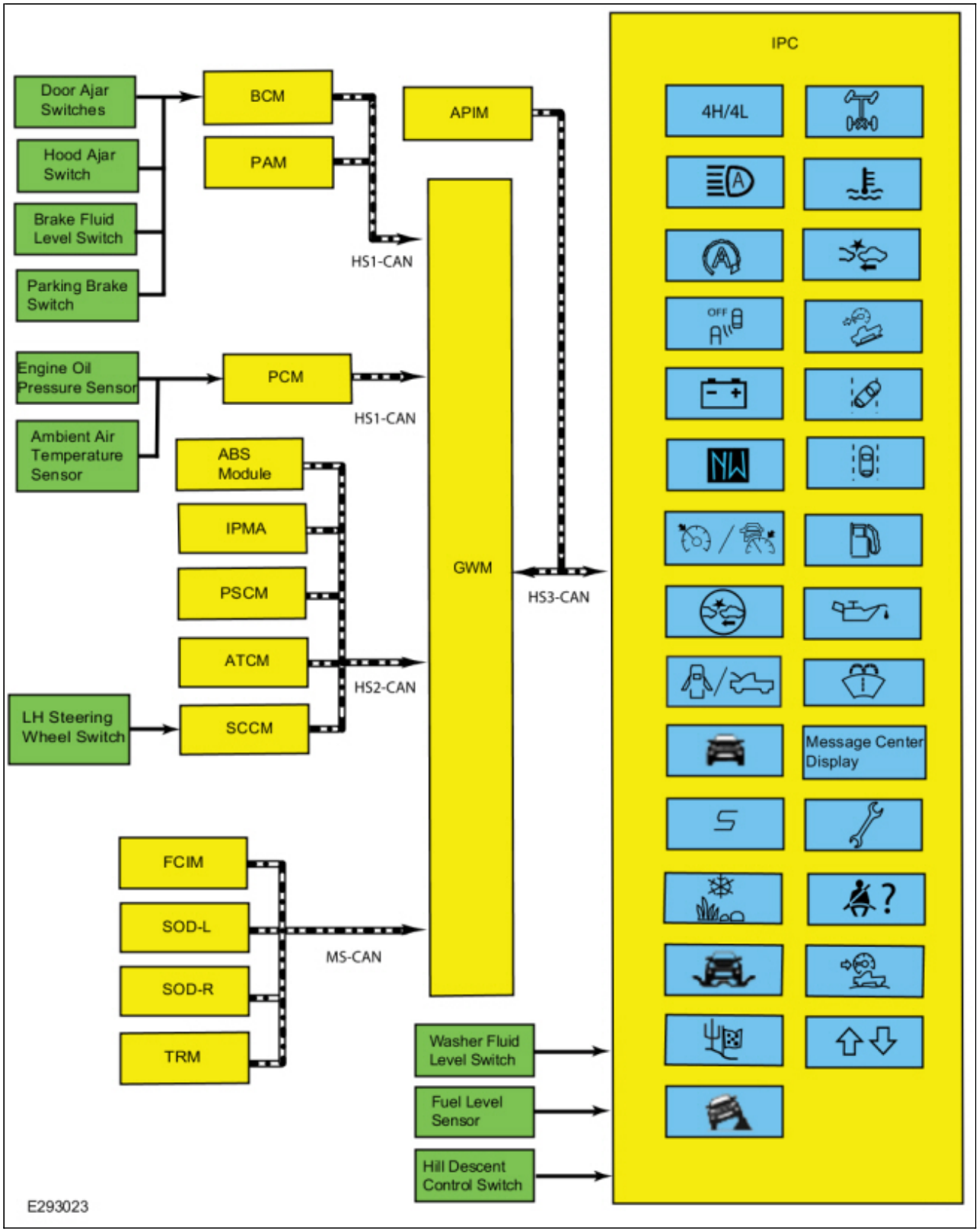
Message Center - System Operation and Component Description

