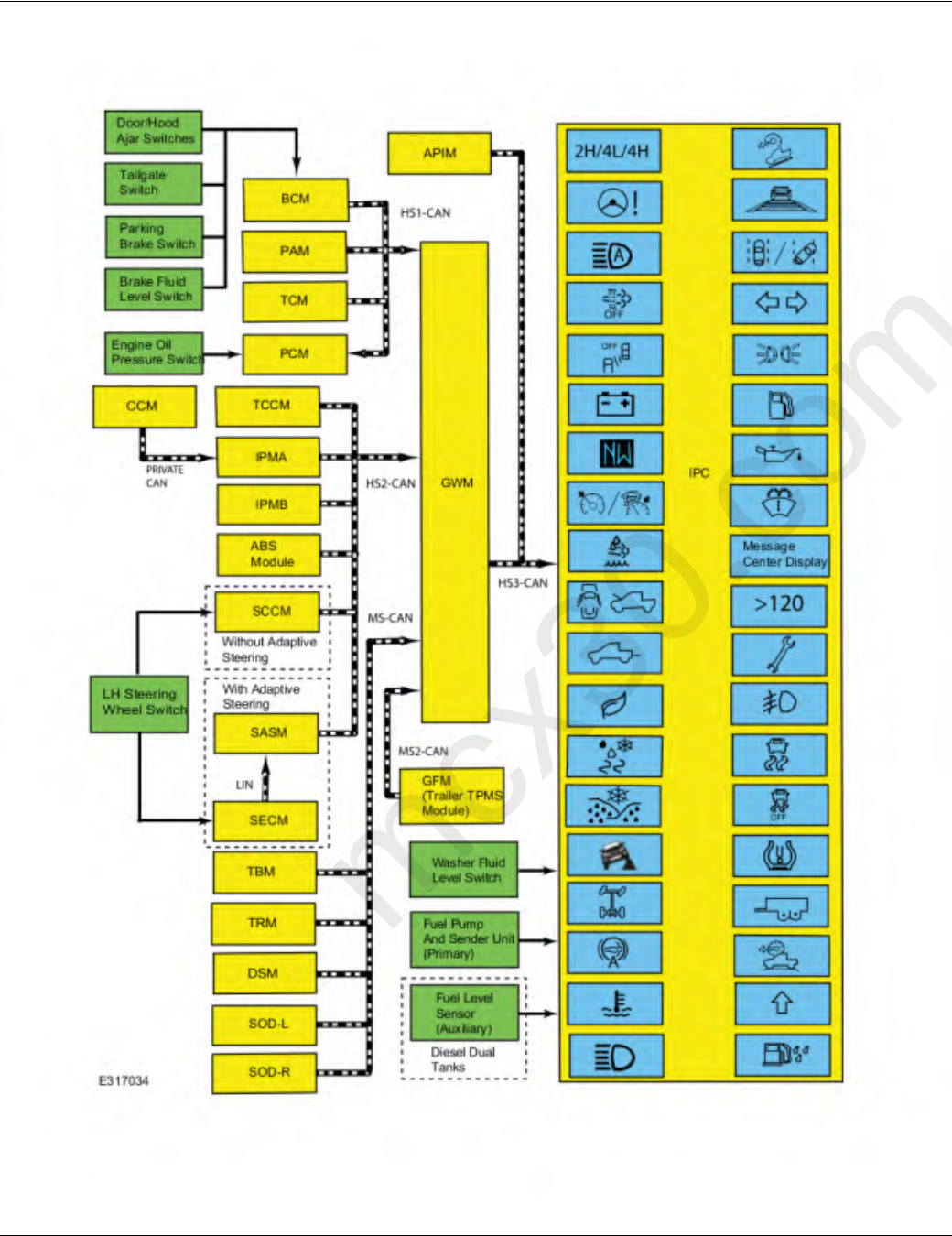


Message Center - System Operation and Component Description

System Operation

System Diagram



Item	Description
1	PAM
2	LH steering wheel switch
3	ABS module
4	TCCM
5	BCM

6	Door/hood ajar switches
7	Parking brake switch
8	Brake fluid level switch
9	GWM
10	SODR
11	IPMA
12	DSM
13	PCM
14	APIM
15	Engine oil pressure switch
16	SODL
17	SCCM
18	TRM
19	TBM
20	Tailgate switch
21	IPC
22	Message center display
23	Fuel pump and sender unit (primary)
24	Fuel level sensor (auxiliary)
25	Diesel dual tanks
26	Washer fluid level switch
27	TCM
28	SASM
29	With adaptive steering
30	Without adaptive steering
31	SECM
32	GFM (Trailer TPMS Module)
33	CCM
34	IPMBIPMB

Network Message Chart

Module Network Input Messages - IPC

Broadcast Message	Originating Module	Message Purpose
4x2 indicator request	TCCM	Input used to control the 2WD (2H) RTT indicator.
4x4 high/low status	TCCM	- Input used to control the 4WD fault messages. - Input used to display the shifting instructions. - Input used to display the change transfer case fluid message. - Input used to display the neutral tow status messages. - Input used to display the off road status messages. - Input used to display the 4WD status shown in the off road display.
4x4 high indicator request	TCCM	Input used to control the 4x4 high (4H) RTT indicator.
4x4 low indicator request	TCCM	Input used to control the 4x4 low (4L) RTT indicator.
Adaptive cruise control gap distance display	CCM	Input used control the ACC gap distance displayed.
Adaptive cruise control message center request	CCM	Input used to display the ACC messages.

Broadcast Message	Originating Module	Message Purpose
4WD lock torque request	ABS module	Input used to control the power distribution display.
4WD range	TCCM	Input used to control the power distribution display.
4WD service required	TCCM	4WD system faults input used to control the powertrain malfunction (wrench) RTT indicator. - Input used to display the check 4WD fault message. - Input used to control the power distribution in the off road display.
Active drive mode status	ABS module	Input used to control the selectable drive mode RTT indicator.
Adaptive steering message center request	SASM	Input used to control the adaptive steering RTT indicator and warning messages.
Auto high beam status display	IPMA	Input used to control the auto high beam RTT indicator.
Auto regen message display	PCM	- Input used to control the DPF auto regeneration RTT (diesel only). - Input used to display the auto exhaust cleaning off message.
Battery low state of charge	BCM	- Input used to control the charging system RTT indicator. - Input used to control the charging system warning messages. - Input used to control the load shed warning messages.
BLIS trailer tow left status	SODL	Input used to control the blind spot information system RTT indicator.
BLIS trailer tow right status	SODR	Input used to control the blind spot information system RTT indicator.
Body service required	BCM	Input used for the BCM controlled system faults input to control the powertrain malfunction (wrench) RTT indicator.
Brake chime request	BCM	Input used to display the parking brake applied message in the message center.
Brake fluid level low message request	BCM	Input used to display the brake fluid level low message in the message center.
Brake pedal applied message request	PCM	Input used to display the brake pedal applied message in the message center while the accelerator is also applied.
Brake (red) warning indicator request	ABS module	Input used to display the message center brake system fault message.
Camera status display	IPMA	- Input used to control the display of lane keeping system message center warning messages. - Input used to display the camera status and fault messages.
Camera front display status	IPMB	Input used to display the camera image when in off road mode.
Check fuel fill inlet message request	PCM	Input used to display the check fuel fill inlet message.
Compass direction	APIM	Input used to display the compass heading.
Cross traffic alert left status	SODL	Input used to control the blind spot information system RTT indicator.
Cross traffic alert right status	SODR	Input used to control the blind spot information system RTT indicator.
Cross traffic left sensor status	SODL	Input used to control the blind spot information system RTT indicator.
Cross traffic right sensor status	SODR	Input used to control the blind spot information system RTT indicator.
Cruise control set speed display	PCM	Input used to control the cruise control set speed displayed in the message center.
Cruise control status	PCM	Input used to control the cruise control RTT indicator and message display based on the system status.
Cruise control override	PCM	Input used to control the adaptive cruise control set speed display when the cruise control is overridden by the driver.
Diesel engine power message display	PCM	Input used to display the reduced engine power message (diesel only).

