

## Removing residual voltage in dc generator

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The dc gain ( $E_g/E_f$ ) of a separately excited generator is an important parameter in its computer model or transfer function. However, direct measurement of this gain is often obscured by residual magnetism in the armature. The magnetism produces an unwanted dc voltage (several volts in a multikilowatt generator) that opposes the normal armature voltage induced by current in the field coil. With the circuitry shown, the output voltage due to residual magnetism can be reduced to a value less than 100 millivolts.

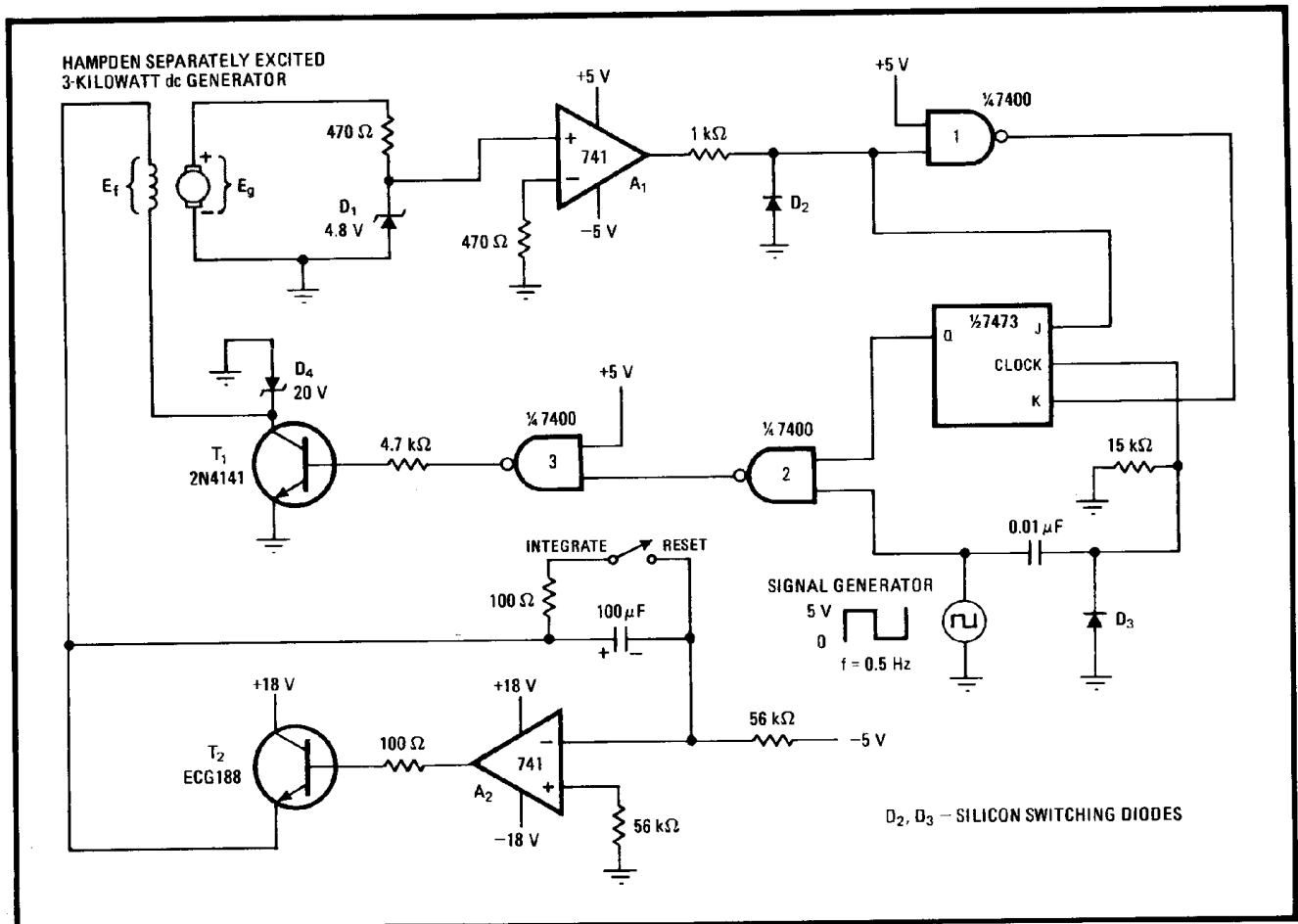
Assume the residual voltage to be canceled has a positive polarity. If the 5-volt square-wave source (shown in the lower right) is low, then gates 2 and 3 hold

transistor switch  $T_1$  off. The positive generator output is sensed by the comparator,  $A_1$ , which switches to its positive state. This output and its complement are used to set a J-K flip-flop.

When the square-wave voltage goes high, a positive pulse is applied to the clock input of the flip-flop. This drives the Q output of the flip-flop high, which, along with the positive square-wave voltage, turns  $T_1$  on, allowing current to pass through the field winding.

This current causes a voltage opposing the residual voltage to appear across the armature winding. The cycle repeats in synchronism with the square wave's period, until the output of the comparator goes negative (when the average residual voltage is close to zero or negative).

An increasing excitation voltage is provided by the integrator circuit  $A_2$ . The time constant selected for the integrator must be long enough so that each increment in field current will be small enough to prevent establishing residual voltage of the opposite polarity. Also, the frequency of the square wave should allow the field current to reach steady state during the time that the field is energized. □



**Residual removal.** Synchronously switched current through the field coil of a dc generator will create a voltage opposing the machine's unwanted residual output. Transistor,  $T_1$  is switched on by a positive-going square wave to cancel the undesired voltage.