P7520A
TriMode™ Probe

Instruction Manual

071-3048-00

Tektronix

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www.tektronix.com
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For product information, sales, service, and technical support:

- In North America, call 1-800-833-9200.
- Worldwide, visit www.tektronix.com to find contacts in your area.

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[W2 – 15AUG04]

Table of Contents

General safety summary

Review the following safety precautions to avoid injury and prevent damage to this product or any products connected to it.

To avoid potential hazards, use this product only as specified.

Only qualified personnel should perform service procedures.

To avoid fire or personal injury

Connect and disconnect properly. Connect the probe output to the measurement instrument before connecting the probe to the circuit under test. Connect the probe reference lead to the circuit under test before connecting the probe input. Disconnect the probe input and the probe reference lead from the circuit under test before disconnecting the probe from the measurement instrument.

Observe all terminal ratings. To avoid fire or shock hazard, observe all ratings and markings on the product. Consult the product manual for further ratings information before making connections to the product.

Do not apply a potential to any terminal, including the common terminal, that exceeds the maximum rating of that terminal.

Do not operate without covers. Do not operate this product with covers or panels removed.

Do not operate with suspected failures. If you suspect that there is damage to this product, have it inspected by qualified service personnel.

Avoid exposed circuitry. Do not touch exposed connections and components when power is present.

Do not operate in wet/damp conditions.

Do not operate in an explosive atmosphere.

Keep product surfaces clean and dry.

Terms in this manual

These terms may appear in this manual:

WARNING. *Warning statements identify conditions or practices that could result in injury or loss of life.*

CAUTION. *Caution statements identify conditions or practices that could result in damage to this product or other property.*

Symbols and terms on the product

These terms may appear on the product:

- DANGER indicates an injury hazard immediately accessible as you read the marking.
- WARNING indicates an injury hazard not immediately accessible as you read the marking.
- CAUTION indicates a hazard to property including the product.

The following symbol(s) may appear on the product:

Environmental Considerations

This section provides information about the environmental impact of the product.

Product End-of-Life Handling

Observe the following guidelines when recycling an instrument or component:

Equipment Recycling. Production of this equipment required the extraction and use of natural resources. The equipment may contain substances that could be harmful to the environment or human health if improperly handled at the product's end of life. In order to avoid release of such substances into the environment and to reduce the use of natural resources, we encourage you to recycle this product in an appropriate system that will ensure that most of the materials are reused or recycled appropriately.

The symbol shown below indicates that this product complies with the European Union's requirements according to Directive 2002/96/EC on waste electrical and electronic equipment (WEEE). For information about recycling options, check the Support/Service section of the Tektronix Web site (www.tektronix.com).

Restriction of hazardous substances

This product is classified as an industrial monitoring and control instrument accessory, and is not required to comply with the substance restrictions of the recast RoHS Directive 2011/65/EU until July 22, 2017.

Preface

This manual describes the installation and operation of the P7520A TriMode Probe. Basic probe concepts, specifications, and maintenance procedures are included in this manual. You can also access the Tektronix Web site for this manual (www.tektronix.com/manuals).

Documentation

To read about	Use these documents
Installation and operation	Read this instruction manual for information about how to use your probe.
Specifications	Read the *Specifications* section in this manual.
Reordering accessories	Use the *Accessories and Options* section or refer to the insert in your accessory kit when reordering accessories.

Key Features

The P7520A TriMode Probe allows you to take differential, single-ended, and common mode measurements with one probe connection. Key features include:

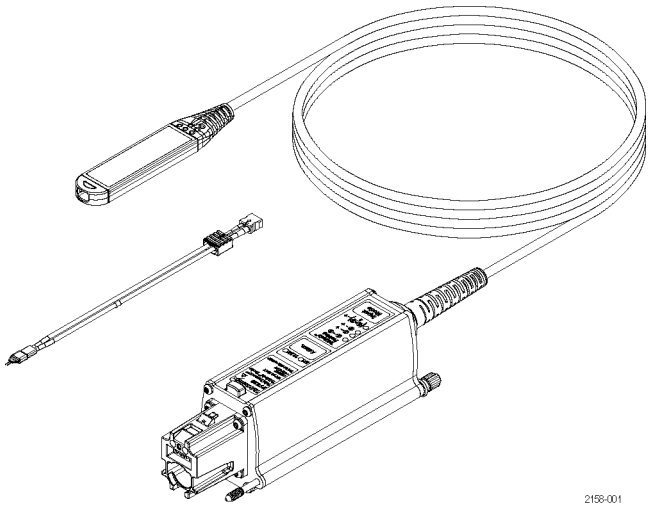
- Revolutionary TriMode operation
- TekConnect interface
- Bandwidth (typical)

  >25 GHz in A – B mode with optional P75PST solder tip @ 100 GS/s

  >20 GHz in A – B mode with standard P75TLRST solder tip
- Rise time (10-90%)

  <20 ps in A – B mode with optional P75PST solder tip @ 100 GS/s

  <27 ps in A – B mode with standard P75TLRST solder tip
  (<29 ps in other modes)
- 100 kΩ differential input resistance, 50 kΩ per side



Operating Considerations

Table 1: P7520A TriMode Probe Characteristics

Characteristic	Description	Specification
Input voltage	Dynamic range	±0.625 V (5X) ±1.60 V (12.5X)
	Input voltage range (DC + peak AC, both ranges; input referenced to ground)	+3.7 V, –2.0 V
Temperature	Operating	0 to +40 °C (+32 °F to +104 °F)
	Nonoperating	-20 °C to +71 °C (-4 °F to +160 °F)
Humidity	Operating	Up to +40 °C (+104 °F) 20%-80% RH
	Nonoperating	+30 °C to +46 °C (+86 °F to +115 °F) 0-90% RH
Pollution degree		2, Indoor use only

CAUTION. *To avoid ESD damage to the probe, always use an antistatic wrist strap (provided with your probe), and work at a static-approved workstation when you handle the probe.*

Installation

The P7520A probe is capable of measuring signals in excess of 25 GHz bandwidth. However, maximum performance is only available when the probe is used with a P75PST probe tip and an oscilloscope with the TekConnect interface and at least 25 GHz bandwidth.

