



Empty battery?

Is the battery empty, or is there something wrong with the device? That's always a difficult question when your walkman or some other battery-powered device appears to be dead when you switch it on. Before you take it to the shop for servicing, the first thing you should do is to test the battery or batteries. Of course, this means you need a reliable battery tester, but it also means you can limit the damage to the cost of a battery or two and a one-time investment of time and money in building a suitable tester.

Photo: www.energizer.com

Battery tester

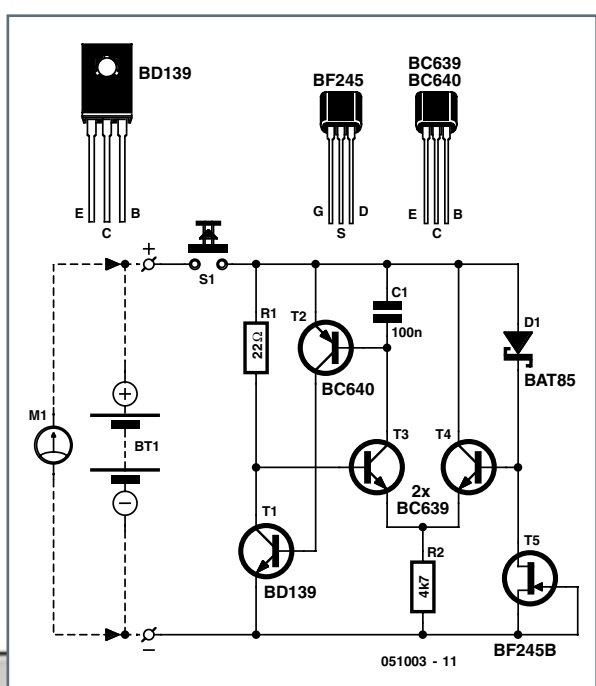
Many commercial battery testers consist of nothing more than a resistor, a simple little meter and a pushbutton. Some manufacturers include an even simpler tester with a set of batteries, consisting of a strip of plastic with a layer of some sort of electrically conductive material that changes colour when a current flows through it. If you press this strip over the battery between the positive and negative terminals, a fully charged battery will cause a more intense change in colour than a partially discharged battery. Naturally, tests of this sort do not provide especially reliable or accurate results.

The idea behind the circuit described here is to load a single battery, a set of batteries connected in series, a rechargeable battery, or even a small button cell with a reasonably constant current and use a separate multimeter or voltmeter module (M1) to check the voltage. A quickly decreasing voltage indicates that the battery or batteries will have to be replaced soon.

If a constant-current circuit is used for the load, the current can never too be large and there is no need to make an adjustment for the number of cells. The constant-current circuit is specially designed to work with a voltage as low as 0.9 V. It's quite difficult to make a circuit work at even lower voltages with normal transistors.

The active constant-current element is transistor T1. The current through it is held constant by comparing the voltage across resistor R1 in its collector path with a relatively constant reference voltage across diode D1. This comparison is provided by differential amplifier T3/T4. The voltage across diode D1 (a Schottky type) is reasonably constant by nature, but it is also stabilised by using FET T5 as a simple constant-current sink. T5 also limits the current at relatively high voltages (with several batteries in series). The constant voltage across D1 is transferred to resistor R12 by differential amplifier T1/T2, so a constant current flows through R1 from the battery or batteries being tested. R1 has a relatively low resistance, so this current is larger than the current drawn by the rest of the circuit. The quiescent current, which incidentally is also reasonably constant, is thus negligible. The test current thus remains reasonably constant while the battery or batteries is/are being tested.

The maximum battery voltage that the tester can handle is set by T5, and here it is 30 V. To ensure that T1 does not get too warm at high battery voltages, keep the test as short as possible. Use a pushbutton switch as a test switch so the battery being tested cannot be left under load by accident.



In these days of environmental awareness it has become desirable to use batteries as efficiently as possible. A lot of battery powered electronic devices do not switch themselves off automatically, such as multimeters. Forgetting to turn these off isn't just a nuisance (since you'll find that you don't have a spare battery at the crucial moment), but you're also unnecessarily reducing the lifespan of the batteries and causing extra pollution. And it isn't really necessary for those electronic thermometers to display the temperature day and night. As a skilful and environmentally aware i-TRIXXer you should make one or more of these small battery saver circuits.

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Electronics inside out !