



## Circuit & Design Ideas

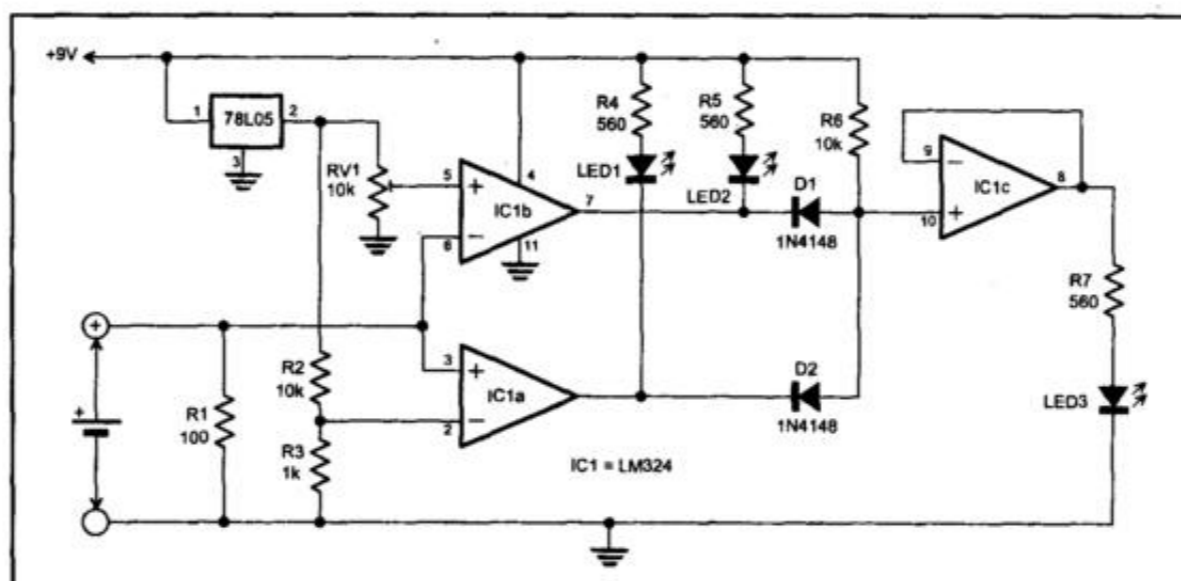
Interesting circuit ideas from readers and technical literature. While this material has been checked as far as possible for feasibility, the circuits have not been built and tested by us. We therefore cannot accept responsibility, enter into correspondence or provide further information.

### NiCad cell tester

I have a collection of ageing AA NiCad cells which I use to power a personal stereo and a radio. Frequently I find that cells which I presumed to be charged are not. This is either due to a loss of charge because too much time has passed since charging, or because the cell has reached the end of its lifetime due to dendrite growth and associated internal short-circuiting of the electrodes. This circuit gives an easy way to test these cells.

The cells are connected to a 100 ohm load resistor (R1) and the voltage tested with comparators IC1a and IC1b. A threshold voltage of 0.45V is derived by R2 and R3 from the 5V produced by the 78L05 voltage regulator, which is used here as a cheap voltage reference. If the cell voltage is below this value, LED1 is lit. This indicates a dead, internally shorted cell, as even discharged cells produce a voltage higher than 0.45V.

A charged cell is indicated by LED2, which turns on if the voltage threshold set by RV1 is exceeded. NiCad cells have a fairly flat discharge curve, so a careful setting of this value is needed,



which also explains the need for a voltage reference. A completely charged cell has a voltage of 1.35V which drops rapidly to about 1.30V over the first few percent of discharge. This is followed by a subsequent gradual decrease to about 1.25V before its capacity is exhausted, which is associated by a sharp drop of voltage. I chose a threshold value of 1.28V, which indicates a cell that is charged to about two thirds of its capacity.

A discharged cell is indicated by LED3, which lights up when the voltage

is between the two threshold values. The signal for this is derived from the output of the two comparators by the AND gate formed by diodes D1 and D2 and pull-up resistor R7. The outputs of IC1a and IC1b are both a logic high if the cell voltage is between the set thresholds. IC1c is a buffer to drive LED3.

The circuitry can be powered by a 9V battery and built into a small box with an AA cell holder mounted on top for easy insertion of the NiCad cell to be tested.

Dr Peter Hauser,  
University of Auckland, NZ. \$40

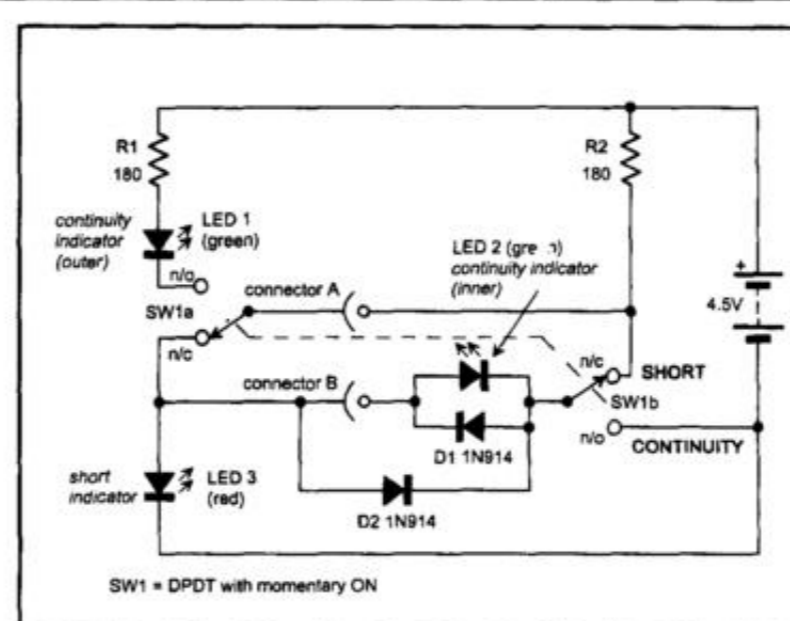
### Cable tester

I could not resist the challenge presented by Jim Rowe's EA November 1994 construction project: the In-a-Flash Cable Checker. My cable-tester circuit runs on a 4.5V supply, using three AA cells, which gives a longer battery life at less cost. It also uses fewer components.

The tester indicates a short-circuit (red LED) between the inner and outer conductors whenever a defective cable is connected. When operated, the spring-loaded DPDT (toggle or slide) switch enables the 'continuity' function, and either one or both green LEDs will light if the appropriate conductors are intact.

If there's an inner-outer short, but the switch is operated anyway, only one continuity LED will light, even though both conductors may be intact. So any short circuits must be eliminated first to get valid test results of continuity. The circuit draws no current when not being used and so it doesn't need an on/off switch.

Murray McGregor,  
Dunedin, NZ. \$40



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