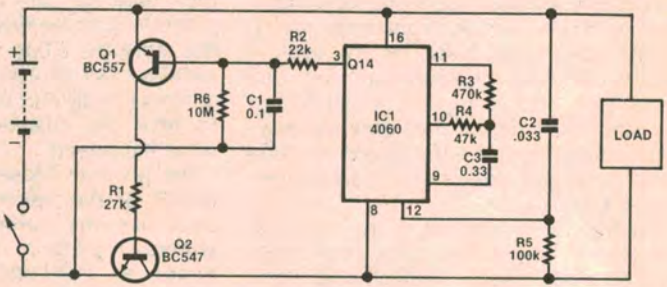
Automatic switch-off circuit saves batteries

Users of battery operated test equipment know how frustrating it is to find that batteries are flat because an instrument was not switched off. Here is a circuit which will automatically disconnect a load from a battery after a predetermined time. When the load is disconnected, the current is so small, less than a microamp, that it can be disregarded. To reconnect the load, the battery switch is turned off and then on again.

The part of the circuit which determines the "on" time is IC1 and its associated oscillator circuitry. The output of the oscillator is divided successively by two in each of the 14 stages of the counter. By pulling the reset line high, all outputs can be set low and this feature is used to ensure that the full number of divisions are carried out each time, thus ensuring equality of timing periods. Division restarts when the reset line goes low again.

When the switch is closed, current flows through the emitter-base junction of Q1 to charge C1 and in doing so, switches Q1 on momentarily. Q1 switches Q2 on and applies power to the load and to IC1. The reset line of IC1 is pulled high while C2 charges through R5 causing the counter outputs (Q14 in particular), to go low. With Q14 low, Q1 is maintained in a switched on condition, Q2 therefore remains switched on and the load continues to receive power.

With the component values shown, the oscillator oscillates at about 30Hz. This is divided by 16,384 with the result that after about nine minutes, Q14 goes high and switches off Q1, which in turn switches off Q2. This disconnects the load from the battery.



None of the component values appear to be critical. R1 is sized to allow sufficient base current to flow to saturate Q2. For light current loads, a value of from 10 to 15 times the load resistance is of the right order.

Q2 must be large enough to carry the load current. Since power transistors tend to require relatively large base currents, a Darlington pair may be used. As drawn, the circuit will operate over a voltage range of about 4.5 to 15 volts. For higher voltages, the Vss connection of IC1 could be connected to load negative via a zener diode so that Vdd to Vss across the IC is no greater than 15V. R5 should be connected beween pins eight and 12.

Longer timing periods could be obtained by increasing the capacitance of C3 and/or the values of R3 and R4 in accordance with the data book information on the IC.

(By Jim Parnell, ZL2APE, in "Break-In", January-February, 1980.)