171.1 Powertrain Interface Definition. High Voltage Battery Temperature Sensor 6 is received by the BPIM.

4.2.3.171.2 Platform Interface Definition. High Voltage Battery Temperature Sensor 6 is transmitted by the VITM. High Voltage Battery Temperature Sensor 6 is the temperature reading of the battery pack temperature sensor 6.

High Voltage Battery Temperature Sensor 6 Validity is the validity of the temperature sensor.

4.2.3.172 High Voltage Battery Balancing Request Matrix. See Table 185.

Table 185: High Voltage Battery Balancing Request Matrix Signal Detail

Signal	Length	Data Type	Range	Conversion
High Voltage Battery Balancing Request Matrix	45	PKT	N/A	N/A
Cell Balancing SubID(N)	40 instances of 1 bit	ENM	N/A	$0 = OFF $1 = ON
Cell Index	4	ENM	N/A	$0 = do not use data $1 = cell index 1 to 40 $2 = cell index 41 to 80 $3 = cell index 81 to 120 $4 = cell index 121 to 160 $5 = cell index 160 to 200 $6 to $F = reserved for future use
Cell Open Circuit Voltage Request	1	ENM	N/A	$0 = Open Circuit Voltage $1 = Under Load

4.2.3.172.1 Powertrain Interface Definition. High Voltage Battery Balancing Request Matrix is transmitted by the BPIM.

The signal is a packet consisting of three subsignals:

a. **Cell Balancing SubID(N):** Cell Balancing SubID(N) indicates which cells in the high voltage battery pack are requested ON/OFF. This signal is used for cell balancing. Each bit represents a cell in the pack. A “0” represents a cell voltage balance circuit with is disengaged, or “Off”. A “1” represents a cell voltage balancing circuit which is engaged, or “On”. It is possible that either all cells commanded “On”, all cells commanded “Off”, or a combination of both. Any unused cell data locations shall be padded with the value

of “0”. To ensure all the required information is communicated within the timing requirements, there shall be 5 messages (N = 1 to 5).

b. **Cell Index:** Cell Index indicates which cell balancing information are currently being transmitted. Cells 1 through 40 shall be identified by Cell Index value of “1”, Cells 41 through 80 shall be identified by Cell Index of “2”, etc. To ensure all the required information is communicated within the timing requirements, there shall be 5 messages (N = 1 to 5).

c. **Cell Open Circuit Voltage Request:** Cell Open Circuit Voltage Request determines if the set of returned cell voltages are open circuit voltages or under load voltages.

Data Delay: TBD ms

4.2.3.172.2 Platform Interface Definition. High Voltage Battery Balancing Request Matrix is received by the VITM.

4.2.3.173 High Voltage Battery Side Voltage. See Table 186.

Table 186: High Voltage Battery Side Voltage Signal Detail

Signal	Length	Data Type	Range	Conversion
High Voltage Battery Side Voltage	16	UNM	0.0 to 655.35 V	E = N × 0.01
High Voltage Battery Side Voltage Validity	1	ENM	N/A	$0 = Valid; $1 = Invalid

4.2.3.173.1 Powertrain Interface Definition. High Voltage Battery Side Voltage is received by the BPIM.

4.2.3.173.2 Platform Interface Definition. High Voltage Battery Side Voltage is transmitted by the VITM. Battery Side Voltage is the measured sensor value of the battery pack overall voltage.

High Voltage Battery Side Voltage Validity is the validity of the battery side voltage data.

4.2.3.174 High Voltage Battery Current Extended Range, High Voltage Battery Current Extended Range Validity. See Table 187.

Table 187: High Voltage Battery Current Extended Range, High Voltage Battery Current Extended Range Validity Signal Detail

Signal	Length	Data Type	Range	Conversion
High Voltage Battery Current Extended Range	17	SNM	-655.36 to 655.32 Amps	E = N × 0.01
High Voltage Battery Current Extended Range Validity	1	ENM	N/A	$0 = Valid; $1 = Invalid

4.2.3.174.1 Powertrain Interface Definition. High Voltage Battery Current Extended Range is received by the BPIM.

4.2.3.174.2 Platform Interface Definition. High Voltage Battery Current Extended Range is transmitted by the VITM. High Voltage Battery Current Extended Range is the measured value of the battery pack current sensor.

High Voltage Battery Current Extended Range Validity is the validity of the battery fine resolution current data.

4.2.3.175 Hybrid Vehicle High Voltage Inverter Disable Requested. See Table 188.

Table 188: Hybrid Vehicle High Voltage Inverter Disable Requested Signal Detail

Signal	Length	Data Type	Range	Conversion
Hybrid Vehicle High Voltage Inverter Disable Requested	1	BLN	N/A	$0 = False $1 = True

4.2.3.175.1 Powertrain Interface Definition. Hybrid Vehicle High Voltage Inverter Disable Requested is received by Powertrain. This signal is used for BAS+ High Voltage Contactor Control in hybrid vehicle applications.

4.2.3.175.2 Platform Interface Definition. Hybrid Vehicle High Voltage Inverter Disable Requested is transmitted by Gateway. Hybrid Vehicle High Voltage Inverter Disable Requested is an indication that a crash event has been detected that requires de-energizing of the vehicle high voltage system.

Data Delay: TBD ms

4.2.3.176 Hybrid Vehicle High Voltage System Disabled. See Table 189.

Table 189: Hybrid Vehicle High Voltage System Disabled Signal Detail

Signal	Length	Data Type	Range	Conversion
Hybrid Vehicle High Voltage System Disabled	1	BLN	N/A	$0 = False $1 = True

4.2.3.176.1 Powertrain Interface Definition. Hybrid Vehicle High Voltage System Disabled is transmitted by BPIM if the vehicle has a BPIM; otherwise it is received by Powertrain. Hybrid Vehicle High Voltage System Disabled is an indication that an event has occurred that will de-energize the vehicle high voltage system and prevent it from being energized on subsequent Operation Cycles.

Data Delay: TBD ms

4.2.3.176.2 Platform Interface Definition. Hybrid Vehicle High Voltage System Disabled is received by Gateway if the vehicle has a BPIM; otherwise it is transmitted by the VICM. This signal is used for BAS+ High Voltage Contactor Control in hybrid vehicle applications.

4.2.3.177 Instantaneous Fuel Flow Estimate. See Table 190.

Table 190: Instantaneous Fuel Flow Estimate Signal Detail

Signal	Length	Data Type	Range	Conversion
Instantaneous Fuel Flow Estimate	16	UNM	0.0 to 63.999 023 g/s	E = N/1024

4.2.3.177.1 Powertrain Interface Definition. Instantaneous Fuel Flow Estimate is transmitted by the ECM. It represents the best estimate of the instantaneous fuel flow as determined by the ECM under all operating conditions (including Engine Crank). Instantaneous Fuel Flow is calculated from the combination of estimated base fuel and transient fuel, and then adjusted by closed loop fuel corrections. To limit the noise in this signal caused by Displacement on Demand (DoD) applications and/or differences in bank to bank fuel corrections, this value is calculated differently depending on ECM operating state. During engine cranking, it represents the fuel flow estimate based upon the cylinder that most recently crossed its fuel injection boundary. For ECM Low Speed operation, it represents the average fuel flow estimate for all cylinders with fuel injectors enabled. During ECM Medium Speed or High Speed operation (when all individual cylinder fuel calculations are not executed for processor throughput savings), it represents the average fuel flow estimate based on engine bank fuel calculations.

Data Delay: 12.5 ms

4.2.3.177.2 Platform Interface Definition. Instantaneous Fuel Flow Estimate is received by the Fuel System Control Module (FSCM). It is required as one of two inputs into a calibration lookup table to determine the base open loop fuel pump duty cycle. This signal is also used in the determination of fuel line pressure loss that is used by the FSCM fuel pump control algorithm in the estimation of fuel rail pressure under all operating conditions. The Instantaneous Fuel Flow Estimate should be the best estimate of the instantaneous fuel consumption, and must include all synchronous and asynchronous fueling adjustments as well as all effects of cylinder deactivation and fuel cut off.

4.2.3.178 Immobilizer Information. See Table 191.

Table 191: Immobilizer Information Signal Detail

Signal	Length	Data Type	Range	Conversion
Immobilizer Information	64	UNM	0 to 1.844 67E+19	E = N × 1

4.2.3.178.1 Powertrain Interface Definition. Immobilizer Information is received by Powertrain. It is used to carry out various functions related to the Vehicle Theft Deterrent System. For details, refer to GMW7349, Platform - Powertrain Immobilizer System Interface and Requirements.

4.2.3.178.2 Platform Interface Definition. Immobilizer Information is transmitted by the Gateway, although the information may originate from a device that is not on the High Speed GMLAN serial data link. This signal contains a complex multi-framed information structure and is used as a “transport layer” for conveying various information from the Immobilizer ECU to the ECM. See Table 192 below. Refer to GMW7349, Platform - Powertrain Immobilizer System Interface and Requirements. The following table contains a brief description of the transmitted Immobilizer Information.

Table 192: Immmobilizer Frame Information

Frame Information	Size	Comment
Response	1 Frame	Immobilizer Response to Powertrain Challenge
Immo Info Storage Request	10 Frames	Request to store secret information in the Powertrain memory
Immo Info Transmission Request	1 Frame	Request to receive secret information from Powertrain for storage or comparison

Data Delay: 125 ms

4.2.3.179 Immobilizer Pre Release Password. See Table 193.

Table 193: Immobilizer Pre Release Password Signal Detail

Signal	Length	Data Type	Range	Conversion
Immobilizer Pre Release Password	16	UNM	0 to 65 535 password	E = N × 1

4.2.3.179.1 Powertrain Interface Definition. Immobilizer Pre Release Password is received by Powertrain. It is used in the Vehicle Theft Deterrent system. Powertrain compares the password transmitted via this signal with its internally stored pre-release password to determine if the engine is allowed to crank. For details of the operation, refer to GMW7349, Platform - Powertrain Immobilizer System Interface and Requirements.

4.2.3.179.2 Platform Interface Definition. Immobilizer Pre Release Password is transmitted by the Gateway, although the information may originate from an immobilizer module that is not on the High Speed GMLAN serial data link. Platform transmits a valid Immobilizer Pre Release password after completing all security checks on a driver authentication device (e.g., a security transponder).

Details of the operation of the Vehicle Theft Deterrent System associated with this signal are found in GMW7349.

This signal is used in conjunction with the Immobilizer Pre Release Password Status signal, which indicates whether or not the data contained in this signal should be consumed.

Data Delay: 30 ms

4.2.3.180 Immobilizer Pre Release Password Status. See Table 194.

Table 194: Immobilizer Pre Release Password Status Signal Detail

Signal	Length	Data Type	Range	Conversion
Immobilizer Pre Release Password Status	1	ENM	N/A	$0 = No Information $1 = Information Valid

4.2.3.180.1 Powertrain Interface Definition. Immobilizer Pre Release Password Status is received by Powertrain. Immobilizer Pre Release Password Status is used in the vehicle security algorithm. The Immobilizer Pre Release Password signal shall only be compared to the Powertrain-stored pre-release password when the Immobilizer Pre Release Password Status signal indicates “Information Valid”. Otherwise, Powertrain shall not compare the Immobilizer Pre Release Password when the Immobilizer Pre-Release Password Status signal indicates “No Information”.

4.2.3.180.2 Platform Interface Definition. Immobilizer Pre Release Password Status is transmitted by the Gateway, although the information may originate from an immobilizer module that is not on the High Speed GMLAN serial data link. The password status signal is determined by the Platform Immobilizer module. This signal indicates whether the information in the Immobilizer Pre Release Password signal contains valid password information.

The Gateway and/or Immobilizer module will initialize the Vehicle Security Non Immobilizer Password Status to “No Information” upon power up. The Immobilizer module will determine the status of the driver authentication device (e.g., key code) and will set Immobilizer Pre Release Password Status to “Information Valid” for valid authorization. The Immobilizer module will set the Immobilizer Pre Release Password Status to “No Information” once the module has received proper Immobilizer Status.

Details of the operation of the Vehicle Theft Deterrent System associated with this signal are found in GMW7349, Platform - Powertrain Immobilizer System Interface and Requirements.

Data Delay: 30 ms

4.2.3.181 Instantaneous Fuel Consumption Rate. See Table 195.

Table 195: Instantaneous Fuel Consumption Rate Signal Detail

Signal	Length	Data Type	Range	Conversion
Instantaneous Fuel Consumption Rate	12	UNM	• 0.0 to 102.375 L/h	E = N × 0.025

4.2.3.181.1 Powertrain Interface Definition. Instantaneous Fuel Consumption Rate is transmitted by the ECM. This signal indicates the instantaneous fuel consumption rate of the engine in liters per hour.

Powertrain shall compute this parameter based on the average fuel consumption rate over the last sample period (e.g., 100 ms). No other filtering shall be applied.

If the engine is not running, Powertrain shall transmit this signal with a value of 0.0 liters per hour. If the instantaneous fuel consumption rate exceeds the maximum encodable value (102.375 L per hour) Powertrain shall transmit this signal with a value of 102.375 L per hour.

Note: For Compressed Natural Gas (CNG), the usual fuel consumption unit of Compressed Natural Gas is kilograms. The density of Compressed Natural Gas is 540 kg/m³ (in liquid condition). The ECM shall recalculate and transmit the Instantaneous Fuel Consumption Rate from kilograms to liters using the above defined density of 540 kg/m³ in the Compressed Natural Gas mode. The usual fuel consumption unit of Liquefied Petroleum Gas is liters; therefore recalculation is not required for Liquefied Petroleum Gas.

Data Delay: 125 ms

Accuracy Requirement: ± 5%

4.2.3.181.2 Platform Interface Definition. Instantaneous Fuel Consumption Rate is received by Platform. It is used for trip computer and fuel consumption rate display functions.

Note: For Compressed Natural Gas (CNG) applications, Platform shall recalculate and indicate the Instantaneous Fuel Consumption Rate from liters to kilograms by application of the above defined density of 540 kg/m³ in the Compressed Natural Gas mode.

4.2.3.182 Interior Dimming Display Level. See Table 196.

Table 196: Interior Dimming Display Level Signal Detail

Signal	Length	Data Type	Range	Conversion
Interior Dimming Display Level	8	UNM	0 to 100%	E = N × 100/255

4.2.3.182.1 Powertrain Interface Definition. The Interior Dimming Display Level is received by Powertrain. The indicator lamps, which tell the driver what position the Transfer Case is in, are dimmed by the BCM with the rest of the Instrument Panel lighting. When the indicator lamps are dimmed, the diagnostic trouble code (DTC) is disabled. Powertrain will be comparing this signal to a calibration to determine if the dimming is Active.

4.2.3.182.2 Platform Interface Definition. The Interior Dimming Display Level is transmitted by the Gateway. Platform sends to Powertrain the Interior Dimming Display Level. This signal will go to 100% in the daytime (full bright so that indicators/Displays are not washed out) and it will be operating at some reduced intensity tracking the dimpot at night.

4.2.3.183 Legislated Diagnostics Standard Conditions Fault Present. See Table 196a.

Table 196a: Legislated Diagnostics Standard Conditions Fault Present Signal Detail

Signal	Length	Data Type	Range	Conversion
Legislated Diagnostics Standard Conditions Fault Present	1	BLN	N/A	$0 = False $1 = True

4.2.3.183.1 Powertrain Interface Definition. Legislated Diagnostics Standard Conditions Fault Present is transmitted by the ECM.

OBD regulations require the maintenance of numerators (and denominators) for OBD II monitors within the ECM and all other OBD controllers (e.g., TCM, FSCM, etc.) The ECM, using engine parameters, determines when standard OBD drive conditions have been met. However, when faults exist on the sensors, which determine these engine parameters, OBD II requires that all numerator increments be disabled. This flag, when “True”, indicates to the other OBD controllers when this fault condition exists, which would preclude numerators within the other OBD controllers from incrementing further (i.e., they should be frozen). When “False”, the other OBD controllers should enable normal numerator maintenance.

This signal shall be initialized to a value of “False” when the ECM is powered up or when the key is turned to the RUN position (or equivalent for Remote Start systems). If Legislated Diagnostics Standard Conditions Met = “False”, Legislated Diagnostics Standard Conditions Fault Present shall be set to “True” within 10 s if a malfunction of any component used to determine when standard monitoring conditions have been met (i.e., vehicle speed, ambient temperature, elevation, idle operation, engine cold start, or time of operation) has been detected and a corresponding fault code has been stored. Once set to “True”, the signal can be reset to “False” provided Legislated Diagnostics Standard Conditions Met = “False” at the time during a trip if the malfunction is no longer present either by passing the respective diagnostic monitor or by erasure with a scan tool. Once Legislated Diagnostics Standard Conditions Met is “True”, Legislated Diagnostics Standard Conditions Fault Present shall be set to “False” regardless of any faults detected subsequently.

4.2.3.183.2 Platform Interface Definition. Legislated Diagnostics Standard Conditions Fault Present is received by the FSCM.

The other OBD controllers shall monitor the Legislated Diagnostics Standard Conditions Fault Present signal continuously throughout the ignition cycle. When the signal is “False”, the other OBD controller numerators may increment normally provided other conditions require it (see Legislated Diagnostics Standard Conditions Met). When the signal is “True”, the other OBD controller numerators must not be allowed to increment. The value provided to the other OBD controller monitors must be initialized at power-up to “False” prior to receiving the very first message.

Upon loss of communication with the ECM, the other OBD controllers shall default the value of this signal to "True" if the last transmitted value of Legislated Diagnostics Standard Conditions Met was "False", indicating a fault has been detected with the standard monitoring conditions met system. If the last received value of Legislated Diagnostics Standard Conditions Met = "True", then the value shall be defaulted to "False". Regardless, when communications are restored, the value should be updated with the most recent signal value.

4.2.3.184 Legislated Diagnostics Standard Conditions Met. See Table 197.

Table 197: Legislated Diagnostics Standard Conditions Met Signal Detail

Signal	Length	Data Type	Range	Conversion
Legislated Diagnostics Standard Conditions Met	1	BLN	N/A	$0 = False $1 = True

4.2.3.184.1 Powertrain Interface Definition. Legislated Diagnostics Standard Conditions Met is transmitted by the ECM.

OBD regulations require the maintenance of denominators for OBD II monitors within the ECM and all other OBD controllers (e.g., TCM, FSCM, etc.). The ECM, using engine parameters, determines when standard OBD drive conditions have been met. This signal will be reset to "False" at the start of each OBD Monitoring Cycle and, when OBD defined standard conditions are met, will be latched to "True". This flag, when "True", indicates to all other OBD controllers when denominators should be incremented, provided that all other monitor specific conditional requirements are met. When "False", the other OBD controllers should not allow incrementing of the denominators, which they maintain.

This signal shall be initialized to a value of "False" when the ECM is powered up or when the key is turned to the RUN position (or equivalent for Remote Start systems). The signal shall only be set to "True" within 10 **s** of meeting all the following conditions:

1. Cumulative time since engine start is greater than or equal to 600 s while at an elevation of less than 2438 m (8000 ft) above sea level and at an ambient temperature of ≥ -6.7°C (20°F). Cumulative vehicle operation at or above 40 km/h (25 mph) occurs for greater than or equal to 300 s while at an elevation of less than 2438 m (8000 ft) above sea level and at an ambient temperature of ≥ -6.7°C (20°F).
2. Continuous vehicle operation at idle (i.e., accelerator pedal released by driver and vehicle speed less than or equal to 1 mile per hour) for greater than or equal to 30 s while at an elevation of less than 2438 m (8000 ft) above sea level and at an ambient temperature of ≥ -6.7°C (20°F).

If Legislated Diagnostics Standard Conditions Fault Present is set to "True" and this signal is still "False", it is assumed this signal cannot become "True" (i.e., if the sensor(s) used to determine when standard conditions have been met are faulty, there is no way to determine that they have been met). Hence this signal would have to remain "False". However, if the fault occurs after this signal becomes "True", then, because this signal is latched, it will remain "True".

4.2.3.184.2 Platform Interface Definition. Legislated Diagnostics Standard Conditions Met is received by the FSCM.

The other OBD controllers shall monitor the Legislated Diagnostics Standard Conditions Met signal continuously throughout the ignition cycle. When the signal is "False", the other OBD controller denominators may not be incremented. When the signal is "True", the other OBD controller denominators must be incremented provided other monitor specific conditions do not prevent it. The value provided to the other OBD controller monitors must be initialized at power-up to "False" prior to receiving the very first message.

Upon loss of communication with the ECM, the other OBD controllers shall hold the last value of this signal. If standard conditions had been met before the loss of communication, then this drive cycle will show this because the signal is latched within the ECM.

4.2.3.185 Mass Air Flow, Mass Air Flow Validity. See Table 198.

Table 198: Mass Air Flow, Mass Air Flow Validity Signal Detail

Signal	Length	Data Type	Range	Conversion
Mass Air Flow	16	UNM	0.0 to 655.35 g/s	E = N × 0.01
Mass Air Flow Validity	1	ENM	N/A	$0 = Valid; $1 = Invalid

4.2.3.185.1 Powertrain Interface Definition. Mass Air Flow is transmitted by the ECM. Mass Air Flow represents the air flow as measured between the air cleaner and throttle body, or in the intake manifold. The placement of the Mass Air Flow sensor is application dependent and could result in significant variation in air flow readings between applications.

Mass Air Flow Validity shall be set to “Invalid” if MAF sensor used to calculate Mass Air Flow has failed and a corresponding DTC has been set.

Data Delay: 125 ms

Accuracy Requirement: ± 1 g/s

4.2.3.185.2 Platform Interface Definition. Mass Air Flow is received by FSCM (Fuel System Control Module). This signal is used by the FSCM for controlling and diagnosing failures with the Exhaust Flapper Valve (EFV) subsystem. The data in Mass Air Flow shall be ignored if the Mass Air Flow Validity is set to “Invalid”.

4.2.3.186 Notification Event Severity Status. See Table 199.

Table 199: Notification Event Severity Status Signal Detail

Signal	Length	Data Type	Range	Conversion
Notification Event Severity Status	7	PKT	N/A	N/A
Frontal Impact Pretensioner Severity Achieved	1	BLN	N/A	$0 = False; $1 = True
Frontal Impact Stage 1 Severity Achieved	1	BLN	N/A	$0 = False; $1 = True
Frontal Impact Stage 2 Severity Achieved	1	BLN	N/A	$0 = False; $1 = True
Left Side Severity Achieved	1	BLN	N/A	$0 = False; $1 = True
Rear Impact Severity Achieved	1	BLN	N/A	$0 = False; $1 = True
Right Side Severity Achieved	1	BLN	N/A	$0 = False; $1 = True
Rollover Severity Achieved	1	BLN	N/A	$0 = False; $1 = True

4.2.3.186.1 Powertrain Interface Definition. Notification Event Severity Status is received by the Powertrain. The source of this signal shall be monitored by the Airbag Virtual Device Availability signal.

4.2.3.186.2 Platform Interface Definition. Notification Event Severity Status is transmitted by the Gateway. The signal is a packet that consists of the following subsignals:

- Frontal Impact Pretensioner Severity Achieved
- Frontal Impact Stage 1 Severity Achieved
- Frontal Impact Stage 2 Severity Achieved
- Left Side Severity Achieved
- Rear Impact Severity Achieved
- Right Side Severity Achieved
- Rollover Severity Achieved

Data Delay: TBD ms

4.2.3.187 Outside Air Temperature Corrected Value, Outside Air Temperature Corrected Value Validity. See Table 200.

Table 200: Outside Air Temperature Corrected Value, Outside Air Temperature Corrected Value Validity Signal Detail

Signal	Length	Data Type	Range	Conversion
Outside Air Temperature Corrected Value	8	UNM	-40 to 87.5°C	E = (N × 0.5) - 40
Outside Air Temperature Corrected Value Validity	1	ENM	N/A	$0 = Valid $1 = Invalid

4.2.3.187.1 Powertrain Interface Definition. Outside Air Temperature Corrected Value is received by Powertrain.

This signal may be used for diesel engine applications, if required, only in non-OBD II markets.

This signal may be used for idle speed load modeling, default induction air temperature, and for the induction air temperature sensor diagnostic.

The data in Outside Air Temperature Corrected Value shall be ignored if Outside Air Temperature Corrected Value Validity is set to “Invalid”.

The source of this signal shall be monitored by the Outside Air Temperature Virtual Device Availability signal.

4.2.3.187.2 Platform Interface Definition. Outside Air Temperature Corrected Value is transmitted by the Gateway.

It represents the temperature processed from the ambient air temperature sensor and the coolant temperature. Platform requires the data from the Engine Coolant Temperature signal prior to calculating and displaying Outside Air Temperature. Outside Air Temperature Corrected Value Validity shall be set to “Invalid” if the sensor providing the data has failed and a backup value cannot be determined.

In vehicle applications where an outside air temperature sensor is not present, Platform shall transmit Outside Air Temperature Corrected Value with a default data value of +15°C and set Outside Air Temperature Corrected Value Validity to “Valid”.

Input Delay: TBD

Accuracy Requirement: TBD

4.2.3.188 Outside Air Temperature Virtual Device Availability. See Table 201.

Table 201: Outside Air Temperature Virtual Device Availability Signal Detail

Signal	Length	Data Type	Range	Conversion
Outside Air Temperature Virtual Device Availability	1	ENM	N/A	$0 = Virtual Device Unavailable $1 = Virtual Device Available

4.2.3.188.1 Powertrain Interface Definition. Outside Air Temperature Virtual Device Availability is received by Powertrain.

Powertrain uses this signal to determine a default outside air temperature in the event of a failure with the original source of Outside Air Temperature Corrected Value.

Power-Up Default: “Virtual Device Available”

Communication Failure Value: “Virtual Device Unavailable”

4.2.3.188.2 Platform Interface Definition. Outside Air Temperature Virtual Device Availability is transmitted by the Gateway.

This signal represents the availability from the original source of the information provided by the GMLAN signals Outside Air Temperature Corrected Value and Outside Air Temperature Corrected Value Validity.

This signal is always transmitted by the Gateway. The Gateway module determines the availability of the Outside Air Temperature Corrected Value and Outside Air Temperature Corrected Value Validity based on signal supervision. If the outside air temperature sensor is not present, this signal shall be set to “Virtual Device Unavailable”. Refer to GMW8772, PPEI Serial Data Architecture Requirements for additional information on Virtual Device Availability signals.

Data Delay: TBD

4.2.3.189 Outside Air Temperature Powertrain Estimated, Outside Air Temperature Powertrain Estimated Validity, Outside Air Temperature Powertrain Estimated Mask. See Table 202.

Table 202: Outside Air Temperature Powertrain Estimated, Outside Air Temperature Powertrain Estimated Validity, Outside Air Temperature Powertrain Estimated Mask Signal Detail

Signal	Length	Data Type	Range	Conversion
Outside Air Temperature Powertrain Estimated	8	UNM	-40 to 87.5°C	E = (N × 0.5) - 40
Outside Air Temperature Powertrain Estimated Validity	1	ENM	N/A	$0 = Valid $1 = Invalid
Outside Air Temperature Powertrain Estimated Mask	1	ENM	N/A	$0 = Do not Use Data $1 = Use Data

4.2.3.189.1 Powertrain Interface Definition. Outside Air Temperature Powertrain Estimated is transmitted by the ECM. This signal represents an estimated value of outside air temperature based on the values of, Engine Inlet Air Temperature, Mass Air Flow, Vehicle Speed, and other parameters known to the engine controller, which are useful in refining this estimated value. Outside Air Temperature Powertrain Estimated Validity shall be set to “Invalid” if a sensor providing data has failed and a corresponding DTC has been set. Outside Air Temperature Powertrain Estimated Mask shall be set to “Do not Use Data” if the required signal accuracy value cannot be met with respect to the associated temperature data range.

Data Delay: 525 ms

Outside Air Temperature Powertrain Estimated shall be transmitted within 7 s after the signal Engine Run Active transitions from “False” to “True”.

Accuracy Requirement: The accuracy of this signal with respect to actual air temperature shall meet the following requirement. See Table 203 below.

Table 203: Outside Air Temperature Accuracy Requirement

Actual Ambient Temperature	Expected Accuracy
-40 to 0°C	-10 /+5°C
0 to 34°C	± 4°C
34 to 86°C	-5 / +10°C

4.2.3.189.2 Platform Interface Definition. Outside Air Temperature Powertrain Estimated is received by Platform. This signal information is used by the Regulated Voltage Control (RVC) subsystem to determine when to activate Fuel Economy Mode operation and voltage boost determination to improve HVAC blower performance. In addition, this signal information is also available to the ABS for TCS Brake Thermal Modeling or HVAC fan “after-blow” determination. This signal is also used by the FSCM fuel pump control algorithm as a basis for estimating the fuel tank bulk liquid temperature in the absence of a suitable fuel temperature sensor.

The Data in Outside Air Temperature Powertrain Estimated may be used by platform to provide a customer display of outside air temperature, however, is not recommended because of inaccuracy of the data.

The data in Outside Air Temperature Powertrain Estimated shall be ignored if Outside Air Temperature Powertrain Estimated Validity is set to “Invalid” or if Outside Air Temperature Powertrain Estimated Mask is set to “Do not Use Data”. During these periods, it is the responsibility of the receiver to provide acceptable fail safe operation of the affected subsystems.

Note: Platform can use the Outside Air Temperature Powertrain Estimated in the Accessory power mode. However, Powertrain is not responsible to provide accurate data in the Accessory power mode because the estimated ambient air temperature cannot be calculated in this mode. Estimated ambient air temperature is a non-volatile variable, so it will have the last temperature value that was written to it during engine running. When in the Accessory power mode, the Outside Air Temperature Powertrain Estimated Mask will always be set to “Do not Use Data”, meaning the data is not being calculated.

This signal may be used for Key Crank, Auto Start, Auto Stop, 12 V Energy Management, Base Brake Control, BAS+ 12 V Energy Management, BAS+ Auto Start and BAS+ Auto Stop in hybrid vehicle applications.

4.2.3.190 Overdrive Disable Request Granted. See Table 204.

Table 204: Overdrive Disable Request Granted Signal Detail

Signal	Length	Data Type	Range	Conversion
Overdrive Disable Request Granted	1	BLN	N/A	$0 = False; $1 = True

4.2.3.190.1 Powertrain Interface Definition. Overdrive Disable Request Granted is transmitted by the TCM if the vehicle has a TCM; otherwise it is transmitted by the ECM. Powertrain shall set Overdrive Disable Request Granted to the state currently recognized by Powertrain. Overdrive Disable Request Granted shall be initialized to “False” on power-up.

This signal does not simply indicate the overdrive disabled status of the transmission, but rather whether a Platform overdrive request has been granted. For example, if Powertrain disables overdrive on its own (i.e., Platform is not requesting an overdrive disable) this signal should be set to “False”. If Platform requests an overdrive disable, but Powertrain does not comply, this signal shall be set to “False”. If Powertrain complies with a Platform request for an overdrive disable then this signal shall be set to “True”.

Applications that do not support disabling of overdrive (including all manual transmission applications) shall always send this signal with a data value of “False”.

Data Delay: 30 ms

4.2.3.190.2 Platform Interface Definition. Overdrive Disable Request Granted is received by Platform. It provides feedback from Powertrain if a Platform overdrive request (conveyed by the Overdrive Disable Requested signal) was granted and may be used for displays.

Output Actuation Delay: 250 ms (with respect to display activation)

4.2.3.191 Overdrive Disable Requested. See Table 205.

Table 205: Overdrive Disable Requested Signal Detail

Signal	Length	Data Type	Range	Conversion
Overdrive Disable Requested	1	BLN	N/A	$0 = False; $1 = True

4.2.3.191.1 Powertrain Interface Definition. Overdrive Disable Requested is received by Powertrain. When the data value of the signal is “True”, Powertrain will disable high gear/low torque ratio operation. The number of gears disabled or the torque ratio limit (with CVT) shall be a mutual agreement between Powertrain and Platform. The disable request may be denied for transmission protection reasons.

Power-Up Default: False

Communication Failure Value: False

Output Actuation Delay: 50 ms (with respect to indicating a change via the Overdrive Disable Request Granted signal)

4.2.3.191.2 Platform Interface Definition. Overdrive Disable Requested is transmitted by the Gateway module. This request is used to enable or disable overdrive in an automatic transmission. The signal shall be latched by the Platform even if the switch is momentary. The Platform shall require explicit driver activation of overdrive switch every ignition cycle. In other words, Platform shall **not** latch the signal between ignition cycles.

Applications that do not support disabling of overdrive (including all manual transmission applications) shall always send this signal with a data value of "False".

This signal may be emissions related. The implementer of the signal shall ensure that the OBD requirements in GMW8762, PPEI General Information on On-Board Diagnostics are fulfilled for a design intended for an OBD II market.

Data Delay: 30 ms

4.2.3.192 Park Brake Switch Active. See Table 206.

Table 206: Park Brake Switch Active Signal Detail

Signal	Length	Data Type	Range	Conversion
Park Brake Switch Active	1	BLN	N/A	$0 = False; $1 = True

4.2.3.192.1 Powertrain Interface Definition. Park Brake Switch Active is received by the Powertrain. It is used by some Transfer Case applications to detect a park brake turn, when the Transfer Case system will reduce the drive torque on the rear wheels. It is also used to deactivate the Powertrain automatic trailer detection (vehicle mass estimation) feature when the park brake switch is active. When the park brake is not active and the Powertrain detects additional vehicle mass (e.g., a trailer load), the accelerator pedal gain may be modified to accommodate the additional vehicle mass. Additionally, (on some applications) the ECM will disengage conventional cruise control when Park Brake Switch Active is set to "True".

4.2.3.192.2 Platform Interface Definition. Park Brake Switch Active is transmitted by the Gateway. This signal indicates whether or not the park brake is applied, and shall represent the correct status on both electrical and mechanical park brake systems.

Input Delay: 125 ms

4.2.3.193 Park Brake Virtual Device Availability. See Table 207.

Table 207: Park Brake Virtual Device Availability Signal Detail

Signal	Length	Data Type	Range	Conversion
Park Brake Virtual Device Availability	1	ENM	N/A	$0 = Virtual Device Unavailable $1 = Virtual Device Available

4.2.3.193.1 Powertrain Interface Definition. Park Brake Virtual Device Availability is received by Powertrain. Powertrain uses this signal to determine proper operation of the various users of Park Brake information in the event of a failure with the original source.

4.2.3.193.2 Platform Interface Definition. Park Brake Virtual Device Availability is transmitted by the Gateway. This signal represents the availability of the original source of Park Brake information. Refer to GMW8772, PPEI Serial Data Architecture for more information on Virtual Device Availability signals.

Data Delay: 125 ms

4.2.3.194 Platform Engine Speed Command. See Table 208.

Table 208: Platform Engine Speed Command Signal Detail

Signal	Length	Data Type	Range	Conversion
Platform Engine Speed Command	12	PKT	N/A	N/A
Platform Engine Speed Command Mode Active	1	BLN	N/A	$0 = False; $1 = True
Platform Engine Speed Request	11	UNM	0 to 8188 rpm	E = N × 4

4.2.3.194.1 Powertrain Interface Definition. Platform Engine Speed Command is received by the Powertrain. This signal is used by the Powertrain to control engine speed when Platform Engine Speed Command: Engine Speed Command Mode Active is “True” and PTO or Fast Idle disable criteria are not present. The Powertrain shall control to the Platform Engine Speed Command: Platform Engine Speed Request transmitted in this signal when conditions allow. Potential measures may include throttle, spark, fuel, transmission control, etc. If the engine control system is temporarily unable to provide the requested engine speed due to arbitration with another requesting source that is limiting the throttle position to a threshold lower than that being requested by PTO or Fast Idle, then the Powertrain shall transmit the signal Platform Engine Speed Request Superceded with a data value of “True”. If PTO or Fast Idle disable criteria are present, the Powertrain shall not respond to PTO or Fast Idle engine speed requests contained in this signal.

The Powertrain shall limit engine speed to an appropriate range for PTO or Fast Idle operation. Normally operating PTO or Fast Idle systems should not encounter this limit.

Powertrain should not respond to the request contained in the Platform Engine Speed Request subsignal unless the Platform Engine Speed Command Mode Active subsignal has a value of “True”.

Powertrain shall disable any OBD diagnostics that may be set incorrectly as a result of PTO or Fast Idle operation.

Power-up Defaults: Platform Engine Speed Request: 0 rpm
Platform Engine Speed Command Mode Active: “False”

Output Actuation Delay: 150 ms (with respect to changing Powertrain internal engine control parameters)

4.2.3.194.2 Platform Interface Definition. Platform Engine Speed Command is transmitted by the PTO module when the PTO module is present, and is not transmitted when the PTO module is not present.

Note: On Fast Idle applications, the Gateway module assumes the role of the PTO module only for Fast Idle functionality; PTO functionality is not supported). This signal consists of two subsignals with the following definition:

a. Platform Engine Speed Command Mode Active - This subsignal is “True” when PTO or Fast Idle is active and controlling engine speed. This subsignal is “False” under all other conditions. The Power Take-Off Module determines that PTO operation has been requested when the PTO in-cab PTO Enable switch has been asserted. Platform Fast Idle function determines that Fast Idle engine speed control has been requested when the Fast Idle Active Switch is activated.

b. Platform Engine Speed Request - This subsignal is an indication of the engine speed the PTO or Fast Idle system is requesting. When the Platform Engine Speed Command Mode Active subsignal is “False” this subsignal shall be sent with a data value of 0 rpm.

Data Delay: 125 ms

4.2.3.195 Platform Engine Speed Command Alive Rolling Count. See Table 209.

Table 209: Platform Engine Speed Command Alive Rolling Count Signal Detail

Signal	Length	Data Type	Range	Conversion
Platform Engine Speed Command Alive Rolling Count	2	UNM	0 to 3	E = N × 1

4.2.3.195.1 Powertrain Interface Definition. Platform Engine Speed Command Alive Rolling Count is received by the Platform. When an Alive Rolling Count error is detected, the corresponding Platform Engine Speed Command signal shall be ignored, i.e., the previously accepted data shall be used. A sliding window x of y strategy shall comprehend both Alive Rolling Count errors and Protection Value errors as defined in GMW8780, PPEI Power Take-Off Algorithm Requirements. Refer to GMW8772, PPEI Serial Data Architecture Alive Rolling Count and Protection Value Requirements.

4.2.3.195.2 Platform Interface Definition. Platform Engine Speed Command Alive Rolling Count is transmitted by the PTO module when the PTO module is present, and is not transmitted when the PTO module is not present.

Note: On Fast Idle applications, the Gateway module assumes the role of the PTO module only for Fast Idle functionality; PTO functionality is not supported.

This Alive Rolling Count is associated with the Platform Engine Speed Command signal. Refer to GMW8772, PPEI Serial Data Architecture Alive Rolling Count and Protection Value Requirements.

Data Delay: 125 ms

4.2.3.196 Platform Engine Speed Command Inhibit Request. See Table 210.

Table 210: Platform Engine Speed Command Inhibit Request Signal Detail

Signal	Length	Data Type	Range	Conversion
Platform Engine Speed Command Inhibit Request	1	ENM	N/A	$0 = Allow Platform Engine Speed Control $1 = Inhibit Platform Engine Speed Control

4.2.3.196.1 Powertrain Interface Definition. Platform Engine Speed Command Inhibit Request is transmitted by the ECM. When the signal is set to “Inhibit Platform Eng. Speed Control”, the Powertrain will disengage or prevent engagement of PTO or Fast Idle. This signal indicates that a condition exists in the Powertrain requiring disengagement of PTO or Fast Idle. Refer to GMW8780, PPEI Power Take-Off and Fast Idle Algorithm Requirements for the Powertrain related disengagement criteria. Applications that do not support Platform engine speed commands shall always transmit this signal with a data value of “Inhibit Platform Engine Speed Control”.

Data Delay: 125 ms

4.2.3.196.2 Platform Interface Definition. Platform Engine Speed Command Inhibit Request is received by Platform. The PTO or Fast Idle functions shall receive this signal indicating that Powertrain is inhibiting or disabling the PTO or Fast Idle function.

Power-up Default: “Allow Platform Engine Speed Control”

Communication Failure: “Inhibit Platform Engine Speed Control”

Output Actuation Delay: 100 ms

4.2.3.197 Platform Engine Speed Command On Switch Active. See Table 211.

Table 211: Platform Engine Speed Command On Switch Active Signal Detail

Signal	Length	Data Type	Range	Conversion
Platform Engine Speed Command On Switch Active	1	BLN	N/A	$0 = False; $1 = True

4.2.3.197.1 Powertrain Interface Definition. Platform Engine Speed Command On Switch Active is received by Powertrain. Powertrain uses this signal as part of a high level supervisory function in PTO and fast idle applications. The switch state shall be monitored along with other inputs to verify key enable/disengagement criteria before responding to PTO or fast idle control requests. If for any reason the ECM, based upon the supervisory function, determines that PTO or fast idle should not be operating, the ECM shall ignore the Platform Engine Speed Command: Platform Engine Speed Request signal and initiate a disengagement by

transmitting the Platform Engine Speed Command Inhibit Request signal as “Inhibit Platform Eng. Speed Control”. For more detailed information regarding this supervisory function, refer to GMW8780, PPEI Power Take-Off and Fast Idle Control Algorithm Requirements.

Powertrain shall ignore the status of this signal if the signal Platform Engine Speed Command Switch Data Integrity is received with a data value of “Failure Detected”.

Power-up Default: “False”

Communication Failure Value: “False”

Output Actuation Delay: 38 ms (with respect to changing Powertrain internal engine control parameters)

4.2.3.197.2 Platform Interface Definition. Platform Engine Speed Command On Switch Active is transmitted by the PTO module when the PTO module is present, and is not transmitted when the PTO module is not present.

Note: On Fast Idle applications, the Gateway module assumes the role of the PTO module only for Fast Idle functionality; PTO functionality is not supported.

This signal represents the status of the PTO or fast idle enable switch. This signal shall be set to “True” when the associated switch transitions from inactive to active. The Platform shall perform any required debouncing of the switch.

Two implementations are available for the switch, latched or momentary.

Latched Switch: For a latched switch, this signal represents the state of the switch.

Momentary Switch: The signal shall be set to “True” when the current state of the signal is “False” and the switch is applied and released. The signal shall be set to “False” when the current state of the signal is “True” and the switch is applied and released.

Once the signal has been set to “True” it shall stay in that state until at least one of the following conditions is fulfilled:

- The associated switch input to platform transitions from “Active” to “Inactive” (i.e., driver requests PTO or fast idle “Off”).
- A Power Mode equal to “Off” is received (i.e., the drive cycle is finished).
- An internal ECU fault has been detected in the platform module reading the switch.
- The Platform module reading the switch has diagnosed the switch as failed.

Input Delay: 48 ms

4.2.3.198 Platform Engine Speed Command Protection Value. See Table 212.

Table 212: Platform Engine Speed Command Protection Value Signal Detail

Signal	Length	Data Type	Range	Conversion
Platform Engine Speed Command Protection Value	12	UNM	0 to 4095	E = N × 1

4.2.3.198.1 Powertrain Interface Definition. Platform Engine Speed Command Protection Value is received by Powertrain. When a Protection Value error is detected, the corresponding Platform Engine Speed ommand signal shall be ignored, i.e., the previously accepted data shall be used. A sliding window x of y trategy shall comprehend both Alive Rolling Count errors and Protection Value errors as defined in MW8780, PPEI Power Take-Off and Fast Idle Algorithm Requirements. Refer to GMW8772, PPEI Serial ata Architecture for Alive Rolling Count and Protection Value Requirements.

.2.3.198.2 Platform Interface Definition. Platform Engine Speed Command Protection Value is transmitted by he PTO module when the PTO module is present, and is not transmitted when the PTO module is not present.

ote: On Fast Idle applications, the Gateway module assumes the role of the PTO module only for Fast Idle functionality; PTO functionality is not supported.

This protection is associated with the Platform Engine Speed Command signal. Refer to GMW8772, PPEI Serial Data Architecture for Alive Rolling Count and Protection Value Requirements.

Data Delay: 125 ms

4.2.3.199 Platform Engine Speed Command Speed Increase Switch Active, Platform Engine Speed Command Speed Decrease Switch Active. See Table 213.

Table 213: Platform Engine Speed Command Speed Increase Switch Active, Platform Engine Speed Command Speed Decrease Switch Active Signal Detail

Signal	Length	Data Type	Range	Conversion
Platform Engine Speed Command Speed Increase Switch Active	1	BLN	N/A	$0 = False; $1 = True
Platform Engine Speed Command Speed Decrease Switch Active	1	BLN	N/A	$0 = False; $1 = True

4.2.3.199.1 Powertrain Interface Definition. Platform Engine Speed Command Speed Increase Switch Active and Platform Engine Speed Command Speed Decrease Switch Active are received by Powertrain. Powertrain uses these signals as part of a high level supervisory function in PTO applications. These switch states shall be monitored along with other inputs to verify key enable/disengagement criteria before responding to PTO control requests. If for any reason the ECM, based upon the supervisory function, determines that PTO should not be operating, the ECM shall ignore the Platform Engine Speed Command: Platform Engine Speed Request signal and initiate a disengagement by transmitting the Platform Engine Speed Command Inhibit Request signal as “Inhibit Platform Eng. Speed Control”. For more detailed information regarding this supervisory function, refer to GMW8780, PPEI Power Take-Off and Fast Idle Control Algorithm Requirements.

Powertrain shall ignore the status of these signals if the signal Platform Engine Speed Command Switch Data Integrity is received with a data value of “Failure Detected”.

Power-Up Default: “False”

Communication Failure Value: “False”

Output Actuation Delay: 38 ms (with respect to changing Powertrain internal engine control parameters)

4.2.3.199.2 Platform Interface Definition. Platform Engine Speed Command Speed Increase Switch Active and Platform Engine Speed Command Speed Decrease Switch Active are transmitted by the PTO module when the PTO module is present, and are not transmitted when the PTO module is not present.

Note: On Fast Idle applications, the Gateway module assumes the role of the PTO module only for Fast Idle functionality; PTO functionality is not supported.

These signals represent the status of the PTO speed increase and decrease switches, respectively. The Platform shall perform any required debouncing of the switches.

Applications where a PTO module is present but that do not support PTO (Fast Idle applications, for example) shall always transmit these signals with a data value of “False”.

Input Delay: 48 ms

4.2.3.200 Platform Engine Speed Command Superceded. See Table 214.

Table 214: Platform Engine Speed Command Superceded Signal Detail

Signal	Length	Data Type	Range	Conversion
Platform Engine Speed Command Superceded	1	BLN	N/A	$0 = False; $1 = True

4.2.3.200.1 Powertrain Interface Definition. Platform Engine Speed Command Superceded is transmitted by the ECM. This signal shall be set to “True” when PTO or Fast Idle is active, but the Powertrain is controlling throttle to a position lower than the position associated with the Platform Engine Speed Command: Platform Engine Speed Request based on a request from a source other than the PTO or Fast Idle function, respectively. This signal shall be set to “False” at all other times. Note that throttle sources resulting in a higher

throttle position than the position associated with PTO or Fast Idle, such as the driver pressing the accelerator pedal, shall not cause this signal to be set to “True”.

Note: In some cases where another source overrides PTO/Fast Idle throttle control, the Powertrain knows it is necessary to disengage PTO without waiting. In this case, the Powertrain shall terminate throttle control for PTO (or Fast Idle) and set Platform Engine Speed Command Inhibit Request to “Inhibit Platform Eng. Speed Control”.

Applications that do not support Power Take-Off or Fast Idle shall send this signal with a data value of “False”.

Data Delay: 125 ms

4.2.3.200.2 Platform Interface Definition. Platform Engine Speed Command Superceded is received by Platform. This signal allows the PTO module or Fast Idle function to know when the control of the throttle has been given to some subsystem other than the PTO or Fast Idle subsystems. This signal allows the PTO/Fast Idle system to know when the control of the throttle has been limited by some subsystem below the position associated with the request from the PTO/Fast Idle subsystem The PTO or Fast Idle functions shall determine whether to disengage platform engine speed control potentially based on Platform Engine Speed Command Superceded being “True” for a calibratable period of time. The PTO or Fast Idle functions may also use this information for its control, for example, to suspend learning.

4.2.3.201 Platform Engine Speed Command Switch Data Integrity. See Table 215.

Table 215: Platform Engine Speed Command Switch Data Integrity Signal Detail

Signal	Length	Data Type	Range	Conversion
Platform Engine Speed Command Switch Data Integrity	2	ENM	N/A	$0 = Data Valid $1 = Data Invalid $2 = Failure Detected

4.2.3.201.1 Powertrain Interface Definition. Platform Engine Speed Command Switch Data Integrity is received by Powertrain. Powertrain uses Platform Engine Speed Command Switch Data Integrity in the PTO and fast idle engine speed control algorithm and supervisory functions. Powertrain shall disengage PTO and fast idle engine speed control if this signal received with a data value of “Failure Detected”.

Power-Up Default: “Data Invalid”

Communication Failure Value: “Data Invalid”

Output Actuation Delay: 38 ms

4.2.3.201.2 Platform Interface Definition. Platform Engine Speed Command Switch Data Integrity is transmitted by the PTO module when the PTO module is present, and is not transmitted when the PTO module is not present.

Note: On Fast Idle applications, the Gateway module assumes the role of the PTO module only for Fast Idle functionality; PTO functionality is not supported.

This signal indicates the status of the PTO or fast idle switch information. When no faults are present and the switch states are determinant, the signal shall be set to “Data Valid”. When the platform detects an invalid switch state a DTC shall be set after a calibratable period of time, and the signal shall be set to “Data Invalid”. When the signal state is “Data Invalid”, the platform shall communicate the switch state of the Platform Engine Speed Command On Switch Active signal as “False”. When a stuck switch fault is detected, the signal shall be set to “Failure Detected” and a DTC shall be stored. When the signal state is “Failure Detected”, platform shall communicate the state of the Platform Engine Speed Command On Switch Active signal as “False”.