System Operation

System Diagram



Network Message Chart

Module Network Input Messages - IPC

Broadcast Message	Originating Module	Message Purpose
AWD mode request	ATCM	Input used to display the 4WD high (4H) and 4WD low (4L) RTT indicators.
Adaptive cruise control gap distance display	IPMA	Input used to display the adaptive cruise control gap distance.
Adaptive cruise control warning request	IPMA	Input used to display the adaptive cruise control warning messages.
Ambient air temperature	PCM	Input used to display the outside air temperature.
Ambient air temperature filtered	FCIM	Filtered input used to display the outside air temperature.
Auto high beam indication request	IPMA	Input used to control the auto high beam RTT indicator.
Battery low state of charge	BCM	Input used to control the charging system RTT indicator, check charging system warning message and load shed messages.
Body service required request	BCM	Input used for the BCM controlled system faults input to control the powertrain malfunction (wrench) RTT indicator.
Brake fluid level low message request	BCM	Input used to display the low brake fluid level message center message and the parking brake fault message.
Brake (red) warning indicator request	ABS module	Input used to display the message center brake system messages and to display the parking brake message center warning messages.
Camera status	IPMA	Input used to display the lane keeping system camera malfunction message.
Check fuel fill inlet message request	PCM	Input used to display the check fuel fill inlet message.
Child lock message display request	BCM	Input used to display the child lock system fault message.
Compass direction	APIM	Input used to display the current compass heading.
Cross traffic alert left sensor status	SODL	Input used to control the blind spot information system RTT indicator and message center messages.
Cross traffic alert left status	SODL	Input used to control the blind spot information system RTT indicator and message center messages.
Cross traffic alert right sensor status	SODR	Input used to control the blind spot information system RTT indicator and message center messages.
Cross traffic alert right status	SODR	Input used to control the blind spot information system RTT indicator and message center messages.
Cruise control set speed display	PCM	Input used to indicate the cruise control set speed displayed in the message center.
Cruise control override	PCM	Input used to control the adaptive cruise control set speed display when the cruise control is overridden by the driver.
Cruise control status	PCM	Input used to control the cruise control RTT indicator and message display based on the system status.
Driver alert warning display	IPMA	Input used to control the driver alert warning display.

Driver door ajar status	BCM	• Input used for the door ajar RTT indicator and warning message. • Input used for the engine on warning message (push button start). • Input used to control the PRNDL not in park warning message.
Driver rear seat buckle status	RCM	Input used to control the rear seatbelt monitor RTT indicator.
EPAS failure	PSCM	Input used to control the service power steering message display.
Engine coolant temperature data	PCM	Input used to control the over-temperature RTT indicator and engine over-temperature warning message.
Engine oil life	PCM	Input used for the engine oil life display and oil change messages.
Engine oil pressure warning indicator request	PCM	Input used to control the low engine oil pressure RTT indicator and the low engine oil pressure message center warning.
Engine overheat indication request	PCM	Input used to control the engine over-temperature RTT indicator and engine over-temperature warning message.
Engine rpm data	PCM	• Input used to control the low engine oil pressure RTT indicator and warning message. • Input used to calculate the Average Fuel Economy (AFE) and DTE.
Engine service required request	PCM	Input used for the powertrain Electronic Throttle Control (ETC) component to control the powertrain malfunction (wrench) RTT indicator.
EPAS failure	PSCM	Input used to display the steering system warning messages.
Factory mode	BCM	Input used to indicate whether the vehicle is set in factory mode or transport mode, display the PRNDL not in park warning message and to display the appropriate message and power down items such as the PRNDL at key off to conserve the battery.
Forward collision warning indicator request	IPMA	Input used to display the forward collision alert warning indicator and malfunction messages.
Forward distance alert warning indicator request	IPMA	Input used to control the distance alert warning indicator.
Fuel alcohol percent	PCM	Input used to calculate the Average Fuel Economy (AFE) and DTE.
Fuel flow volume display	PCM	Input used to calculate the Average Fuel Economy (AFE) and DTE.
Hill descent control indicator request	ABS module	Input used to control the hill descent control RTT indicator and message center messages.
Hill start assist status	ABS module	Input used to display the hill start status messages.
Hood ajar status	BCM	Input used to control door ajar RTT indicator and the hood ajar warning message.
Ignition key type	BCM	Input used to calculate the Average Fuel Economy (AFE) and DTE for MyKey® settings.
Ignition status	BCM	• Ignition RUN, START and accessory states required for the IPC operating modes and fault reporting. • Input used to display the PRNDL not in park warning message. • Input used to control the odometer display.