Broadcast Message	Originating Module	Message Purpose
Diesel exhaust fluid contaminated	PCM	- Input used to control the DPF fluid level RTT indicator (diesel only). - Input used to display the DPF fluid level RTT indicator and range messages (diesel only).
Diesel exhaust fluid level indicator	PCM	- Input used to display the diesel exhaust fluid level RTT indicator and range messages (diesel only). - Input used to display the diesel exhaust fluid level gauge in the information on-demand message center display.
Diesel exhaust fluid level range indicator	PCM	Input used to display the diesel exhaust fluid level RTT indicator and range messages (diesel only).
Diesel exhaust fluid message display	PCM	- Input used to control the DPF fluid level RTT indicator (diesel only). - Input used to display the DPF fluid level RTT indicator and range messages (diesel only).
Diesel exhaust over-temperature	PCM	Input used to display the stop safely now message (diesel only).
Diesel fuel filter lamp request	PCM	Input used to display the low diesel fuel pressure warning message (diesel only).
DPF regen	PCM	Input used to display the DPF cleaning status messages (diesel only).
Driver door ajar status	BCM	- Input used to control the driver door ajar RTT warning indicator and warning message. - Input used to display the not in park warning message. - Input used to display the engine on warning message.
Engine auto exhaust brake indicator request	PCM	Input used to control the engine brake RTT indicator.
Engine coolant temperature data	PCM	- Input used to control the temperature gauge, the over-temperature RTT warning indicator. - Input used to control the engine over-temperature warning message.
Engine exhaust brake indicator request	PCM	Input used to control the engine brake RTT indicator.
Engine idle shutdown	PCM	Input used to control the automatic engine idle shutdown message displayed in the message center.
Engine oil life	PCM	Input used to display the oil life status and oil change messages.
Engine oil temperature	PCM	Input used to display the engine oil temperature status display.
Engine overheat indication request	PCM	- Input used to control the temperature gauge, the over-temperature RTT warning indicator. - Input used to control the engine over-temperature warning message.
Engine rpm data	PCM	- Input used to control the low oil pressure RTT warning indicator. - Input used to display the engine idle hours. - Input used to calculate the DTE display.
Engine service required	PCM	Input used for the powertrain component to control the powertrain malfunction (wrench) RTT indicator.
Engine status	PCM	Input used to display the engine on warning message.
Factory mode	BCM	Input used to indicate whether the vehicle is set in factory mode during vehicle build.
Front fog lamp indicator request	BCM	Input used to control the front fog lamp RTT indicator.
Forward collision warning indicator request	IPMA	Input used to display the forward collision warning indicator in the message center (when the vehicle is not equipped with a HUD).
Forward collision warning message request	IPMA	Input used to display the forward collision fault warning messages.
Fuel alcohol percent	PCM	Input used to calculate the running average fuel economy.

Broadcast Message	Originating Module	Message Purpose
Fuel flow volume display	PCM	Input used to calculate the DTE.
Gear lever position	PCM (gas engine) or TCM (diesel engine)	Input used for the power distribution display.
Headlamp high/low status	BCM	Input used to control the high beam RTT indicator.
Hill descent message request	ABS module	- Input used to display the hill descent status messages. - Input used for the off road message center display.
Hill descent mode	ABS module	Input used to control the hill descent RTT indicator.
Hill start assist status	ABS module	Input used to display the hill start assist fault message.
Hood ajar status	BCM	Input used to control the hood ajar RTT warning indicator and warning message.
Ignition status	BCM	- Ignition RUN, START and accessory states required for the IPC operating modes and fault reporting. - Input used to display the not in park warning message.
Immobilizer message display	BCM	Input used to display the PATS, passive entry and key programming messages.
Keypad factory code	BCM	Input used to display the factory keypad code.
Lane keeping system active display	IPMA	Input used to control the lane keeping assist RTT indicator.
Lane keeping system status display	IPMA	Input used to display the lane keeping system RTT indicator, message center fault and status messages.
Lane keeping system switch status	IPMA	Input used to turn the lane keeping system display on or off in the message center.
Lane keeping system message request	IPMA	Input used to display the lane keeping alert keep hands on wheel message center warning message.
Left rear door ajar status	BCM	Input used to control the left rear door ajar RTT warning indicator and warning message.
Left turn lamp on request	BCM	Input used to control the LH turn signal RTT indicator.
Lock system message request	BCM	Input used to display the power child lock, switch inhibit and low key FOB battery message center messages.
Memory command	DSM	Input used to display the memory seat operational messages.
Odometer count	PCM	- Input used to display the vehicle odometer. - Input used for the odometer reading for configured trailers in the trailer information display. - Input used to calculate the DTE.
Oil pressure warning indicator request	PCM	- Input used to control the low oil pressure RTT warning indicator. - Input used to display the low oil pressure warning message.
Parking aid fault status	PAM	Input used to display the check parking aid fault messages.
Parklamp status	BCM	- Input used to control the lights on RTT indicator. - Input used to enable the trailer lighting display.
Passenger door ajar status	BCM	Input used to control the passenger door ajar RTT warning indicator and warning message.
Perimeter alarm chime request	BCM	Input used to display the perimeter alarm message when the vehicle is entered before deactivating the perimeter alarm.
Power pack status	PCM	- Input used to display the PATS, passive entry and key programming messages. - Input used to display the engine on warning message.
Power shed level request	BCM	- Input used to turn off the progressive range select and SelectShift® displays when vehicle power shed function is requesting battery conservation. - Input used to display the power shed informational messages.
Powertrain drive mode status	PCM	Input used to control the tow haul RTT indicator.

Broadcast Message	Originating Module	Message Purpose
Reduced guard status	BCM	Input used to display the reduced guard popup allowing the driver to select the desired alarm setting while exiting the vehicle.
Rear differential lock status	TCCM	- Input used to control the locking differential RTT indicator. - Input used to display the locking differential fault and informational messages.
Rear differential service required	TCCM	Input used to display the locking differential fault and informational messages.
Remote start status	BCM	Input used to display the remote start status messages.
Right turn lamp on request	BCM	Input used to control the RH turn signal RTT indicator.
Selectable drive mode request	ABS module	Input used to control the selectable drive mode RTT indicator.
Selectable drive mode status	ABS module	Input used to control the selectable drive mode RTT indicator.
Side obstacle detect status-left	SODL	Input used to display the BLIS/ CTA system fault messages.
Side obstacle detect status-right	SODR	Input used to display the BLIS/ CTA system fault messages.
Stability-traction control chime request	ABS module	Input used to display the service AdvanceTrac® message.
Stability-traction control disabled indicator request	ABS module	Input used to control the stability-traction control disabled RTT indicator (sliding car OFF icon) .
Stability-traction control indicator request	ABS module	Input used to control the stability-traction control RTT indicator (sliding car icon).
Stability-traction control on/off message request	ABS module	- Input used to control the stability-traction control on/off status messages. - Input used for the off road message center display.
Starting system message request	PCM	Input used to display starting system messages.
Steering wheel angle	ABS module	Input used to display steering wheel angle in the off road display.
Steering wheel lock message request	BCM	Input used to display steering wheel lock fault and information messages.
Tire pressure system status	BCM	Input used to display the TPMS tire pressure status, fault and alert messages.
Tire pressure placard data	BCM	Input used to display the TPMS tire pressure status by wheel location.
Tire pressure warning indicator	BCM	Input used to control the TPMS RTT indicator.
Trail control message request	ABS	Input used to display the trail control message center messages.
Trail control set speed display	PCM	Input used to display the selected speed when vehicle is in trail control mode.
Trail control status	ABS	Input used to control the trail control RTT indicator.
Trailer battery charge	TRM	- Input used to determine the trailer connected status for the trailer information display. - Input used to display the trailer battery charging fault message.
Trailer brake control status	TBM	Input used to display the trailer brake system fault and general trailer brake electrical messages.
Trailer lamp connected	TRM	- Input used to determine the trailer connected status for the trailer information display. - Input used to display the trailer lighting status.
Trailer lamp out	TRM	- Input used to display trailer lamp outage messages. - Input used to display the trailer lighting status.
Trailer sway event in progress	ABS module	Input used to display the trailer sway reduce speed message.

