

Build Your Own

Make SCR testing a snap with this simple, easy-to-build, and easy-to-use tester. Use it to test Triacs, LEDs, and diodes, too!



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SCR Tester

A few months ago, a man who had a handful of what looked like transistors came into the school shop. He said the parts were off of a marine engine and he could not locate replacements. We tried to reference the part numbers, but to no avail. When the plastic, TO-220-cased parts were tested to see if they were indeed defective, they failed. But that's because everyone had assumed that the devices were transistors.

Then a thought occurred to us: Because they were off a gasoline engine, maybe the devices were SCRs (silicon controlled rectifiers). An SCR checker wasn't immediately available, so one was rigged up using a power supply, a current meter, and a couple of resistors. Sure enough, the mysterious parts were SCRs, one of which was defective.

Since then, microwaves, TV sets, and other pieces of electronic equipment that use SCRs have come to the school shop for service. Rigging up a makeshift tester every time a few SCRs showed up was awkward and inconvenient. Because of that, the SCR tester described in this article was built.

The SCR tester has proven to be a

very effective test instrument. In addition to testing SCRs, it is useful for checking Triacs, diodes, and LEDs. The entire tester can be built for about \$5.00 or for about \$1.00 if you have a well-stocked junkbox.

SCR's and Transistors. The SCR— invented by General Electric in 1957— is a versatile and useful semiconductor device. It can be used as a fast-acting latching switch and as a sensitive am-

plifier. Further, it can be used as a rectifying device since it will pass current only in one direction.

SCRs offer some important advantages over transistors and other devices in certain applications. That's because the device is either on (conducting) or off (not conducting). Though they too can be used as on-off switches, transistors, in contrast, can be more-closely likened to variable resistors.

The SCR is turned on by applying power momentarily to its gate terminal. After that, as long as the forward or latching current remains above a certain threshold, the device remains in conduction, regardless of the presence or absence of a signal at the gate terminal. In contrast, transistors need a continuous current through their base to remain on.

Testing SCRs. The easiest way to test a positively-triggered SCR is to momentarily trigger the gate on with a positive voltage; that should latch the device on. (While negatively-triggered SCRs exist, the vast majority of devices that you are likely to encounter as a hobbyist will be positively trig-

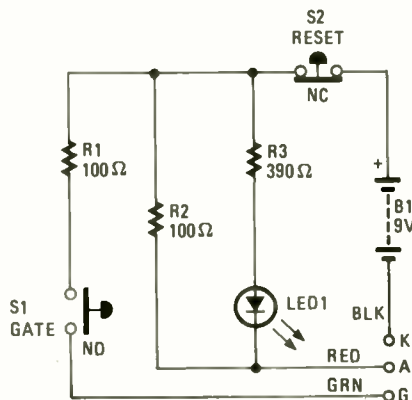


Fig. 1. Testing an SCR is a relatively simple matter that is made even easier with this SCR tester. It uses just a handful of easily found components.

PARTS LIST FOR THE SCR TESTER

- B1—9-volt transistor-radio battery
- LED1—Jumbo red LED, (Radio Shack 276-068A or equivalent)
- R1, R2—100-ohm resistors
- R3—390-ohm resistor
- S1—SPST, momentary-contact, normally open switch, (Radio Shack 215-1547 or equivalent)
- S2—SPST, momentary-contact, normally closed switch, (Radio Shack 215-1548 or equivalent)
- Experimenters box (Radio Shack 270-230 or equivalent), battery holder (Radio Shack 270-236 or equivalent), battery clip, insulated alligator clips, wire, solder, lettering for case, etc.

gered. This tester will test only positively triggered SCRs.)

The difficulty with checking SCRs with typical analog or digital ohmmeters is that they don't supply enough

current to hold (latch) the SCR on; that's important, since a key test for determining the condition of an SCR is that the unit should remain latched until the latching current is interrupted.

In many cases, SCRs require a latching current of 50 to 100 mA; generally, the larger the SCR (that is, the greater its current-carrying capacity), the more latch current required. Our SCR tester supplies enough latch and gate current to test most SCRs and Triacs used in consumer-electronics circuits.

The Circuit. The schematic diagram of the SCR tester is shown in Fig. 1. As you can see, the circuit is extremely simple. The device-under-test's (DUT) cathode, anode, and gate are connected to the unit's K, A, and G terminals, respectively. Pressing switch S1 feeds a gate current to the DUT, which triggers it on. Resistor R1 limits the gate current to the appropriate level. Re-

sistor R3 limits the current through the LED to about 20 mA, which, with the current through R2, results in a latching current of about 110 mA.

The LED is used to monitor the latching current. If the DUT is good, once the gate is triggered with S1 the LED will remain lit, indicating that the device is conducting. To end the test, turn off the device by interrupting the latching-current flow using switch S2. The LED should turn off and remain off.