Immobilizer message request	BCM	Input used to display the passive entry (no key detected, place key in backup slot, restart now, key programming and accessory power active).
Lane keeping system active display	IPMA	Input used to control the lane keeping aid on RTT indicator and lane keeping aid display.
Lane keeping system status display	IPMA	Input used to control the lane keeping system off RTT indicator and the lane keeping system fault messages.
Lane keeping system hands off display	IPMA	Input used to display the lane keeping system keep hands on the steering wheel warning message.
Left rear door ajar status	BCM	Input used for the door ajar RTT indicator and the left rear door ajar warning message.
Lock system message request	BCM	Input used for the switch inhibit and child lock malfunction warning messages.
Manual shift indicator display	PCM	Input used to control the SelectShift RTT indicators.
Odometer count	PCM	• Input used to control the odometer display. • Input used to calculate the Average Fuel Economy (AFE) and DTE.
Parking aid rear status	PAM	Input used to display the parking aid malfunction message.
Parking brake chime request	BCM	Input used to display the message center brake system messages.
Parking brake message request	ABS module	Input used to display the parking brake status messages.
Parking brake (red) indicator request	ABS module	Input used to display the parking brake status messages.
Passenger door ajar status	BCM	Input used for the door ajar RTT indicator and the passenger door ajar warning message.
Passenger rear seatbelt buckle status	RCM	Input used to control the rear seatbelt monitor RTT indicator.
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 for the engine on warning message (push button start) • Input used to calculate the Average Fuel Economy (AFE) and DTE.
Rear belt monitor	RCM	Input used to display rear belt monitor status.
Rear differential fault status	PCM	Input used to control the check locking differential warning message.
Rear differential lock indicator request	PCM	Input used to control the electronic locking differential RTT indicator and warning message.
Remote start status	BCM	Input used to control the remote start informational message display.
Right rear door ajar status	BCM	Input used for the door ajar RTT indicator and the right rear door ajar warning message.

Side obstacle detect status-left	SODL	Input used to control the blind spot information system RTT indicator and message center messages.
Side obstacle detect status-right	SODR	Input used to control the blind spot information system RTT indicator and message center messages.
Starting system message request	PCM	Input used to display starting system messages.
Stability-traction control chime request	ABS module	Input used to control the service AdvanceTrac® and traction control off warning displays. Also used to control the traction control on/off status messages.
Starting system message request	PCM	Input used to display the starting system message center messages.
Steering wheel angle	ABS module	Input used to control the terrain management off road display.
Steering wheel lock message request	BCM	Input used to control the steering wheel lock system messages.
Steering wheel message center switch data	SCCM	Input used to control the message center navigation and functions.
Stop-start message request	PCM	Input used to control the auto stop-start warning messages.
Stop-start standby indicator	PCM	Input used to control the auto stop-start RTT indicator.
Terrain mode status display request (Raptor only)	ATCM	Input used to control the terrain management drive mode RTT indicators (normal, sport, grass/gravel/snow, mud/sand, Baja, rock) and warning messages.
Terrain mode indicator display (Raptor only)	ATCM	Input used to control the terrain management drive mode RTT indicators (normal, sport, grass/gravel/snow, mud/sand, Baja, rock) and warning messages.
Tire pressure placard data	BCM	Input used for the tire pressure displays by tire location.
Tire pressure system status	BCM	Input used to display specific tire training instructional messages and TPMS fault messages.
Trail control message request	ABS module	Input used to display the trail control warning messages.
Trail control set speed display	ABS module	Input used to display the trail control set speed RTT indicator.
Trail control status	ABS module	Input used to display the trail control RTT indicator.
Trailer sway event status	ABS module	Input used to display the trailer sway event in progress message.
Transmission service required	PCM	Input used for the transmission component to control the powertrain malfunction (wrench) RTT indicator and transmission warning messages.
Transmission gear display	PCM	• Transmission gear selection input used for the PRNDL display. • Input used for the engine on (push button start) warning message.
Transmission gear lever position	PCM	Input used to display the manual (M) in the PRNDL.
Transport mode	BCM	• Input used to indicate whether the vehicle is set in factory mode or transport mode, display the PRNDL not in park warning

