Low-battery indicator

TODAY MANY HOBBYISTS BUILD BATTERY-operated projects using highly efficient solid-state devices that ensure long battery-life. Even with those circuits, though, a need occasionally arises to make certain that the battery—which may have been in use for some time—is still in good condition. I use the low-battery indicator shown in Fig. 1 in several battery-powered special-effects devices for the theater, where it is crucial that everything operate when it's supposed to.

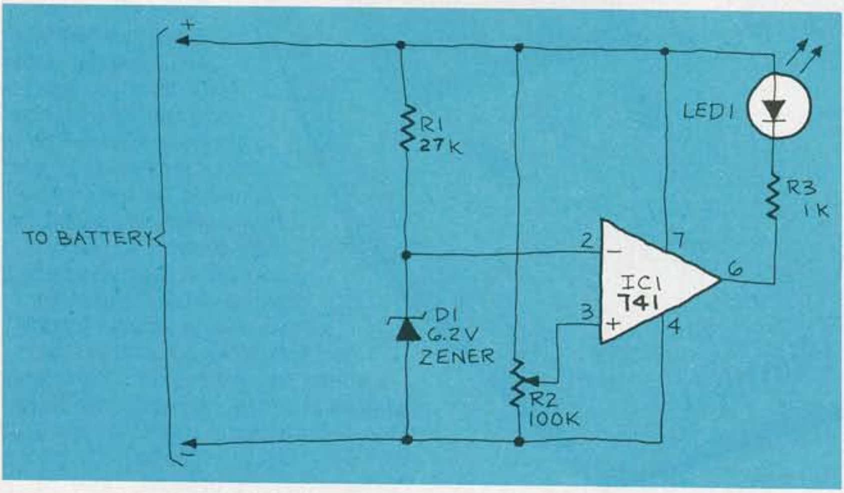


FIG. 1

The low-battery indicator uses an LED to signal when the battery voltage has dropped below a pre-selected level. It is easy to build, reliable, and inexpensive, and can be adapted for a wide range of voltages. The device shown is intended to operate in a 9-volt circuit.

The sensing circuit consists of a 741 op-amp set up as a voltage comparator, using a Zener diode as a voltage reference. The op-amp is inserted as a bridge between two resistance ladders, one containing the Zener reference, and the other a high-value linear potentiometer. The Zener is connected to the inverting input of the op-amp, and the wiper of the potentiometer is connected to the non-inverting input. The top and bottom of the bridge are connected to V_{CC} and ground, respectively.

When the voltage at the wiper of the potentiometer drops below the voltage set by the Zener, the output of the op-amp goes low: that turns on the LED connected between it and V_{CC}. The LED turn-on voltage is selected by the potentiometer; the device can be adjusted most easily by applying to it the voltage at which you want the LED to turn on and adjusting the potentiometer until it just does so.

The indicator uses only six parts: R1 is 27K; R2 is a 100K linear potentiometer; R3 is 1K, and Zener diode D1 is rated at 6.2 volts; IC1 is a 741, and just about any LED will work. The device is easy to build and doesn't present much of a load to the battery it monitors—the version I use draws only about one milliamp when idling, and about 20 milliamps when the LED is lit.

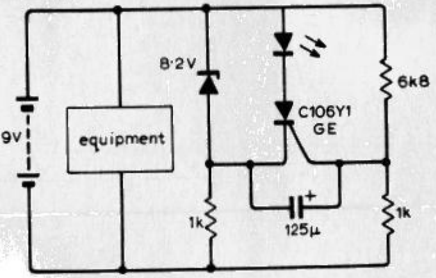
The circuit can be adapted to work with battery-powered circuits requiring between 6 and 18 volts; the only changes needed would be a lower-voltage Zener and smaller current-limiting resistor in the case of voltages below nine volts, and a larger resistor for higher voltages.—*Donald F. Ricklies*

"But, Mom, I liked *the green faces—they were scary."*

Low battery voltage indicator

This circuit was devised to indicate when the voltage of the battery fell below a minimum acceptable value during a long period of use.

The design is for a 9-volt version, but can easily be adapted to suit any suppiy voltage. In this particular case the l.e.d. lights up when the supply voltage falls to 8.3V — this minimum voltage is determined by choice of circuit components. The l.e.d. used is a Hewlett-Packard 5082-4440 available from Integrex. The zener diode is a BZY85 C8V2 400mW, but in this circuit its avalanche point is only 7.7V due to the low current drawn. The circuit draws about 2.5mA normally, and 7mA when the thyristor conducts. The 125-μF capacitor



is included to prevent pulses triggering the thyristor as capacitors charged.

P. C. J. Parsonage,
Whangarei,
New Zealand.

Low battery voltage indication

May I add something more to the interesting idea of P. C. J. Parsonage (*Circuit Ideas*, January 1973).

● The low battery voltage indicator circuit can be modified to work as a high battery voltage indicator, or simply a high voltage indicator, just by interchanging gate and cathode connections of the thyristor. In particular, say a battery voltage is 8.3V and needs to be charged to 9V, then the circuit of Fig. 1 can be used. The l.e.d. lights when battery charges to 9V.

Fig. 1

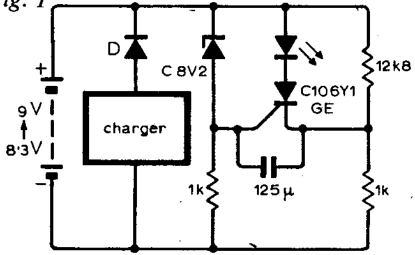


Fig. 2

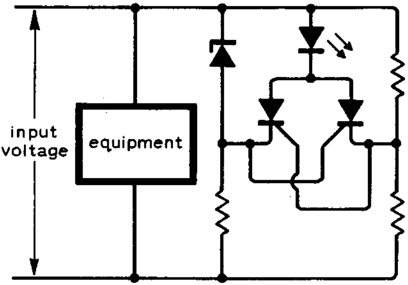
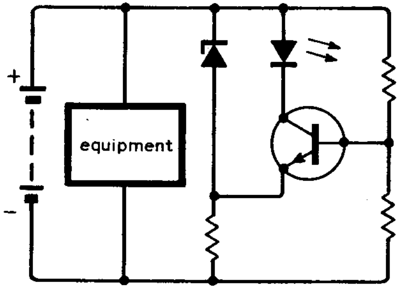


Fig. 3



● The l.e.d. in the circuit of Fig. 2 lights up when the input voltage is > or < $(V+\Delta V)$, where V is the normal voltage at which circuit is designed and ΔV is the change in input voltage at which l.e.d. lights up.

● The cost of the equipment can be cut slightly by replacing the thyristor with a less costly silicon switching transistor, Fig. 3. This circuit can return to its original state (l.e.d. off) when the voltage returns to its design value.

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