NOTE. *Your TekConnect instrument may require a firmware upgrade to support full functionality of the P7520A probe. Before you connect the probe, check the version requirements. (See page 70, Host Instrument Firmware.)*

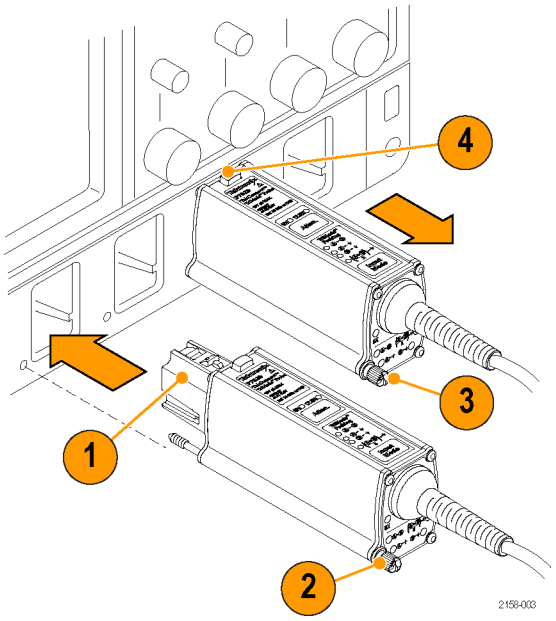
When the probe is connected to compatible ≥25 GHz bandwidth oscilloscopes, probe characteristic data is transferred to the oscilloscope and is stored for future use on all channels. The data transfer time typically takes a few minutes, and is only done the first time the connection is made. Oscilloscopes with bandwidths lower than 25 GHz will not transfer the data, and the system bandwidth will be limited.

Connecting to the Host Instrument

1. Slide the probe into the TekConnect receptacle. The probe clicks into place when fully engaged.
2. Turn the thumbscrew clockwise (finger-tight only) to secure the probe to the instrument.

CAUTION. *Do not tighten the thumbscrew beyond finger-tight. Over-torquing can result in performance degradation.*

3. To disconnect, turn the thumbscrew counter-clockwise.
4. Press the latch release button and pull the probe away from the instrument.

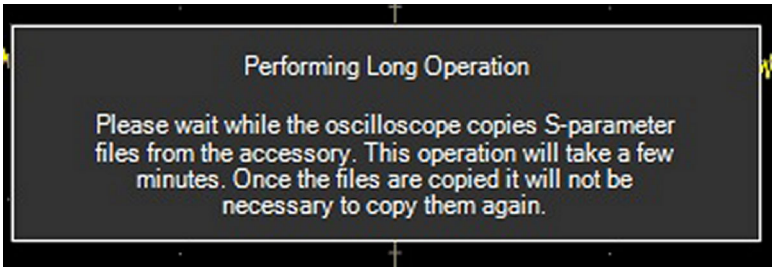


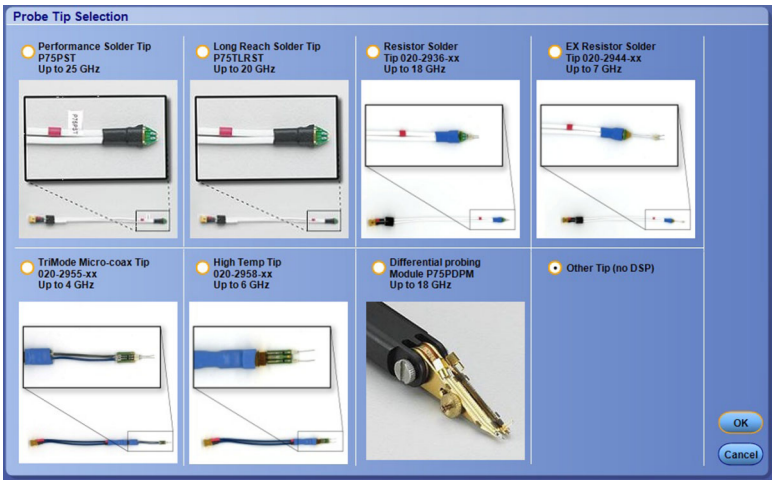
Probe Power-On

After the initial connection to the oscilloscope is made:

1. The probe briefly lights all LEDs during a self-test, and then one Range and one Mode LED remain lit.
2. If applicable, the probe transfers data to the host instrument, and a message displays on the instrument as the transfer occurs.
3. The data transfer takes a few minutes, and is only done when the host instrument discovers a new probe. The data transfer only occurs on instruments that are fully compatible with the probe.
4. The host instrument displays the Probe Tip Selection screen. The default selection is Other Tip (no DSP).
5. Select the tip you are using and click **OK**.

   The tip selection that you make here is retained until you change it. The Probe Tip Selection screen does not appear again at power-on; you must access it through the Probe Setup screen. (See Figure 1 on page 6.)



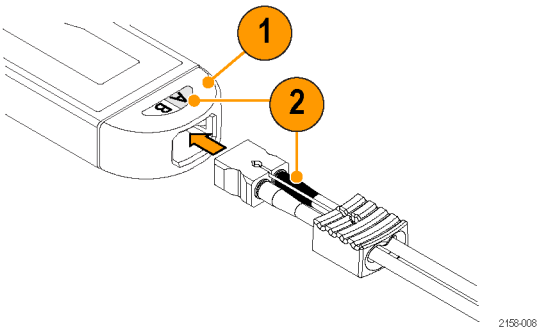


Connecting Accessories to the Probe Body

CAUTION. *The probe has replaceable contacts inside the probe body connector that may stick to the accessory connector when it is disconnected. To prevent damage to the probe, before you connect accessories to the probe body, always check that the contacts are located in the probe body only.*

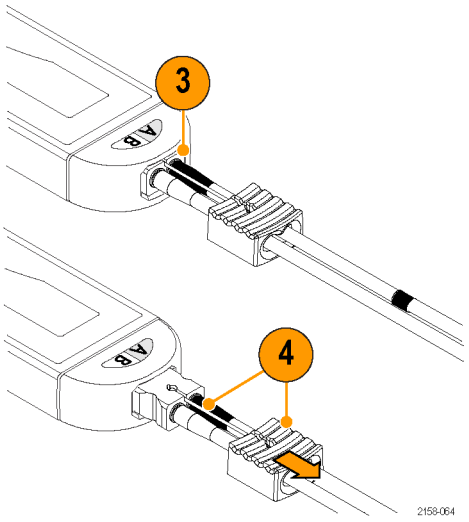
The probe body and tip cable ends are keyed to ensure correct installation. Connect them as follows:

1. Orient the probe body with the A and B inputs on top, as shown.
2. Align the tip cable lead with the red band to the A input.



3. Grasp the cable connector by hand and push the cable into the probe body until you feel a click. The cable housing is fully seated when it is flush with the edge of the probe body.
4. To remove the tip, pull the cable tab straight out from the probe body.