		message and to display the appropriate message and power down items such as the PRNDL at key off to conserve the battery. • Input used to control the odometer display.
Trip odometer verify	PCM	Input used to control the trip odometer display.
Vehicle configuration data	BCM	Input used to control the odometer display.
Vehicle dynamics SOS	ABS module	Input used to control the spin-out detected message.
Vehicle pitch angle display	ABS module	Input used to control the terrain management off road display.
Vehicle roll angle display	ABS module	Input used to control the terrain management off road display.
Vehicle speed	PCM	• Input used to control the PRNDL not in park warning message. • Input used to display the digital speedometer. • Input used to control the engine on warning message (push button start). • Input used to calculate the Average Fuel Economy (AFE) and DTE.

Module Network Input Messages - PCM

Broadcast Message	Originating Module	Message Purpose
Engine oil life reset request	IPC	Input used to reset the engine oil life.

Message Center Displays

Adaptive Cruise Control

When the adaptive cruise control system is active, the IPC provides a message center lead vehicle image display that indicates that the adaptive cruise control system detects a lead vehicle. The IPC receives the adaptive cruise control gap distance display message from the GWM over the HS-CAN3. The GWM receives the adaptive cruise control gap distance display message from the IPMA over the HS-CAN2.

Compass Display

On the 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). The IPC receives the compass direction from the APIM over the HS-CAN3.

Digital Speedometer

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

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).
The IPC utilizes software that modifies the display to account for differences between the speedometer gauge indication and the digital display resulting from built in biasing of the indication and tolerances in speedometer stepper motor/needle movement.

DTE/Average Fuel Economy (AFE)

The DTE is calculated in the IPC using the Running Average Fuel Economy (RAFE), which is the fuel economy over the last 480 km (300 miles), and the fuel level input from the fuel sender(s) to determine how many miles the vehicle can be driven based on the remaining fuel in the tank. 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 an 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 to provide their respective functions. If the fuel gauge doesn't function correctly, both the fuel gauge and the DTE display are affected.

The IPC defaults to a preset baseline mpg (English) or liters/100 km (metric) when the battery is initially connected and changes based on driving habits and conditions.

NOTE: *The actual 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 (480 km [300 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 (partial refueling).

To better illustrate the affects of how driving conditions can affect DTE, refer to the following 2 examples. The first example below illustrates how the following observations are normal and expected since the low fuel reminder is triggered from a fuel volume and not from a fixed distance to empty.

- If while driving, the low fuel reminder (low fuel indicator and low fuel warning message) displays when the DTE equals 94.4 km (59 miles) and the driver adds 11.36 L (3 gallons) of fuel, the new DTE may become 124.8 km (78 miles). After continued driving, the low fuel reminder may now display when the DTE equals 83.2 km (52 miles).

The second example (below) illustrates what occurs when idling on an incline. In this example, the customer should be made aware of how the condition will correct after a few minutes of idling on a level surface.

- If the customer stops and parks the vehicle on an incline in a driveway, then in the morning remote starts the vehicle, allowing the engine to idle, the DTE may now equal 184 km (115 miles). As the customer drives, the low fuel reminder displays when the DTE equals 148.8 km (93 miles). Finally, after 5 more minutes of driving, the DTE is back to 80 km (50 miles).

