

Powertrain Control Module (PCM) Controlled Charging System

Overview

Note: When the battery (or PCM) is disconnected and connected, some abnormal drive symptoms may occur while the vehicle relearns its adaptive strategy. The charging system set point may also vary. The vehicle may need to be driven to relearn its strategy.

The PCM-controlled charging system provides many additional benefits over the current integral generator regulator system. The first benefit is improved battery life. In a PCM-controlled charging system, the regulator voltage set point is determined by the PCM and communicated to the regulator through the generator regulator control (GENRC) circuit. The PCM uses an algorithm to estimate battery temperature. Improving battery temperature estimates reduces battery damage caused by over- and undercharging.

The second benefit is improved engine performance. Whenever the PCM senses a wide open throttle (WOT) condition, the PCM momentarily lowers the regulator voltage set point. This reduces the torque load of the generator on the engine and improves acceleration. The PCM has a calibrated time limit on this reduced voltage feature. This prevents the generator output from being cut back for an extended WOT period, which could cause battery discharge.

The third benefit is improved idle stability. In response to the PCM GENRC signal, the regulator uses a generator load input (GENLI) signal to provide feedback to the PCM. The GENLI signal provides the PCM with charging system information. Specifically, it lets the PCM know when the charging system receives a transient electrical load which would normally affect idle stability. Because the PCM can anticipate additional loads, actions can be taken to minimize idle sag. The PCM can choose to either reduce the regulator set point or increase engine idle speed, both of which are calibrated features. In order to establish whether the regulator is accurately maintaining the desired voltage set point, the regulator uses a charging system voltage line to sense battery voltage.

The fourth benefit is reduced cranking efforts. The PCM reduces the mechanical load on the starter by initially commanding a low voltage set point. This may improve start times.

If the PCM detects a charging system error, it broadcasts a low voltage telltale (ON) network communication message which tells the cluster to illuminate the charge indicator. The charge indicator is illuminated if the PCM does not see a signal on the GENLI circuit for a time period greater than 500 milliseconds. This telltale command is also used to indicate over-voltage conditions detected by the PCM-controlled generator.

Each time the ignition switch is cycled to the run position, the instrument cluster initiates a bulb check by illuminating the charge indicator. It is the responsibility of the PCM to issue a low voltage telltale (OFF) command if the charging system is functioning correctly. This message should be sent during the network initialization in the voluntary phase (250 milliseconds to 450 milliseconds after the ignition switch is cycled to the run position). If a low voltage telltale (OFF) communications network message is not received, the instrument cluster continues to illuminate the charge indicator indefinitely.