CAUTION. *Pull only on the cable tab when removing the tip. You may damage the tip or probe if you pull on the cables.*



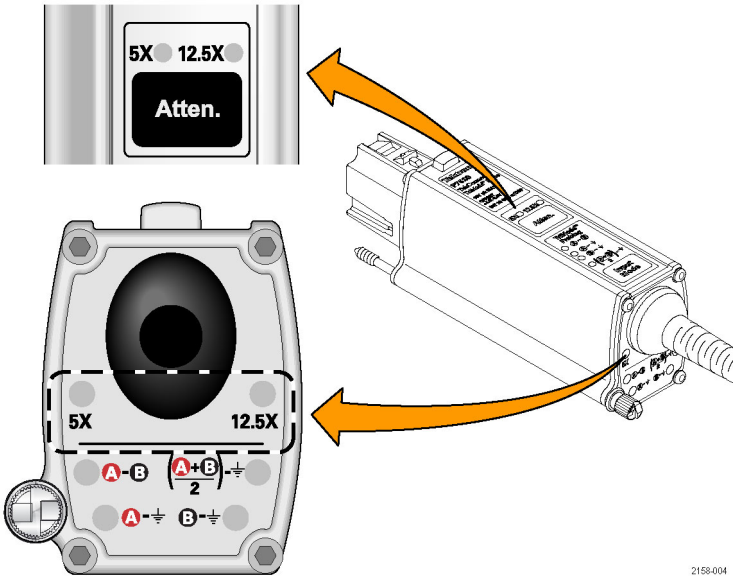
Control Box Controls and Indicators

Atten. Button and LEDs

After the probe is connected, the host instrument automatically selects the attenuation (voltage range) of the probe, depending on the instrument volts/div setting.

You must change the attenuation autoselect feature on the instrument to enable the **Atten.** button on the probe:

1. In the oscilloscope menu bar, select Vertical and then select Probe Setup.
2. From the Probe Setup or Probe Controls screen, change the Range selection from **Auto** to **Manual**. (See Figure 1 on page 6.) You can also change the attenuation setting from these screens.
3. With the instrument in **Manual** Range mode, press the **Atten.** button on the probe to toggle the attenuation setting between 5X and 12.5X. The corresponding LED lights to indicate the selected attenuation.



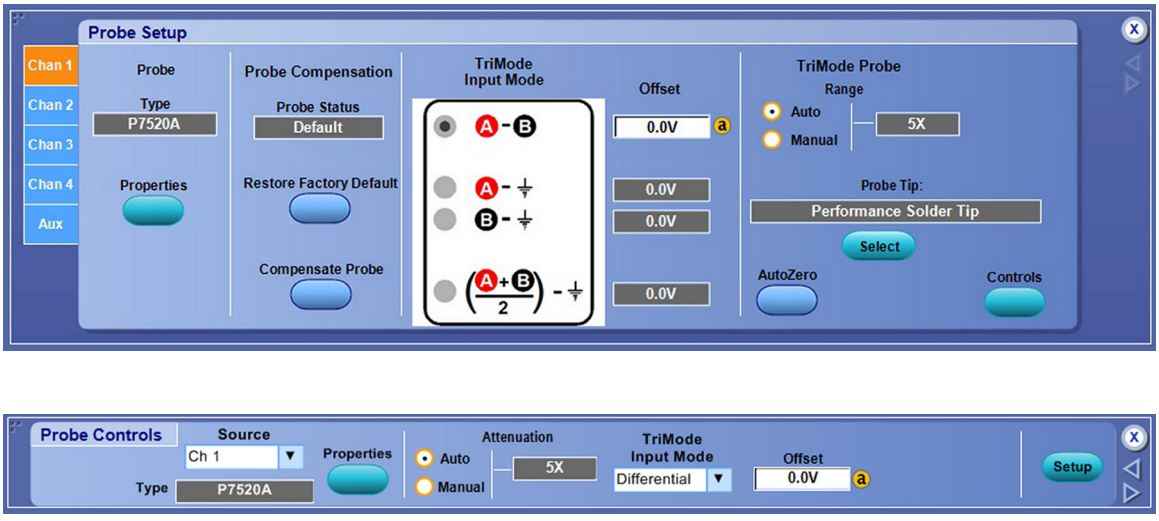


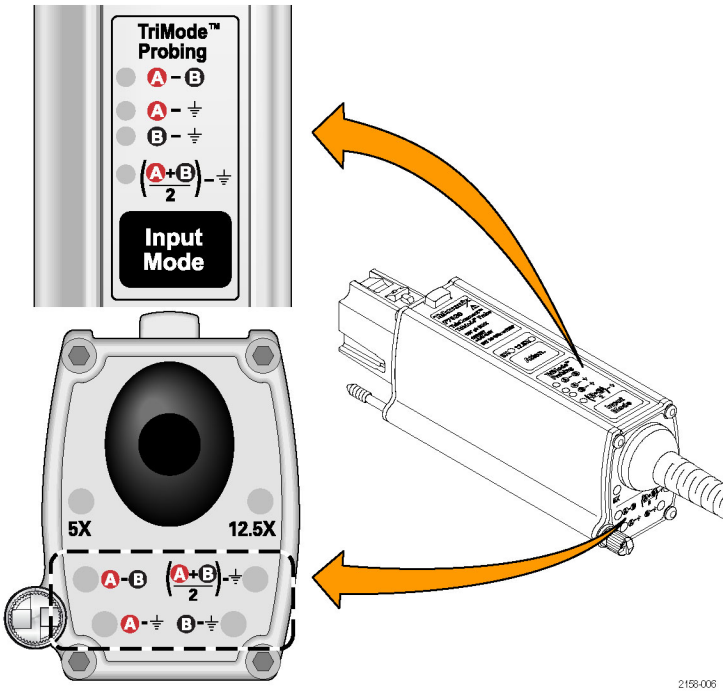
Figure 1: Probe Setup and Probe Controls screens

Input Mode Button and LEDs

Press the Input Mode button to select one of the four TriMode measurements. The modes cycle in the following sequence:

- A – B (for differential signal measurement)
- A – GND (for A input single-ended measurement)
- B – GND (for B input single-ended measurement)
- (A + B)/2 – GND (for common mode measurement)

NOTE. *Some oscilloscope models only allow the A – B Input Mode to be selected, depending on which input tip is selected in the oscilloscope Probe Setup screen. (See page 71, Input Mode/Probe Tip Selection.)*

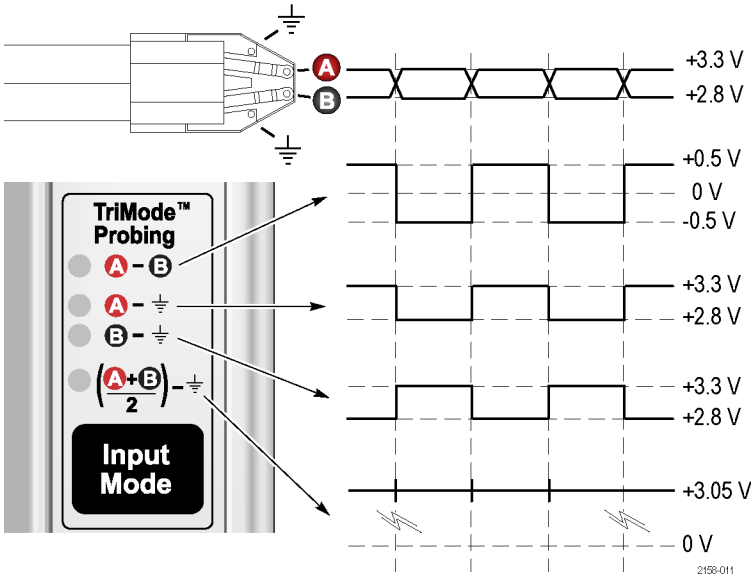


The following pages discuss characteristics of the TriMode measurements.