Engine Oil Life Message Center Display

The IPC provides message center messages to inform the driver about the engine oil life 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 PCM receives the engine oil life data reset request from the GWM over the HS-CAN1. The GWM receives the engine oil life data reset request from the IPC over the HS-CAN3.

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.

Factory-Transport Mode Display

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 80 km (50 mi).

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

Lane Keeping System

The lane keeping system combines the lane keeping alert and lane keeping aid systems. The lane keeping alert system alerts the driver of unintentional drifting outside of the lane and the lane keeping aid system corrects the vehicle steering to keep the vehicle in the center of the lane. The IPC provides a lane keeping display as an overhead view 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 their 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 the camera status, lane keeping system status display and the lane keeping system hands off display messages from the GWM over the HS-CAN3.

The GWM receives the lane keeping system status display, the lane keeping system hands off display and camera status messages from the IPMA over the HS-CAN2.

MyKey® Function 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, front wheel turning angle, 4x4 system status and rear differential lock status. The IPC uses the steering wheel angle, vehicle pitch angle display and vehicle roll angle display messages from the GWM over the HS-CAN3. The GWM receives the steering wheel angle, vehicle pitch angle display and vehicle roll angle display messages from the ABS module over the HS-CAN2.

Outside Air Temperature

The Ambient Air Temperature (AAT) sensor is hardwired to the PCM through separate input and return circuits. The PCM provides a reference voltage to the Ambient Air Temperature (AAT) sensor and monitors the change in voltage resulting from changes in resistance as determined by outside air temperature.

The PCM sends the ambient air temperature data to the GWM through the HS-CAN1. The GWM sends the ambient air temperature message to the HVAC (part of the FCIM) over the MS-CAN. The FCIM filters the data and sends the ambient air temperature filtered data back to the GWM over the MS-CAN. The GWM sends the ambient air temperature filtered message to the IPC over the HS-CAN3.

The FCIM is programmed to update the messaged outside temperature data at different rates depending on several criteria to prevent false temperature displays due to a condition known as heat soaking. Heat soaking is where the outside air temperature is hotter in the location of the Ambient Air Temperature (AAT) sensor than the actual outside air temperature.

The outside air temperature display update strategy requires a starting temperature to update from. This starting temperature is controlled based on the length of time the engine is off and the engine temperature. When the engine has been off for longer than 4 hours, the update strategy begins with the unfiltered ambient air temperature input to the PCM. If the engine has been off for less than 4 hours, and the engine coolant temperature is less than 30° C (86° F), the update strategy begins with the filtered ambient air temperature equal to the unfiltered ambient air temperature. If the engine has been off for less than 4 hours, and the engine coolant temperature is greater than 30° C (86° F), the update strategy begins at the stored previous outside air temperature value.

When the sensed outside temperature rises and the vehicle speed is above 32 km/h (21 mph), the outside air temperature display updates after approximately 90 seconds. As the vehicle speed increases, the outside air temperature display updates at a faster rate that is proportional to the increase in vehicle speed. Once the vehicle speed exceeds 80 km/h (50 mph), the display updates without any delay. If the vehicle speed drops below 32 km/h (21 mph), the update delays reset. When the sensed outside temperature drops, the display updates more quickly following the drop experienced by the Ambient Air Temperature (AAT) sensor.

TPMS

The IPC provides a message center display showing each tire on vehicle image to indicate specific tire pressures. The IPC receives the tire pressure placard data message from the GWM over the HS-CAN3. The GWM receives the tire pressure placard data message from the BCM over the HS-CAN1.

RTT Indicators

4WD High and 4WD Low

The IPC provides a 4WD Low and High RTT indicator to indicate transfer case status, including shift in

progress information. It uses the AWD mode request message to set the RTT indicator. The IPC receives the required message from the GWM over the HS-CAN3. The GWM receives the AWD mode request message from the ATCM over the HS-CAN2.

Auto High Beam

The IPC provides the auto high beam RTT indicator to indicate the auto high beam is active. The IPC receives the auto high beam indication request message from the GWM over the HS-CAN3. The GWM receives the auto high beam indication request message from the IPMA over the HS-CAN2.