A module on the high-speed serial data link shall read the PTO or fast idle switches and transmit this signal. This signal shall be transmitted in the same frame as the Platform Engine Speed Command On Switch Active, Platform Engine Speed Command Speed Increase Switch Active, and Platform Engine Speed Command Speed Decrease Switch Active signals.

Input Delay: 48 ms

4.2.3.202 Platform Engine Speed Command System Type. See Table 216.

Table 216: Platform Engine Speed Command System Type Signal Detail

Signal	Length	Data Type	Range	Conversion
Platform Engine Speed Command System Type	3	ENM	N/A	$0 = No Platform Eng. Speed Command Sys. $1 = Stationary PTO $2 = Stationary Variable PTO $3 = Mobile Variable PTO $4 = Fast Idle $5 = Enhanced Fast Idle

4.2.3.202.1 Powertrain Interface Definition. Platform Engine Speed Command System Type is received by Powertrain. The PTO and Fast Idle system types defined by this signal shall be stored in non-volatile memory of the Powertrain electronics in case communications is lost with the platform controller sending this signal.

4.2.3.202.2 Platform Interface Definition. Platform Engine Speed Command System Type is transmitted by the vehicle Regular Production Option (RPO) Master electronics function. This signal indicates whether or not an engine speed command system is present on the vehicle, as well as what engine speed system type has been enabled by Platform.

Data Delay: Not applicable.

4.2.3.203 Platform Minimum Idle Boost Level Request. See Table 217.

Table 217: Platform Minimum Idle Boost Level Request Signal Detail

Signal	Length	Data Type	Range	Conversion
Platform Minimum Idle Boost Level Request	2	ENM	N/A	$0 = No Boost Requested $1 = Boost Level 1 $2 = Boost Level 2 $3 = Boost Level 3

4.2.3.203.1 Powertrain Interface Definition. Platform Minimum Idle Boost Level Request is received by Powertrain. Each idle boost level will correspond to two minimum calibratable idle speed thresholds (one for in-gear and one for not-in-gear) above which the Powertrain electronics must maintain the engine speed. The determination of the calibratable idle speed thresholds is a coordinated effort between Powertrain and Platform. Powertrain may support up to three separate idle boost levels depending on the vehicle. Arbitration must be done on the platform side and then powertrain is only expecting to receive the message from a single source.

To meet OBD II regulations, GMPT freezes idle speed at the current level or calibrateable maximum level, whichever level is lower, when the catalyst monitor diagnostic is initiated. The catalyst monitor will freeze idle rpm to a maximum of 60 s, but typically less than 30 s, once per trip if successfully completed.

Power-Up Default: No Boost Requested (OBD II requirement)

Communication Failure Value: No Boost Requested (OBD II requirement)

4.2.3.203.2 Platform Interface Definition. Platform Minimum Idle Boost Level Request is transmitted by Platform. This signal is used to request the Powertrain boost the idle speed due to excessive electrical loading on the vehicle. This signal is also used by the HVAC subsystem to increase idle speed to improve cooling performance by increasing A/C compressor output during extreme high temperature conditions. It may also be used to reduce passenger compartment warm-up time during extreme low temperature conditions by increasing heat rejection from the engine.

This signal may be emissions related. Refer to GMW8762, PPEI General Information on On-Board Diagnostics for additional OBD II requirements.

Data Delay: 1025 ms

4.2.3.204 Platform Transmission Tap Up/Down Enable Switch State. See Table 218.

Table 218: Platform Transmission Tap Up/Tap Down Enable Switch State Signal Detail

Signal	Length	Data Type	Range	Conversion
Platform Transmission Tap Up/Down Enable Switch State	2	ENM	N/A	$0 = No Activation $1 = Driver Shift Control Enable Switch Active $2 = Electronic Range Select Enable Switch Active $3 = Illegal Enable Switch State Active

4.2.3.204.1 Powertrain Interface Definition. Platform Transmission Tap Up/Down Enable Switch State is received by Powertrain.

Upon receipt of the Platform Transmission Tap Up/Down Enable Switch State with a data value of "Illegal Enable Switch State Active", Powertrain shall take appropriate failsoft action to provide powertrain protection, and/or maintain vehicle safety/stability based upon the current operating conditions. Also, Powertrain shall ensure that the OBD requirements are fulfilled for a design intended for an OBD II market.

Upon receipt of the Platform Transmission Tap Up/Down Enable Switch State with a data value of "Driver Shift Control Enable Switch Active", Powertrain shall determine if the requested feature can be enabled based on current conditions. If conditions allow, Powertrain shall transmit the Transmission Tap Up/Tap Down Mode Status with a value of "Driver Shift Control Active" and also transmit an appropriate value for the Driver Shift Control Target Gear signal in response to enabling the requested feature.

Upon receipt of the Platform Transmission Tap Up/Down Enable Switch State with a data value of "Electronic Range Select Enable Switch Active", Powertrain shall determine if the requested feature can be enabled based on current conditions. If conditions allow, Powertrain shall transmit the Transmission Tap Up/Tap Down Mode Status with a value of "Electronic Range Select Active" and also transmit an appropriate value for the Transmission Shift Lever Position signal in response to enabling the requested feature.

Upon receipt of Platform Transmission Tap Up/Down Enable Switch State with a data value of "No Activation" Powertrain shall disable both the Driver Shift Control and Electronic Range Select features.

Power-Up Default: "No Activation"

Communication Failure Value: "No Activation"

Output Actuation Delay: 50 ms (with respect to indicating a change via the Transmission Tap Up/Tap Down Mode Status signal)

4.2.3.204.2 Platform Interface Definition. Platform Transmission Tap Up/Down Enable Switch State is transmitted by the Gateway module.

This signal shall be used to enable or disable the Driver Shift Control or Electronic Range Select features. Platform shall only activate one of these features at any given time.

The mechanization used to activate these features in the Platform electronics are explicitly specified in GMW8777. In applications where Platform calibrations dictate that Powertrain determine the enable of Driver Shift Control or Electronic Range Select features using a dedicated lever position within the transmission range selection system, Platform shall transmit Platform Transmission Tap Up/Down Enable Switch State with a data value of either "Driver Shift Control Enable Switch Active" or "Electronic Range Select Enable Switch Active" in any non-OFF power mode. Regardless of application, if Platform detects an open circuit or short to ground fault in the enable switch, Platform shall transmit Platform Transmission Tap Up/Down Enable Switch State with a data value of "No Activation".

Applications which do not support Driver Shift Control or Electronic Range Select features (including all manual transmission applications) shall always send the Platform Transmission Tap Up/Down Enable Switch State signal with a data value of "No Activation".

Platform Transmission Tap Up/Down Enable Switch State Data Delay: 40 ms

4.2.3.205 Platform Transmission Tap Up/Down Switch State. See Table 219.

Table 219: Platform Transmission Tap Up/Tap Down Switch State Signal Detail

Signal	Length	Data Type	Range	Conversion
Platform Transmission Tap Up/Down Switch State	2	ENM	N/A	$0 = No Activation $1 = Increment Switch Active $2 = Decrement Switch Active $3 = Illegal Up/Down Switch State Active

4.2.3.205.1 Powertrain Interface Definition. Platform Transmission Tap Up/Down Switch State is received by Powertrain.

On applications that use two sets of tap up/down switches, refer to Platform Transmission Tap Up/Down Secondary Switch State for the combined interpretation of the switches and the transmission response to these signals.

When only one set of tap up/down switches are utilized, upon receipt of the Platform Transmission Tap Up/Down Switch State with a data value of “Illegal Up/Down Switch State Active”, Powertrain shall take appropriate failsoft action to provide powertrain protection, and/or maintain vehicle safety/stability based upon the current operating conditions. Also, Powertrain shall ensure that the OBD requirements are fulfilled for a design intended for an OBD II market.

- For Driver Shift Control (DSC) - Upon receipt of the Platform Transmission Tap Up/Down Switch State with a data value of “Increment Switch Active” or “Decrement Switch Active”, Powertrain shall use the Platform Transmission Tap Up/Down Switch State signal to detect driver requested gear changes when the Driver Shift Control feature is active. Powertrain shall require an explicit transition of the data value in the Platform Transmission Tap Up/Down Switch State signal for each gear change. Multiple sequential signals received with the same data value shall not result in multiple gear changes. For example, the data must transition to “Increment Switch Active” from another value (No Activation or Decrement Switch Active) in order to execute a “Tap Up” request. Likewise, the data must transition to “Decrement Switch Active” in order to execute a “Tap Down” request.
- For Electronic Range Select (ERS) - When only one set of tap up/down switches are utilized, Powertrain shall use the Platform Transmission Tap Up/Down Switch State signal to detect driver requested range changes when the Electronic Range Select feature is active. Powertrain shall require an explicit transition of the data value in the Platform Transmission Tap Up/Down Switch State signal for each range change. Multiple sequential signals received with the same data value shall not result in multiple range changes. For example, the data must transition to “Increment Switch Active” from another value (“No Activation” or “Decrement Switch Active”) in order to execute a “Tap Up” request. Likewise, the data must transition to “Decrement Switch Active” in order to execute a “Tap Down” request.

P wer-Up Default: “No Activation”

C mmunication Failure Value: “No Activation”

O tput Actuation Delay: 50 ms (with respect to indicating a change via the Driver Shift Control Target Gear or Transmission Shift Lever Position signal)

4. .3.205.2 Platform Interface Definition. Platform Transmission Tap Up/Down Switch State is transmitted by th Gateway module.

T s signal shall be used to communicate the debounced state of the Tap Up/Tap Down request switches for the Driver Shift Control or Electronic Range Select features. The mechanization used to support the increment and decrement functions in the Platform electronics are explicitly specified in GMW8777.

Applications that do not support Driver Shift Control or Electronic Range Select features (including all manual transmission applications) shall always send the Platform Transmission Tap Up/Down Switch State signal with a data value of “No Activation”.

Platform Transmission Tap Up/Down Switch State **Input Delay:** 40 ms

4.2.3.206 Platform Transmission Tap Up/Down Secondary Switch State. See Table 220.

Table 220: Platform Transmission Tap Up/Tap Down Secondary Switch State Signal Detail

Signal	Length	Data Type	Range	Conversion
Platform Transmission Tap Up/Down Secondary Switch State	2	ENM	N/A	$0 = No Activation $1 = Increment Switch Active $2 = Decrement Switch Active $3 = Illegal Up/Down Switch State Active

4.2.3.206.1 Powertrain Interface Definition. Platform Transmission Tap Up/Down Secondary Switch State is received by Powertrain.

Upon receipt of the Platform Transmission Tap Up/Down Secondary Switch State with a data value of “Illegal Up/Down Switch State Active”, Powertrain shall take appropriate failsoft action to provide powertrain protection, and/or maintain vehicle safety/stability based upon the current operating conditions. Also, Powertrain shall ensure that the OBD requirements are fulfilled for a design intended for an OBD II market.

Upon receipt of the Platform Transmission Tap Up/Down Secondary Switch State with a data value of “Increment Switch Active” or “Decrement Switch Active”, Powertrain shall use the combination of the Platform Transmission Tap Up/Down Switch State and the Platform Transmission Tap Up/Down Secondary Switch State signals to detect driver requested gear changes when the Driver Shift Control feature is active, or to detect driver requested range changes when Electronic Range Select feature is active.

- **For Driver Shift Control (DSC):** The Platform Transmission Tap Up/Down Switch State and Platform Transmission Tap Up/Down Secondary Switch State shall be combined in the same PPEI frame in order to simultaneously interpret driver requested gear changes, as well as ensure the OBD requirements are fulfilled when two sets of switches are available. Powertrain shall require an explicit transition of the data value in either the Platform Transmission Tap Up/Down Switch State or the Platform Transmission Tap Up/Down Secondary Switch state to trigger each gear change. Anytime both signals are simultaneously requesting a gear change in the same direction, Powertrain shall interpret it as a request for a single gear change. Anytime the two signals are simultaneously received with one switch indicating “Increment Switch Active” and the other is requesting “Decrement Switch Active”, Powertrain shall interpret the request as “No Activation” and no gear change shall occur. However, any subsequent individual received data value of “Increment Switch Active” or “Decrement Switch Active” in either Platform Transmission Tap Up/Down Switch State or Platform Transmission Tap Up/Down Secondary Switch State following a “No Activation” interpretation shall be interpreted by Powertrain as a request to increment or decrement gear accordingly. This method is intended to ensure appropriate tap system response by processing every appropriate driver switch tap input, and ignoring inappropriate driver tap switch inputs.

  Anytime Platform Transmission Tap Up/Down Switch State is being actively received and remains unchanged with a data value of “No Activation”, Powertrain shall require an explicit transition of the data value in the Platform Transmission Tap Up/Down Secondary Switch State signal for each gear change. Multiple sequential signals received with the same data value shall not result in multiple gear changes. For example, the data must transition to “Increment Switch Active” from another value (No Activation or Decrement Switch Active) in order to execute a “Tap Up” request. Likewise, the data must transition to “Decrement Switch Active” in order to execute a “Tap Down” request.
- **For Electronic Range Select (ERS):** Powertrain shall likewise use the Platform Transmission Tap Up/Down Secondary Switch State signal in combination with the Platform Transmission Tap Up/Down Switch State to detect driver requested range changes when the Electronic Range Select feature is active.

Power-Up Default: “No Activation”

Communication Failure Value: "No Activation"

Output Actuation Delay: 50 ms (with respect to indicating a change via the Driver Shift Control Target Gear or Transmission Shift Lever Position signal)

4.2.3.206.2 Platform Interface Definition. Platform Transmission Tap Up/Down Secondary Switch State is transmitted by the Gateway module.

This signal shall be used to communicate the debounced state of the tap up/down switches for the Driver Shift Control or Electronic Range Select features. The mechanization used to support the increment and decrement functions in the Platform electronics are explicitly specified in GMW8777.

Applications that do not support Driver Shift Control or Electronic Range Select features or do not utilized two sets of tap up/down switches (including all manual transmission applications) shall always send the Platform Transmission Tap Up/Down Switch State signals with a data value of "No Activation".

Platform Transmission Tap Up/Down Secondary Switch State Input Delay: 40 ms

4.2.3.207 Platform Transmission Tap Up/Down Switch Status Alive Rolling Count. See Table 221.

Table 221: Platform Transmission Tap Up/Down Switch Status Alive Rolling Count Signal Detail

Signal	Length	Data Type	Range	Conversion
Platform Transmission Tap Up/Down Switch Status Alive Rolling Count	2	UNM	0 to 3	E = N × 1

4.2.3.207.1 Powertrain Interface Definition. Platform Transmission Tap Up/Down Switch Status Alive Rolling Count is received by Powertrain. When an Alive Rolling Count error is detected, the corresponding Platform Transmission Tap Up/Down Enable Switch State, Platform Transmission Tap Up/Down Switch State and Platform Transmission Tap Up/Down Secondary Switch State (if used) shall be ignored, i.e., the previously accepted data shall be used. Refer to GMW8772, PPEI Serial Data Architecture for Alive Rolling Count.

4.2.3.207.2 Platform Interface Definition. Platform Transmission Tap Up/Down Switch Status Alive Rolling Count is transmitted by the Gateway module. On applications that use only one set of tap up/down switches, this Alive Rolling Count shall be associated with the general reliability of the read/capture of the Platform Transmission Tap Up/Down Enable Switch State and Platform Transmission Tap Up/Down Switch State. On applications that use two sets of tap up/down switches, Platform Transmission Tap Up/Down Switch Status Alive Rolling Count shall be associated with the general reliability of the read/capture of the Platform Transmission Tap Up/Down Enable Switch State, Platform Transmission Tap Up/Down Switch State and Platform Transmission Tap Up/Down Secondary Switch State.

Refer to GMW8772, PPEI Serial Data Architecture for Alive Rolling Count.

Data Delay: 40 ms

4.2.3.208 Power Mode Master Accessory Terminal Status. See Table 222.

Table 222: Power Mode Master Accessory Terminal Status Signal Detail

Signal	Length	Data Type	Range	Conversion
Power Mode Master Accessory Terminal Status	1	ENM	N/A	$0 = Inactive $1 = Active

4.2.3.208.1 Powertrain Interface Definition. Power Mode Master Accessory Terminal Status is received by Powertrain. This signal is used for diagnostic purposes only.

4.2.3.208.2 Platform Interface Definition. Power Mode Master Accessory Terminal Status is transmitted by the Gateway Module. It represents the state of the Accessory input signal to the Power Mode Master. On systems without an ignition switch (e.g., Easy Key), it represents the state of the output that generates the Accessory signal to the Powertrain electronics.

Input Delay: 200 ms

4.2.3.209 Power Mode Master Run Crank Terminal Status. See Table 223.

Table 223: Power Mode Master Run Crank Terminal Status Signal Detail

Signal	Length	Data Type	Range	Conversion
Power Mode Master Run Crank Terminal Status	1	ENM	N/A	$0 = Inactive $1 = Active

4.2.3.209.1 Powertrain Interface Definition. Power Mode Master Run Crank Terminal Status is received by Powertrain. This signal is used for diagnostic purposes only.

4.2.3.209.2 Platform Interface Definition. Power Mode Master Run Crank Terminal Status is transmitted by the Gateway Module. It represents the state of the Run/Crank input signal to the Power Mode Master. On systems without an ignition switch (e.g., Easy Key), it represents the state of the output that controls the Run/Crank relay.

Input Delay: 200 ms

4.2.3.210 Power Take Off Mode Active. See Table 224.

Table 224: Power Take Off Mode Active Signal Detail

Signal	Length	Data Type	Range	Conversion
Power Take Off Mode Active	1	BLN	N/A	$0 = False; $1 = True

4.2.3.210.1 Powertrain Interface Definition. Power Take Off Mode Active is received by Powertrain. Power Take Off Mode Active allows a receiving module to monitor the status of the power take off subsystem without having to process the entire Platform Engine Speed Command serial data signal.

Output Actuation Delay: 38 ms

Power-Up Default: False

Communication Failure Value: False

4.2.3.210.2 Platform Interface Definition. Power Take Off Mode Active is transmitted by the PTO module when the PTO module is present, and is not transmitted when the PTO module is not present. This signal indicates the status of power take off and is identical to the GMLAN signal Platform Engine Speed Command: Platform Engine Speed Command Mode Active. Power Take Off Mode Active shall be set to “False” if a failure exists in the PTO subsystem.

Input Delay: 48 ms

4.2.3.211 Power Take Off Engine Torque Limit Requested, Power Take Off Engine Torque Limit Value Extended Range. See Table 225.

Table 225: Power Take Off Engine Torque Limit Requested, Power Take Off Engine Torque Limit Value Extended Range Signal Detail

Signal	Length	Data Type	Range	Conversion
Power Take Off Engine Torque Limit Requested	1	BLN	N/A	$0 = False; $1 = True
Power Take Off Engine Torque Limit Value Extended Range	8	UNM	0 to 2040 N·m	E = N × 8

4.2.3.211.1 Powertrain Interface Definition. Power Take Off Engine Torque Limit Requested and Power Take Off Engine Torque Limit Value Extended Range are received by Powertrain. Together these signals are

used to insure that the torque limit rating of the PTO equipment is not exceeded. Power Take Off Engine Torque Limit Value Extended Range shall be ignored if Power Take Off Engine Torque Limit Requested is equal to “False”. When Power Take Off Engine Torque Limit Requested is equal to “True, the Powertrain electronics shall limit the maximum engine torque to the Power Take Off Engine Torque Limit Value Extended Range. Driver throttle override shall be limited to the Torque Limit Request Value.

Powertrain shall receive Platform Engine Speed Command: Engine Speed Command Mode Active with a data value of “True” and Power Take Off Engine Torque Limit Requested equal to “True” before it shall respond to the information in Power Take Off Engine Torque Limit Value Extended Range signal to limit engine torque. In addition, Power Take Off Engine Torque Limit Requested and Power Take Off Engine Torque Limit Value Extended Range signals shall only be acknowledged during Stationary PTO operation. Platform Engine Speed Command System Type has been received equal to “Stationary Preset” or “Stationary Variable”. Refer to GMW8771, PPEI Air Conditioning Compressor Control Algorithm Requirements for more information.

- Power Take Off Engine Torque Limit Value Extended Range:

  Power-Up Default: 2040 N·m

  Communication Failure Value: 2040 N·m

- Power Take Off Engine Torque Limit Requested:

  Power-Up Default: “False”

  Communication Failure Value: “False”

  Output Actuation Delay: 70 ms

4.2.3.211.2 Platform Interface Definition. Power Take Off Engine Torque Limit Requested and Power Take Off Engine Torque Limit Value Extended Range are transmitted by the PTO module on vehicles with PTO (or by the BCM Gateway on vehicles with Fast Idle Control), and are not sent on vehicles without these functions.

- Power Take Off Engine Torque Limit Request Value Extended Range:

  Powertrain is requested to limit engine torque to this signal value when the signal Power Take Off Engine Torque Limit Requested is equal to “True”. When Power Take Off Engine Torque Limit Requested is transmitted as “False” or when PTO is not enabled, the Power Take Off Engine Torque Limit Request Value shall be set equal to 2040 N·m.

  Initialization Value: 2040 N·m

- Power Take Off Engine Torque Limit Requested:

  When this signal is equal to “True”, Powertrain is requested to limit engine torque to the value provided by the signal Power Take Off Engine Torque Limit Value Extended Range.

  Initialization Value: “False”

Power Take-Off applications which are not calibrated to support torque limit control or Fast Idle Control applications shall always send this signal set to “False”. The PTO module shall transmit this signal set to “True” when operating in the Stationary PTO mode, only. Platform Engine Speed Command System Type shall be transmitted equal to “Stationary Preset” or “Stationary Variable”. Refer to GMW8771, PPEI Air Conditioning Compressor Control Algorithm Requirements for more information.

Data Delay: 30 ms

4.2.3.212 Power Take Off Powertrain Run Aborted. See Table 226.

Table 226: Power Take Off Powertrain Run Aborted Signal Detail

Signal	Length	Data Type	Range	Conversion
Power Take Off Powertrain Run Aborted	1	BLN	N/A	$0 = False; $1 = True

4.2.3.212.1 Powertrain Interface Definition. Power Take Off Powertrain Run Aborted is transmitted by the ECM. The data value of this signal is set to “True” when the ECM has disabled fuel during PTO remote engine running operation initiated by the PTO Remote Start System and the fuel disable is for conditions that do not allow a re-start. Refer to GMW8780, PPEI Power Take-Off and Fast Idle Control Algorithm requirements for more details.

This signal shall be transmitted as “True” when Power Take Off Remote Engine Start function is not supported by the vehicle application.

Data Delay: 1025 ms

4.2.3.212.2 Platform Interface Definition. Power Take Off Powertrain Run Aborted is received by Platform. This signal is used for PTO Remote Engine Start function to take appropriate action to delay or deny remote start attempts.

4.2.3.213 Powertrain Shift Pattern Override Active. See Table 227.

Table 227: Powertrain Shift Pattern Override Active Signal Detail

Signal	Length	Data Type	Range	Conversion
Powertrain Shift Pattern Override Active	1	BLN	N/A	$0 = False; $1 = True

4.2.3.213.1 Powertrain Interface Definition. Powertrain Shift Pattern Override Active is received by Powertrain.

For automatic transmissions, the data value of this signal is set to “True” when the driver preference algorithm residing in the BCM has determined that the TCM should not be following requests to use the transmission shift pattern based on the Transmission Platform Shift Pattern Switch Active/Driver Mode Control requests. When this signal is set to “True” the transmission shall remain in the default shift pattern or transition to default shift pattern. When the data value of this signal is set to “False” the TCM shall enable/disable the alternate shift pattern as determined by the Transmission Platform Shift Pattern Switch X (X = 1, 2, 3 or 4) Active signal.

For manual transmissions, this signal is not used.

4.2.3.213.2 Platform Interface Definition. Powertrain Shift Pattern Override Active is transmitted by the Gateway module. This signal is generated using information from the driver preference (personalization) selection menu in conjunction with platform calibrations. For applications that do not support driver preference (personalization), this signal shall be sent with a data value of “False”.

Data Delay: 1025 ms

Power-up Default: False

4.2.3.214 Power Take Off Remote Engine Shutdown Requested. See Table 228.

Table 228: Power Take Off Remote Engine Shutdown Requested Signal Detail

Signal	Length	Data Type	Range	Conversion
Power Take Off Remote Engine Shutdown Requested	1	BLN	N/A	$0 = False; $1 = True

4.2.3.214.1 Powertrain Interface Definition. Power Take Off Remote Engine Shutdown Requested is received by Powertrain. When PTO or Fast Idle is currently controlling engine speed, the reception of this signal with a data value of “True” shall trigger an immediate shutdown of the engine by the Powertrain. This message is also used as a rationality check against the Remote Engine Shutdown hardwire Powertrain input. PTO engine shutdown can be initiated either by this signal or by the Power Take Off Remote Engine Shutdown hardwire. Refer to GMW8780, PPEI Power Take-Off and Fast Idle Control Subsystem Requirements. This signal is ignored by the Powertrain electronics when **K_Power_Take_Off_Engine_Shutdown** is set to “Disabled”. Refer to GMW8780, PPEI Power Take-Off and Fast Idle Control Algorithm Requirements.

If the Power Take Off Engine Shutdown Switch is diagnosed as failed, the value of this signal shall be set to “True”.

Power-Up Default: “False”

Communication Failure Value: “False”

Output Actuation Delay: 150 ms (relative to Powertrain internal initiation of engine shutdown)

4.2.3.214.2 Platform Interface Definition. Power Take Off Remote Engine Shutdown Requested is transmitted by the PTO module when the PTO module is present, and is not transmitted when the PTO module is not present.

Note: On Fast Idle applications, the Gateway module assumes the role of the PTO module only for Fast Idle functionality; PTO functionality is not supported.

This signal shall be transmitted as “False” on vehicles that do not support the PTO function. The signal is set to “True” when the Platform determines that a PTO Remote Engine Shutdown command has been made by the PTO operator. A transition from “False” to “True” indicates a driver request to shut down the engine has been made.

The Power Take Off Remote Engine Shutdown Requested signal shall be disabled by the Platform (i.e., this signal shall be sent with a data value of “False”) whenever the hardwire used to generate the request is unreliable.

Applications that do not support remote engine shutdown shall always send this signal with a data value of “False”.

Data Delay: 125 ms

4.2.3.215 Power Take Off Remote Start Master Engine Start Request. See Table 229.

Table 229: Power Take Off Remote Start Master Engine Start Request Signal Detail

Signal	Length	Data Type	Range	Conversion
Power Take Off Remote Start Master Engine Start Request	1	ENM	N/A	$0 = PTO Remote Start Not Requested $1 = PTO Remote Start Requested

4.2.3.215.1 Powertrain Interface Definition. Power Take Off Remote Start Master Engine Start Request is received by Powertrain. When the data value of signal is equal to “PTO Remote Start Requested”, this signal serves as a request to crank. Refer to GMW8767, Starter Control Algorithm. The criteria required for keeping the engine running in PTO remote start mode is provided in GMW8780, PTO Remote Start Monitor Algorithm.

Output Actuation Delay: 150 ms

4.2.3.215.2 Platform Interface Definition. Power Take Off Remote Start Master Engine Start Request is transmitted by the Gateway module. Power Take Off Remote Start Master Engine Start Request is set equal to “PTO Remote Start Requested” when the PTO system is requesting remote start to be active. If remote start and run is not desired for any reason by the PTO Remote Start system, this signal shall be transmitted with a data value of “Remote Start Not Requested” (i.e., the park brake, or the hood switch are activated, or the PTO module function is no longer requesting remote engine start operation).

Applications that do not support remote vehicle start shall always send this signal with a data value of “PTO Remote Start Not Requested”.

Data Delay: 30ms

4.2.3.216 Power Take Off Remote Start Master Engine Shutdown Requested. See Table 230.

Table 230: Power Take Off Remote Start Master Engine Shutdown Requested Signal Detail

Signal	Length	Data Type	Range	Conversion
Power Take Off Remote Start Master Engine Shutdown Requested	1	BLN	N/A	$0 = False; $1 = True

4.2.3.216.1 Powertrain Interface Definition. Power Take Off Remote Start Master Engine Shutdown Requested is received by Powertrain. When a remote engine crank or start has been initiated, the reception of this signal with a data value of “True” shall trigger an immediate shutdown of the engine by the Powertrain.

This signal is also used by the ECM in conjunction with the signal Power Take Off Remote Engine Start Request to distinguish between a need to shutdown the engine or allow a transition to normal engine run because PTO is no longer active. Refer to GMW8780, PPEI Power Take-Off and Fast Idle Control Algorithm Requirements. Powertrain shall not allow a transition to normal run mode if this signal is equal to “True”. Once this signal has been set to “True”, Powertrain shall always disable PTO remote engine starting until the signal becomes “False” and the ignition has been cycled.

Power-Up Default: “False”

Communication Failure Value: “True”

Output Actuation Delay: 150 ms

4.2.3.216.2 Platform Interface Definition. Power Take Off Remote Start Master Engine Shutdown Requested is transmitted by the PTO Remote Engine Start Master when either the PTO or Fast Idle Control is present on the vehicle, and is not transmitted when the PTO and Fast Idle are not present. This signal shall be transmitted as “False” on vehicles that support Fast Idle Control, but do not support PTO. The signal is set to “True” when the PTO Remote Engine Start Master detects a condition requiring engine disable/shutdown (i.e., park brake has been released, the hood is ajar, etc.), otherwise the signal shall be set to “False”. These disable conditions will always cause Powertrain to disable PTO remote engine starting until the disable conditions have been corrected and the ignition has been cycled. Powertrain will not allow a transition to normal run mode if this signal is equal to “True”.

This signal shall always be transmitted as “False” when PTO remote engine start and run control is not requested when the signal Power Take Remote Engine Start Request equal to “Remote Start Not Requested”.

Data Delay: 125 ms

4.2.3.217 Power Take Off Transmission Gear Request. See Table 231.

Table 231: Power Take Off Transmission Gear Request Signal Detail

Signal	Length	Data Type	Range	Conversion
Power Take Off Transmission Gear Request	6	PKT	N/A	N/A
Request Type	2	ENM	N/A	$0 = No Action $1 = Max Gear Request $2 = Min Gear Request $3 = Hold Gear
Requested Gear	4	ENM	N/A	$0 = No Action $1 = First Gear $2 = Second Gear $3 = Third Gear $4 = Fourth Gear $5 = Fifth Gear $6 = Sixth Gear $7 = Seventh Gear $8 = Eighth Gear $9 to $F = Unused and Reserved

4.2.3.217.1 Interface Definition. Power Take Off Transmission Gear Request is received by Powertrain.

Powertrain shall maintain transmission operation in a gear greater than or equal to the value reported in the Requested Gear whenever Request Type is “Min Gear Request”. Powertrain shall maintain transmission operation in a gear less than or equal to the value reported in the Requested Gear whenever Request Type is “Max Gear Request”. Powertrain shall maintain transmission operation in a gear equal to the value reported in the Requested Gear whenever Request Type is “Hold Gear”.

Powertrain shall prioritize this signal with the other transmission gear requests and act on the winner of the arbitration. Powertrain may need to override the Power Take Off Transmission Gear Request in order to respond to diagnostic events, provide powertrain protection, and/or respond to safety/stability requests.

When the Request Type is “No Action”, the gear request shall be ignored. If the Request Type is other than “No Action” and the Requested Gear is either “No Action” or any of the “Unused and Reserved” states the signal is considered invalid and shall be ignored.

4.2.3.217.2 Platform Interface Definition. Power Take Off Transmission Gear Request is transmitted by the PTO module when the PTO module is present, and is not transmitted when the PTO module is not present.

Note: On Fast Idle applications, the Gateway module assumes the role of the PTO module only for Fast Idle functionality; PTO functionality is not supported.

The Power Take Off controller shall arbitrate all of its internal gear requests and transmit the gear request of the winner of its arbitration to Powertrain via this signal.

The signal is a packet consisting of two subsignals:

a. **Request Type:** This subsignal indicates the type of gear intervention that is requested from Powertrain. The meanings of the various states are:
   - **No Action:** This state is used when the subsystem is not requesting any intervention on the part of powertrain. Any information in the Requested Gear subsignal is ignored.
   - **Max Gear Request:** This state is used to request the transmission to operate at or below the gear indicated in the Requested Gear subsignal.
   - **Min Gear Request:** This state is used to request the transmission to operate at or above the gear indicated in the Requested Gear subsignal.
   - **Hold Gear:** This state is used to request the transmission to operate at exactly the gear indicated in the Requested Gear subsignal.

b. **Requested Gear:** This subsignal indicates the specific gear that is applicable to the gear request. The data in the Request Type subsignal determines how the requested gear information is interpreted (i.e., whether it is a max gear request, minimum gear request, or a specific gear request).

Note: On PTO/Fast Idle applications not requiring explicit transmission shift control the PTO module shall transmit this signal with Request Type of “No Action” and Requested Gear of “No Action”.

This signal may be emissions related. The implementer of the signal shall ensure that the OBD requirements in GMW8762, PPEI General Information on On-Board Diagnostics are fulfilled for a design intended for an OBD II market.

Data Delay: 125 ms

4.2.3.218 Powertrain Brake Pedal Discrete Input Status, Powertrain Brake Pedal Discrete Input Status Validity. See Table 232.

Table 232: Powertrain Brake Pedal Discrete Input Status, Powertrain Brake Pedal Discrete Input Status Validity Signal Detail

Signal	Length	Data Type	Range	Conversion
Powertrain Brake Pedal Discrete Input Status	1	ENM	N/A	$0 = Brake Not Applied $1 = Brake Applied
Powertrain Brake Pedal Discrete Input Status Validity	1	ENM	N/A	$0 = Valid $1 = Invalid

4.2.3.218.1 Powertrain Interface Definition. Powertrain Brake Pedal Discrete Input Status is transmitted by the ECM. The ECM shall report the status of its discrete brake apply input through this signal. This signal only indicates whether the brake pedal has been applied and is not necessarily indicative of the state of the stop lamps.

Powertrain shall send the signal Powertrain Brake Pedal Discrete Input Status Validity signal with a value of “Invalid” if it has diagnosed a failure in its brake pedal discrete input and the appropriate DTC has been set.

Note: This signal was added to provide a common interface to the Powertrain for BASS implementations and discrete brake switch implementations. On discrete brake switch implementations this signal makes a second source of brake switch information (the Brake Pedal Apply information) available to modules other than the ECM.

Input Delay: 60 ms

4.2.3.218.2 Platform Interface Definition. Powertrain Brake Pedal Discrete Input Status is received by Platform. The Adaptive Cruise Control with Alert (ACCA) and PTO subsystems may use this as an additional source of brake apply information.

Since the Brake Sensing Module is the source of the brake apply discrete to the ECM on BAS applications, the Brake Sensing Module can use this signal as part of its diagnostics to verify the discrete input is being correctly recognized by the ECM.

4.2.3.219 Power Pack Fan Afterrun Time. See Table 233.

Table 233: Power Pack Fan Afterrun Time Signal Detail

Signal	Length	Data Type	Range	Conversion
Power Pack Fan Afterrun Time	9	UNM	0 to 511 s	E = N × 1

4.2.3.219.1 Powertrain Interface Definition. Power Pack Fan Afterrun Time is transmitted by the BPIM. It is used for the BAS+ Power Pack Module Thermal Management.

4.2.3.219.2 Platform Interface Definition. Power Pack Fan Afterrun Time is received by the VITM. Power Pack Fan Afterrun Time indicates the time to keep the Powertrain relay up after the vehicle has been powered down.

Input Delay: TBD

4.2.3.220 Powertrain Crank Aborted. See Table 234.

Table 234: Powertrain Crank Aborted Signal Detail

Signal	Length	Data Type	Range	Conversion
Powertrain Crank Aborted	1	BLN	N/A	$0 = False; $1 = True

4.2.3.220.1 Powertrain Interface Definition. Powertrain Crank Aborted is transmitted by the ECM. The data value of this signal is set to “True” under certain conditions when the ECM is not attempting to crank the engine or has aborted the crank while in the Crank Request power mode and the engine is not yet started. Refer to GMW8767, PPEI Starter Control Algorithm Requirements on Powertrain Crank Aborted Signal for details.

Data Delay: 30 ms

4.2.3.220.2 Platform Interface Definition. Powertrain Crank Aborted is received by Platform. This signal is used for Easy Key and remote start systems to determine which power mode the vehicle should transition to after an aborted engine start. It is also used by the remote start system to limit the number of start attempts. It is also used by platforms, which support Extended Crank functionality as a way to determine when platform should not be in extended crank mode (crank was requested, but ECM disabled or did not enable the starter).

4.2.3.221 Powertrain Crank Active. See Table 235.

Table 235: Powertrain Crank Active Signal Detail

Signal	Length	Data Type	Range	Conversion
Powertrain Crank Active	1	BLN	N/A	$0 = False; $1 = True

4.2.3.221.1 Powertrain Interface Definition. Powertrain Crank Active is transmitted by the ECM. The data value of this signal is set to "True" when the ECM has activated the starter relay.

Data Delay: 30 ms

4.2.3.221.2 Platform Interface Definition. Powertrain Crank Active is received by Platform. Platform does not need to monitor the Powertrain Crank Active signal unless it supports extended crank functionality.

While the platform is in extended crank mode (Powertrain Crank Active is equal to "True" and the power mode is equal to "Run") actions should be taken to minimize high current loads which would otherwise be turned on based on being in the "Run" power mode. This is to maximize the battery power available for the duration of the extended start.

This signal may be used for Key Crank and BAS+ High Voltage Contactor Control in hybrid vehicle applications.

4.2.3.222 Powertrain Exhaust Particle Filter Warning Indication On. See Table 236.

Table 236: Powertrain Exhaust Particle Filter Warning Indication On Signal Detail

Signal	Length	Data Type	Range	Conversion
Powertrain Exhaust Particle Filter Warning Indication On	1	BLN	N/A	$0 = False; $1 = True

4.2.3.222.1 Powertrain Interface Definition. Powertrain Exhaust Particle Filter Warning Indication On is transmitted by Powertrain. The data value of this signal is set to "True" when Powertrain has determined that the Diesel particle filter loading is too high OR if too many consecutive Diesel particle filter regenerations were interrupted (e.g., due to engine shut-off or due to exceeding a calibrated time limit). If the Diesel Particle Filter is not present on the vehicle, the data value of the Powertrain Exhaust Particle Filter Warning Indication On shall always be set to "False".

Data Delay: 525 ms

4.2.3.221.2 Platform Interface Definition. Powertrain Exhaust Particle Filter Warning Indication On is received by Platform. If the value of this signal is equal to "True", then a telltale or message will be displayed to inform the driver to start a specific driving condition to start the regeneration process. When implemented as a telltale, platform shall provide a "bulb-check" of the telltale.

4.2.3.223 Powertrain High Electrical Load Requested. See Table 237.

Table 237: Powertrain High Electrical Load Requested Signal Detail

Signal	Length	Data Type	Range	Conversion
Powertrain High Electrical Load Requested	1	BLN	N/A	$0 = False; $1 = True

4.2.3.223.1 Powertrain Interface Definition. Powertrain High Electrical Load Requested is transmitted by Po ertrain. The data value of this signal is set to "True" when the ECM determines that the regeneration pro ess of the Diesel Particle Filter should start, and there is no excessive generator load. This is acc mplished by the ECM evaluating the generator F-terminal to determine whether further activation of ele rical loads can occur without draining the battery. The regeneration process requires a high exhaust tem erature. This specific temperature may be achieved by turning on electrical consumers, resulting in higher eng ne loads necessary to start the regeneration process.

If th Diesel Particle Filter Sensor is not present on the vehicle, the data value of the Powertrain High Electrical Loa Request shall always be set to "False".

Data Delay: 525ms

4.2.3.223.2 Platform Interface Definition. Powertrain High Electrical Load Request is received by Platform. If the value of this signal is equal to "True", then one or more electrical consumers (e.g., rear window defogging) will be turned on by Platform.

4.2.3.224 Powertrain Immobilizer Information. See Table 238.

Table 238: Powertrain Immobilizer Information Signal Detail

Signal	Length	Data Type	Range	Conversion
Powertrain Immobilizer Information	64	UNM	0 to 1.84467E+19	E = N × 1

4.2.3.224.1 Powertrain Interface Definition. Powertrain Immobilizer information is transmitted by the ECM. This signal contains a complex multi-framed information structure and is used as a "transport layer" for conveying various information from the ECM to the Immobilizer ECU. For details, refer to GMW7349, Platform – Powertrain Immobilizer System Interface and Requirements. Table 239 below contains a brief description of the transmitted Immobilizer Information.

Table 239: Transmitted Immobilizer Information

Frame Information	Size	Comment
Challenge	1 Frame	Powertrain Challenge
Immo Info Storage Negative Response	1 Frame	Acknowledgement that the storage of secret information was **not** stored in the Powertrain.
Immo Info Storage Positive Response	1 Frame	Acknowledgement that the storage of secret information was stored in the Powertrain.
Immo Info Transmission Request Negative Response	1 Frame	Acknowledgement that the request to send secret information to the Immobilizer was **not** accepted by Powertrain.
Immo Info Transmission Report	10 Frames	Powertrain sends the requested secret information to the Immobilizer.

Data Delay: 125 ms

4.2.3.224.2 Platform Interface Definition. Powertrain Immobilizer Information is received by Platform. It is used to carry out various functions related to the Vehicle Theft Deterrent System. For details, refer to GMW7349, Platform – Powertrain Immobilizer System Interface and Requirements.

4.2.3.225 Powertrain Regulated Generator Control Active. See Table 240.

Table 240: Powertrain Regulated Generator Control Active Signal Detail

Signal	Length	Data Type	Range	Conversion
Powertrain Regulated Generator Control Active	1	BLN	N/A	$0 = False; $1 = True

4.2.3.225.1 Powertrain Interface Definition. Powertrain Regulated Generator Control Active is transmitted by Powertrain. This signal represents that Powertrain is actively controlling the generator setpoint duty cycle.

If Powertrain is controlling the generator setpoint duty cycle, the ECM shall transmit the GMLAN signal Powertrain Regulated Generator Control Active = "True" to notify the Platform that the charging system is not in regulated voltage control. Platform RVC algorithm will suspend controlling the generator voltage. Whenever the Powertrain control algorithm determines that the system is not controlling the generator setpoint duty cycle, Powertrain will transmit the GMLAN signal Powertrain Regulated Generator Control Active = "False". Platform RVC algorithm will resume voltage control of the generator.

On vehicles without generator torque estimation, this signal shall always be sent with a data value of “False”

Applies to GMPT controllers with generator torque estimation.

Data Delay: 30 ms

4.2.3.225.2 Platform Interface Definition. Powertrain Regulated Generator Control Active is received by the Gateway module. The RVC algorithm uses this information for electric power management.

4.2.3.226 Powertrain Run Aborted. See Table 241.

Table 241: Powertrain Run Aborted Signal Detail

Signal	Length	Data Type	Range	Conversion
Powertrain Run Aborted	1	BLN	N/A	$0 = False; $1 = True

4.2.3.226.1 Powertrain Interface Definition. Powertrain Run Aborted is transmitted by the ECM. The data value of this signal is set to “True” when the ECM has disabled fuel during remote engine running operation initiated by the Remote Start System and the fuel disable is for conditions that do not allow a restart. Refer to GMW8767, PPEI Starter Control – Remote Vehicle Start Monitor Algorithm.

Data Delay: 1025 ms

4.2.3.226.2 Platform Interface Definition. Powertrain Run Aborted is received by Platform. This signal is used for Remote Vehicle Start (RVS) to take appropriate action, including denying any further remote start attempts until the ignition switch is cycled.

4.2.3.227 Powertrain Top Speed Limit Reduced. See Table 242.

Table 242: Powertrain Top Speed Limit Reduced Signal Detail

Signal	Length	Data Type	Range	Conversion
Powertrain Top Speed Limit Reduced	1	BLN	N/A	$0 = False; $1 = True

4.2.3.227.1 Powertrain Interface Definition. Powertrain Top Speed Limit Reduced is transmitted by the ECM. Powertrain shall set the data value to “True” when a powertrain detected dynamic event occurs which requires vehicle speed limiting such as oil starvation detection, loss of the Platform serial data signal Vehicle Top Speed Limit Request, or other Powertrain detected dynamic event. When no such Powertrain detected vehicle speed limiting condition exists, this signal shall be sent as “False”.

Data Delay: 1025 ms

4.2.3.227.2 Platform Interface Definition. Powertrain Top Speed Limit Reduced is received by Platform and is used for display purposes. It is used to identify dynamic events occurring in the Powertrain, which may result in a lower Vehicle Top Speed Limit Arbitrated Value, and allows Platform to provide an indication to the driver prior to actually encountering the vehicle top speed limit.

4.2.3.228 Rear Axle Operational Mode. See Table 243.

Table 243: Rear Axle Operational Mode Signal Detail

Signal	Length	Data Type	Range	Conversion
Rear Axle Operational Mode	3	ENM	N/A	$0 = Open $1 = Active $2 = Locked $3 = Unknown

4.2.3.228.1 Powertrain Interface Definition. Rear Axle Operational Mode is sent by the TCCM on vehicles equipped with a TCCM controlled electronic rear locking differential, otherwise it is not sent.

The operational modes for the electronic rear locking differential are defined as follows:

- **Open:** The rear axle is open and slip is allowed between the left and right half shafts.
- **Active:** Not supported.
- **Locked:** The left and right half shafts are locked together.
- **Unknown:** Not supported.

Data Delay: 125 ms

4.2.3.228.2 Platform Interface Definition. Rear Axle Operational Mode is received by Platform. It is used by the Anti-lock Brake System/Electronic Stability Control system.

4.2.3.229 Reduced Power Indication On. See Table 244.

Table 244: Reduced Power Indication On Signal Detail

Signal	Length	Data Type	Range	Conversion
Reduced Power Indication On	1	BLN	N/A	$0 = False; $1 = True

4.2.3.229.1 Powertrain Interface Definition. Reduced Power Indication On is transmitted by the ECM. The data value of this signal will be set to “True” if a powertrain system failure (in either the engine or transmission) is detected and the powertrain control system deliberately reduces the powertrain performance. The powertrain may reduce performance via transmission shift limits or engine power limiting. Reasons for performance reductions would be for engine protection, transmission protection or customer safety.

Data Delay: 1025 ms

4.2.3.229.2 Platform Interface Definition. Reduced Power Indication On is received by Platform. It is used by Platform to indicate, through a telltale or message, when the data value is “True”, that engine power is being reduced. Platform shall support a display for this condition on all applications. When implemented as a telltale, platform shall provide a “bulb check” of the telltale. At the discretion of Platform, a chime can accompany the visual indication.

This signal may also be used by the SDM for the Event Data Recorder function.

4.2.3.230 Remote Vehicle Start Engine Running. See Table 245.

Table 245: Remote Vehicle Start Engine Running Signal Detail

Signal	Length	Data Type	Range	Conversion
Remote Vehicle Start Engine Running	1	BLN	N/A	$0 = False; $1 = True

4.2.3.230.1 Powertrain Interface Definition. Remote Vehicle Start Engine Running is transmitted by the ECM. It is an indication of the running status of the engine during a remote start. The transition of Remote Vehicle Start Engine Running from “True” to “False” occurs when the ECM has transition from remote start running to normal running. This signal is enabled in any power mode and is sent whenever the signal changes state. However, the signal can only be sent when the Powertrain electronics are powered.

Data Delay: 125 ms

4.2.3.230.2 Platform Interface Definition. Remote Vehicle Start Engine Running is used by the RVS system.

4.2.3.231 Remote Vehicle Start Request. See Table 246.

Table 246: Remote Vehicle Start Request Signal Detail

Signal	Length	Data Type	Range	Conversion
Remote Vehicle Start Request	1	ENM	N/A	$0 = Remote Start Not Requested $1 = Remote Start Requested

4.2.3.231.1 Powertrain Interface Definition. Remote Vehicle Start Request is received by Powertrain. When the data value received is “Remote Start Requested”, this signal serves as a request to crank (refer to GMW8767, PPEI Starter Control Algorithm Requirements) and criteria for keeping the engine running in remote mode. Refer to GMW8767, PPEI Starter Control - Remote Vehicle Start Monitor Algorithm Requirements.

Output Actuation Delay: 150 ms

4.2.3.231.2 Platform Interface Definition. Remote Vehicle Start Request is transmitted by the Platform Gateway module Remote Vehicle Start Request is set equal to “Remote Start Requested” when the RVS system is requesting remote start to be active. If remote start and run is not desired for any reason by the RVS system, this signal shall be sent with a data value of “Remote Start Not Requested”. Applications which do not support remote vehicle start shall always send this signal with a data value of “Remote Start Not Requested”.

Data Delay: 30 ms

4.2.3.232 Road Load Nominal Axle Torque. See Table 247.

Table 247: Road Load Nominal Axle Torque Signal Detail

Signal	Length	Data Type	Range	Conversion
Road Load Nominal Axle Torque	19	UNM	-22 534 to 43 000 N·m	E = (N/8) - 22 534

4.2.3.232.1 Powertrain Interface Definition. Road Load Nominal Axle Torque is transmitted by Powertrain. This signal represents the road load axle torque under nominal conditions. Nominal conditions include level road, nominal vehicle mass, no wind, etc. The road load nominal axle torque is calculated using vehicle speed and three coefficients. The three coefficients are determined using test procedure R2-15-2263 Road Coastdown – Technician. For more details on this calculation, refer to the algorithm section of GMW8769.

Data Delay: 125 ms

4.2.3.232.2 Platform Interface Definition. Road Load Nominal Axle Torque is received by Platform. Road Load Nominal Axle Torque provides an indication of the axle torque required to maintain the current vehicle speed under nominal conditions. Having an indication of nominal axle torque reduces the authority needed for a function such as ACC closing loop on vehicle response.

A validity signal is not defined for Road Load Nominal Axle Torque. The only variable used to calculate this signal is vehicle speed and a validity signal is already associated with the vehicle speed signal. For more details on this calculation, refer to the algorithm section of GMW8769.