Broadcast Message	Originating Module	Message Purpose
Trailer tire status	GFM (trailer TPMS module)	Input used to control the trailer tire pressure display.
Trailer turn indicator status	TRM	- Input used to display trailer turn lamp status messages. - Input used to display the trailer lighting status.
Transmission gear display	PCM (gas engine) or TCM (diesel engine)	- Input used to display the not in park warning message. - Input also used to control specific gear display in the progressive and SelectShift[®] display.
Transmission gear display mode	PCM (gas engine) or TCM (diesel engine)	- Input used to display the not in park warning message. - Input also used to control the progressive and SelectShift[®] displays (on, off or flash). - Input used to display the engine on warning message.
Transmission range display	PCM (gas engine) or TCM (diesel engine)	- Input used to display the not in park warning message. - Input also used to control the progressive and SelectShift[®] displays.
Transmission range display mode	PCM (gas engine) or TCM (diesel engine)	- Input used to display the not in park warning message. - Input also used to control the progressive and SelectShift[®] displays (on, off or flash).
Transmission shift mode display	PCM (gas engine) or TCM (diesel engine)	- Input used to display the not in park warning message. - Input also used to control the progressive and SelectShift[®] displays.
Transmission service required	PCM (gas engine) or TCM (diesel engine)	Input used for the transmission component to control the powertrain malfunction (wrench) RTT indicator.
Transmission upshift indicator	PCM	Input used to control the upshift RTT indicator (manual transmission only).
Transport mode	BCM	- Input used to indicate whether the vehicle is set in transport mode following vehicle build. - Input used to display the not in park warning message. - Input used to determine the DTE display.
Vehicle dynamics SOS	ABS module	Input used to control the spin-out detected message.
Vehicle speed	PCM	- Input used to control the: - cruise control RTT indicator. - digital speedometer display. - DTE display - engine hour and engine idle hour displays. - not in park warning message. - off road display. - overspeed warning (gulf cooperative countries [GCC]) - power distribution display. - progressive range select and SelectShift[®] displays. - trailer information display. - input used to display the engine on warning message.
Vehicle roll angle display	ABS module	Input used to display the vehicle pitch in the off road display.
Vehicle pitch angle display	ABS module	Input used to display the vehicle angle in the off road display.
Water in fuel	PCM	Input used to control the water in fuel RTT indicator.
Wheel torque	PCM	Input used to determine the fill level for the power distribution display.

Module Network Input Messages - PCM

Broadcast Message	Originating Module	Message Purpose
Engine oil life data reset	IPC	Input used to request an oil life reset.

Message Center Displays

Adaptive Cruise Control

The message center provides a display showing the ACC gap setting, set speed and a graphical image of a vehicle from behind. The IPC receives the cruise control set speed display and the adaptive cruise control gap distance display messages from the GWM over the HS-CAN3. The GWM receives the cruise control set speed display message from the PCM over the HS-CAN1. The GWM receives the adaptive cruise control gap distance display message from the IPMA over the HS-CAN2.

Compass

On the base (2-inch display) and mid-level (4-inch display) IPC, the compass is displayed as a 1 or 2 character display in the message center that indicates the current direction of the vehicle (N, NE, E, SE, S, SW, W, or NW). On the high-level (8-inch display) IPC, the compass can be displayed as a virtual compass along with the 1 or 2 character display. The IPC receives the compass direction from the APIM over the HS-CAN3.

Diesel Exhaust Fluid Level

The diesel exhaust fluid level gauge displays in the message center as a selectable on-demand display. It provides the driver an indication of the current diesel exhaust fluid level available. The IPC receives the diesel exhaust fluid level indicator message from the GWM over the HS-CAN3. The GWM receives the diesel exhaust fluid level indicator message from the PCM over the HS-CAN1.

Digital Speedometer

NOTE: *The digital speed displayed can differ slightly from the analog speedometer due to stepper motor-pointer movement and indication tolerances.*

The IPC provides a redundant digital speedometer display in the message center. The digital speedometer display operates using the same vehicle speed inputs used to control the analog speedometer. See Speedometer.

Refer to: Instrument Panel Cluster (IPC) - System Operation and Component Description (413-01 Instrumentation, Message Center and Warning Chimes, Description and Operation).

DTE

The DTE is calculated in the PCM using the Running Average Fuel Economy (RAFE), which is the fuel economy up to 400 km (250 miles), and the fuel level input from the fuel sender to determine how many kilometers (miles) the vehicle can be driven based on the remaining fuel in the tank. The DTE displayed value can increase, or decrease, or stay the same value depending on customer driving patterns.

The Running Average Fuel Economy (RAFE) is not transmitted over the CAN, however the IPC will show an invalid Running Average Fuel Economy (RAFE) value in Engineering Test Mode. The DTE can vary in the short term by up to 80 km (50 miles), but is usually within 16 km (10 miles). Even if the fuel economy is relatively constant, the DTE can be off over a 80 km (50 mile) range by -24% to +38%.

The DTE display and the fuel gauge both use the fuel level input from the fuel tank and engine fuel consumption to provide their respective functions. If the fuel gauge doesn't function correctly, both the fuel gauge and the DTE display are affected.

If the DTE does not function correctly and the fuel gauge is correct, then Running Average Fuel Economy (RAFE), odometer or vehicle speed related input can be invalid.

The PCM defaults to a preset baseline L/100km (mpg) when the keep alive memory is reset or PCM is flashed and changes afterward based on driving habits and conditions.

NOTE: *The customer calculated DTE can be higher or lower than the DTE displayed in the message center due to changes in driving conditions. It is important to understand how the DTE is calculated and the factors that impact the DTE display when determining how to address any DTE concerns.*

Since the DTE is calculated and averaged over a longer period of time (400 km [250 miles]), varying driving conditions can have a significant impact on the current or short term DTE as opposed to the displayed DTE. This difference often leads to customer complaints of incorrect or invalid DTE. The following list provides some (not all) of the driving conditions that may lead to an incorrect or fluctuating DTE concern:

- Changing between towing/not towing.
- Changing driving between city and highway.
- Allowing the vehicle to idle for long periods of time.
- Using the remote start feature frequently to allow the vehicle to warm up, particularly when parked on a grade.

- Parking or driving on grades.
- Inconsistent use of gasoline or E85 fuels.
- Over-fueling or not filling the tank completely (trickle filling at above full, partial filling with less than 10% of tank capacity).

The PCM uses the following network messages to control the DTE.

- Fuel alcohol percent
- Fuel flow volume display
- Odometer count
- Transport mode
- Fuel level input from the IPC

The IPC receives all messages from the GWM over the HS-CAN3. The GWM receives the transport mode message from the BCM over the HS-CAN1 and the fuel alcohol percent, fuel flow volume display and the odometer count messages from the PCM over the HS-CAN1.

Engine Hour And Engine Idle Hour

The IPC provides engine hour and engine idle hour displays in the message center and uses the following network messages to control the engine hour and engine idle hour displays.

- Engine rpm data
- Vehicle speed

The IPC receives the engine rpm data message for both displays from the GWM over the HS-CAN3. The GWM receives the engine speed message for both displays from the PCM over the HS-CAN1.

The engine idle hour displays also uses vehicle speed to identify whether the engine is simply idling or if the vehicle is being driven. The IPC receives the vehicle speed message from the GWM over the HS-CAN3. The GWM receives the vehicle speed message from the PCM over the HS-CAN1.

Engine Oil Life Message Center Display

The instrument cluster provides messages to inform the driver about the engine oil life status, engine oil life reset status and when an engine oil change is required. The duration of the interval between engine oil changes is calculated in the PCM and varies due to driving conditions. The PCM assumes a base mileage of 16,090 km (10,000 mi) or 1 year for normal driving. However, this number is adjusted down for conditions such as high engine temperature, high engine rpm, use of flex fuel, engine hours (diesel engines), oil dilution (diesel), engine torque (diesel), oil temperature (diesel) and possibly low engine oil level. The PCM calculates and provides the engine oil life percent message to the IPC. The IPC further converts the remaining engine oil life using the driver's configured engine oil life start value and displays the engine oil life percentage, indicating the remaining engine oil life. The engine oil change minder can be reset at any time by the driver.

The IPC receives the engine oil life message from the GWM over the HS-CAN3. The GWM receives the engine oil life message from the PCM over the HS-CAN1.

The PCM receives the engine oil life data reset message from the GWM over the HS-CAN1. The GWM receives the engine oil life data reset message from the IPC over the HS-CAN3.

Engine Oil Temperature

The message center provides an engine oil temperature display to inform the driver of the engine oil temperature. The IPC receives the engine oil temperature data message from the GWM over the HS-CAN3. The GWM receives the engine oil temperature data message from the PCM over the HS-CAN1.

Forward Collision Warning

The message center provides a forward collision alert display when a possible forward collision is detected due to a short following distance to the vehicle in front and little or no driver intervention is detected. The forward collision warning alert is displayed when a HUD is not equipped. The IPC receives the forward collision warning indicator request message from the GWM over the HS-CAN3. The GWM receives the forward collision warning indicator request message from the IPMA over the HS-CAN2.