TriMode Probing

The TriMode feature allows you to view two single-ended signals and the resultant differential waveform and common-mode voltage without moving the probe connection. Press the Input Mode button to cycle through the waveform views.

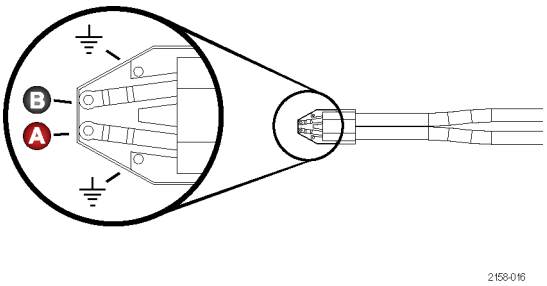
This example shows a typical HDMI signal (one half-lane) on the A and B inputs. The resultant differential waveform and common-mode voltage are shown.



Connecting to Your Circuit

Before you connect these tips to your probe, we recommend that you perform a functional test and probe calibration. (See page 9, *Functional Check and Calibration*.) Procedures for attaching the probe tips are described in *Basic Operation*. (See page 16, *Basic Operation*.)

Use the P75TLRST Long Reach Solder Tip to connect the probe to your circuit. The P75TLRST Long Reach Solder Tip provides a soldered, multi-point connection (A, B, and GND). The P75TLRST tip is shipped with the probe.

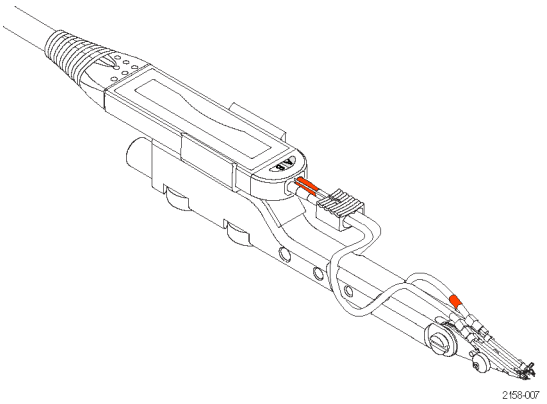


Use the optional P75PST Performance Solder Tip to get full bandwidth (>25 GHz) measurements from the probe.

These tips provide full TriMode capabilities, which are described in *Basic Operation*. (See page 36, *Input Mode Selection*.)

Other tips are available and are described later. (See page 30, *Optional Accessories*.)

The optional P75PDPM Precision Differential Probing Module allows handheld and fixtured probing of your circuit. The small, precision-tapered tips and adjustable-width tip spacing accommodate a variety of testing needs.



The P75PDPM Probing Module is designed for differential measurements, and does not incorporate a ground connection to your circuit. However, you can make single-ended measurements in the TriMode A – B mode by connecting the B input to your circuit ground.

Functional Check and Calibration

After you connect the probe to the oscilloscope, perform a functional check using the calibration board included with the probe.

CAUTION. *To avoid ESD damage to the probe, always use an antistatic wrist strap (provided with your probe), and work at a static-approved workstation when you handle the probe.*

Functional Check

This procedure checks the four TriMode settings on the probe, using the PROBE COMPENSATION or FAST EDGE connection on the front panel of the oscilloscope. The A – B (differential mode) is set up and verified first, and then the remaining input modes are checked and compared to the differential mode measurement.

Table 2: Required Equipment

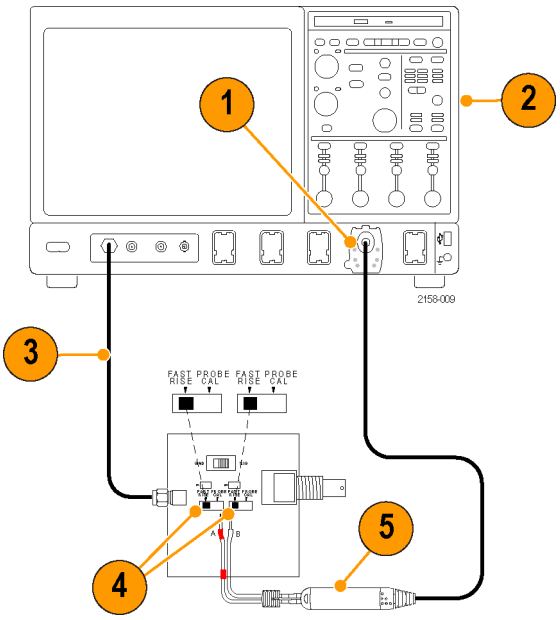
Item Description	Performance Requirement	Recommended Example [1]
Oscilloscope	TekConnect Interface	Tektronix DPO/DSA72504D
Test board	TriMode DC Calibration board	067-1821-xx [2]
Coaxial cable	SMA, 50Ω, male-to-male	174-1120-xx [2]
Coaxial cable	BNC, 50Ω, male-to-male	012-0208-xx [2]

[1] Nine-digit part numbers (xxx-xxxx-xx) are Tektronix part numbers

[2] Standard accessory included with probe

Test Setup

1. Connect the probe to any channel (1–4) of the oscilloscope.
2. Set the oscilloscope to display the channel.
3. Connect an SMA cable from the Probe Compensation or FAST EDGE output connector on the oscilloscope to the SMA connector on the TriMode DC Calibration board.
4. Set the two output switches on the TriMode DC Calibration board to the FAST RISE position.
5. Connect the probe to the cable on the TriMode DC Calibration board (note correct connector polarity).