4.2.3.233 Secondary Axle Control Mode. See Table 248.

Table 248: Secondary Axle Control Mode Signal Detail

Signal	Length	Data Type	Range	Conversion
Secondary Axle Control Mode	1	ENM	N/A	$0 = Internal $1 = External

4.2.3.233.1 Powertrain Interface Definition. This signal will be transmitted by the transfer case control module on Rear Wheel Drive (RWD) vehicles equipped with 4WD or AWD. This signal is not transmitted for other vehicle driveline configurations. This signal is transmitted as “Internal” when the transfer case does not have the ability to electronically control clutch coupling.

Secondary Axle Control Mode represents the current control mode within the torque control module. The module can operate in stand-alone (internal control) mode, where it makes the torque control decisions based on input data. The module can also operate as a slave (external control), in which it controls torque based on the value received from a platform chassis control module. The definitions are as follows:

- **Internal:** The module is controlling torque based on internal algorithms.
- **External:** The module is controlling torque based on a request from the platform chassis control module.

Data Delay: 30 ms

4.2.3.233.2 Platform Interface Definition. Secondary Axle Control Mode is received by Platform. It is used by the Anti-lock Brake System, Traction Control System and Electronic Stability Control System to verify the Powertrain torque control module is following the torque request.

4.2.3.234 Secondary Axle Maximum Differential Velocity Allowed Active, Secondary Axle Maximum Differential Velocity Allowed Request. See Table 249.

Table 249: Secondary Axle Maximum Differential Velocity Allowed Active, Secondary Axle Maximum Differential Velocity Allowed Request Signal Detail

Signal	Length	Data Type	Range	Conversion
Secondary Axle Maximum Differential Velocity Allowed Request	7	UNM	0 to 254 rpm	E = N × 2
Secondary Axle Maximum Differential Velocity Allowed Active	1	BLN	N/A	$0 = False; $1 = True

4.2.3.234.1 Powertrain Interface Definition. This signal will be transmitted by the transfer case control module on RWD vehicles equipped with 4WD or AWD. This signal is not transmitted for other vehicle driveline configurations.

Secondary Axle Maximum Differential Velocity Allowed Request represents the maximum desired speed difference across the secondary axle differential, i.e., the speed difference between the front and rear axles. The secondary axle torque control module may need to request Platform to limit the speed difference across the axle to control heat within the clutches.

Data Delay: 125 ms

4.2.3.234.2 Platform Interface Definition. Secondary Axle Maximum Differential Velocity Allowed Request and Secondary Axle Maximum Differential Velocity Allowed Active are received by platform. When Secondary Axle Maximum Differential Velocity Allowed Active is True, Platform shall limit the speed difference across the secondary axle to the value in Secondary Axle Maximum Differential Velocity Allowed Request. The Platform module shall compensate for final drive ratio. This feature is available in Full Function traction systems (i.e., the brake controller has the ability to autonomously apply the brakes) only, and Platform shall honor this request even if the customer disables traction control via the switch.

4.2.3.235 Secondary Axle Temporary Inhibit Indication On. See Table 250.

Table 250: Secondary Axle Temporary Inhibit Indication On Signal Detail

Signal	Length	Data Type	Range	Conversion
Secondary Axle Temporary Inhibit Indication On	1	BLN	N/A	$0 = False; $1 = True

4.2.3.235.1 Powertrain Interface Definition. This signal will be transmitted by the transfer case control module on RWD vehicles equipped with 4WD or AWD. This signal is not transmitted for other vehicle driveline configurations.

This signal is used for warning the driver when the driveline control module detects a condition that temporarily disables secondary axle torque control, such as the clutch packs overheating. The condition is temporary and may recover during the ignition cycle. This display shall not be linked to a DTC, as this is a temporary condition that does not require service.

Data Delay: 125 ms

4.2.3.235.2 Platform Interface Definition. Secondary Temporary Inhibit Indication On is received by Platform. Platform shall use this signal to activate the AWD/4WD Off display to the driver, either a telltale or DIC message.

4.2.3.236 Secondary Axle Torque Request. See Table 251.

Table 251: Secondary Axle Torque Request Signal Detail

Signal	Length	Data Type	Range	Conversion
Secondary Axle Torque Request	11	PKT	N/A	
Secondary Axle Torque Request Value	10	UNM	0 to 10 230 N·m	E = N × 10
Secondary Axle Torque Request Active	1	ENM	N/A	$0 = False; $1 = True

4 2.3.236.1 Powertrain Interface Definition. This signal is received by the transfer case control module. If S condary Axle Torque Request Active is “True”, the Secondary Axle torque controlling module shall control t e Secondary Axle torque to the value in Secondary Axle Torque Request Value.

ta Delay: 125 ms

4 2.3.236.2 Platform Interface Definition. This signal will be transmitted by the Platform chassis control odule on vehicles equipped with AWD or 4WD. This signal is not transmitted for other vehicle driveline c nfigurations. This signal is used to control the Secondary Axle torque during certain vehicle dynamic events.

4.2.3.237 Secondary Axle Torque Request Alive Rolling Count. See Table 252.

Table 252: Secondary Axle Torque Request Alive Rolling Count Signal Detail

Signal	Length	Data Type	Range	Conversion
Secondary Axle Torque Request Alive Rolling Count	2	UNM	0 to 3 counts	E = N × 1

4.2.3.237.1 Powertrain Interface Definition. This signal is received by the transfer case control module. Rolling Counter errors as determined by a sliding window x of y strategy will lead to an irreversible rejection of all further torque requests by Powertrain until the end of the respective driving cycle. Refer to GMW8772, PPEI Serial Data Architecture for Alive Rolling Count and Protection Value Requirements.

Data Delay: 125 ms

4.2.3.237.2 Platform Interface Definition. This signal will be transmitted by the Platform chassis control module on vehicles equipped with AWD or 4WD. This signal is not transmitted for other vehicle driveline configurations.

4.2.3.238 Secondary Axle Torque Request Protection Value. See Table 253.

Table 253: Secondary Axle Torque Request Protection Value Signal Detail

Signal	Length	Data Type	Range	Conversion
Secondary Axle Torque Request Protection Value	11	UNM	0 to 255	E = N × 1

4.2.3.238.1 Powertrain Interface Definition. Secondary Axle Torque Request Protection Value is received by the transfer case control module. When a Protection Value error is detected, the corresponding Secondary Axle Torque Request shall be ignored, i.e. the previously accepted data shall be used. A sliding window x of y strategy shall comprehend both Alive Rolling Count errors and Protection Value errors as defined in GMW8773, PPEI Brakes and Traction Control Algorithm Requirements. Refer to GMW8772, PPEI Serial Data Architecture for Alive Rolling Count and Protection Value Requirements.

Data Delay: 125 ms

4.2.3.238.2 Platform Interface Definition. This signal will be transmitted by the Platform chassis control module on AWD or 4WD vehicles. This signal is not transmitted for other vehicle driveline configurations.

This protection is associated with the Secondary Axle Torque Request message. Refer to GMW8772, PPEI Serial Data Architecture for Alive Rolling Count and Protection Value Requirements.

4.2.3.239 Secondary Axle Malfunction Indication On. See Table 254.

Table 254: Secondary Axle Malfunction Indication On Signal Detail

Signal	Length	Data Type	Range	Conversion
Secondary Axle Malfunction Indication On	1	BLN	N/A	$0 = False; $1 = True

4.2.3.239.1 Powertrain Interface Definition. This signal will be transmitted by the transfer case control module on RWD vehicles equipped with 4WD or AWD. This signal is not transmitted for other vehicle driveline configurations.

This signal is used for warning the driver when the driveline control module detects a fault that disables secondary axle torque control and is not emission related. The signal shall only be true if a current DTC is set that disables the system or causes degraded performance.

Data Delay: 125 ms

4.2.3.239.2 Platform Interface Definition. Secondary Axle Malfunction Indication On is received by Platform. Platform shall use this signal to activate the service display to the driver, either a telltale or DIC message.

4.2.3.240 Secondary Axle Operational Mode. See Table 255.

Table 255: Secondary Axle Operational Mode Signal Detail

Signal	Length	Data Type	Range	Conversion
Secondary Axle Operational Mode	4	ENM	N/A	$0 = 2 Wheel Drive High $1 = 4 Wheel Drive High Locked $2 = 4 Wheel Drive Low Locked $3 = Active All Wheel Drive (High) $4 = 4 Wheel Drive High Open $5 = 4 Wheel Drive Low Open $6 = Active All Wheel Drive (Low) $7 = 2 Wheel Drive Low $E = Unknown $F = Neutral

4.2.3.240.1 Powertrain Interface Definition. This signal will be transmitted by the transfer case control module on RWD vehicles equipped with 4WD or AWD and controlled by an electronic module. On systems that have a mechanical transfer case this signal shall be transmitted by the ECM. The signal is intended to represent the actual operating mode of the device independent of the operator selected mode. For example if the driver selected mode is "4 Wheel Drive High Locked" and the front axle lock fails to engage, the operations mode transmitted would be "2 Wheel Drive High". This signal is not transmitted for other vehicle driveline configurations. During the period when the Secondary Axle is transitioning modes, the operational mode shall remain in the last determined or engaged state until the transition is complete or a failure occurs.

This signal represents the operational mode of the Secondary Axle.

The operational modes for the secondary axle are defined as follows:

- **2 Wheel Drive High:** Used to indicate that the vehicle is only supplying torque to the driven wheels and is not capable of transferring torque to the secondary axle. Vehicles that have a front axle disconnect will transmit this message in any high mode (4 Wheel Drive High Locked, Active All Wheel Drive High, 4 Wheel Drive High Open) where the front axle disconnect fails to engage.
- **4 Wheel Drive High Locked:** Used to indicate that the vehicle is supplying torque to the front and rear axles per the predefined torque split and is not capable of modifying the torque to the secondary axle. The transfer case is in high range which indicates the transfer case ratio is 1:1.
- **4 Wheel Drive Low Locked:** Used to indicate that the vehicle is supplying torque to the front and rear axles per the predefined torque split and is not capable of modifying the torque to the secondary axle. The transfer case is in low range which indicates the transfer case uses a secondary ratio.
- **Active All Wheel Drive (High):** Used to indicate that the vehicle is capable of transferring torque between the front and rear axles. The actual torque split is contained in the signal "Secondary Axle Estimated Torque". The transfer case is in high range which indicates the transfer case ratio is 1:1.
- **4 Wheel Drive High Open:** Used to indicate that the vehicle is capable of transferring torque between the front and rear axles. The actual torque split is not available over serial data. The transfer case is in high range which indicates the transfer case ratio is 1:1.
- **4 Wheel Drive Low Open:** Used to indicate that the vehicle is capable of transferring torque between the front and rear axles. The actual torque split is not available over serial data. The transfer case is in low range which indicates the transfer case uses a secondary ratio.
- **Active All Wheel Drive (Low):** Used to indicate that the vehicle is capable of transferring torque between the front and rear axles. The actual torque split is contained in the signal "Secondary Axle Estimated Torque". The transfer case is in low range which indicates the transfer case uses a secondary ratio.
- **2 Wheel Drive Low:** Used to indicate that the vehicle is only supplying torque to the driven wheels and is not capable of transferring torque to the secondary axle. The transfer case is in low range which indicates the transfer case uses a secondary ratio. Vehicles that have a front axle disconnect will transmit this state in any Low mode (4 Wheel Drive Low Locked, 4 Wheel Drive Low Open, Active All Wheel Drive Low) where the front axle disconnect fails to engage the front axle.
- **Unknown:** Used if the module is unable to determine what state the Secondary Axle is in. This state is used to indicate that a failure has occurred within the system and it is unable to properly determine the operational mode.
- **Neutral:** Used to indicate that the output of the transmission is not connected to either axle.

Data Delay: 125 ms

4.2.3.240.2 Platform Interface Definition. Secondary Axle Operational Mode is received by Platform. It is used by the Anti-lock Brake System, Traction Control System and Electronic Stability Control System to modify control parameters.

4.2.3.241 Secondary Axle Estimated Torque, Secondary Axle Estimated Torque Validity. See Table 256.

Table 256: Secondary Axle Estimated Torque, Secondary Axle Estimated Torque Validity Signal Detail

Signal	Length	Data Type	Range	Conversion
Secondary Axle Estimated Torque	10	UNM	0 to 10 230 N·m	E = N × 10
Secondary Axle Estimated Torque Validity	1	ENM	N/A	$0 = Valid; $1 = Invalid

4.2.3.241.1 Powertrain Interface Definition. This signal will be transmitted by the transfer case control module on RWD vehicles equipped with 4WD or AWD if the systems are electronically-controlled. This signal is not transmitted for other vehicle driveline configurations. This signal is transmitted as 0 when the transfer case does not have the ability to electronically control clutch coupling.

Secondary Axle Estimated Torque is the estimated torque on the secondary axle, which connects the driveline torque transfer device (transfer case or platform module) to the undriven wheels. Secondary Axle Estimated Torque Validity shall be set to “Invalid” if the torque cannot be properly estimated due to internal or external conditions and a DTC has been set.

Data Delay: 30 ms

4.2.3.241.2 Platform Interface Definition. Secondary Axle Estimated Torque is received by Platform. It is used by the Anti-lock Brake System, Traction Control System and Electronic Stability Control System to modify control parameters.

4.2.3.242 Secondary Axle Status. See Table 257.

Table 257: Secondary Axle Status Signal Detail

Signal	Length	Data Type	Range	Conversion
Secondary Axle Status	3	ENM	N/A	$0 = Normal Operation $1 = Temporary Limited $2 = Temporarily Inhibited $3 = Permanently Failed

4.2.3.242.1 Powertrain Interface Definition. This signal will be transmitted by the Transfer Case Control Module on RWD vehicles equipped with 4WD or AWD and controlled by an electronic module. This signal is not transmitted for other vehicle driveline configurations.

- **Normal Operation:** The system is capable of normal control of the secondary axle torque. This is considered the default condition.
- **Temporarily Limited:** An operating condition has been detected that limits the amount of torque transfer between the front and rear axles (e.g., Internal Temperature thresholds exceeded or spare tire detected). Torque control may resume once the condition has cleared.
- **Temporary Inhibit:** This state indicates that torque transfer through the secondary axle is unavailable due to internal transitory conditions (e.g., output drivers exceeding their thermal limits). It is considered temporary because the conditions that have disabled torque control may possibly recover within the ignition cycle. When this temporary situation is over, torque requests are honored.
- **Permanently Failed:** This state indicates that the torque control module has diagnosed a failure that prevents torque control between the front and rear axles. Torque control is inhibited for the remainder of the ignition cycle.

Data Delay: 50 ms

4.2.3.242.2 Platform Interface Definition. Secondary axle Status is received by Platform. It is used by the Anti-lock Brake System, Traction Control System and Electronic Stability Control System to modify control parameters.

4.2.3.243 Service Hybrid System Indication On. See Table 258.

Table 258: Service Hybrid System Indication On Signal Detail

Signal	Length	Data Type	Range	Conversion
Service Hybrid System Indication On	1	BLN	N/A	$0 = False; $1 = True

4.2.3.243.1 Powertrain Interface Definition. Service Hybrid System Indication On is transmitted by the BPIM if the vehicle has a BPIM; otherwise it is received by Powertrain. Service Hybrid System Indication On is used to flag when “SERVICE HYBRID SYSTEM” is displayed on the DIC.

Data Delay: 1025 ms

4.2.3.243.2 Platform Interface Definition. Service Hybrid System Indication On is received by the Gateway if the vehicle has a BPIM; otherwise it is transmitted by the VICM. Platform shall optionally support a display to indicate, through message, that the hybrid system needs servicing. At the discretion of Platform, a chime can accompany the visual indication.

4.2.3.244 Spare Tire Status. See Table 259.

Table 259: Spare Tire Status Signal Detail

Signal	Length	Data Type	Range	Conversion
Spare Tire Status	3	ENM	N/A	$0 = Undetermined $1 = No Spare Detected $2 = Spare Detected - Driven Wheels $3 = Spare Detected - Non-Driven Wheels

4.2.3.244.1 Powertrain Interface Definition. Spare Tire Status is received by Powertrain and is used to turn off all wheel drive if a mini spare tire is present.

4.2.3.244.2 Platform Interface Definition. Spare Tire Status is transmitted by the EBCM, and is not sent when the EBCM is not present. It is an indication of whether a mini spare tire is present on the vehicle. This tire has a smaller diameter than the original equipment tire for the vehicle. Spare Tire Status “Undetermined” will be sent until sufficient driving time has occurred under the proper conditions to allow calculation of the correct state. This signal will reset to “Undetermined” at each power up.

Data Delay: 1025 ms

4.2.3.244 Starter Generator Speed, Starter Generator Speed Validity. See Table 260.

Table 260: Starter Generator Speed, Starter Generator Speed Validity Signal Detail

Signal	Length	Data Type	Range	Conversion
Starter Generator Speed	14	UNM	0 to 16 383.8 rpm	E = N × 1
Starter Generator Speed Validity	1	ENM	N/A	$0 = Valid, $1 = Invalid

4.2.3.244.1 Powertrain Interface Definition. Starter Generator Speed and Starter Generator Speed Validity is transmitted by the BPIM. Starter Generator Speed is the speed of Motor/Generator used as input to rampouts.

Starter Generator Speed Validity shall be set to “Invalid” if the inputs for determining the data value are failed with the appropriate DTC set.

Data Delay: TBD ms

4.2.3.244.2 Platform Interface Definition. Starter Generator Speed and Starter Generator Speed Validity is received by EBCM.

This signal is used for BAS+ Hill Start Assist in hybrid vehicle applications.

The data in Starter Generator Speed Validity shall not be used if Starter Generator Speed Validity is set to "Invalid".

4.2.3.245 Starting Disabled Indication On. See Table 261.

Table 261: Starting Disabled Indication On Signal Detail

Signal	Length	Data Type	Range	Conversion
Starting Disabled Indication On	1	BLN	N/A	$0 = False; $1 = True

4.2.3.245.1 Powertrain Interface Definition. Starting Disabled Indication On is transmitted by the ECM. The data value of this signal is set to "True" when engine starting is disabled by the Powertrain electronics due to a failure detected with the Electronic Throttle Control system. The data value of this signal is set to "False" when Powertrain electronics does not detect or no longer detects a failure with the Electronic Throttle Control system. This signal is required with Electronic Throttle Control.

Data Delay: 1025 ms

4.2.3.245.2 Platform Interface Definition. Starting Disabled Indication On is received by Platform. Platform shall optionally support a display to indicate, through a telltale or message, that starting is not allowed. When implemented as a telltale, platform shall provide a "bulb check" of the telltale. At the discretion of Platform, a chime can accompany the visual indication.

4.2.3.246 Steering Wheel Angle, Steering Wheel Angle Validity, Steering Wheel Angle Sensor Calibration Status, Steering Wheel Angle Gradient. See Table 262.

Table 262: Steering Wheel Angle, Steering Wheel Angle Validity, Steering Wheel Angle Sensor Calibration Status, Steering Wheel Angle Gradient Signal Detail

Signal	Length	Data Type	Range	Conversion
Steering Wheel Angle	16	SNM	-2048.00 to 2047.94 degrees	E = N × 0.0625
Steering Wheel Angle Validity	1	ENM	N/A	$0 = Valid $1 = Invalid
Steering Wheel Angle Sensor Calibration Status	2	ENM	N/A	$0 = Unknown $1 = Estimated $2 = Calibrated
Steering Wheel Angle Gradient	12	SNM	-2048.00 to 2047.94 degrees/s	E = N

4.2.3.246.1 Powertrain Interface Definition. Steering Wheel Angle, Steering Wheel Angle Validity, Steering Wheel Angle Sensor Calibration Status, Steering Wheel Angle Gradient signals are received by Powertrain.

The Steering Wheel Angle signal is used by Powertrain as an input to the Transfer Case Controls. In addition, Steering Wheel Angle may be used for applications utilizing hydraulic power steering (P/S) pumps (as opposed to electro hydraulic) where strong torque influences caused by steering maneuvers could cause engine stalls in idle, which are not prevented by idle speed control. The additional load of the electro hydraulic system is buffered by the battery and the generator, the influence of hydraulic system can not be buffered or estimated because no information of the status of the pump load is available. For these hydraulic P/S pump applications, the value of the steering wheel angle sensor could be used to perform a load equivalent of the steering pump. To avoid increasing fuel consumption for not steering or steering wheel rotations within a certain rotation angle away from the lock position, a torque reserve should be applied. This torque reserve is calibratable and works as a global offset to all other torque reserves. Steering Wheel Angle shall be defaulted to zero "0" if Steering Wheel Angle Validity is set to "Invalid".

The Steering Wheel Angle Sensor Calibration Status signal indicates if the Steering Angle Sensor value has been normalized to the Steering wheel center position. Once the center position has been determined, the signal is set to a state of “Calibrated”.

Note: Not all applications will be calibrated to an absolute center position at the assembly plant or service. On vehicles that do dynamic centering, this value shall be “Unknown” until the module reading the sensor has determined the center position. Vehicles that do not learn dynamic center will be required to determine their own center position. Under this situation the Steering Wheel Angle Sensor Status signal will be set to “Estimated”.

The Steering Wheel Angle Gradient signal may be used to determine if additional torque reserves should be added for applications utilizing hydraulic power steering (P/S) pumps. For fast steering wheel rotations above a certain calibrateable turn rate, an additional torque reserve value is added. This additional torque reserve is calibratable and works as a global offset to all other reserves. The Steering Wheel Angle Gradient shall be defaulted to zero “0” if Steering Wheel Angle Validity is set to “Invalid”.

The powertrain module requires a calibration.

4.2.3.246.2 Platform Interface Definition. Steering Wheel Angle, Steering Wheel Angle Validity, Steering Wheel Angle Sensor Calibration Status and Steering Wheel Angle Gradient signals are transmitted by the Electric Power Steering (EPS) Module when the EPS is present. If the EPS is not present, and the application has a GMLAN Steering Wheel Sensor, this signal will be transmitted by the Steering Angle Sensor (SAS). If the EPS is not present and the application does not have a GMLAN Steering Wheel Sensor, this signal will be transmitted by the EBCM. On all other systems this signal will not be transmitted.

The function of the steering wheel angle sensor is to provide a signal, which is proportional to the steering wheel angle of a vehicle. The Platform Module reading the sensor shall have the capability of monitoring the integrity of its internal components for failures.

The value of the Steering Wheel Angle and Steering Wheel Angle Gradient shall follow ISO 8855 (i.e., Steering Wheel Angle/Gradient is positive when rotated counterclockwise).

Steering Wheel Angle Validity shall be set to “Invalid” if the inputs for determining the data value are failed with the appropriate DTC set. The Steering Wheel Angle Validity shall be set to “Valid” as soon as the failure conditions are no longer present and the DTC is not current.

The Steering Wheel Angle Sensor Calibration Status signal shall be set to “Calibrated” if the module that reads the steering angle sensor has “learned” the handwheel center position.

Note: Not all systems will learn the center position. In this case, the Steering Wheel Angle Sensor Calibration Status signal shall be set to “Unknown”. Some systems may be able to infer steering wheel angle position. In this case, the Steering Wheel Angle Sensor Calibration Status signal will be set to “Estimated”.

Data Delay: 20 ms

4.2.3.247 System Backup Power Mode. See Table 263.

Table 263: System Backup Power Mode Signal Detail

Signal	Length	Data Type	Range	Conversion
System Backup Power Mode	2	ENM	N/A	$0 = Off $1 = Accessory $2 = Run $3 = Crank Request

4.2.3.247.1 Powertrain Interface Definition. System Backup Power Mode is received by Powertrain. Refer to the GMW8767, PPEI Starter Control Algorithm for details of how it is used for starter control. This data shall not be used unless the System Backup Power Mode Enabled signal is equal to “True” and the Backup Power Mode Master Virtual Device Availability signal is equal to “Available”.

A transition from “Run” to “Off” or “Accessory” of this signal shall not be used by powertrain to shut down the engine. Powertrain shall use the Run/Crank hardwire input for this purpose.

4.2.3.247.2 Platform Interface Definition. System Backup Power Mode is transmitted by the Gateway Module. Platform determines the System Backup Power Mode based on ignition (or Easy Key) switch inputs. This signal is determined by a module other than the Power Mode Master Module. If the platform does not use a Backup Power Mode Master, this signal shall always be set to "Off".

Data Delay: TBD ms

4.2.3.248 System Backup Power Mode Enabled. See Table 264.

Table 264: System Backup Power Mode Enabled Signal Detail

Signal	Length	Data Type	Range	Conversion
System Backup Power Mode Enabled	1	BLN	N/A	$0 = False; $1 = True

4.2.3.248.1 Powertrain Interface Definition. System Backup Power Mode Enabled is received by Powertrain. When System Backup Power Mode Enabled is "True", the starter control algorithm shall use the System Backup Power Mode signal to determine system power mode.

4.2.3.248.2 Platform Interface Definition. System Backup Power Mode Enabled is transmitted by the Gateway Module. This bit shall be set to "True" if the system is using a Backup Power Mode Master to determine system power mode. If the platform does not use a Backup Power Mode Master, this signal shall always be set to "False".

Data Delay: TBD ms

4.2.3.249 System Power Mode. See Table 265.

Table 265: System Power Mode Signal Detail

Signal	Length	Data Type	Range	Conversion
System Power Mode	2	ENM	N/A	$0 = Off $1 = Accessory $2 = Run $3 = Crank Request

4.2.3.249.1 Powertrain Interface Definition. System Power Mode is received by Powertrain. System Power Mode is used as an input in determining whether to initiate cranking in the Starter Control algorithm. System Power Mode may also be used to determine which serial data signals should be supported since not all serial data signals may be valid or supported by other devices in all system power modes that the Powertrain controller is awake.

A transition from "Run" to "Off" or "Accessory" of this signal shall not be used by powertrain to shut down the engine. Powertrain shall use the Run/Crank hardwire input for this purpose.

4.2.3.249.2 Platform Interface Definition. System Power Mode is transmitted by the Gateway Module. Platform determines the System Power Mode based on ignition (or Easy Key) switch inputs.

Data Delay: TBD ms

4.2.3.250 Throttle Position, Throttle Position Validity. See Table 266.

Table 266: Throttle Position, Throttle Position Validity Signal Detail

Signal	Length	Data Type	Range	Conversion
Throttle Position	8	UNM	0 to 100%	E = N × 100/255
Throttle Position Validity	1	ENM	N/A	$0 = Valid; $1 = Invalid

4.2.3.250.1 Powertrain Interface Definition. Throttle Position is transmitted by the Powertrain ECM. It represents a throttle position sensor interpretation, after scaling, zeroing, diagnosis, and failsofting and does include cruise control effects.

0% shall represent the near closed bore position at which the engine will often stall. An idle or coast or 0% Driver Intent state will be represented by a value between 0.5% and 20 to 40% depending upon engine temperature (fast idle) and application (throttle body design criteria). 100% shall represent full available power airflow, but full available power may or may not be provided.

This parameter will reflect all controls and functions, which use the throttle as an actuator: This parameter can significantly vary during a shift without the driver or cruise requesting a change:

- Driver intent functions (e.g., driver depressing the accelerator pedal, mode switches, and other parameters as well as filtering, cruise control).
- If driver intent is interpreted to be an acceleration or axle torque request, then this parameter shall include the functions (e.g., mass, gear ratio) required to produce the desired axle torque or acceleration.
- Any control function requesting the opening or closing of the throttle to increase/decrease engine output torque (e.g., traction control, drag control, all torque management, vehicle speed governing/limiting and engine speed governing/limiting).
- Throttle adjustment for engine combustion efficiency torque losses (e.g., due to EGR, Air-fuel ratio, and certain spark retards).
- Throttle adjustment to compensate for engine, transmission or vehicle friction, accessory loads, and torque swaps (e.g., gear losses, idle friction, a/c compensation, individual cylinder deactivation/shutoff).
- Throttle adjustment to compensate for air density (e.g., altitude, temperature).
- In all cases:
- It is not an indication of actual power or acceleration.
- It does not include the effects of spark retard or cylinder shutoff or other non-throttle control torque reductions.

Powertrain shall capture and then calculate this parameter at a nominal rate between 10 and 20 ms with a variation of ± 2.5% and transmit every new calculation and only new calculations at the same capture/calculation rate ± 20%. By doing such, receivers of this parameter can calculate the rate of change of this parameter with an accuracy of ± 2.5%. The actual nominal rate must be defined in supplier specific section. Need to determine acceptable variation. This 5% value is a guess.

This parameter will always represent the actual throttle output of the engine during failure mode operation. This is a result of the security strategy to limit driver intent (and resulting actual torque) to approximately 0 to 20 to 40% throttle position, depending on application.

When both of the throttle sensors fail, the ETC system will disable the throttle motor and the actual Throttle Position will be between 20 and 40%, depending upon application and some part-to-part tolerance. At the same time ETC will cause torque management to reduce the torque to that desired by the ETC system based upon other inputs. Usually, the torque will vary with the accelerator Pedal Position between idle (Pedal = 0%) and the Maximum Authority (approximately 88 km/h (55 mph) steady state road load). When this is occurring, this parameter is failsofted to the throttle position that would provide the maximum torque as the ETC torque management system is providing. It will vary between approximately 0% and 20% to 40% throttle position, depending on application. Since this parameter still represents throttle fairly accurately, Throttle Actual Position Validity = “Valid” and Reduced Power Indication On is “True”. Cruise control, traction control and drag control are disabled. Any functions (such as kickdown shifts) that still require a 0 to 100% driver intent accelerator pedal position indication will not operate properly and must look at Accelerator Actual Position.

Input Delay: 30 ms

4.2.3.250.2 Platform Interface Definition. Throttle Position is used by the SDM for crash recording.

This Parameter cannot be included in any Frame that includes a send on change parameter.

4.2.3.251 Throttle Progression Request. See Table 267.

Table 267: Throttle Progression Request Signal Detail

Signal	Length	Data Type	Range	Conversion
Throttle Progression Request	2	ENM	N/A	$0 = Map A $1 = Map B $2 = Map C

4.2.3.251.1 Powertrain Interface Definition. Throttle Progression Request is received by Powertrain. This signal is used to allow the Platform to select an alternate pedal-to-throttle gain profile. Powertrain shall enable the appropriate throttle progression table, if allowed, based on the data value of this signal. The powertrain control software is capable of supporting three unique throttle progression tables. Specific values of each throttle progression table define the throttle progression mode (e.g., sport mode, or valet mode) assigned to each table for a given application. It is the responsibility of the application to calibrate each of the discrete progression tables to meet platform requirements. Progression “Map A” shall be calibrated to offer the most desirable default progression if a communications failure occurs. For vehicles sold in OBD II markets, “Map A” shall be the emission certified normal progression.

It is an OBD II requirement that the powertrain controller must power-up into the emission certified normal throttle progression, “Map A”, and remain in that state until the Throttle Progression Request signal is received and transitions from “Map A” to another state. The powertrain controller shall default to the “Map A” throttle progression if the GMLAN message is not received or stops being received.

Refer to GMW8762, PPEI General Information on On-Board Diagnostics of this document for additional OBD II requirements for this interface.

The Powertrain controller may begin a change to the new requested pedal-to-throttle gain profile “Map” without any delay when receiving the “Throttle Progression Request” signal with a request for a different pedal-to-throttle gain profile “Map” than currently active.

To avoid instantaneous change to the alternate pedal-to-throttle gain profile at intermediate throttle positions, a ramp function shall be used. The ramp function is a function that linearly changes the pedal-to-throttle gain profile (Pedal Position to Pedal Engagement Torque interpretation) from the previously used to the new requested one with a constant ramping velocity/derivative (calibratable). It shall be possible to calibrate the ramping velocity/derivative for a decreasing and an increasing torque independently. Changes between throttle progressions shall only occur instantaneously when the vehicle is at idle/coast or at wide-open throttle so that the progression change can be made without an increase in power.

Powertrain may override all above requests and operate with an ETC limp home limited authority progression when ETC detects certain failures.

Power-Up Default: Map A (an OBD II emission requirement).

Communication Failure Value: Map A (an OBD II emission requirement).

4.2.3.251.2 Platform Interface Definition. Throttle Progression Request is transmitted by the Gateway module. Platform sends this signal to reflect the driver-selected request. Platform is responsible for arbitrating between multiple switch inputs to determine the desired state of the Throttle Progression Request signal.

For OBD II applications, a momentary switch or selectable display or input device may be used provided that each ignition cycle the selectable throttle progression starts with the emission certified normal throttle progression “Map A” and requires a customer input for a change to anything other than “Map A”.

If there is a communication failure with the source of this information, the Platform gateway module on the high speed data link shall transmit this signal with a value of “Map A”, and set the value of the signal to the power-up default value for the next ignition cycle (also “Map A”).

The Platform shall communicate the throttle progression requirements via the Vehicle Technical Specification or other appropriate document. For vehicles sold in OBD II markets “Map A” shall be the emission certified normal progression.

Applications that do not support selectable throttle progression shall always transmit this signal with a data value of “Map A”.

Refer to GMW8762, PPEI General Information on On-Board Diagnostics of this document for additional OBD II requirements for this interface.

Data Delay: 60 ms

4.2.3.252 Throttle Progression Status. See Table 268.

Table 268: Throttle Progression Status Signal Detail

Signal	Length	Data Type	Range	Conversion
Throttle Progression Status	2	ENM	N/A	$0 = Map A $1 = Map B $2 = Map C $3 = ECM Selected Progression

4.2.3.252.1 Powertrain Interface Definition. Throttle Progression Status is transmitted by the ECM. This signal is used to inform Platform of the currently active throttle progression map, and operates in conjunction with the Platform-transmitted Throttle Progression Request signal.

This signal reflects the status of the currently active throttle progression map, regardless of the status of any Platform request for a particular throttle progression. Following a request for a throttle progression change that is delayed while waiting for an idle/coast or wide-open throttle condition, this signal will continue to indicate the current progression until the progression is actually changed. State $3, “ECM Selected Progression”, is used to indicate a condition where a platform requested progression has been overridden by a Powertrain internal progression (for example, a Powertrain internal progression used in an ETC Limp Home failure condition).

The following examples illustrate the operation of this signal:

- **Example 1:** Platform is sending Throttle Progression Request with a value of “Map A”, and Powertrain is currently using the Map A throttle progression. An ETC fault occurs, causing the Powertrain to change to an internally selected “limp home” progression. Platform continues to request Map A. Once the ECM has changed to the “limp home” progression, the ECM will transmit Throttle Progression Status with a value of “ECM Selected Progression” as long as the “limp home” mode progression is in use.
- **Example 2:** Platform is sending Throttle Progression Request with a value of “Map A”, and Powertrain is currently using the Map A throttle progression. An ETC fault occurs, causing the Powertrain to change to an internally selected “limp home” progression. Platform begins to request Map B. Once the ECM has changed to the “limp home” progression, the ECM will transmit Throttle Progression Status with a value of “ECM Selected Progression” as long as the limp home mode progression is in use.
- **Example 3:** Platform is sending Throttle Progression Request with a value of “Map A”, and Powertrain is currently using the Map A throttle progression. Platform begins to request Map B. The Powertrain will ultimately accept the Map B request, but continues to use Map A until conditions are correct for a throttle progression change (i.e., idle/coast or wide open throttle). Powertrain will transmit Throttle Progression Status with a value of “Map A” until the throttle progression has actually been switched to Map B, at which point Powertrain will begin to transmit the signal with a value of “Map B”.
- **Example 4:** Platform is sending Throttle Progression Request with a value of “Map A”, but Powertrain has detected an ETC fault, and has been operating using an internally selected “limp home” throttle progression map. Powertrain is thus currently transmitting Throttle Progression Status with a value of “ECM Selected Progression”. After a period of time the ETC fault is corrected, and Powertrain will ultimately switch to the Platform requested throttle progression, but continues to use the “limp home” map until conditions are correct for a throttle progression change (i.e., idle/coast or wide open throttle). Powertrain will continue to transmit Throttle Progression Status with a value of “ECM Selected Progression” until the throttle progression has actually been switched to Map A, at which point Powertrain will begin to transmit the signal with a value of “Map A”.

  Note: Powertrain behavior may not allow a change back to a Platform requested throttle progression during the current ignition cycle. This example is for illustrative purposes only.

Data Delay: 60 ms

4.2.3.252.2 Platform Interface Definition. Throttle Progression Status is received by Platform, and is used to determine whether Powertrain has actually carried out a requested change to the throttle progression map. Platform may use this information to coordinate changes in throttle progression, shift patterns, displays, etc.

4.2.3.253 Top of Travel Clutch Switch Active, Top of Travel Clutch Switch Active Validity. See Table 269.

Table 269: Top of Travel Clutch Switch Active, Top of Travel Clutch Switch Active Validity Signal Detail

Signal	Length	Data Type	Range	Conversion
Top of Travel Clutch Switch Active	1	BLN	N/A	$0 = False; $1 = True
Top of Travel Clutch Switch Active Validity	1	ENM	N/A	$0 = Valid; $1 = Invalid

4.2.3.253.1 Powertrain Interface Definition. Top of Travel Clutch Switch Active and Top of Travel Clutch Switch Active Validity are transmitted by the ECM with manual transmission applications, otherwise they are transmitted by the TCM. This signal indicates whether the manual transmission clutch pedal is applied beyond a Top of Travel Threshold (clutch pedal depressed). Note, two methods exist to detect the clutch pedal apply. One method uses a discrete Top of Travel switch. The second method uses a CPP sensor and compares the position against the threshold associated with the Top of Travel position. Either method provides the same functionality for the signal. The Top of Travel Threshold is typically set near the pedal released position so the state will change relatively early in the pedal travel. Top of Travel Clutch Switch Active Validity shall be set to "Invalid" if the switch or sensor providing the data has failed and a corresponding DTC has been set.

Applications that do not have a top of travel clutch switch or CPP sensor (e.g., vehicles with automatic transmissions) shall send Top of Travel Clutch Switch Active and Top of Travel Clutch Switch Active Validity signals with data values of "False" and "Valid", respectively.

Input Delay: 48 ms

4.2.3.253.2 Platform Interface Definition. Top of Travel Clutch Switch Active and Top of Travel Clutch Switch Active Validity are received by Platform. Platform functions utilizing these signals may include traction control, Power Take-Off, ACC, etc. The data in Top of Travel Clutch Switch Active shall be ignored if Top of Travel Clutch Switch Active Validity is set to "Invalid".

4.2.3.254 Traction Control Alive Rolling Count. See Table 270.

Table 270: Traction Control Alive Rolling Count Signal Detail

Signal	Length	Data Type	Range	Conversion
Traction Control Alive Rolling Count	2	UNM	0 to 3	E = N × 1

4.2.3.254.1 Powertrain Interface Definition. Traction Control Alive Rolling Count is received by Powertrain. Rolling Counter errors as determined by a sliding window x of y strategy will lead to an irreversible rejection of all further torque requests by Powertrain until the end of the respective driving cycle. Refer to GMW8772, PPEI Serial Data Architecture for Alive Rolling Count and Protection Value Requirements.

4.2.3.254.2 Platform Interface Definition. Traction Control Alive Rolling Count is transmitted by the EBCM on vehicles when the module is present, otherwise it is not sent. On vehicles with ABS, Traction Control Alive Rolling Count shall be updated and sent whether or not a traction control algorithm is present and running in the vehicle. This signal is related to the Chassis System Torque Request signal. Refer to GMW8772, PPEI Serial Data Architecture for Alive Rolling Count and Protection Value Requirements.

Data Delay: 30 ms

4.2.3.255 Traction Control Maximum Torque Increase Rate. See Table 271.

Table 271: Traction Control Maximum Torque Increase Rate Signal Detail

Signal	Length	Data Type	Range	Conversion
Traction Control Maximum Torque Increase Rate	6	UNM	0 to 1008 N·m/s	E = N × 16

4.2.3.255.1 Powertrain Interface Definition. Traction Control Maximum Torque Increase Rate is received by Powertrain. This signal is used to communicate to Powertrain the anticipated maximum rate of change in Chassis System Engine Torque Request Extended Range message. This rate will only be applicable to "increasing" torque requests. An increasing torque request is defined as a transmitted torque request level that is higher in magnitude than the last transmitted torque request level.

The purpose of this message is to give Powertrain the ability to manipulate torque modification actuators, like spark timing and ETC throttle position, during traction control events to achieve this torque rate. This message will give Powertrain the earliest indication of the expected response the Traction Control system will require. By communicating this rate during a traction event, Powertrain can determine the best combination of torque reduction actuation that still allows this torque rate to be obtained.

4.2.3.255.2 Platform Interface Definition. Traction Control Maximum Torque Increase Rate is transmitted by the EBCM on vehicles with an EBCM, and is not sent on vehicles without an EBCM. This signal is used to communicate to Powertrain the maximum rate of torque increase that the EBCM will send. This rate will only be applicable to "increasing" torque requests. An increasing torque request is defined as a transmitted torque request level that is higher in magnitude than the last transmitted torque request level.

The Platform will use this signal to give Powertrain advance notice of the maximum expected torque profile required when returning engine torque during a traction control event. For example, when returning engine torque during traction control events on high coefficient of friction surfaces, the engine torque increase is relatively high. However, on low coefficient of friction surfaces, the engine torque increase rate is lower. Depending on the torque rate, Powertrain can determine the best combination of torque reduction actuators to use (i.e., spark timing/ETC) to insure the maximum torque increase rate is attainable.

Applications which do not support Traction Control shall always send this signal with a value of 1008 N·m/s.

Data Delay: 30 ms

4.2.3.256 Traction Control System Active. See Table 272.

Table 272: Traction Control System Active Signal Detail

Signal	Length	Data Type	Range	Conversion
Traction Control System Active	1	BLN	N/A	$0 = False; $1 = True

4.2.3.256.1 Powertrain Interface Definition. Traction Control System Active is received by Powertrain. Powertrain may cancel cruise control when the data value of this signal is "True" for a calibratable time (Powertrain owns this calibration). The cruise control system may also use additional traction control information to further distinguish the magnitude of the traction event to prevent the system from being overly sensitive to minor traction events. Powertrain may use this signal to disable Power Take-Off operation when the traction control system is active. Powertrain may use this signal to modify operation of Powertrain diagnostics and to modify the operation of features that may be affected by driveline disturbances or engine disturbances caused by the application of brakes or traction control modifications to engine torque. For example, Powertrain may use this signal to temporarily disable the misfire detection diagnostic to prevent the setting of false codes during traction control events.

4.2.3.256.2 Platform Interface Definition. Traction Control System Active is transmitted by the EBCM when the EBCM is present, and is not sent when the EBCM is not present. This signal indicates whether or not the traction control system is active (i.e., trying to control wheel slip). This signal shall be set to "True" whenever the Traction Control System, including differential score protection, is actively attempting to control or prevent wheel slip by any means (brakes, fuel, spark, throttle, transmission gear, etc.), that is, it shall not only be set to "True" when a certain combination of means are used.

Platform shall not extend the period of time that the Traction Control System Active signal is sent as "True" beyond the period of time that the traction control system is actually active (for example, it shall not be extended for display purposes).

The EBCM must set this value to "True" during a Traction Event before Powertrain will respond to Chassis System Engine Torque Request requests to increase engine torque above Engine Torque Driver Requested Extended Range.

Powertrain requires this signal be placed in a different frame than Chassis System Engine Torque Request Extended Range.

For OBDII compliance, Platform must not indicate an active condition when the Traction Control System is not active for more than 60 s.

Applications with an EBCM that do not support traction control shall always send this signal with a data value of “False”.

Data Delay: 30 ms

4.2.3.257 Traction Control System Driver Intent. See Table 273.

Table 273: Traction Control System Driver Intent Signal Detail

Signal	Length	Data Type	Range	Conversion
Traction Control System Driver Intent	1	ENM	N/A	$0 = Disabled $1 = Enabled

4.2.3.257.1 Powertrain Interface Definition. Traction Control System Driver Intent is received by Powertrain. The Powertrain controller may use this information to change the actuators (e.g., Spark, fuel and/or air) used to manage torque and to enable or disable function such as Brake Torque Management.

4.2.3.257.2 Platform Interface Definition. Traction Control System Driver Intent is transmitted by the EBCM when the EBCM is present, and is not transmitted when the EBCM is not present. This signal reflects the desired state of the traction control system as chosen by the driver. This signal is not affected by any failure modes or inhibits. For example, the driver has traction control enabled when a DTC is set that disables the traction control system. In this case Traction Control System Driver Intent will be sent as “Enabled”, and the Traction Control System Enabled signal is set to “False”.

Applications with an EBCM that do not support traction control shall always send this signal with a data value of “Disabled”.

Data Delay: 125 ms

4.2.3.258 Traction Control System Enabled. See Table 274**.**

Table 274: Traction Control System Enabled Signal Detail

Signal	Length	Data Type	Range	Conversion
Traction Control System Enabled	1	BLN	N/A	$0 = False; $1 = True

4.2.3.258.1 Powertrain Interface Definition. Traction Control System Enabled is received by Powertrain. This signal is used by the traction control algorithm in the powertrain controller.

Powertrain shall have the following interpretations on the states of this signal:

- **False:** The TCS system is not capable of sending a torque request to the Powertrain Controller. Powertrain will NOT execute any torque requests communicated via the Chassis System Engine Torque Request Extended Range signal when Traction Control System Enabled equals “False”. During this condition Powertrain is responsible to activate “internal” failsoft driveline protection algorithms to protect against component damage (e.g., differential score protection for front wheel drive transaxles or AWD center differentials) as deemed necessary.
- **True:** TCS system is capable of sending torque requests for traction control and/or driveline protection algorithms. Powertrain will honor any received torque requests based on agreed upon engine operating parameters. Powertrain “internal” failsoft driveline protection algorithms will be disabled in favor of the TCS algorithms only if Powertrain is able to perform TCS torque reductions as requested by Platform (i.e., no TCS torque reduction fault conditions exist in Powertrain).

This signal may be used for BAS+ Process Wheel Slip Status Component in hybrid vehicle applications.

4.2.3.258.2 Platform Interface Definition. Traction Control System Enabled is transmitted by the EBCM when an EBCM is present, and is not sent when the EBCM is not present. This signal will be set to “False” when the EBCM does not intend to have any torque reductions performed by the powertrain control module including when a Traction Control System does not exist on the vehicle. The traction control system could be disabled by the driver (via a disable switch) or by a failure detected within the traction control system. For instance, in some applications (such as non all wheel drive), this signal may be set to “False” due to driver disable of the TCS system alone. This signal would NOT be set to “False” if the TCS module was able to perform driveline protection, or other Platform algorithms (e.g., Power Hop) that might require Torque reductions by powertrain.

Applications with an EBCM that does not support traction control shall always send this signal with a data value of “False”.

Data Delay: 125 ms

4.2.3.259 Traction Control System Operating Mode. See Table 275**.**

Table 275: Traction Control System Operating Mode Signal Detail

Signal	Length	Data Type	Range	Conversion
Traction Control System Operating Mode	3	ENM	N/A	$0 = Off $1 = Normal $2 = Off Road

4.2.3.259.1 Powertrain Interface Definition. Traction Control System Operating Mode is received by TCCM.

4.2.3.259.2 Platform Interface Definition. Traction Control System Operating Mode is transmitted by the EBCM. Traction Control System Operating Mode is used to select the road usage mode.

Data Delay: TBD ms

4.2.3.260 Traction Control System Present. See Table 276**.**

Table 276: Traction Control System Present Signal Detail

Signal	Length	Data Type	Range	Conversion
Traction Control System Present	1	BLN	N/A	$0 = False; $1 = True

4.2.3.260.1 Powertrain Interface Definition. Traction Control System Present is received by Powertrain. This signal is used to determine if the traction control system is present so that functions and diagnostics that may not apply may be turned off.

4.2.3.260.2 Platform Interface Definition. Traction Control System Present is transmitted by the Gateway module. Platform indicates that the traction control system is present by setting the data value of the signal to “True”.

Data Delay: Not applicable.

4.2.3.261 Transmission Brake System Clutch Release Requested. See Table 277**.**

Table 277: Transmission Brake System Clutch Release Requested Signal Detail

Signal	Length	Data Type	Range	Conversion
Transmission Brake System Clutch Release Requested	1	BLN	N/A	$0 = False; $1 = True

4.2.3.261.1 Powertrain Interface Definition. Transmission Brake System Clutch Release Requested is received by Powertrain.

For fully automatic transmissions, Powertrain shall use this signal as a mechanism for the platform to unlock the Torque Converter Clutch.

Powertrain may over-ride the brake system clutch release request for engine and/or transmission diagnostic or protection reasons.

Power-Up Default: "False"

Communication Failure Value: "False"

Output Actuation Delay: 50 ms

4.2.3.261.2 Platform Interface Definition. Transmission Brake System Clutch Release Requested is transmitted by the EBCM when the EBCM is present, and is not transmitted when the EBCM is not present. Although not restricted to this use, this is the intended communication method for Platform to release the Torque Converter Clutch during ABS activations, depending on the application. It may also be used to allow the ABS to release the clutch for automated manual transmission applications.

Applications that do not support commanding the Torque Converter Clutch shall always send this signal with a data value of "False".

This signal may be emissions related. The implementer of the signal shall ensure that the OBD requirements in GMW8762, PPEI General Information on On-Board Diagnostics are fulfilled for a design intended for an OBD II market.

Data Delay: 30 ms

4.2.3.262 Transmission Change Oil Now Indication On. See Table 278.

Table 278: Transmission Change Oil Now Indication On Signal Detail

Signal	Length	Data Type	Range	Conversion
Transmission Change Oil Now Indication On	1	BLN	N/A	$0 = False; $1 = True

4.2.3.262.1 Powertrain Interface Definition. Transmission Change Oil Now Indication On is transmitted by the TCM if the vehicle has a TCM; otherwise this signal is transmitted by the ECM.

Th state of Transmission Change Oil Now is based on the transmission oil life determination algorithm that res es in the Powertrain electronics. The algorithm is based on the principle that transmission operation will de ease oil life either over mileage or over time-temperature. Once the oil life is reduced to a specific cal ratable level, Powertrain will set the data value of this signal to True to command the Change Tra smission Oil display. Powertrain will set the data value of this signal to "False" when the algorithm does not r no longer determines that the transmission oil needs to be changed.

Ap ications which do not support transmission oil life determination algorithm (including all manual transmission applications), shall always send this signal with a data value of "False".

