

Generator Field Control

The output voltage of an AC generator is controlled by controlling the strength of the rotating DC field. Increasing the field strength increases the AC output voltage while a decrease in the DC field strength will reduce the output voltage. As generator load is increased, the field strength must be increased to hold the output voltage constant. (A necessary condition of generator operation is that the machine must be running at its rated speed because the generator output voltage is also proportional to generator RPM. See Frequency Compensation below.)

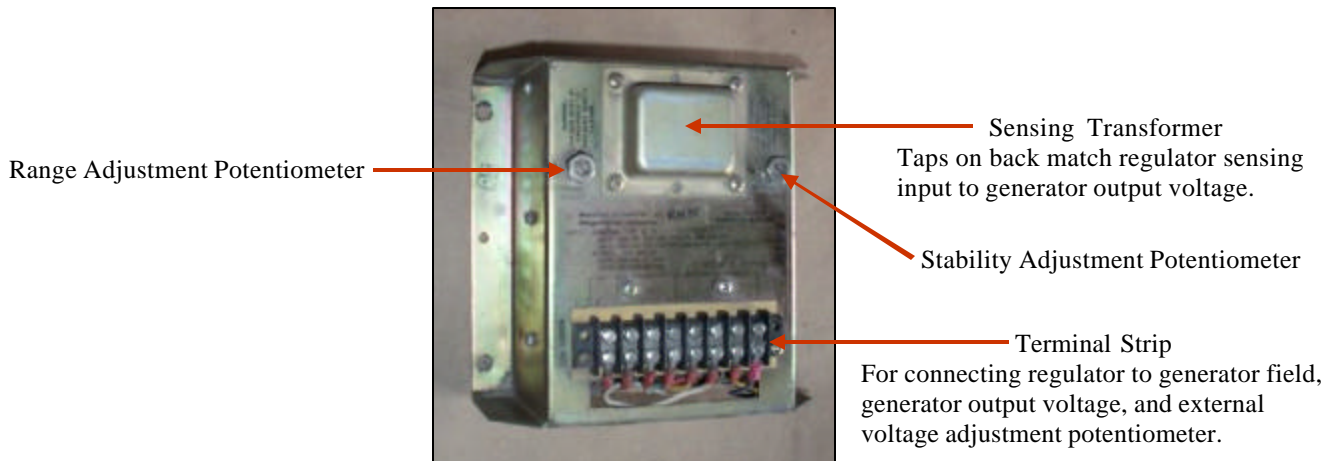
Several methods of field control are commonly used (see connection diagrams on the following page):

- The DC field voltage produced by the generator voltage regulator is applied directly to the slip rings of the main rotating field of the generator. The advantage of this configuration is its relative simplicity; the trade-off is that a voltage regulator with a higher current output is required to drive the main field directly.
- The DC field voltage produced by the generator regulator is applied to the stationary field of an exciter. (An exciter is a small DC generator which is used for the purpose of providing DC field current to an AC generator field, an AC synchronous motor field, a DC motor field, or a DC generator field.) This concept permits the use of a generator regulator (or motor field control) with a lower output current capability as the exciter acts, in essence, as an amplifier. Controlling the smaller exciter field current will control the larger exciter output current which is then connected to the main rotating field. Brushless systems are often employed.

On very large generators, a pilot exciter may be used. In this excitation scheme the pilot exciter stationary field will be controlled by the regulator and the output of the pilot exciter will control the field of the main exciter, which will in turn, control the machine main rotating field current.

Bassler KR7FF Generator Voltage Regulator

Designed for engine-driven generators.



Kilowatt Classroom Photo

Frequency Compensation

As noted above, if the generator prime mover speed drops, the generator output voltage will drop. The voltage regulator will see this drop in voltage and will attempt to correct it by increasing the field excitation. This can result in damage to the regulator SCR's due to excessive current. In applications where the generator frequency can fall below the rated value, a regulator having frequency compensation circuitry, such as the Bassler KR7FF shown above, should be employed. This circuitry recognizes the reason for the reduced generator output voltage is a result of reduced frequency and the frequency compensation circuitry current-limits the firing of the SCR's.