Lane Keeping System

The lane keeping system provides the driver with a lane keeping alert when unintentional drifting outside of the lane is detected. The IPC provides a lane keeping display of the vehicle in the middle of a lane with right and left lane markers to indicate the vehicle position with relation to the lane markings as well as overlay or popup messages to alert the driver when they are drifting out of the lane. The lane markers change color to indicate the condition associated with a specific condition and action or warning as controlled by the lane keeping system. The IPC also provides a lane keeping system message center off indicator to inform the driver that the lane keeping system is turned off. When the lane keeping system is turned off, the IPC turns on the lane keeping system RTT and turns off the lane keeping system display.

The IPC receives both the lane keeping system status display message and the lane keeping system switch status message from the GWM over the

HS-CAN3.

The GWM receives the lane keeping system status display message and the lane keeping system switch status message from the IPMA over the HS-CAN2.

MyKey® Function Message Displays

The IPC provides message center displays for the MyKey® feature. MyKey® displays are controlled through the IPC software based on the MyKey® settings configured through the message center and the type of key in use (MyKey® or administrator key). The MyKey® function also uses other messages received by the IPC for other indications such as vehicle speed for speed limiter displays.

Odometer

The IPC receives the odometer count message from the GWM over the HS-CAN3. The GWM receives the odometer count from the PCM over the HS-CAN1. The IPC monitors the odometer count input from the GWM and commands the odometer with a digital display in the message center.

Off Road Display

The off road display shows the vehicle pitch, vehicle roll and the front wheel turning angle and uses the following network messages to enable and control the display.

Network Message	Function
4x4 high/low status	Used to display the drive (front/rear) status.
Hill descent message request	Used to enable the hill descent icon in the display (on/off) based on driver selection as well as system status.
Stability-traction control on/off message request	Used to enable/disable the off road system based on whether the traction control is enabled/disabled.
Steering wheel angle	Used to display the direction the wheels are pointed (right to left).
Vehicle speed	Used to indicate the vehicle is in motion and to activate the display.
Vehicle pitch angle display	Used to display the vehicle pitch.
Vehicle roll angle display	Used to display the vehicle roll.
Camera front display status	Used to indicate whether the front camera display is on or off.

The IPC receives all messaged inputs from the GWM over the HS-CAN3.

The GWM receives the vehicle speed message from the PCM over the HS-CAN1.

The GWM receives the vehicle roll angle display, vehicle pitch angle display, hill descent message request, stability-traction control on/off message request and the steering wheel angle messages from the ABS module over the HS-CAN2. The GWM receives the 4x4 high low status message from the TCCM over the HS-CAN2. The GWM receives the camera front display status from the IPMB over the HS-CAN2.

TPMS

The IPC provides a message center display showing each tire on a vehicle image to indicate specific tire pressures.

The IPC receives the tire pressure system status and tire pressure placard data messages from the GWM over the HS-CAN3. The GWM receives the tire pressure system status and tire pressure placard data messages from the BCM over the HS-CAN1.

Trailer Information

The trailer information function, located in the towing tab, allows the driver to save up to ten trailers, name the trailers and track or reset their mileage. When a trailer is connected to the vehicle, the trailer information screens display the information for the most recently connected trailer. The user can change the active trailer to another named trailer or create and name a new trailer. If the user chooses not to name a trailer, a default trailer is provided. This feature also provides step-by-step instruction for connecting standard trailers.

The IPC uses the following inputs to display the trailer information.

- BLIS trailer tow left status
- BLIS trailer tow right status

- Gear lever position
- Ignition status
- Odometer count
- Trailer reverse message request
- Trailer setup
- Transport mode
- Vehicle speed

The IPC receives all messaged inputs from the GWM over the HS-CAN3.

The GWM receives the odometer count, gear lever position and vehicle speed messages from the PCM over the HS-CAN1.

The GWM receives the transport mode and ignition status messages from the BCM over the HS-CAN1.

The GWM receives the trailer reverse message request messages from the IPMB over the HS-CAN2.

The GWM receives the BLIS trailer tow left status and BLIS trailer tow right status messages from the SODL and SODR, respectively, over the MS-CAN.

Trailer Lighting

The trailer lighting display provides trailer running, stop and turn lights whenever a trailer is connected. The display shows an image of a trailer from the rear with individual lamps in typical locations. The lights are either filled or highlighted depending on the lamps status along with a text status for the lighting system.

The IPC uses the following inputs to display the trailer lighting.

- Parklamp status
- Trailer lamp connected
- Trailer turn indicator status
- Trailer lamp out (displays trailer parking lamp status)

The IPC receives all messaged inputs from the GWM over the HS-CAN3.

The GWM receives the parklamp status message from the BCM over the HS-CAN1.

The GWM receives the trailer lamp connected, trailer turn indicator status and the trailer lamp out messages from the TRM over the MS-CAN.

Trailer TPMS

The IPC provides a trailer TPMS display to indicate tire pressures in the trailer tires.

The IPC receives the trailer tire status message from the GWM over the HS-CAN3. The GWM receives the trailer tire status message from the GFM (trailer TPMS module) over the HS-CAN2.

RTT Indicators

NOTE: *It is important to view each of the cluster options in the Overview to identify which IPC uses a specific RTT.*

Refer to: Instrument Panel Cluster (IPC) - Overview (413-01 Instrumentation, Message Center and Warning Chimes, Description and Operation).

4WD (2H, 4L, And 4H)

For the Electronic Shift On the Fly (ESOF) 4WD system, the IPC provides RTT indicators to inform the driver of the status of the 4WD system state. The IPC receives the 4x2 indicator request, 4x4 low indicator request and 4x4 high indicator request messages from the GWM over the HS-CAN3. The GWM receives the 4x2 indicator request, 4x4 low indicator request and 4x4 high indicator request messages from the TCCM over the HS-CAN2.

Adaptive Steering

The message center provides the adaptive steering RTT to alert the driver to adaptive steering states and faults. Depending on the state, the adaptive steering RTT flashes amber, is solid amber or solid red. The IPC receives the adaptive steering message center request from the GWM over the HS-CAN3. The GWM receives the adaptive steering message center request from the SASM over the HS-CAN2.

Auto High Beam

The IPC provides the auto high beam RTT to inform the driver the auto high beam function is turned on and the high beam status may automatically change. The IPC receives the auto high beam status display message from the GWM over the HS-CAN3. The GWM receives the high beam status display message from the IPMA over the HS-CAN1.

BLIS Off

The IPC provides a RTT to inform the driver the BLIS is turned off.

The IPC receives all network messages required to operate the BLIS RTT from the GWM over the HS-CAN3.

The GWM receives the cross traffic alert left status, side obstacle detect status-left and the BLIS trailer tow left status messages from the SODL over the MS-CAN.

The GWM receives the cross traffic alert right status, side obstacle status-right and the BLIS trailer tow right status messages from the SODR over the MS-CAN.

Charging System

The IPC provides a charging system RTT along with message displays indicating the status of the charging system. When a fault is present in the charging system, the BCM sends the battery low state of charge message to display message center warning messages and the charging system RTT.

The IPC receives the battery low state of charge message from the GWM over the HS-CAN3. The GWM receives the battery low state of charge message from the BCM over the HS-CAN1.

Cruise Control

The cruise control RTT informs the driver of the cruise control status (off, active or standby). When off, the cruise control RTT is not displayed. When the cruise control system is active, the cruise control RTT turns green and turns gray when in standby.

The IPC uses cruise control status, cruise control set speed and cruise control override messages to control the cruise control RTT.

The IPC receives the cruise control status, cruise control set speed and cruise control override messages from the GWM over the HS-CAN3.

The GWM receives the cruise control status, cruise control set speed and cruise control override messages from the PCM over the HS-CAN1.

Diesel Exhaust Fluid Level

The diesel exhaust fluid level indicator uses the following messages to control the indicator.

- Diesel exhaust fluid message display
- Diesel exhaust fluid contaminated

The IPC provides the diesel exhaust fluid level RTT indicator to inform the driver the diesel exhaust fluid level is low or a fault condition exists in the diesel exhaust fluid level indication system. The IPC receives the diesel exhaust fluid message display and the diesel exhaust fluid contaminated messages from the GWM over the HS-CAN3. The GWM receives the diesel exhaust fluid message display and the diesel exhaust fluid contaminated messages from the PCM over the HS-CAN1. When a fault condition exists or the diesel exhaust fluid level is low, the IPC flashes the diesel exhaust fluid level RTT indicator to alert the driver and draw attention to the warning message displayed related to the fluid level status and engine status.

