status messages from the GWM over the HS-CAN3. The GWM receives the transmission fluid temperature data, the engine RPM data and the engine off status messages from the PCM over the HS-CAN1.

DESCRIPTION AND OPERATION > INSTRUMENT PANEL CLUSTER (IPC) - SYSTEM OPERATION AND COMPONENT DESCRIPTION > VIRTUAL GAUGES (HIGH-LEVEL IPC ONLY)

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

Refer to: Instrument Panel Cluster (IPC) - Overview .

Engine Temperature

The IPC uses 2 messages to control the temperature gauge. The first is the engine coolant temperature data, which provides the current engine temperature input to the PCM. The second message is the engine overheat indication request, which is sent by the PCM to the IPC when an overheating condition exists. When the IPC receives the engine overheat indication request message, the IPC sends the temperature gauge to full hot and turns on the over-temperature warning indicator.

The IPC receives all the temperature gauge inputs from the GWM over the HS-CAN3. The GWM receives the engine coolant temperature data and the engine overheat indication request messages from the PCM over the HS-CAN1.

Fuel

The IPC sends a reference voltage to the fuel level sender(s). As the fuel level changes, a float actuates the variable resistor fuel level sender, raising or lowering the fuel level signal voltage. The IPC monitors the changes in voltage from both senders and commands the fuel gauge with a corresponding movement of the pointer.

After a fuel fill up, the time for the fuel gauge to move from empty (E) to full (F) ranges from 2 seconds to 55 minutes depending on which operating mode the fuel gauge is in.

The IPC uses 4 different operating modes to calculate the fuel level:

- Anti-slosh (default mode)
- Key OFF fueling
- Key ON fueling
- Recovery

Anti-Slosh Mode

The default fuel gauge mode is called the anti-slosh mode. To prevent fuel gauge changes from fuel slosh (gauge instability due to changes in fuel sensor readings caused by fuel moving around in the tank), the fuel gauge takes approximately 40 minutes to go from empty (E) to full (F).

Key OFF Fueling Mode

The key OFF fueling mode (2 seconds to read empty [E] to full [F]) requires 3 conditions to be met:

- The ignition must be in the OFF mode when refueling the vehicle.
- At least 6% of the vehicle's fuel capacity must be added to the fuel tank.
- The IPC must receive a valid ignition ON fuel sensor reading within one second of the ignition being put into the RUN mode. The key ON sample readings are considered valid if the fuel sensor reading is between 10 ohms ± 2 ohms and 180 ohms ± 4 ohms.

If these conditions are not met, the fuel gauge stays in the anti-slosh mode, which results in a slow to read full (F) event.

Key ON Fueling Mode

In key ON fueling mode, a 30-second timer activates after the transmission is put into the PARK (P) or NEUTRAL (N) position. When the 30-second time has elapsed and at least 9% of the vehicle's fuel capacity has been added, the fuel gauge response time is 60 seconds to read from empty (E) to full (F). When the transmission is shifted out of PARK (P) or NEUTRAL (N), the fuel gauge strategy reverts to the anti-slosh mode. The key ON fueling mode prevents slow to read full events from happening if the customer refuels the vehicle with the ignition in the RUN mode.

The key ON fueling mode (approximately 60 seconds to read empty [E] to full [F]) requires the following conditions be met:

- The transmission is in PARK (P) or NEUTRAL (N).
- The ignition is in the RUN mode.
- At least 6% of the vehicle's fuel capacity must be added to the fuel tank

Recovery Mode

Recovery mode is incorporated into the IPC strategy to recover from a missing fuel level input after a refueling event. Missing fuel level inputs result from intermittent opens in the fuel sensor or its circuits. Recovery mode (empty [E] to full [F] approximately 17 minutes) is initiated when the following 2 conditions are met:

- The IPC is in the anti-slosh (default) mode.
- The actual fuel level in the tank is 5% different from what is being displayed by the fuel gauge.

Oil Pressure

The IPC uses the oil pressure warning indicator request network message to control the oil pressure gauge. The engine oil pressure switch is hardwired to the PCM. The PCM sends the oil pressure warning indicator request message to the GWM over the HS-CAN1. The GWM sends the oil pressure warning indicator request message to the IPC over the HS-CAN3.

Transmission Temperature

The IPC receives the transmission fluid temperature message from the GWM over the HS-CAN3. The GWM receives the transmission fluid temperature message from the PCM over the HS-CAN1. The PCM filters the transmission fluid temperature signal to remove fluctuations that could affect the stability of the transmission temperature gauge indication.

Turbo Boost