
Oscilloscope Probe Compensator Getting Started

2022-07-11



Contents

Introduction.....	3
Compatibility.....	3
Physical.....	3
Compensating Passive Probes.....	4

Introduction

This guide describes how to use the oscilloscope probe compensator.

The oscilloscope probe compensator allows you to compensate passive probes on compatible NI oscilloscopes using traditional compensation terminals.

Compatibility

The oscilloscope probe compensator is compatible with the following oscilloscopes and PFI lines.

Module	Connector
PXIe/PXI/PCI-5105 ^[1]	PFI 1
PXI/PCI-5152	PFI 1
PXIe-5160	PFI 1
PXIe-5162	PFI 1
PXIe-5163	SMB PFI 0 ^[2]
PXIe-5164	SMB PFI 0 ^[2]

¹ Requires a probe capable of compensating high capacitance inputs and a BNC (f)-to-SMB (f) cable with sufficiently low capacitance, such as the 0.08 mSMB-100 (part number 781449-01).

² Though the PFI 0 line is also available via the AUX 0 MHDMMR connector, the probe compensation signal is available only from SMB PFI 0.

Physical

Connectors	SMB (f) Terminals: compensation signal, ground
Dimensions	8.53 cm × 2.03 cm × 0.76 cm (3.94 in. × 0.80 in. × 0.30 in.)
Weight	24 g (0.85 oz)

Compensating Passive Probes

Compensating passive probes increases the accuracy of your measurements by matching the capacitance of your probe to the capacitance of a particular oscilloscope input channel.

Before beginning this procedure, complete the following:

- Set up your oscilloscope in a compatible chassis;
- Install a version of NI-SCOPE compatible with your oscilloscope on your system; and
- Configure a panel and layout in InstrumentStudio to include your oscilloscope.



Note For more information on using InstrumentStudio, refer to the **Instrument Studio Manual** at ni.com/manuals.

NI oscilloscopes can output a 1 kHz square wave that you can use to compensate passive probes. This procedure assumes your passive probe uses a BNC connector and has a 10× attenuation option.

Complete the following steps to compensate a passive probe:

1. Connect the probe to an input channel of your oscilloscope.
 - PXIe-5105, PXI-5105, PCI-5105 only:
 1. Connect the BNC end of the probe to the BNC end of the SMB (f)-to-BNC (f) cable.
 2. Connect the SMB end of the cable to an input channel of your oscilloscope.
 - All other applicable oscilloscopes: Connect the BNC end of the probe to an input channel of your oscilloscope.
2. If your probe has switchable attenuation, ensure the physical switch on the probe is set to 10× attenuation.

3. Depending on your probe compensation technique, connect the probe tip to the oscilloscope:

Instrument	Compensation Technique	Description
<ul style="list-style-type: none"> ▪ PXIe/PXI/PCI-5105 ▪ PXI/PCI-5152 ▪ PXIe-5160 ▪ PXIe-5162 ▪ PXIe-5163 ▪ PXIe-5164 	Oscilloscope Probe Compensator	<ol style="list-style-type: none"> 1. Connect the SMB end of the Oscilloscope Probe Compensator to the PFI connector of the oscilloscope that generates the probe compensation signal. 2. Connect the ground clip of the probe to the ground terminal. 3. Contact the tip of the probe to the square wave terminal.
	Direct connection to oscilloscope PFI	SMB PFI <ol style="list-style-type: none"> 1. Attach the BNC adapter to the tip of the probe. 2. Connect the ground clip of the probe to a ground. 3. Connect the probe to the BNC end of the SMB (f)-to-BNC (f) cable. 4. Connect the SMB end of the cable to the PFI connector of the oscilloscope that generates the probe compensation signal.
<ul style="list-style-type: none"> ▪ PXIe/PXI/PCI-5114 ▪ PXIe/PXI/PCI-5122 ▪ PXI/PCI-5124 ▪ PXI/PCI-5142 		DIN PFI <ol style="list-style-type: none"> 1. Attach the BNC adapter to the tip of the probe. 2. Connect the ground clip of the probe to a ground. 3. Connect the probe to the BNC end of the 9-pin DIN-to-BNC cable. 4. Connect the DIN end of the cable to the DIN connector on the oscilloscope.
<ul style="list-style-type: none"> ▪ USB-5132 		BNC PFI <ol style="list-style-type: none"> 1. Attach the BNC adapter to the tip of the probe.

