AC-continuity tester finds single-ended faults in cables

Kevin Bilke, Maxim Integrated Products, Fleet, Hants, UK

An ac-based continuity tester for front-line test-and-repair jobs provides a simple go/no-go test for localizing faults in multiconductor cables (**Figure 1**). Open circuits are more likely to occur at the connector ends. This tool helps to identify the faulty end, thereby avoiding the risk of damaging a good connector by opening it. It's also useful for testing an installed cable for which both ends are in different locations. The circuit injects an ac signal on one wire of a cable and then looks for an absence of capacitive coupling to the other wires. After locating this fault, the circuit identifies the open wire and allows you to open and repair the correct cable end.

One end of a bad cable typically shows good ac continuity, and the other end typically has one or more connector pins with no ac continuity. Because a short in the cable appears as a good connection, the operator can easily confirm that the tester is operating correctly by simply shorting its test leads together. The first section of IC_1, a Maxim (www.maxim-ic.com) MAX9022 low-power dual comparator, forms a relaxation oscillator operating at approximately 155 kHz. It produces a peak-to-peak output signal approximately equal to the supply voltage, which feeds to a connector of the cable under test. The second section of the circuit processes any ac signal that the interlead capacitance picks up. A pair of silicon diodes first rectifies that signal and then integrates the rectified signal on storage capacitor C_5. Bleed resistor R_5 provides some noise immunity and helps to reset the capacitor between tests.

Output resistor R_4 and input capacitor C_4 provide limited circuit protection. The circuit indicates open for any test-cable capacitance below 100

pF. Thus, a standard mains-test lead, whose typical lead-to-lead capacitance is 200 pF, would test OK. The circuit is also immune to false triggering that the 60-Hz pickup from the power lines causes. Because the typical current draw of this low-power circuit is less than 40 μA, the circuit can usually operate from battery power in the form of three 1.5V AA or AAA cells. Many low-cost alternatives are available for the output device—for example, you could use a dc-activated piezoelectric buzzer—and most feature a suitably wide range of operating voltages. The 100-nF capacitors are standard ceramic decoupling capacitors, and the circuit contains no critical passive components. The comparator's high-side drive is somewhat better than its low-side drive, so it should source rather than sink current to the indicator device. D_1, D_2, and D_3 are silicon diodes. EDN

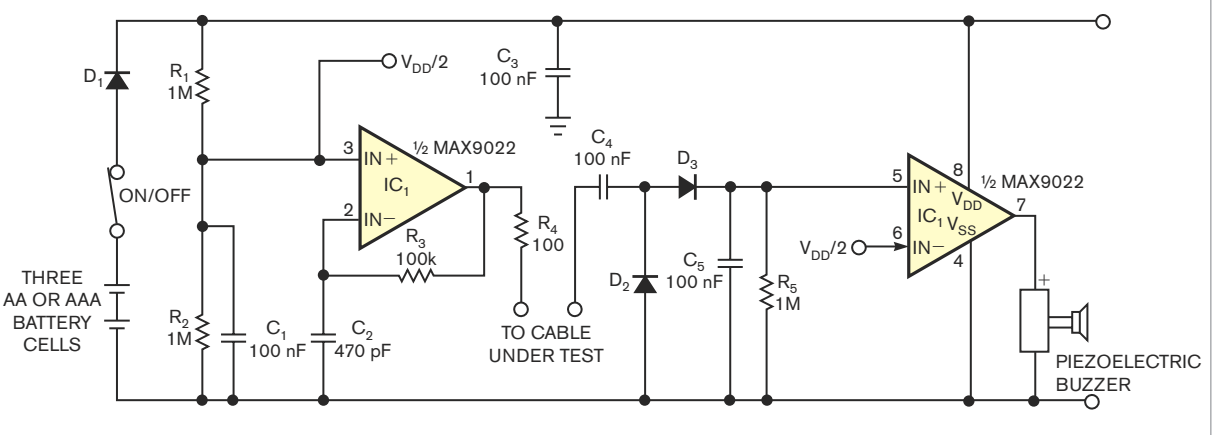

Figure 1 Based on a low-power dual comparator, this ac-continuity tester locates open-circuit pins in a cable.