Test your pot

If you've been faced with the problem of finding an intermittant open, you'll like this easy-to-build tester.

by Colin J. Shakespeare

Necessity, they say, is the mother of invention, and it was necessity that provided the impetus to design and build this particular piece of test equipment. My problem was to service the potentiometers in the control panel of a theatrical lighting system with the panel removed from the system. The controls are typically 10,000 ohm wire wound linear potentiometers which become noisy with age. This results in some rather startling and disturbing on-stage effects.

The potentiometer tester can, of course, also be used for testing any out-of-circuit potentiometer or any other circuit configuration where an intermittant open circuit is suspected. The circuit detects any momentary open circuit—down to the nanosecond region—and produces a visible flash of approximately one tenth of a second on an LED.

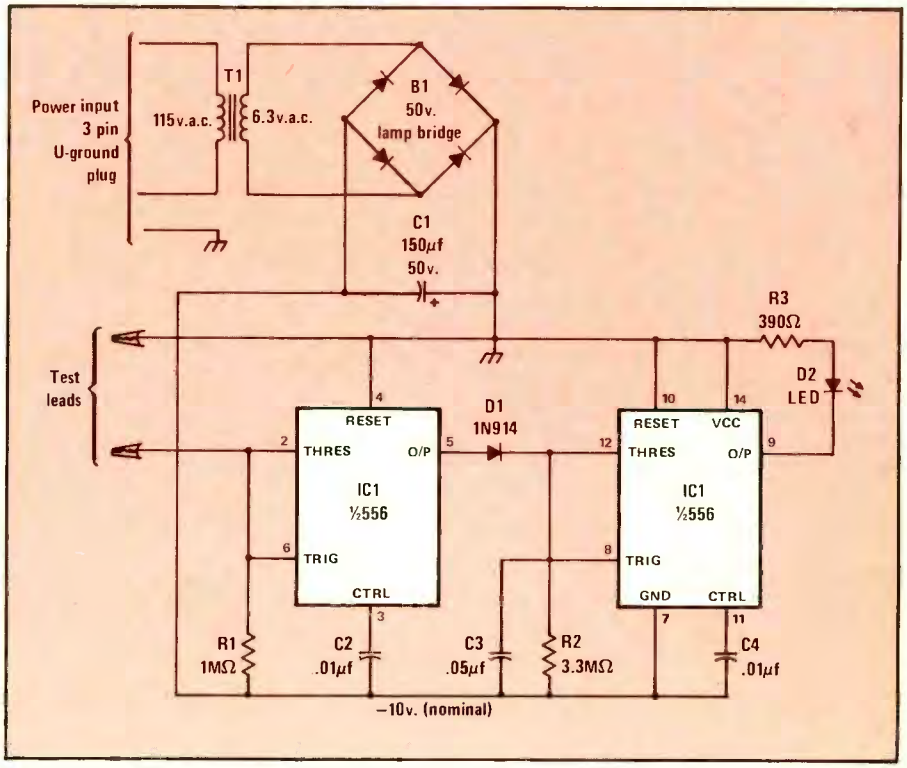
Simple circuit

As with any of these simple circuits, the power supply components cost more than the functional components, but in order to make the unit completely self contained a power supply had to be included. The circuit is tolerant of a wide range of supply voltages and power supply ripple. Component layout is not critical.

An inexpensive 6.3-volt transformer was chosen in the hope that it would give more than 6.3 volts on light load, which tends to be characteristic of the inexpensive ones. Any transformer which gives between 7 and 12 volts ac will work well in the circuit.

The circuitry, as shown, is operated from a negative supply voltage. In the case of my lighting control panel, the potentiometers happen to be connected together in pairs with diodes. Choosing the negative polarity made it possible to test the panel without unsoldering the diodes.

