

Isolator circuit permits scope to check ungrounded voltages

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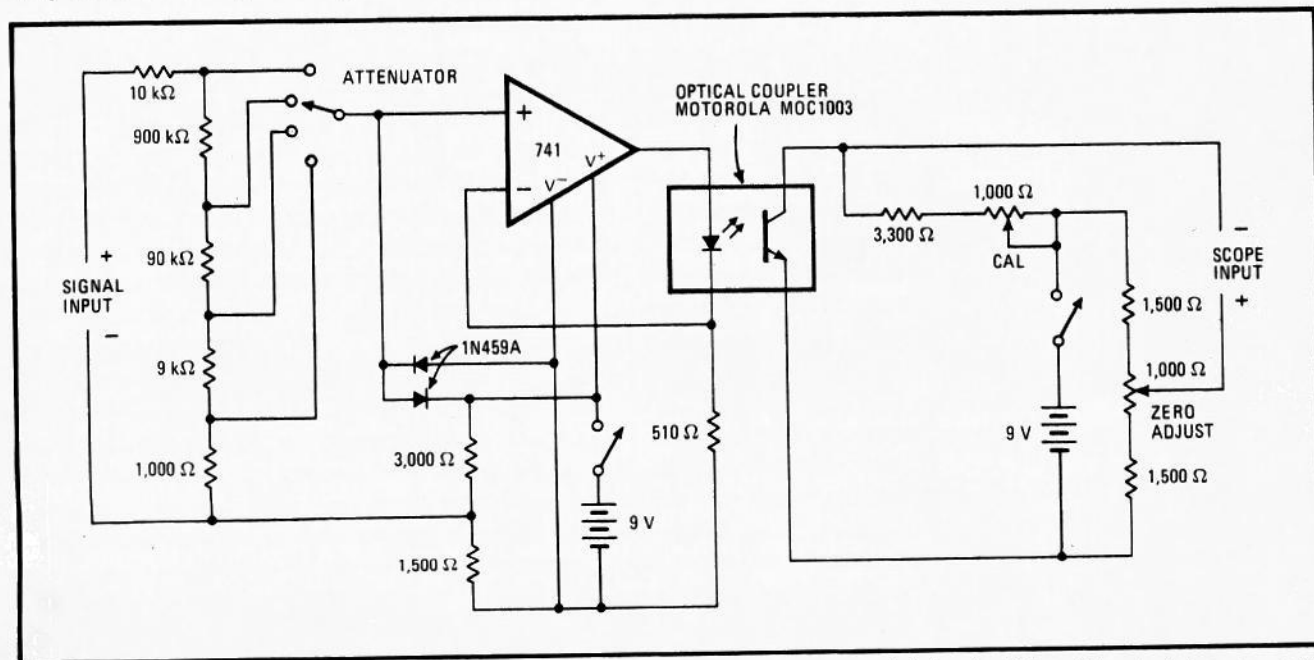
Measuring low-level voltages in circuits that are not referenced to ground can be rather difficult. But a special oscilloscope isolator circuit allows a grounded scope to be used for observing small voltages—including their dc levels—in ungrounded circuits.

With this isolator, even common-mode potentials as high as 500 volts will have no effect on the measurement of differential potentials as low as 0.1 v. The circuit is particularly suitable for measuring SCR gate-to-cathode voltages and thyatron grid-to-cathode voltages in motor-control circuits, where the cathodes are typically removed from ground by 120 v ac.

The isolator circuit is divided into two sections, which are separated by the insulating barrier of an optical coupler. The input section consists of a precision decade step attenuator, limiting diodes, and an operational amplifier. The op amp employs current feedback so that the current supplied to the LED of the optical coupler is linearly proportional to the input voltage but offset by one-half of the full signal range. The circuit's output section contains the phototransistor of the optical coupler and a balancing network, which assures that the circuit's output voltage will be zero when the signal voltage is zero.

For maximum safety, the two sections should be assembled in a plastic box, with a plastic barrier separating the two, except for the connections to the optical coupler. The isolator's operating bandwidth is limited to the audio range by the 741-type op amp. A wider-bandwidth op amp will improve the frequency response. □

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Floating Input. Oscilloscope isolator circuit is ideal for measuring small voltages in ungrounded circuits. Differential potentials as low as 0.1 volt can be discerned out of common-mode potentials as large as 500 V. An optical coupler separates signal and scope inputs.