

Ford Application: Alternator GenCom and GenMon Signals

The Ford Smart Charge System was introduced in the 1999 Ford Windstar and has continually evolved to include all applications as well as additional modules, sensors and strategies. By understanding the alternator command and feedback signals, referred to as GenCom and GenMon, you'll be better able to diagnosis charging system issues. Because charging system codes do not turn on the check engine light, scan tool diagnosis is always required.

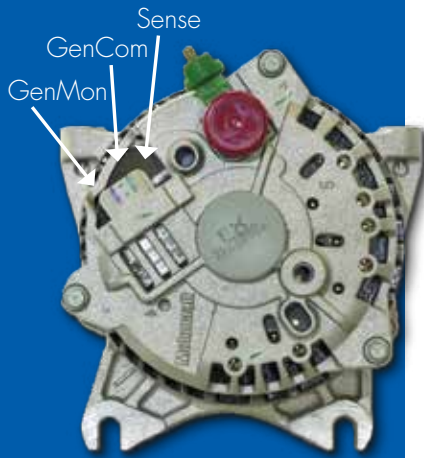
Default Charging

Before conducting any tests, retrieve all diagnostic codes. Diagnostic testing will cause codes to set, which can later be misinterpreted as a vehicle concern. The alternator will default charge at ~13.7 volts when there are vehicle concerns with GenCom or GenMon. Depending upon the type of failure, the PCM may command a high voltage set point, and then switch to default at timed intervals, making the voltage fluctuate. To manually put the vehicle in a fixed default mode, disconnect the 3-pin regulator connector at the alternator, start the vehicle, and increase engine rpm to 2500 briefly. The alternator will default charge at ~13.7 volts depending upon vehicle electrical demands. While the vehicle is in default mode, load the alternator and perform power and ground voltage drop tests.

GenCom Diagnosis

GenCom is the PCM-commanded voltage set point sent to the regulator (within the alternator). The voltage source for the signal originates at the regulator, and the PCM modulates the signal to ground with a variable duty cycle signal. The signal is approximately 128 Hz, but varies based on specific regulator. The duty cycle command varies from 3 - 95%. The higher the duty cycle, the higher the commanded voltage set point. It is important to remember that most versions of Ford Smart Charge will have no command present if the alternator is performing as desired.

- With the key in the off position, disconnect the 3-pin regulator connector and measure voltage in the center pin of the regulator (Figure 1). Voltage should be 7.5 volts or higher and is most commonly near battery voltage (regulator dependent). If voltage is less than 7.5 volts, and the alternator has adequate power and ground, replace the alternator.
- Reconnect the regulator connector and carefully backprobe GenCom. Start the vehicle while monitoring duty cycle or DC voltage on the wire.
 - On initial startup you may notice a ~3% duty command (~.3 - .5 volts). This start-up mode reduces engine load during the crank cycle.
 - After startup you will see a command anywhere from ~35 - 65% duty cycle (4 - 9 volts). (The exact values are vehicle and system voltage dependent.)



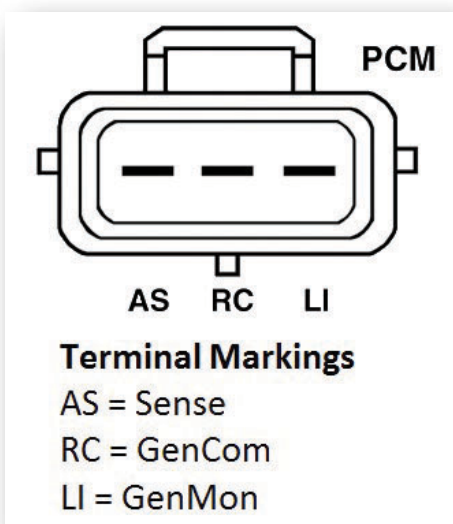
(Figure 1)

REMINDER: Fully charge and load test the battery before beginning. A partially charged or failing battery will result in incorrect test results. Do not have a battery charger attached during vehicle testing.

- Once the vehicle is stable, add loads by turning on the headlamps, wipers and other accessories. The value should rise in both duty cycle and voltage. Remember, the command may not always be present. If there is no command, adding loads to the vehicle should always result in a new PCM command.
 - If duty cycle and/or voltage remain high and do not fluctuate, check the GenCom wire for an open, or a potential PCM failure.
 - If duty cycle and/or voltage are low and do not fluctuate, check the regulator connector for open, GenCom for short to ground, and—although very unlikely—a failed PCM.
 - If duty cycle and/or voltage respond similar to the above description, GenCom is operating normally. However, problems in the GenMon circuit can result in GenCom codes because the PCM cannot verify the command was received by the regulator.

GenMon Diagnosis

GenMon is the alternator load information provided to the PCM by the regulator. The voltage source for the signal originates at the PCM, and the regulator modulates the signal to ground with a variable duty cycle signal. The signal is approximately 128 Hz, but varies based on specific regulator. The duty cycle command varies from 5 - 95%. The higher the duty cycle, the higher the load. GenMon should have a signal anytime the alternator is operating.



(Figure 2)

- With the key in the off position, disconnect the 3-pin regulator connector, turn the key to the on position, and measure voltage on the GenMon pin of the wiring harness connector, (Figure 2). The voltage should be near battery voltage. If voltage is low check the GenMon circuit for short to ground or high resistance short. If the harness checks ok, the PCM is likely failed.
- Turn the key off and reconnect the regulator connector. Carefully backprobe the GenMon terminal (Figures 1 & 2). Start the vehicle and monitor the duty cycle and/or voltage. There is no fixed value—it is dependent upon battery SOC and vehicle loads. Once the vehicle has stabilized, add loads. The duty cycle and/or voltage should rise. Turning off loads should result in a decrease.
 - If the duty cycle and/or voltage do not rise and fall with corresponding changes in loads, inspect the alternator connector, verify alternator power and ground circuits, and replace the alternator.

Sense Circuit, B+ Power and Ground Circuits

Fluctuating, low and high voltage can all be caused by the sense circuit, as well as alternator B+ and ground. These conditions—common in Ford applications—are diagnosed daily by the technical support team. Applied voltage must match system voltage, and more importantly, voltage drop cannot exceed .5 volts in each of these circuits.