Oscilloscope / Differential Probe Terminology

> **Attenuation**: Ratio of the output signal to the input signal. Attenuation should remain constant decreasing by 3dB only as the frequency increases to the maximum bandwidth.

> **Bandwidth**: The maximum -3dB frequency that can be expected.

> **Cable Length**: Length of the cable from the end of the probe to the end of the connector. It is important to use a probe with just enough cable length for your needs. Long cables increase the capacitance and propagation delay of the probe.

> **Compensation Range**: The range a probe can be compensated to match the input capacitance of the test equipment it is being used with.

> **IEC 1010**: Probes with the IEC 1010 category rating have been designed for safety.

> **Input Impedance**: The total resistance and capacitance as measured at the tip of the probe. This specification is used to define the loading effect of a probe. At frequencies under 1MHz the input resistance of the probe will have the most influence. At higher frequencies the input capacitance will have the most influence.

> **Max Input Voltage**: The maximum voltage the probe can be used at.

> **Max Differential Voltage**: The maximum differential voltage that can be measured by a differential probe.

> **Readout**: Probes with this capability are compatible with readout function oscilloscopes that automatically detect and display the attenuation factor of the probe.

> **Rise Time**: The time required for the leading edge of a pulse to rise from 10% to 90% of its final value.

> **CMRR**: Common Mode Rejection Ratio. A measure of a differential probes ability to reject any signals common to both test points in a differential measurement.

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Oscilloscope / Differential Probe Selection

Selecting the correct oscilloscope probe ensures accuracy and can improve the performance of your test instrument. TPI offers a wide range of high quality oscilloscope probes designed to meet the most demanding applications.

The IP series monolithic probes have switchable attenuation and are available in 60 and 250MHz. These probes are ideal for technicians that need a basic oscilloscope probe.

The slimline design P and SP series probes are available in fixed or switchable attenuation. These series of probes are perfect for the technician needing additional features such as replaceable cable and interchangeable probe tip. The compensation adjustment for these probes is located in the BNC to eliminate noise pickup.

TPI also offers three models of high voltage differential probes all with high common mode rejection, wide bandwidth, and fast rise times. Differential probes enable the viewing of signals not referenced to earth ground and provide better performance than a matched pair of single ended oscilloscope probes when measuring these types of signals.

Several important factors must be taken into account when selecting the proper probe.

- The probe should have sufficient bandwidth and rise time for the test instrument and application. Choose a probe with at least an equal bandwidth as the scope it will be used with. For best performance a probe with twice the bandwidth as the scope should be selected.

- For oscilloscope probes, the input capacitance of your oscilloscope should be within the compensation range specification of the probe. In addition, if your oscilloscope has readout function, select a probe with this capability.

- For differential probes, make sure the maximum differential voltage is adequate for your application and the common mode rejection specification meets the requirements of the tests being performed.

Refer to the oscilloscope and differential probe specification tables to select the correct probe for your application.
Oscilloscope Probe Specifications

Can TPI oscilloscope probes be used with Tektronix and Hewlett Packard scopes?
Yes. TPI oscilloscope probes can be used with most major brands of scopes.

Why is selecting a probe with the correct bandwidth important?
Choosing a probe with the correct bandwidth enables you to use your scope to its full potential.

Why do TPI oscilloscope probes have a compensation range adjustment?
Since the input of every oscilloscope is different our probes have a compensation adjustment so the capacitance of the probe doesn’t load down the circuit under test.

What is the benefit of a probe with X1 and X10 switchable attenuation?
Probe X10 probes allow you to read a signal 10 times the amplitude of that viewed with a X1 probe. Example: an eight division graticule on 50V/div setting would display a 40 volt peak-to-peak signal using the X1 setting. You can view a 400 volt signal using the X10 setting.

What is readout?
Readout is an activator pin that protrudes out of the BNC connector of an X10 or X100 probe that completes a circuit. For example, if your oscilloscope has 44mm safety plugs, you must plug the readout pin into the 44mm safety plug of your oscilloscope to complete the circuit. If your oscilloscope does not have contacts around the BNC connector, it does not need this feature.

Why should I select a probe with readout?
Select a probe with readout if you plan to use it on multiple oscilloscopes. Readout is an activator pin that protrudes out of the BNC connector of an X10 or X100 probe that completes a circuit.

FAQ

DIFFERENTIAL PROBES

What can you measure with a differential probe?
With 20 MHz bandwidth, a switchable attenuation of 20:1, and 200:1 (part no. ADF25), you can measure high-voltage circuits, motor speed controls, power supply design, and high-power electronic converters.

What probe should I buy?
You will receive one differential probe, 2 probe tips, and 2 retractable sprung probes for accessing small wires for measurements.

FAQ

What is common rejection ratio (CMMR) important for differential probes?
CMMR is a measure of how much a differential probe will reject common signals leaving the desired signal to be displayed by the scope.

FAQ

What is input impedance?
Input impedance is a measure of how much a signal will be restricted. In general, it is best to have high resistance and low capacitance to ensure signal quality, accuracy of tests, and to ensure the probe doesn’t load down the circuit under test.

FAQ

What does the maximum differential voltage specification tell me?
This specification provides you with the maximum voltage that can be applied to the inputs of the differential probe. If the maximum voltage is exceeded, waveform distortion will occur.

What is passive X10 probes?
Passive X10 probes allow you to read a signal 10 times the amplitude of that viewed with a X1 probe. Example: an eight division graticule on 50V/div setting would display a 40 volt peak-to-peak signal using the X1 setting.

FAQ

How do I choose the correct bandwidth for a probe?
Select a probe that is at least the same bandwidth as the oscilloscope you intend to use; however, for optimum performance, select a probe with twice the bandwidth of your test instrument.
Color Coded, Compact Economical Nano Clips

- **Can access 0.3mm Pitch Leads:** Allows you to attach the clip to a lead on the smallest of surface mount IC's for testing the input and/or output of the IC. Normal oscilloscope lead tips are too large and the probe handle is too heavy to access these leads. See image.

- **High Reliability with Gold-Plated hood and contact:** Ensure minimal signal loss and constant contact with highly conductive gold plating.

- **High Durability with Fluorine Resin coated barrel extension:** The barrel of the clip is fully insulated eliminating the chance of the clip shorting to adjacent nano clips, IC leads or components. Fluorine Resin is very rugged and will last the lifetime of the clip.

- **Hold Bar:** Each nano clip set (excludes individual clips) comes with an exclusive hold bar that connects the clips together while measuring multiple leads on the same IC.

- **Hot and Ground leads:** Hot and ground leads are included in each set (excludes individual clips) for easy connection between the nano clip and the tip of the oscilloscope probe. This allows the tip of the oscilloscope probe to be placed outside the measurement area so it does not interfere with the circuitry.

- **Assorted Colors:** Clips are available in Black, Red, Yellow, Blue, Green and Gray for easy identification.
Compact, Economical Nano-Clips

0.3mm Pitch Nano-Clip Test Clips

- Can access .3mm pitch leads.
  Comfortably stacks side to side.
- High Reliability with Gold-Plated hook and contact.
- High Durability with fluorine resin coated barrel extension.
- Available in Black, Gray, Red, Yellow, Green and Blue.

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**Nano-Clip Specifications**

- Accessible lead pitch in stack: 0.3mm min.
- Clip retention: 50g min.
- Stroke: 1.65mm
- Operating force: 300g max.
- Contact resistance: 30m max.
- Conductor resistance: 300m max.

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