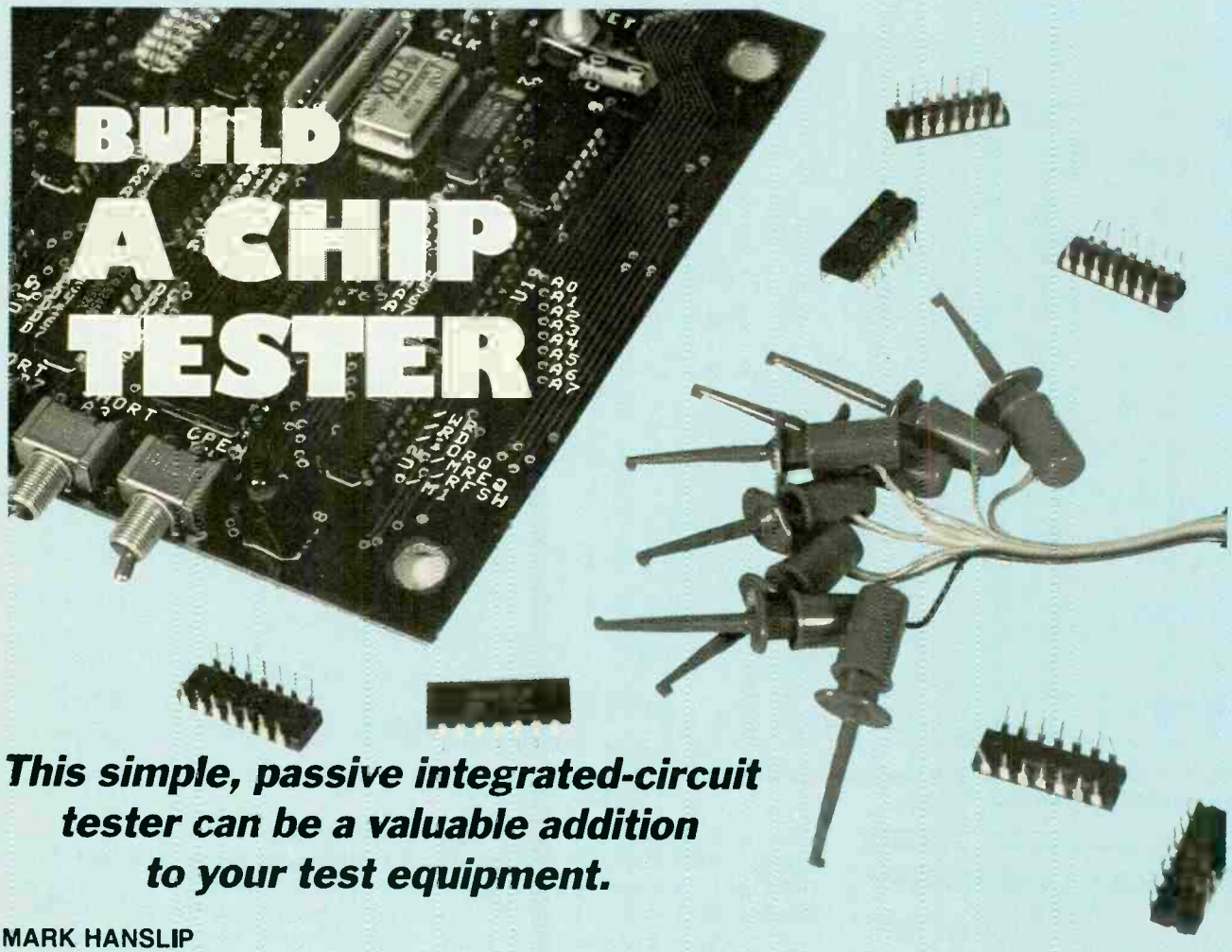

This simple, passive integrated-circuit tester can be a valuable addition to your test equipment.

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A TESTER FOR INTEGRATED CIRcuits can be passive or active. An active tester determines how a device reacts to a set of input signals. It can determine if an IC is faulty, but only if the device is removed from its host circuit.

The passive tester described here can test ICs in a circuit, and does not need to be reconfigured for each device to be tested. A passive tester can also function as a logic analyzer to monitor input and produce output signals.

This article describes how to design, build, and use a simple, inexpensive passive IC tester that can be a valuable addition to your suite of test equipment. But keep in mind that the tester is designed for testing TTL and CMOS devices powered by +5 volts, only.

The tester can test devices with any number of pins. The author designed his prototype to test ICs with up to 20 pins. Chips with 8 to 20 pins that are packaged in DIPs (dual in-line packages) usually have the same width and pin spacing. Thus if a zero-insertion-force (ZIF) socket is added to the intergrated-circuit tester, it will be able to accept most 8-, 14-, 16-, 18-, and 20-pin ICs.

The IC tester puts one or more pins of a known good device in parallel with the corresponding pins of a suspect device. The tester then lights one LED lamp if differences are found in the signals between any matching pins, and other LEDs on the tester light up to show where those differences are.

Circuit design

A typical input circuit is shown at left in the Fig. 1 schematic; one is needed for each test pin. (Only one input circuit is shown. It can test only one suspect pin at a time, but the tester can be built with as many input circuits as you need. Connect additional input circuits to the latch circuit via the 1N4148 diodes as shown in the schematic.) The 74LS266 is an open-collector quad EXCLUSIVE NOR (XNOR) gate. One input to each 74LS266 gate is attached to one pin of the device under test (DUT), and the other input is attached to the same pin of the "good" chip. A single 74LS266 can accommodate up to four inputs, although only a single input is shown in the schematic.

