

On-the-Dash Battery Tester

THE biggest worry for drivers, they say, is ice on the road, and then comes fog. Not far behind, particularly for those who drive at night, is a failing or dead battery.

Suppose my headlights start to fade—then what? After I get there and the car cools off, will it start again? So go the worries of the man who is battery-conscious.

Fact is, few of us ever know the true condition of a car's battery but for three exceptions: 1. The car starts and the lights are good

enough to drive by. 2. The car barely starts and you have trouble telling a tree from a telephone pole. 3. It's all dead; the battery is kaput.

The problem lies with testing equipment and procedures. The equipment needed is a hydrometer, which service stations have but you may not, and the procedure is opening the hood and testing each cell of the battery, which may be easy on a summer day in the driveway but becomes difficult in a dark garage in winter and impossible for any-

body except Superman while you're cruising along an interstate.

Our Battery Tester, which amounts to an electronic hydrometer, solves all these problems neatly and cheaply. At a glance, it tells you two things about your battery and also tattles on the generator.

Like a hydrometer, the Battery Tester shows the battery's specific gravity and, therefore, its health. It also indicates the power available from the battery, which is important because a battery may be fully charged with a high specific-gravity reading yet no longer capable of providing much power out. An analogy is a person who eats a big meal yet has little strength. Lastly, our Battery Tester tells whether the generator is working properly.

The battery tester can be built for only about \$15 in a couple of evenings.

You can build this versatile instrument in one of two ways: as a built-in that you mount on your dash or in a 3X3X4-in. cabinet. In



A BATTERY'S true condition can be checked easily and quickly from driver's seat by our Battery Tester, which shows both charge and power available. While you're driving, it tells health of alternator.

the first instance, if you want to do it right you select an uncluttered place on your dash, punch a hole with a chassis punch or make one with a drill and through-mount the meter and test pushbutton. In instance No. 2, the cased instrument may reside normally in the garage and you lift the hood and apply it directly to the battery when you think you need to do a checkup. If the meter is on the dash, of course, you can do a check every time you get into your car—and even while you're cruising along at 60 or 70 you can find out whether the alternator is working properly.

We'll deal with the theory in a moment but, first, the construction. You have less than a dozen parts to deal with and placement is not critical. If you're building the cabinet model, it's best to keep all wiring on one side of the perfboard and, when you mount the board to the chassis, put a piece of cardboard behind it for insulation. Our piece of perfboard measures 1½X3 in. Only

components mounted on the front panel are the meter, the pushbutton and the LED (light-emitting diode). Six wires connect perfboard and front panel.

The meter scale we supply at full size with this article is designed for a 50-microamp meter such as Radio Shack's No. 22-051, or an equivalent. The scale can be cut out and glued directly over the meter's supplied face (be careful not to damage the pointer). We used furniture varnish as an adhesive.

When construction is complete, two wires emerge from the back of the case, one that clamps to the battery's positive terminal, the other to ground (U.S. cars). You can cut them any length you wish.

Building the Battery Tester for mounting on your dash is different but no more complicated. The components can be wired point-to-point in a cluster between the meter's binding posts or you can mount the parts on a tiny piece of perfboard and then cement it to the back of

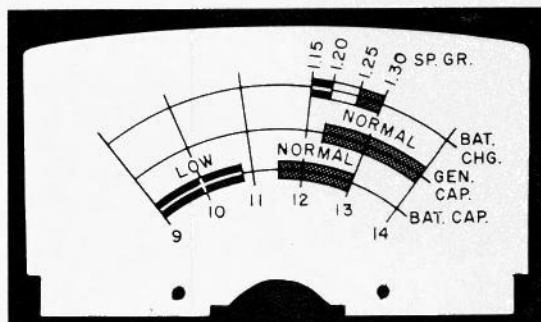
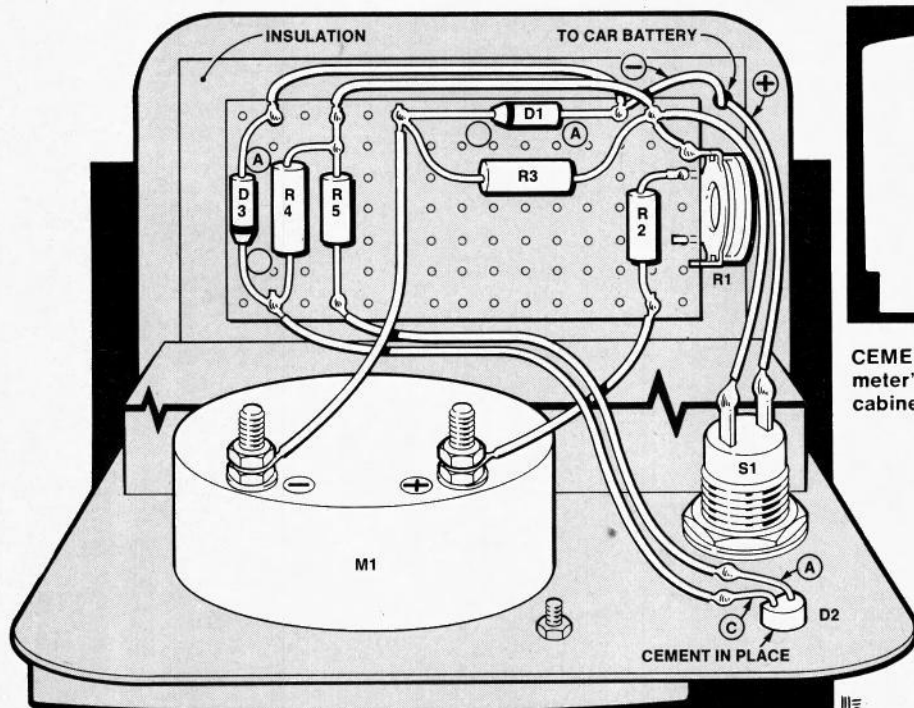
the meter. The LED is optional for the dash mount.