Auto Stop-Start

The IPC provides the auto stop-start RTT indicator along with multiple messages displayed at various times throughout the auto stop-start system operation to inform the driver of the system status and to provide direction when driver intervention is required. The IPC receives the stop-start standby indicator request from the GWM over the HS-CAN3. The GWM receives the stop-start standby indicator request from the PCM over the HS-CAN1.

Blind Spot Monitoring System (BLIS®) Off

The IPC provides a RTT indicator to inform the driver that the BLIS is turned off. The IPC receives the cross traffic alert left status, cross traffic alert right status, side obstacle detect status-left and side obstacle detect status-right messages from the GWM over the HS-CAN3. The GWM receives the cross traffic alert left status, cross traffic alert right status, side obstacle detect status-left and side obstacle detect status-right messages from the SODL and SODR over the MS-CAN.

Charging System

The IPC provides a charging system RTT indicator 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 indicator.

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 IPC uses the following messaged inputs to control the cruise control RTT indicator and set speed display:

- cruise control status
- cruise control set speed display
- cruise control override

The IPC receives the cruise control messages from the GWM over the HS-CAN3. The GWM receives the cruise control messages from the PCM over the HS-CAN1.

Distance Alert

The IPC provides a graphical display in the message center of the time gap to the vehicle traveling in the same direction, when the cruise control or adaptive cruise control is switched off. The IPC receives the forward distance alert warning indicator request message from the GWM over the HS-CAN3. The GWM receives the forward distance alert warning indicator request message from the IPMA over the HS-CAN2.

Door and Hood Ajar

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

Drive Mode - Normal, Sport, Grass/Gravel/Snow, Mud/Sand, Baja, Rock (Raptor)

The IPC provides a drive mode RTT indicator when a terrain drive mode is selected. The IPC receives the terrain mode status display request and the terrain mode indicator display messages from the GWM over the HS-CAN3. The GWM receives the terrain mode status display request and the terrain mode indicator display messages from the ATCM over the HS-CAN2.

Engine Over-Temperature

The IPC provides a message center warning 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.

Forward Collision Warning

The IPC provides a forward collision warning system indicator and message center message to warn the driver the vehicle is rapidly approaching another vehicle, and a collision event is possible. The IPC receives the forward collision warning indicator request from the GWM over the HS-CAN3. The GWM receives the forward collision warning indicator request from the IPMA over the HS-CAN2.

Hill Descent Control

The IPC provides a RTT indicator to indicate the hill descent control is active. The IPC receives the hill descent control indicator request from the GWM over the HS-CAN3. The GWM receives the hill descent control indicator request from the 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 messages from the GWM over the HS-CAN3. The GWM receives the lane keeping system active display and lane keeping system status display messages from the IPMA over the HS-CAN2.

Low Fuel

To supplement the fuel gauge indication, the IPC provides the low fuel message center warning RTT indicator. When the DTE reaches approximately 80 km (50 miles) or 100 km (62 miles) for MyKey® users, the IPC turns on the low fuel message center warning 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 RTT warning indicator. The engine oil pressure sensor is hardwired to the PCM. The PCM provides the engine oil pressure warning indicator status request and the engine rpm data to the GWM over the HS-CAN1. The GWM provides the engine oil pressure warning indicator status 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 opens, pulling the reference voltage high. When the IPC detects the washer fluid input is an open circuit, it illuminates the low washer fluid level RTT indicator.

Powertrain Malfunction (Wrench)

The IPC provides a powertrain malfunction (wrench) RTT indicator to indicate transmission, Electronic Throttle Control (ETC), AWD and BCM concerns.

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

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

The GWM receives the engine service required and transmission service required messages from the PCM over the HS-CAN1.

Rear Locking Differential

The IPC provides a RTT indicator to indicate current status of the locking differential. The IPC receives the rear differential indicator request message from the GWM over the HS-CAN3. The GWM receives the rear differential indicator request message from the PCM over the HS-CAN1.