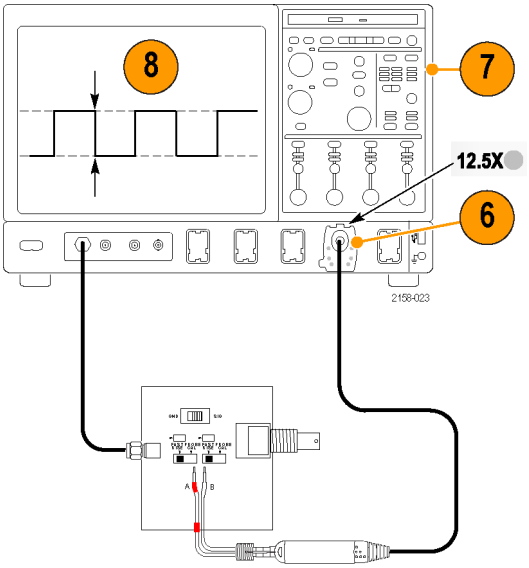


Test Procedure

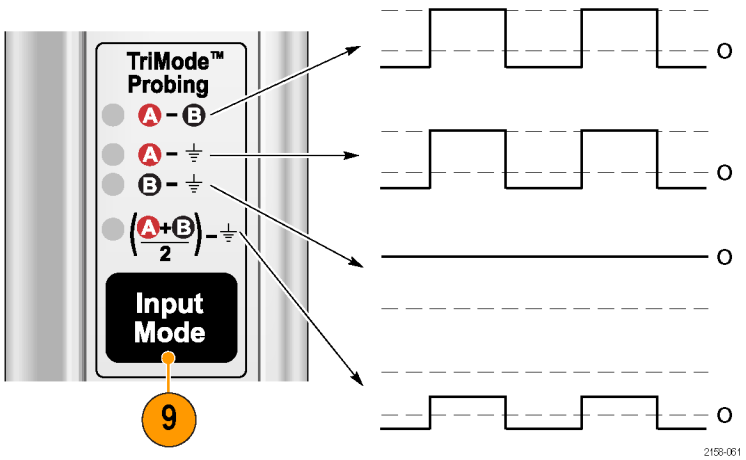
6. Set the probe attenuation to 12.5X and the Input Mode to A – B.
7. Adjust the oscilloscope to display a stable waveform (or press the Autoset button).

NOTE. *If you do not see a waveform, check the connection at the probe body. (See page 5, Connecting Accessories to the Probe Body.)*

8. When you see a stable square wave, check the amplitude. (Use the horizontal cursors.) Signal output levels for some oscilloscope models are listed below.
   - DPO/DSA72504D: 440 mV p-p
   - DPO/DSA73304D: 440 mV p-p



9. Cycle the **Input Mode** button through the remaining selections and compare the displayed waveforms to the waveform that you measured in step 8.
   - A – B (the waveform from step 8)
   - A – GND (same amplitude and polarity as measured in step 8)
   - B – GND (the B input is grounded; no signal is measured)
   - (A+B)/2 – GND (half-amplitude, but the same polarity as measured in step 8)
10. Set the probe attenuation to 5X and the Input Mode to A – B.
11. Repeat steps 7 through 9 for the 5X attenuation setting.



TriMode Probe Calibration

After you perform a functional check of the probe, run a probe calibration routine. We recommend that you repeat the probe calibration for all four of the TriMode settings, and do this on each channel that you use.

The probe calibration operation minimizes measurement errors by optimizing the gain and offset of both probe attenuation settings on each channel. Individual calibration constants are stored for each calibrated TriMode setting, on each probe, on each channel.

CAUTION. *To avoid ESD damage to the probe, always use an antistatic wrist strap (provided with your probe), and work at a static-approved workstation when you handle the probe.*

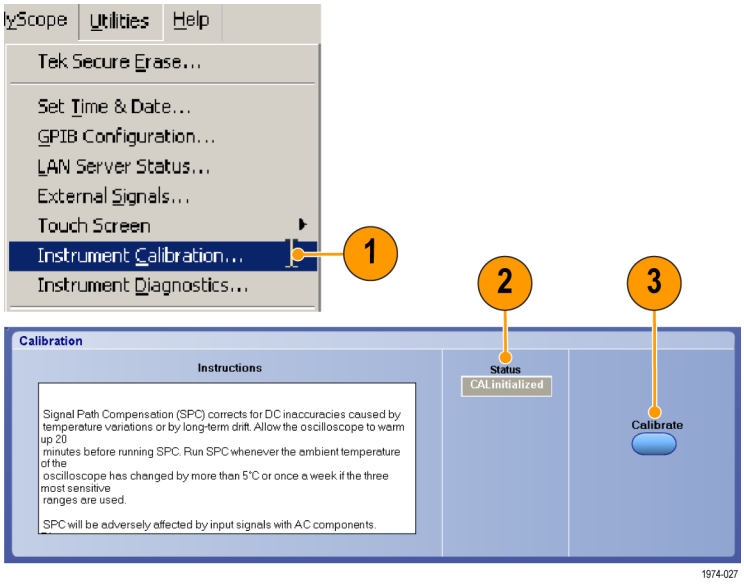
You can use the equipment shown in the *Functional Check* to perform the probe calibration. (See Table 2 on page 9.)

Check the Instrument Calibration Status

The Calibration Status of the instrument Signal Path Compensation test must be **Pass** for the probe calibration routine to run.

1. From the Utilities menu, select Instrument Calibration.
2. In the Calibration box, check that the Status field is **Pass**.
3. If the status is not pass, disconnect all probes and signal sources from the oscilloscope, and run the Signal Path Compensation routine.

When the Signal Path compensation test status is **Pass**, calibrate the probe. (See page 13, *Calibrate the Probe*.)

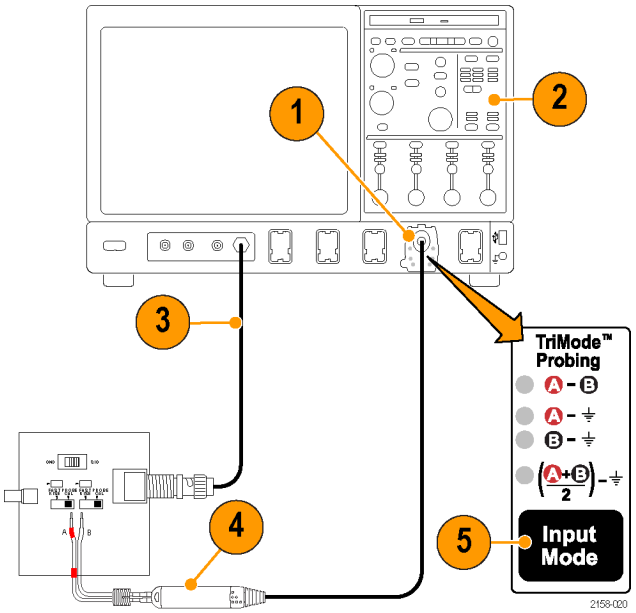


Calibrate the Probe

1. Connect the probe to any channel (1–4) of the oscilloscope. Allow the probe to warm up for 20 minutes.
2. Set the oscilloscope to display the channel.
3. Connect a BNC cable from the Probe Calibration output connector on the oscilloscope to the BNC connector on the TriMode DC Calibration board.

