

**Figure 9-56.** Generator control unit (GCU).

In general, modern GCUs for high-output generators employ solid-state electronic circuits to sense the operations of the generator or starter-generator. The circuitry then controls a series of relays and/or solenoids to connect and disconnect the unit to various distribution buses. One unit found in almost all voltage regulation circuitry is the zener diode. The zener diode is a voltage sensitive device that is used to monitor system voltage. The zener diode, connected in conjunction to the GCU circuitry, then controls the field current, which in turn controls the generator output.

### Generator Controls for Low-Output Generators

A typical generator control circuit for low-output generators modifies current flow to the generator field to control generator output power. As flight variables and electrical loads change, the GCU must monitor the electrical system and make the appropriate adjustments to ensure proper system voltage and current. The typical generator control is referred to as a voltage regulator or a GCU.

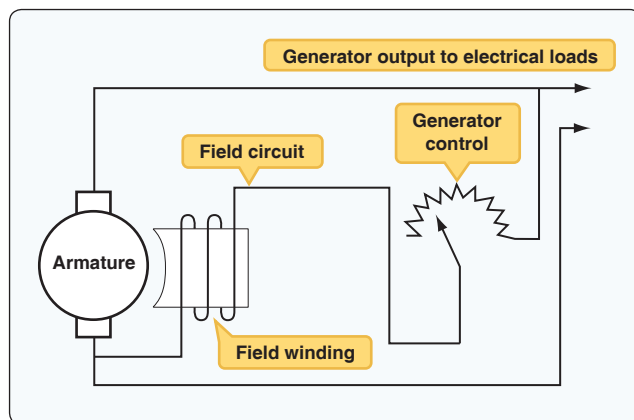
Since most low-output generators are found on older aircraft, the control systems for these systems are electromechanical devices. (Solid-state units are found on more modern aircraft that employ DC alternators and not DC generators.) The two most common types of voltage regulator are the carbon

pile regulator and the three-unit regulator. Each of these units controls field current using a type of variable resistor. Controlling field current then controls generator output. A simplified generator control circuit is shown in *Figure 9-57*.

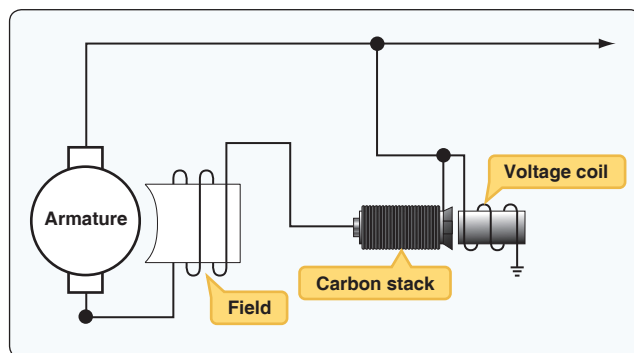
### Carbon Pile Regulators

The carbon pile regulator controls DC generator output by sending the field current through a stack of carbon disks (the carbon pile). The carbon disks are in series with the generator field. If the resistance of the disks increases, the field current decreases and the generator output goes down. If the resistance of the disks decreases, the field current increases and generator output goes up. As seen in *Figure 9-58*, a voltage coil is installed in parallel with the generator output leads. The voltage coil acts like an electromagnet that increases or decreases strength as generator output voltage changes. The magnetism of the voltage coil controls the pressure on the carbon stack. The pressure on the carbon stack controls the resistance of the carbon; the resistance of the carbon controls field current and the field current controls generator output.

Carbon pile regulators require regular maintenance to ensure accurate voltage regulation; therefore, most have been replaced on aircraft with more modern systems.



**Figure 9-57.** Voltage regulator for low-output generator.



**Figure 9-58.** Carbon pile regulator.