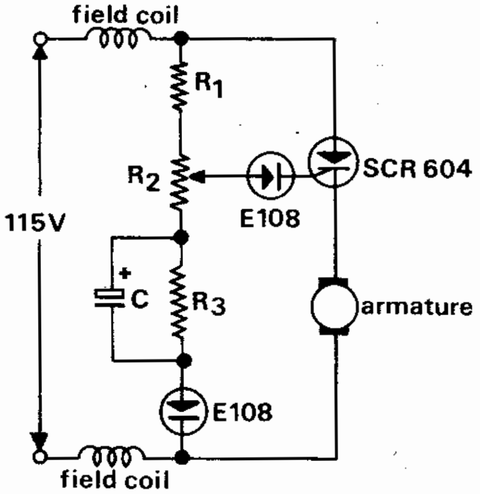
# ELCOM Motor Speed Control-Fractional Hp Motors

The traditional speed control techniques commonly used in fractional horse-power motors (adjustable series resistor, mechanical means, etc.) can be replaced with this simple electronic system. The main disadvantage of these older methods is that motor speed is dependent on the applied load. A more stable torque characteristic can be obtained with the electronic feedback system.

Most variable speed f.h.p. motors are used in applications which call for high torque at low speed setting. Two examples being food mixers (up to 150 W) and sewing machines. The electronic system achieves this in the following way. A feedback effect is obtained by connecting the SCR cathode to the motor. The motor generates a back e.m.f. (proportional to motor speed) which appears in full across the motor terminals when the SCR is in the non-conducting state. When a load is applied motor speed decreases and the back e.m.f. fails. This causes the SCR to conduct earlier in the power cycle and more current is delivered to the motor, thus increasing torque. Motor speed then rises to approximately the original value.

## MIXER CONTROL CIRCUIT

Control over the firing angle of the SCR is obtained with variable resistor $R_2$, an earlier firing angle gives a higher speed. Minimum speed is determined by Resistor $R_3$. The $R_3C$ network prevents motor vibration under conditions of low speed and low torque. Diode $D_2$ reduces the power rating required for $R_1$, $R_2$ and $R_3$ by blocking negative half cycles: it also serves to protect the SCR gate against damage from positive voltage peaks from the motor. Diode $D_1$ protects the gate during negative half cycles. A practical range of motor speed for this circuit is 1:3.

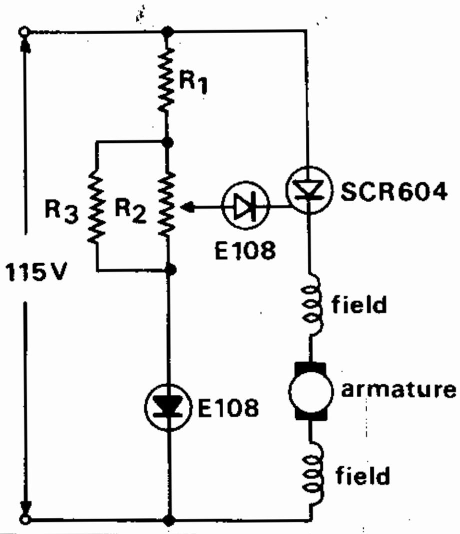



| | | |
|---|---|---|
| $R_1$ | = | 5600 Ω, 2 W |
| $R_2$ | = | 1000 Ω, 1/2 W (potentiometer) |
| $R_3$ | = | 270 Ω, 1/4 W |
| C | = | 16 μF, 64 V |

## SEWING MACHINE CONTROL CIRCUIT

In the conventional series-resistor method of control, a large voltage drop occurs across the resistor when the starting current flows. The resistance is reduced, whereupon the motor picks up speed very quickly necessitating an increase in resistance to lower the speed again. Thus smooth low-speed control cannot be obtained. Reducing the input power in order to reduce speed unfortunately lowers the available torque; at low speed setting, therefore, only a low torque is available.

The circuit shown, however, gives excellent control over low-speed operation. As for the mixer, potentiometer, $R_2$ provides control over the SCR firing angle. Power dissipation in $R_2$ has been lowered by paralleling it with $R_3$: however, if maximum feedback (finer control) is desired the resistance of $R_2$ must be reduced to that of the paralleled resistors, $R_2 . R_3/R_2 + R_3$ = 1 KΩ approximate minimum. The power rating of potentiometer $R_2$ must then be increased to 1/2 W. Diode $D_1$ and $D_2$ have the same functions as before.




| | | |
|---|---|---|
| $R_1$ | = | 5600 Ω, 2 W |
| $R_2$ | = | 5000 Ω, 1/4 W (potentiometer) |
| $R_3$ | = | 1200 Ω, 1/4 W |