Half of the 556 IC is used as a voltage comparator. Provided the potentiometer



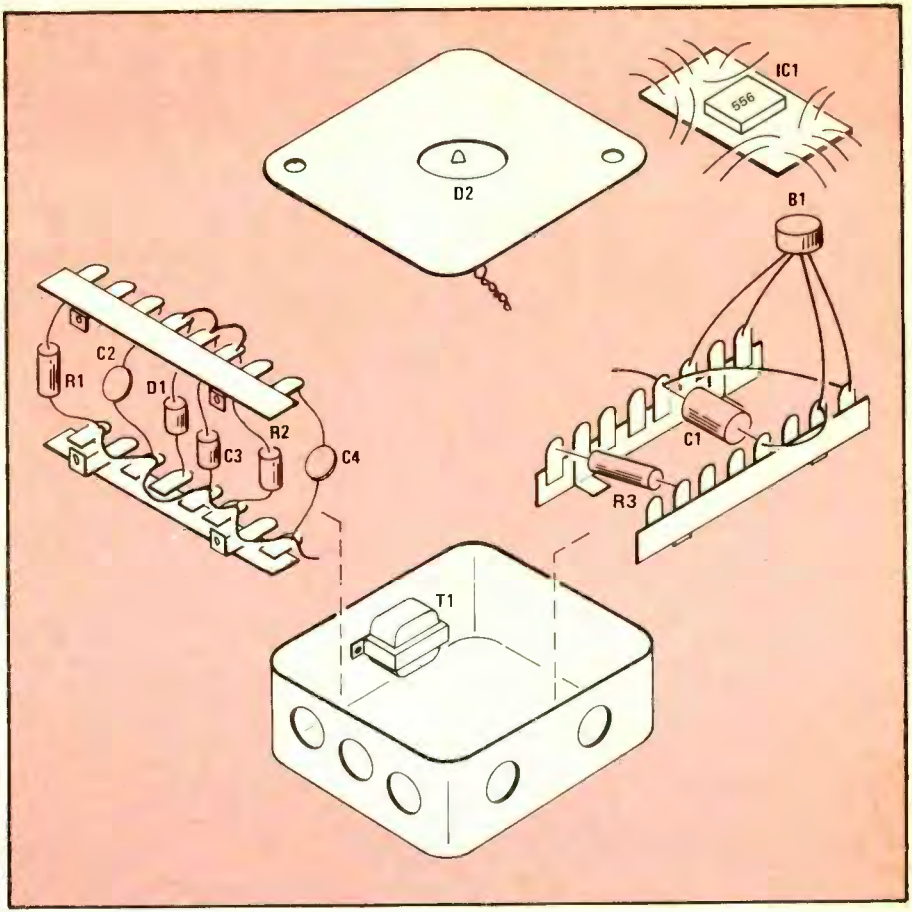
The potentiometer tester is build around a single 556 timer integrated circuit powered by a conventional full-wave bridge rectifier power supply. The circuit shown runs off the negative voltage output of the bridge. However, the circuit can be modified to operate from a positive dc voltage. The potentiometer or circuit under test is connected across the test leads.

under test is less than one half the value of R1, the input to the 556 will stay above the threshold voltage and so the output, pin 5, will be low. When the potentiometer under test goes open circuit, the input to the 556 falls below the trigger voltage and pin 5 goes high, charging the timing capacitor C3. By keeping C3 small, its charging time is comparable with the shortest duration open circuit that can be sensed by the 556. The time, in seconds, that the LED remains lit after pin 5 goes low is approximately equal to the value in ohms of R2 multiplied by the value in farads of C3.

Easy to build

The circuit was built into a standard four-inch electrical box. Being a metal box, it is important that a 3-wire cord be used and that the box be properly grounded. It is also a good idea to tack the knock-outs down with solder, but this is easier said than done. Having made sure the inside of the box is grease free, you'll need a really hot soldering iron and maybe a little extra flux to get the solder to flow properly.

The LED will be more visible if mounted with a black background. In my version the top of the box was sprayed with a matt black paint and the LED inserted through a hold drilled into the middle. Of course, you can build your tester in a black plastic case, or any other suitable cabinet you have handy.



Parts layout isn't critical. Although the prototype was build in an electrical junction box, any cabinet will do.