DPF Auto Regeneration

The IPC provides a menu selection to allow the user to turn off the DPF auto regeneration mode. The IPC receives the auto regeneration request message to the GWM over the HS-CAN3. The GWM sends the auto regeneration request message to the PCM over the HS-CAN1. If the PCM agrees to turn off the DPF auto regeneration control, the PCM sends the auto regen message display message back to the GWM over the HS-CAN1. The GWM sends the auto regen message display message to the IPC over the HS-CAN3 to illuminate the DPF auto regeneration RTT indicator.

Door Ajar, Hood Or Tailgate Ajar Warning

The IPC provides the door, hood ajar or tailgate ajar RTT indicator along with message displays to indicate the status of the doors, hood or tailgate. The BCM monitors each of the ajar inputs (driver, passenger, left rear, right rear, hood or tailgate) and sends the driver door ajar, passenger door ajar, left rear door ajar, right rear door ajar, hood ajar and tailgate ajar status messages to the GWM over the HS-CAN1. The IPC receives the driver door ajar, passenger door ajar, left rear door ajar, right rear door ajar, hood ajar and tailgate ajar status messages from the GWM over the HS-CAN3 to display the specific ajar RTT and corresponding warning message.

ELD

The IPC receives the rear differential lock status message from the GWM over the HS-CAN3. The GWM receives the rear differential lock status message from the TCCM over the HS-CAN1.

If the vehicle is shifted into ELD mode, the TCCM sends the rear differential lock status message to illuminate the ELD indicator. If the vehicle is shifted out of ELD mode, the TCCM sends the rear differential lock status message to turn off the ELD indicator, informing the driver the vehicle has shifted out of ELD mode.

Engine Brake

The IPC provides the engine brake RTT indicator to inform the driver that the engine brake feature has been turned on. The IPC receives the engine exhaust brake indicator request from the GWM over the HS-CAN3. The GWM receives the engine exhaust brake indicator request from the PCM over the HS-CAN1.

Engine Over-Temperature

The IPC provides the engine over-temperature RTT indicator to alert the driver the engine is over temperature. The IPC receives the engine overheat indication request and the engine coolant temperature data from the GWM over the HS-CAN3. The GWM receives the engine overheat indication request and the engine over-temperature message from the PCM over the HS-CAN1.

Front Fog Lamp

The front fog lamp RTT indicator informs the driver that the front fog lamps are turned on. The IPC receives the front fog lamp indicator request from the GWM over the HS-CAN3. The GWM receives the front fog lamp indicator request from the BCM module over the HS-CAN1.

High Beam Indicator

The high beam RTT indicator informs the driver that the high beams are turned on. The IPC receives the headlamp high beam status message from the GWM over the HS-CAN3. The GWM receives the headlamp high beam status message from the BCM module over the HS-CAN1.

Hill Descent

The IPC provides the hill descent RTT to indicate to the driver that the hill descent control is on. The IPC receives the hill descent mode message from the GWM over the HS-CAN3. The GWM receives the hill descent mode message from ABS module over the HS-CAN2.

Lane Keeping Aid

The IPC provides the lane keeping aid on RTT indicator to indicate the lane keeping system has been turned on or is active, and a lane keep assist RTT indicator to indicate the vehicle is drifting outside the traffic lane. The IPC receives the lane keeping system active display and the lane keeping system status display from the GWM over the HS-CAN3. The GWM receives the lane keeping system active display and the lane keeping system status display from the IPMA over the HS-CAN2.

LH - RH Turn Signal/Hazard

When the multifunction switch is in the LH or RH turn position or if the hazard switch is on, the BCM sends the right turn lamp on request, the left turn lamp on request or both messages to the GWM over the HS-CAN1. The GWM sends the right turn lamp on request, the left turn lamp on request or both messages to the IPC over the HS-CAN3. Upon receipt of the applicable turn signal on/off data, the IPC flashes the turn signal RTT indicator on and off.

Lights On

When the parking lamps are turned on, the BCM sends the parklamp status message to the GWM over the HS-CAN1. The IPC receives the parklamp status message from the GWM over the HS-CAN3 to illuminate the lights on RTT indicator.

Low Fuel

To supplement the fuel gauge indication, the IPC provides the low fuel RTT indicator. When the fuel level reaches approximately 120 km (75 miles) (MyKey® users only) and 80 km (50 miles), 40 km (25 miles), 20 km (10 miles) and 0 km (0 miles) for MyKey® and administrator key users, the IPC turns on the low fuel RTT indicator.

Low Engine Oil Pressure

The IPC uses the engine oil pressure warning indicator request and engine rpm data to control the low engine oil pressure indicator. The engine oil pressure switch is hardwired to the PCM. The PCM provides the engine oil pressure warning indicator request and the engine rpm data to the GWM over the HS-CAN1. The GWM provides the engine oil pressure warning indicator request and engine rpm data to the IPC over the HS-CAN3. The IPC requires engine rpm above 400 rpm before the message center displays the low engine oil pressure RTT indicator.

Low Washer Fluid Level

The low washer fluid level switch is hardwired to the IPC through a single signal circuit and is grounded through a separate ground circuit. The IPC provides a reference voltage to the washer fluid level switch. When the washer fluid is low, the washer fluid level switch closes to ground, pulling the reference voltage low. When the IPC detects the washer fluid input pulled low and illuminates the low washer fluid level RTT indicator.

Overspeed Warning (Gulf Cooperative Countries [GCC])

The IPC provides an overspeed warning RTT indicator when the vehicle speed has reached or exceeded the 120 km/h (75 mph) threshold. The IPC receives the vehicle speed message from the GWM over the HS-CAN3. The GWM receives the vehicle speed message from the PCM over the HS-CAN1.

Powertrain Malfunction (Wrench)

The IPC provides a powertrain malfunction (wrench) message center RTT to indicate transmission, Electronic Throttle Control (ETC), 4WD, and BCM concerns.

The IPC receives all the required messages from the GWM over the HS-CAN3.

The GWM receives the engine service required message from the PCM over the HS-CAN1.

The GWM receives the transmission service required message from the PCM (gas engine) or TCM (diesel engine) over the HS-CAN1.

The GWM receives the 4WD service required message from the TCCM over the HS-CAN2.

The GWM receives the body service required message from the BCM over the HS-CAN1.

PRNDM/Progressive Range Select And SelectShift®

The progressive range select display provides a numerical display of the lower transmission ranges and indicates to the driver which gear is currently selected when the driver has manually shifted to a lower range (1-6 or 1-10). The SelectShift® display indicates to the driver which gear is currently selected when the transmission is in the SelectShift® mode. When the transmission is in SelectShift® mode, the gear number is displayed in the SelectShift® display area.

For additional information related to the progressive range select or SelectShift® features, refer to the Owner's Literature.

The IPC uses the following messages to control the PRNDM/progressive range select and SelectShift® indication.

- Ignition status
- Power shed level request
- Transmission gear display
- Transmission gear display mode
- Transmission range
- Transmission range display mode
- Transport mode
- Vehicle speed

The IPC receives all required messages from the GWM over the HS-CAN3.

The GWM receives the transmission gear display, the transmission gear display mode, the transmission range and transmission range display mode messages from the PCM (gas engine) or TCM (diesel engine) and the vehicle speed message from the PCM over the HS-CAN1.

The GWM receives the ignition status, power shed level request and transport mode messages from the BCM over the HS-CAN1.

The IPC also uses a park detect switch (part of the selector lever) input to signal the shift lever is fully seated in the PARK (P) position. The IPC compares the park detect switch input with the park status in the transmission gear position message sent from the PCM. The IPC provides a battery reference voltage to the park detect switch. When the selector lever is in PARK (P), the park detect switch routes the reference voltage to ground, pulling the circuit low to the IPC. When the selector lever is moved out of PARK (P), the park detect switch opens to ground, sending the reference voltage high.

Selectable Drive Mode (ECO, Slippery, Sand/Snow, Rock Crawl)

The IPC provides the selectable drive mode indicator to indicate which drive mode is selected and active. The driver can select ECO mode for more economical driving, slippery mode, deep snow/sand mode or rock crawl mode for improved traction. The IPC receives the selectable drive mode status, selectable drive mode request and active drive mode status messages from the GWM over the HS-CAN3. The GWM receives the selectable drive mode status, selectable drive mode request and active drive mode status messages from the ABS module over the HS-CAN2.

