

INEXPENSIVE **AUTO BATTERY TESTER**

BY HANK OLSON

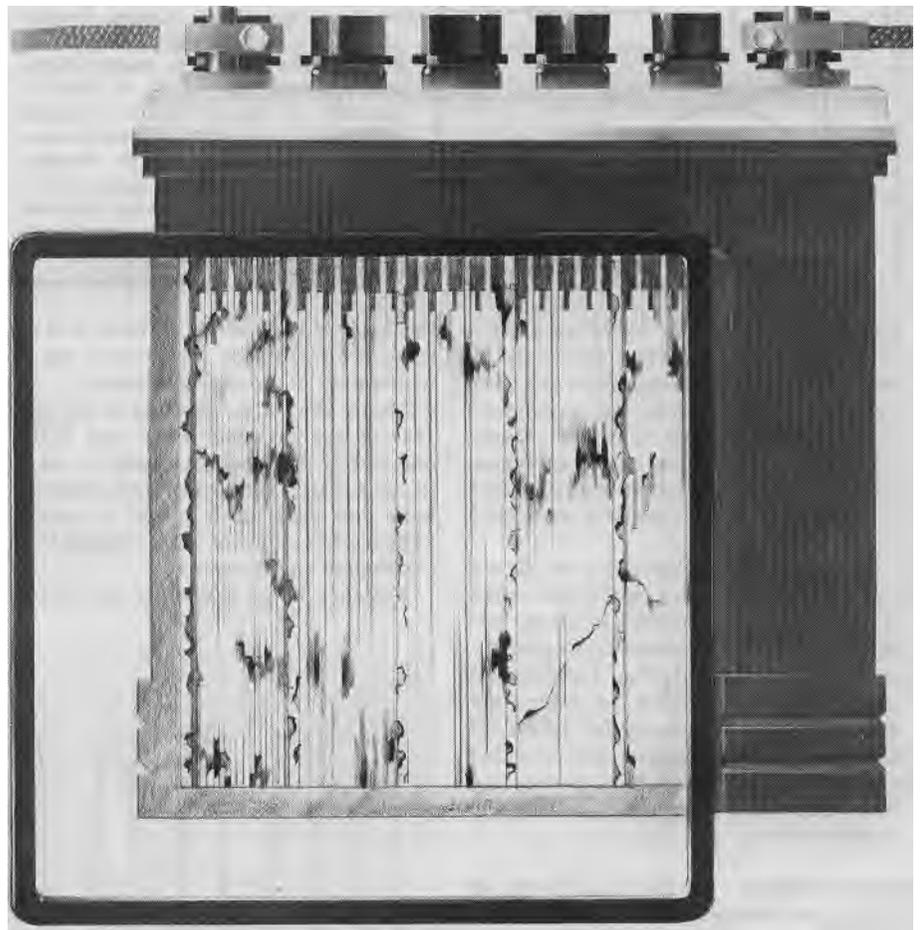
Simulates 200-ampere starter-motor load

AN AUTOMOTIVE battery works very hard, especially when cranking the engine, and if you have a plethora of electrically operated accessories that often draw more power than the unaided alternator can deliver, it may not have a full charge to work with. Even a battery that loafs most of the time may age to the point where it can no longer start the engine on a cold day, so it's a good idea to check your battery's health now and then.

Numerous tests can be made on a battery, and all of them give some indication of its condition. But none is as conclusive as checking its performance under load. To do that you need a professional battery tester, an inexpensive version of which you can build, as described in this article.

The Circuit. The battery tester, shown schematically in Fig. 1, assumes the test current to be 200 amperes at 12 volts. (To determine appropriate load current, refer to the box.) Using Ohm's Law and assuming a 12-volt battery, you can readily see that load resistor $R2$'s value would have to be a very low 0.06 ohm ($R = E/I = 12 \text{ volts}/200 \text{ amperes} = 0.06 \text{ ohm}$). Furthermore, its power rating would have to be a whopping 2400 watts ($P = IE = 200 \text{ amperes} \times 12 \text{ volts} = 2400 \text{ Watts}$). Clearly, you're not going to find a resistor with these ratings in your local electronics parts store. Fortunately, however, you can fabricate your own power resistor from available inexpensive materials.

Continuing with our example of 12 volts and 200 amperes, you'll need about 12 feet of 1/2-inch wide, 0.025-inch thick steel banding strap (used to cinch wooden packing cases) to fabricate $R2$. Connect the strap in series with an ammeter that can handle at least 2.5 amperes across a variable power supply capable of delivering up to 1 volt at more than 2