Data Delay: 1025 ms

4.2.3.262.2 Platform Interface Definition. Transmission Change Oil Now Indication On is received by Platform. The signal is used by platform to indicate to the driver, through a telltale or message, that that the Transmission Oil needs to be changed, when the data value is "True". Platform shall optionally support a display for this condition on all applications. When implemented as a telltale, platform shall provide a "bulb check" of the telltale. At the discretion of Platform, a chime can accompany the visual indication.

4.2.3.263 Transmission Creep Mode Active. See Table 279.

Table 279: Transmission Creep Mode Active Signal Detail

Signal	Length	Data Type	Range	Conversion
Transmission Creep Mode Active	1	BLN	N/A	$0 = False; $1 = True

4.2.3.263.1 Powertrain Interface Definition. Transmission Creep Mode Active signal is transmitted by the TCM, if the vehicle has a TCM, otherwise it is transmitted by the ECM.

Manual Transmission Automatic (MTA) transmission applications implement a creep function used for easy parking. When the vehicle is standing, not in neutral, engine is running, and the driver releases the brake pedal, the creep mode becomes active. The MTA controller closes the clutch to the point where torque transmittance occurs and the vehicle begins to creep. The signal shall be set as long as the creep mode is active.

4.2.3.263.2 Platform Interface Definition. Transmission Creep Mode Active signal is received by Platform. Platform uses this signal to warn the driver on MTA applications when the transmission creep mode is active and the park brake is not active and the driver door is open. Platform shall provide an audible warning and/or a display message.

4.2.3.264 Transmission Emissions Related Malfunction Active. See Table 280.

Table 280: Transmission Emissions Related Malfunction Active Signal Detail

Signal	Length	Data Type	Range	Conversion
Transmission Emissions Related Malfunction Active	1	BLN	N/A	$0 = False; $1 = True

4.2.3.264.1 Powertrain Interface Definition. Transmission Emissions Related Malfunction is transmitted by the TCM if the vehicle has a TCM; otherwise this signal is transmitted by the ECM. This signal is the means by which the TCM requests the ECM to command emission related Malfunction Indication Lamp (MIL) illumination.

Powertrain shall determine the state of Transmission Emissions Related Malfunction Active based on the status of the TCM diagnostic monitors. If no TCM DTCs are requesting MIL illumination, then the value Transmission Emissions Related Malfunction Active will be set to “False”. If one or more DTCs in the TCM are requesting MIL illumination, the value of Transmission Emissions Related Malfunction Active shall be set to “True”.

Applications, which do not have a TCM, shall always transmit this signal with a data value of “False”.

Data Delay: 1025 ms

4.2.3.264.2 Platform Interface Definition. Transmission Emissions Related Malfunction Active is received by Platform and is used for any display purposes desired beyond that provided by the MIL. (Note that when this signal is set to “True” the MIL will also become illuminated.) This signal shall not be used by the Platform to directly control the MIL indication.

This display indication is intended to inform the vehicle operator that emissions related anomalous conditions within the transmission have been detected and that the transmission may need to be serviced. The existence of an additional telltale is a Platform decision. When implemented as a telltale, Platform shall provide a “bulb c eck” of the telltale Platform may also choose to combine this signal with Transmission Non Emissions F lated Malfunction Active to provide a combined indication of any transmission malfunction whether e issions related or not.

4 .3.265 Transmission Engaged State, Transmission Engaged State Validity. See Table 281.

Table 281: Transmission Engaged State, Transmission Engaged State Validity Signal Detail

Signal	Length	Data Type	Range	Conversion
Transmission Engaged State	2	ENM	N/A	$0 = Transmission Not Engaged $1 = Engaged in Forward $2 = Engaged in Reverse $3 = Operating State Not Reached
Transmission Engaged State Validity	1	ENM	N/A	$0 = Valid; $1 = Invalid

4.2.3.265.1 Powertrain Interface Definition. Transmission Engaged State is transmitted by the TCM if the vehicle has a TCM; otherwise it is transmitted by the ECM. Transmission Engaged State provides an indication of the commanded engaged state of the transmission. The term “commanded” implies that the engaged state is current and/or imminent. Therefore, upon initial transitions between states, it reflects a leading indication of an imminent state and retains the engaged state until a subsequent transition is commanded.

For automatic transmissions, this signal is not guaranteed accurate unless the transmission is developing sufficient hydraulic pressure to engage the appropriate Forward or Reverse propulsion clutches, and/or determine valid pressure switch states, and/or control appropriate pressure control actuators. This occurs in a conventional automatic transmission when the engine is running, however, in a hybrid application, sufficient hydraulic pressure may be achieved with an auxiliary electric pump. Therefore, when sufficient hydraulic pressure is not present, the TCM shall indicate “Operating State Not Reached”.

For automatic transmissions, based upon transmission architecture Transmission Engage State shall be set to “Engaged in Forward” when the transmission shift lever position sensor, hydraulic pressure switch state, or commanded control actuator state indicates that the transmission is engaged in any forward gear. Likewise, based upon transmission architecture, Transmission Engage State shall be set to “Engaged in Reverse” when the transmission shift lever position sensor, hydraulic pressure switch state, or commanded control actuator state indicates that the transmission is engaged in reverse range. Otherwise (i.e., Park range is engaged, Neutral range is engaged, Reverse engagement is inhibited for transmission protection reasons, Forward Drive engagement is inhibited for transmission protection reasons, etc.) Transmission Engage State shall be set to “Transmission Not Engaged”.

For conventional manual transmissions, Transmission Engaged State is determined based upon the electro-mechanical reverse switch and the engine running state. Unless the engine is running, no input torque is available for the transmission to engage. Therefore, the ECM shall indicate “Operating State Not Reached” when the engine is not running. Transmission Engage State shall be set to “Engaged in Forward” when the reverse switch indicates that reverse is not selected. Transmission Engage State shall be set to “Engaged in Reverse” when the reverse switch indicates that reverse is selected.

If a failure is detected in the sensors or systems that are used to determine the state of Transmission Engaged State, the transmitter shall set the Transmission Engaged State Validity signal to “Invalid”. A Diagnostic Trouble Code (DTC) must be set when the Transmission Engaged State Validity signal is transmitted as “Invalid”. Otherwise, the transmitter shall set the Transmission Engaged State Validity signal to “Valid”.

Data Delay: 50 ms

4.2.3.265.2 Platform Interface Definition. The Transmission Engaged State signal is received by Platform. This signal may be used for Platform functions such as door lock controls, and displays where the engaged status is critical to system operation. It may also be used for vehicle motion calculations for park assist and virtual bumper. It is also intended as the source of information for functions requiring accurate Reverse information (e.g., back-up lamps). Reverse information is presented in the same manner for all applications - manual, automatic, hybrid.

Platform may use Transmission Engaged State in cooperation with the driver select information in the Transmission Shift Lever Position signal to apply an appropriate display strategy when the two do not correspond (e.g., Transmission Shift Lever Position is “Reverse Range” and Transmission Engaged State is “Transmission Not Engaged”). The receiver shall ignore the Transmission Engaged State signal if Transmission Engaged State Validity is “Invalid”, or if Transmission Engaged State indicates “Operating State Not Reached”, and shall provide proper failsofting to prevent inadvertent Platform system operation and dash displays.

Upon a loss of communication, the receiver shall provide proper failsofting to prevent inadvertent Platform system operation and dash displays.

Output Actuation Delay: 150 ms (with respect to reverse lamp illumination)
250 ms (with respect to display output)

4.2.3.266 Transmission Estimated Gear, Transmission Estimated Gear Validity. See Table 282.

Table 282: Transmission Estimated Gear, Transmission Estimated Gear Validity Signal Detail

Signal	Length	Data Type	Range	Conversion
Transmission Estimated Gear	4	ENM	N/A	$0 = Not Supported $1 = First Gear $2 = Second Gear $3 = Third Gear $4 = Fourth Gear $5 = Fifth Gear $6 = Sixth Gear $7 = Seventh Gear $8 = Eighth Gear $C = CVT Forward Gear $D = Neutral Gear $E = Reverse Gear $F = Park Gear
Transmission Estimated Gear Validity	1	ENM	N/A	$0 = Valid; $1 = Invalid

4.2.3.266.1 Powertrain Interface Definition. Transmission Estimated Gear is transmitted by the TCM if the vehicle has a TCM; otherwise this signal is transmitted by the ECM.

In Automatic Step Gear Transmissions, Transmission Estimated Gear is used to indicate an estimate of the gear that the transmission has achieved. This estimate is based primarily on the feedback provided by transmission sensors. As such, Transmission Estimated Gear will not change its value until a shift is complete. It should be considered a lagging indicator. When Transmission Estimated Gear becomes equal to Automatic Transmission Commanded Gear, Automatic Transmission Gear Shift Direction will be set to No Shift in Progress.

Also note that, in some cases, the measurement of the transmission gear may be unobservable through the transmission sensors. These may include situations such as zero vehicle speed and free wheeling operation. In those cases, Transmission Estimated Gear, as an estimate, may be set to the same value as Automatic Transmission Commanded Gear.

If any diagnostics suggest that the sensor information used to determine Transmission Estimated Gear is unreliable, the Transmission Estimated Gear Validity will be set to “Invalid”.

In Manual Transmissions, Transmission Estimated Gear is used to indicate an estimate of the gear that the transmission has achieved. This estimate is based primarily on the feedback provided by Powertrain speed sensors and/or vehicle speed sensors. As such, Transmission Estimated Gear will not change its value until a shift is complete. It should be considered a lagging indicator. Note that for many applications, it is difficult to discern the difference between First Gear and Reverse Gear based on speed sensor information alone. This signal should also utilize the information from the Reverse Switch. When the Reverse Switch is indicating Reverse, then this signal should look at corroborating information from the speed sensor information. If the two signals agree, then Transmission Estimated Gear will be set to Reverse Gear. Note that the Reverse Switch alone is not sufficient to estimate Reverse – the clutch may also be depressed and therefore the transmission would be in a Neutral state. (Bottom of Travel Clutch Switches is not required in all applications). If a Bottom of Travel Clutch Switch is present and indicating a depressed clutch, then Transmission Estimated Gear will be set to Neutral Gear.

If the speed sensor indication does not suggest that the transmission is not in a specific gear (the speed ratios to not match the ratio range defined for any of the gears), Transmission Estimated Gear will be set to Neutral Gear. Also, at vehicle speeds near zero, this signal may become unobservable and Transmission Estimated Gear should be set to Neutral Gear.

Park Gear will not be used on Manual Transmissions.

It should be noted that there is no known use for the Not Supported state of this signal. It is shown here only to provide common enumeration with other gear related signals.

If any diagnostics suggest that the sensor information is unreliable and a corresponding DTC has been set, the Transmission Estimated Gear Validity will be set to “Invalid”.

For Continuously Variable Transmissions, states First Gear through Eighth Gear may be used if the CVT is emulating Step Gear Operation. If this emulation is not active, Transmission Estimated Gear will be limited to Park Gear, Reverse Gear, Neutral Gear and CVT Forward Gear. CVT Forward Gear is used for CVTs since the terminology of First Gear through Eighth Gear is not valid for CVTs operating in a continuous mode.

Data Delay: 60 ms

4.2.3.266.2 Platform Interface Definition. Transmission Estimated Gear is received by Platform.

Transmission Estimated Gear is intended for use as a control signal for functions wanting a trailing indicator of the transmission gear (the gear the transmission has achieved).

Note: The Transmission Estimated Gear is NOT to be the source of Reverse information for Reverse Lamp Control (see Transmission Engaged State).

4.2.3.267 Transmission Non Emissions Related Malfunction Active. See Table 283.

Table 283: Transmission Non Emissions Related Malfunction Active Signal Detail

Signal	Length	Data Type	Range	Conversion
Transmission Non Emissions Related Malfunction Active	1	BLN	N/A	$0 = False; $1 = True

4.2.3.267.1 Powertrain Interface Definition. Transmission Non Emissions Related Malfunction Active is transmitted by the TCM if the vehicle has a TCM; otherwise this signal is transmitted by the ECM. This signal is the means by which the TCM informs the ECM of non-emissions related faults.

Powertrain shall determine the state of Transmission Non Emissions Related Malfunction Active based on the status of the TCM diagnostic monitors for diagnostics that are not emission related but require operator notification. If no such TCM DTCs are active, then Transmission Non Emissions Related Malfunction Active will be set to “False”. If one or more of the non-emissions related DTCs in the TCM are active, the TCM shall set the value of Transmission Non Emissions Related Malfunction Active to “True”.

Applications, which do not have a TCM, shall always transmit this signal with a data value of “False”.

Data Delay: 1025 ms

4.2.3.267.2 Platform Interface Definition. Transmission Non Emissions Related Malfunction Active is received by Platform and is used for display purposes. (Note that when this signal is set to “True”, the MIL will not become illuminated as a result of this signal).

This display indication is intended to inform the vehicle operator that non-emissions related anomalous conditions within the transmission have been detected and that the transmission may need to be serviced. A “Service Vehicle Soon” telltale or DIC message shall be used to provide indication to the operator when this signal is “True”.

4.2.3.268 Transmission Oil Life Reset Request. See Table 284.

Table 284: Transmission Oil Life Reset Request Signal Detail

Signal	Length	Data Type	Range	Conversion
Transmission Oil Life Reset Request	1	BLN	N/A	$0 = False; $1 = True

4.2.3.268.1 Powertrain Interface Definition. Transmission Oil Life Reset Request is received by Powertrain.

The Transmission Oil Life Algorithm (see Transmission Change Oil Now Indication On signal) is reset when this signal toggles to “True”.

4.2.3.268.2 Platform Interface Definition. Transmission Oil Life Reset Request is transmitted by the Gateway module.

Transmission Oil Life Reset Request is set to “True” to indicate that the Driver or Service Technician has indicated that the Transmission Oil has been changed. The method of gathering this information is not specified. Once set to “True”, this signal shall remain “True” for 5 s.

Applications that do not support the reset of transmission oil life estimation shall always send this signal with a data value of “False”.

Data Delay: 1025 ms

4.2.3.269 Transmission Oil Temperature, Transmission Oil Temperature Validity, Transmission Oil Temperature Sensor Present. See Table 285.

Table 285: Transmission Oil Temperature, Transmission Oil Temperature Validity, Transmission Oil Temperature Sensor Present Signal Detail

Signal	Length	Data Type	Range	Conversion
Transmission Oil Temperature	8	UNM	-40 to 215°C	E = (N × 1) - 40
Transmission Oil Temperature Validity	1	ENM	N/A	$0 = Valid; $1 = Invalid
Transmission Oil Temperature Sensor Present	1	BLN	N/A	$0 = False; $1 = True

4.2.3.269.1 Powertrain Interface Definition. Transmission Oil Temperature is transmitted by the TCM if the vehicle has a TCM; otherwise this signal is transmitted by the ECM. It represents the temperature of the transmission fluid. Transmission Oil Temperature Validity shall be set to “Invalid” if the sensor providing the data has failed and a corresponding DTC has been set.

If the transmission does not have the ability to measure the transmission oil temperature, then Transmission Oil Temperature Sensor Present shall be set to “False”. In this case Transmission Oil Temperature Validity shall be set to “Valid”. Note that this case is typical for most Manual Transmissions.

Data Delay: 1100 ms

4.2.3.269.2 Platform Interface Definition. Transmission Oil Temperature is received by Platform and is used primarily for display purposes.

This signal may be used for BAS+ Auto Stop and BAS+ Regenerative Brake Control in hybrid vehicle applications.

The data in Transmission Oil Temperature shall be ignored if Transmission Oil Temperature Validity is set to “Invalid” or if Transmission Oil Temperature Sensor Present is set to “False”.

4.2.3.270 Transmission Output Rotational Status. See Table 286.

Table 286: Transmission Output RTotational Status Signal Detail

Signal	Length	Data Type	Range	Conversion
Transmission Output Rotational Status:	32	PKT	N/A	N/A
Transmission Output Rotational Status: Rotation Direction	2	ENM	N/A	$0 = Unknown $1 = Forward $2 = Reverse $3 = Undefined
Transmission Output Rotational Status: Last Transition Type	2	ENM	N/A	$0 = Single Edge Sensor $1 = Rising Transition $2 = Falling Transition $3 = Undefined
Transmission Output Rotational Status: Reset Occurred	1	BLN	N/A	$0 = False; $1 = True
Transmission Output Rotational Status: Validity	1	ENM	N/A	$0 = Valid; $1=Invalid
Transmission Output Rotational Status: Pulse Counter	10	UNM	0 to 1023 counts	E = N × 1
Transmission Output Rotational Status: Timestamp	16	UNM	0 to 65 535 counts	E = N × 1

4.2.3.270.1 Powertrain Interface Definition. Transmission Output Rotational Status is transmitted by the TCM. Transmission Output Rotational Status: Transmission Output Rotational Status Rotation Direction indicates the transmission rotational direction.

Data Delay: TBD ms

4.2.3.270.2 Platform Interface Definition. The Transmission Output Rotational Status is received by EBCM.

4.2.3.271 Transmission Output Shaft Angular Velocity, Transmission Output Shaft Angular Velocity Validity, Transmission Output Shaft Angular Velocity Sensor Present. See Table 287.

Table 287: Transmission Output Shaft Angular Velocity, Transmission Output Shaft Angular Velocity Validity, Transmission Output Shaft Angular Velocity Sensor Present Signal Detail

Signal	Length	Data Type	Range	Conversion
Transmission Output Shaft Angular Velocity	16	UNM	0.0 to 16 383.8 rpm	E = N × 0.25
Transmission Output Shaft Angular Velocity Validity	1	ENM	N/A	$0 = False; $1 = True
Transmission Output Shaft Angular Velocity Sensor Present	1	BLN	N/A	$0 = False; $1 = True

4.2.3.271.1 Powertrain Interface Definition. Transmission Output Shaft Angular Velocity is transmitted by the TCM if the vehicle has a TCM; otherwise this signal is transmitted by the ECM.

The Transmission Output Shaft Angular Velocity signal indicates the speed of the transmission output shaft in revolutions per minute. This signal shall be calculated from the most recent period of the transmission output speed sensor signal. On front wheel drive configurations this signal shall represent the average speed of the

front axles (includes the differential gear ratio effects). In rear wheel drive configurations this signal shall represent the speed of the input speed to the rear differential.. The Transmission Output Shaft Angular Velocity Validity signal shall be set to “Invalid” if any TOSS related diagnostics are in the “fault active” state and a corresponding DTC has been set.

On applications where this signal is not supported, Transmission Output Shaft Angular Velocity shall be set to zero (0), Transmission Output Shaft Angular Velocity Sensor Present shall be set to “False” and Transmission Output Shaft Angular Velocity Validity shall be set to “Valid”.

Data Delay: 25 ms

4.2.3.271.2 Platform Interface Definition. Transmission Output Shaft Angular Velocity is received by Platform.

Transmission Output Shaft Angular Velocity may be used by Platform TCS to calculate the 4th wheel speed in the event of a single wheel speed sensor failure.

When Platform is operating with one wheel speed sensor failed and is relying on the transmission output velocity for failsoft wheel speed calculations, and Transmission Output Shaft Angular Velocity Validity is “Invalid”, the Traction Control System shall become fully disabled.

4.2.3.272 Transmission Overall Estimated Torque Ratio, Transmission Overall Estimated Torque Ratio Validity. See Table 288.

Table 288: Transmission Overall Estimated Torque Ratio, Transmission Overall Estimated Torque Ratio Validity Signal Detail

Signal	Length	Data Type	Range	Conversion
Transmission Overall Estimated Torque Ratio	15	SNM	-64.0 to 63.996 093 75	E = N × 1/256
Transmission Overall Estimated Torque Ratio Validity	1	ENM	N/A	$0 = Valid; $1 = Invalid

4.2.3.272.1 Powertrain Interface Definition. Transmission Overall Estimated Torque Ratio is transmitted by the TCM if the vehicle has a TCM; otherwise this signal is transmitted by the ECM.

Transmission Overall Estimated Torque Ratio is used to indicate the Torque Multiplication provided by the Transmission. This signal includes the contributions of all torque multiplying elements from the Engine to the Transmission Output Shaft. As such it includes chain sprocket ratio, torque converter torque ratio and gearbox ratio. It excludes the effect of any axle ratio elements (e.g., Rear Axle Ratio or a Final Drive Ratio). It also excludes any other downstream torque multiplication such as found in 2WD, 4WD or AWD systems. This signal will be zero if the transmission is in Park, Neutral or is Free-wheeling; it will be negative in Reverse.

Typically, this signal will result from the calculation of the following formula:

Transmission Overall Estimated Torque Ratio =

(Torque Converter Torque Ratio) ×
(Chain Sprocket Ratio or Transfer Gear Ratios (if any)) × (Gearbox Ratio)

Notes on the use of the Formula:

- The Torque Converter Torque Ratio shall be based on the “as-designed theoretical” value as a function of the speed ratio measured across the torque converter. If Transmission Torque Converter Clutch Commanded Mode is Locked or Controlled Slip, the Torque Converter Torque Ratio will be one (1.0). Applications without Torque Converters ignore this multiplicand.
- Contributions for the Chain Sprocket or Gearbox Ratios shall not include any mechanical losses.
- For Automatic Step Gear Transmissions, the gearbox ratio contribution is based on the gear ratio for the gear indicated in Automatic Transmission Commanded Gear. Since Automatic Transmission Commanded

Gear is a leading indicator, Transmission Overall Estimated Torque Ratio will be a leading indicator. It may also have steps in its output.

- For Continuously Variable Transmissions, the "gearbox ratio" shall be based on the commanded Variator Ratio.
- For Manual Transmissions, the "Gearbox ratio" shall be based on the gear ratio of the gear indicated in Transmission Estimated Gear. Note that this calculation does not directly take the status of the clutch into account – it assumes that the Clutch is locked. However, if the clutch is depressed, the ratio of Engine Speed to Vehicle Speed may not match any of transmission's gear ratios (see the signal definition for Transmission Estimated Gear). Therefore, depending on the application specific calibration, there is a potential that Transmission Estimated Gear will be set to Neutral Gear. If this occurs, the Transmission Overall Estimated Torque Ratio will be set to zero.

If any diagnostics suggest that the sensor information used to determine Transmission Overall Estimated Torque Ratio is unreliable and a corresponding DTC has been set, Transmission Overall Estimated Torque Ratio Validity shall be set to "Invalid".

Data Delay: 50 ms

4.2.3.272.2 Platform Interface Definition. Transmission Overall Estimated Torque Ratio is received by Platform.

Transmission Overall Estimated Torque Ratio is intended for use as a control signal in calculation of driveline torque. As an example, Platform could calculate axle torque by multiplying Engine Torque Actual Extended Range by Transmission Overall Estimated Torque Ratio and then by a transfer case ratio (if applicable) and an axle ratio.

4.2.3.273 Transmission Platform Shift Pattern Switch 1 Active. See Table 289.

Table 289: Transmission Platform Shift Pattern Switch 1 Active Signal Detail

Signal	Length	Data Type	Range	Conversion
Transmission Platform Shift Pattern Switch 1 Active	1	BLN	N/A	$0 = False; $1 = True

4.2.3.273.1 Powertrain Interface Definition. Transmission Platform Shift Pattern Switch 1 Active signal is received by Powertrain. This signal is received by the TCM for automatic transmissions, and the ECM for manual transmissions. Powertrain shall ensure that the OBD requirements are fulfilled for a design intended for an OBD II market.

When the switch contacts are closed, the corresponding "Transmission Platform Shift Pattern Switch 1 Active" serial data signal shall equal $1 = "True". When the switch contacts are open, the corresponding serial data signal shall equal $0 = "False".

Refer to the algorithm description in the Shift Preference section of GMW8777 for description(s) of how the system shall perform based on the ECM/TCM calibration(s) selected.

In applications where Platform calibrations dictate that Powertrain determine one of the alternate shift pattern requests using the Platform Transmission Tap Up/Down Enable Switch State signal, Powertrain shall interpret this as a driver request for "shift pattern 1" and shall ignore the Transmission Platform Shift Pattern Switch 1 Active signal.

In applications that require a dedicated switch to return the system to normal/default shift pattern Switch 4 shall be assigned to this function.

When Powertrain does not interpret that any driver requests has been made from the individual pattern switch states, Powertrain shall operate in the default shift pattern.

Powertrain shall indicate the status of the last individual shift pattern requested in the Transmission Shift Pattern Active Status signal.

Powertrain may activate a different shift pattern than what is being requested in order to protect the transmission (e.g., Hot Mode Shift Pattern) or may activate a different shift pattern for other desired vehicle performance characteristic related reasons (e.g., Cruise Control Shift Pattern, automatic downshifts when DSC is active, etc.)

Power-Up Default: Transmission Platform Shift Pattern Switch 1 Active = “False”

Communication Failure Value: Transmission Platform Shift Pattern Switch 1 Active = “False”

4.2.3.273.2 Platform Interface Definition. Transmission Platform Shift Pattern Switch 1 Active is transmitted by the Gateway module.

This signal is used primarily to request an automatic transmission shift pattern based on driver preferences. The mechanization used to activate shift patterns in the Platform electronics are explicitly specified in GMW8777. Examples of driver preference may include (but are not limited to): Normal, Economy, Performance, Winter, Trailer, Sport, or Valet. A request for a Continuously Variable Transmission to emulate a step-gear transmission would also be considered a Shift Pattern preference. There is no implied standard that a given Shift Pattern number shall be always associated with a specific label – Powertrain and Platform shall agree to a definition of the requirements for a given Shift Pattern Switch number for each application. There is a maximum of 4 Platform Pattern Requests for a given application (1, 2, 3, 4).

In applications where Platform calibrations dictate that Powertrain determine one of the alternate shift pattern requests using the Platform Transmission Tap Up/Down Enable Switch State signal, Powertrain will interpret this as a driver request for “shift pattern 1” and shall ignore the Transmission Platform Shift Pattern Switch 1 Active signal, and therefore Platform shall utilize only Transmission Platform Shift Pattern Switch 2 Active, Transmission Platform Shift Pattern Switch 3 Active, and Transmission Platform Shift Pattern Switch 4 Active signals to request alternate shift patterns.

If there is a communication failure with the source of this information, the Platform gateway module on the high speed data link shall transmit the following values: Transmission Platform Shift Pattern Switch 1 Active = “False

Applications that do not support Transmission Platform Shift Pattern Switch 1 Active shall always transmit the following values: Transmission Platform Shift Pattern Switch 1 Active = “False”.

Input Delay: 50 ms

4.2.3.274 Transmission Platform Shift Pattern Switch 2 Active. See Table 290.

Table 290: Transmission Platform Shift Pattern Switch 2 Active Signal Detail

Signal	Length	Data Type	Range	Conversion
Transmission Platform Shift Pattern Switch 2 Active	1	BLN	N/A	$0 = False; $1 = True

4.2.3.274.1 Powertrain Interface Definition. Transmission Platform Shift Pattern Switch 2 Active signal is received by Powertrain. This signal is received by the TCM for automatic transmissions, and the ECM for manual transmissions. Powertrain shall ensure that the OBD requirements are fulfilled for a design intended for an OBD II market.

When the switch contacts are closed the corresponding “Transmission Platform Shift Pattern Switch 2 Active” serial data signal shall equal $1 = “True”. When the switch contacts are open the corresponding serial data signal shall equal $0 = “False”.

Refer to the algorithm description in the Shift preference section of GMW8777 for description(s) of how the system shall perform based on the ECM/TCM calibration(s) selected.

In applications that require a dedicated switch to return the system to normal/default shift pattern Switch 4 shall be assigned to this function.

When Powertrain does not interpret that any driver requests has been made from the individual pattern switch states, Powertrain shall operate in the default shift pattern.

Powertrain shall indicate the status of the last individual shift pattern requested in the Transmission Shift Pattern Active Status signal.

Powertrain may activate a different shift pattern than what is being requested in order to protect the transmission (e.g., Hot Mode Shift Pattern) or may activate a different shift pattern for other desired vehicle performance characteristic related reasons (e.g., Cruise Control Shift Pattern, automatic downshifts when DSC is active, etc.)

Power-Up Default: Transmission Platform Shift Pattern Switch 2 Active = “False”

Communication Failure Value: Transmission Platform Shift Pattern Switch 2 Active = “False”

4.2.3.274.2 Platform Interface Definition. Transmission Platform Shift Pattern Switch 2 Active is transmitted by the Gateway module.

This signal is used primarily to request an automatic transmission shift pattern based on driver preferences. The mechanization used to activate shift patterns in the Platform electronics are explicitly specified in GMW8777. Examples of driver preference may include (but are not limited to): Normal, Economy, Performance, Winter, Trailer, Sport, or Valet. A request for a Continuously Variable Transmission to emulate a step-gear transmission would also be considered a Shift Pattern preference. There is no implied standard that a given Shift Pattern number shall be always associated with a specific label – Powertrain and Platform shall agree to a definition of the requirements for a given Shift Pattern Switch number for each application. There is a maximum of 4 Platform Pattern Requests for a given application (1, 2, 3, 4).

In applications where Platform calibrations dictate that Powertrain determine one of the alternate shift pattern requests using the Platform Transmission Tap Up/Down Enable Switch State signal, Powertrain will interpret this as a driver request for “Shift Pattern 1” and shall ignore the Transmission Platform Shift Pattern Switch 1 Active signal, and therefore Platform shall utilize only Transmission Platform Shift Pattern Switch 2 Active, Transmission Platform Shift Pattern Switch 3 Active, and Transmission Platform Shift Pattern Switch 4 Active signals to request alternate shift patterns.

If there is a communication failure with the source of this information, the Platform gateway module on the high speed data link shall transmit the following values: Transmission Platform Shift Pattern Switch 2 Active = “False”.

Applications that do not support Transmission Platform Shift Pattern Switch 2 Active shall always transmit the following values: Transmission Platform Shift Pattern Switch 2 Active = “False”.

Input Delay: 50 ms

4.2.3.275 Transmission Platform Shift Pattern Switch 3 Active. See Table 291.

Table 291: Transmission Platform Shift Pattern Switch 3 Active Signal Detail

Signal	Length	Data Type	Range	Conversion
Transmission Platform Shift Pattern Switch 3 Active	1	BLN	N/A	$0 = False; $1 = True

4.2.3.275.1 Powertrain Interface Definition. Transmission Platform Shift Pattern Switch 3 Active signal is received by Powertrain. This signal is received by the TCM for automatic transmissions, and the ECM for manual transmissions. Powertrain shall ensure that the OBD requirements are fulfilled for a design intended for an OBD II market. When the switch contacts are closed the corresponding “Transmission Platform Shift Pattern Switch 3 Active” serial data signal shall equal $1 = “True”. When the switch contacts are open the corresponding serial data signal shall equal $0 = “False”.

Refer to the algorithm description in the Shift preference section of GMW8777 for descriptions of how the system shall perform based on the ECM/TCM calibration(s) selected.

In applications that require a dedicated switch to return the system to normal/default shift pattern Switch 4 shall be assigned to this function.

When Powertrain does not interpret that any driver requests has been made from the individual pattern switch states, Powertrain shall operate in the default shift pattern.

Powertrain shall indicate the status of the last individual shift pattern requested in the Transmission Shift Pattern Active Status signal.

Powertrain may activate a different shift pattern than what is being requested in order to protect the transmission (e.g., Hot Mode Shift Pattern) or may activate a different shift pattern for other desired vehicle performance characteristic related reasons (e.g., Cruise Control Shift Pattern, automatic downshifts when DSC is active, etc.)

Power-Up Default: Transmission Platform Shift Pattern Switch 3 Active = “False”

Communication Failure Value: Transmission Platform Shift Pattern Switch 3 Active = “False”

4.2.3.275.2 Platform Interface Definition. Transmission Platform Shift Pattern Switch 3 Active is transmitted by the Gateway module.

This signal is used primarily to request an automatic transmission shift pattern based on driver preferences. The mechanization used to activate shift patterns in the Platform electronics are explicitly specified in GMW8777. Examples of driver preference may be (but are not limited to): Normal, Economy, Performance, Winter, Trailer, Sport, or Valet. A request for a Continuously Variable Transmission to emulate a step-gear transmission would also be considered a Shift Pattern preference. There is no implied standard that a given Shift Pattern number shall be always associated with a specific label; Powertrain and Platform shall agree to a definition of the requirements for a given Shift Pattern Switch number for each application. There is a maximum of 4 Platform Pattern Requests for a given application (1, 2, 3, 4).

In applications where Platform calibrations dictate that Powertrain determine one of the alternate shift pattern requests using the Platform Transmission Tap Up/Down Enable Switch State signal, Powertrain will interpret this as a driver request for “shift pattern 1” and shall ignore the Transmission Platform Shift Pattern Switch 1 Active signal, and therefore Platform shall utilize only Transmission Platform Shift Pattern Switch 2 Active, Transmission Platform Shift Pattern Switch 3 Active, and Transmission Platform Shift Pattern Switch 4 Active signals to request alternate shift patterns.

If there is a communication failure with the source of this information, the Platform gateway module on the high speed data link shall transmit the following values: Transmission Platform Shift Pattern Switch 3 Active = “False”.

Applications that do not support Transmission Platform Shift Pattern Switch 3 Active shall always transmit the following values: Transmission Platform Shift Pattern Switch 3 Active = “False”.

Input Delay: 50 ms

4.2.3.276 Transmission Platform Shift Pattern Switch 4 Active. See Table 292.

Table 292: Transmission Platform Shift Pattern Switch 4 Active Signal Detail

Signal	Length	Data Type	Range	Conversion
Transmission Platform Shift Pattern Switch 4 Active	1	BLN	N/A	$0 = False; $1 = True

4.2.3.276.1 Powertrain Interface Definition. Transmission Platform Shift Pattern Switch 4 Active signal is received by Powertrain. This signal is received by the TCM for automatic transmissions, and the ECM for manual transmissions. Powertrain shall ensure that the OBD requirements are fulfilled for a design intended for an OBD II market.

When the switch contacts are closed the corresponding “Transmission Platform Shift Pattern Switch 4 Active” serial data signal shall equal $1 = “True”. When the switch contacts are open the corresponding serial data signal shall equal $0 = “False”.

Refer to the algorithm description in the Shift preference section of GMW8777 for descriptions of how the system shall perform based on the ECM/TCM calibration(s) selected.

In applications that require a dedicated switch to return the system to normal/default shift pattern Switch 4 shall be assigned to this function.

When Powertrain does not interpret that any driver requests has been made from the individual pattern switch states, Powertrain shall operate in the default shift pattern.

Powertrain shall indicate the status of the last individual shift pattern requested in the Transmission Shift Pattern Active Status signal.

Powertrain may activate a different shift pattern than what is being requested in order to protect the transmission (e.g., Hot Mode Shift Pattern) or may activate a different shift pattern for other desired vehicle performance characteristic related reasons (e.g., Cruise Control Shift Pattern, automatic downshifts when DSC s active, etc.)

Power-Up Default: Transmission Platform Shift Pattern Switch 4 Active = “False”

Communication Failure Value: Transmission Platform Shift Pattern Switch 4 Active = “False”

4.2.3.276.2 Platform Interface Definition. Transmission Platform Shift Pattern Switch 4 Active is transmitted by the Gateway module.

This signal is used primarily to request an automatic transmission shift pattern based on driver preferences. The mechanization used to activate shift patterns in the Platform electronics are explicitly specified in GMW8777. Examples of driver preference may be (but are not limited to): Normal, Economy, Performance, Winter, Trailer, Sport, or Valet. A request for a Continuously Variable Transmission to emulate a step-gear transmission would also be considered a Shift Pattern preference. There is no implied standard that a given Shift Pattern number shall be always associated with a specific label – Powertrain and Platform shall agree to a definition of the requirements for a given Shift Pattern Switch number for each application. There is a maximum of 4 Platform Pattern Requests for a given application (1, 2, 3, 4).

In applications where Platform calibrations dictate that Powertrain determine one of the alternate shift pattern requests using the Platform Transmission Tap Up/Down Enable Switch State signal, Powertrain will interpret this as a driver request for “shift pattern 1” and shall ignore the Transmission Platform Shift Pattern Switch 1 Active signal, and therefore Platform shall utilize only Transmission Platform Shift Pattern Switch 2 Active, Transmission Platform Shift Pattern Switch 3 Active, and Transmission Platform Shift Pattern Switch 4 Active signals to request alternate shift patterns.

If there is a communication failure with the source of this information, the Platform gateway module on the high speed data link shall transmit the following values: Transmission Platform Shift Pattern Switch 4 Active = “False”.

Applications that do not support Transmission Platform Shift Pattern Switch 4 Active shall always transmit the following values: Transmission Platform Shift Pattern Switch 4 Active = “False”.

Input Delay: 50 ms

4.2.3.277 Transmission Platform Shift Pattern Switch Alive Rolling Count. See Table 293.

Table 293: Transmission Platform Shift Pattern Switch Alive Rolling Count Signal Detail

Signal	Length	Data Type	Range	Conversion
Transmission Platform Shift Pattern Switch Alive Rolling Count	2	UNM	0 to 3	E = N × 1

4.2.3.277.1 Powertrain Interface Definition. Transmission Platform Shift Pattern Switch Alive Rolling Count is received by Powertrain. When an Alive Rolling Count error is detected, the corresponding Transmission Platform Shift Pattern Switch shall be ignored, i.e., the previously accepted data shall be used. Reference GMW8772, PPEI Serial Data Architecture for Alive Rolling Count.

4.2.3.277.2 Platform Interface Definition. Transmission Platform Shift Pattern Switch Alive Rolling Count is transmitted by the Gateway module. This Alive Rolling Count is associated with the signals Transmission Platform Shift Pattern Switch 1 Active, Transmission Platform Shift Pattern Switch 2 Active, Transmission Platform Shift Pattern Switch 3 Active, and Transmission Platform Shift Pattern Switch 4 Active. Reference GMW8772, PPEI Serial Data Architecture for Alive Rolling Count.

Data Delay: 50 ms

4.2.3.278 Transmission Power Take Off Clutch Release Requested. See Table 294.

Table 294: Transmission Power Take Off Clutch Release Requested Signal Detail

Signal	Length	Data Type	Range	Conversion
Transmission Power Take Off Clutch Release Requested	1	BLN	N/A	$0 = False; $1 = True

4.2.3.278.1 Powertrain Interface Definition. Transmission Power Take Off Clutch Release Requested is received by Powertrain.

For fully automatic transmissions, Powertrain shall use this signal as a mechanism for power take off to unlock the Torque Converter Clutch. For automated manual transmissions with clutch control, Powertrain shall use this signal as a mechanism for the power take off to release the clutch to facilitate starting etc.

Powertrain may override the power take off clutch release request for engine and/or transmission diagnostic or protection reasons.

Output Actuation Delay: 50 ms

4.2.3.278.2 Platform Interface Definition. Transmission Power Take Off Clutch Release Requested is transmitted by the PTO module when the PTO module is present, and is not transmitted when the PTO module is not present.

Note: On Fast Idle applications, the Gateway module assumes the role of the PTO module only for Fast Idle functionality; PTO functionality is not supported.

Although not restricted to this use, this is the intended communication method for Power Take-Off to release the Torque Converter Clutch at every Service Brake activation or only during ABS system activations, depending on the application. As described above, it may also be used to release the clutch for automated manual transmission applications.

Applications where a PTO module is present but that do not require explicit control of the torque converter clutch for Power Take-Off (certain PTO implementations and all Fast Idle implementations) shall always transmit this signal with a data value of “False”.

Data Delay: 125 ms

4.2.3.279 Transmission Range Inhibit Status. See Table 295.

Table 295: Transmission Range Inhibit Status Signal Detail

Signal	Length	Data Type	Range	Conversion
Transmission Range Inhibit Status	3	ENM	N/A	$0 = No Range Inhibit Active $1 = Transmission Inhibit Active $2 = Transmission Range Re-Selection Req $3 = Driveline Not Engaged $4 = Diagnostic Inhibit Active

4.2.3.279.1 Powertrain Interface Definition. Transmission Range Inhibit Status is sent by the TCM if the vehicle has a TCM; otherwise this signal is transmitted by the ECM. The Transmission may inhibit shifts into Forward or Reverse Ranges for various reasons. This action may be manifested in any number of ways including limiting Shift Lever Movement or Inhibiting the hydraulic application of clutches. Regardless of the method, when this condition is occurring, Transmission Range Inhibit Status shall indicate the reason for the particular inhibit.

- **No Range Inhibit Active:** This value shall be sent if the transmission is not inhibiting Forward and Reverse ranges.
- **Transmission Inhibit Active:** This value can be sent when the transmission is inhibiting Forward or Reverse range during engine and driveline protection modes. While this value is being sent, driver intervention of a gear selector (PRNDL) movement is not required to engage a transmission gear. That is, when the inhibit condition clears (e.g., High Throttle, High Torque, High Engine Speed), the transmission will command gear.
- **Transmission Re-Selection Request :** This value shall be sent when the transmission is inhibiting Forward or Reverse range, and driver intervention of a PRNDL movement is required to exit the inhibit state. Possible sources of this inhibit status are engine/driveline protection modes, transmission range switch/manual valve mismatches, or hydraulic feedback not available at start-up.
- **Driveline Not Engaged:** This value shall be sent when the transmission is inhibiting Forward or Reverse range due to feedback that indicates the driveline is not engaged. This can be done to facilitate easy/non-abusive engagement of the transfer case. A possible source of this inhibit is a manual transfer case with an output speed sensor monitoring the transfer case output. Given this manual transfer case

implementation, shifts from Park/Neutral to Forward/Reverse can be monitored to determine if the driveline is engaged.

- **Diagnostic Inhibit Mode Active:** This value shall be sent when the transmission is inhibiting Forward or Reverse range due to an active diagnostic limp-home mode of operation. Possible sources of this inhibit include: diagnostic limp home operation that does not allow Reverse range to be achieved; latched neutral operation due to controller reset during diagnostic limp-home; neutral operation to provide engine overspeed protection during diagnostic limp-home operation. This mode of operation shall accompany a diagnostic telltale indication to the vehicle operator (e.g., Service Engine Soon).

Applications that do not support range inhibit (including all manual transmission applications) shall always transmit this signal with a data value of “No Range Inhibit Active”.

Data Delay: 125 ms

4.2.3.279.2 Platform Interface Definition. Transmission Range Inhibit Active is received by Platform and is intended for usage as a driver display. Usage is Platform Optional.

4.2.3.280 Transmission Shift Lever Lock Requested. See Table 296.

Table 296: Transmission Shift Lever Lock Requested Signal Detail

Signal	Length	Data Type	Range	Conversion
Transmission Shift Lever Lock Requested	1	BLN	N/A	$0 = False; $1 = True

4.2.3.280.1 Powertrain Interface Definition. Transmission Shift Lever Lock Requested is transmitted by Powertrain. Powertrain shall set this signal to “True” if the transmission is currently not working (e.g., low temperature for CVT transmission < -25°C).

Data Delay: 100 ms

Power-Up Default: True

Communication Failure Value: False

4.2.3.280.2 Platform Interface Definition. Transmission Shift Lever Lock Requested is received by Platform. Platform shall lock the transmission gear shift lever in Park or Neutral position if the signal is set to “True”.

4.2.3.281 Transmission Shift Lever Position, Transmission Shift Lever Position Validity. See Table 297.

Table 297: Transmission Shift Lever Position, Transmission Shift Lever Position Validity Signal Detail

Signal	Length	Data Type	Range	Conversion
Transmission Shift Lever Position	4	ENM	N/A	$0 = Between Ranges $1 = Park Range $2 = Reverse Range $3 = Neutral Range $4 = Forward Range A $5 = Forward Range B $6 = Forward Range C $7 = Forward Range D $8 = Forward Range E $9 = Forward Range F $F = Lever Position Unknown
Transmission Shift Lever Position Validity	1	ENM	N/A	$0 = Valid; $1 = Invalid

4.2.3.281.1 Powertrain Interface Definition. Transmission Shift Lever Position is transmitted by the TCM if the vehicle has a TCM; otherwise this signal is transmitted by the ECM.

Transmission Shift Lever Position provides an indication of the state of the transmission shift lever position as selected by the driver. In much of the literature this shift lever is also known as a "Gear Shift Lever" or "PRNDL lever". For purposes of this document, the system states of the Shift Lever shall be referred to as "Ranges" to aid in distinguishing them from gear related signals.

In automatic transmissions, vehicle standards define the order of the ranges be Park, Reverse, Neutral, followed by one or more forward ranges. Transmission Shift Lever Position allows for 6 forward ranges, "Forward Range A" through "Forward Range F". "Forward Range A" is defined to be the forward range closest to Neutral. If Powertrain detects that the transmission shift lever system is between states, this signal shall be set to "Between Ranges".

Note: Not all six forward positions need to be used in any application. For example: a 6-position range selection system (Park, Reverse, Neutral, with three forward ranges) would use "Forward Range A", "Forward Range B" and "Forward Range C". A 7-position range selection system would use "Forward Range A" through "Forward Range D". The number of forward ranges for a given application will be defined as part of the vehicle configuration.

Note: In vehicles using Electronic Range Selection (Tap Up/Down Mode Request is set to "Enable Electronic Range Select"), this signal will reflect the forward ranged selected by the driver by Electronic Range Selection switches.

In Manual Transmissions, Transmission Shift Lever Position will be set to "Reverse Range" if the Transmission reverse switch is indicating that reverse has been selected. If the reverse switch is not indicating reverse and there are no other means for detecting the shift lever position, then this signal will be set to "Lever Position Unknown".

If any diagnostics suggest that the sensor information used to Transmission Shift Lever Position is unreliable and a corresponding DTC has been set, Transmission Shift Lever Position Validity shall be set to "Invalid".

Data Delay: 50 ms

4.2.3.281.2 Platform Interface Definition. Transmission Shift Lever Position is received by Platform.

Transmission Shift Lever Position is intended for use as display signal to indicate to the driver, the transmission range currently selected. Platform shall blank automatic transmission displays if Transmission Shift Lever Position is set to "Between Ranges" or an unused state is indicated. It shall also blank the display if Transmission Shift Lever Position Validity is "Invalid".

Note: Transmission Shift Lever Position is NOT to be the source of Reverse information for Reverse Lamp Control (see Transmission Engaged State).

This signal may be used for Key Crank, Auto Start, Auto Stop, High Voltage Energy Management, Base Brake Control, BAS+ Hill Start Assist, BAS+ Auto Start, BAS+ Auto Stop, BAS+ High Voltage Energy Management, BAS+ High Voltage Contactor Control and Occupant Information in hybrid vehicle applications.

Output Actuation Delay: 250 ms (with respect to display update)

4.2.3.282 Transmission Shift Mode Status. See Table 298.

Table 298: Transmission Shift Mode Status Signal Detail

Signal	Length	Data Type	Range	Conversion
Transmission Shift Mode Status	3	ENM	N/A	$0 = No Override Mode $1 = Performance Mode $2 = Lift-Foot Cornering Mode $3 = Automatic Grade Braking Mode

4.2.3.282.1 Powertrain Interface Definition. Transmission Shift Mode Status is transmitted by the TCM if the vehicle has a TCM; otherwise this signal is transmitted by the ECM.

This signal is meant to provide platform with the ability to display the activation of "marketable" transmission features. When these modes are active, the Powertrain shall set this signal to the appropriate state. Gear over-

rides for the purposes on Diagnostics or Powertrain protection are not indicated by this signal. Currently, these modes are identified as Performance Mode (also known as Performance Adaptive Shifting – PAS), Lift-Foot Cornering Mode, and Automatic Grade Braking Mode. If none of these modes are active, then Transmission Shift Mode Status shall be set to "No Override Mode". Future States are reserved for other additional modes.

Note that when Transmission Tap Up/Tap Down Mode Status is "Driver Shift Control Active", Transmission Shift Mode Status will be set to "No Override Mode".

For Manual Transmissions specifically or for any other transmissions where gear overrides are not supported, Transmission Shift Mode Status will be set to "No Override Mode".

Data Delay: 60 ms

4.2.3.282.2 Platform Interface Definition. Transmission Shift Mode Status is received by platform and is intended as a signal that may be displayed to the Driver.

4.2.3.283 Transmission Shift Pattern Active Status. See Table 299.

Table 299: Transmission Shift Pattern Active Status Signal Detail

Signal	Length	Data Type	Range	Conversion
Transmission Shift Pattern Active Status	3	ENM	N/A	$0 = Default Shift Pattern Active $1 = Shift Pattern 1 Active $2 = Shift Pattern 2 Active $3 = Shift Pattern 3 Active $4 = Shift Pattern 4 Active $5 = PT Non-Protection Pattern Active $6 = PT Protection Pattern Active

4.2.3.283.1 Powertrain Interface Definition. Transmission Shift Pattern Active Status is transmitted by the TCM if the vehicle has a TCM; otherwise this signal is transmitted by the ECM.

Powertrain shall report the last activated individual shift pattern requested from the Transmission Platform Shift Pattern Switch 1 Active, Transmission Platform Shift Pattern Switch 2 Active, Transmission Platform Shift Pattern Switch 3 Active and Transmission Platform Shift Pattern Switch 4 Active signals. The signal Transmission Shift Pattern Active Status may not necessarily reflect the currently active shift pattern being performed by Powertrain. PT Non-Protection Pattern Active and PT Protection Pattern Active states are reserved and are not supported.

When Transmission Platform Shift Pattern Switch X Active signals (X = 1, 2, 3 or 4) are deselected by the driver, Powertrain shall transmit "Default Shift Pattern Active".

Data Delay: 60 ms

4.2.3.283.2 Platform Interface Definition. Transmission Shift Pattern Active Status is received by Platform.

Transmission Shift Pattern Active Status signal may be used to configure a shift pattern display to the driver.

If there is a communication failure, Platform shall assume that Powertrain is using the "Default Shift Pattern Active".

4.2.3.284 Transmission Shifts Delayed. See Table 300.

Table 300: Transmission Shifts Delayed Signal Detail

Signal	Length	Data Type	Range	Conversion
Transmission Shifts Delayed	1	ENM	N/A	$0 = Inactive $1= Active

4.2.3.284.1 Powertrain Interface Definition. Transmission Shifts Delayed is transmitted by the TCM if the vehicle has a TCM; otherwise it is transmitted by the ECM. During extreme cold starts, some automatic

transmissions cannot allow full forward range availability and must delay some shifts until the transmission fluid temperature is warmed up. Transmission Shifts Delayed will be set to “Active” when the transmission is in warm up mode, otherwise this signal shall be set to “Inactive”.