The preceding procedure will work with SCRs and Triacs. To check LED's and other diodes, connect the anode and cathode leads to the anode and cathode of the diode; LED1 should light. When the leads are reversed, the LED should remain off.

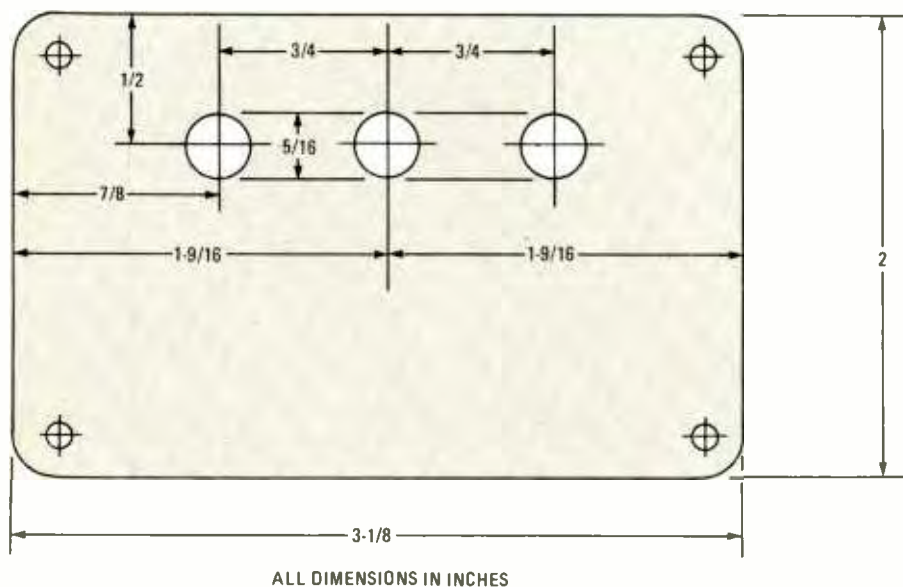
Construction. The tester can be built in about an hour and will fit into a 2 x 3-1/8-inch cabinet.

Begin construction by preparing the box. First, drill three small holes in the side of the box. The test leads will pass through those holes when the project is assembled. Those holes should be just small enough for the wire to go through, but not a strain-relief knot. Next, drill the holes for the switches and the LED. A front-panel template for the box is shown in Fig. 2. The holes should be no farther than 1/2-inch from the edge of the box so that there will be enough room inside the box for the battery.

Assemble the circuit on the front panel using Fig. 3 as a rough wiring guide. About the only critical factor in assembling the circuit is identifying the LED leads. Often, but not always, the short lead is the anode. Be sure which lead is which before doing the wiring.

We suggest using color-coded wires for the test leads as indicated in the figures. Use wire lengths that are long enough to allow for easy use of the tester. Tie strain-relief knots in each of the leads and thread them through the three side holes. Terminate each lead with an insulated alligator clip. To keep the battery from bouncing around, use a 9-volt battery holder and secure the holder to the bottom of the box using screws or glue. Place the wired front panel on the box, insert and tighten the screws, and you are done.

Well, almost. It's a good idea to label the switch and lead functions using press-type or any other technique that suits you. Not only does that give the tester a more finished or "professional appearance," but it can save some head scratching later on. ■



ALL DIMENSIONS IN INCHES

Fig. 2. The SCR tester can be assembled within a small experimenters box. If you use the box specified in the article, use this template when preparing the front panel.

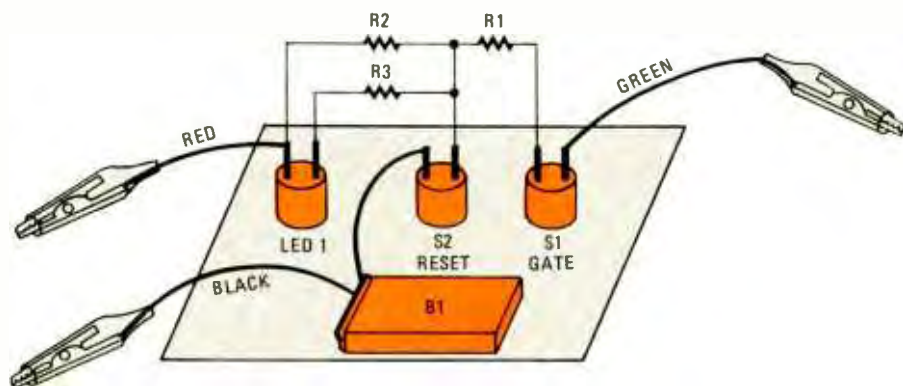


Fig. 3. The circuit is simple enough to be put together using point-to-point wiring. We suggest using color-coded wires for the test leads, as shown here, to avoid confusion.