Stability-Traction Control Disabled RTT Indicator (Sliding Car OFF Icon)

When the driver enables or disables the stability-traction control system, the ABS module sends the stability-traction control disabled indicator request message to the GWM over the HS-CAN2. The GWM sends the stability-traction control disabled indicator request message to the IPC over the HS-CAN3 to illuminate or turn off the stability-traction control disabled RTT indicator (sliding car OFF icon) based upon the system state.

Refer to ABS/Brake/Stability-Traction Control System Indication description for information on the conditions when the stability-traction control disabled indicator (sliding car OFF icon) is turned on.

When a MyKey® administrator has set the AdvanceTrac® feature to always on and a MyKey® programmed key is in use, the stability-traction control system cannot be disabled. The menu selection in the message center used to disable the stability-traction control system does not display when a MyKey® is in use, but remains active for the MyKey® administrator to select the AdvanceTrac® always on feature off. The stability-traction control RTT indicator still functions normally to indicate a stability-traction control system fault and a stability-traction control

active event.

Refer to ABS/Brake/Stability-Traction Control System Indication description for information on the conditions when the stability-traction control indicator (sliding car icon) is turned on.

Stability-Traction Control RTT (Sliding Car Icon)

The stability-traction control RTT indicator informs the driver the stability-traction control system is active by flashing the indicator or that a fault condition exists by illuminating the indicator steady.

The IPC receives the stability-traction control indicator request message from the GWM over the HS-CAN3. The GWM receives the stability-traction control indicator request message from the ABS module over the HS-CAN2.

Refer to ABS/Brake/Stability-Traction Control System Indication description for information on the conditions when the stability-traction control indicator (sliding car icon) is turned on.

TPMS

The IPC receives the tire pressure warning indicator message from the GWM over the HS-CAN3. The GWM receives the tire pressure warning indicator message from the BCM over the HS-CAN1.

If the BCM determines the tire pressure has exceeded the low tire pressure limits, the tire pressure warning indicator request message is sent to the IPC to illuminate the TPMS RTT.

If a TPMS monitor or sensor fault condition exists, the BCM sends the tire pressure warning indicator request message to the IPC to flash the TPMS RTT. The IPC flashes the TPMS warning indicator for 75 seconds then turns the indicator on solid.

Tow Haul

The tow haul RTT indicator illuminates when the tow haul system has been engaged and is actively providing tow haul control for the vehicle. When the system is actively providing tow haul control, the PCM sends the powertrain drive mode status message to the GWM over the HS-CAN1. The IPC receives the powertrain drive mode status message from the GWM over the HS-CAN3.

Trail Control

The trail control RTT illuminates when trail speed control has been selected and the system is active or in standby mode. The selected speed can be adjusted by using the steering wheel switch (SET+ or SET-) or the brake pedal. Pressing the brake pedal does not turn off the system. The IPC receives the trail control status, trail control message request and trail control set speed display from the GWM over the HS-CAN3. The GWM receives the trail control status and trail control message request from the ABS module over the HS-CAN2. The GWM receives the trail control set speed display message from the PCM over the HS-CAN1.

Upshift

The upshift indicator is used to inform the driver of shift points that provide the highest fuel economy. The IPC receives the transmission up shift indicator message from the GWM over the HS-CAN3. The GWM receives the transmission up shift indicator message from the PCM over the HS-CAN1.

Water In Fuel

The water in fuel RTT indicator informs the driver that water has been detected in the fuel. The IPC receives the water in fuel message from the GWM over the HS-CAN3. The GWM receives the water in fuel message from the PCM over the HS-CAN1.

Warning Messages

4WD

The message center provides messages to check the 4x4 system, shifting instructions and to provide a system status when a fault condition exists.

For the 4WD fault message display, the IPC receives the 4WD service required message from the GWM over the HS-CAN3. The GWM receives the 4WD service required message from the TCCM over the HS-CAN2.

For the shifting instructions and system status messages, the IPC receives the 4x4 high/low status message from the GWM over the HS-CAN3. The GWM receives the 4x4 high/low status message from the TCCM over the HS-CAN2.

Adaptive Cruise Control

The message center provides messages explaining the need for driver intervention and system status. The adaptive cruise control messages are supplemental to the cruise control RTT and the adaptive cruise control warning chime. The IPC receives the adaptive cruise control message center request message from the GWM over the HS-CAN3. The GWM receives the adaptive cruise control message center request message from the CCM over the HS-CAN2.

Adaptive Steering

The message center provides the adaptive steering message to supplement the RTT indicator and inform the driver of system states. Depending on the state, the message can be either informational or a warning. The IPC receives the adaptive steering message request from the GWM over the HS-CAN3. The GWM receives the adaptive steering message request from the SASM over the HS-CAN2.

Automatic Engine Idle Shutdown

The message center provides multiple messages explaining the status of an impending engine idle shut down. The IPC receives the engine idle shut down status message request from the GWM over the HS-CAN3. The GWM receives the engine idle shut down status message request from the PCM over the HS-CAN1.

BLIS/ CTA

The message center provides messages indicating the BLIS/ CTA status or fault.

The IPC receives all network messages required to operate the BLIS message display from the GWM over the HS-CAN3.

The GWM receives the cross traffic alert left status, side obstacle detect status-left and the BLIS trailer tow left status messages from the SODL over the MS-CAN.

The GWM receives the cross traffic alert right status, side obstacle status-right and the BLIS trailer tow right status messages from the SODR over the MS-CAN.

Brake System

The message center provides brake system warning messages for the following concerns and status:

- Low brake fluid level
- Parking brake status and faults
- ABS faults

The IPC receives all network messages required to operate the brake warning indicator from the GWM over the HS-CAN3.

When a base brake system fault exists, the ABS module sends the brake (red) warning indicator request to the GWM over the HS-CAN2 to display the check brake system message center warning.

When the parking brake is applied, the BCM sends the brake chime request to the GWM over the HS-CAN1 to display the parking brake engaged message center warning.

When a low brake fluid level condition exists, the BCM sends the brake fluid level low message request to the GWM over the HS-CAN1 to display the brake fluid level low message center warning.

Brake Applied - Power Reduced

The message center provides a brake applied warning message to inform the driver that the brake pedal and accelerator pedals are both applied. The IPC receives the brake pedal applied message request from the GWM over the HS-CAN3. The GWM receives the brake pedal applied message request from the PCM over the HS-CAN1.

Change 4WD Lube

The message center provides the change 4WD lube to inform the driver to change the transfer case lube. The IPC receives the 4x4 high/low status message from the GWM over the HS-CAN3. The GWM receives the 4x4 high/low status message from the TCCM over the HS-CAN2.

Charging System

The message center provides a warning message indicating the status of the charging system. When a fault is present in the charging system, the BCM sends the battery low state of charge message to the GWM over the HS-CAN1. The IPC receives the battery low state of charge message from the GWM over the HS-CAN3.

Check Fuel Fill Inlet

The message center provides a check fuel fill inlet message to warn the driver there is a problem with the fuel fill inlet pipe resulting in a significant evaporative emission leak following vehicle refueling. The IPC receives the check fuel fill inlet message request from the GWM over the HS-CAN3. The GWM receives the check fuel fill inlet message request from the PCM over the HS-CAN1.

Diesel Engine and DPF Messages

The message center provides message center warnings to inform the driver of the DPF status and to explain engine/performance concerns.

- Exhaust over-temperature
 - The message center provides a message informing the driver that the PCM has detected an exhaust over-temperature condition due to a powertrain fault. The IPC receives the diesel exhaust over-temperature message from the GWM over the HS-CAN3. The GWM receives the diesel exhaust over-temperature message from the PCM over the HS-CAN1.
- Fuel pressure low
 - The message center provides a low fuel pressure message informing the driver the fuel pressure is low. The IPC receives the fuel filter lamp request from the GWM over the HS-CAN3. The GWM receives the fuel filter lamp request from the PCM over the HS-CAN1.
- Diesel exhaust fluid level
 - The message center provides multiple status, warning and informational messages to keep the driver informed of the status of the diesel exhaust fluid level. The IPC uses the diesel exhaust fluid level range indicator, the diesel exhaust fluid warning indicator, the diesel exhaust fluid contaminated and the diesel exhaust fluid message display messages to display the appropriate diesel exhaust fluid level status. The IPC receives all the required network messages from the GWM over the HS-CAN3. The GWM receives all the required network messages from the PCM over the HS-CAN1.
- Auto exhaust cleaning OFF
 - The IPC provides an informational message informing the driver the auto exhaust cleaning is turned off. The IPC receives the auto regen message display request from the GWM over the HS-CAN3. The GWM receives the auto regen message display request from the PCM over the HS-CAN1.
- DPF cleaning status
 - The IPC provides an informational message informing the driver of the status of the DPF regeneration. The IPC receives the DPF regen message from the GWM over the HS-CAN3. The GWM receives the DPF regen message from the PCM over the HS-CAN1.
- Diesel engine reduced power
 - The IPC provides an informational message informing the driver that the PCM is reducing engine power as a result of certain engine faults. The IPC receives the diesel engine power message display from the GWM over the HS-CAN3. The GWM receives the diesel engine power message display from the PCM over the HS-CAN1.