Applications that do not support delay shifting due to temperature (including all manual transmission applications) shall always send this signal with a data value of “Inactive”.

Power-up Default: Inactive

Data Delay: 125 ms

4.2.3.284.2 Platform Interface Definition. Transmission Shifts Delayed is received by Platform. It is used by the DIC to indicate, through a message, that the transmission is delaying shifts due to cold temperatures when the data value is “Active”. At the discretion of Platform, a chime can accompany the visual indication.

4.2.3.285 Transmission Skip Shift Indication On. See Table 301.

Table 301: Transmission Skip Shift Indication On Signal Detail

Signal	Length	Data Type	Range	Conversion
Transmission Skip Shift Indication On	1	BLN	N/A	$0 = False; $1 = True

4.2.3.285.1 Powertrain Interface Definition. Transmission Skip Shift Indication On is transmitted by the TCM if the vehicle has a TCM; otherwise this signal is transmitted by the ECM.

On manual transmission applications, there are certain operating conditions in which upshifting to the next transmission gear is inhibited. The Powertrain electronics will indicate this via this signal. The driver is required to upshift to the next available transmission gear. As an example, if presently in first gear and skip shift is indicated, the driver will be allowed to shift into any other gear except for second gear. When the Powertrain electronics determines that conditions for transmission skip shift are present, the Powertrain electronics will set the data value of this signal appropriately to command the Transmission Skip Shift display.

For manual transmission applications where this feature is not supported or automatic transmission applications, Transmission Skip Shift Indication On shall be set to “False”.

Data Delay: 125 ms

4.2.3.285.2 Platform Interface Definition. Transmission Skip Shift Indication On is used by platform to indicate, through a telltale or message, when the data value is “True”; Transmission Skip Shift has been activated. Platform shall support a display for this condition on all manual transmission applications with skip shift. When implemented as a telltale, platform shall provide a “bulb check” of the telltale. At the discretion of Platform, a chime can accompany the visual indication.

Output Actuation Delay: 250 ms (with respect to display activation)

4.2.3.286 Transmission Tap Up/Tap Down Mode Status. See Table 302.

Table 302: Transmission Tap Up/Tap Down Mode Status Signal Detail

Signal	Length	Data Type	Range	Conversion
Transmission Tap Up/Tap Down Mode Status	2	ENM	N/A	$0 = No Activation $1 = Driver Shift Control Active $2 = Electronic Range Select Active

4.2.3.286.1 Powertrain Interface Definition. Transmission Tap Up/Tap Down Mode Status is transmitted by the TCM if the vehicle has a TCM, otherwise it is transmitted by the ECM.

The data value of this signal shall be set to “Driver Shift Control Active” when the Driver Shift Control (DSC) mode is active which occurs when all of the following are true:

- The value of the Platform Transmission Tap Up/Down Enable Switch State signal received from Platform is set to “Driver Shift Control Enable Switch Active”.

- Other criteria for Powertrain to activate Driver Shift Control mode is/are satisfied (e.g. no active DSC diagnostic faults, etc.)

The data value of this signal shall be set to “Electronic Range Select Active” when the Electronic Range Select (ERS) mode is active which occurs when all of the following are true:

- The value of the Platform Transmission Tap Up/Down Enable Switch State signal received from Platform is set to “Electronic Range Select Enable Switch Active”.
- Other criteria for Powertrain to activate Electronic Range Select mode is/are satisfied (e.g. no active ERS diagnostic faults, etc.).

In all other cases, the data value of this signal should be set to “No Activation”.

Applications, which do not support DSC or ERS (including all manual transmission applications), shall always send this signal with a data value of “No Activation”.

Data Delay: 30 ms

4.2.3.286.2 Platform Interface Definition. Transmission Tap Up/Tap Down Mode Status is received by Platform. Although not restricted to this use, this parameter may be used to enable displays that are only active during DSC or ERS modes, etc.

Output Actuation Delay: 250 ms (displays affected by this signal)

4.2.3.287 Transmission Thermal Management Status. See Table 303.

Table 303: Transmission Thermal Management Status Signal Detail

Signal	Length	Data Type	Range	Conversion
Transmission Thermal Management Status	2	ENM	N/A	$0 = Normal $1 = Countermeasures Active $2 = Driver Intervention Requested

4.2.3.287.1 Powertrain Interface Definition. Transmission Thermal Management Status is transmitted by the TCM if the vehicle has a TCM; otherwise this signal is transmitted by the ECM.

Transmission Thermal Management Status provides an indication of the actions taken and requested in order to minimize excessive transmission heat generation. When the transmission controls reach a temperature condition where it decides to alter operation in order to in minimize heat generation, Powertrain will set Transmission Thermal Management Status to “Countermeasures Active”. When the transmission thermal monitoring suggests that immediate action by the driver is necessary to prevent transmission failure, Powertrain will set Transmission Thermal Management Status to “Driver Intervention Requested”.

Applications that do not support thermal management of the transmission (including all manual transmission applications) shall always send this signal with a data value of “Normal”.

Data Delay: 1100 ms

4.2.3.287.2 Platform Interface Definition. Transmission Thermal Management Status is received by Platform and is used for display purposes. The existence of a telltale is a platform decision.

4.2.3.288 Transmission Torque Converter Clutch Commanded Mode. See Table 304.

Table 304: Transmission Torque Converter Clutch Commanded Mode Signal Detail

Signal	Length	Data Type	Range	Conversion
Transmission Torque Converter Clutch Commanded Mode	3	ENM	N/A	$0 = Unlocked $1 = Transitioning $2 = Controlled Slip $3 = Locked $7 = Not Supported

4.2.3.288.1 Powertrain Interface Definition. Transmission Torque Converter Clutch Commanded Mode is transmitted by the TCM if the vehicle has a TCM; otherwise this signal is transmitted by the ECM.

Transmission Torque Converter Clutch Commanded Mode is used to indicate the current operational mode of Torque Converter Clutch Control. The states are defined as:

- **Unlocked:** The Torque Converter Clutch is Unlocked and the Torque Converter's input and output members are mechanically separated from one another.
- **Transitioning:** The Torque Converter Clutch is transitioning from an Unlocked mode to/from a Locked or Controlled Slip Mode. This is primarily used for applications that control the transition to/from these modes.
- **Controlled Slip:** The Torque Converter Clutch is operating in a mode where, although the clutch is not locked, the slip across the clutch is controlled to a small value.
- **Locked:** The Torque Converter Clutch is Locked and the input and output members of the torque converter are rotating at the same speed.

For applications which do not have Torque Converter Clutches, (e.g., manual transmissions), Transmission Torque Converter Clutch Commanded Mode is set to "Not Supported."

Data Delay: 60 ms

4.2.3.288.2 Platform Interface Definition. Torque Converter Clutch Mode is received by Platform.

Platform typically uses Torque Converter Clutch Mode as a control signal to indicate when the Torque converter may be changing mechanical dynamics of the driveline by mechanically coupling the engine and transmission. This signal is not intended to be used as a display to the Driver.

There are more states defined in this signal than platform may typically care to know. However, this signal is also use for communication between Powertrain Controllers and is duplicated here to minimize the need for additional messages.

4.2.3.289 Vehicle Dynamics Control System Status. See Table 305.

Table 305: Vehicle Dynamics Control System Status Signal Detail

Signal	Length	Data Type	Range	Conversion
Vehicle Dynamics Control System Status	3	ENM	N/A	$0 = Normal Operation $1 = Reduced Function $2 = Temporarily Inhibited $3 = Permanently Failed $4 = Warming Up $5 = Calibrating $7 = Driver Disabled

4.2.3.289.1 Powertrain Interface Definition. Vehicle Dynamics Control System Status is received by Powertrain. This signal is used by the Transfer Case algorithm in the powertrain controller to disable the Transfer Case stability algorithms.

4.2.3.289.2 Platform Interface Definition. Vehicle Dynamics Control System Status is transmitted by the EBCM if that module is present; otherwise this signal is not transmitted. This signal indicates whether the Vehicle Stability Enhancement System is operational. The vehicle dynamics system could be disabled by the driver (via a disable switch), system operating conditions or by a failure detected within the system.

Data Delay: 125 ms

4.2.3.290 Vehicle Dynamics Over Under Steer, Vehicle Dynamics Over Under Steer Validity. See Table 306.

Table 306: Vehicle Dynamics Over Under Steer, Vehicle Dynamics Over Under Steer Validity Signal Detail

Signal	Length	Data Type	Range	Conversion
Vehicle Dynamics Over Under Steer	10	SNM	-256.0 to 255.5%	E = N × 0.5
Vehicle Dynamics Over Under Steer Validity	1	ENM	N/A	$0 = Valid; $1 = Invalid

4.2.3.290.1 Powertrain Interface Definition. Vehicle Dynamics Over Under Steer and Vehicle Dynamics Over Under Steer Validity are received by Powertrain.

Vehicle Dynamics Over Under Steer will be an input to the Transfer Case control function. The Transfer Case will use this signal to compare and correct the Transfer Case internal vehicle reference model with the Vehicle Stability Enhancement System reference model. The Transfer Case will consider the Vehicle Stability Enhancement System model ruling in case of differences.

The Transfer Case will consider Vehicle Dynamics Over Under Steer correct and reliable as long as Vehicle Dynamics Over Under Steer Validity equals “Valid”.

4.2.3.290.2 Platform Interface Definition. Vehicle Dynamics Over Under Steer and Vehicle Dynamics Over Under Steer Validity are transmitted by the EBCM when the EBCM is present, and are not sent when the EBCM is not present.

Vehicle Dynamics Over Under Steer represents the error between the actual and desired vehicle state in the Vehicle Stability Enhancement System reference model. The mapping of the signal and its interpretation on the receiver side shall be negotiated between Platform and Powertrain on each application.

Vehicle Dynamics Over Under Steer Validity shall be set to “Invalid” if the inputs used to calculate the data have failed and a corresponding DTC has been set.

Data Delay: 40 ms

4.2.3.291 Vehicle Dynamics Yaw Rate, Vehicle Dynamics Yaw Rate Validity. See Table 307.

Table 307: Vehicle Dynamics Yaw Rate, Vehicle Dynamics Yaw Rate Validity Signal Detail

Signal	Length	Data Type	Range	Conversion
Vehicle Dynamics Yaw Rate	12	SNM	-128.000 to 127.938 degrees/s	E= N × 1/16
Vehicle Dynamics Yaw Rate Validity	1	ENM	N/A	$0 = Valid; $1 = Invalid

4.2.3.291.1 Powertrain Interface Definition. Vehicle Dynamics Yaw Rate and Vehicle Dynamics Yaw Rate Validity are received by Powertrain.

Powertrain will use Vehicle Dynamics Yaw Rate as an input to the Transfer Case Controls. Powertrain will perform internal filtering and offset calibration on the Vehicle Dynamics Yaw Rate before use in internal calculations.

The data in Vehicle Dynamics Yaw Rate shall not be used if Vehicle Dynamics Yaw Rate Validity is set to “Invalid”.

4.2.3.291.2 Platform Interface Definition. Vehicle Dynamics Yaw Rate and Vehicle Dynamics Yaw Rate Validity are transmitted by the EBCM, and are not transmitted if the EBCM is not present on the vehicle.

The Vehicle Dynamics Yaw Rate signal represents the vehicles rotation around its vertical axis. The signal may be compensated for temperature. The value of the Yaw Rate shall follow ISO 8855 (i.e., Yaw rate is positive in a left turn. Vehicle Dynamics Yaw Rate Validity shall be set to "Invalid" if the inputs for determining the data value are failed with the appropriate DTC set or if the yaw rate sensor self test is active. The Vehicle Dynamics Yaw Rate Validity shall be set to "Valid" if both of the following are true:

a. The failure conditions are no longer present and the DTC is not current.

b. The yaw rate sensor self test is inactive.

Data Delay: 30 ms

4.2.3.292 Vehicle Mass Nominal. See Table 308.

Table 308: Vehicle Mass Nominal Signal Detail

Signal	Length	Data Type	Range	Conversion
Vehicle Mass Nominal	8	UNM	500 to 5620 kg	E = (N × 20) + 500

4.2.3.292.1 Powertrain Interface Definition. Vehicle Mass Nominal is transmitted by Powertrain. This signal represents the mass of base vehicle w/ driver and full fuel tank however no passengers or trailer [Base curb mass + single occupant mass (68.0 kg)]. This signal represents a fixed calibration for a given vehicle and as such does not change dynamically over time.

Data Delay: N/A

4.2.3.292.2 Platform Interface Definition. Vehicle Mass Nominal is received by Platform. This signal is used to translate between vehicle acceleration and axle torque values. Refer to GMW8769, PPEI Cruise Control Subsystem for more details on the conversion between acceleration and axle torque.

4.2.3.293 Vehicle Identification Number Digits 10 to 17. See Table 309.

Table 309: Vehicle Identification Number Digits 10 to 17 Signal Detail

Signal	Length	Data Type	Range	Conversion
Vehicle Identification Number Digits 10 to 17	64	ASC	N/A	Eight ASCII Characters

4.2.3.293.1 Powertrain Interface Definition. Vehicle Identification Number Digits 10 to 17 is received by Powertrain and is used to determine when a Powertrain controller has been transferred from one vehicle to another. If this condition has been detected, the powertrain adaptive parameters that are stored in EEPROM equivalent memory will be re-initialized. It is critical that certain OBD-II diagnostic parameters also get re-initialized to avoid indicating a false diagnostic status.

4.2.3.293.2 Platform Interface Definition. Vehicle Identification Number Digits 10 to 17 is transmitted by the Gateway. The Vehicle Identification Number (VIN) is programmed at the vehicle assembly plant. The data consists of digits 10 through 17 of the VIN encoded in ASCII. The Platform shall transmit this signal with the data value set to $00 (all ASCII null characters) when the VIN has not been programmed in the Platform module.

Data Delay: Not applicable

4.2.3.294 Vehicle Speed Average Driven, Vehicle Speed Average Driven Source, Vehicle Speed Average Driven Validity, Vehicle Speed Average Non Driven, Vehicle Speed Average Non Driven Validity. See Table 310.

Table 310: Vehicle Speed Average Driven, Vehicle Speed Average Driven Source, Vehicle Speed Average Driven Validity, Vehicle Speed Average Non Driven, Vehicle Speed Average Non Driven Validity Signal Detail

Signal	Length	Data Type	Range	Conversion
Vehicle Speed Average Driven	15	UNM	0.0 to 511.46 km/h	E = N × 0.015625
Vehicle Speed Average Driven Source	1	ENM	N/A	$0 = Transmission Output Speed $1 = Wheel Speed
Vehicle Speed Average Driven Validity	1	ENM	N/A	$0 = Valid; $1 = Invalid
Vehicle Speed Average Non Driven	15	UNM	0.0 to 511.46 km/h	E = N × 0.015625
Vehicle Speed Average Non Driven Validity	1	ENM	N/A	$0 = Valid; $1 =Invalid

4.2.3.294.1 Powertrain Interface Definition. Vehicle Speed Average Driven, Vehicle Speed Average Driven Validity, Vehicle Speed Average Non Driven, Vehicle Speed Average Non Driven Validity, and Vehicle Speed Average Driven Source are transmitted by the ECM. The ECM calculates vehicle speed by using vehicle speed sensor information that is obtained via either hardwire or serial data.

For AWD the primary (high torque) axle will be designated as the driven and the other axle as the non-driven.

The Vehicle Speed Average Driven shall be calculated based on available information in the following order of precedence:

1. **TOSS:** Transmission Output Shaft Angular Velocity Sensor Present signal indicates available and “Valid”. Toss is mandatory in automatic and manual transmissions in the OBDII market.
2. **Average of Driven Wheels:** Transmission Output Shaft Angular Velocity Sensor Present signal indicates unavailable or “Invalid”, and Antilock Brake System Present indicates available or “True”, and **K_WheelSpeedSensorsPresent** = **“**Driven and Non Driven” or “Driven” and Wheel Rotational Status Left Driven and Wheel Rotational Status Right Driven indicate “Valid”.
3. **Single Driven Wheel:** Transmission Output Shaft Angular Velocity Sensor Present signal indicates unavailable or “Invalid”, and Antilock Brake System Present indicates available or “True”, and one driven wheel rotational status signal will indicate “Invalid” and one will indicate “Valid”.
4. **Invalid:** Transmission Output Shaft Angular Velocity Sensor Present signal indicates unavailable or “Invalid”,and both Wheel Rotational Status Left Driven and Wheel Rotational Status Right Driven indicate “Invalid”.

In the case of Invalid, the Vehicle Speed Average Driven Validity = “Invalid”. In all other cases, Vehicle Speed Average Driven Validity = “Valid”.

Vehicle Speed Average Driven Source shall be set to “Transmission Output Speed” when the Transmission Output Shaft Angular Velocity Sensor is used to determine the Vehicle Speed Average Driven and shall be set to “Wheel Speed” for all other calculation methods.

Vehicle Speed Average Non Driven is transmitted by the ECM. The ECM calculates Vehicle Speed Average Non Driven from the Vehicle Speed sensor information that is obtained via serial data.

The Vehicle Speed Average Non Driven shall be calculated based on available information, in the following order of precedence:

1. **Average of Non-Driven Wheels:** Antilock Brake System Present indicates available or “True”, and Wheel Rotational Status Left Non Driven and Wheel Rotational Status Right Non Driven indicate “Valid”.

2. **Single Non-Driven Wheel:** Antilock Brake System Present indicates available or “True”, and one non driven wheel rotational status signal will indicate “Invalid” and one will indicate “Valid”.
3. **Non-Driven Wheel Speed Sensors are Not on Vehicle:** Antilock Brake System Present indicates unavailable or “False”. Vehicle Speed Average Non Driven will be transmitted with a value of zero (“0”) and Vehicle Speed Average Non Driven Validity will be transmitted with a value of “Valid”.
4. **Both WSS Invalid:** In the case of Invalid, the Vehicle Speed Average Non Driven Validity = “Invalid”. In all other cases, Vehicle Speed Average Non Driven Validity = “Valid”.

The Presence and validity of all inputs to the Vehicle Speed Average Driven and Non Driven calculations are available in GMLAN signals defined elsewhere in this section.

All sources of data being used to develop vehicle speed information shall be capable of providing reliable speed information for vehicle speeds greater than or equal to 3.0 km/h. Non-zero vehicle speed information must be based on reliable data. If the vehicle speed is such that the sensor system cannot provide reliable data, Powertrain shall send a vehicle speed average of 0.0 km/h. If the sensor system is capable of providing reliable data below 3.0 km/h it may do so, but only reliable data can be sent with non-zero values.

If the vehicle is moving slow enough such that no speed sensor pulses occurred within a sampling interval (but still fast enough that the sensors would be operating reliably), Powertrain may need to calculate a new lower speed value. If the time that has elapsed since the arrival of the last pulse represents a velocity lower than the last velocity transmitted, Powertrain shall calculate a new velocity value by assuming a pulse had occurred at the sample time; otherwise, Powertrain shall transmit the last velocity sample again.

Data Delay: 100 ms

4.2.3.294.2 Platform Interface Definition. Vehicle Speed Average Driven, Vehicle Speed Average Driven Validity, Vehicle Speed Average Non Driven, Vehicle Speed Average Non Driven Validity, and Vehicle Speed Average Driven Source are received by Platform. These signals (except the Vehicle Speed Average Driven Source signal) are used by all Platform modules that require vehicle speed. The Vehicle Speed Average Driven Source signal is used by all Platform modules that use multiple vehicle speed sources for redundancy checks. For example, such modules may include the EBCM, PTO Module, and/or Rear Drive Module (RDM). Typically, some GMNA applications will use the Vehicle Speed Average Driven for displaying vehicle speed and supporting other platform functions such as automatic door locking and navigation.

The data in Vehicle Speed shall be ignored if Vehicle Speed Validity is set to “Invalid”.

4.2.3.295 Vehicle Speed Control System Type. See Table 311.

Table 311: Vehicle Speed Control System Type Signal Detail

Signal	Length	Data Type	Range	Conversion
Vehicle Speed Control System Type	3	ENM	N/A	$0 = No Vehicle Speed Control $1 = Conventional Cruise Control $2 = Adaptive Cruise Control

4.2.3.295.1 Powertrain Interface Definition. Vehicle Speed Control System Type is received by Powertrain and is used to select the appropriate control logic. The value of this signal is compared against a calibration in the ECM. If these are not the same, cruise control will be disengaged/inhibited (adaptive cruise control or conventional cruise control). This comparison will add protection against the cruise control system type changing “on the fly” incorrectly via service procedure/reflash, etc.

The TCM may use this signal to select a modified transmission shift schedule specific to the vehicle speed control present.

4.2.3.295.2 Platform Interface Definition. Vehicle Speed Control System Type is transmitted by the Gateway module. The Gateway module reports which vehicle speed control system is present on the vehicle.

Data Delay: Not applicable.

4.2.3.296 Vehicle Stability Enhancement Mode. See Table 312.

Table 312: Vehicle Stability Enhancement Mode Signal Detail

Signal	Length	Data Type	Range	Conversion
Vehicle Stability Enhancement Mode	3	ENM	N/A	$0 = Off $1 = Normal $2 = Competitive

4.2.3.296.1 Powertrain Interface Definition. Vehicle Stability Enhancement Lateral Acceleration is received by Powertrain.

4.2.3.296.2 Platform Interface Definition. Vehicle Stability Enhancement Lateral Acceleration is transmitted by the EBCM when the EBCM is present, and is not sent when the EBCM is not present. Vehicle Stability Enhancement Mode is used to indicate the driver selectable stability mode.

Input Delay: TBD ms

4.2.3.297 Vehicle Stability Enhancement Lateral Acceleration, Vehicle Stability Enhancement Lateral Acceleration Validity. See Table 313.

Table 313: Vehicle Stability Enhancement Lateral Acceleration, Vehicle Stability Enhancement Lateral Acceleration Validity Signal Detail

Signal	Length	Data Type	Range	Conversion
Vehicle Stability Enhancement Lateral Acceleration	12	SNM	-32.0 to 31.9844 m/s^2	E = N × 1/64
Vehicle Stability Enhancement Lateral Acceleration Validity	1	ENM	N/A	$0 = Valid; $1= Invalid

4.2.3.297.1 Powertrain Interface Definition. Vehicle Stability Enhancement Lateral Acceleration is received by Powertrain. It is used as an input to the high performance shift control algorithm to determine whether or not it should be enabled, and to what extent the automatic transmission shift schedule is modified. The signal is also used as an input to the Transfer Case Controls.

The data in Vehicle Stability Enhancement Lateral Acceleration shall be ignored if Vehicle Stability Enhancement Lateral Acceleration Validity is set to “Invalid”.

4.2.3.297.2 Platform Interface Definition. Vehicle Stability Enhancement Lateral Acceleration is transmitted by the EBCM when the EBCM is present, and is not sent when the EBCM is not present. This signal represents the lateral acceleration of the vehicle as measured from an accelerometer. The lateral Acceleration shall follow ISO 8855 (i.e., vehicle acceleration is positive in the left direction). Vehicle Stability Enhancement Lateral Acceleration Validity shall be set to “Invalid” if the sensor providing the data has failed and a corresponding DTC has been set.

On vehicles with ABS, Vehicle Stability Enhancement Lateral Acceleration shall be sent with the value equal to 0.0 m/s^2 when the Lateral Accelerometer is not present on the vehicle.

Input Delay: 25 ms

4.2.3.298 Vehicle Stability Enhancement System Active. See Table 314.

Table 314: Vehicle Stability Enhancement System Active Signal Detail

Signal	Length	Data Type	Range	Conversion
Vehicle Stability Enhancement System Active	1	BLN	N/A	$0 = False; $1 = True

4.2.3.298.1 Powertrain Interface Definition. Vehicle Stability Enhancement System Active is received by Powertrain.

Powertrain shall cancel cruise control when the data value of this signal is “True” for a calibratable time. Powertrain may use this signal to modify operation of Powertrain diagnostics and to modify the operation of features that may be affected by driveline disturbances or engine disturbances caused by the application of brakes or stability enhancement modifications to engine torque. For example, Powertrain may also use this signal to temporarily disable the misfire detection diagnostic to prevent the setting of false codes during Vehicle Stability Enhancement System events.

4.2.3.298.2 Platform Interface Definition. Vehicle Stability Enhancement System Active is transmitted by the EBCM when the EBCM is present, and is not transmitted when the EBCM is not present. Platform reports to Powertrain whether Yaw control is active or not via this signal. This signal shall be set to “True” whenever the Vehicle Stability Enhancement System is actively attempting to control or prevent vehicle yaw by any means (e.g., brakes, fuel, spark, throttle, transmission gear, etc.), that is, it shall not only be set to “True” when a certain combination of means are used.

Platform shall not extend the period of time that the Vehicle Stability Enhancement System Active signal is sent as “True” beyond the period of time that the Vehicle Stability system is actually active (for example, it shall not be extended for display purposes).

The EBCM must set this value to “True” during a Vehicle Stability Event before Powertrain will respond to Chassis System Engine Torque Request requests to increase engine torque above Engine Torque Driver Requested Extended Range.

Powertrain requires this signal be placed in a different frame than Chassis System Engine Torque Request Extended Range.

For OBD II compliance, Platform must not indicate an active condition when the Vehicle Stability Enhancement System is not active for more than 60 s.

Applications that have an EBCM but that do not support a Vehicle Stability Enhancement System shall always transmit this signal with a data value of “False”.

Data Delay: 30 ms

4.2.3.299 Vehicle Stability Enhancement System Present. See Table 315.

Table 315: Vehicle Stability Enhancement System Present Signal Detail

Signal	Length	Data Type	Range	Conversion
Vehicle Stability Enhancement System Present	1	BLN	N/A	$0 = False; $1 = True

4.2.3.299.1 Powertrain Interface Definition. Vehicle Stability Enhancement System Present is received by Powertrain. The Powertrain then knows whether to include activation of this system as a cruise control disengagement criterion or not.

4.2.3.299.2 Platform Interface Definition. Vehicle Stability Enhancement System Present is transmitted by the Gateway. This signal is used to indicate whether the vehicle stability enhancement option is present on the vehicle.

Data Delay: Not applicable.

4.2.3.300 Vehicle Top Speed Limit Arbitrated Value. See Table 316.

Table 316: Vehicle Top Speed Limit Arbitrated Value Signal Detail

Signal	Length	Data Type	Range	Conversion
Vehicle Top Speed Limit Arbitrated Value	8	UNM	0 to 510 km/h	E = N × 2

4.2.3.300.1 Powertrain Interface Definition. Vehicle Top Speed Limit Arbitrated Value is transmitted by the ECM. Powertrain shall continuously report the lowest vehicle top speed limit value resulting from arbitration in this signal. The ECM will use a Powertrain calibrated value if the Vehicle Top Speed Limit Request value is below 132 km/h. In order to avoid any OBD implications, the vehicle top speed limit arbitrated value may not fall below 132 km/h.

Data Delay: 1025 ms

4.2.3.300.2 Platform Interface Definition. Vehicle Top Speed Limit Arbitrated Value is received by Platform and is used for display purposes.

4.2.3.301 Vehicle Top Speed Limit Mode Active. See Table 317.

Table 317: Vehicle Top Speed Limit Mode Active Signal Detail

Signal	Length	Data Type	Range	Conversion
Vehicle Top Speed Limit Mode Active	1	BLN	N/A	$0 = False; $1 = True

4.2.3.301.1 Powertrain Interface Definition. Vehicle Top Speed Limit Mode Active is transmitted by the ECM. Powertrain shall set the data value to “True” when Powertrain is actively limiting the vehicle speed to the value contained in the serial data signal Vehicle Top Speed Limit Arbitrated Value.

Data Delay: 1025 ms

4.2.3.301.2 Platform Interface Definition. Vehicle Top Speed Limit Mode Active is received by Platform. This signal may be used for display purposes or by any other platform device as deemed necessary.

4.2.3.302 Vehicle Top Speed Limit Request. See Table 318.

Table 318: Vehicle Top Speed Limit Request

Signal	Length	Data Type	Range	Conversion
Vehicle Top Speed Limit Request	8	UNM	0 to 510 km/h	E = N × 2

4.2.3.302.1 Powertrain Interface Definition. Vehicle Top Speed Limit Request is received by Powertrain. Powertrain will limit vehicle speed to the data value of this signal or to any lower value required for Powertrain reasons. Refer to Vehicle Top Speed Limit Arbitrated Value for more information. Powertrain shall provide a sufficiently damped control system with appropriate filtering to prevent undesirable vehicle speed oscillation. The driven vehicle speed shall not exceed the Vehicle Top Speed Limit Request value when the engine is producing positive torque. Powertrain may not honor Vehicle Top Speed Limit Request values below 132 km/h due to OBD compliance.

Power-Up Default: 510 km/h

Communication Failure Value: (Platform-owned calibration in ECM)

4.2.3.302.2 Platform Interface Definition. Vehicle Top Speed Limit Request is transmitted by the Gateway module. The vehicle speed limit data value transmitted is the Platform arbitrated result of the highest priority speed limiting condition currently active on the Platform side of the PPEI interface. Platform speed limiting conditions may include, but are not limited to, tire top speed rating, suspension fault, spare tire detected, brake system fault, propshaft protection, or other. Tire top speed rating shall be supported by this signal. Platform is responsible for determination of the proper value of this signal when the inputs that go into the Platform arbitration process are failed.

Data Delay: 1025 ms

4.2.3.303 Wheel Distance Per Revolution Driven. See Table 319.

Table 319: Wheel Distance Per Revolution Driven Signal Detail

Signal	Length	Data Type	Range	Conversion
Wheel Distance Per Revolution Driven	10	UNM	800 to 3869 mm	E = (N × 3) + 800

4.2.3.303.1 Powertrain Interface Definition. Wheel Distance Per Revolution Driven is transmitted by Powertrain. On TOSS equipped vehicles, TOSS is mandatory on all automatic and manual transmissions in the OBD II market, this signal defines the driven wheel circumferential distance per revolution, which is derived from the specified number of tire revolutions per kilometer (ECM calibration **K_WheelDistancePerRevolutionDriven**).

4.2.3.303.2 Platform Interface Definition. Wheel Distance Per Revolution Driven is used by the Gateway and EBCM. This signal is used by the EBCM in conjunction with the signal Driveline Final Axle Ratio on TOSS equipped vehicles (TOSS is mandatory on all automatic and manual transmissions in OBD II markets) to calculate vehicle distance and speed. This signal is also used in conjunction with the signal Driveline Final Axle Ratio on TOSS equipped vehicles by the Body Control Module (BCM) to calculate propshaft vehicle speed limit. On GMNA Platforms, the driven wheel speed is used as the main source for vehicle distance and speed display.

Input Delay: 1000 ms

4.2.3.304 Wheel Distance Per Revolution Non Driven. See Table 320.

Table 320: Wheel Distance Per Revolution Non Driven Signal Detail

Signal	Length	Data Type	Range	Conversion
Wheel Distance Per Revolution Non Driven	10	UNM	800 to 3869 mm	E = (N × 3) + 800

4.2.3.304.1 Powertrain Interface Definition. Wheel Distance Per Revolution Non Driven is transmitted by Powertrain. This signal defines the non-driven wheel circumferential distance per revolution, which is derived from the specified number of tire revolutions per kilometer (ECM calibration **K_NonDrivenWheelDistancePerRevolution**).

4.2.3.304.2 Platform Interface Definition. Wheel Distance Per Revolution Non Driven is used by the Gateway and EBCM. This signal is used by the EBCM and Instrument Panel Cluster (IPC) controllers to calculate vehicle distance and speed of the non-driven wheel. On GME Platforms, the non-driven wheel speed is used as the main source for vehicle distance and speed display.

Input Delay: 1000 ms

4.2.3.305 Wheel Rotational Status Left Driven, Wheel Rotational Status Right Driven, Wheel Rotational Status Left Non Driven, Wheel Rotational Status Right Non Driven. See Table 321.

Table 321: Wheel Rotational Status Left Driven, Wheel Rotational Status Right Driven, Wheel Rotational Status Left Non Driven, Wheel Rotational Status Right Non Driven Signal Detail

Signal	Length	Data Type	Range	Conversion
Wheel Rotational Status Left Driven	32	PKT	N/A	N/A
Wheel Distance Timestamp Rollover Counter	2	UNM	0 to 3 counts	E = N × 1
Sequence Number	2	UNM	0 to 3 counts	E = N × 1
Wheel Rotational Status Reset Occurred	1	BLN	N/A	$0 = False $1 = True

Signal	Length	Data Type	Range	Conversion
Wheel Distance Validity	1	ENM	N/A	$0 = Valid; $1 = Invalid
Wheel Distance Pulse Counter	10	UNM	0 to 1023 counts	E = N × 1
Wheel Distance Timestamp	16	UNM	0 to 65535 counts	E = N × 1
Wheel Rotational Status Right Driven	32	PKT	N/A	N/A
Wheel Distance Timestamp Rollover Counter	2	UNM	0 to 3 counts	E = N × 1
Sequence Number	2	UNM	0 to 3 counts	E = N × 1
Wheel Rotational Status Reset Occurred	1	BLN	N/A	$0 = False $1 = True
Wheel Distance Validity	1	ENM	N/A	$0 = Valid; $1 = Invalid
Wheel Distance Pulse Counter	10	UNM	0 to 1023 counts	E = N × 1
Wheel Distance Timestamp	16	UNM	0 to 65535 counts	E = N × 1
Wheel Rotational Status Left Non Driven	32	PKT	N/A	N/A
Wheel Distance Timestamp Rollover Counter	2	UNM	0 to 3 counts	E = N × 1
Sequence Number	2	UNM	0 to 3 counts	E = N × 1
Wheel Rotational Status Reset Occurred	1	BLN	N/A	$0 = False; $1 = True
Wheel Distance Validity	1	ENM	N/A	$0 = Valid; $1 = Invalid
Wheel Distance Pulse Counter	10	UNM	0 to 1023 counts	E = N × 1
Wheel Distance Timestamp	16	UNM	0 to 65535 counts	E = N × 1
Wheel Rotational Status Right Non Driven	32	PKT	N/A	N/A
Wheel Distance Timestamp Rollover Counter	2	UNM	0 to 3 counts	E = N × 1
Sequence Number	2	UNM	0 to 3 counts	E = N × 1
Wheel Rotational Status Reset Occurred	1	BLN	N/A	$0 = False; $1 = True
Wheel Distance Validity	1	ENM	N/A	$0 = Valid; $1 = Invalid
Wheel Distance Pulse Counter	10	UNM	0 to 1023 counts	E = N × 1

Signal	Length	Data Type	Range	Conversion
Wheel Distance Timestamp	16	UNM	0 to 65535 counts	E = N × 1

4.2.3.305.1 Powertrain Interface Definition. The Wheel Rotational Status signals are received by Powertrain. This signal is used as the basis for any high resolution/high accuracy or low latency Powertrain requirements for vehicle distance, speed, acceleration, and rough road detection. Powertrain may also make use of other internal mechanisms to compute vehicle speed (Transmission Output Shaft Speed, for example).

Powertrain shall design its features to support two different vehicle configurations – one that provides only Two Non Driven Wheel Rotational Status signals, and another that provides Wheel Rotational Status signals from all wheels. Applications that only support two non-driven wheel speed sensors may not be able to provide certain functionality, and other functionality may operate with degraded performance. Additional information should be obtained from Powertrain application engineers.

The data in these signals inherently have no compensation for wheel diameter differences (from a mini-spare, loss of air, mismatched tires, etc.) Receivers shall either be robust to these differences, or provide their own wheel diameter compensation.

The data in these signals are not filtered by the transmitter – Powertrain is expected to provide any necessary software filtering.

Powertrain is expected to provide its own software method to update internal variables when pulses have not been present during a particular data update (i.e., the data is sent with the same values for pulse count and timestamp in two or more consecutive transmissions).

The data in Wheel Distance Pulse Counter and Wheel Distance Timestamp shall be ignored if Wheel Distance Validity is set to “Invalid”. Powertrain is expected to provide all of its own failsofting.

Powertrain must properly handle any rolling count resets, ECM resets, illegal rate of change conditions, loss of serial data, missed messages, etc. In addition, Powertrain receivers must properly deal with low speed situations (where Platform stops updating data due to operation at low vehicle speeds).

Powertrain shall be configured using the calibrations described in GMW8781, PPEI Vehicle Speed and Rough Road Sensing Calibration Requirements such that it understands which sensors are actually present on the vehicle. In addition, Powertrain shall be calibrated for the relationship between the data values used in this signals (distance and timestamp counts) and the actual units represented by these counts.

4.2.3.305.2 Platform Interface Definition. Wheel Rotational Status Left Driven, Wheel Rotational Status Right Driven, Wheel Rotational Status Left Non Driven, and Wheel Rotational Status Right Non Driven are transmitted by the EBCM if the EBCM is present, and are not transmitted if the EBCM is not present. These signals consist of several subsignals which, when taken together, allow the computation of vehicle speed, acceleration, and distance traveled with a high degree of precision.

The definitions of the individual subsignals of both packets are the same, and are defined below:

- **Wheel Distance Pulse Counter:** This subsignal provides a rolling count of the distance traveled by the indicated wheel. The distance is expressed in units of counts, which are intended to represent a rolling count of the number of pulses from a wheel speed sensor, which have been received by platform. Receivers of this signal shall have platform-provided calibrations that allow them to convert pulse counts into units of distance (for example, a calibration factor that would indicate the number of millimeters per count). Platform shall provide a system where the ground distance represented by a single count is between 15 and 63 mm. Powertrain receivers shall be calibrated with factors providing the distance per revolution of the wheels and the distance per pulse (separate calibrations for driven and non-driven wheels). The wheel distance counter is designed to roll over after it has exceeded its maximum range. The accuracy of the computation should be the same regardless of whether or not a rollover has just occurred. Platform is not required to ensure the continuity of this signal across ignition cycles (i.e., it is acceptable for Platform to restart the counter for each ignition cycle).
- **Wheel Distance Timestamp:** This subsignal provides a rolling timestamp of the time of arrival of the last distance pulse count sent in the Wheel Distance Pulse Counter subsignal, which is sent in the same frame. This signal shall represent the time of detection of the last pulse included in the count, not the time that the message was prepared.

- The timestamp information is expressed in terms of counts, the units of which are the internal time-base of the transmitter. Platform shall provide a system where the actual time represented by a single count meets the following two requirements:
  1. The time represented by a single timestamp count shall be less than or equal to 4 ms.
  2. The combination of parameters used for timestamp resolution and distance per pulse shall be such that the timer will not complete its cycle (at least as is represented within this serial data subsignal) between distance pulses for speeds above 3 km/h.

The second requirement prevents subsequent pulses to have timestamps on different "cycles" of the timer for speeds above 3 km/h. For systems that provide 15 mm per pulse, this requirement would be met if a single count of the timestamp represents more than 0.275 µs. For systems that provide 63 mm per pulse, this requirement would be met if a single count of the timestamp represents more than 1.154 µs.

Powertrain receivers of this signal shall have a platform-supplied calibration that allows them to convert counts into units of time (for example, the calibration factor would be the number of milliseconds or microseconds per count).

The wheel distance timestamp signal is designed to roll over immediately after it has exceeded its maximum range. The accuracy of the computation should be the same regardless of whether or not a rollover has just occurred. Platform is not required to ensure the continuity of this signal across ignition cycles (i.e., it is acceptable for Platform to restart the counter for each ignition cycle).

- **Wheel Rotational Status Reset Occurred:** This subsignal is used to indicate a lack of continuity of the data in either the Wheel Distance Pulse Counter or Wheel Distance Timestamp subsignals. To avoid loss of data or inaccurate data used by Powertrain, Platform shall set the data value of the Wheel Distance Reset Occurred signal to "True" whenever the Platform memory that maintains the rolling count for either the distance or timestamp is reset. Specifically, Platform must indicate that a reset occurred any time a power-on or any other reset type has interrupted its ability to provide continuous data.

The Platform shall ensure that the Reset Occurred subsignal is sent as "True" for at least 200 ms even if no additional resets have occurred. While these transmissions are taking place, however, the Platform shall continue to update the Wheel Distance Pulse Counter and Wheel Distance Timestamp subsignals.

Platform shall also indicate a reset occurred for the first 200 ms of transmission of the Wheel Rotational Status signal following the activation of the associated Virtual Network.

- **Sequence Number:** This subsignal is a rolling counter (0 to 3) used to coordinate Wheel Rotational Status data transmitted in separate frames. All Wheel Rotational Status data shall be sampled within 0.5 ms and be assigned the same sequence number. The sequence number shall be incremented with every sample and will rollover after reaching 3.
- **Wheel Distance Validity:** This subsignal shall be set to "Invalid" if the either the sensor circuit providing the data for that wheel has failed or any system failure has occurred such that the data is unreliable. This subsignal shall not be set to "Invalid" until a corresponding DTC has been set in the transmitter. Note that for purposes of the previous definition, unreliable does not include the normal process of being unable to produce usable information below a certain speed. A single validity bit covers all of the other signals in the packet, i.e., the validity signal shall be set to "Invalid" if any of the parameters in the packet are invalid. Platform shall not perform any failsofting or defaulting of the Wheel Distance Pulse Counter or Wheel Distance Timestamp values. In case of an invalid sensor, the Platform shall transmit non-failsofted data (i.e., the data should report what the sensor actually saw). This report of non-failsofted data is required for OBD II.

Applications, which do not support four wheel speed sensors, shall always transmit the non-supported Wheel Rotational Status signals with the following data values for the individual subsignals:

- Wheel Distance Pulse Counter: 0 counts
- Wheel Distance Timestamp: 0 counts
- Wheel Rotational Status Reset Occurred: "False"
- Wheel Distance Validity: "Valid"

For the purposes of the definition of this signal, all four-wheeled vehicles have two driven and two non-driven wheels. Determination of the definition of driven vs. non-driven wheels is as follows.

- On vehicles with two wheel drive (2WD) the driven wheels are the wheels capable of being driven by the engine.
- On vehicles with selectable four wheel drive (selectable between 2WD and 4WD) the driven wheels are those that are the driven wheels when the system is operating in 2WD mode.
- In AWD systems, at least one set of wheels is driven under all operating modes and failure conditions. If there is only one set of wheels that is always driven then that set is considered to be the driven wheels. If more than one set is always driven, the set that receives the larger share of engine torque under normal (non-slip) operating conditions is considered to be the driven wheels.

Platform shall capture the wheel speed sensor pulse counts and time stamps at a nominal capture rate of between 10 and 15 ms. Within a particular system, the tolerance on the nominal rate shall be ± 0.5 ms. All wheel speed sensor captures must be completed within a 0.5 ms total time window in order to allow precise relational calculations.

Platform shall ensure that all wheel speed sensor data corresponding to a specific sample period is always transmitted consecutively and with the same sequence number. Platform shall ensure that a new set of time consistent wheel rotational status data is transmitted (i.e., completes bus arbitration) every 10 to 15 ms ± 2 ms. The serial data subsystem must be designed such that each 10 to 15 ms nominal capture is transmitted and received before another 10 to 15 ms capture is transmitted. Platform shall ensure that the time between the sampling of the data and the completion of transmission is less than 2 ms.

Input Delay (including latency partitioning): Maximum time from the point that a pulse occurs until the software capture that includes that pulse is complete:

Nominal Capture Rate + 1.0 ms, with 10 ms ≤ Nominal Capture Rate ≤ 15 ms

Note: 1.0 ms arises from 0.5 ms tolerance on nominal time and 0.5 ms requirement on sampling time difference between the wheels. This time is not specifically a requirement of the system; it is merely an indication of the performance of the sampling system described above.

Processing: Maximum time from first pulse capture to trigger of transmission: 0.6 ms

Transmission: Maximum time from transmission trigger to message complete (arbitration included): 1.9 ms

Accuracy Requirement: TBD

4.2.3.306 Wheel Speed Sensing Legislated Diagnostic Status. See Table 322.

Table 322: Wheel Speed Sensing Legislated Diagnostic Status Signal Detail

Signal	Length	Data Type	Range	Conversion
Wheel Speed Sensing Legislated Diagnostic Status	8	PKT	N/A	N/A
Diagnostic Trouble Code Index	5	UNM	0 to 31	E = N × 1
Diagnostic Trouble Code Status	3	ENM	N/A	$0 = Not Supported $1 = Critically Disabled $2 = No Status to Report $3 = Diagnostic Passed $4 = Diagnostic Failed

4. .3.306.1 Powertrain Interface Definition. The Wheel Speed Sensing Legislated Diagnostic Status packet is eceived by Powertrain. It is used by Powertrain to monitor and store OBD/EOBD faults associated with the pl tform source of vehicle speed information, i.e., the Control Module and the Wheel Speed Sensor(s). P wertrain shall implement a Diagnostic Data Manager that tracks the status of the DTCs received using this si nal.

Due to the expected delays between fault detection and notification to Powertrain, Powertrain cannot use these messages or the DTCs stored within the Powertrain controller(s) to activate safety critical default modes of operation. Default modes, which require quicker notification, must use validity flags associated with the corresponding wheel speed input data being used. The primary purpose of this Diagnostic status signal is to

allow for OBD II DTC storage within the Powertrain controller without requiring Platform control modules to bear the burden of compliance related OBD infrastructure software. However, it is expected that, for many Powertrain default and diagnostic functions, the notification and DTC storage latency will be acceptable as implemented, and in this case, using the ECM stored code as (default or enable) criteria is recommended.

If consecutive messages received by Powertrain are identical (e.g., DTC Index is the same as the last received DTC Index) then Powertrain shall ignore the 2nd and any further consecutive identical messages.

If consecutive messages are such that it appears that a DTC Index has been skipped, Powertrain will have no choice but to ignore the fact and DTC corresponding to this missing DTC Index will not change status. In other words, no pass/fail reports of any kind will occur for this monitor.

4.2.3.306.2 Platform Interface Definition. The Wheel Speed Sensing Legislated Diagnostic Status packet is transmitted by the EBCM if the EBCM is present, and is not transmitted if the EBCM is not present. This signal is used to report on the status of all legislated (emissions-related) trouble codes related to wheel speed.

The EBCM shall use a single signal to report the status of all emissions-related DTCs (both those that are supported and those that are not) by periodically cycling through all 32 possibilities, with each successive one in subsequent transmissions of the signal. For example, if the Platform only actually supported some subset of the 32 possibilities related to wheel speed sensing, then frames for all unsupported monitors would be sent with a status = $0, Not Supported. Upon power up, the first diagnostic message shall contain the diagnostic information for the 1st monitor (monitor index = 0), and after completing the transmission of the 32nd monitor (monitor index 31), the process would start over by sending a frame for the 1st monitor. Due to the expected delays between fault detection and notification to Powertrain, Powertrain cannot use these messages or the DTCs stored within the Powertrain controller(s) to activate safety critical default modes of operation. Default modes that require faster notification must use validity flags or some other mechanism directly associated with the corresponding input data being used. The primary purpose of this signal is to allow for OBD II DTC storage within the Powertrain controller without requiring Platform control modules to bear the burden of compliance-related OBD infrastructure software. However, it is expected that, for many Powertrain default and diagnostic functions, the notification and DTC storage latency will be acceptable as is, and in this case, using the ECM stored code as (default or enable) criterion is recommended.

The Wheel Speed Sensing Legislated Diagnostic Status packet shall be transmitted by Platform at a periodic rate of 50 ± 5 ms. The reported Wheel Speed DTC Index and associated status shall be incremented or updated as described above at the periodic transmit rate. The Wheel Speed DTC Index and associated status shall not be incremented or updated faster than the periodic transmit rate such that no Wheel Speed DTC index value and associated status is lost. Minimum internal update rates for the outgoing message shall be no slower than once per 70 ms ± 10 ms. Each and every Wheel Speed DTC Index update and associated status update shall be transmitted. If consecutive messages received by Powertrain are identical, (e.g., DTC Index and status is the same as last received message), then Powertrain shall ignore the 2nd and any further consecutive identical messages.

This generic mechanism allows the general interface mechanism to remain constant in the global world of changing requirements for wheel speed sensing systems and OBD/EOBD legislated diagnostics.

The diagnostic status packet contains two subsignals described below:

a. **Wheel Speed Diagnostic Trouble Code Index:** The Wheel Speed DTC Index data value is used as an index into the table of supported DTCs described below. This subsignal indicates the particular DTC whose status is indicated in the Wheel Speed DTC Status subsignal. In this application, the DTC index values shall have the following meanings, as described in Table 323 below:

Table 323: Wheel Speed Diagnostic Trouble Code Index

Index	Description
00	Left Front Wheel Speed Signal (WSS) input circuit low
01	Right Front WSS input circuit low
02	Left Rear WSS input circuit low
03	Right Rear WSS input circuit low
04	Left Front WSS input circuit high

Index	Description
05	Right Front WSS input circuit high
06	Left Rear WSS input circuit high
07	Right Rear WSS input circuit high
08	Left Front WSS no input signal/irrational low
09	Right Front WSS no input signal/irrational low
10	Left Rear WSS no input signal/irrational low
11	Right Rear WSS no input signal/irrational low
12	Left Front WSS input erratic/noise/irrational high
13	Right Front WSS input erratic/noise/irrational high
14	Left Rear WSS input erratic/noise/irrational high
15	Right Rear WSS input erratic/noise/irrational high
16	Reserved for Future Use
17	EBCM Random Access Memory (RAM) fault
18	EBCM Read Only Memory (ROM) fault
19	EBCM TBD fault
20	Reserved for Future Use
21	Reserved for Future Use
22	Reserved for Future Use
23	Reserved for Future Use
24	Reserved for Future Use
25	Reserved for Future Use
26	Reserved for Future Use
27	Reserved for Future Use
28	Reserved for Future Use
29	Reserved for Future Use
30	Reserved for Future Use
31	Reserved for Future Use

b. **Wheel Speed Diagnostic Trouble Code Status:** The Wheel Speed DTC Status contains the diagnostic test status of the DTC indicated in the Wheel Speed DTC Index subsignal. Diagnostic test statuses supported for this subsignal are described below.