Instrument	Compensation Technique	Description
<ul style="list-style-type: none"> ▪ USB-5133 		<ol style="list-style-type: none"> 2. Connect the ground clip of the probe to a ground. 3. Connect the probe to the PFI connector.
<ul style="list-style-type: none"> ▪ PXIe-5110 ▪ PXIe-5111 ▪ PXIe-5113 	Connection to probe compensation terminals	<ol style="list-style-type: none"> 1. Connect the ground clip of the probe to the ground terminal on the front of the oscilloscope. 2. Contact the tip of the probe to the 5 V square wave terminal on the front of the oscilloscope.

4. Enable the probe compensation signal:

- PXIe-5110, PXIe-5111, PXIe-5113 only: No action required, the probe compensation signal is enabled by default.
- All other applicable oscilloscopes: based on your programming environment, do either of the following:
 - InstrumentStudio: In the instrument header menu

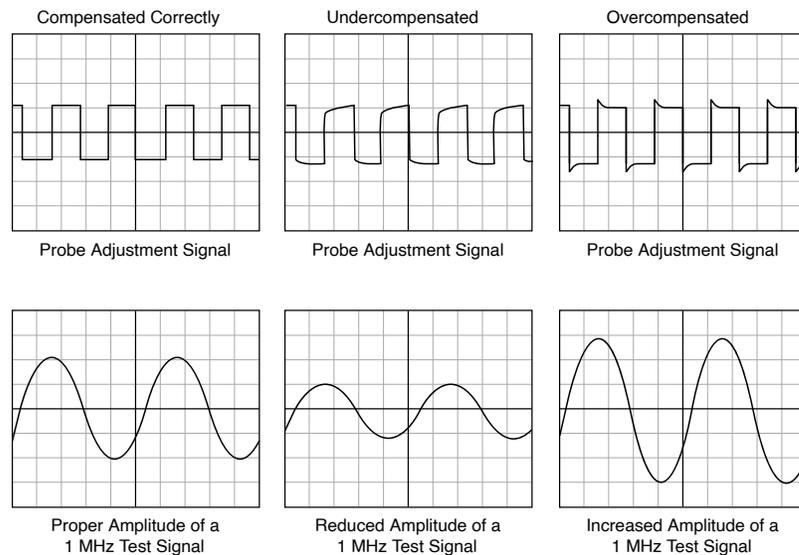


) in the upper-right corner of the panel, select

Probe Compensation » Enabled.

- NI-SCOPE: Call the Probe Compensation Signal Start function.
- #### 5. In InstrumentStudio, configure the settings of the input channel to which you connected the probe.
1. Set the channel to On to display the signal.
 2. Set the Input impedance of the channel to 1 M Ω .
 3. (PXIe-5110, PXIe-5111, PXIe-5113 only) Set the Vertical Offset to 2.5 V.
 4. Set the Probe attenuation setting to 10 X.

6. Adjust the vertical range on the input channel until the signal starts to clip and then increase the vertical range by one step so that it no longer clips. This process ensures you are using the maximum dynamic range of the ADC.
7. Examine the digitized signal and adjust the tunable capacitor on the probe. The probe is correctly compensated when the waveform appears as square as possible:



A compensated probe conveys signals to the input channel accurately, without artificially attenuating or amplifying frequency components of the signal.



Tip For the most accurate measurements:

- Compensate probes for each channel of the oscilloscope;
- Use a compensated probe only with the channel you used to compensate it; and
- Compensate your probes frequently.