Door Ajar Or Hood Ajar

The IPC provides specific message displays to indicate the status of the doors and hood. The IPC receives the driver door ajar, passenger door ajar, left rear door ajar, right rear door ajar and hood ajar status messages from the GWM over the HS-CAN3. The GWM receives the driver door ajar, passenger door ajar, left rear door ajar, the right rear door ajar and hood ajar status messages from the BCM over the HS-CAN1. The BCM monitors each of the ajar inputs and sends the specific door ajar status message to the IPC to display the specific ajar warning message.

ELD

The message center provides informational and fault messages to inform the driver of the ELD status. The IPC receives the rear locking differential service required message and the rear differential lock message request from the GWM over the HS-CAN3. The GWM receives the rear locking differential service required message and the rear differential lock message request from the TCCM over the HS-CAN2.

Engine Oil Life

The instrument cluster provides messages to inform the driver about the engine oil life status, engine oil life reset status and when an engine oil change is required. The duration of the interval between engine oil changes is calculated in the PCM and varies due to driving conditions. The PCM assumes a base mileage of 16,090 km (10,000 mi) or 1 year for normal driving. However, this number is adjusted down for conditions such as high engine temperature, high engine rpm, use of flex fuel and possibly low engine oil level. The PCM calculates and provides the engine oil life percent message to the IPC. The engine oil change minder can be reset at any time by the driver.

The IPC receives the engine oil life message from the GWM over the HS-CAN3. The GWM receives the engine oil life message from the PCM over the HS-CAN1.

The PCM receives the engine oil life data reset message from the GWM over the HS-CAN1. The GWM receives the engine oil life data reset message from the IPC over the HS-CAN3.

Engine Over-Temperature

The message center provides the engine coolant over-temperature message to supplement the engine over-temperature RTT and alert the driver the engine is over temperature. The IPC receives the engine overheat indication request and the engine coolant temperature data from the GWM over the HS-CAN3. The GWM receives the engine overheat indication request and the engine over-temperature message from the PCM over the HS-CAN1.

Factory-Transport Mode

During vehicle build, some modules, such as the IPC and the BCM, are set in factory mode. While in the factory mode the IPC displays FACTORY MODE CONTACT DEALER in the message center. If the vehicle is set in factory mode, the system does not automatically exit the mode and must be manually set to either the transport or normal operation mode.

When the vehicle build is complete, the vehicle is set to transport mode. While in transport mode, the IPC displays TRANSPORT MODE

CONTACT DEALER in the message center. Transport mode is used to reduce the drain on the battery during longer periods where the vehicle is not used. Various systems may be altered or are disabled when in the transport mode. The vehicle automatically reverts to normal operation mode after being driven 201 km (125 mi).

The IPC receives the factory mode message and the transport mode messages from the GWM over the HS-CAN3. The GWM receives the factory mode message and the transport mode message from the BCM over the HS-CAN1.

Forward Collision

The message center provides the forward collision warning messages to inform the driver of the forward collision system status. The IPC receives the forward collision warning message request from the GWM over the HS-CAN3. The GWM receives the forward collision warning message request from the IPMA over the HS-CAN2.

Front Camera

The message center provides multiple messages to inform the driver of the status of the front camera. The IPC receives the camera status display message from the GWM over the HS-CAN3. The GWM receives the camera status display message from the IPMA over the HS-CAN2.

Hill Descent Control

The message center provides informational and fault hill descent control messages to inform the driver of the hill descent control system status. The IPC receives the hill descent message request from the GWM over the HS-CAN3. The GWM receives the hill descent message request from the ABS module over the HS-CAN2.

Hill Start Assist

The message center provides a hill start assist fault message to inform the driver of a hill start assist fault. The IPC receives the hill start assist status message request from the GWM over the HS-CAN3. The GWM receives the hill start assist status message request from the ABS module over the HS-CAN2.

Ignition-Engine On

The message center provides the engine on warning message to inform the driver they are exiting the vehicle when the engine is running. The IPC uses multiple inputs to determine the vehicle is stopped and the driver is preparing to exit the vehicle. The messages required to control the engine on warning message are as follows:

- Driver door ajar status
- Power pack status
- Transmission gear display mode
- Vehicle speed

The IPC receives the driver door ajar status from the GWM over the HS-CAN3. The GWM receives the driver door ajar status from the BCM over the HS-CAN1.

The IPC receives the power pack status and the vehicle speed messages from the GWM over the HS-CAN3. The GWM receives the power pack status, transmission gear display mode and the vehicle speed messages from the PCM over the HS-CAN1.

The IPC receives the transmission gear display mode message from the GWM over the HS-CAN3. The GWM receives the transmission gear display mode message from the PCM (gas engine) or TCM (diesel engine) over the HS-CAN1.

Keypad Factory Code

The message center can display the original keypad factory code when requested. The IPC receives the keypad factory code data from the GWM over the HS-CAN3. The GWM receives the keypad factory code data from the BCM over the HS-CAN1. For information on how to retrieve the factory code,

Refer to: Handles, Locks, Latches and Entry Systems - System Operation and Component Description (501-14 Handles, Locks, Latches and Entry Systems, Description and Operation).

Lane Keeping System

The message center provides a warning message for the lane keeping alert and system fault messages for the over all lane keeping system. The IPC receives the lane keeping system message request, the lane keeping system status display and the camera status messages from the GWM over the HS-CAN3. The GWM receives the lane keeping system message request, the lane keeping system status display and the camera status display message from the IPMA over the HS-CAN2.

Load Shed

The message center provides load shed messages to inform the driver to use less options to conserve battery voltage. The IPC receives the power shed level request from the GWM over the HS-CAN3. The GWM receives the power shed level request from the BCM over the HS-CAN1.

Memory Seat Status

The message center provides memory seat status messages to provide the driver confirmation that memory position storing was successful and that recalling a memory position cannot be recalled while driving the vehicle. The IPC receives the memory command message from the GWM over the HS-CAN3. The GWM receives the memory command message from the DSM over the MS-CAN.

MyKey®

The IPC provides a number of MyKey® related warnings and status messages to indicate restrictions imposed on the MyKey® user. These include MyKey® active, park aid, speed limits, and buckle up warnings among others. MyKey® displays are controlled through the IPC software based on the MyKey® settings configured through the message center and the type of key in use (MyKey® or administrator key). The MyKey® function also uses other messages received by the IPC for other indications such as vehicle speed for speed limiter displays.

Neutral Tow

The message center provides towing system messages to indicate the status of the neutral tow feature when the neutral tow system is enabled and the vehicle is capable of free-rolling. The IPC receives the 4x4 high/low status message from the GWM over the HS-CAN3. The GWM receives the 4x4 high/low status message from the TCCM over the HS-CAN2.

Off Road Mode

The message center provides off road informational messages to indicate the status of the off road system status. The IPC receives the 4x4 high/low status message from the GWM over the HS-CAN3. The GWM receives the 4x4 high/low status message from the TCCM over the HS-CAN2.

Parking Aid System

The IPC provides messages to indicate the status of the parking aid system. The IPC receives the parking aid fault status message from the GWM over the HS-CAN3. The GWM receives the parking aid fault status message from the PAM over the HS-CAN1.

PATS And Passive Key And Immobilizer System

The message center provides the starting system fault message to indicate there is a concern with the PATS. The message center provides passive key and immobilizer system messages to indicate the key is in the luggage compartment, the key is left in the vehicle, no key is detected, accessory power is active, to press the brake to start the vehicle or to place the key in the backup slot. The IPC uses the immobilizer message display messaged input from the BCM to display the applicable message center message.

The IPC receives the immobilizer message display and the power pack status messages from the GWM over the HS-CAN3.

The GWM receives the immobilizer message display message from the BCM over the HS-CAN1.

The GWM receives the power pack status message from the PCM over the HS-CAN1.

