Questions & Answers

Are North Star Probes Resistive or Capacitive?

The probes are parallel combinations a resistance (for lower frequencies and DC), and a capacitance for high frequencies. Additional components compensate for stray capacitances and capacitances between the resistor and the capacitor.

Can North Star Probes be used with both Oscilloscopes and Meters?

The probes can generally be used with both oscilloscopes and meters if a switch option is purchased. This option makes sure that the output impedance of the two devices to be used are matched.

How can high current distortion be detected?

High current distortion is detected by disconnecting the probe input but leaving the grounding unchanged. If a signal is detected on the disconnected probe with no input signal, there is probably high current distortion.

How can high currents distort voltage waveforms on any voltage probes?

In some high current circuits part of the main pulse or AC current will return via the ground shield of the High Voltage probe (any high voltage probe). This is generally undesirable, and often leads to the use of shielded rooms or enclosures. A signal which may be as large as V = Ishield * Rshield (Ishield is the current flowing along the probe ground and Rsheild is the resistance of the probe outer shield) may be added to the signal that the oscilloscope sees. For example our standard 15 ft cable has a braid resistance of 6 milliohms. If 100 A returns along this cable, it will look like a 0.6 V or 600 V input signal.

In some cases inductance can have the same effect as a resistance.

Note: high currents should return to the voltage source. If they return by an unplanned path (like the probe) they probably cause problems with other instrumentation as well. A probe is intended to perturb the circuit in a minimal way, and if there are high currents on the ground shield, the probe is perturbing the circuit.

How should the probe tip resistor be installed?

The black probe tip should be inserted directly towards the handle with the banana plug out. Do not rotate the probe tip - it installs straight in.

What information is required in order to specify the switch option?

We need to know the meter input resistance and input capacitance. Be aware that some meters change this value on different input voltage scales.

What insulating fluid is used in the probes?

The PVM10, PVM11, and PVM12 are air insulated. Standard new transformer oil is used in all other probes.

What is the bubble in the PVM5/6?

The bubble is a vacuum bubble which allows for expansion and contraction of the oil as the temperature changes up to 140 F/60C. It has not lead to any high voltage breakdown to the best of our knowledge.

What is the maximum voltage rating of a probe at 50/60 cycles?

The peak voltage is the main determining factor, so the RMS maximum voltage is 0.7 times the maximum DC voltage. For example, for the VD-60 the RMS 60 cycle voltage is 0.7* 60 kV = 42 kV.

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Why are the probes terminated for the 1 Megohm oscilloscope input impedance?

A lower input impedance will result in either too much current draw (see below) or too little signal (100 Megohms/50 ohms = 2 Million:1 or 25 microvolts at 50 kV measurement voltage).

Why is the black resistor on the PVM-1 - PVM-6 attached with a Banana Plug?

The black resistor is the damping resistor which suppresses resonance at >120 Mhz frequencies. The resistor can fail at very high frequencies and so is easily replaced. Failure of this component is rare but it does happen. The resistor should be pressed in and out, and it should not be rotated. If the banana plug binds up the probe tip can be over-rotated which causes leaks and can break the internal connections.

Why not rely on an active probe?

An amplifier can only distort the signal, and so signal fidelity will always suffer with an amplifier. Amplifiers are also prone to failure around high voltage transients.

Why not terminate the probes so they can operate with a 50 ohm oscilloscope input?

A passive probe with a 50 ohm termination would (at 10,000:1) have a resistance of 500,000 ohms. At (for example) 50 kV this would have a current draw of 0.1 A and a power draw of 5 kW. 50 ohms is too low a resistance for measurement of any signal with a high duty cycle.

Why not use a resistive probe by itself?

Purely resistive probes are subject to stray capacitances which distort the signal. As an example, a 400 Megohm resistance with a 2 pf stray capacitance undergoes distortion for time scales = 400 Megohms * 2 pf = 800 microseconds. Even a purely pulsed probe with a 100k resistor would undergo distortion at time scales of 2 pf * 100 k = 200 ns.