Battery testers

As all of you long-time Hardware Hackers know, I am very much a fan of *elegant simplicity,* or any way to do very much with very little. Those *Duracell* folks have finally reduced battery testing to an elegantly simplistic minimum. Just in case you haven't noticed, there's now a free battery tester built into their battery packaging. An incredibly sophisticated one, and obviously cheap.

Flashlight cells do not often fail suddenly. Instead, because of cell polarization and other effects, their internal resistance slowly increases. That, in turn, drops the cell's voltage under load, eventually to the point where they can no longer be used.

To test a flashlight cell, just place a power resistor across it that represents a fairly heavy load for that size cell. Wait several seconds. Then measure the battery's open-circuit voltage.

In the *Duracell* package, there is a pair of printed contacts with a printed power resistor between them. Around three ohms for the AA-size alkaline cell. The resistor gets noticeably hot when you connect your cell to it.

Now for that elegantly simple part. As Fig. 5 shows us, the printed resistor is not uniform. Instead it forms a *wedge* shape. The narrow portion of the wedge at the bottom will have a higher resistance *per unit length* and thus will get *hotter* than the upper, wider part. Thus, this particular resistor will set up a temperature gradient that is hottest at the bottom and coolest at the very top.

How hot? Well, that all depends on how much current your cell puts out under load. Power equals the current squared times the total resistance.

A thin liquid-crystal coating gets placed on the reverse side of the resistor. It's the same stuff used in clinical and desk thermometers. At a certain *transition temperature,* the liquid crystal will turn a bright green. Below that temperature it will remain black, and above it a dark gray.

The more the available current under load, the higher the green spot on the display. So, a "good" cell will

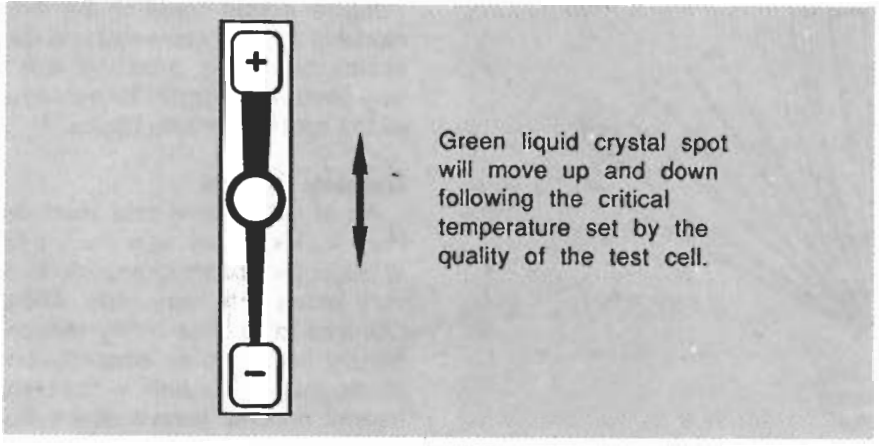

FIG. 5—THE LOAD RESISTOR in the Duracell battery tester is wedge shaped so that it gets hotter per unit length at the bottom than at the top. A liquid-crystal coating changes color at a critical temperature, moving a green indicating spot up with a strong cell and down with a weak one.

have a "high" green spot, and a "bad" cell might have a "low" green spot, or perhaps none at all.

The results surely change with the ambient temperature and the size of the cell being tested, but they assume you are testing your cells at room temperature, and that the cell being tested is the type and size provided in the package. Basically what you have here is a three-cent 0 to 500 DC milliammeter. What other uses can you come up with for this great new concept?

GOOD/NO GOOD BATTERY TESTER

This is a simple tester for use with a PP3 or similar battery.

It is wired to a PP3 battery clip remembering that red is connected to −ve of battery and black to the +ve. It uses 3 small LEDs of the same size: one red, one green. Due to the fact that the green LED needs a far greater current, the green will glow only if the battery is in reasonable condition. The red will glow even if battery is down. If the red glow is very faint the battery is no good.