NOTE. *You may be able to use the PROBE COMPENSATION output connector. Check your oscilloscope manual or online Help for more information.*

4. Connect the probe to the cable on the TriMode DC Calibration board.
5. Set the Input Mode to A – B on the probe.



6. Set the switches on the TriMode DC Calibration board to the positions shown for the selected input mode. (See Table 3.)

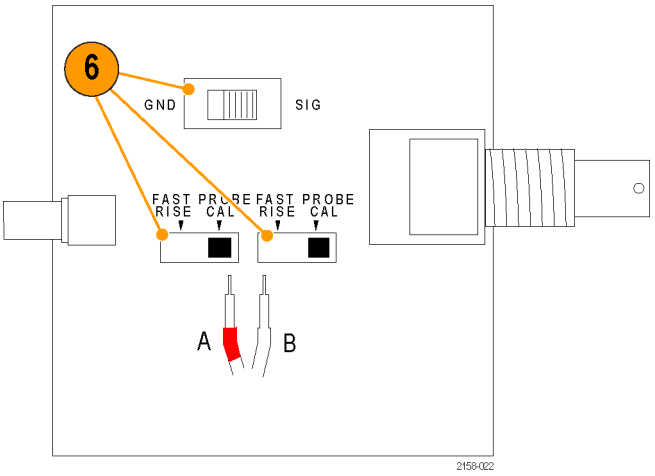


Table 3: TriMode DC Calibration board switch settings

Probe input mode	Fast rise/probe cal	Gnd/Sig
A – B	Probe Cal	Gnd
A	Probe Cal	Sig
B	Probe Cal	Sig
(A+B)/2	Probe Cal	Sig

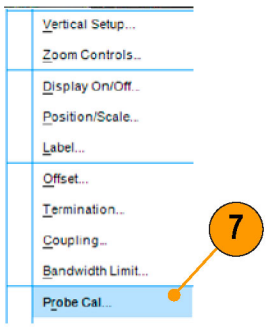
7. In the menu bar, select Vertical and then select Probe Cal.

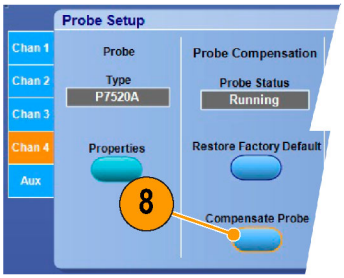
The Probe Setup screen appears. (Some oscilloscopes support an automated TriMode calibration routine and switch automatically between input modes.)

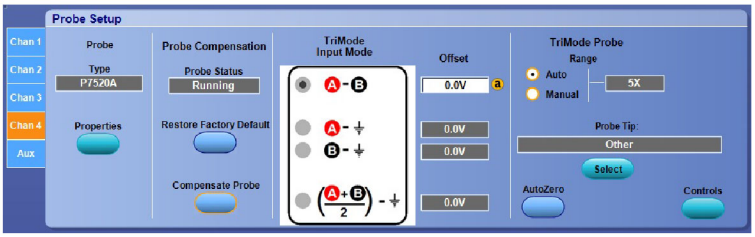
8. Select **Compensate Probe**.

The probe calibration routine runs, optimizing the probe to the oscilloscope for both probe attenuation settings. The displayed results differ between oscilloscope models:

9. Oscilloscopes that do not support the automated TriMode calibration routine display **Compensated** in the Probe Status box. Repeat steps 5 through 8 for the remaining input mode settings.







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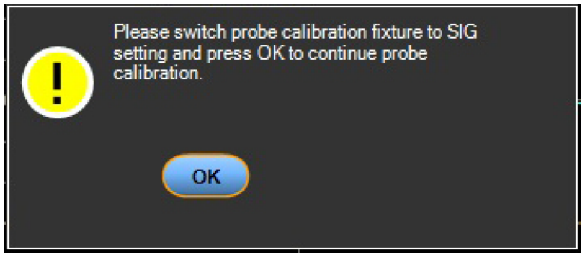
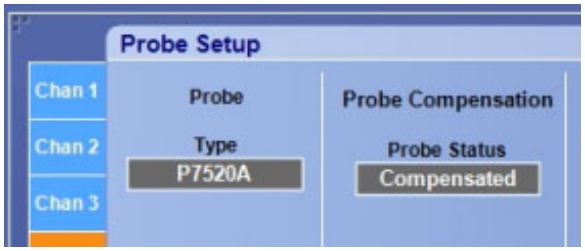
NOTE. If the Probe Cal routine fails, check the connection at the probe body. (See page 5, Connecting Accessories to the Probe Body.)

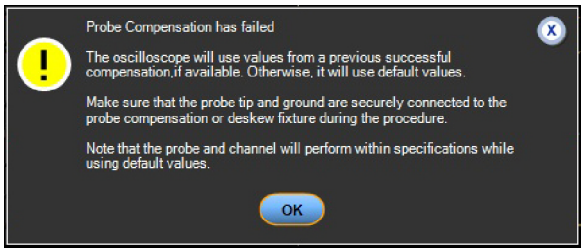
10. Oscilloscopes that support the automated TriMode calibration routine will display an on-screen prompt to toggle the probe calibration fixture SIG/GND switch. Follow the instructions to complete the calibration for the remaining input modes.



11. After a successful Probe Cal, **Compensated** appears in the Probe Status box.



NOTE. If the Probe Cal routine fails, check the connection at the probe body. (See page 5, Connecting Accessories to the Probe Body.)



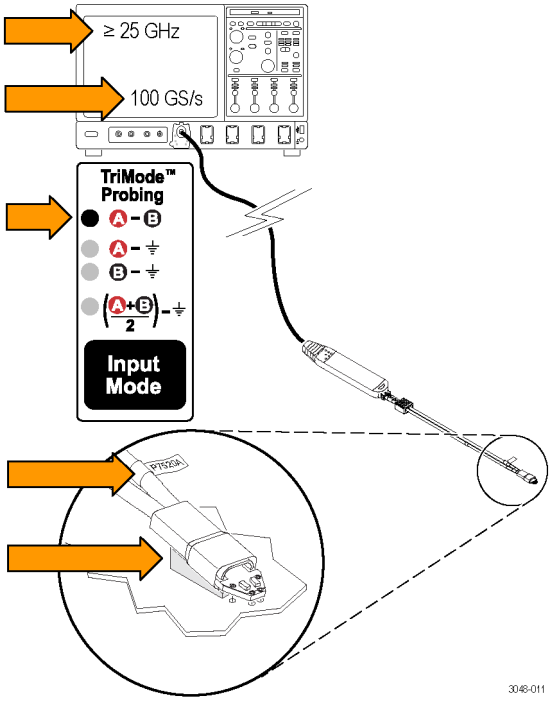
Basic Operation

This section includes more information about using the probe controls on the control box and procedures for connecting the probe to your circuit.