Rear Seatbelt Monitor

The IPC provides a RTT indicator to indicate a rear seatbelt is not fastened. The IPC receives the driver rear seatbelt buckle status and passenger rear seatbelt buckle status messages from the GWM over the HS-CAN3. The GWM receives the driver rear seatbelt buckle status and passenger rear seatbelt buckle status messages from the RCM over the HS-CAN2.

SelectShift Gear Position

The IPC provides a suggested upshift and downshift RTT indicator along with a gear position RTT indicator when SelectShift is activated. The IPC receives the manual shift indicator display message from the GWM over the HS-CAN3. The GWM receives the manual shift indicator display message from the PCM over the HS-CAN1.

Trail Control (Raptor)

The IPC provides a RTT indicator when the trail control feature is activated. The IPC receives the trail control status and trail control set speed display messages from the GWM over the HS-CAN3. The GWM receives the trail control status and trail control set speed display messages from the ABS module over the HS-CAN2.

Warning Messages

4WD

The message center provides warning messages and shifting instructions for the driver when using the 4WD system. The IPC receives the AWD status display request message from the GWM over the HS-CAN3. The GWM receives the AWD status display request message from the PCM over the HS-CAN1.

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 indicator and the adaptive cruise control warning chime. The IPC receives the adaptive cruise control warning request message from the GWM over the HS-CAN3. The GWM receives the adaptive cruise control warning request message from the IPMA over the HS-CAN2.

Blind Spot Monitoring System (BLIS®)/Cross Traffic Alert (CTA)

The message center provides messages indicating the reason for the Blind Spot Monitoring System (BLIS®)/Cross Traffic Alert (CTA) fault. The IPC receives the cross traffic alert left sensor status, cross traffic alert right sensor status, side obstacle sensor status-left and side obstacle sensor status-right messages from the GWM over the HS-CAN3. The GWM receives the cross traffic alert left sensor status, side obstacle sensor status-left, cross traffic alert right sensor status and side obstacle sensor status-right messages from the SODL and SODR, respectively, over the MS-CAN.

Brake System

The IPC provides brake system messages for the following concerns and status:

- Low brake fluid level.
- Parking brake status and faults.
- ABS concerns that display along with the brake warning indicator operation.

When the parking brake is applied, the BCM sends the parking brake chime request to the GWM over the HS-CAN1. The GWM sends the message to the IPC over the HS-CAN3 to illuminate the brake warning indicator and turn on the parking brake applied message in the message center.

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. The GWM sends the message to the IPC over the HS-CAN3 to illuminate the brake warning indicator and turn on the brake fluid level low message in the message center.

When an ABS or parking brake system concern exists, the ABS module sends the brake (red) warning indicator request message to the GWM over the HS-CAN2. The GWM sends the brake (red) warning indicator request message to the IPC over the HS-CAN3 to illuminate the ABS warning indictor and to turn on the check brake system message center warning display.

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.

Check Locking Differential

The IPC provides warnings to indicate an issue with the electronic locking differential. When a fault is present, the PCM sends the rear differential fault status message to the GWM over HS-CAN1. The IPC receives the

required message from the GWM over the HS-CAN3 to display the message.

Dimming Scroll Bar

The IPC displays a dimming scroll bar warning to provide customers feedback on the current dimming status. This warning will be displayed for every dimming button press regardless of a dimming level change. When there is a dimming button press the BCM sends an updated dimming level message to the GWM over HS-CAN1. The IPC receives the required message from the GWM over the HS-CAN3.

Door-Hood Ajar

The IPC provides door and hood ajar warnings to indicate the status of the doors and hood. The IPC receives the driver door ajar, passenger door ajar, left rear door ajar, the right rear door ajar status 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 status 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 ajar warning indicator and corresponding warning message.

Driver Alert

The message center provides driver alert warning messages to alert the driver that rest is suggested or required due to detected erratic vehicle movement. The IPC receives the driver alert warning display message from the GWM over the HS-CAN3. The GWM receives the driver alert warning display message from the IPMA over the HS-CAN2.

