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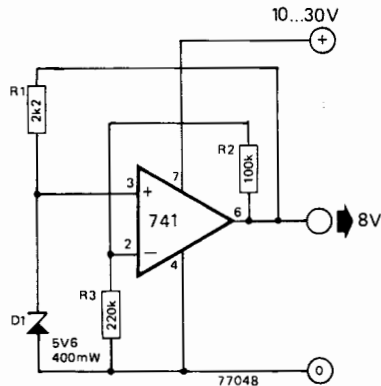
super zener

This circuit is intended primarily to produce a stable reference voltage in battery operated equipment designed for minimum current consumption. Despite the fact that only 1 mA flows through the zener the output voltage showed a fluctuation of less than 1 mV for supply voltage variations of 10 to 30 volts.

The reference voltage from the zener is applied to the non-inverting input of a 741 op-amp, and the output voltage is the zener voltage multiplied by the op-amp

$$\text{gain i.e. } V_O = V_Z \times \frac{R_2 + R_3}{R_3}$$

This approach has two advantages. Firstly, a low temperature coefficient zener (5.6 V) can be used to provide any desired reference voltage simply by altering the op-amp gain. Secondly, since no significant current is 'robbed' from the zener by the op-amp input, the zener need only be fed by a small current. So that the resistance of the zener does not affect the output voltage the zener current must be fairly constant. This is achieved by feeding the zener via R1 from



the output of the op-amp. The zener current is $\frac{V_O - V_Z}{R_1}$, so R1 should be chosen to give a zener current of about 1 mA. The reference voltage obtained from the op-amp output can supply currents of up to 15 mA. One point to note when using this circuit is that the supply voltage must be at least 2 V greater than the output voltage of the circuit.