Perimeter Alarm And Reduced Guard (Intrusion/Motion)

The message center provides the perimeter alarm message to indicate the perimeter alarm has been activated and to start the vehicle to stop the alarm. The IPC receives the perimeter alarm chime request message from the GWM over the HS-CAN3. The GWM receives the perimeter alarm chime request message from the BCM over the HS-CAN1.

The message center also provides a menu to set up the reduced guard (intrusion/motion) feature of the alarm system. The IPC receives the reduced guard status message from the GWM over the HS-CAN3. The GWM receives the reduced guard status message from the BCM over the HS-CAN1.

Power Child Lock-Switch Inhibit And Low Key Fob

The IPC provides a power child lock warning to inform the driver the child lock feature did not function properly. The power child lock feature is activated through the rear window lockout switch on the driver side master window control switch.

The IPC provides a switch inhibit warning to notify the driver that some switches have been purposely inhibited and are inoperative. For security purposes, interior switches are inhibited by the BCM 20 seconds after the vehicle is electronically locked and prevents someone from using a stick (or other object) through an open window and activating the switch.

The IPC provides a low key fob battery warning to alert the driver the key fob battery needs to be replaced. The low key fob battery warning is not displayed in RUN or START modes if the power child lock warning is active to prevent the BCM from cycling between the two warnings, causing the chime associated with the power child lock warning from repeatedly sounding every 4 seconds.

The IPC receives the lock system message request from the GWM over the HS-CAN3. The GWM receives the lock system message request from the BCM over the HS-CAN1.

PRNDM Not In Park (Shift To Park)

The message center provides a shift to park message to inform the driver the vehicle is not in PARK (P) under 2 sets of conditions. First, the IPC displays the shift to park message if the selector lever is not in PARK (P), the ignition is OFF and the driver door is open or ajar. Second, the message center displays the shift to park message if the selector lever is not in PARK (P), the ignition is ON or in ACC, the driver door is open or ajar and the brake pedal is not applied with vehicle speed less than 5 km/h (3 mph). The IPC uses multiple messages to control the shift to park message.

The IPC receives all required messages from the GWM over the HS-CAN3.

The GWM receives the vehicle speed message from the PCM over the HS-CAN1.

The GWM receives the transmission gear display mode message from the PCM (gas engine) or TCM (diesel engine) over the HS-CAN1.

The GWM receives the driver door ajar status, transport mode and ignition status message from the BCM over the HS-CAN1.

The IPC also uses the park position detect input to determine whether the vehicle is in PARK (P) along with the transmission gear display mode message.

See Park Position Detect Switch component description.

Refer to: Instrument Panel Cluster (IPC) - System Operation and Component Description (413-01 Instrumentation, Message Center and Warning Chimes, Description and Operation).

Remote Start

The IPC provides remote start messages to inform the driver the vehicle is in the remote start active state and how to change the state to a drivable state. The remote start message display is active as soon as the vehicle is remote started (that is, the engine is running, but the ignition status is off).

The IPC receives the remote start status message from the GWM over the HS-CAN3. The GWM receives the remote start status message from the BCM over the HS-CAN1.

Spinout Detection System

The spinout detection feature activates the hazard indicator to alert other vehicles approaching the vehicle following a spinout, potentially reducing the risk of collision, especially in low visibility weather conditions. A spinout is defined as a slip angle greater than 40 degrees followed by 5 seconds of vehicle at rest.

When a spinout is detected, the system activates the hazard indicator and the IPC displays a message to inform the driver that the hazards have been turned on. The IPC receives the vehicle dynamics SOS message from the GWM over the HS-CAN3. The GWM receives the vehicle dynamics SOS message from the ABS module over the HS-CAN2.

Stability - Traction Control

The message center provides stability-traction control system messages to indicate the stability-traction control system status or if the stability-traction control system has a fault and requires service.

When the stability-traction control system has been selected off or on, the ABS module sends the stability-traction control on/off message request to the GWM over the HS-CAN2. The GWM sends the stability-traction control on/off message request to the IPC over the HS-CAN3.

When a fault condition exists in the stability-traction control system, the ABS module sets a DTC and sends the stability-traction control chime request to the GWM over the HS-CAN2. The GWM sends the stability-traction control chime request to the IPC over the HS-CAN3.

Starting System

The message center provides a starting system message to inform the driver of further actions required to start the engine or to explain the reason for the inability to start the engine. The IPC receives the starting system message request from the GWM over the HS-CAN3. The GWM receives the starting system message request from the PCM over the HS-CAN1.

Steering Wheel Lock (If Equipped)

The message center provides messages to inform the driver to turn the steering wheel to enable the release of the steering wheel lock or of a system fault condition. The IPC receives the steering wheel lock message request from the GWM over the HS-CAN3. The GWM receives the steering wheel lock message request from the BCM over the HS-CAN1.

TPMS

The IPC provides message center displays to indicate the TPMS sensor training status or a malfunction in the TPMS. The IPC receives the tire pressure system status message from the GWM over the HS-CAN3. The GWM receives the tire pressure system status message from the BCM over the HS-CAN1.

Trailer

The message center provides messages describing the status of the trailer electrical system. The IPC uses the following inputs to display the trailer message center messages.

- Trailer battery charge
- Trailer brake control status
- Trailer lamp connected
- Trailer lamp out
- Trailer sway event in progress
- Trailer turn indicator status

The IPC receives all messaged inputs from the GWM over the HS-CAN3.

The GWM receives the trailer brake control status message from the TBM over the HS-CAN2.

The GWM receives the trailer sway event in progress message from the ABS module over the HS-CAN2.

The GWM receives the trailer lamp connected, trailer lamp out, trailer turn indicator status and trailer battery charge messages from the TRM over the MS-CAN.

Component Description

Brake Fluid Level Switch

The brake fluid level switch is mounted in the master cylinder reservoir and is hardwired to the BCM through a signal circuit and grounded through a separate body ground circuit. The BCM provides a reference voltage to the brake fluid level switch. When the brake fluid level is low, the float drops, allowing the switch to close, pulling the reference voltage low. When the brake fluid level is high, the float lifts, opening the switch contacts, sending the reference voltage high on the signal circuit to the BCM.

The brake fluid level switch uses an internal resistor in parallel. This enables the BCM to differentiate between a disconnected brake fluid level switch connector and a full level condition.

Fuel Level Sender

The fuel level sender is mounted to the fuel pump and sender unit or the fuel level sensor. The fuel level sender is a dual sweep potentiometer style resistor connected to a float mechanism. The dual sweep design provides a second resistance measurement that reduces the intermittent loss of data due to corrosion between the resistor wires and the sweep arm. As the fuel level changes, the float rises or falls with the fuel level moving the sweep arm across the resistor wires. This movement either increases or decreases the resistance through the unit. The fuel level sensor resistance ranges from 180 ohms $\hat{\pm}$ 4 ohms at empty (E) to 10 ohms $\hat{\pm}$ 2 ohms at full (F). When the fuel level is low, the fuel level sensor resistance is high. When the fuel level is high, the fuel level sensor resistance is low.

Both the fuel pump and sender unit and fuel level sensor are hardwired to the IPC through separate signal and return circuits. The fuel level return circuits are grounded internally in the IPC. The IPC provides a reference voltage on the fuel level signal circuit. As the fuel level changes, the change in resistance raises or lowers the fuel level signal voltage depending on the resistance of the fuel level sender.

Engine Oil Pressure Sensor - 7.3L, 6.7L Diesel

The engine oil pressure sensor is hardwired to the PCM through voltage reference (VREF), signal and return circuits. The PCM provides the sensor voltage supply on the VREF circuit and monitors the change in voltage through the signal and return circuits as the engine oil pressure changes.

Engine Oil Pressure Switch - 6.2L

The engine oil pressure switch is a normally open switch that is hardwired to the PCM through a single signal circuit. The ground is provided by the switch housing when it is mounted on the engine. The PCM provides a reference voltage to the engine oil pressure switch. When engine oil pressure is low, the engine oil pressure switch remains open, sending the reference voltage high. When the engine oil pressure is sufficient, the engine oil pressure switch closes, pulling the reference voltage low to the PCM.

Steering Wheel Switch - Message Center

The message center switch is part of the LH steering wheel switch and is comprised of 5 buttons (up, down, left, right and OK). The message center switch uses different resistance values associated with each specific button. The SCCM sends out a reference voltage to the upper LH steering wheel switch on the input circuit and monitors the voltage drops. The voltage drop varies depending upon the resistance of the specific button pressed, providing indication to the SCCM which button is pressed.