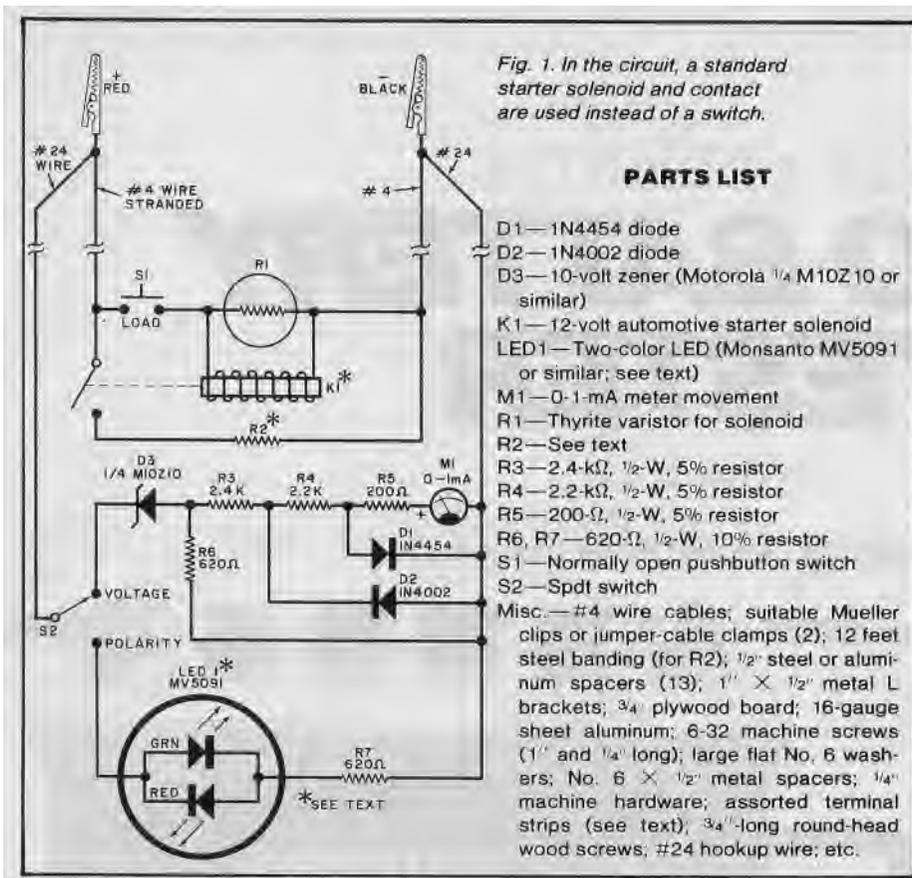
amperes. Adjust the power supply for a 2-A output and measure the voltage across the load. If it is over 0.12 volt, trim the strap until it equals 0.12 V.

Turn off the power supply and disconnect the test setup. You've now determined the length of steel strap to use for a 0.06-ohm load resistor. (You can use the same test setup to determine the length needed for any other battery voltage/power ratings simply by changing

the voltage or/and current to the appropriate values in the formulas that are provided in the box.)

You're not likely to find a switch that can handle 200 amperes in an electronic parts store, but a conventional 12-volt automotive starter solenoid (KI in Fig. 1) will fill your need. Operating current for the solenoid is controlled by normally open pushbutton switch SI .

Meter M , resistors $R3$ through $R6$,



and diodes *D1* and *D2* make up a 0-to-6-volt dc voltmeter. When connected in series with 10-volt zener diode *D3*, this meter circuit becomes an expanded-scale 10-to-16-volt dc voltmeter. Diode *D2* protects the meter against reverse polarity, while diode *D1* protects against overvoltage when the meter is connected in proper polarity.

When selector switch *S2* is set to **POLARITY**, *LED1* glows green if the tester is connected to the battery in proper polarity, red when the connection's polarity is incorrect. Note that Fig. 1 shows and the Parts List specifies an integrated red/green LED assembly for *LED1*. If you wish, you can replace this with discrete red and green LEDs, connecting them into the circuit as shown for the integrated unit.

Construction Hints. As shown in Fig. 2, the best way to mount the steel strapping that makes up the load resistor, *R2*, is on a 3/4-inch plywood board, using No. 6 metal *not* plastic—spacers and machine hardware. Start by drilling a 1/4-inch hole spaced 1/4-inch in from each end of the strapping.

Next, drill two rows of 1/8-inch holes through the board, spacing the rows about 8 inches apart and the holes within each row about 1 inch apart. Then mount a metal spacer at each hole location with a 6-32 X 1" machine screw, placing a large flat No. 6 washer under

the head of each screw. Mount another large flat washer on top of each spacer with a 6-32 X 1/4" machine screw.

Mount the starter solenoid at the right rear of the plywood board and fasten one end of the steel strapping to one of its terminals. Then route the strapping back and forth from spacer to spacer. (The washers prevent the strapping from slipping off the spacers.)

Fasten a large L bracket to the free

end of the strapping with 1/4-inch hardware. Then secure the L bracket and one- and two-lug terminal strips to the wood base with 3/4-inch round-head wood screws.

For the front panel, you will need a sheet of 16-gauge aluminum. Trim it to the width of the plywood base. Then, if possible, bend a 90° lip, about 1 inch wide, along the panel's bottom edge (alternatively, use three large L brackets) and drill three or four Vs-inch holes along the length of the lip to permit mounting the panel to the plywood base.

Machine the panel and mount on it the meter movement, integrated LED assembly (or discrete LEDs), switches, and two three-lug terminal strips. This done, mount the panel to the top front of the plywood base with 3/4-inch-long roundhead wood screws.

Wire the circuit as shown in Fig. 1. Note that separate #24 wires are used as voltage sensors and are run in parallel with the large #4 cables that carry the actual current. The #24 wires are used to measure the voltage at the battery before any voltage drops in the cable resulting from the high-current flow through *R3*. When installing the #24 wires, route them along the #4 cables and use either lacing cord or tape to bind wire and cable together. Finish the assembly by attaching large Mueller clips or jumper-cable clamps to the free ends of the #4 cables.

Use. To use the tester, connect the two Mueller clips (or clamps) to the battery/charger system (at the battery's terminals) in the vehicle you wish to test and set *S2* to **POLARITY**. If the LED glows green, the tester is properly connected, but if the LED glows red, reverse the connections to the battery.

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