Maximizing P7520A Signal Bandwidth

The bandwidth of the P7520A probe can be maximized to 25 GHz only when the following conditions are met:

- The host oscilloscope bandwidth must be ≥25 GHz and not be bandwidth limited.
- The host oscilloscope sample rate must be set to 100 GS/s. Slower sample rates reduce the probe bandwidth.
- The P7520A Input Mode must be set to (A – B) mode. (Note: the bandwidth is less for other input modes.)
- A P75PST solder tip must be used for the probe DUT connection.
- The solder ramp that is supplied with the probe is recommended as an aid to keep the probe tip wire connections as short as possible (<0.032 in./0.8 mm).



Connecting to a Circuit Board

The P75TLRST Long Reach Solder Tip is shipped with the probe. Use the P75TLRST tip to connect the probe to your circuit, or use the optional P75PST TriMode Performance Solder Tip for ≥25 GHz bandwidth measurements. Other TriMode solder tips are available, as well as a handheld probing module, described on the following pages.

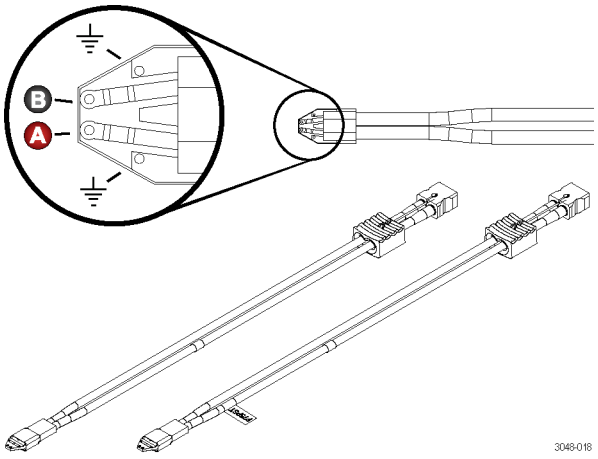
P75TLRST TriMode Long Reach Solder Tip (Standard)

P75PST TriMode Performance Solder Tip (Optional)

The Long Reach and Performance Solder tips enable you to make full signal characterizations from a multi-point soldered connection.

The soldered connection passes the two complementary signals (the A signal and the B signal), and a ground reference from your circuit to the TriMode probe.

The P75PST tip is optimized for high-speed performance. Maximum P7520A bandwidth can only be achieved with the P75PST tip and an oscilloscope with ≥25 GHz bandwidth.



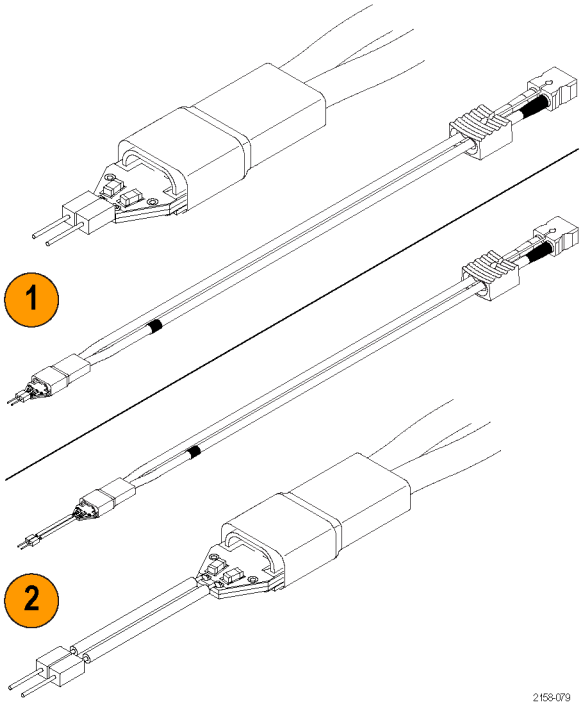
TriMode Resistor Solder Tips

These are optional accessory tips that you can order for your probe. The tips provide solder connection points for the A and B probe input signals at the resistor leads, instead of on the solder tip board.

1. 020-2936-xx TriMode Resistor Solder Tip – measures <29 ps rise times
2. 020-2944-xx TriMode Extended Resistor Solder Tip – measures <32 ps rise times

The tip resistors can tolerate more solder cycles than the P75TLRST tip board, and can be replaced when necessary.

These tips provide full TriMode capabilities when you use the soldered-ground connection on the tip board.



CAUTION. *The TriMode solder tips are very small and must be handled carefully to avoid damaging them. The following pages describe the proper techniques for using the tips.*

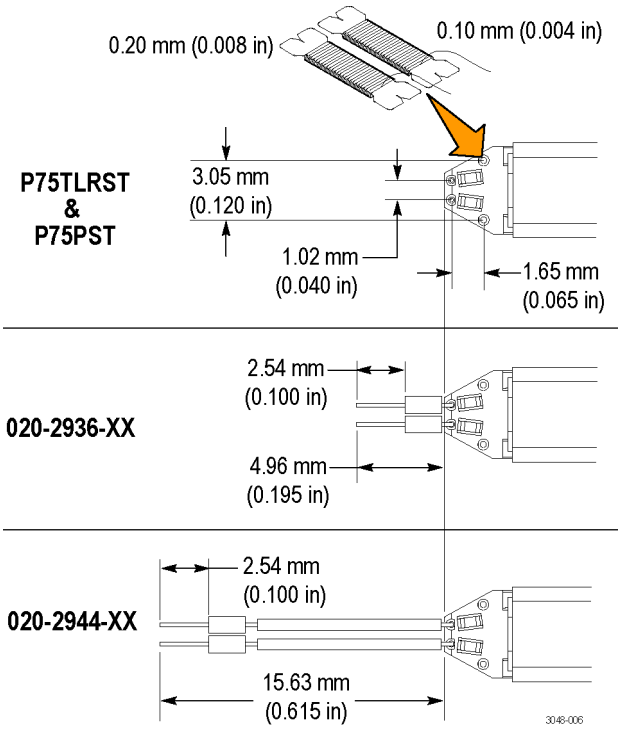
The dimensions of the solder tip connections are provided here for reference. You can also design the tip footprint into your circuit board layout for easier test connections.

To connect the probe tip to your circuit, use the wire and solder that are provided in the wire replacement kit. The kit includes:

- 0.004 in (0.10 mm) wire
- 0.008 in (0.20 mm) wire
- SAC305 solder (RoHS compliant)

You will also need tweezers, a low-wattage soldering iron, and a pair of sharp wire cutters.

Separate procedures follow for soldering the different tips to your circuit.