EPAS

The IPC provides a message center message to indicate there is an EPAS system concern. When a fault exists in the EPAS, the PSCM sends a request to the IPC through the GWM.

The IPC receives the EPAS failure message from the GWM over the HS-CAN3.

The GWM receives the EPAS failure message from the PSCM over the HS-CAN2.

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 all required messages from the GWM over the HS-CAN3.

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

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

Engine Over-Temperature

The message center provides the engine coolant over-temperature warning message to supplement the engine over-temperature RTT indicator 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 data message from the PCM over the HS-CAN1.

Factory-Transport Mode

The message center provides the factory mode or transport mode warning message to inform the driver the vehicle is still operating in factory or transport mode. The IPC receives the factory mode or transport mode message from the GWM over the HS-CAN3. The GWM receives the factory mode or transport mode message from the BCM over the HS-CAN1.

Forward Collision

If a fault is detected with the forward collision system, the message center provides the forward collision warning messages to inform the driver of the 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 Malfunction

When a fault is present with the front camera the IPMA sends the front camera malfunction message to the GWM over HS-CAN2. The IPC receives the required message from the GWM over the HS-CAN3.

Hill Descent Control

The IPC provides hill descent control warnings to inform the driver of the system status and when driver intervention is required. The ABS sends the HDC indicator request message to GWM over HS-CAN2. The IPC receives the required message from the GWM over the HS-CAN3.

Hill Start Assist

The message center provides a message indicating the hill start assist feature is not available due to a fault in the ABS. When a fault is detected and the hill start assist is disabled, the ABS module sends the hill start assist status message to the GWM over the HS-CAN2. The GWM sends the hill start assist status message to the IPC over the HS-CAN3.

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 all required messages from the GWM over the HS-CAN3. The GWM receives the lane keeping system status display, camera status and lane keeping system hands off display messages 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 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.

Low Engine Oil Pressure

The message center provides a low engine oil pressure warning message to inform the driver the engine oil pressure is low. The message supplements the IPC warning indicator and RTT warning indicator. The IPC receives the engine oil pressure warning indicator request message from the GWM over the HS-CAN3. The

GWM receives the engine oil pressure warning indicator request message from the PCM over the HS-CAN1.

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.

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.

Parking Aid System

The IPC provides messages to indicate the status of the parking aid system. The IPC receives the parking aid front status and parking aid rear status messages from the GWM over the HS-CAN3. The GWM receives the parking aid front status and parking aid rear status messages 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 program is successful, key battery is low, key could not be programmed or failed or maximum number of keys have been programmed. 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 request from the GWM over the HS-CAN3.

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

Perimeter Alarm Message Display

The IPC provides a display 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 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 to repeatedly sound 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.

Starting System

The message center provides starting system messages to inform the driver of the starting system status and when driver intervention is required in order to start the engine. The IPC receives the starting system message request and the stop-start message request messages from the GWM over the HS-CAN3. The GWM receives the starting system message request and the stop-start message request messages from the PCM 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 Sway

The message center provides a message to inform the driver to slow the vehicle to reduce trailer sway and bring the trailer under control. The IPC receives the trailer sway event status message from the GWM over the HS-CAN3. The GWM receives the trailer sway event status message from the ABS module over the HS-CAN2.

Transmission 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 transmission gear display mode and vehicle speed messages from the PCM 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).

Component Description

Low Washer Fluid Level Switch

The low washer fluid switch is hardwired to the IPC through a single signal wire and is grounded to a body ground through a separate circuit. The IPC provides a reference voltage to the low washer fluid level switch. When the washer fluid level is low, the float drops closing the switch and pulling the reference voltage low. When the washer fluid level is high, the float lifts opening the circuit to the IPC and sending the reference voltage high.

Engine Oil Pressure Sensor

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.

Steering Wheel Switch - Message Center

The message center switch is the 5-way portion of the LH steering wheel switch. The message center switch uses different resistance values associated with each specific button (up, down, left, right and OK). 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.