



## BUILD A LOW-COST OP-AMP TESTER

TESTS GAIN, STABILITY, INPUT OFFSET AND BIAS CURRENT

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AS OP AMPS become increasingly popular and useful, there is a growing need for a good, low-cost op-amp tester. The universal op-amp tester described here can be used to test virtually all of the popular units. It automatically checks the important parameters and has a red light-emitting diode (LED) to indicate the condition of the op amp.

The parameters which are checked by the tester are gain, stability, input offset voltage, and input bias current. The tester, which itself uses two op amps, can test internally compensated op amps, such as the 741, as well as uncompensated op amps, such as the 709 and 748. Both 8-pin TO-5 and 14-pin DIP sockets are provided.

**Circuit Design.** Integrated circuit *IC1* is used as a square-wave generator and the op amp being tested is used as an inverting amplifier with gain of 100. The output of *IC1* is applied to both *IC2* and (through voltage divider *R4* and *R5*) to the unit being tested. The output of the latter is applied as a second input to *IC2*, which is used as a summing amplifier.

If the op amp being tested is good, its output will exactly cancel the square wave applied to *IC2* through *R11*. When these two signals cancel, there is zero output from *IC2* and *LED1* will not light.

If the op amp being tested is bad, the two inputs to *IC2* will not cancel and *LED1* turns on. Before *LED1* turns on, however, the output of *IC2* must exceed the threshold determined by the forward voltage drops of two of the bridge diodes (*D1* to *D4*) and *LED1*. Assuming a failure, this threshold will be exceeded if the op amp has a gain of less than 60, an input offset voltage greater than 30 mV or an input bias current greater than 3 microamperes. Any of the popular IC op amps should have parameter values better than these. Similarly, the LED will turn on if the op amp is unstable in the test circuit or has any "shorts" or "opens."

**Construction.** Most any type of assembly method can be used for the tester. For the prototype, the components were assembled on two perf boards mounted in a 2 $\frac{1}{2}$ " by 4 $\frac{1}{4}$ " by 3" metal cabinet. Printed circuit boards could also be used.

The two test sockets (*S01* and *S02*) were mounted on one perf board with their associated components, and the board was fixed to the upper inside surface so that both sockets protruded through holes cut in the upper surface.

The second perf board (with *IC1* and *IC2* and their related components) was mounted on the bottom of the cabinet