Choosing the Right Probe

Probes provide a physical and electrical connection between the oscilloscope and the test point on your device. Tektronix offers a variety of probe types to match your measurement needs. Here are some probe types and performance considerations for choosing the right probe for your application:

**Probes Considerations**

**Attenuation**
- Attenuation is the amount by which the probe reduces the signal amplitude. Higher attenuation factors are typically used for measurements which require larger dynamic range whereas lower attenuation is used for low amplitude signals where noise may be a concern.

**Bandwidth**
- The bandwidth of both the oscilloscope and probe should be at least five times that of the circuit being tested to ensure an sine wave amplitude error of no more than 3%.

**Rise Time**
- The rise time of the measurement system should be less than one fifth of the rise- or fall-time of the measured signal to ensure an error of no more than 3%.

**Passive Probes**
- Ship standard with most oscilloscopes and provide a low cost, general purpose probing solution for a wide variety of applications.

Probing Tips

The following probing tips will help you avoid common measurement pitfalls:

- **Compensate Your Probes.** Compensation is the process of manually adjusting the ratio of the capacitances which appear in parallel with the probe’s attenuator resistance to adjust AC attenuation of the signal. Compensate your probe every time you connect it to an oscilloscope channel to avoid measurement errors, especially when measuring rise- and fall-times.

- **Use appropriate probe tip adapters whenever possible.** A probe tip adapter that’s appropriate to the circuit being measured makes probe connection quick, convenient, and electrically repeatable and stable.

- **Keep ground leads as short and as direct as possible.** The added inductance of an extended ground lead can cause ringing to appear on fast-transition waveforms.

- **Degauss Your Current Probe.** Degaussing is used to correct or maintain a peak current reading. The degauss warning indicator alerts you to perform a degauss operation. Degaussing removes any residual DC flux in the core of the probe’s transformer, which may be caused by flux results in an output offset error that can build over time resulting in inaccurate measurements; remember to degauss your probe.

Find the Right Probe with Tektronix

**TCP Series Current Probes**
- Measure AC and DC signals up to 500 A
- High bandwith and low leakage for fast-waveform capture

**TDP Series Differential Voltage Probes**
- Measure high speed signals with up to 3.5 GHz bandwidth
- Excellent common mode rejection ratio (CMRR)
- AutoZero button automatically removes probe offset

**TPP Series Passive Voltage Probes**
- Measure up to 350 MHz bandwidth
- Excellent CMRR
- AutoZero button automatically removes probe offset

**TMPD & THDP Series High-voltage Differential Probes**
- Safety measure differential signals up to 6.0 kV
- Switchable attenuation and bandwidth limits
- Access relevant probe settings and controls by simply pressing the probe’s menu button

**TAP Series Active Voltage Probes**
- Measure high speed signals with up to 3.5 GHz bandwidth
- < 1 pf probe capacitance minimizes probe loading
- Automatic units scaling and readout on the oscilloscope display
- AutoZero button automatically removes probe offset

Impact of Probe Loading

Probes are vital to oscilloscope measurements because there has to be some kind of electrical connection between the test point and the oscilloscope. To produce a voltage waveform on the oscilloscope, an oscilloscope probe’s tip has to draw some current from the circuit under test. Since the probe tip has to draw some current, it’s going to disturb your circuit. Two probe specifications related to how a probe loads or disturbs your circuit are input resistance and input capacitance.

The loading of greatest concern is typically the capacitance at the probe tip. For low frequencies, this capacitance has a reactance that is very high, and the loading is not as much. As frequency increases, however, the capacitive reactance decreases, meaning the probe impedance decreases and the loading is much greater. Because of the adverse effects of capacitive loading, Tektronix includes a new series of passive probes with their oscilloscopes with industry best input capacitance of 3.9 pF.

Considereations for Power Measurements

**Eliminate Skew**

Making power measurements requires using two different probes, one voltage and one current, each with its own propagation delay. The difference in the delays between the probes, known as skew, causes inaccurate amplitude and timing measurements which leads to incorrect power measurements. Some oscilloscopes allow you to disable current and voltage measurements to minimize this problem; remember to disable your channels every time you make a new probe connection.

**Remove Your Probe Offset**

Differential probes have a slight voltage offset. This offset may affect accuracy and must be removed before proceeding with measurements. Most differential voltage probes have built-in DC offset adjustment controls; remember to remove your probe offset.

Tektronik Probes

Tektronix offers over 100 different probes to match our industry-leading oscilloscopes. For help finding the right probe for your oscilloscope and application, use the Tektronik Probe Selector Tool at: www.tektronix.com/probes