FORD PCM CONTROLLED CHARGING SYSTEM

The Ford PCM (Powertrain Control Module) controlled charging system that is used on many of its vehicles from 1999 up to the present has many benefits. First and most important is improved battery life. This is because the PCM can calculate battery temperature and adjust the charging system voltage based on that temperature, preventing overcharging or undercharging. An additional benefit is improved engine performance at wide open throttle where the PCM can lower the charging system's voltage output to reduce alternator load. Keep in mind that this feature has a "time out" limit so as not to create a battery discharge condition.

The third benefit is improved idle stability. The PCM has the ability to adjust charging system voltage according to the electrical load, resulting in a much quicker response in order to maintain a stable idle. The final benefit is reduced cranking effort, where the PCM will lower the voltage output during cranking, which reduces starter load and improves start up times.

The PCM monitors alternator load on the GEN-MON/GFS wire in the form of a frequency or duty cycled signal which is directly proportional to the electrical load. For example, 97% indicates a full load, while less than 6% indicates no load as indicated through a scan tool reading on the GFS (Generator Field Sense) PID (Parameter Identification Data). This signal is sent by the alternator to the PCM so that the PCM can determine the vehicle's electrical load so that it may maintain the proper voltage set point. This signal is also used by the PCM to determine the load placed on the engine by the charging system so that the PCM can properly control idle speed.

The PCM controls the alternator regulator through the GEN-COM/GENFDC terminal/wire. A command signal is sent by the PCM to the regulator indicating the desired voltage set point. Inputs such as: throttle position, coolant temperature, air temperature, and vehicle speed are considered when calculating the voltage set point.

This signal is transmitted by way of pulse trains that are transmitted at least once every five seconds. The frequency/duty cycle of the pulse trains determines the voltage set point.

The PCM has the ability to store codes if there is a problem within the system. These codes are:

P1244 - Alternator load input low
P1245 - Alternator load input high
P1246 - Alternator load input failed

These codes are set when the PCM monitors a mismatch with the alternator input compared to what the vehicle load should be during normal operation.

When the PCM detects a charging system problem, it will broadcast a low voltage telltale network communication message which tells the instrument cluster to illuminate the charge indicator light.

The charge light will illuminate if the PCM fails to see a signal from the alternator load input (GEN-MON/GFS) for a period of time of approximately 1/2 of a second. The indicator will also be illuminated if there is an overcharge voltage condition. The regulator set point (12.5-16 volts) is established by a temperature sensor that calculates battery temperature. This sensor is located inside of the regulator itself. The PCM will control the voltage set point through the GEN-COM(GEN/FDC) wire depending on what the regulator reports to PCM.

Throughout the years Ford has changed the acronyms on the system, but relatively the definitions are the same. There are four wires going into this alternator. First is the heavy gauge wire that is attached to the main post of the alternator that goes right to the battery. The remaining wires are in a three terminal connector (refer to the diagram) that has the SENSE circuit which allows the regulator to read the actual voltage of the battery, a GEN-COM or GENRC (Generator Field Command) circuit for the PCM to control the regulator and lastly a GEN-MON or GENLI (Generator Monitor) circuit for feedback information back to the PCM.

Acronyms/Definitions for components used in this system are identified (depending on the year of manufacture) as follows: GEN-COM/GENFDC would relatively mean the same,

- GEN-COM/GENRC – generator field command
- GENFDC – generator field control output

For the GEN-MON/GFS/GENLI

- GEN-MON – generator monitor
- GFS – generator field sense

To test this system, first disconnect the three-terminal connector. Use a schematic to identify the SENSE, GEN-COM and GEN-MON circuits. With the ignition key on, engine off and the alternator connector disconnected, your SENSE wire should have battery voltage at the connector. Next, the GEN-COM wire should have zero volts, and the GEN-MON wire should have nine volts at the connector. The GEM-COM signal is duty cycled to ground by the PCM while the regulator supplies battery voltage to this circuit, so if the PCM does not pull the voltage low on this circuit, the regulator would not turn on and then the generator would not charge. When this circuit is checked with a meter set up for frequency, if it registers 125 Hz., the system should charge at 14 volts. At 102 Hz, charging system voltage should be at 14.7 volts. And at 250 Hz, it should be at 13 volts. For the GEN-MON circuit, if the circuit goes open/short to ground or to power, it would set a P1246, so checking this circuit with either a frequency or duty cycle meter would be acceptable as long there is a reading on it.

Before you check our trouble shooting list, make sure that you have the correct alternator for your vehicle. We have had more charging system problems because an incorrect alternator was installed. Also, if you do decide to replace the alternator, double check with your supplier that you are getting the correct alternator for your specific vehicle, so that you will avoid unnecessary diagnostics.

Here's a list of what to look for when you get a trouble code:

P1244- Alternator Load High Input- Input is higher than the load should be during normal operation.
Check: Battery shorted
GEN-MON circuit shorted to voltage.
GEN-COM circuit shorted to voltage.
Battery positive cable has an open circuit prior to start up.
GEN-COM circuit open prior to start up.
Faulty PCM.

P1245- Alternator Load Input Low- Input is lower than the load should be during normal operation, or the alternator has no output.
Check: GEN-COM circuit shorted to ground.
GEN-MON circuit shorted to ground
Battery positive cable has an open circuit during operation.
Low system voltage due to battery or alternator problem.
Inoperative alternator due to being bad or a broken belt.
Faulty PCM.

P1246- Alternator Load Input Failed- For some reason, the PCM is not receiving the load frequency signal from the alternator.
Check: Any of the wires to the alternator for: shorts to ground or, short to power, or open circuit.
Inoperative alternator, or a broken belt.
Faulty PCM.

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