Oscilloscope probes can do many jobs

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If you walk into a design prototyping area and see oscilloscope probes sprouting not only from scopes but from oscillators, counters, meters, filters, and even power supplies, don't jump to the conclusion that either you or the engineer who works there is a bit daffy. On the contrary, when you are working with breadboarded circuits, especially the sloppy variety, scope probes are useful for getting signals both in and out of a circuit.

Scope probes are handy, shielded, insulated lines that have a built-in ground connection. They attach readily to component leads on one end and are equipped with BNC-type connectors on the other, as is most test equipment. An ordinary probe from one maker will work fine on equipment from another manufacturer.

For example, a Tektronix P6011 1× probe has a series resistance of about 300 ohms. This is insignificant when the probe is used with a measuring instrument providing an input resistance of 1 megohm, which is generally the case. A 1× probe is also usually acceptable for inserting signals into circuits that have an input impedance of 1 kilohm to 1 megohm. However, if the exact input signal amplitude or phase must be known, it may be necessary to measure the signal at the circuit, instead of at the driving source.

A Tektronix P6012 10× probe has a series resistance of 9 megohms; it operates into an input resistance of 1 megohm shunted by a capacitance of 15 to 47 picofarads. Many measuring instruments other than oscilloscopes have a similar input impedance, and the probe works equally well with them. At low frequencies (roughly those below 1 kilohertz), it is not even necessary to adjust the capacitance.

Sometimes when you're inserting a signal, you must either greatly attenuate the voltage (as for a preamplifier) or insert a current rather than a voltage (as for the virtual ground of an op-amp circuit). For these sorts of jobs, a series resistance is necessary, and the 10× probe with its 9-megohm resistance is handy.

If it is properly matched to the input impedance of a measuring instrument, a probe is accurate from dc to well up in the megahertz region. In fact, a probe can often improve the accuracy of your measurements, suffering from neither the noise picked up by unshielded test leads nor the loading caused by high-capacitance shielded cables.

When you insert a sine wave with a scope probe, there is no loss in accuracy provided that the signal's amplitude and phase are measured at the circuit. And if you are applying complex waveforms to your circuit, you must also check to see that distortion has not occurred because of attenuation and phase shift. □