

DESCRIPTION AND OPERATION

Charging System

The charging system is a negative ground system consisting of the following:

- generator(s)
- internal voltage regulator
- charging system warning indicator
- storage battery
- necessary wiring and cables

The generator is belt-driven by the engine accessory drive system.

In a single generator system, with the key in the ON position, voltage is applied through the warning indicator I circuit to the voltage regulator. This turns the regulator on, allowing current to flow from battery sense A circuit to the generator field coil. The dual generator system (6.0L diesel engines only), with the ignition key in the ON position, applies voltage through the powertrain control module (PCM)-controlled I circuits (1183 [WH/YE], upper generator; 1185 [YE], lower generator) to both generators. Once the PCM sees a voltage drop on the lower generator, it turns off the voltage to the lower generator if the glow plug system is cycling. Once the glow plug system stops cycling, the PCM applies voltage to the lower generator, which turns the regulator on allowing current to flow from the battery sense A circuit to the generator field coil; at which time it begins to function normally. The PCM maintains voltage (on the I circuit) to the upper generator at all times (key on, engine off or running). This turns the upper generator regulator on, allowing current to flow from the battery sense A circuit to the generator field coil. When the engine is started, the generator begins to generate alternating current (AC) which is internally converted to direct current (DC). This current is then supplied to the electrical system through the output terminal (B+) of the generator.

Once the generator begins generating current, a voltage signal is taken from the generator stator and fed back to the regulator S circuit. This voltage feedback signal (typically half battery voltage) is used to turn off the warning indicator on the single generator system. On the dual generator system, the PCM uses this signal to determine when to turn off the warning indicator.

With the system functioning normally, the generator output current is determined by the voltage of the A circuit. This A circuit voltage (battery sense circuit) is compared to a set voltage internal to the regulator, and the regulator controls the generator field current to maintain correct generator output.

The set voltage will vary with temperature and is typically higher in cold temperatures than in warm temperatures. This allows for better battery recharge in the winter and reduces the chance of overcharging in the summer.

The battery is a 12-volt direct current source connected in a negative ground system. The battery case is sealed and includes two vent holes to release gases. The battery has three major functions:

- engine cranking power source
- voltage stabilizer for the electrical system
- temporary power when electrical loads exceed the generator output current

The dual generator package consists of an upper/lower dual generator system. The 6.0L upper generator is a VR42 140-amp generator with a 2.79:1 pulley ratio. The 6.0L lower generator is a 4G 120-amp generator with a 3.00:1 pulley ratio. The upper and lower generators are not interchangeable.

This system is also monitored and controlled by the PCM. The PCM monitors both the upper and lower generator I circuits to determine the output of both generators and sets possible diagnostic trouble codes (DTCs). The PCM controls the lower generator by turning it off when the glow plug system is commanded on by the PCM to avoid possible damage (excessive voltage) to the glow plugs. As soon as the glow plug system stops cycling, the PCM will power up the lower generator.

The generators operate independently of the other. Control is through internal voltage regulators. If one generator fails, the other generator can maintain system performance under light load conditions. Under a heavy load, the PCM detects a concern, sets a DTC and illuminates the warning indicator.

On the dual generator system, the PCM controls the charging system warning indicator and commands the light on if the PCM detects a concern on the monitored circuits.

DESCRIPTION AND OPERATION (Continued)

The single generator system consists of the generator mounted on the top right of the engine (diesel) or top center of the engine (gas). The gas engines use a 3G 115-amp generator with a 2.71:1 pulley ratio. The 6.0L diesel engine uses a 6G 115-amp generator with a 2:79 pulley ratio.

Circuit Description**Battery Output Terminal (B+)**

The generator output is supplied through the battery positive output (B+) terminal on the rear of the generator to the battery and electrical system.

I Circuit — Single Generator

The I (ignition) circuit is used to turn on the voltage regulator. This circuit is powered up when the key is in the ON position. Voltage is supplied from the ignition switch to the central junction box (CJB) fuse 45 (10A), then to the instrument cluster and through the charge warning indicator (battery icon) to the generator. This circuit is also used to turn the charging system warning indicator on if there is a fault in the charging system operation.

I Circuit — Dual Generator

The I (ignition) circuit is used to turn on the voltage regulators. This circuit is powered up when the key is in the ON position. When the PCM detects key ON, the PCM will provide power to the upper generator I circuit 1183 (WH/YE) and also to the lower generator I circuit 1185 (YE).

A Circuit

The A circuit or battery sense circuit is used to sense battery voltage. This voltage is used by the regulator to determine generator output. This circuit is also used to supply current to the generator field, which will determine generator output.