Broadcast Message	Originating Module	Message Purpose
Load Shed Request	BCM	Used to indicate what level of load shed is commanded.

Charging System

The PCM controlled Smart Charge charging system determines the optimal voltage setpoint for the charging system and communicates this information to the voltage regulator. The Smart Charge charging system is designed to set a DTC when a charging system fault is present. All of the Diagnostic Trouble Codes (DTCs) can set continuous faults, but not all Diagnostic Trouble Codes (DTCs) set as on-demand faults.

The smart regenerative charge system primary strategy is stored in the BCM. The BCM receives information relating to the battery condition from the battery monitoring sensor via a LIN. The BCM calculates and sends the set value needed for the generator charging voltage via the HS-CAN to the PCM. The PCM then adjusts the value received (if necessary) and sends it to the generator via a different LIN. The charging voltage is adjusted depending on various parameters, such as the current level of engine efficiency. The smallest possible set value for the generator voltage is 12.2 volts, while the maximum charging voltage can be anywhere between 14.5 and 14.9 volts. However, when the battery is in a refresh phase, the voltage may occasionally reach up to 15.2 volts. These refresh phases are required when the battery charge status is 80% over long periods of time, which increases the risk of sulfation in the battery cells.

The PCM simultaneously controls and monitors generator output. When the current consumption is high or the battery is discharged, the PCM raises engine speed as needed to increase generator output. The generator charges the battery and at the same time supplies power for all electrical loads. The battery is more effectively charged with a higher voltage when the battery is cold and a lower voltage when the battery is warm.

The PCM turns off the generator during cranking to reduce the generator load and improve cranking speed. Once the engine starts, the PCM slowly increases generator output to the desired voltage.

The PCM reports any charging system faults and sends a message through the HS-CAN to the BCM. The BCM then sends a message over the MS-CAN to the IPC, which controls the charging system warning indicator. The status of the PCM charging system warning indicator message can be confirmed by viewing the PCM Generator Fault Indicator Lamp (GENFIL) PID. Any charging system fault detected by the PCM results in 1 or more Diagnostic Trouble Codes (DTCs) being set and the GENFIL PID having a status of ON. If equipped with a charging system warning indicator, the IPC turns the indicator on or off. If equipped with a message center, the IPC displays the corresponding message to notify the driver of the condition.

Under certain circumstances, the charging system may have a concern but still keeps the battery charged while the vehicle is running. The LIN is normally used to initiate charging, but with a fault in this circuit the generator self-excites or begins charging on its own. The charging system warning indicator is illuminated and/or the corresponding message to notify the driver of the condition is displayed and the generator operates in a default mode (approximately 13.5 volts).

Electrical Energy Management System

NOTICE: When any vehicle module is being programmed, connect an external battery charger to make sure the module programming is completed without interruption due to the load shedding feature becoming active. The external battery charger must maintain a system voltage above 13 volts. This may require a charger setting higher than the lowest charge setting. The external battery charger negative connection must be made to an engine or vehicle chassis ground and not the negative battery terminal. If the connection is to the negative battery terminal, load shedding may begin and module programming may be corrupted. After charging has begun, start the engine to clear any load shed states and then turn the engine off and proceed with programming.

This vehicle is equipped with an Electrical Energy Management system which manages battery charging and monitors the battery state of charge. The Electrical Energy Management system also utilizes a load shed strategy to help control discharge of the battery and prevent, when possible, an excessively low battery state of charge. The BCM uses a battery monitoring sensor to monitor the battery state of charge.

To maintain correct operation of the load shed system, any electrical devices or equipment must be grounded to the chassis ground and not the negative battery terminal. A connection to the negative battery terminal causes an inaccurate measurement of the battery state of charge and incorrect load shed system operation due to the current being used bypassing the battery monitoring sensor. Refer to the Battery Monitoring Sensor component description in this section.

Battery State of Charge

The Electrical Energy Management system monitors the battery current flow and voltage to determine the battery state of charge. During the drive cycle the Electrical Energy Management system software monitors the charge and discharge current and increases the state of charge during charging, and decreasing it during discharge. During rest periods (key off with no electrical loads) when the vehicle enters sleep mode, the battery voltage is sampled to calibrate the state of charge. The sensor automatically executes this calibration anytime the vehicle enters sleep mode and when the total vehicle current draw is below 300mA. It takes 4 to 6 hours in the sleep mode to calibrate the battery state of charge to high accuracy. If the system draw does not allow the battery state of charge calibration over the previous 7 to 10 days the state of charge quality factor changes to flag this and some Electrical Energy Management system functions, which rely on the accuracy of the battery state of charge, may be temporarily turned off until a calibration takes place.