At power-up the diagnostic test status for each non-supported DTC must be initialized to $0, Not Supported, and the diagnostic test status for each supported DTC must be initialized to $2, “No Status to Report”, until the diagnostic test is disabled or completes a pass/fail decision. If a diagnostic test becomes critically disabled as defined below the reported status shall remain in the critically disabled state until the disabling conditions no longer exists, at which time the diagnostic test must be re-initialized to the power-up values. After a pass or fail status is reported the diagnostic test and status must be re-initialized to the power-up values until another pass/fail decision is made. The diagnostic tests must be continually re-initialized after every pass or fail decision and reporting. This type of behavior is required because if codes are cleared in the ECM, another

pass/fail must be received by the ECM in order to log it. This type of behavior is also required because the ECM will provide the diagnostic status for each DTC to service technicians via a 1 byte DTC Status so that the service tool can directly display the real time status. Also after a code clear in the ECM, the ECM will cease reporting to the diagnostic data manager for a calibratable amount of time (2 to 3 s) so that only NEW (post-code clear) monitor status information from ABS will be logged.

Platform will be responsible for determining when the DTC Status should be $3, “Diagnostic Passed” or $4, “Diagnostic Failed” for each diagnostic monitor using the following guidelines for implementation.

Continuous monitors are those in which fault criterion is checked periodically during each driving cycle. Continuous monitors shall use an “x” fail indications in “y” samples OBD algorithm to determine when a “pass” or “fail” has occurred. This algorithm is such that each time fault criteria is checked and a valid minor decision (good or bad) can be made, a “y” sample counter is incremented by 1. If the minor decision was good (no fault), then the “x” or “fail” counter is not incremented. If the minor decision was bad (a fault is likely), then the “x” or “fail” counter is incremented by 1. A “Diagnostic Failed” DTC status ($4) occurs if the “x” (fail counter) becomes equal to a calibratable fail threshold. A “Diagnostic Passed” DTC status ($3) happens if the sample counter reaches a calibratable threshold without the “x” (fail counter) reaching its calibratable fail threshold. If driving conditions are such that the fault criterion is unreliable and a “good/bad” decision cannot be made, then neither the “x” or “y” counters are incremented. However, under these conditions, the counters are not reset. Both the fail counter (x) and the sample counter (y) are reset to 0 at each power-up and are also reset each time a “Diagnostic Passed” or “Diagnostic Failed” status is transmitted for that monitor. This sequence of events continues for the remainder of each driving cycle. Also, both x and y should have a range of 0 to 65 535 in order to be consistent with all other OBD monitors which use this type of algorithm. Furthermore, each continuous monitor shall be assigned a unique x and y counter and a unique sample counter threshold calibration and fail counter threshold calibration.

Non-Continuous monitors are those in which fault criteria are not checked periodically but instead may be checked only once per trip, e.g., RAM check once each power up. These monitors, although they actually only execute once or only a few times per driving cycle) shall be such that the DTC status indication sent by Platform (Table 324) shall remain in the state it had been when the initial decision had been made until such time as a new decision is made or until a power up initialization occurs or the diagnostic system is reset (e.g., codes are cleared) in the Platform controller. This requirement is necessary so that if DTCs are cleared in the powertrain controller without clearing or resetting them in the platform controller, they will soon reappear in the powertrain controller as required per OBD regulations.

Table 324: DTC Status Indication

Status	Description
0	**Not Supported:** Diagnostic is not supported, not enabled, pass/fail status is never to be expected.
1	**Critically Disabled:** Diagnostic is critically disabled, pass/fail status is not likely for the remainder of the driving cycle. Note 1
2	**No Status to Report:** Diagnostic is not critically disabled, but pass/fail status is not available at this time. Monitoring is in progress or monitoring has been suspended temporarily due to current driving conditions, braking conditions, etc.
3	**Diagnostic Passed:** Diagnostic has just collected enough information and has just passed.
4	**Diagnostic Failed:** Diagnostic has just collected enough information and has just failed.
5	Reserved
6	Reserved
7	Reserved

Note 1: A DTC Status of Critically Disabled ($1) shall indicate when a diagnostic test is disabled in a manner such that there is no way (or little likelihood) for the driver to operate the vehicle for the remainder of the driving cycle and make the diagnostic test run.

Typical examples are:

- Engine-off soak not long enough (e.g., cold start temperature conditions not satisfied)
- Diagnostic maximum time limit or number of attempts/aborts exceeded
- Ambient air temperature too low or too high
- Intake air temperature too low or too high
- Barometric pressure too low (high altitude)
- A fault is detected in a sensor or system that directly (via software) disables the diagnostic. Faults that indirectly disable the diagnostic shall not be included.
- The diagnostic shall not indicate “Critically Disabled” for operator-controlled conditions such as RPM, vehicle speed, throttle position, minimum time limit not exceeded, etc.

Although unlikely, it is possible that a diagnostic test status could change back and forth from “Critically Disabled” to “No Status to Report” at any time during a driving cycle. For example, altitude changes from greater than 2438 m (8000 ft) to less than 2438 m (8000 ft) and back up again could conceivably produce this result.

Applications that do not support a specific DTC (for example, applications where the relevant sensor is not present) shall report the DTC with the Diagnostic Trouble Code Status subsignal with a data value of “Not Supported”. In additional, all DTCs listed in the above table as “Reserved for Future Use” shall report a DTC status of “Not Supported”.

Data Delay: 60 ms

4.2.4 CAN Identifier Allocations.

Table 325 outlines the allocation of CAN identifiers. Identifiers with an allocation of “Powertrain” may be used by Powertrain for communication between Powertrain devices. Identifiers with an allocation of “Platform” may be used by Platform for communication between Platform devices. Neither Powertrain nor Platform shall make use of identifiers with any other allocation unless it is for the purpose indicated.

Table 325: CAN Identifier Allocation

Start	End	Allocation
000	01F	Reserved – Future Usage
020	03F	Reserved – Future Usage
040	05F	Reserved – Future Usage
060	07F	Reserved – Future Usage
080	09F	Powertrain
0A0	0BF	Powertrain
0C0	0DF	PPEI
0E0	0FF	PPEI
100	11F	Wakeup, All Nodes Diagnostics
120	13F	Platform
140	15F	Platform
160	17F	Platform
180	184	Powertrain
185	185	Platform
186	19F	Powertrain
1A0	1BF	Powertrain
1C0	1DF	PPEI
1E0	1FF	PPEI

Start	End	Allocation
200	21F	Platform
220	23F	Platform
240	25F	Diagnostics – USDT Request
260	27F	Platform
280	29F	Powertrain
2A0	2BF	Powertrain
2C0	2DF	PPEI
2E0	2FF	PPEI
300	31F	Platform
320	33F	Platform
340	35F	Platform
360	37F	Platform
380	39F	Powertrain
3A0	3BF	Powertrain
3C0	3DF	PPEI
3E0	3FF	PPEI
400	41F	Platform
420	43F	Platform
440	45F	Platform
460	47F	Platform
480	49F	Powertrain
4A0	4BF	Powertrain
4C0	4DF	PPEI
4E0	4FF	PPEI
500	51F	Platform
520	53F	Platform
540	55F	Diagnostics – UUDT Response
560	57F	Platform
580	59F	Powertrain
5A0	5BF	Powertrain
5C0	5DF	PPEI
5E0	5FF	Diagnostics – UUDT Response (Emissions)
600	61F	VNMF
620	63F	VNMF
640	65F	Diagnostics – USDT Response
660	67F	Platform
680	68F	Powertrain - ECM Universal Measurement and Calibration Protocol

Start	End	Allocation
690	69F	Powertrain - TCM Universal Measurement and Calibration Protocol
6A0	6BF	Powertrain
6C0	6DF	PPEI
6E0	6FF	PPEI
700	71F	Platform
720	73F	Platform
740	75F	Platform
760	77F	Extended Diagnostic Information
780	79F	Extended Diagnostic Information
7A0	7BF	Powertrain
7C0	7DF	OBD/EOBD
7E0	7FF	OBD/EOBD or Non-Allowed Identifier

4.2.5 GMLAN Framing and Diagnostic Trouble Code Information.

4.2.5.1 PPEI GMLAN Frames and Powertrain Expansion Bus Frames.

4.2.5.1.1 PPEI GMLAN Frame Space. The following tables define the global common frames used for the GMLAN communication of PPEI signals. The PPEI signal descriptions and definitions are located in subsections. See Table 326.

4.2.5.1.2 Unused PPEI GMLAN Frame Space. Several of the PPEI frames defined in this table have additional (unused) space available in the frames. The unused PPEI frame space (bits and bytes) “signal name” fields are left blank.

4.2.5.1.3 PPEI GMLAN Frame Space Reserved for Non-PPEI Use. It is understood that there will be a strong desire to use the space in the PPEI frames for non-PPEI use such as: Powertrain-to-Powertrain or Platform-to-Platform communication. While such use is discouraged, it is allowed to optimize the framing design on the GMLAN High Speed Bus. The reserved signals have defined signal names, which indicate that the signals must be used solely for that feature and that signal position must not be used for any other Powertrain or Platform usage.

The signal descriptions for the “Reserved for ETEI” signals can be found in the Engine Control Module – Transmission Control Module Electrical Interface Specification. The signal descriptions for the “Reserved for Platform” signals can be found in the respective platform subsystem technical specification.

Before such a use may be made the appropriate organization must obtain approval from the PPEI workgroup, who will manage the resources of the PPEI frames. In such circumstances, the PPEI workgroup will assign a portion of a frame as reserved for non-PPEI use.

Note: Neither Powertrain nor Platform shall make use of any portion of any PPEI frame without the approval of the PPEI workgroup.

4.2.5.2 Diagnostic Trouble Code Information Extended Signal Rationale.

Diagnostic information is only communicated using diagnostic frames and modes as defined in GMW3110. In this instance, diagnostic information is communicated using normal communication. This is an exception to GMW3110. Reasons for using normal communication are as follows:

a. Smallest burden for a Vehicle Diagnostic Record (VDR) and Telematics controller.
    1. Trigger bit is always at identical position.
    2. Only one CAN ID per controller has to be evaluated by VDR.
b. VDR device only needs to be on one serial data bus since normal communication can go through a vehicle gateway.
c. DTC is synchronized with the trigger by design.

d. No modification of GMW3110 required.
e. No interference with a tester.

Table 326: PPEI and ETEI Frame Summary Table

Frame Identifier	Signal	Periodic Interval	Transmitter	Powertrain/Platform	Transmit in Accessory
$0C1	PPEI Driven Wheel Rotational Status	10 ms	ABS	Platform	-
$0C5	PPEI Non Driven Wheel Rotational Status	10 ms	ABS	Platform	-
$0C7	PPEI Transmission Output Rotational Status	12.5 ms	TCM	Powertrain	
$0C9	PPEI Engine General Status 1	12.5 ms	ECM	Powertrain	yes
$0F1	PPEI Brake Apply Status	10 ms	BSM	Platform	-
$0F9	PPEI Transmission General Status 1	12.5 ms	TCM (ECM)	Powertrain	yes
$150	PPEI High Voltage Battery Information 1	30 ms	BPCM, VICM	Platform	
$154	PPEI High Voltage Battery Information 2	100 ms	BPCM	Platform	
$158	PPEI High Voltage Battery Information 3	100 ms	BPCM	Platform	
$17D	Antilock_Brake_and_TC_Status_HS	100 ms	EBCM	Platform	
$1A1	PTEI Engine General Status	25 ms	ECM	Powertrain	
$1C3	PPEI Engine Torque Status 2	25 ms	ECM	Powertrain	
$1C4	PPEI Torque Request Status	25 ms	ECM	Powertrain	
$1C5	PPEI Driver Intended Axle Torque Status	25 ms	ECM	Powertrain	
$1C7	PPEI Chassis Engine Torque Request 1	20 ms	EBCM	Powertrain	
$1C8	PPEI Launch Control Request	20 ms	LCSM	Platform	
$1CC	PPEI: Secondary Axle Status	20 ms	TCCM/FDCM	Powertrain	
$1CE	PPEI: Secondary Axle Control	20 ms	EBCM	Platform	
$1CF	PPEI: Secondary Axle General Information	100 ms	TCCM/RDCM	Powertrain	
$1D0	PPEI: Front Axle Status	20 ms	TCCM/FDCM	Powertrain	
$1D1	PPEI: Rear Axle Status	20 ms	TCCM/RDCM	Powertrain	
$1E1	PPEI Cruise Control Switch Status	30 ms	BCM	Platform	-
$1E5	PPEI Steering Wheel Angle	10 ms	ABS	Platform	-
$1E9	PPEI Chassis General Status 1	20 ms	ABS	Platform	-
$1EA	PPEI Alternative Fuel System Status	12.5 ms	ECM	Powertrain	
$1EB	PPEI Fuel System Status	12.5 ms	FSCM	Platform	-
$1ED	PPEI Fuel System Request	12.5 ms	ECM	Powertrain	yes
$1EF	PPEI Fuel System Request 2	12.5 ms	ECM	Powertrain	yes
$1F1	PPEI Platform General Status	100 ms	BCM	Platform	yes
$1F3	PPEI Platform Transmission Requests	25 ms	GW	Platform	
$1F5	PPEI Transmission General Status 2	25 ms	TCM (ECM)	Powertrain	yes
$1F9	PPEI PTO Command Data	30 ms	PTO	Platform	-
$2B0	Starter_Generator_Status_3	20 ms	SGCM	Powertrain	
$2C3	PPEI Engine Torque Status 3	50 ms	ECM	Powertrain	yes
$2CB	PPEI Adaptive Cruise Axle Torque Request	50 ms	ACC	Platform	
$2F9	PPEI Chassis General Status 2	50 ms	ABS	Platform	-

Frame Identifier	Signal	Periodic Interval	Transmitter	Powertrain/Platform	Transmit in Accessory
$3C1	PPEI Powertrain Immobilizer Data	100 ms	ECM	Powertrain	yes
$3C9	PPEI Platform Immobilizer Data	100 ms	BCM	Platform	yes
$3D1	PPEI Engine General Status 2	100 ms	ECM	Powertrain	yes
$3E1	PPEI_Engine_BAS_Status_1	100 ms	BPIM	Powertrain	
$3E9	PPEI Vehicle Speed and Distance	100 ms	ECM	Powertrain	yes
$3ED	Vehicle_Limit_Speed_Control_Cmd	250 ms	Onstar	Platform	
$3F1	PPEI Platform Engine Control Request	250 ms	BCM	Platform	-
$3F9	PPEI Engine General Status 3	250 ms	ECM	Powertrain	yes
$3FB	PPEI Engine Fuel Status	250 ms	ECM	Powertrain	-
$451	PPEI Gateway LS General Information	25 ms	GW	?	?
$4C1	PPEI Engine General Status 4	500 ms	ECM	Powertrain	yes
$4C9	PPEI Transmission General Status 3	500 ms	TCM (ECM)	Powertrain	yes
$4D1	PPEI Engine General Status 5	500 ms	ECM	Powertrain	yes
$4D9	PPEI Fuel System General Status	500 ms	FSCM	Platform	-
$4E1	PPEI Vehicle Identification Digits 10 thru 17	1000 ms	BCM	Platform	yes
$4E9	PPEI Platform Configuration Data	1000 ms	BCM	Platform	yes
$4F1	PPEI Powertrain Configuration Data	1000 ms	ECM	Powertrain	yes
$4F3	PPEI Powertrain Configuration Data 2	1000 ms	ECM	Powertrain	
$772	Diagnostic Trouble Code Information Extended	1000 ms	ECM	Powertrain	yes
$77A	Diagnostic Trouble Code Information Extended	1000 ms	TCCM	Powertrain	yes
$77F	Diagnostic Trouble Code Information Extended	1000 ms	TCM	Powertrain	yes
Powertrain Expansion Bus					
$3F3	PPEI Power Pack General Status	500 ms	BPIM	Powertrain	
$3F7	PPEI Hybrid Temperature Status	200 ms	VITM	Platform	
$1D9	PPEI Hybrid Balancing Request	25 ms	BPIM	Powertrain	
$1DE	PPEI Hybrid Battery General Status	25 ms	VITM	Platform	

PPEI GMLAN Frames												
Message	ID	Periodic Interval (ms)	Update Time (ms)	Event Trigger	Signal	Start Byte	Start Bit	Length	Data Type Note 1	Range	Conversion	Transmitter
PPEI Driven Wheel Rotational Status	$0C1	10			Wheel Rotational Status Left Driven	0	7	32	PKT	N/A	N/A	EBCM
					Reserved for Platform, Wheel Distance Timestamp Rollover Counter	0	7	2	UNM	0 to 3 counts	E = N × 1	
					Sequence Number	0	5	2	UNM	0 to 3 counts	E = N × 1	
					Wheel Rotational Status Reset Occurred	0	3	1	BLN	N/A	$0 = False; $1 = True	
					Wheel Distance Validity	0	2	1	ENM	N/A	$0=Valid; $1=Invalid	
					Wheel Distance Pulse Counter	0	1	10	UNM	0 to 1023 counts	E = N × 1	
					Wheel Distance Timestamp	2	7	16	UNM	0 to 65 535 counts	E = N × 1	
					Wheel Rotational Status Right Driven	4	7	32	PKT	N/A	N/A	
					Reserved for Platform, Wheel Distance Timestamp Rollover Counter	4	7	2	UNM	0 to 3 counts	E = N × 1	
					Sequence Number	4	5	2	UNM	0 to 3 counts	E = N × 1	
					Wheel Rotational Status Reset Occurred	4	3	1	BLN	N/A	$0 = False; $1 = True	
					Wheel Distance Validity	4	2	1	ENM	N/A	$0 = Valid; $1 = Invalid	
					Wheel Distance Pulse Counter	4	1	10	UNM	0 to 1023 counts	E = N × 1	
					Wheel Distance Timestamp	6	7	16	UNM	0 to 65 535 counts	E = N × 1	
PPEI Non Driven Wheel Rotational Status	$0C5	10			Wheel Rotational Status Left Non Driven	0	7	32	PKT	N/A	N/A	EBCM

PPEI GMLAN Frames												
Message	ID	Periodic Interval (ms)	Update Time (ms)	Event Trigger	Signal	Start Byte	Start Bit	Length	Data Type Note 1	Range	Conversion	Transmitter
					Reserved for Platform, Wheel Distance Timestamp Rollover Counter	0	7	2	UNM	0 to 3 counts	E = N × 1	
					Sequence Number	0	5	2	UNM	0 to 3 counts	E = N × 1	
					Wheel Rotational Status Reset Occurred	0	3	1	BLN	N/A	$0 = False; $1 = True	
					Wheel Distance Validity	0	2	1	ENM	N/A	$0 = Valid; $1 = Invalid	
					Wheel Distance Pulse Counter	0	1	10	UNM	0 to 1023 counts	E = N × 1	
					Wheel Distance Timestamp	2	7	16	UNM	0 to 65 535 counts	E = N × 1	
					Wheel Rotational Status Right Non Driven	4	7	32	PKT	N/A	N/A	
					Reserved for Platform, Wheel Distance Timestamp Rollover Counter	4	7	2	UNM	0 to 3 counts	E = N × 1	
					Sequence Number	4	5	2	UNM	0 to 3 counts	E = N × 1	
					Wheel Rotational Status Reset Occurred	4	3	1	BLN	N/A	$0 = False; $1 = True	
					Wheel Distance Validity	4	2	1	ENM	N/A	$0 = Valid; $1 = Invalid	
					Wheel Distance Pulse Counter	4	1	10	UNM	0 to 1023 counts	E = N × 1	
					Wheel Distance Timestamp	6	7	16	UNM	0 to 65 535 counts	E = N × 1	
PPEI Transmission Output Rotational Status	$0C7	12.5			Transmission Output Rotational Status	0	7	32	PKT	N/A	N/A	TCM
					Transmission Output Rotational Status: Rotation Direction	0	7	2	ENM	N/A	$0 = Unknown $1 = Forward $2 = Reverse $3 = Undefined	
					Transmission Output Rotational Status: Last Transition Type	0	5	2	ENM	N/A	$0 = Single Edge Sensor $1 = Rising Transition $2 = Falling Transition $3 = Undefined	

PPEI GMLAN Frames												
Message	ID	Periodic Interval (ms)	Update Time (ms)	Event Trigger	Signal	Start Byte	Start Bit	Length	Data Type Note 1	Range	Conversion	Transmitter
					Transmission Output Rotational Status: Reset Occurred	0	3	1	BLN	N/A	$0 = False $1 = True	
					Transmission Output Rotational Status: Validity	0	2	1	ENM	N/A	$0 = Valid $1 = Invalid	
					Transmission Output Rotational Status: Pulse Counter	0	1	10	UNM	0 to 1023 counts	E = N × 1	
					Transmission Output Rotational Status: Timestamp	2	7	16	UNM	0 to 65 535 counts	E = N × 1	
PPEI Engine General Status 1	$0C9	12.5			Engine Run Active	0	7	1	BLN	N/A	$0 = False; $1 = True	ECM
					Powertrain Crank Active	0	6	1	BLN	N/A	$0 = False; $1 = True	
					Powertrain Crank Aborted	0	5	1	BLN	N/A	$0 = False; $1 = True	
					Powertrain Run Aborted	0	4	1	BLN	N/A	$0 = False; $1 = True	
					Power Take Off Powertrain Run Aborted	0	3	1	BLN	N/A	$0 = False; $1 = True	
					Engine Idle Active	0	2	1	BLN	N/A	$0 = False; $1 = True	
					Engine Speed Status	0	1	2	ENM	N/A	$0 = Normal Operation $1 = Degraded Operation $3 = Invalid	
					Engine Speed	1	7	16	UNM	0.0 to 16 383.8 rpm	E = N × 0.25	
					Accelerator Actual Position Validity	3	7	1	ENM	N/A	$0 = Valid; $1 = Invalid	
					Cruise Control Active	3	6	1	BLN	N/A	$0 = False; $1 = True	
					Cruise Control Enabled	3	5	1	BLN	N/A	$0 = False; $1 = True	
					Driver Throttle Override Detected	3	4	1	BLN	N/A	$0 = False; $1 = True	
					Driver Throttle Override Detection Alive Rolling Count	3	3	2	UNM	0 to 3	E = N × 1	

PPEI GMLAN Frames												
Message	ID	Periodic Interval (ms)	Update Time (ms)	Event Trigger	Signal	Start Byte	Start Bit	Length	Data Type Note 1	Range	Conversion	Transmitter
					Driver Throttle Override Detected Protection Value	3	1	2	UNM	0 to 3	E = N × 1	
					Accelerator Actual Position	4	7	8	UNM	0 to 100%	E = N × 100/255	
					Platform Engine Speed Command Superceded	5	5	1	BLN	N/A	$0 = False; $1 = True	
					Platform Engine Speed Command Inhibit Request	5	4	1	ENM	N/A	$0 = Allow Platform Engine Speed Control $1 = Inhibit Platform Eng. Speed Control	
					Engine Cylinder Deactivation Mode	5	3	2	ENM	N/A	$0 = All Cylinders Active $1 = Deactivation In Progress $2 = Half of Total Cylinders Active $3 = Reactivation In Progress	
					Powertrain Brake Pedal Discrete Input Status Validity	5	1	1	ENM	N/A	$0 = Valid $1 = Invalid	
					Powertrain Brake Pedal Discrete Input Status	5	0	1	ENM	N/A	$0 = Brake Not Applied $1 = Brake Applied	
					Remote Vehicle Start Engine Running	6	7	1	BLN	N/A	$0 = False $1 = True	
					Engine Cylinder Deactivation Event Pending	6	6	1	BLN	N/A	$0 = False $1 = True	
					Engine Intake Air Boost Pressure Validity	6	3	1	ENM	N/A	$0 = Valid $1 = Invalid	
					Engine Intake Air Boost Pressure	7	7	8	SNM	-128 to 127 kPa g	E = N × 1	
PPEI Brake Apply Status	$0F1	10			Brake Pedal Moderate Travel Achieved Validity	0	7	1	ENM	N/A	$0 = Valid $1 = Invalid	BSM
					Brake Pedal Moderate Travel Achieved	0	6	1	BLN	N/A	$0 = False $1 = True	
					Brake Pedal Position Alive Rolling Count	0	5	2	UNM	0 to 3	E = N × 1	
					Brake Pedal Initial Travel Achieved Protection	0	3	2	UNM	0 to 3	E = N × 1	
					Brake Pedal Initial Travel Achieved Status	0	1	2	PKT	N/A	N/A	

PPEI GMLAN Frames												
Message	ID	Periodic Interval (ms)	Update Time (ms)	Event Trigger	Signal	Start Byte	Start Bit	Length	Data Type Note 1	Range	Conversion	Transmitter
					Brake Pedal Initial Travel Achieved	0	1	1	BLN	N/A	$0 = False; $1 = True	
					Brake Pedal Initial Travel Achieved Validity	0	0	1	ENM	N/A	$0 = Valid $1 = Invalid	
					Brake Pedal Position	1	7	8	UNM	0 to 100%	E = N × 100/255	
					Reserved for Platform, Brake Pedal Position Gradient	2	7	8				
					Reserved for Platform, Brake Lights Active	3	7	1				
					Brake Apply Sensor Home Position Learned	3	6	1	BLN	N/A	$0 = False; $1 = True	
PPEI Transmission General Status 1	$0F9	12.5			Transmission Overall Estimated Torque Ratio Validity	0	7	1	ENM	N/A	$0 = Valid; $1 = Invalid	TCM, ECM
					Transmission Overall Estimated Torque Ratio	0	6	15	SNM	-64.0 to 63.996 093 75	E = N × 1/256	
					Transmission Output Shaft Angular Velocity Validity	2	7	1	ENM	N/A	$0 = Valid; $1=Invalid	
					Transmission Output Shaft Angular Velocity Sensor Present	2	6	1	BLN	N/A	$0 = False; $1 = True	
					Reserved for ETEI, Transmission Output Rotations Rolling Count Reset Occurred	2	5	1				
					Reserved for ETEI, Transmission Output Rotations Rolling Count Validity	2	4	1				
						2	3	1				
						2	2	1				
						2	1	1				
						2	0	1				
					Transmission Output Shaft Angular Velocity	3	7	16	UNM	0.0 to 16 383.75 rpm	E = N × 0.25	

PPEI GMLAN Frames												
Message	ID	Periodic Interval (ms)	Update Time (ms)	Event Trigger	Signal	Start Byte	Start Bit	Length	Data Type Note 1	Range	Conversion	Transmitter
					Reserved for ETEI, Transmission Output Rotations Rolling Count	5	7	16				
					Reserved for ETEI Transmission Cruise Control Vehicle Speed Shift Event Threshold	7	7	8				
Vehicle_ Odometer_HS	$120				Reserved for Platform, Vehicle Odometer	0	7	32				
					Reserved for Platform, Vehicle Odometer Validity	4	0	1				
Antilock_ Brake_and_ TC_Status_ HS	$17D	100			Traction Control System Operating Mode	0	4	3	ENM	N/A	$0 = Off $1 = Normal $2 = Off Road	EBCM
					Vehicle Stability Enhancement Mode	6	2	3	ENM	N/A	$0 = Off $1 = Normal $2 = Competitive	EBCM
PPEI Engine Torque Status 2	$1C3	25			Engine Torque Reduction Failure Status	0	7	3	ENM	N/A	$0 = Torque Reduction OK $1 = Torque Reduction Temporarily Failed $2 = Torque Reduction Permanently Failed $3 = Torque Reduction Limited $4 = Torque Reduction Communication Failed	ECM
					Engine Torque Actual Extended Range Validity	0	4	1	ENM	N/A	$0 = Valid; $1 = Invalid	
					Engine Torque Actual Extended Range	0	3	12	UNM	-848.0 to 1199.5 N·m	E = (N × 0.50) - 848	
						2	7	1				
					Powertrain Regulated Generator Control Active	2	6	1	BLN	N/A	$0 = False; $1 = True	
					Accelerator Effective Position Validity	2	5	1	ENM	N/A	$0 = Valid; $1 = Invalid	
					Engine Torque Driver Requested Extended Range Validity	2	4	1	ENM	N/A	$0 = Valid; $1 = Invalid	

PPEI GMLAN Frames												
Message	ID	Periodic Interval (ms)	Update Time (ms)	Event Trigger	Signal	Start Byte	Start Bit	Length	Data Type Note 1	Range	Conversion	Transmitter
					Engine Torque Driver Requested Extended Range	2	3	12	UNM	-848.0 to 1199.5 N·m	E = (N × 0.50) - 848	
					Fuel Filter Remaining Life	4	7	8	UNM	0 to 100%	E = N × 100/255	
					Generator Current Validity	5	7	1	ENM	N/A	$0 = Valid; $1 = Invalid	
					Generator Current	5	6	7	UNM	0 to 127 A	E = N × 1	
					Accelerator Effective Position	6	7	8	UNM	0 to 100%	E = N × 100/255	
					Engine Driver Preference Mode Switch 1 Enabled	7	7	1	BLN	N/A	$0 = False; $1 = True	
					Engine Driver Preference Mode Switch 1 Status	7	6	1	ENM	N/A	$0 = Inactive; $1 = Active	
					Economy Mode Active Indication On	7	5	1	BLN	N/A	$0 = False; $1 = True	
					Economy Mode Request Denied Indication On	7	4	1	BLN	N/A	$0 = False; $1 = True	
PPEI Torque Request Status	$1C4	25				0	7	1				ECM
						0	6	1				
						0	5	1				
					Accelerator Pedal Override Active	0	4	1	BLN	N/A	$0 = False; $1 = True	
					Accelerator Pedal Override Active Alive Rolling Count	0	3	2	UNM	0 to 3	E = N × 1	
					Accelerator Pedal Override Active Protection Value	0	1	2	UNM	0 to 3	E = N × 1	
					Adaptive Cruise Control Axle Torque Command Status	1	7	5	PKT			

PPEI GMLAN Frames												
Message	ID	Periodic Interval (ms)	Update Time (ms)	Event Trigger	Signal	Start Byte	Start Bit	Length	Data Type Note 1	Range	Conversion	Transmitter
					Request Status	1	7	3	ENM	N/A	$0 = No Request $1 = Request Honored $2 = Lost Arbitration $3 = Request Denied $4 = Request Suspended Until Driver Input $5 = Unused $6 = Unused $7 = Unused	
					Limiting Status	1	4	2	ENM	N/A	$0 = Request Not Limited $1 = Request Value Limited Minimum $2 = Request Value Limited Maximum $3 = Request Rate Limited	
					Road Load Nominal Axle Torque	1	2	19	UNM	-22 534 to 43 000 N·m	E = (N/8) - 22534	
PPEI Driver Intended Axle Torque Status	$1C5	25			Driver Intended Axle Torque Validity	0	7	1	ENM	N/A	$0 = Valid; $1 = Invalid	ECM
					Driver Intended Axle Torque	0	6	15	UNM	-22 534 to 43 000 N·m	E = (N × 2) – 22 534	
					Driver Intended Axle Torque Minimum Validity	2	7	1	ENM	N/A	$0 = Valid; $1 = Invalid	
					Driver Intended Axle Torque Minimum	2	6	15	UNM	-22 534 to 43 000 N·m	E = (N × 2) – 22 534	
					Driver Intended Axle Torque Maximum Validity	4	7	1	ENM	N/A	$0 = Valid; $1 = Invalid	
					Driver Intended Axle Torque Maximum	4	6	15	UNM	-22 534 to 43 000 N·m	E = (N × 2) – 22 534	
PPEI Chassis Engine Torque Request 1	$1C7	20				0	7	1				EBCM
						0	6	1				
					Chassis System Engine Torque Request Extended Range	0	5	14	PKT	N/A	N/A	

PPEI GMLAN Frames												
Message	ID	Periodic Interval (ms)	Update Time (ms)	Event Trigger	Signal	Start Byte	Start Bit	Length	Data Type Note 1	Range	Conversion	Transmitter
					Torque Intervention Type	0	5	2	ENM	N/A	$0 = No Intervention $1 = Reduce Torque $2 = Increase Torque	
					Torque Request Value	0	3	12	UNM	-848.0 to 1199.5 N·m	E = (N × 0.5) - 848	
					Traction Control Alive Rolling Count	2	7	2	UNM	0 to 3	E = N × 1	
					Chassis System Engine Torque Request Protection	2	5	14	UNM	0 to 16 383	E = N × 1	
						4	7	1				
						4	6	1				
						4	5	1				
						4	4	1				
						4	3	1				
						6	7	1				
					Traction Control Maximum Torque Increase Rate	6	5	6	UNM	0 to 1008 N·m/s	E = N × 16	
PPEI: Secondary Axle Status	$1CC	20			Secondary Axle Status	0	7	3	ENM		$0 = Normal Operation $1 = Temporary Inhibit $2 = Temporarily Limited $3 = Permanently Failed	TCCM/RDCM
					Secondary Axle Control Mode	0	4	1	ENM		$0 = Internal $1 = External	
					Secondary Axle Estimated Torque	0	1	10	UNM	0 to 10 230 N·m	E = N × 10	
					Secondary Axle Estimated Torque Validity	0	2	1	ENM		$0 = Valid $1 = Invalid	
					Secondary Axle Maximum Differential Velocity Allowed	2	7	8	PKT			
					Secondary Axle Maximum Differential Velocity Allowed Active	2	7	1	BLN		$0 = False; $1 = True	
					Secondary Axle Maximum Differential Velocity Allowed Request	2	6	7	UNM	0 to 254 rpm	E = N × 2	
PPEI: Secondary Axle Control	$1CE	20			Secondary Axle Torque Request	0	7	11	PKT			EBCM

PPEI GMLAN Frames												
Message	ID	Periodic Interval (ms)	Update Time (ms)	Event Trigger	Signal	Start Byte	Start Bit	Length	Data Type Note 1	Range	Conversion	Transmitter
					Secondary Axle Torque Request Active	0	7	1	BLN		$0 = False; $1 = True	
					Secondary Axle Torque Request Value	0	6	10	UNM	0 to 10 230 N·m	E = N × 10	
					Secondary Axle Torque Request Alive Rolling Count	2	4	2	UNM	0 to 3	E = N × 1	
					Secondary Axle Torque Request Protection Value	2	2	11	UNM	0 to 255	N/A	
PPEI: Secondary Axle General Information	$1CF	100			Secondary Axle Malfunction Indication ON	0	7	1	BLN		$0 = False; $1 = True	TCCM/RDCM
					Secondary Axle Temporary inhibit Indication On	0	6	1	BLN		$0 = False; $1 = True	
					Secondary Axle Operational Mode	0	3	4	ENM		$0 = 2 Wheel Drive High $1 = 4 Wheel Drive High Locked $2 = 4 Wheel Drive Low Locked $3 = Active All Wheel Drive (High) $4 = 4 Wheel Drive High Open $5 = 4 Wheel Drive Low Open $6 = Active All Wheel Drive (Low) $7 = 2 Wheel Drive Low $F = Neutral	
PPEI: Front Axle Status	$1D0	20			Reserved for Platform Front Axle Status	0	7	3	ENM		$0 = Normal Operation $1 = Temporary Inhibit $2 = Temporarily Limited $3 = Permanently Failed	TCCM/FDCM
					Reserved for Platform Front Axle Control Mode	0	4	1	ENM		$0 = Internal $1 = External	
					Reserved for Platform Front Axle Estimated Torque	0	3	11	SNM	-5120 to 5115 N·m	E = N × 10	
					Reserved for Platform Front Axle Estimated Torque Validity	1	0	1	ENM		$0 = Valid $1 = Invalid	

PPEI GMLAN Frames												
Message	ID	Periodic Interval (ms)	Update Time (ms)	Event Trigger	Signal	Start Byte	Start Bit	Length	Data Type Note 1	Range	Conversion	Transmitter
					Reserved for Platform Front Axle Maximum Differential Velocity Allowed.	2	7	8	PKT			
					Reserved for Platform Front Axle Maximum Differential Velocity Allowed Active	2	7	1	BLN		$1 = True ; $0 = False	
					Reserved for Platform Front Axle Maximum Differential Velocity Allowed Value	2	6	7	UNM	0 to 254 rpm	E = N × 2	
					Front Axle Operational Mode	3	7	3	ENM		$0 = Open $1 = Active $2 = Locked $3 = Unknown	
PPEI: Rear Axle Status	$1D1	20			Reserved for Platform Rear Axle Status	0	7	3	ENM		$0 = Normal Operation $1 = Temporary Inhibit $2 = Temporarily Limited $3 = Permanently Failed	TCCM/RDCM
					Reserved for Platform Rear Axle Control Mode	0	4	1	ENM		$0 = Internal $1 = External	
					Reserved for Platform Rear Axle Estimated Torque	0	3	11	SNM	-5120 to 5115 N·m	E = N × 10	
					Reserved for Platform Rear Axle Estimated Torque Validity	1	0	1	ENM		$0 = Valid $1 = Invalid	
					Reserved for Platform Rear Axle Maximum Differential Velocity Allowed.	2	7	8	PKT			
					Reserved for Platform Rear Axle Maximum Differential Velocity Allowed Active	2	7	1	BLN		$1 = True; $0 = False	
					Reserved for Platform Rear Axle Maximum Differential Velocity Allowed Value	2	6	7	UNM	0 to 254 rpm	E = N × 2	
					Rear Axle Operational Mode	3	7	3	ENM		$0 = Open $1 = Active $2 = Locked $3 = Unknown	

PPEI GMLAN Frames												
Message	ID	Periodic Interval (ms)	Update Time (ms)	Event Trigger	Signal	Start Byte	Start Bit	Length	Data Type Note 1	Range	Conversion	Transmitter
PPEI Cruise Control Switch Status	$1E1	30			Cruise Control Switch Status	0	7	8	PKT	N/A	N/A	GW
					Cancel Switch Active	0	7	1	BLN	N/A	$0 = False; $1 = True	
					On Switch Active	0	6	1	BLN	N/A	$0 = False; $1 = True	
					Resume Switch Active	0	5	1	BLN	N/A	$0 = False; $1 = True	
					Set Switch Active	0	4	1	BLN	N/A	$0 = False; $1 = True	
					Speed Increase Switch Active	0	3	1	BLN	N/A	$0 = False; $1 = True	
					Speed Decrease Switch Active	0	2	1	BLN	N/A	$0 = False; $1 = True	
					Switch Data Integrity	0	1	2	ENM	N/A	$0 = Data Valid $1 = Data Invalid $2 = Failure Detected $3 = Illegal Range	
					Cruise Control Switch Status Protection Value	1	7	8	UNM	0 to 255	E = N × 1	
					Reserved for Platform, Adaptive Cruise Control Gap Switch Activation	2	7	2				
						2	5	1				
						2	4	1				
						2	3	1				
					Cruise Control Cancel Request	2	2	1	ENM	N/A	$0 = Do Not Cancel; $1 = Cancel	
					Cruise Control Switch Status Alive Rolling Count	2	1	2	UNM	0 to 3	E = N × 1	
					Fuel Mode Switch Active Validity	3	5	1	ENM	N/A	$0 = Valid, $1 = Invalid	
					Fuel Mode Switch Active	3	4	1	BLN	N/A	$0 = False; $1 = True	
					Engine Driver Preference Mode Switch 1 Active	4	7	1	BLN	N/A	$0 = False; $1 = True	

PPEI GMLAN Frames												
Message	ID	Periodic Interval (ms)	Update Time (ms)	Event Trigger	Signal	Start Byte	Start Bit	Length	Data Type Note 1	Range	Conversion	Transmitter
					Engine Driver Preference Mode Switch 1 Alive Rolling Count	4	6	2	UNM	0 to 3	E = N × 1	
PPEI Steering Wheel Angle	$1E5	10			Steering Wheel Angle Validity	0	7	1	ENM	N/A	$0 = Valid; $1 = Invalid	EBCM, EPS
					Steering Wheel Angle Sensor Calibration Status	0	6	2	ENM	N/A	$0 = Unknown $1 = Estimated $2 = Calibrated	
						0	4	1				
						0	3	1				
					Reserved for Platform, Steering Wheel Angle Sensor Initialized	0	2	1				
					Reserved for Platform, Steering Wheel Angle Sensor Multiturn Capable	0	1	1				
						0	0	1				
					Steering Wheel Angle	1	7	16	SNM	-2048.0 to 2047.94 degrees	E = N × (1/16)	
					Reserved for Platform, Steering Wheel Angle Sensor Present	3	7	1				
					Reserved for Platform, Steering Wheel Angle Alive Rolling Count	3	6	2				
					Reserved for Platform, Power Steering Indication On	3	4	1				
					Steering Wheel Angle Gradient	3	3	12	SNM	-2048.0 to 2047.94 degrees/s	E = N × 1	
					Reserved for Platform, Steering Wheel Angle Extended Protection Value	5	7	16				
					Reserved for Platform, Steering Wheel Angle Timebase Rolling Count	7	7	8				

PPEI GMLAN Frames												
Message	ID	Periodic Interval (ms)	Update Time (ms)	Event Trigger	Signal	Start Byte	Start Bit	Length	Data Type Note 1	Range	Conversion	Transmitter
PPEI Chassis General Status 1	$1E9	20			Brake Pedal Driver Applied Pressure Detected Validity	0	7	1	ENM	N/A	$0 = Valid; $1 = Invalid	EBCM
					Brake Pedal Driver Applied Pressure Detected	0	6	1	BLN	N/A	$0 = False; $1 = True	
					Transmission Brake System Clutch Release Requested	0	5	1	BLN	N/A	$0 = False; $1 = True	
					Vehicle Stability Enhancement Lateral Acceleration Validity	0	4	1	ENM	N/A	$0 = Valid; $1 = Invalid	
					Vehicle Stability Enhancement Lateral Acceleration	0	3	12	SNM	-32.0 to 31.9844 m/s^2	E = N × 1/64	
					Brake System Transmission Gear Request	2	5	6	PKT	N/A	N/A	
					Request Type	2	5	2	ENM	N/A	$0 = No Action $1 = Max Gear Request $2 = Min Gear Request $3 = Hold Gear	
					Requested Gear	2	3	4	ENM	N/A	$0 = No Action $1 = First Gear $2 = Second Gear $3 = Third Gear $4 = Fourth Gear $5 = Fifth Gear $6 = Sixth Gear $7 = Seventh Gear $8 = Eighth Gear	
					Adaptive Cruise Control Braking Active	3	7	1	BLN	N/A	$0 = False; $1 = True	
					Antilock Brake System Active	3	6	1	BLN	N/A	$0 = False; $1 = True	
					Antilock Brake System Failed	3	5	1	BLN	N/A	$0 = False; $1 = True	
					Traction Control System Active	3	4	1	BLN	N/A	$0 = False; $1 = True	
					Traction Control System Enabled	3	3	1	BLN	N/A	$0 = False; $1 = True	
					Traction Control System Driver Intent	3	2	1	ENM	N/A	$0 = Disabled; $1 = Enabled	

PPEI GMLAN Frames												
Message	ID	Periodic Interval (ms)	Update Time (ms)	Event Trigger	Signal	Start Byte	Start Bit	Length	Data Type Note 1	Range	Conversion	Transmitter
					Vehicle Stability Enhancement System Active	3	0	1	BLN	N/A	$0 = False; $1 = True	
					Vehicle Dynamics Control System Status	4	7	3	ENM	N/A	$0 = Normal Operation $1 = Reduced Function $2 = Temporarily Inhibited $3 = Permanently Failed $4 = Warming Up $5 = Calibrating $7 = Driver Disabled	
					Vehicle Dynamics Yaw Rate Validity	4	4	1	ENM	N/A	$0 = Valid; $1 = Invalid	
					Vehicle Dynamics Yaw Rate	4	3	12	SNM	-128.0 to 127.938 degrees/s	E = N × (1/16)	
					Driver Independent Brake Apply Active	6	7	1	BLN	N/A	$0 = False; $1 = True	
						6	6	1				
						6	5	1				
						6	4	1				
						6	3	1				
					Vehicle Dynamics Over Under Steer Validity	6	2	1	ENM	N/A	$0 = Valid; $1 = Invalid	
					Vehicle Dynamics Over Under Steer	6	1	10	SNM	-256 to 255.5%	E = N × 0.5	
PPEI Alternative Fuel System Status	$1EA	12.5			Fuel Mode Status	0	7	3	ENM	N/A	$0 = Alternative Fuel Cut-off Active $1 = Gasoline Mode $2 = Compressed Natural Gas $3 = Liquefied Petroleum Gas	ECM
					Alternative Fuel Mode Request Denied Indication On	0	4	1	BLN	N/A	$0 = False; $1 = True	
					Fuel Level Tank 2 Percent Validity	0	3	1	ENM	N/A	$0 = Valid, $1 = Invalid	
					Alternative Fuel Level Low	0	2	1	BLN	N/A	$0 = False; $1 = True	
					Alternative Fuel Pre-heating Active	0	1	1	BLN	N/A	$0 = False; $1 = True	

PPEI GMLAN Frames												
Message	ID	Periodic Interval (ms)	Update Time (ms)	Event Trigger	Signal	Start Byte	Start Bit	Length	Data Type Note 1	Range	Conversion	Transmitter
					Alternative Fuel Acceleration Warning Active	0	0	1	BLN	N/A	$0 = False; $1 = True	
					Fuel Level Tank 2 Percent	1	7	8	UNM	0 to 100%	E = N × (100/255)	
					Fuel Total Capacity Tank 2	2	7	12	UNM	0.0 to 511.875 liters	E = N × (1/8)	
PPEI Fuel System Status	$1EB	12.5			Fuel System Estimated Pressure Delivered Validity	0	7	1	ENM	N/A	$0 = Valid; $1 = Invalid	FSCM
					Exhaust Pressure Regulator Valve Position Validity	0	6	1	ENM	N/A	$0 = Valid; $1 = Invalid	
					Exhaust Pressure Regulator Valve Position	0	5	1	ENM	N/A	$0 = Open; $1 = Closed	
						0	4	1				
						0	3	1				
						0	2	1				
					Fuel System Estimated Pressure Delivered	0	1	10	UNM	0 to 1023 kPa	E = N	
PPEI Fuel System Request	$1ED	12.5			Fuel Control System Fault Present	0	7	1	BLN	N/A	$0 = False; $1 = True	ECM
					Fuel Pump Enabled Discrete Output Commanded Status	0	6	1	ENM	N/A	$0 = Fuel Pump Disabled $1 = Fuel Pump Enabled	
						0	5	4				
					Fuel Delivery Pressure Requested	0	1	10	UNM	0 to 1023 kPa	E = N	
					Instantaneous Fuel Flow Estimate	2	7	16	UNM	0.0 to 63.999 023 g/s	E = N/1024	
					Advanced Fuel Flow Estimate	4	7	16	UNM	0.0 to 63.999 023 g/s	E = N/1024	
					Commanded Air Fuel Ratio	6	7	16	UNM	0.0 to 31.999 512	E = N/2048	
PPEI Fuel System Request 2	$1EF	12.5			Mass Air Flow Validity	0	7	1	BLN	N/A	$0 = Invalid, $1 = Valid	
						0	6	7				
						1	7	8				

PPEI GMLAN Frames												
Message	ID	Periodic Interval (ms)	Update Time (ms)	Event Trigger	Signal	Start Byte	Start Bit	Length	Data Type Note 1	Range	Conversion	Transmitter
					Mass Air Flow	2	7	16	UNM	0.0 to 655.35 g/s	E = N × 0.01	
PPEI Platform General Status	$1F1	100	25	X	Backup Power Mode Master Virtual Device Availability	0	7	1	ENM	N/A	$0 = Virtual Device Unavailable $1 = Virtual Device Available	GW
				X	System Backup Power Mode Enabled	0	6	1	BLN	N/A	$0 = False; $1 = True	
				X	System Backup Power Mode	0	5	2	ENM	N/A	$0 = Off $1 = Accessory $2 = Run $3 = Crank Request	
					Power Mode Master Run Crank Terminal Status	0	3	1	ENM	N/A	$0 = Inactive; $1 = Active	
					Power Mode Master Accessory Terminal Status	0	2	1	ENM	N/A	$0 = Inactive; $1 = Active	
				X	System Power Mode	0	1	2	ENM	N/A	$0 = Off $1 = Accessory $2 = Run $3 = Crank Request	
				X	Remote Vehicle Start Request	1	7	1	ENM	N/A	$0 = Remote Start Not Requested $1 = Remote Start Requested	
				X	Power Take Off Remote Start Master Engine Start Request	1	6	1	ENM	N/A	$0 = PTO Remote Start Not Requested $1 = PTO Remote Start Requested	
				X	Power Take Off Remote Start Master Engine Shutdown Requested	1	5	1	BLN	N/A	$0 = False; $1 = True	
				X	Air Conditioning Compressor Mode Request	1	4	2	ENM	N/A	$0 = Disengage Immediately $1 = Disengage $2 = Engage	
					Air Conditioning Compressor Normalized Load Validity	1	2	1	ENM	N/A	$0 = Valid; $1 = Invalid	
					Air Conditioning Compressor System Virtual Device Availability	1	1	1	ENM	N/A	$0 = Virtual Device Unavailable $1 = Virtual Device Available	