When the two inputs to a 74LS266 gate are the same (e.g., pin 3 of the DUT and pin 3 of the reference device), the output is high; when the inputs differ, the output is low.

Multiple 74LS266 output signals are added together through a series of 1N4148 diodes which are connected to the latch circuit. Only a single latch circuit is needed for the entire tester. After power is applied to the tester, push reset button S1 to initialize the circuit. The reset

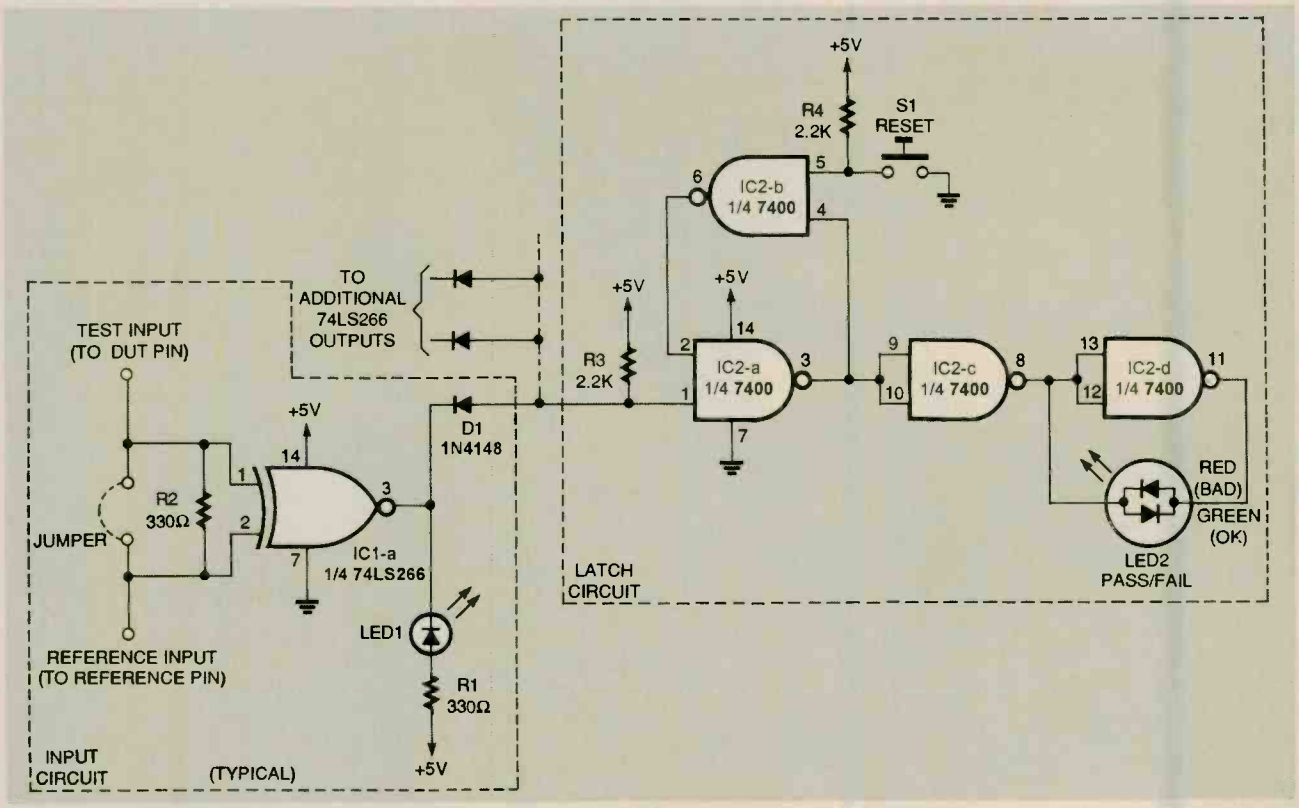

FIG. 1—THIS SIMPLE IC TESTER compares two logic signals and indicates whether the signals are the same or different.

causes bi-color LED2 to light up green. After that, any low output from a 74LS266 will trigger the latch circuit which drives the bi-color LED to red. That color indicates that at least one pin of the DUT doesn't agree with the good chip. The faulty pin is flagged by the LED (LED1 in Fig. 1) attached to the corresponding gate's output. Press the reset pushbutton again to start a new test.

The 330-ohm resistor that parallels the comparator's inputs (R2) allows the signals to the DUT to flow to the reference IC as well. That resistor also prevents the output of the DUT from affecting the reference IC. The jumper that parallels the resistor can short circuit the ground and +5-volt pins of the DUT to the reference IC so the reference IC can be powered by the DUT circuit. Power for the remainder of the test circuit (LED, comparators, and latch) must come from an external power supply.

Remember that the tester is designed for testing 5-volt TTL and CMOS devices only. *To prevent damage, do not exceed that voltage on any pin.*

The tester can be converted to a logic analyzer by inserting a DIP header into the test socket. All of the DIP header pins except the power pin should be connected together and grounded. This will allow you to monitor the signals going to and coming from the DUT with the green LEDs.

Tester use

To use the tester, first connect the test input to the suspect pin of the DUT. Next, connect the reference input to the same pin of an identical reference chip that is known-to-be-good. Push the reset button to begin the test; the green section of the bi-color LED will be illuminated. Any signal on the test device that differs from the one on the reference device will then momentarily light the LED lamp that corresponds to that pin, and also latch on the red section of the bi-color LED. That indicates that the device under test is faulty. If the reference and DUT signals are the same, the DUT is OK, and the green LED will remain lit. Ω