The Battery Tester, which is powered by the battery it's testing, (Continued on page 135)

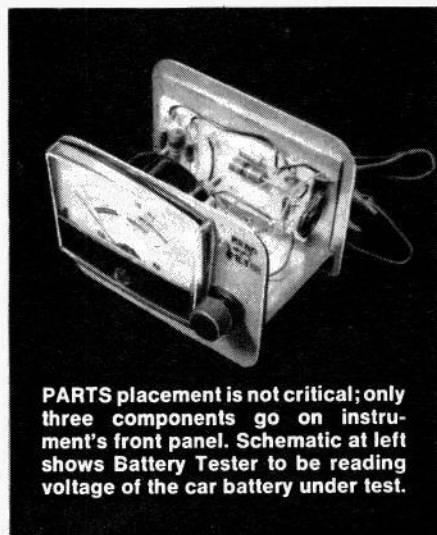
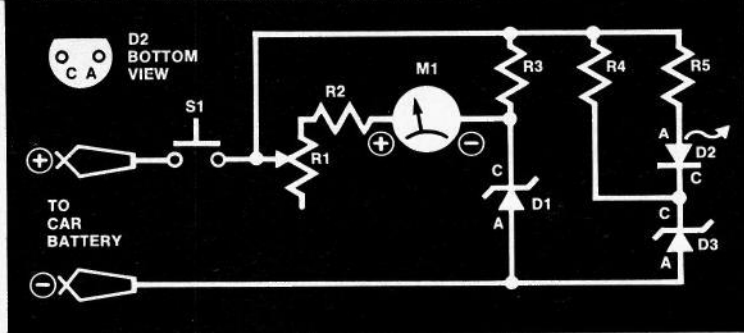
PARTS LIST

- D1—Zener Diode 9.1V ±1% tolerance, 1 watt (Schauer Diode SZ 9.1 1% or equiv.)
- D2—LED (light-emitting diode), 1.6V forward voltage (Radio Shack No. 276-040 or equiv.)
- D3—Zener Diode 8.2V ±1% tolerance, 1 watt (Schauer Diode SZ 8.2 1% or equiv.)
- M1—Panel Meter, 50 microamps (Radio Shack No. 22-051 or equiv.)
- R1—Variable Resistor, 50,000 ohms, ¼ watt (Radio Shack 271-219 or equiv.)
- R2—Resistor, 68,000 ohms, ½ watt
- R3—Resistor, 50 ohms, 1 watt
- R4—Resistor, 100 ohms, 1 watt
- R5—Resistor, 100 ohms, ½ watt
- S1—Pushbutton Switch (Radio Shack 275-609 or equiv.)

NOTE: Diodes D1 and D3, 1% tolerance, can be obtained for \$3 ppd. from Corvair Electronics, Inc., 150 Fifth Ave., New York, N.Y. 10011. Ask for Kit No. 400.



CEMENT meter scale above directly on 50-microamp meter's face. Pictorial at left shows Tester built in cabinet; parts can be clustered for a dash mount.



PARTS placement is not critical; only three components go on instrument's front panel. Schematic at left shows Battery Tester to be reading voltage of the car battery under test.

Battery Tester

(Continued from page 49)

works by taking advantage of the fact that lead-acid batteries show a relationship between open-circuit voltage and the density (specific gravity) of the acid. Once the meter is calibrated, the specific gravity can be read directly on its face.

There are two methods of calibration. If you have a hydrometer, take a reading of each cell and calculate the average. Then, with the engine off switch the headlights on for 30 sec. (this stabilizes the battery). Let the battery rest for 2 min. and hook up the Tester. Adjust R1 until it reads the proper specific gravity, such as 1.270. It need never be calibrated again.

A specific gravity of 1.25 to 1.30 indicates a battery in good condition. A 1.15-1.20 reading tells you a charge is needed.

If you have no hydrometer, go through the lights-on procedure, hook up the tester and then, with a new battery, set the specific gravity to 1.30; a battery a year or so old should get a setting of about 1.260. This calibration is less accurate but the readings no less useful.

Testing for Charge. Engine off. Lights on 30 sec., followed by 2-min. rest. Press button and read specific gravity.

Testing for Capacity. Engine off. Turn lights on 30 sec. and read lowest scale. Compare to previous readings.

Testing the Generator. Engine running. Press button and read middle scale. In order to charge a 12-V battery, an alternator needs to produce 12.5V or so. A lower reading means the battery is not being charged.

The LED is merely a reference to tell whether the meter can give you an accurate reading. When the battery is nearly dead, the LED will not light and you needn't bother with a meter reading.

Don't wait to use your Battery Tester until something goes wrong. Instead, make periodic checks when things are going right. That way, you'll notice an abnormal reading right away and be able to spot trouble before it gets too bad. ●