PPEI GMLAN Frames												
Message	ID	Periodic Interval (ms)	Update Time (ms)	Event Trigger	Signal	Start Byte	Start Bit	Length	Data Type Note 1	Range	Conversion	Transmitter
				X	Immobilizer Pre Release Password Status	1	0	1	ENM	N/A	$0 = No Information $1 = Information Valid	
					Immobilizer Pre Release Password	2	7	16	UNM	0 to 65 535 password	E = N × 1	
				X	Throttle Progression Request	4	7	2	ENM	N/A	$0 = Map A $1 = Map B $2 = Map C	
					Engine Oil Life Reset Request	4	5	1	BLN	N/A	$0 = False; $1 = True	
					Park Brake Switch Active	4	4	1	BLN	N/A	$0 = False; $1 = True	
					Park Brake Virtual Device Availability	4	3	1	ENM	N/A	$0 = Virtual Device Unavailable $1 = Virtual Device Available	
						4	2	11				
					Air Conditioning Compressor Normalized Load	6	7	8	UNM	0.0 to 25.5 (dm^3/ minute)/s	E = N × 0.1	
					Air Conditioning Compressor Failed On	7	7	1	BLN	N/A	$0 = False; $1 = True	
					Reserved for Platform, Park Brake Virtual Device Mask	7	6	1				
					Reserved for Platform, Backup Power Mode Master Virtual Device Mask	7	5	1				
					Reserved for Platform, Air Conditioning Compressor System Virtual Device Mask	7	4	1				
					Display Measurement System	7	3	1	ENM	N/A	$0 = Metric $1 = English	
					Airbag Deployed	7	2	1	BLN	N/A	$1 = True, $0 = False	BCM
					Airbag Virtual Device Availability	7	1	1	ENM	N/A	$0 = Virtual Device Unavailable $1 = Virtual Device Available	BCM
					Fuel Filter Life Reset Requested	7	0	1	BLN	N/A	$0 = False; $1 = True	

PPEI GMLAN Frames												
Message	ID	Periodic Interval (ms)	Update Time (ms)	Event Trigger	Signal	Start Byte	Start Bit	Length	Data Type Note 1	Range	Conversion	Transmitter
PPEI Platform Transmission Requests	$1F3	30			Transmission Platform Shift Pattern Switch Alive Rolling Count	0	7	2	UNM	0 to 3	E = N × 1	GW
					Transmission Platform Shift Pattern Switch 1 Active	0	5	1	BLN	N/A	$0 = False; $1 = True	
					Transmission Platform Shift Pattern Switch 2 Active	0	4	1	BLN	N/A	$0 = False; $1 = True	
					Transmission Platform Shift Pattern Switch 3 Active	0	3	1	BLN	N/A	$0 = False; $1 = True	
					Transmission Platform Shift Pattern Switch 4 Active	0	2	1	BLN	N/A	$0 = False; $1 = True	
					Transmission Oil Life Reset Request	0	1	1	BLN	N/A	$0 = False; $1 = True	
					Overdrive Disable Requested	0	0	1	BLN	N/A	$0 = False; $1 = True	
					Platform Transmission Tap Up/Down Switch Status Alive Rolling Count	1	7	2	UNM	0 to 3	E = N × 1	
					Platform Transmission Tap Up/Down Enable Switch State	1	5	2	ENM	N/A	$0 = No Activation $1 = Driver Shift Control Enable Switch Active $2 = Electronic Range Select Enable Switch Active $3 = Illegal Enable Switch State Active	
					Platform Transmission Tap Up/Down Switch State	1	3	2	ENM	N/A	$0 = No Activation $1 = Increment Switch Active $2 = Decrement Switch Active $3 = Illegal Up/Down Switch State Active	
					Platform Transmission Tap Up/Down Secondary Switch State	1	1	2	ENM	N/A	$0 = No Activation $1 = Increment Switch Active $2 = Decrement Switch Active $3 = Illegal Up/Down Switch State Active	

PPEI GMLAN Frames												
Message	ID	Periodic Interval (ms)	Update Time (ms)	Event Trigger	Signal	Start Byte	Start Bit	Length	Data Type Note 1	Range	Conversion	Transmitter
					Powertrain Shift Pattern Override Active	2	7	1	BLN	N/A	$0 = False; $1 = True	
PPEI Transmission General Status 2	$1F5	25			Transmission Torque Converter Clutch Commanded Mode	0	7	3	ENM	N/A	$0 = Unlocked $1 = Transitioning $2 = Controlled Slip $3 = Locked $7 = Not Supported	TCM, ECM
					Transmission Estimated Gear Validity	0	4	1	ENM	N/A	$0 = Valid; $1 = Invalid	
					Transmission Estimated Gear	0	3	4	ENM	N/A	$0 = Not Supported $1 = First Gear $2 = Second Gear $3 = Third Gear $4 = Fourth Gear $5 = Fifth Gear $6 = Sixth Gear $7 = Seventh Gear $8 = Eighth Gear $C = CVT Forward Gear $D = Neutral Gear $E = Reverse Gear $F = Park Gear	
					Top of Travel Clutch Switch Active Validity	1	7	1	ENM	N/A	$0 = Valid; $1 = Invalid	
					Top of Travel Clutch Switch Active	1	6	1	BLN	N/A	$0 = False; $1 = True	
					Automatic Transmission Gear Shift Direction	1	5	2	ENM	N/A	$0 = No Shift in Progress $1 = Upshift in Progress $2 = Downshift in Progress	
					Automatic Transmission Commanded Gear	1	3	4	ENM	N/A	$0 = Not Supported $1 = First Gear $2 = Second Gear $3 = Third Gear $4 = Fourth Gear $5 = Fifth Gear $6 = Sixth Gear $7 = Seventh Gear $8 = Eighth Gear $C = CVT Forward Gear $D = Neutral Gear $E = Reverse Gear $F = Park Gear	

PPEI GMLAN Frames												
Message	ID	Periodic Interval (ms)	Update Time (ms)	Event Trigger	Signal	Start Byte	Start Bit	Length	Data Type Note 1	Range	Conversion	Transmitter
					Transmission Skip Shift Indication On	2	7	1	BLN	N/A	$0 = False; $1 = True	
					Engine Recommended Upshift Indication On	2	6	1	BLN	N/A	$0 = False; $1 = True	
					Driver Shift Control Request Denied Indication On	2	5	1	BLN	N/A	$0 = False; $1 = True	
						2	4	1				
					Driver Shift Control Target Gear	2	3	4	ENM	N/A	$0 = Not Supported $1 = First Gear $2 = Second Gear $3 = Third Gear $4 = Fourth Gear $5 = Fifth Gear $6 = Sixth Gear $7 = Seventh Gear $8 = Eighth Gear	
					Transmission Range Inhibit Status	3	7	3	ENM	N/A	$0 = No Range Inhibit Active $1 = Transmission Inhibit Active $2 = Transmission Range Re-Selection Req $3 = Driveline Not Engaged $4 = Diagnostic Inhibit Active	
					Transmission Shift Lever Position Validity	3	4	1	ENM	N/A	$0 = Valid; $1 = Invalid	
					Transmission Shift Lever Position	3	3	4	ENM	N/A	$0 = Between Ranges $1 = Park Range $2 = Reverse Range $3 = Neutral Range $4 = Forward Range A $5 = Forward Range B $6 = Forward Range C $7 = Forward Range D $8 = Forward Range E $9 = Forward Range F $F = Lever Position Unknown	
					Overdrive Disable Request Granted	4	7	1	BLN	N/A	$0 = False; $1 = True	

PPEI GMLAN Frames												
Message	ID	Periodic Interval (ms)	Update Time (ms)	Event Trigger	Signal	Start Byte	Start Bit	Length	Data Type Note 1	Range	Conversion	Transmitter
					Clutch Start Switch Active Validity	4	6	1	ENM	N/A	$0 = Valid; $1 = Invalid	
					Clutch Start Switch Active	4	5	1	BLN	N/A	$0 = False; $1 = True	
						4	4	2				
					Transmission Shift Mode Status	4	2	3	ENM	N/A	$0 = No Override Mode $1 = Performance Mode $2 = Lift-Foot Cornering Mode $3 = Automatic Grade Braking Mode	
					Transmission Shift Lever Lock Requested	5	7	1	BLN	N/A	$0 = False; $1 = True	
					Transmission Creep Mode Active	5	6	1	BLN	N/A	$0 = False; $1 = True	
					Transmission Shifts Delayed	5	5	1	ENM	N/A	$0 = Inactive; $1= Active	
					Transmission Shift Pattern Active Status	5	4	3	ENM	N/A	$0 = Default Shift Pattern Active $1 = Shift Pattern 1 Active $2 = Shift Pattern 2 Active $3 = Shift Pattern 3 Active $4 = Shift Pattern 4 Active $5 = PT Non-Protection Pattern Active (Reserved and Not Supported) $6 = PT Protection Pattern Active (Reserved and Not Supported)	
					Transmission Tap Up/Tap Down Mode Status	5	1	2	ENM	N/A	$0 = No Activation $1 = Driver Shift Control Active $2 = Electronic Range Select Active	
					Clutch Pedal Actual Position Validity	6	7	1	ENM	N/A	$0 = Valid; $1 = Invalid	

PPEI GMLAN Frames												
Message	ID	Periodic Interval (ms)	Update Time (ms)	Event Trigger	Signal	Start Byte	Start Bit	Length	Data Type Note 1	Range	Conversion	Transmitter
					Reserved for PTEI Transmission Pattern Selection Economy Mode Override Commanded	6	4	1	BLN	N/A	$0 = False; $1 = True	
					Reserved for PTEI Transmission Fluid Pressure Present	6	3	1	BLN	N/A	$0 = False; $1 = True	
					Transmission Engaged State Validity	6	2	1	ENM	N/A	$0 = Valid; $1 = Invalid	
					Transmission Engaged State	6	1	2	ENM	N/A	$0 = Transmission Not Engaged $1 = Engaged in Forward $2 = Engaged in Reverse $3 = Operating State Not Reached	
					Clutch Pedal Actual Position	7	7	8	UNM	0 to 100%	E = N × 100/255	
PPEI PTO Command Data	$1F9	30			Platform Engine Speed Command On Switch Active	0	7	1	BLN	N/A	$0 = False; $1 = True	PTO
					Platform Engine Speed Command Speed Increase Switch Active	0	6	1	BLN	N/A	$0 = False; $1 = True	
					Platform Engine Speed Command Speed Decrease Switch Active	0	5	1	BLN	N/A	$0 = False; $1 = True	
					Accelerator Pedal Power Take Off Override Active	0	4	1	BLN	N/A	$0 = False; $1 = True	
					Platform Engine Speed Command	0	3	12	PKT	N/A	N/A	
					Platform Engine Speed Command Mode Active	0	3	1	BLN	N/A	$0 = False; $1 = True	
					Platform Engine Speed Request	0	2	11	UNM	0 to 8188 rpm	E = N × 4	
					Platform Engine Speed Command Alive Rolling Count	2	7	2	UNM	0 to 3	E = N × 1	
					Platform Engine Speed Command Switch Data Integrity	2	5	2	ENM	N/A	$0 = Data Valid $1 = Data Invalid $2 = Failure Detected	
					Platform Engine Speed Command Protection Value	2	3	12	UNM	0 to 4095	E = N * 1	

PPEI GMLAN Frames												
Message	ID	Periodic Interval (ms)	Update Time (ms)	Event Trigger	Signal	Start Byte	Start Bit	Length	Data Type Note 1	Range	Conversion	Transmitter
					Power Take Off Remote Engine Shutdown Requested	4	7	1	BLN	N/A	$0 = False; $1 = True	
					Transmission Power Take Off Clutch Release Requested	4	6	1	BLN	N/A	$0 = False; $1 = True	
					Power Take Off Transmission Gear Request	4	5	6	PKT	N/A	N/A	
					Request Type	4	5	2	ENM	N/A	$0 = No Action $1 = Max Gear Request $2 = Min Gear Request $3 = Hold Gear	
					Requested Gear	4	3	4	ENM	N/A	$0 = No Action $1 = First Gear $2 = Second Gear $3 = Third Gear $4 = Fourth Gear $5 = Fifth Gear $6 = Sixth Gear $7 = Seventh Gear $8 = Eighth Gear	
					Fast Idle Mode Active	5	7	1	BLN	N/A	$0 = False; $1 = True	
					Power Take Off Mode Active	5	6	1	BLN	N/A	$0 = False; $1 = True	
					Power Take Off Engine Torque Limit Requested	5	5	1	BLN	N/A	$0 = False; $1 = True	
					Reserved for Platform, Power Take Off Remote Engine Start Request	5	4	1				
						5	3	1				
						5	2	1				
						5	1	1				
						5	0	1				
					Power Take Off Engine Torque Limit Value Extended Range	6	7	8	UNM	0 to 2040 N·m	E = N × 8	
					Reserved for Platform, Power Take Off System Vehicle Top Speed Limit Value	7	7	8				

PPEI GMLAN Frames												
Message	ID	Periodic Interval (ms)	Update Time (ms)	Event Trigger	Signal	Start Byte	Start Bit	Length	Data Type Note 1	Range	Conversion	Transmitter
Starter_Generator_Status_3	$2B0	20			Starter Generator Speed	2	5	14	UNM	0 to 16 383 rpm	E = N × 1	SGCM
					Starter Generator Speed Validity	4	7	1	ENM	N/A	$0 = Valid; $1 = Invalid	
PPEI Engine Torque Status 3	$2C3	50			Engine Manifold Absolute Pressure Validity	0	7	1	ENM	N/A	$0 = Valid; $1 = Invalid	ECM
						0	6	1				
						0	5	1				
					Engine Torque Maximum Extended Range Validity	0	4	1	ENM	N/A	$0 = Valid; $1 = Invalid	
					Engine Torque Maximum Extended Range	0	3	12	UNM	-848.0 to 1199.5 N·m	E = (N × 0.50) – 848	
						2	7	1				
						2	6	1				
						2	5	1				
					Engine Torque Minimum Extended Range Validity	2	4	1	ENM	N/A	$0 = Valid; $1 = Invalid	
					Engine Torque Minimum Extended Range	2	3	12	UNM	-848.0 to 1199.5 N·m	E = (N × 0.50) - 848	
						4	7	1				
						4	6	1				
						4	5	1				
					Engine Manifold Absolute Pressure	6	7	8	UNM	0 to 127.5 kPa	E = N × 0.5	
PPEI Adaptive Cruise Axle Torque Request	$2CB	50			Adaptive Cruise Control Command Alive Rolling Count	0	7	2	UNM	0 to 3	E = N × 1	ACC
					Adaptive Cruise Control Axle Torque Command	0	0	25	PKT	N/A	N/A	
					Adaptive Cruise Control Active	0	0	1	BLN	N/A	$1 = True; $0 = False	
					Adaptive Cruise Control Type	1	7	2	ENM	N/A	$0 = Adaptive Cruise Control $1 = Full Speed Range Adaptive Cruise Control $2 = Unused $3 = Unused	

PPEI GMLAN Frames												
Message	ID	Periodic Interval (ms)	Update Time (ms)	Event Trigger	Signal	Start Byte	Start Bit	Length	Data Type Note 1	Range	Conversion	Transmitter
					Driver Assisted Go State	1	5	2	ENM	N/A	$0 = Not Stopped $1 = Apply Accel Pedal to Go $2 = Apply Accel Pedal or Resume Switch to Go $3 = Unused	
					Special Re-engagement Input Required	1	3	1	BLN	N/A	$1 = True; $0 = False	
					Axle Torque Request	1	2	19	UNM	-22 534 to 43 000 N·m	E = (N/8) – 22 534	
					Adaptive Cruise Control Axle Torque Command Protection	4	0	25	UNM	0 to 335 544 31	E = N × 1	
PPEI Chassis General Status 2	$2F9	50			Wheel Speed Sensing Legislated Diagnostic Status	0	7	8	PKT	N/A	N/A	EBCM
					Diagnostic Trouble Code Index	0	7	5	UNM	0 to 31	E = N × 1	
					Diagnostic Trouble Code Status	0	2	3	ENM	N/A	$0 = Not Supported $1 = Critically Disabled $2 = No Status to Report $3 = Diagnostic Passed $4 = Diagnostic Failed	
						1	7	1				
						1	6	1				
						1	5	1				
					Brake Pedal Driver Applied Pressure Validity	1	4	1	ENM	N/A	$0 = Valid; $1 = Invalid	
						1	3	1				
					Spare Tire Status	1	2	3	ENM	N/A	$0 = Undetermined $1 = No Spare Detected $2 = Spare Detected - Driven Wheels $3 = Spare Detected- Non-Driven Wheels	
					Brake Temperature	2	7	8	UNM	-40 to 980°C	E = (N × 4) - 40	
					Chassis Braking Load	3	7	8	UNM	0 to 100%	E = N × 100/255	
					Brake Pedal Driver Applied Pressure	5	7	8	UNM	0 to 19 125 kPa	E = N × 75	

PPEI GMLAN Frames												
Message	ID	Periodic Interval (ms)	Update Time (ms)	Event Trigger	Signal	Start Byte	Start Bit	Length	Data Type [Note 1]	Range	Conversion	Transmitter
PPEI Powertrain Immobilizer Data	$3C1	100			Powertrain Immobilizer Information	0	7	64	UNM	0 to 1.844 67 E+19	E = N × 1	ECM
PPEI Platform Immobilizer Data	$3C9	100			Immobilizer Information	0	7	64	UNM	0 to 1.844 67 E+19 N/A	E = N × 1	GW
PPEI Engine General Status 2	$3D1	100			Throttle Position Validity	0	7	1	ENM	N/A	$0 = Valid; $1 = Invalid	ECM
					Throttle Progression Status	0	6	2	ENM	N/A	$0 = Map A $1 = Map B $2 = Map C $3 = ECM Selected Progression	
					Engine Emissions Related Malfunction Active	0	4	1	BLN	N/A	$0 = False; $1 = True	
					Engine Non Emissions Related Malfunction Active	0	3	1	BLN	N/A	$0 = False; $1 = True	
					Engine Emissions Related Malfunction Indication Request	0	2	3	ENM	N/A	$0 = Continuous Indication $1 = No Indication $2 = Flashing 1 Hertz Indication $3 = Flashing 2 Hertz Indication $4 = Flashing ½ Hertz Indication	
					Throttle Position	1	7	8	UNM	0 to 100%	E = N × 100/255	
					Engine Boost Pressure Indication Validity	2	7	1	ENM	N/A	$0 = Valid; $1 = Invalid	
					Engine Coast Fuel Cut Off Active	2	6	1	BLN	N/A	$0 = False; $1 = True	
					Engine Oil Starvation Indication On	2	5	1	BLN	N/A	$0 = False; $1 = True	
					Apply Brake Before Cruise Indication On	2	4	1	BLN	N/A	$0 = False; $1 = True	
					Cruise Control Driver Selected Speed	2	3	12	UNM	0.0 to 255.938 km/h	E = N × 1/16	
					Cruise Control Driver Selected Speed Active	4	7	1	BLN	N/A	$0 = False; $1 = True	

PPEI GMLAN Frames												
Message	ID	Periodic Interval (ms)	Update Time (ms)	Event Trigger	Signal	Start Byte	Start Bit	Length	Data Type Note 1	Range	Conversion	Transmitter
					Fuel Filter Life Reset Performed	4	6	1	BLN	N/A	$0 = False; $1 = True	
					Air Conditioning Compressor Command	4	5	1	ENM	N/A	$0 = Off; $1 = On	
					Engine Oil Life Reset Performed	4	4	1	BLN	N/A	$0 = False; $1 = True	
					Instantaneous Fuel Consumption Rate	4	3	12	UNM	0.0 to 102.375 L/hr	E = N × 0.025	
					Engine Boost Pressure Indication	6	7	8	UNM	0 to 100%	E = N × 100/255	
					Air Conditioning Compressor Normalized Load Gradient Allowed	7	7	8	UNM	0.0 to 25.5 (dm^3/ minute)/s	E = N × 0.1	
PPEI_Engine_BAS_Status_1	$3E1	100			Service Hybrid System Indication On	0	5	1	BLN	N/A	$0 = False; $1 = True	BPIM
					Hybrid Vehicle High Voltage System Disabled	0	2	1	BLN	N/A	$0 = False; $1 = True	
					Charge Assist Gauge Percent	1	7	8	SNM	-100.787 456 to 100.000 054%	E = N × 0.787 402	BPI M
PPEI Vehicle Speed and Distance	$3E9	100			Vehicle Speed Average Driven Validity	0	7	1	ENM	N/A	$0 = Valid; $1 = Invalid	ECM
					Vehicle Speed Average Driven	0	6	15	UNM	0.0 to 511.46 km/h	E = N × 0.0156 25	
					Vehicle Speed Average Driven Source	2	7	1	ENM	N/A	$0 = Transmission Output Speed $1 = Wheel Speed	
					Distance Rolling Count Average Driven Validity	2	6	1	ENM	N/A	$0 = Valid; $1 = Invalid	
					Distance Rolling Count Average Driven Reset Occurred	2	5	1	BLN	N/A	$0 = False; $1 = True	
					Distance Rolling Count Average Driven	2	4	13	UNM	0.0 to 1023.875 m	E = N × 1/8	
					Vehicle Speed Average Non Driven Validity	4	7	1	ENM	N/A	$0 = Valid; $1 = Invalid	

PPEI GMLAN Frames												
Message	ID	Periodic Interval (ms)	Update Time (ms)	Event Trigger	Signal	Start Byte	Start Bit	Length	Data Type Note 1	Range	Conversion	Transmitter
					Vehicle Speed Average Non Driven	4	6	15	UNM	0.0 to 511.46 km/h	E = N × 0.015 625	
					Distance Rolling Count Average Driven Source	6	7	1	ENM	N/A	$0 = Transmission Output Speed $1 = Wheel Speed	
					Distance Rolling Count Average Non Driven Validity	6	6	1	ENM	N/A	$0 = Valid; $1 = Invalid	
					Distance Rolling Count Average Non Driven Reset Occurred	6	5	1	BLN	N/A	$0 = False; $1 = True	
					Distance Rolling Count Average Non Driven	6	4	13	UNM	0 to 1023.875 m	E = N × 1/8	
Vehicle_Limit _Speed_ Control_Cmd	$3ED	250			Enhanced Services Vehicle Top Speed Limit Request	0	7	2	ENM	N/A	$0 = No Action $1 = Active $2 = Inactive	Onstar
					Enhanced Services Vehicle Top Speed Limit Value Alive Rolling Count	0	5	2	UNM	0 to 3	E = N × 1	
					Enhanced Services Vehicle Top Speed Limit Password	1	7	32	UNM	N/A	4 ASCII Characters	
					Enhanced Services Vehicle Top Speed Limit Value	5	7	8	UNM	0 to 510 km/h	E = N × 2	
PPEI Platform Engine Cntrl Requests	$3F1	250			Engine Cooling Fan Speed Adjustment	0	7	8	SNM	-100.0 to 99.2188%	E = N × 200/256	GW
					Generator Regulator Setpoint Duty Cycle Request	1	7	8	UNM	0 to 100%	E = N × 100/255	
					Vehicle Top Speed Limit Request	2	7	8	UNM	0 to 510 km/h	E = N × 2	
						3	7	1				
						3	6	1				
					Air Conditioning Compressor Engine Run Request	3	5	1	ENM	N/A	$0 = No Action $1 = Engine Run Requested	

PPEI GMLAN Frames												
Message	ID	Periodic Interval (ms)	Update Time (ms)	Event Trigger	Signal	Start Byte	Start Bit	Length	Data Type Note 1	Range	Conversion	Transmitter
					Reserved for Platform, Engine Off Time Virtual Device Mask	3	4	1				
					Engine Off Time Virtual Device Availability	3	3	1	ENM	N/A	$0 = Virtual Device Unavailable $1 = Virtual Device Available	
					Engine Off Time Extended Range Validity	3	2	1	ENM	N/A	$0 = Valid; $1 = Invalid	
					Platform Minimum Idle Boost Level Request	3	1	2	ENM	N/A	$0 = No Boost Requested $1 = Boost Level 1 $2 = Boost Level 2 $3 = Boost Level 3	
					Engine Off Time Extended Range	4	7	8	UNM	0 to 1020 minutes	E = N × 4	
					Interior Dimming Display Level	5	7	8	UNM	0 to 100%	E = N × 100/255	
					Outside Air Temperature Virtual Device Availability	6	1	1	ENM	N/A	$0 = Virtual Device Unavailable $1 = Virtual Device Available	
					Outside Air Temperature Corrected Value Validity	6	0	1	ENM	N/A	$0 = Valid; $1 = Invalid	
					Outside Air Temperature Corrected Value	7	7	8	UNM	-40 to 87.5°C	E = (N × 0.5) - 40	
PPEI Engine General Status 3	$3F9	250			Fuel Injected Rolling Count Reset Occurred	0	7	1	BLN	N/A	$0 = False; $1 = True	ECM
					Generator Field Duty Cycle Validity	0	6	1	ENM	N/A	$0 = Valid; $1 = Invalid	
					Generator Failed	0	5	1	BLN	N/A	$0 = False; $1 = True	
					Engine Speed Limitation Mode Active	0	4	1	BLN	N/A	$0 = False; $1 = True	
					Vehicle Top Speed Limit Mode Active	0	3	1	BLN	N/A	$0 = False; $1 = True	
					Powertrain Top Speed Limit Reduced	0	2	1	BLN	N/A	$0 = False; $1 = True	
					Air Conditioning Refrigerant High Side Fluid Pressure Validity	0	1	1	ENM	N/A	$0 = Valid; $1 = Invalid	

PPEI GMLAN Frames												
Message	ID	Periodic Interval (ms)	Update Time (ms)	Event Trigger	Signal	Start Byte	Start Bit	Length	Data Type Note 1	Range	Conversion	Transmitter
					Generator Setpoint Duty Cycle Powertrain Override Active	0	0	1	BLN	N/A	$0 = False; $1 = True	
					Fuel Injected Rolling Count	1	7	16	UNM	0.0 to 1.999 97 L	E = N × 1/32 768	
					Generator Field Duty Cycle	3	7	8	UNM	0 to 100%	E = N × 100/255	
					Vehicle Top Speed Limit Arbitrated Value	4	7	8	UNM	0 to 510 km/h	E = N × 2	
					Engine Cooling Fan Speed	5	7	8	UNM	0 to 100%	E = N × 100/255	
					Engine Oil Remaining Life	6	7	8	UNM	0 to 100%	E = N × 100/255	
					Air Conditioning Refrigerant High Side Fluid Pressure	7	7	8	UNM	0 to 3570 kPa·g	E = N × 14	
PPEI Engine Fuel Status	$3FB	250			Fuel Alcohol Composition Validity	0	7	1	ENM	N/A	$0 = Valid; $1 = Invalid	ECM
					Emissions Related Fuel Level Low	0	6	1	BLN	N/A	$0 = False; $1 = True	
					Fuel Level Emissions Related Status	0	5	1	ENM	N/A	$0 = Valid; $1 = Invalid	
					Fuel Alcohol Composition Adaptation in Progress	0	4	1	BLN	N/A	$0 = False; $1 = True	
					Engine Fuel Control State	0	1	2	ENM	N/A	$0 = Open Loop $1 = Non-Stoichiometric Closed Loop $2 = Stoichiometric Closed Loop	
					Fuel Alcohol Composition	1	7	8	UNM	0 to 100%	E = N × (100/255)	
PPEI Gateway LS General Information	$451	25										GW
					Hybrid Vehicle High Voltage Inverter Disable Requested	2	7	1	BLN	N/A	$0 = False; $1 = True	
					Notification Event Severity Status	3	6	7	PKT	N/A	N/A	
					Frontal Impact Pretensioner Severity Achieved	3	6	1	BLN	N/A	$0 = False; $1 = True	

PPEI GMLAN Frames												
Message	ID	Periodic Interval (ms)	Update Time (ms)	Event Trigger	Signal	Start Byte	Start Bit	Length	Data Type Note 1	Range	Conversion	Transmitter
					Frontal Impact Stage 1 Severity Achieved	3	5	1	BLN	N/A	$0 = False; $1 = True	
					Frontal Impact Stage 2 Severity Achieved	3	4	1	BLN	N/A	$0 = False; $1 = True	
					Left Side Severity Achieved	3	3	1	BLN	N/A	$0 = False; $1 = True	
					Rear Impact Severity Achieved	3	2	1	BLN	N/A	$0 = False; $1 = True	
					Right Side Severity Achieved	3	1	1	BLN	N/A	$0 = False; $1 = True	
					Rollover Severity Achieved	3	0	1	BLN	N/A	$0 = False; $1 = True	
					Climate Control Front Blower Fan Speed	4	7	8	UNM	0 to 100%	E = N × 100/255	
PPEI Engine General Status 4	$4C1	500			Barometric Pressure Absolute Validity	0	7	1	ENM	N/A	$0 = Valid; $1 = Invalid	ECM
					Engine Coolant Temperature Validity	0	6	1	ENM	N/A	$0 = Valid; $1 = Invalid	
					Engine Intake Air Temperature Validity	0	5	1	ENM	N/A	$0 = Valid; $1 = Invalid	
					Outside Air Temperature Powertrain Estimated Mask	0	4	1	ENM	N/A	$0 = Do not Use Data $1 = Use Data	
					Outside Air Temperature Powertrain Estimated Validity	0	3	1	ENM	N/A	$0 = Valid; $1 = Invalid	
					Legislated Diagnostics Standard Conditions Met	0	2	1	BLN	N/A	$0 = False; $1 = True	
					Legislated Diagnostics Standard Conditions Fault Present	0	1	1	BLN	N/A	$0 = False; $1 = True	
					Engine Warm Up Cycle Achieved	0	0	1	BLN	N/A	$0 = False; $1 = True	
					Barometric Pressure Absolute	1	7	8	UNM	0.0 to 127.5 kPa	E = N × 0.50	
					Engine Coolant Temperature	2	7	8	UNM	-40.0 to 215°C	E = (N × 1) - 40	
					Engine Intake Air Temperature	3	7	8	UNM	-40.0 to 215°C	E = (N × 1) - 40	
					Outside Air Temperature Powertrain Estimated	4	7	8	UNM	-40.0 to 87.5°C	E = (N × 0.50) - 40	

PPEI GMLAN Frames												
Message	ID	Periodic Interval (ms)	Update Time (ms)	Event Trigger	Signal	Start Byte	Start Bit	Length	Data Type Note 1	Range	Conversion	Transmitter
					Reserved for ETEI, Legislated Diagnostics Cold Start Conditions Met	5	7	1				
					Reserved for ETEI, Legislated Diagnostics Cold Start Conditions Fault Present	5	6	1				
					Engine Oil Hot Indication On	5	5	1	BLN	N/A	$0 = False; $1 = True	
					Reserved for PTEI, Engine Economy Mode Commanded	6	6	1	BLN	N/A	$0 = False; $1 = True	
					Diesel Exhaust Fluid Warning Indication Request	6	5	3	ENM	N/A	$0 = No Indication $1 = Warning Level 1 $2 = Warning Level 2 $3 = Warning Level 3 $4 = Warning Level 4 $5 = Warning Level 5 $6 =Reserved $7 =Reserved	
					Diesel Exhaust Fluid Remaining Distance Validity	6	2	1	ENM	N/A	$0 = Valid; $1 = Invalid	
					Diesel Exhaust Fluid Remaining Distance	6	1	10	UMN	0 to 102 300 km	E = N × 100	
PPEI Transmission General Status 3	$4C9	500			Transmission Oil Temperature Validity	0	7	1	ENM	N/A	$0 = Valid; $1 = Invalid	TCM, ECM
					Transmission Oil Temperature Sensor Present	0	6	1	BLN	N/A	$0 = False; $1 = True	
					Transmission Emissions Related Malfunction Active	0	5	1	BLN	N/A	$0 = False; $1 = True	
					Transmission Non Emissions Related Malfunction Active	0	4	1	BLN	N/A	$0 = False; $1 = True	
						0	3	1				
					Transmission Change Oil Now Indication On	0	2	1	BLN	N/A	$0 = False; $1 = True	

PPEI GMLAN Frames												
Message	ID	Periodic Interval (ms)	Update Time (ms)	Event Trigger	Signal	Start Byte	Start Bit	Length	Data Type Note 1	Range	Conversion	Transmitter
					Transmission Thermal Management Status	0	1	2	ENM	N/A	$0 = Normal $1 = Counter-measures Active $2 = Driver Intervention Requested	
					Transmission Oil Temperature	1	7	8	UNM	-40 to 215°C	E = (N × 1) - 40	
					Reserved for ETEI, Transmission Emissions Related DTC	2	7	16				
PPEI Engine General Status 5	$4D1	500			Engine Oil Temperature Validity	0	7	1	ENM	N/A	$0 = Valid; $1 = Invalid	ECM
					Engine Oil Pressure Validity	0	6	1	ENM	N/A	$0 = Valid; $1 = Invalid	
					Engine Oil Pressure Low Indication On	0	5	1	BLN	N/A	$0 = False; $1 = True	
					Engine Oil Level Low Indication On	0	4	1	BLN	N/A	$0 = False; $1 = True	
					Engine Oil Change Indication On	0	3	1	BLN	N/A	$0 = False; $1 = True	
					Engine Hot Fuel Enrichment Indication On	0	2	1	BLN	N/A	$0 = False; $1 = True	
					Engine Hot/Stop Engine Indication On	0	1	1	BLN	N/A	$0 = False; $1 = True	
					Air Conditioning Off Indication On	0	0	1	BLN	N/A	$0 = False; $1 = True	
					Engine Oil Temperature	1	7	8	UNM	-40 to 215°C	E = (N × 1) - 40	
					Engine Oil Pressure	2	7	8	UNM	0 to 1020 kPa	E = N × 4	
					Reduced Power Indication On	3	7	1	BLN	N/A	$0 = False; $1 = True	
					Starting Disabled Indication On	3	6	1	BLN	N/A	$0 = False; $1 = True	
					Check Fuel Filler Cap Indication On	3	5	1	BLN	N/A	$0 = False; $1 = True	
					Fuel Level Percent Validity	3	4	1	ENM	N/A	$0 = Valid; $1 = Invalid	

PPEI GMLAN Frames												
Message	ID	Periodic Interval (ms)	Update Time (ms)	Event Trigger	Signal	Start Byte	Start Bit	Length	Data Type Note 1	Range	Conversion	Transmitter
					Fuel Total Capacity	3	3	12	UNM	0.0 to 511.875 liters	E = N × 1/8	
					Fuel Level Percent	5	7	8	UNM	0 to 100%	E = N × 100/255	
					Engine Shutdown Pending Indication On	6	1	1	BLN	N/A	$0 = False; $1 = True	
					Engine Shutdown Active	6	0	1	BLN	N/A	$0 = False; $1 = True	
					Diesel Glow Plug Indication On	6	7	1	BLN	N/A	$0 = False; $1 = True	
					Engine Water In Fuel Indication On	6	6	1	BLN	N/A	$0 = False; $1 = True	
					Powertrain Exhaust Particle Filter Warning Indication On	6	5	1	BLN	N/A	$0 = False; $1 = True	
					Powertrain High Electrical Load Requested	6	4	1	BLN	N/A	$0 = False; $1 = True	
					Fuel Filter Change Now Indication On	6	3	1	BLN	N/A	$0 = False; $1 = True	
					Engine Diagnostic Trouble Code Present Indication On	6	2	1	BLN	N/A	$0 = False; $1 = True	
						6	1	1				
						6	0	1				
					Engine Speed Maximum Limit	7	7	8	UMN	0 to 8160 rpm	E = N × 32	
PPEI Fuel System General Status	$4D9	500			Fuel System Emissions Related Mal-function Active	0	7	1	BLN	N/A	$0 = False; $1 = True	FSCM
						0	6	7				
					Fuel System Emissions Related DTC	1	7	16	PKT	N/A	N/A	

PPEI GMLAN Frames												
Message	ID	Periodic Interval (ms)	Update Time (ms)	Event Trigger	Signal	Start Byte	Start Bit	Length	Data Type [Note 1]	Range	Conversion	Transmitter
					System Designator	1	7	12	ENM	N/A	$0 = P0-Powertrain Codes SAE Controlled $1 = P1-Powertrain Codes MFG Controlled $2 = P2-Powertrain Codes Reserved $3 = P3-Powertrain Codes Reserved $4 = C0-Chassis Codes SAE Controlled $5 = C1-Chassis Codes MFG Controlled $6 = C2-Chassis Codes Reserved $7 = C3-Chassis Codes Reserved $8 = B0-Body Codes SAE Controlled $9 = B1-Body Codes MFG Controlled $A = B2-Body Codes Reserved $B = B3-Body Codes Reserved $C = U0-Network Codes SAE Controlled $D = U1-Network Codes MFG Controlled $E = U2- Network Codes Reserved $F = U3-Network Codes Reserved	
					Code Number	2	3	4	UNM	0 to 4095	E = N × 1	
PPEI VIN Digits 10 to 17	$4E1	1000			Vehicle Identification Number Digits 10 to 17	0	7	64	ASC	N/A	Eight ASCII Characters	GW
PPEI Platform Configuration Data	$4E9	1000			Antilock Brake System Present	0	7	1	BLN	N/A	$0 = False; $1 = True	GW
					Traction Control System Present	0	6	1	BLN	N/A	$0 = False; $1 = True	
					Vehicle Stability Enhancement System Present	0	5	1	BLN	N/A	$0 = False; $1 = True	
					Elapsed Time Count Reset Occurred	0	4	1	BLN	N/A	$0 = False; $1 = True	
						0	3	1				

PPEI GMLAN Frames												
Message	ID	Periodic Interval (ms)	Update Time (ms)	Event Trigger	Signal	Start Byte	Start Bit	Length	Data Type Note 1	Range	Conversion	Transmitter
					Vehicle Speed Control System Type	0	2	3	ENM	N/A	$0 = No Vehicle Speed Control $1 = Conventional Cruise Control $2 = Adaptive Cruise Control	
					Air Conditioning Compressor Type	1	7	3	ENM	N/A	$0 = None $1 = Fixed Displacement Clutched $2 = Variable Displacement Mechanical $3 = Variable Displacement Electronic $4 = Electric Motor Driven $5 = Reserved $6 = Reserved $7 = Reserved	
						1	4	1				
						1	3	1				
					Platform Engine Speed Command System Type	1	2	3	ENM	N/A	$0 = No Platform Engine Speed Command System Type $1 = Stationary PTO $2 = Stationary Variable PTO $3 = Mobile Variable PTO $4 = Fast Idle $5 = Enhanced Fast Idle	
					Elapsed Time Count	2	7	24	UMN	0 to 16 777 215 minutes	E = N × 1	
					Engine Performance Identifier	5	7	8	UMN	0 to 510 kW	E = N × 2	
PPEI Powertrain Configuration Data	$4F1	1000				0	7	1				ECM
						0	6	1				
						0	5	1				
						0	4	1				
						0	3	1				

PPEI GMLAN Frames												
Message	ID	Periodic Interval (ms)	Update Time (ms)	Event Trigger	Signal	Start Byte	Start Bit	Length	Data Type Note 1	Range	Conversion	Transmitter
						0	2	1				
					Wheel Distance Per Revolution Driven	0	1	10	UNM	800 to 3869 mm	E = (N × 3) + 800	
						2	7	1				
						2	6	1				
						2	5	1				
						2	4	1				
						2	3	1				
						2	2	1				
					Wheel Distance Per Revolution Non Driven	2	1	10	UNM	800 to 3869 mm	E = (N × 3) + 800	
						4	7	1				
						4	6	1				
						4	5	1				
						4	4	1				
						4	3	1				
						4	2	1				
						4	1	1				
					Driveline Final Axle Ratio	4	0	9	UNM	2.0 to 7.11	E = (N × 0.01) + 2	
PPEI Powertrain Configuration Data 2	$4F3	1000			Vehicle Mass Nominal	0	7	8	UNM	500 to 5620 kg	E = (N × 20) + 500	ECM
VIN_Digits_2_ to_9_HS	$514				Reserved for Platform, Vehicle Identification Number Digits 2-9	0	7	64				
Diagnostic Trouble Code Information Extended	$772	1000			Diagnostic Trouble Code Information Extended	0	7	56	PKT	N/A	N/A	ECM
					Unused1	0	7	1	BLN	N/A	$0 = False; $1 = True	
					Unused2	0	6	1	BLN	N/A	$0 = False; $1 = True	
					Unused3	0	5	1	BLN	N/A	$0 = False; $1 = True	
					Unused4	0	4	1	BLN	N/A	$0 = False; $1 = True	

PPEI GMLAN Frames												
Message	ID	Periodic Interval (ms)	Update Time (ms)	Event Trigger	Signal	Start Byte	Start Bit	Length	Data Type Note 1	Range	Conversion	Transmitter
					Unused5	0	3	1	BLN	N/A	$0 = False; $1 = True	
					Unused6	0	2	1	BLN	N/A	$0 = False; $1 = True	
					Unused7	0	1	1	BLN	N/A	$0 = False; $1 = True	
					Diagnostic Trouble Code Triggered	0	0	1	BLN	N/A	$0 = False; $1 = True	
					Diagnostic Trouble Code Source	1	7	8	UNM	0 to 255	E = N × 1	
					Diagnostic Trouble Code Number	2	7	16	UNM	0 to 65 535	E = N × 1	
					Diagnostic Trouble Code Failure Type	4	7	8	UNM	0 to 255	E = N × 1	
					Warning Indicator Requested Status	5	7	1	BLN	N/A	$0 = False; $1 = True	
					Test Failed Since Power Up Status	5	6	1	BLN	N/A	$0 = False; $1 = True	
					Test Not Passed Since Power Up Status	5	5	1	BLN	N/A	$0 = False; $1 = True	
					History Status	5	4	1	BLN	N/A	$0 = False; $1 = True	
					Test Failed Since Code Cleared Status	5	3	1	BLN	N/A	$0 = False; $1 = True	
					Test Not Passed Since Code Cleared Status	5	2	1	BLN	N/A	$0 = False; $1 = True	
					Current Status	5	1	1	BLN	N/A	$0 = False; $1 = True	
					Code Supported	5	0	1	BLN	N/A	$0 = False; $1 = True	
					Diagnostic Trouble Code Fault Type	6	7	8	ENM		$00 = Not Supported $01 = Type A $02 = Type B $03 = Type C $04 to $FF = reserved	
Diagnostic Trouble Code Information Extended	$77A	1000			Diagnostic Trouble Code Information Extended	0	7	56	PKT	N/A	N/A	TCCM

PPEI GMLAN Frames												
Message	ID	Periodic Interval (ms)	Update Time (ms)	Event Trigger	Signal	Start Byte	Start Bit	Length	Data Type Note 1	Range	Conversion	Transmitter
					Unused1	0	7	1	BLN	N/A	$0 = False; $1 = True	
					Unused2	0	6	1	BLN	N/A	$0 = False; $1 = True	
					Unused3	0	5	1	BLN	N/A	$0 = False; $1 = True	
					Unused4	0	4	1	BLN	N/A	$0 = False; $1 = True	
					Unused5	0	3	1	BLN	N/A	$0 = False; $1 = True	
					Unused6	0	2	1	BLN	N/A	$0 = False; $1 = True	
					Unused7	0	1	1	BLN	N/A	$0 = False; $1 = True	
					Diagnostic Trouble Code Triggered	0	0	1	BLN	N/A	$0 = False; $1 = True	
					Diagnostic Trouble Code Source	1	7	8	UNM	0 to 255	E = N × 1	
					Diagnostic Trouble Code Number	2	7	16	UNM	0 to 65 535	E = N × 1	
					Diagnostic Trouble Code Failure Type	4	7	8	UNM	0 to 255	E = N × 1	
					Warning Indicator Requested Status	5	7	1	BLN	N/A	$0 = False; $1 = True	
					Test Failed Since Power Up Status	5	6	1	BLN	N/A	$0 = False; $1 = True	
					Test Not Passed Since Power Up Status	5	5	1	BLN	N/A	$0 = False; $1 = True	
					History Status	5	4	1	BLN	N/A	$0 = False; $1 = True	
					Test Failed Since Code Cleared Status	5	3	1	BLN	N/A	$0 = False; $1 = True	
					Test Not Passed Since Code Cleared Status	5	2	1	BLN	N/A	$0 = False; $1 = True	
					Current Status	5	1	1	BLN	N/A	$0 = False; $1 = True	
					Code Supported	5	0	1	BLN	N/A	$0 = False; $1 = True	

PPEI GMLAN Frames												
Message	ID	Periodic Interval (ms)	Update Time (ms)	Event Trigger	Signal	Start Byte	Start Bit	Length	Data Type Note 1	Range	Conversion	Transmitter
					Diagnostic Trouble Code Fault Type	6	7	8	ENM		$00 = Not Supported $01 = Type A $02 = Type B $03 = Type C $04 to $FF = reserved	
Diagnostic Trouble Code Information Extended	$77F	1000			Diagnostic Trouble Code Information Extended	0	7	56	PKT	N/A	N/A	TCM
					Unused1	0	7	1	BLN	N/A	$0 = False; $1 = True	
					Unused2	0	6	1	BLN	N/A	$0 = False; $1 = True	
					Unused3	0	5	1	BLN	N/A	$0 = False; $1 = True	
					Unused4	0	4	1	BLN	N/A	$0 = False; $1 = True	
					Unused5	0	3	1	BLN	N/A	$0 = False; $1 = True	
					Unused6	0	2	1	BLN	N/A	$0 = False; $1 = True	
					Unused7	0	1	1	BLN	N/A	$0 = False; $1 = True	
					Diagnostic Trouble Code Triggered	0	0	1	BLN	N/A	$0 = False; $1 = True	
					Diagnostic Trouble Code Source	1	7	8	UNM	0 to 255	E = N × 1	
					Diagnostic Trouble Code Number	2	7	16	UNM	0 to 65 535	E = N × 1	
					Diagnostic Trouble Code Failure Type	4	7	8	UNM	0 to 255	E = N × 1	
					Warning Indicator Requested Status	5	7	1	BLN	N/A	$0 = False; $1 = True	
					Test Failed Since Power Up Status	5	6	1	BLN	N/A	$0 = False; $1 = True	
					Test Not Passed Since Power Up Status	5	5	1	BLN	N/A	$0 = False; $1 = True	
					History Status	5	4	1	BLN	N/A	$0 = False; $1 = True	
					Test Failed Since Code Cleared Status	5	3	1	BLN	N/A	$0 = False; $1 = True	

PPEI GMLAN Frames												
Message	ID	Periodic Interval (ms)	Update Time (ms)	Event Trigger	Signal	Start Byte	Start Bit	Length	Data Type Note 1	Range	Conversion	Transmitter
					Test Not Passed Since Code Cleared Status	5	2	1	BLN	N/A	$0 = False; $1 = True	
					Current Status	5	1	1	BLN	N/A	$0 = False; $1 = True	
					Code Supported	5	0	1	BLN	N/A	$0 = False; $1 = True	
					Diagnostic Trouble Code Fault Type	6	7	8	ENM		$00 = Not Supported $01 = Type A $02 = Type B $03 = Type C $04 to $FF = Reserved	

ote 1: BLN = Boolean, ENM = Enumerated, PKT = Packet, SNM = Signed Numeric, UNM = Unsigned Numeric

Powertrain Expansion Bus GMLAN Frames												
Message	ID	Periodic Interval (ms)	Update Time (ms)	Event Trigger	Signal	Start Byte	Start Bit	Length	Data Type	Range	Conversion	Transmitter
PPEI Power Pack General Status	$3F3	500			Power Pack Fan Afterrun Time	0	0	9	UNM	0 to 511 s	E = N × 1	BPIM
PPEI Hybrid Temperature Status	$3F7	200			High Voltage Battery Temperature Sensor 6 Validity	0	5	1	ENM	N/A	$0 = Valid; $1 = Invalid	VITM
					High Voltage Battery Temperature Sensor 5 Validity	0	4	1	ENM	N/A	$0 = Valid; $1 = Invalid	
					High Voltage Battery Temperature Sensor 4 Validity	0	3	1	ENM	N/A	$0 = Valid; $1 = Invalid	
					High Voltage Battery Temperature Sensor 3 Validity	0	2	1	ENM	N/A	$0 = Valid; $1 = Invalid	
					High Voltage Battery Temperature Sensor 2 Validity	0	1	1	ENM	N/A	$0 = Valid; $1 = Invalid	
					High Voltage Battery Temperature Sensor 1 Validity	0	0	1	ENM	N/A	$0 = Valid; $1 = Invalid	
					High Voltage Battery Temperature Sensor 1	1	7	8	UNM	-40°C to 215°C	E = (N × 1) - 40	

Powertrain Expansion Bus GMLAN Frames												
Message	ID	Periodic Interval (ms)	Update Time (ms)	Event Trigger	Signal	Start Byte	Start Bit	Length	Data Type	Range	Conversion	Transmitter
					High Voltage Battery Temperature Sensor 2	2	7	8	UNM	-40°C to 215°C	E = (N × 1) - 40	
					High Voltage Battery Temperature Sensor 3	3	7	8	UNM	-40°C to 215°C	E = (N × 1) - 40	
					High Voltage Battery Temperature Sensor 4	4	7	8	UNM	-40°C to 215°C	E = (N × 1) - 40	
					High Voltage Battery Temperature Sensor 5	5	7	8	UNM	-40°C to 215°C	E = (N × 1) - 40	
					High Voltage Battery Temperature Sensor 6	6	7	8	UNM	-40°C to 215°C	E = (N × 1) - 40	
PPEI Hybrid Balancing Request	$1D9	25			High Voltage Battery Balancing Request Matrix	0	7	48	PKT	N/A	N/A	BPIM
					Cell Index	0	7	4	ENM	N/A	$0 = do not use data $1 = cell index 1 to 40 $2 = cell index 41 to 80 $3 = cell index 81 to 120 $4 = cell index 121 to 160 $5 = cell index 160 to 200 $6 to $F = reserved for future use	
					Cell Open Circuit Voltage Request	0	3	1	BLN	N/A	$0 = Open Circuit Voltage $1 = Under Load	
					Reserved	0	2	3	N/A	N/A	N/A	
					Cell Balancing SubID 1	1	7	1	ENM	N/A	$0 = Off; $1 = On	
					Cell Balancing SubID 2	1	6	1	ENM	N/A	$0 = Off; $1 = On	
					Cell Balancing SubID 3	1	5	1	ENM	N/A	$0 = Off; $1 = On	
					Cell Balancing SubID 4	1	4	1	ENM	N/A	$0 = Off; $1 = On	
					Cell Balancing SubID 5	1	3	1	ENM	N/A	$0 = Off; $1 = On	
					Cell Balancing SubID 6	1	2	1	ENM	N/A	$0 = Off; $1 = On	
					Cell Balancing SubID 7	1	1	1	ENM	N/A	$0 = Off; $1 = On	
					Cell Balancing SubID 8	1	0	1	ENM	N/A	$0 = Off; $1 = On	
					Cell Balancing SubID 9	2	7	1	ENM	N/A	$0 = Off; $1 = On	

