

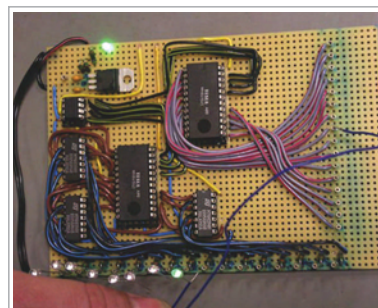
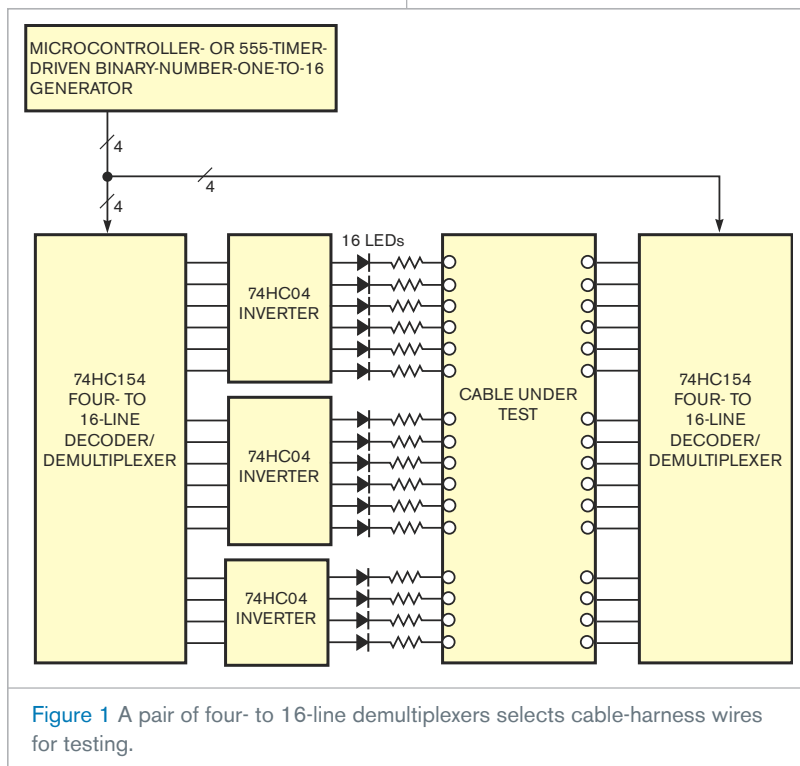
## Cable tester uses LEDs to find faults

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This Design Idea describes a simple cable-test machine that visually shows continuity issues on a 16-wire cable harness for ultrasonic-parking-aid systems. A subcontractor produces the harness in low volumes, making it impractical to use an automated tester. For simplicity, the test signal drives LEDs for a visual indication of continuity.

The circuit in **Figure 1** generates a

binary number from zero to 15 (0000 to 1111). You can generate the numbers with a 555 timer and a binary counter, but this circuit uses a tiny, eight-pin microcontroller. A four-wire bus sends the digits to two four-to-16-line 74HC154 decoders, which generate active-low signals on their 16 lines. Inverting the outputs of the driver decoder with a 74HC04 inverter provides a drive signal for an LED



**Figure 2** The cable-harness tester uses LEDs to indicate good connections.

and current-limiting resistor on each harness wire.

The tester should produce one and only one illuminated LED for a good wire as the circuit scans the harness. If the scan is fast enough, all LEDs will all appear to be on, although each is on for just one-sixteenth of the time. **Figure 2** shows the completed circuit with eight LEDs, but it has room for 16 LEDs.

Broken wires in a harness, wrong wire positions, or other continuity failures lead directly to the turn-off of the corresponding LED. Swapped wires can also lead to the turn-off of two LEDs. Meanwhile, only one cathode is driven high, whereas the others are driven low, and only the cathode's anode is driven low, whereas the others are driven high. So only correctly connected wires could pass this test.

If you need to test harnesses with more than 16 wires, you can cascade additional decoders. You can also use a high-pin-count microcontroller in the same way. **EDN**