Powertrain Expansion Bus GMLAN Frames												
Message	ID	Periodic Interval (ms)	Update Time (ms)	Event Trigger	Signal	Start Byte	Start Bit	Length	Data Type	Range	Conversion	Transmitter
					Cell Balancing SubID 10	2	6	1	ENM	N/A	$0 = Off; $1 = On	
					Cell Balancing SubID 11	2	5	1	ENM	N/A	$0 = Off; $1 = On	
					Cell Balancing SubID 12	2	4	1	ENM	N/A	$0 = Off; $1 = On	
					Cell Balancing SubID 13	2	3	1	ENM	N/A	$0 = Off; $1 = On	
					Cell Balancing SubID 14	2	2	1	ENM	N/A	$0 = Off; $1 = On	
					Cell Balancing SubID 15	2	1	1	ENM	N/A	$0 = Off; $1 = On	
					Cell Balancing SubID 16	2	0	1	ENM	N/A	$0 = Off; $1 = On	
					Cell Balancing SubID 17	3	7	1	ENM	N/A	$0 = Off; $1 = On	
					Cell Balancing SubID 18	3	6	1	ENM	N/A	$0 = Off; $1 = On	
					Cell Balancing SubID 19	3	5	1	ENM	N/A	$0 = Off; $1 = On	
					Cell Balancing SubID 20	3	4	1	ENM	N/A	$0 = Off; $1 = On	
					Cell Balancing SubID 21	3	3	1	ENM	N/A	$0 = Off; $1 = On	
					Cell Balancing SubID 22	3	2	1	ENM	N/A	$0 = Off; $1 = On	
					Cell Balancing SubID 23	3	1	1	ENM	N/A	$0 = Off; $1 = On	
					Cell Balancing SubID 24	3	0	1	ENM	N/A	$0 = Off; $1 = On	
					Cell Balancing SubID 25	4	7	1	ENM	N/A	$0 = Off; $1 = On	
					Cell Balancing SubID 26	4	6	1	ENM	N/A	$0 = Off; $1 = On	
					Cell Balancing SubID 27	4	5	1	ENM	N/A	$0 = Off; $1 = On	
					Cell Balancing SubID 28	4	4	1	ENM	N/A	$0 = Off; $1 = On	
					Cell Balancing SubID 29	4	3	1	ENM	N/A	$0 = Off; $1 = On	
					Cell Balancing SubID 30	4	2	1	ENM	N/A	$0 = Off; $1 = On	
					Cell Balancing SubID 31	4	1	1	ENM	N/A	$0 = Off; $1 = On	

Powertrain Expansion Bus GMLAN Frames												
Message	ID	Periodic Interval (ms)	Update Time (ms)	Event Trigger	Signal	Start Byte	Start Bit	Length	Data Type	Range	Conversion	Transmitter
					Cell Balancing SubID 32	4	0	1	ENM	N/A	$0 = Off; $1 = On	
					Cell Balancing SubID 33	5	7	1	ENM	N/A	$0 = Off; $1 = On	
					Cell Balancing SubID 34	5	6	1	ENM	N/A	$0 = Off; $1 = On	
					Cell Balancing SubID 35	5	5	1	ENM	N/A	$0 = Off; $1 = On	
					Cell Balancing SubID 36	5	4	1	ENM	N/A	$0 = Off; $1 = On	
					Cell Balancing SubID 37	5	3	1	ENM	N/A	$0 = Off; $1 = On	
					Cell Balancing SubID 38	5	2	1	ENM	N/A	$0 = Off; $1 = On	
					Cell Balancing SubID 39	5	1	1	ENM	N/A	$0 = Off; $1 = On	
					Cell Balancing SubID 40	5	0	1	ENM	N/A	$0 = Off; $1 = On	
PPEI Hybrid Battery General Status	$1DE	25			High Voltage Battery Side Voltage Validity	0	0	1	ENM	N/A	$0 = Valid; $1 = Invalid	VITM
					High Voltage Battery Current Extended Range Validity	1	1	1	ENM	N/A	$0 = Valid; $1 = Invalid	
					High Voltage Battery Current Extended Range	1	0	17	SNM	-655.36 to 655.32 A	E = N × 0.01	
					High Voltage Battery Side Voltage	4	7	16	UNM	0.0 to 655.35 V	E = N × 0.01	

Powertrain Electrical Interface (PTEI) Bus GMLAN Frames												
Message	ID	Periodic Interval (ms)	Update Time (ms)	Event Trigger	Signal	Start Byte	Start Bit	Length	Data Type	Range	Conversion	Transmitter
PTEI Engine General Status	$1A1	25			Reserved for PTEI Engine Diagnostic Torque Converter Clutch Unlock Requested	0	7	1	BLN	N/A	$0 = False; $1 = True	
					Reserved for PTEI Engine Cylinder Deactivation Torque Smoothing Active	0	6	1	BLN	N/A	$0 = False; $1 = True	
					Reserved for PTEI Engine Transmission Gear Request	0	5	6	PKT	N/A	N/A	
					Request Type	0	5	2	ENM	N/A	$0 = No Action $1 = Max Gear Request $2 = Min Gear Request $3 = Hold Gear	
					Requested Gear	0	3	4	ENM	N/A	$0 = No Action $1 = First Gear $2 = Second Gear $3 = Third Gear $4 = Fourth Gear $5 = Fifth Gear $6 = Sixth Gear $7 = Seventh Gear $8 = Eighth Gear	
					Reserved for PTEI Engine Brake Status	1	7	2	ENM	N/A	$0 = Inactive $1 = Active Not Absorbing Torque $2 = Active Absorbing Torque	
					Reserved for PTEI Air Conditioning Compressor Clutch Engaged	1	5	1	BLN	N/A	$0 = False; $1 = True	
					Reserved for PTEI Traction Control System Powertrain Inhibit	1	4	1	BLN	N/A	$0 = False; $1 = True	

Powertrain Electrical Interface (PTEI) Bus GMLAN Frames												
Message	ID	Periodic Interval (ms)	Update Time (ms)	Event Trigger	Signal	Start Byte	Start Bit	Length	Data Type	Range	Conversion	Transmitter
					Reserved for PTEI Engine Metal Protection Active	1	3	1	BLN	N/A	$0 = False; $1 = True	
					Reserved for PTEI Engine Cylinder Deactivation Requested	1	2	1	BLN	N/A	$0 = False; $1 = True	
					Reserved for PTEI Engine Cylinder Deactivation Mode	1	1	2	ENM	N/A	$0 = All Cylinders Active $1 = Deactivation In Progress $2 = Half of Total Cylinders Active $3 = Reactivation In Progress	
					Reserved for PTEI Engine Cold High Idle Active	2	7	1	BLN	N/A	$0 = False; $1 = True	
					Reserved for PTEI Park Neutral Switch Status	2	6	1	ENM	N/A	$0 = Park/Neutral $1 = Not Park/Neutral	
					Reserved for PTEI Park Neutral Switch Status Validity	2	5	1	ENM	N/A	$0 = Valid; $1 = Invalid	
					Reserved for PTEI Diesel Particulate Filter Idle Regeneration Mode Request	2	4	1	BLN	N/A	$0 = False; $1 = True	
					Reserved for PTEI Diesel Particle Filter Cleaning Algorithm Active	2	3	1	BLN	N/A	$0 = False; $1 = True	
					Reserved for PTEI Diesel Particle Filter Cleaning Algorithm Active Mask	2	2	1	ENM	N/A	$0 = Do Not Use Data $1 = Use Data	

Powertrain Electrical Interface (PTEI) Bus GMLAN Frames												
Message	ID	Periodic Interval (ms)	Update Time (ms)	Event Trigger	Signal	Start Byte	Start Bit	Length	Data Type	Range	Conversion	Transmitter
					Reserved for PTEI Accelerator Pedal Position Percent Full Range Validity	2	1	1	ENM	N/A	$0 = Valid; $1 = Invalid	
					Reserved for PTEI Engine Controller Run Crank Terminal Status	2	0	1	ENM	N/A	$0 = Inactive; $1 = Active	
					Reserved for PTEI Engine Post Oxygen Sensor Diagnostic Assistance Requested	3	7	1	BLN	N/A	$0 = False; $1 = True	
					Reserved for PTEI Engine Cruise Control Mode	3	5	3	ENM	N/A	$0 = Inactive $1 = Engaged $2 = Resume $3 = Accel $4 = Coast $5 = Tap	
					Reserved for PTEI Cruise Control Constant Speed Active	3	2	1	BLN	N/A	$0 = False; $1 = True	
					Reserved for PTEI Warm Up Shift Pattern Request	3	1	1	ENM	N/A	$0 = Inactive; $1 = Active	
					Reserved for PTEI Engine Allowed Clutch Adaptation	3	0	1	BLN	N/A	$0 = False; $1 = True	
					Reserved for PTEI Engine Idle Speed Reduced Range	4	7	8	UNM	0 to 2040 rpm	E = N × 8	
					Reserved for PTEI Base Target Engine Idle Speed	5	7	8	UNM	0 to 2040 rpm	E = N × 8	

Powertrain Electrical Interface (PTEI) Bus GMLAN Frames												
Message	ID	Periodic Interval (ms)	Update Time (ms)	Event Trigger	Signal	Start Byte	Start Bit	Length	Data Type	Range	Conversion	Transmitter
					Reserved for PTEI							
					Accelerator Pedal Position Percent Full Range	6	7	8	UNM	0 to 100%	E = N × 100/255	

5 Provisions for Shipping

Not applicable.

6 Notes

6.1 Glossary. Not applicable.

6.2 Acronyms, Abbreviations, and Symbols.

See Appendix A, Table A2.

7 Additional Paragraphs

7.1 All materials supplied to this specification must comply with the requirements of GMW3001, **Rules and Regulations for Materials Specifications.**

7.2 All parts or systems supplied to this standard must comply with the requirements of GMW3059, **Restricted and Reportable Substances for Parts.**

8 Coding System

This standard shall be referenced in other documents, drawings, etc., as follows:

GMW8762

9 Release and Revisions

This standard was originated in June 2003. It was first approved by The Global PPEI Core Team in December 2003. It was first published in February 2004 for the Global PPEI Version 3.4.

Issue	Publication Date	Description (Organization)
1	FEB 2004	Initial publication.
2	AUG 2004	Global PPEI Version 3.5 Release.
3	JUL 2005	Global PPEI Version 3.6 Release.
4	MAR 2006	Global PPEI Version 3.7 Release.
5	MAR 2011	Global PPEI Version 3.8 Release (Global PPEI Core Team)

Appendix A

A1 Change Requests (CRs)

The following are approved Change Requests (CRs) for the Global PPEI Version 3.8 Release that impacted the GMW8762 PPEI General Information, On-Board Diagnostics, Electrical and GMLAN Serial Data Signal Definitions and Framing Requirements:

Table A1: Change Requests

Sections Changed	Description Of Changes	Rationale/Authorization
4.2.2 4.2.3 4.2.5.1	Added the following signals to GMLAN signal summary table, serial data definition and framing: Fuel Filter Life Reset Performed - $3D1 Fuel Filter Life Reset Requested - $1F1 Fuel Filter Remaining Life - $1C3 Fuel Filter Change Now Indication On - $4D1	CR378
4.2.3	Revise Air Conditioning Compressor Mode Request Platform description to further define the “Disengage Immediately” state.	CR392
4.2.2 4.2.3 4.2.5.1	Add the following new signals for reverse backup lamp information: Transmission Engaged State and Transmission Engaged State Validity and add to frame $1F5. Revise Transmission Shift Lever Position platform interface to remove this signal as the source of reverse backup information. Revise Automatic Transmission Commanded Gear platform interface to remove Transmission Shift Lever Position as the source of reverse information and to use Transmission Engaged State. Revise Transmission Estimated Gear platform interface to remove Transmission Shift Lever Position as the source of reverse information and to use Transmission Engaged State.	CR463
4.2.3	Revise Diesel Glow Plug Indication On Powertrain and Platform interface definition to define preglowing and not performing a bulb check.	CR566
4.2.3	Remove references to moderate brake travel switch in the signal Brake Pedal Moderate Travel Achieved.	CR1047
4.2.2 4.2.3 4.2.5.1	Add new signal Platform Transmission Tap Up/Down Secondary Switch State to signal summary and framing. Revise Platform Transmission Tap Up/Down Switch State Powertrain and Platform interface definitions for ERS and DSC. Revise Platform Transmission Tap Up/Down Switch Status Alive Rolling Count to include Platform Transmission Tap Up/Down Secondary Switch State.	CR1112
4.2.2 4.2.3	Add new signal Transmission Shifts Delayed to GMLAN signal summary table serial data definition and framing.	CR1372

Sections Changed	Description Of Changes	Rationale/Authorization
4.2.5.1		
4.2.2 4.2.3 4.2.5.1	Add new signals Engine Intake Air Boost Pressure and Engine Intake Air Boost Pressure Validity to serial data table, signal definition and framing. Revise Engine Boost Pressure Indication to define this value shall be displayed in percent.	CR1408
4.2.5.1	Add Check Fuel Filler Cap Indication On to framing $4D1.	CR1720
4.2.2 4.2.3 4.2.5.1	Add new signals Clutch Start Switch Active and Clutch Start Switch Active Validity to serial data table, signal definition and framing.	CR1690
4.2.3	Revise Vehicle Top Speed Limit Arbitrated Value interface definition to specify the lowest speed value of 132 km/h. Revise Vehicle Top Speed Limit Request interface definition to specify the lowest speed value of 132 km/h.	CR635
4.2.3	Revise Powertrain Exhaust Particle Filter Warning Indication On signal to re-define when the signal will be sent with a data value of “True”.	CR2640
4.2.2 4.2.3 4.2.5.1	Add new signals Clutch Pedal Actual Position and Clutch Pedal Actual Position Validity to serial data table, signal definition and framing.	CR2794
4.2.2 4.2.3 4.2.5.1	Add new signals Accelerator Effective Position and Accelerator Effective Position Validity to serial data table, signal definition and framing.	CR2795
4.2.2 4.2.3 4.2.5.1	Add new signals Brake Pedal Driver Applied Pressure and Brake Pedal Driver Applied Pressure Validity to serial data table, signal definition and framing.	CR589
4.2.2 4.2.3 4.2.5.1	Add new signals Generator Current, Generator Current Validity and Powertrain Regulated Generator Control Active to serial data table, signal definition and framing.	CR317
4.2.2	Revise signal Transmission Output Shaft Angular Velocity Powertrain Interface Description to state “In rear wheel drive configurations this signal shall represent the speed of the input speed to the rear differential.”	CR367
4.2.2 4.2.3 4.2.5.1	Add new signal Engine Performance Identifier to serial data table, signal definition and framing.	CR308
4.2.2 4.2.3 4.2.5.1	Add new alternative fuel signals: Alternative Fuel Acceleration Warning Active Alternative Fuel Level Low Alternative Fuel Level Percent Alternative Fuel Level Percent Validity Alternative Fuel Mode Request Denied Indication On	CR1759

Sections Changed	Description Of Changes	Rationale/Authorization
	Alternative Fuel Mode Selector Switch Active Alternative Fuel Mode Selector Switch Active Validity Alternative Fuel Mode Status Alternative Fuel Pre-heating Active Alternative Fuel Total Capacity to serial data table, signal definition and framing. Revised signals Fuel Injected Rolling Count and Instantaneous Fuel Consumption Rate to include exceptions for alternative fuel usage.	
4.2.2 4.2.3 4.2.5.1	Add new signals: Engine Shutdown Active Engine Shutdown Pending Indication On Add signals to frame $4D1.	CR3754
4.2.2 4.2.3 4.2.5.1	Add new signals: Outside Air Temperature Corrected Value Outside Air Temperature Corrected Value Validity Outside Air Temperature Virtual Device Availability Add signals to frame $3F1	CR3867
2.3	Added the reference to Distributed OBD Architecture and version	CR 651
4.2.2	Provide details on when Powertrain shall transmit normal (non-diagnostic) serial data signals in Accessory/Wakeup or in Run/Crank VNs. Revise PPEI Signal Summary List as follows: Show the ACC VN and Run/Crl VN as used for the following signals: Distance Rolling Count Average Driven Source Show the Run/Crl VN as used for the following signals: Engine Oil Life Reset Performed Fast Idle Mode Active Power Take Off Active Remove the ACC VN for the following signals: Vehicle Speed Average Driven Vehicle Speed Average Driven Source Vehicle Speed Average Driven Validity Vehicle Speed Average Non Driven Vehicle Speed Average Non Driven Validity	CR914
4.2.5.3	Add new table and new section 4.2.5.3 PPEI and ETEI Frame Summary Table	CR1033
4.2.2	Revise signal Engine Run Active to include requirements for hybrid vehicle applications.	CR1490
4.2.1	Define Pulse in GMLAN Serial Data Signals, Terms and Definitions	CR2410

Sections Changed	Description Of Changes	Rationale/Authorization
4.2.3	Revise signal Cruise Control Active Powertrain interface definition to define states for switch active.	CR2485
4.2.3	Revised signal description to add “TOSS is mandatory in automatic and manual transmissions in the OBD II market.” For the following signals: Distance Rolling Count Average Driven, Distance Rolling Count Average Driven Reset Occurred, Distance Rolling Count Average Driven Validity, Distance Rolling Count Average Driven Source, Distance Rolling Count Average Non Driven, Distance Rolling Count Average Non Driven Reset Occurred, Distance Rolling Count Average Non Driven Validity, Driveline Final Axle Ratio, Vehicle Speed Average Driven, Transmission Output Shaft Angular Velocity, Transmission Output Shaft Angular Velocity Validity, Transmission Output Shaft Angular Velocity Sensor Present , Vehicle Speed Average Driven Source, Vehicle Speed Average Driven Validity, Vehicle Speed Average Non Driven, Vehicle Speed Average Non Driven Validity, Wheel Distance Per Revolution Driven	CR2677
4.2.3	Revised signal description for Cruise Control Switch Status to define a one-way solution for the two signal states Speed Increase Switch Active and Speed Decrease Switch Active.	CR2922
4.2.3	Revise Fuel Delivery Pressure Requested to reflect that it is a gauge pressure.	CR3041
4.2.1 4.2.3 4.2.5.1	Remove the signal Brake System Transmission Gear Request Transition Type from signal summary, serial data definitions and framing.	CR3571
4.2.2 4.2.3 4.2.5.1	Add new signal Powertrain Shift Pattern Override Active to serial data table, signal definition and framing. Revise Transmission Platform Shift Pattern Switch 1 Active, Transmission Platform Shift Pattern Switch 2 Active, Transmission Platform Shift Pattern Switch 3 Active, Transmission Platform Shift Pattern Switch 4 Active Powertrain and Platform interface definitions.	CR3141
4.2.2 4.2.3 4.2.5.1	Add the following new GMLAN signals: Accelerator Pedal Override Active Alive Rolling Count Accelerator Pedal Override Active Accelerator Pedal Override Active Protection Value Adaptive Cruise Control Axle Torque Command Adaptive Cruise Control Axle Torque Command Protection Adaptive Cruise Control Axle Torque Command Status Driver Intended Axle Torque Maximum, Driver Intended Axle Torque Maximum Validity Driver Intended Axle Torque Minimum, Driver Intended Axle Torque Minimum Validity Driver Intended Axle Torque, Driver Intended Axle Torque	CR3597

Sections Changed	Description Of Changes	Rationale/Authorization
	Validity Road Load Nominal Axle Torque Vehicle Mass Nominal Remove the following signals: Adaptive Cruise Control Command Adaptive Cruise Control Command Protection Adaptive Cruise Control Powertrain Acceleration Request Superceded Adaptive Cruise Control Powertrain Inhibit Request Adaptive Cruise Control Transmission Gear Request Vehicle Deceleration Engine Torque Minimum Extended Range Vehicle Deceleration Engine Torque Minimum Extended Range Validity Revise the following signal: Adaptive Cruise Control Command Alive Rolling Count (carryover) Add framing: $2CB, $1C4, $1C5, $4F3 Remove framing: $2C9	
4.2.3	Revise signal All Wheel Drive System Status to add a new state $3 and revise signal description. Update framing to show added state.	CR3570
4.2.2 4.2.3 4.2.5.1	Add the following signals to the GMLAN bus and framing: Air Conditioning Compressor Engine Run Request Charge Assist Gauge Percent Climate Control Front Blower Fan Speed Climate Control Rear Blower Fan Speed Driver Door Open Switch Active Driver Intended Axle Torque Driver Intended Axle Torque Maximum Driver Intended Axle Torque Maximum Validity Driver Intended Axle Torque Minimum Driver Intended Axle Torque Minimum Validity Driver Intended Axle Torque Validity High Voltage Battery Available Charge Power High Voltage Battery Available Charge Power Validity High Voltage Battery Available Discharge Power High Voltage Battery Available Discharge Power Validity	CR381

Sections Changed	Description Of Changes	Rationale/Authorization
	High Voltage Battery Contactor Status High Voltage Battery Module Maximum Temperature High Voltage Battery Module Maximum Voltage High Voltage Battery Module Minimum Temperature High Voltage Battery Module Minimum Voltage High Voltage Battery State of Charge High Voltage Battery State of Charge Validity High Voltage Battery Voltage High Voltage Battery Voltage Validity High Voltage Interlock Status Hood Open Indication On Hybrid Hybrid Economy Mode Indication On Hybrid Vehicle High Voltage Inverter Disable Hybrid Vehicle High Voltage System Disabled Rollover Severity Status Service Hybrid System Indication On Starter Generator Speed Starter Generator Speed Validity Traction Control System Operating Mode Transmission Output Rotational Status Vehicle Grade Vehicle Grade Validity Vehicle Stability Enhancement Mode Add Powertrain Expansion Bus and framing for the following signals: Accessory Power Module Input Current Accessory Power Module Input Current Validity Actual Axle Torque Actual Axle Torque Rear Axle Torque Split Actual Axle Torque Validity Air Conditioning Compressor Electrical Power Air Conditioning Compressor Electrical Power Gradient Allowed Air Conditioning Compressor Electrical Power Limit Air Conditioning Compressor Electrical Power Validity Air Conditioning Compressor Virtual Device Availability Chassis System Rear Axle Torque Split Request Chassis System Total Axle Torque Request Chassis System Total Axle Torque Request Status Chassis System Transmission Shift Request Driver Intended Axle Torque Driver Intended Axle Torque Validity Driver Intended Total Brake Torque	

Sections Changed	Description Of Changes	Rationale/Authorization
	Driver Intended Total Brake Torque Alive Rolling Count Engine Deceleration Fuel Cut Off State Jump Assist Status Maximum Immediate Axle Torque Capacity Minimum Immediate Axle Torque Capacity Power Electronics Cooling Loop Temperature Power Electronics Cooling Loop Temperature Validity Powertrain Service Hybrid System Indication Requested Framing: $0C3 PPEI Hybrid Torque Status $0C8 PPEI Regenerative Braking Request $0F5 PPEI Driver Command Brake Status $122 PPEI_Engine_Hybrid_Status_1 $18A ETEI Hybrid Engine Status 1 $18B ETEI_Hybrid_Eng_Torq_Status_ $192 ETEI Engine Hybrid Status 1 $1CA PPEI Chassis System Axle Torque Request $1CE PPEI Chassis System Rear Axle Torque Split Request $1D3 PPEI_Hybrid_General_Status_2 $1D5 PPEI Accessory Power Module General Status $1D7 PPEI Hybrid General Status 1 $451 PPEI Gateway LS General Information Revise the following signal definitions: Accelerator Actual Position Airbag Deployed Airbag Virtual Device Availability Air Conditioning Compressor Normalized Load Automatic Transmission Commanded Gear Cruise Control Active Engine Coolant Temperature Outside Air Temperature Powertrain Estimated Powertrain Crank Active Traction Control System Enabled Transfer Case Mode Transmission Oil Temperature Transmission Shift Lever Position Revise acronym table for new hybrid modules.	
4.2.3 4.2.5.1	Frame $0C1 and $0C5: Redefine the spare bits from “Unused and Reserved 1 and 2” to “Reserved for Platform, Wheel Distance Timestamp Rollover Counter.	CR4517

Sections Changed	Description Of Changes	Rationale/Authorization
	Revise signal descriptions to reflect reserved for platform for the GMLAN signals: Wheel Rotational Status Left Driven, Wheel Rotational Status Right Driven, Wheel Rotational Status Left Non Driven, Wheel Rotational Status Right Non Driven	
4.2.3	Engine Non Emissions Related Malfunction Active and Transfer Case Non Emissions Related Malfunction Active and Transmission Non Emissions Related Malfunction Active: Revise Powertrain and Platform definitions to allow the Service Vehicle Soon telltale to be used.	CR4807
4.2.3	Revise Air Conditioning Compressor System Virtual Device Availability interface definitions to redefine what signals are being monitored. Define what VDA state will be transmitted with the three different A/C systems.	CR1022
4.2.2 4.2.3 4.2.5.1	Add Brake Apply Sensor Home Position Learned to serial data table, definitions and framing (removed “Reserved for Platform”).	CR4526
4.2.3	Revise Wheel Rotational Status Left Driven, Wheel Rotational Status Right Driven, Wheel Rotational Status Left Non Driven, Wheel Rotational Status Right Non Driven signals to remove reference to wheel pulses of 48 to 100.	CR1709
4.2.3 4.2.5.1	Revise Adaptive Cruise Control Axle Torque Command to define Adaptive Cruise Control Type and Driver Assisted Go State. Revise framing to include new state (replaced reserved bits in framing).	CR5519
4.2.3 4.2.5.1	Revise Adaptive Cruise Control Axle Torque Command Status: Request Status to add $4 = Request Suspended Until Driver Input. Revise descriptions to add new state. Revise framing to reflect state $4.	CR5520
4.2.5.1	Revise Engine Intake Air Boost Pressure Validity bit location start bit from 4 to 3.	CR5285
4.2.2 4.2.3 4.2.5.1	Add Notification Event Severity Status to serial data table, signal descriptions and frame $451. Remove signal Rollover Severity Status from serial data table, signal descriptions and frame $451. Revise Airbag Virtual Device Availability to add Notification Event Severity Status as a source signal.	CR5707
4.2.2 4.2.3 4.2.5.1	Add the following signals to serial data table, signal definitions and framing: Engine Platform Switch 1 Enabled Engine Platform Switch 1 Active Engine Platform Switch 1 Status Engine Platform Switch Alive Rolling Count	CR5251
4.2.5.1	Add Frame $3ED for the following signals: Enhanced Services Vehicle Top Speed Limit Active, Enhanced Services Vehicle Top Speed Limit Value Alive	CR5764

Sections Changed	Description Of Changes	Rationale/Authorization
	Rolling Count, Enhanced Services Vehicle Top Speed Limit Password, Enhanced Services Vehicle Top Speed Limit Value	
4.2.2 4.2.3 4.2.5.1	Add the following signals to serial data table, signal definitions and framing: Power Pack Air Temperature In Sensor Value Power Pack Air Temperature Out Sensor Power Pack Fan Afterrun Time	CR5582
4.2.3	Revise Cruise Control Switch Status interface definitions to define the ECM will read the switches. Revise Cruise Control Switch Status Alive Rolling Count and Cruise Control Switch Status Protection Value to add Powertrain will OBD requirements are met.	CR5622
4.2.2 4.2.3 4.2.5.1	Add Wheel Slip Status	CR5581
4.2.2 4.2.3 4.2.5.1	Add the following signals and framing: Launch Control Enabled, Engine Speed Maximum Allowed, Supervisor System Engine Torque Request Extended Range, Supervisor System Engine Torque Request Protection	CR4952
4.2.2 4.2.3 4.2.5.1	Remove the following signals and framing: Launch Control Enabled, Engine Speed Maximum Allowed, Supervisor System Engine Torque Request Extended Range, Supervisor System Engine Torque Request Protection	CR10635
4.2.3	Revise Air Conditioning Compressor Type to add Electric Driven Motor state.	CR3851
4.2.2 4.2.3 Powertrain Expansion Bus	Add new signals: High Voltage Battery Cell Voltage Matrix High Voltage Battery Temperature Sensor 1/Validity High Voltage Battery Temperature Sensor 2/Validity High Voltage Battery Temperature Sensor 3/Validity High Voltage Battery Temperature Sensor 4/Validity High Voltage Battery Temperature Sensor 5/Validity High Voltage Battery Temperature Sensor 6/Validity High Voltage Battery Balancing Request Matrix High Voltage Battery Side Voltage/Validity High Voltage Battery Current/Validity High Voltage Battery Cell Balancing Active Status Voltage Current Temperature Module Initialization Status	CR7022
	Remove Hybrid Vehicle High Voltage System Disabled from $451 and add to $3E1. Revise signal summary to show $3E1 as frame location.	CR6743

Sections Changed	Description Of Changes	Rationale/Authorization
	Cleaned up a second $451 frame and combined it into an existing $451 frame.	Continous Improvement
	Remove Hood Open Indication On Hybrid from signal description and frame $150. Revise Power Pack Fan Afterrun Time frame location from $3F5 to new $3F3. Move Frame $3F5 from GMLAN frame location to Powertrain Expansion Bus GMLAN Frames location. Remove the following frames from the Powertrain Expansion Bus: $0C3, $0C8, $0F5, $122, $18A, $18B, $192, $1CA, $1CE, $1D3, $1D5, $1D7, $451 Remove the following signals: Accessory Power Module Input Current Accessory Power Module Input Current Validity Actual Axle Torque Actual Axle Torque Rear Axle Torque Split Actual Axle Torque Validity Air Conditioning Compressor Electrical Power Air Conditioning Compressor Electrical Power Gradient Allowed Air Conditioning Compressor Electrical Power Limit Air Conditioning Compressor Electrical Power Validity Air Conditioning Compressor Virtual Device Availability Chassis System Rear Axle Torque Split Request Chassis System Total Axle Torque Request Chassis System Total Axle Torque Request Status Chassis System Transmission Shift Request Driver Intended Axle Torque Driver Intended Axle Torque Validity Driver Intended Total Brake Torque Driver Intended Total Brake Torque Alive Rolling Count Engine Deceleration Fuel Cut Off State Jump Assist Status Maximum Immediate Axle Torque Capacity Minimum Immediate Axle Torque Capacity Power Electronics Cooling Loop Temperature Power Electronics Cooling Loop Temperature Validity Powertrain Service Hybrid System Indication Requested Wheel Slip Status Remove Vehicle Grade and Validity from signal summary, signal description and framing.	CR7103

Sections Changed	Description Of Changes	Rationale/Authorization
	Revise Hybrid Vehicle High Voltage Inverter Disable signal name to Hybrid Vehicle High Voltage Inverter Disable Requested. Revise High Voltage Battery Current to High Voltage Battery Current Extended Range and High Voltage Battery Current Validity to High Voltage Battery Current Extended Range Validity.	
4.2.2 4.2.3 Frame $1F9	Revise Power Take Off Active to Power Take Off Mode Active	THN#1281
4.2.2 4.2.3 Frame $3ED	Revise Enhanced Services Vehicle Top Speed Limit Active to Enhanced Services Vehicle Top Speed Limit Request Add signal descriptions: Enhanced Services Vehicle Top Seed Limit Request Enhanced Services Vehicle Top Speed Limit Value Alive Rolling Count Enhanced Services Vehicle Top Speed Limit Password Enhanced Services Vehicle Top Speed Limit Value Revise framing in $3ED.	CR5765
4.2.3	Revise Transmission Shift Pattern Active Status Powertrain description to remove requirement “For Manual Transmission Applications, Transmission Shift Pattern Active Status shall be set to ‘Default Shift Pattern Active’.”	CR5306
4.2.3 4.2.5.1	Revise Power Take Off Engine Torque Limit Value Signal to Power Take Off Engine Torque Limit Value Extended Range and framing range from 1020 to 2040 and revise conversion from E = N × 4 to E = N × 8	CR4806
4.2.2 4.2.3	Revise CNG/LPG signals: Remove the following signals: Alternative Fuel Level Percent Alternative Fuel Level Percent Validity Alternative Fuel Mode Status Alternative Fuel Total Capacity Add the following: Fuel Level Tank 2 Percent Fuel Level Tank 2 Percent Validity Fuel Mode Status Fuel Total Capacity Tank 2 Revise Framing.	CR5900
4.2.2	Revise the following existing signals names:	CR6987

Sections Changed	Description Of Changes	Rationale/Authorization
4.2.3 Frame $1C3 Frame $1E1	FROM: Engine Platform Switch 1 Active TO: Engine Driver Preference Mode Switch 1 Active FROM: Engine Platform Switch Alive Rolling Count TO: Engine Driver Preference Mode Switch 1 Alive Rolling Count FROM: Engine Platform Switch 1 Enabled TO: Engine Driver Preference Mode Switch 1 Enabled FROM: Engine Platform Switch 1 Status TO: Engine Driver Preference Mode Switch 1 Status	
4.2.3	Revise “Antilock Brake System Present” Powertrain Interface Definition by adding allowing Powertrain to determine if wheel speed signals can be used to calculate vehicle speed.	CR7563
Frame $1E1	Add “$3 = Illegal Range” to Switch Data Integrity.	CR7765
4.2.3	Revise “Transmission Oil Temperature” to state a -40°C default temperature if a sensor is not present.	CR8212
4.2.2 4.2.3 Frame $4C1	Add Engine Oil Hot Indication On signal.	CR8401
4.2.2 4.2.3 Frame $1E5	Add Steering Wheel Angle Gradient as a required PPEI signal. Update signal descriptions to incorporate usage and requirements of this signal.	CR8793
4.2.4	Add CAN identifiers for: 180 to 184 – Powertrain 185 – Platform 186 to 19F – Powertrain Remove CAN identifier for: 180 19F Powertrain	CR7383
4.2.4	Add CAN identifiers for: 760 to 77F - Extended Diagnostic Information 780 to 79F - Extended Diagnostic Information Remove CAN identifier for: 180 19F Powertrain	CR7384
4.2.5.2	Revise $1F3 Periodic Interval from 25 to 30 ms	CR8368
4.2.3	Revise Throttle Progression Request Powertrain Interface Definition to clairify when instantaneous changes to throttle.	CR8156
4.2.2 4.2.3 4.2.5.1	Add the following signals to the Signal Summary, Signal Descriptions and to Frame $4C1: Diesel Exhaust Fluid Warning Indication Request Diesel Exhaust Fluid Remaining Distance Validity Diesel Exhaust Fluid Remaining Distance	CR8698
4.2.3	Revise signal description for Transmission Oil Temperature,	CR9838

Sections Changed	Description Of Changes	Rationale/Authorization
	Transmission Oil Temperature Validity, Transmission Oil Temperature Sensor Present Powertrain Interface Definition to state what value shall be sent when a senor is not present.	
4.2.2 4.2.3	Add Fuel Level Emissions Related Status signal: Add the following: Fuel Level Emissions Related Status Revise the following: Fuel Level Percent Validity Revise Framing.	CR10156
4.2.4	Add “Reserved for PTEI Transmission Fluid Pressure Present” to frame $1F5	CR10159
4.2.2 4.2.3 4.2.5.1	Add the following signal to the Signal Summary, Signal Descriptions and revise Frame $0F1 to remove “Reserved for Platform”: Brake Pedal Position	CR8795
4.2.2 4.2.3 4.2.5.1	Add the following signals to the Signal Summary, Signal Descriptions and to Frame $2C3: Engine Manifold Absolute Pressure Engine Manifold Absolute Pressure Validity	CR9815
4.2.5.3	Add $1A1 to table. Add PTEI Frame $1A1 to framing section.	CR10227
4.2.3	For signals Distance Rolling Count Average Driven, Distance Rolling Count Average Driven Reset Occurred, Distance Rolling Count Average Driven Validity, Distance Rolling Count Average Driven Source, Distance Rolling Count Average Non Driven, Distance Rolling Count Average Non Driven Reset Occurred, Distance Rolling Count Average Non Driven Validity, add to Platform Interface Definition “All OBD modules/devices that support legislated PIDs $21 and/or $31 shall use these signals or a subset of these signals for calculating distance traveled.”	CR10545
4.2.3	Revise Engine Cooling Fan Speed signal Powertrain Interface Definition to include radiator outlet temperature, radiator delta temperature (across the radiator), intake air temperature as part of the parameters used to transmit this signal.	CR10800
4.2.5.1	Add frames $120 - Vehicle Odometer and Validity and $514 – Vehicle Identification Number Digits 2-9. Show as “Reserved for Platform”.	CR9130
4.2.2 4.2.3 4.2.5.1	Remove the following signals: All Wheel Drive System Status Center Differential Status Front Differential Locked Rear Differential Locked Secondary Axle Engaged Transfer Case Clutch Temperature	CR10130

Sections Changed	Description Of Changes	Rationale/Authorization
	Transfer Case Clutch Temperature Validity Transfer Case Coupling Decay Gradient Control Transfer Case Coupling Report Type Transfer Case Coupling Request Transfer Case Coupling Request Alive Rolling Count Transfer Case Coupling Request Protection Transfer Case Coupling Status Transfer Case Coupling Value Actual Transfer Case Coupling Value Actual Validity Transfer Case Emissions Related Malfunction Active Transfer Case Mode Transfer Case Mode Validity Transfer Case Non Emissions Related Malfunction Active Transfer Case Oil Temperature Transfer Case Oil Temperature Validity Transfer Case Overheated Indication On Transfer Case Range Transfer Case Range Validity Reserved for ETEI, Transfer Case Emissions Related DTC Traction Torque Decay Gradient Control Transfer Case Axle Maximum Differential Velocity Allowed Active Transfer Case Axle Maximum Differential Velocity Allowed Request Traction Torque Decay Control Active Traction Torque Decay Gradient Control Add the following signals: Front Axle Operational Mode Rear Axle Operational Mode Secondary Axle Control Mode Secondary Axle Estimated Torque Secondary Axle Estimated Torque Validity Secondary Axle Malfunction Indication On Secondary Axle Maximum Differential Velocity Allowed Active Secondary Axle Maximum Differential Velocity Allowed Request Secondary Axle Operational Mode Secondary Axle Status Secondary Axle Temporary Inhibit Indication On Secondary Axle Torque Request Secondary Axle Torque Request Alive Rolling Count	

Sections Changed	Description Of Changes	Rationale/Authorization
	Secondary Axle Torque Request Protection Value	
4.2.2 4.2.3 4.2.5.1	Add new signal and framing for Fuel Alcohol Composition Adaptation in Progress. Revise platform definition for the signal Fuel Alcohol Composition.	CR10948
4.2.3	Revise Powertrain interface definition for the Accelerator Effective Position, Accelerator Effective Position Validity	CR11316
4.2.2 4.2.3 4.2.5.1	Add new signals and framing: Economy Mode Active Indication On Economy Mode Request Denied Indication On Add following signal to frame $1F5: Reserved for PTEI Transmission Pattern Selection Economy Mode Override Commanded Add following signal to frame $ $4C1: Reserved for PTEI, Engine Economy Mode Commanded	CR10916
4.2.3	Revise platform interface description for signal Platform Engine Speed Command Switch Data Integrity.	CR5294
4.2.2	Revise signal name Driver Independent Brake Pedal Apply Active to Driver Independent Brake Apply Active in serial data table.	CR1786
4.2.5.1 4.2.2 4.2.3 4.2.5.1 4.2.5.1	Frame $1C5 revise signal Driver Intended Axle Torque Minimum Validity at location 4,7,1 to Driver Intended Axle Torque Maximum Validity. Revise signal Advance Fuel Flow Estimate to Advanced Fuel Flow Estimate in serial data table, signal definitions and framing. Revise framing $451 for Hybrid Vehicle High Voltage Inverter Disable Requested from a bit length of 2 to 1.	CR11969
4.2.5.1	Revise Fuel Level Emissions Related Status to be a ENM signal in frame $3FB.	CR10761
4.2.2	$1CC: Revise signal locations: Secondary Axle Estimated Torque Secondary Axle Estimated Torque Validity Secondary Axle Maximum Differential Velocity Allowed Secondary Axle Maximum Differential Velocity Allowed Active	CR14252

Sections Changed	Description Of Changes	Rationale/Authorization
	Secondary Axle Maximum Differential Velocity Allowed Request Revise Engine Driver Preference Mode Switch 1 Active signal definition to remove usage for economy mode applications.	
4.2.2 4.2.3 4.2.5.1	Remove hybrid signals not used in PPEI. Remove the following signals: $150: Remove Frame High Voltage Interlock Status High Voltage Battery Contactor Status High Voltage Battery Current Validity High Voltage Battery Current High Voltage Battery Voltage Validity High Voltage Battery Voltage $154: Remove Frame High Voltage Battery Module Maximum Voltage High Voltage Battery Module Minimum Voltage $158: Remove Frame High Voltage Battery Available Charge Power High Voltage Battery Available Charge Power Validity High Voltage Battery Available Discharge Power High Voltage Battery Available Discharge Power Validity High Voltage Battery Module Maximum Temperature High Voltage Battery Module Minimum Temperature High Voltage Battery State of Charge High Voltage Battery State of Charge Validity $451: Climate Control Rear Blower Fan Speed $12A: Remove frame Driver Door Open Switch Active $3E1: Hybrid Economy Mode Indication On $3F5: Remove frame Power Pack Air Temperature In Sensor Value Power Pack Air Temperature Out Sensor Value (Keith Buford email 5/2/2008)	CR14262

Sections Changed	Description Of Changes	Rationale/Authorization
	$1DA: Remove frame Voltage Current Temperature Module Initialization Status High Voltage Battery Cell Balancing Active Status High Voltage Battery Cell Voltage Matrix Cell SubID 1 Voltage Validity Cell SubID 1 Voltage Cell Index Cell SubID 2 Voltage Validity Cell SubID 2 Voltage Cell Open Circuit Voltage Status Cell SubID 3 Voltage Validity Cell SubID 3 Voltage Cell SubID 4 Voltage Validity Cell SubID 4 Voltage	
A.2 A.4 A.5 A.6	Remove PPEI Application Spreadsheet references. Remove ICR summary Table. Remove PPEI Documentation Hierarchy	CR15490

A2 Document Use Summary.

This section includes: (1) Definitions of the PPEI Documents, (2) Naming Conventions for Powertrain controllers, (3) Symbol Convention, (4) Acronyms and Abbreviations of components used within PPEI.

A2.1 Definitions.

Working Document implies that this document has not been reviewed or approved.

Draft Document implies that this document has been submitted to the appropriate technical work groups for internal review and acceptance.

Approved Document implies that this document has been approved by the PPEI Work Group.

Released Document implies that this document has been approved by the PPEI Work Group for publication.

A2.2 Naming Conventions.

Use of the term Powertrain Electronics within this specification may represent modules such as an ECM, TCM or TCCM depending on the application.

A2.3 Symbol Conventions.

A bi-polar transistor symbol is used only to represent low side and high side drivers and is not intended to be a restriction on the actual design.

A3 Acronyms and Abbreviations. See Table A2.

Table A2: Acronyms

Acronym	Name
2WD	Two Wheel Drive
4WD	Four Wheel Drive
ABS	Anti-Lock Brake System
AC	Air Conditioning (Pressure)
AC	Alternating Current
A/C	Air Conditioning
ACC	Adaptive Cruise Control
ACCA	Adaptive Cruise Control with Alert
ACCM	Air Conditioning Control Module
A/D	Analog to Digital
AIR	Air Injection Reaction
APM	Accessory Power Module
ARC	Alive Rolling Count
ASCII	American Standard Code for Information Interchange
AWD	All Wheel Drive
BAS	Brake Apply Sensor
BAS+	Belt Alternator Starter (Hybrid System)
BASS	Brake Apply Sensing System
BBVE	Brake Boost Vacuum Estimation
BCM	Body Control Module

Acronym	Name
BLN	Boolean
BLS	Brake Lamp Switch
BPA	Brake Pedal Apply
BPIM	BAS Power Inverter Module
BSM	Brake Sensing Module
BTSI	Brake Transmission Shift Interlock
CAN	Controller Area Network
CARB	California Air Resource Board
CASE	Crank Angle Sensing Error
CatMon	Catalyst Monitoring
CNG	Compressed Natural Gas
CPID	Control Parameter Identifier
CPP	Clutch Pedal Position
CPPS	Clutch Pedal Position Sensing
CR	Change Request
CRC	Corrected Rolling Count
CRFM	Condensor Radiator Fan Module
CTS	Component Technical Specification
CVT	Continuously Variable Transmission
DC	Direct Current
DFCO	Decel Fuel Cutoff
DIC	Driver Information Center
DID	Data Identifier
DLS	Design Level Suffix
DoD	Displacement on Demand
DPID	Data Parameter Identifier
DSC	Driver Shift Controls
DTC	Diagnostic Trouble Code
EBCM	Electronic Brake Control Module
ECM	Engine Control Module
ECVD	Electrically Controlled Variable Displacement
EDC	Engine Drag Control
EDR	Event Data Recorder
EEPROM	Electrically Erasable Programmable Read Only Memory
EFV	Exhaust Flapper Valve

Acronym	Name
EFVM	Exhaust Flapper Valve Module
EGR	Exhaust Gas Recirculation
EIR	Emission Information Report
EIS	Electrical Interface Standard
eLSD	electrical Limited Slip Differential
EMC	Electro-Magnetic Compatibility
EOBD	European On-Board Diagnostics
EONV	Engine Off Natural Vacuum
EOL	End Of Line
EOT	Engine Oil Temperature
ENM	Enumeration
EPB	Electric Park Brake
EPM	Engine Power Management or Electric Power Management (related to Generator Control)
EPS	Electric Power Steering
ERS	Electronic Range Select
ETC	Electronic Throttle Control
ETEI	Engine/Transmission Electrical Interface
ETS	Enhanced Traction System
EV	Electro Viscous
EVAP	Evaporative Emissions
EVDC	Electronically Variable Displacement Compressors
EWIR	Emission Warranty Information Report
FIR	Field Information Report
FMVSS	Federal Motor Vehicle Safety Standard
FPSC	Fuel Pump Speed Controller
FSCM	Fuel System Control Module
FSRA	Full Speed Range Adaptive
FWD	Front Wheel Drive
GM	General Motors
GMAP	General Motors Asia Pacific
GMB	General Motors do Brasil
GME	General Motors Europe
GMIO	General Motors International Operations
GMLAAM	General Motors Latin America, Africa and Middle East

Acronym	Name
GMLAN	General Motors Local Area Network
GMNA	General Motors North America
GMPT	General Motors Powertrain
GMW	General Motors Worldwide
GRPM	Generator Revolutions Per Minute
GW	Gateway
HVAC	Heating Ventilation and Air Conditioning
HWIO	Hardware Input/Output
IAT	Intake Air Temperature
ICD	Interface Control Document
ICR	Interface Change Request
IMS	Internal Mode Switch
IPC	Instrument Panel Cluster
IT	Intake Temperature
ITDC	International Technical Development Center
LED	Light Emitting Diode
LEV	Low Emissions Vehicle
LPG	Liquefied Petroleum Gas
L/R	Load/Response
LRC	Low Response Control
LSB	Least Significant Bit
LSD	Low Side Driver
MAP	Manifold Absolute Pressue
MAT	Manifold Air Temperature
MBT	Mean Best Timing
MEC	Manufacturing Engineering Counter
MIL	Malfunction Indicator Lamp
MRF	Magneto Rheological Fan
MSB	Most Significant Bit
MTA	Manual Transmission Automatic
NAO	North American Operations (Being Replaced by GMNA)
NSBU	Neutral Start Back-Up
NVM	Non-Volatile Memory
NVRAM	Non-Volatile Random Access Memory
OAT	Outside Air Temperature

Acronym	Name
OBD	On-Board Diagnostics
OBD II	On-Board Diagnostics II
OFVC	Off Vehicle Communications
PAS	Performance Algorithm Shifting
PCB	Printed Circuit Board
PCFS	Post Collision Fuel Shutdown
PEPS	Passive Entry Passive Start
PF	Platform
PID	Parameter Identifier
PKT	Packet
PMM	Power Mode Master
PPEI	Platform-Powertrain Electrical Interface
PPS	Pedal Position Sensor
PRNDL	Park Reverse Neutral Drive Low (Gear Selector)
PSDS	Power and Signal Distribution System
PT	Powertrain
PTEI	Powertrain Electrical Interface
PTO	Power Take-Off
PTSS	Powertrain System State
PWM	Pulse Width Modulated (or Modulation)
PZEV	Partial Zero Emission Vehicle
RadDelta	Radiator Temperature Delta
RadOut	Radiator Outlet Temperature
RAM	Random Access Memory
RDM	Rear Drive Module
ROM	Read Only Memory
RPO	Regular Production Option
RVC	Regulated Voltage Control
RVS	Remote Vehicle Start
RWD	Rear Wheel Drive
SAS	Steering Angle Sensor
SDL	Serial Data Link
SDM	Sensing and Diagnostic Module
SDSS	Signal Delivery Subsystem Design and Analysis
SGCM	Starter Generator Control Module

Acronym	Name
SNM	Signed Numeric
SSTS	Subsystem Technical Specification
SVS	Service Vehicle Soon
TBD	To Be Determined
T-case	Transfer Case
TCC	Torque Converter Clutch
TCCM	Transfer Case Control Module
TCM	Transmission Control Module
TCS	Traction Control System
TCSS	Transfer Case Speed Sensor
TLEV	Transitional Low Emissions Vehicle
TOSS	Transmission Output Shaft Angular Velocity Sensor
TOT	Transmission Oil Temperature
TPIM	Traction Power Inverter Module
TUTD	Tap Up Tap Down
ULEV	Ultra Low Emissions Vehicle
UNM	Unsigned Numeric
USDT	??? ??? ??? ???
UUDT	??? ??? ??? ???
VDA	Virtual Device Availability
VDR	Vehicle Diagnostic Record
VEC	Vehicle Electrical Center
VICM	Vehicle Integration Control Module
VIN	Vehicle Identification Number
VITM	Voltage Current Temperature Module
VN	Virtual Network
VSES	Vehicle Stability Enhancement System
VSS	Vehicle Speed Signal
VTD	Vehicle Theft Deterrent
VTS	Vehicle Technical Specification
WOT	Wide Open Throttle
WSS	Wheel Speed Signal