Connect the P75TLRST or P75PST Solder Tip

You must keep the interconnect wire lengths short (<0.032 in./0.8 mm) to achieve 25 GHz performance with the P75PST Solder Tip. Use the solder tip ramp to position the tip board close to the DUT test points to minimize wire lengths.

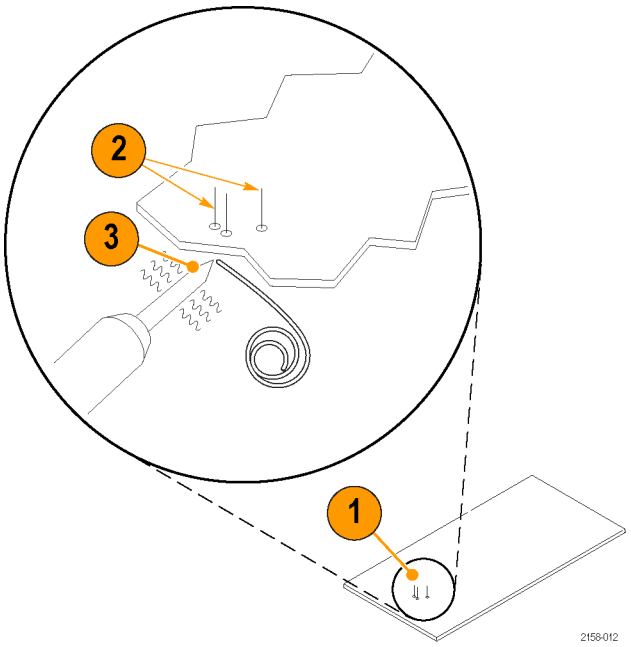
1. Identify a location where the tip can be placed, soldered, and secured to your circuit.

NOTE. *You can work with long wires (~1 inch), but keep the finished wire lengths of the signal and ground connections as short as possible.*

2. Lay the wires against a circuit board pad, trace, or other conductive feature. (If vias or through-holes are very close, you can thread the wires through them.)

3. Solder the wires to your circuit.

NOTE. *For best results, use a flux pen to clean your connections before soldering.*



4. Align the bottom of the tip to the notch in the ramp as shown, and then secure the tip to the ramp with glue or tape.

   The notch in the ramp helps you to position the tip as close as possible (<0.032 in./0.8 mm) to the circuit connections. Very short leads are required for 25 GHz measurements.

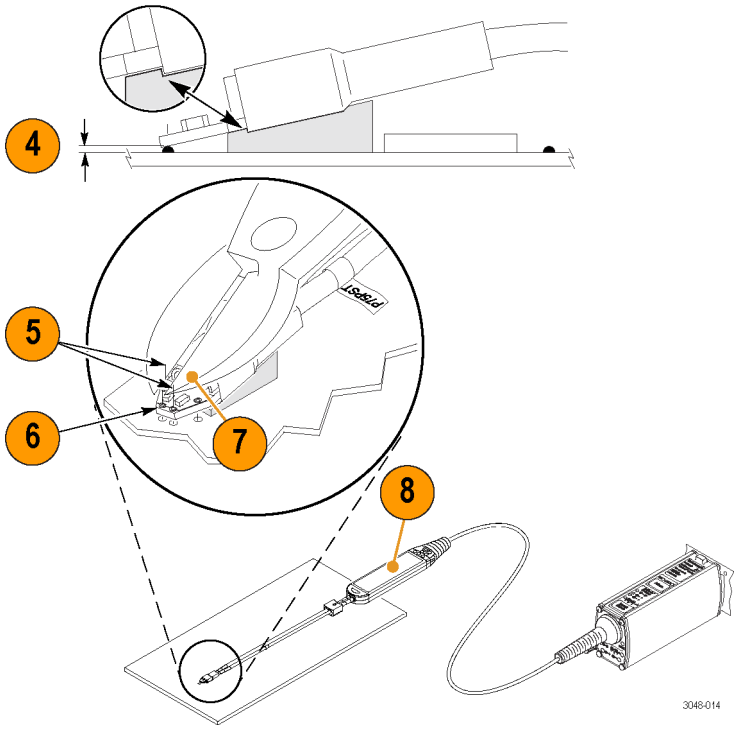
5. Thread the wires through the tip.

6. Press the tip to the circuit board and solder the wires to the tip. Keep all finished wire lengths as short as possible.

7. Clip off the excess wire from all of the solder joints.

8. Attach the probe to the tip. (Note polarity).

9. For a secure mechanical connection, use tape or hot glue to secure the tip and probe to your circuit. (See page 22, *Secure the Tip*.)



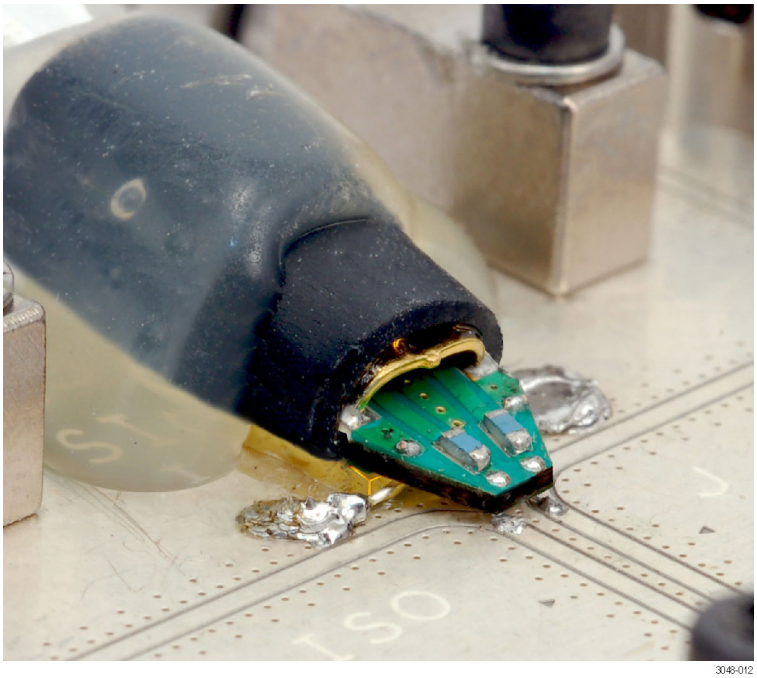
Soldered Tip Example

The lead length of the connection wires between the probe tip board and the DUT must be kept as short as possible to preserve the integrity of the measured signal.

The connection wires must also be kept as equal in length as possible to minimize the skew between the A and B inputs.

This photo shows the P75PST solder tip mounted to the circuit with the solder ramp. Typical wire lengths required for 25 GHz performance are <0.032 in./0.8 mm.

Use a magnifying glass or microscope to get the best results. (See page 23, *Notes on Using the Tips*.)



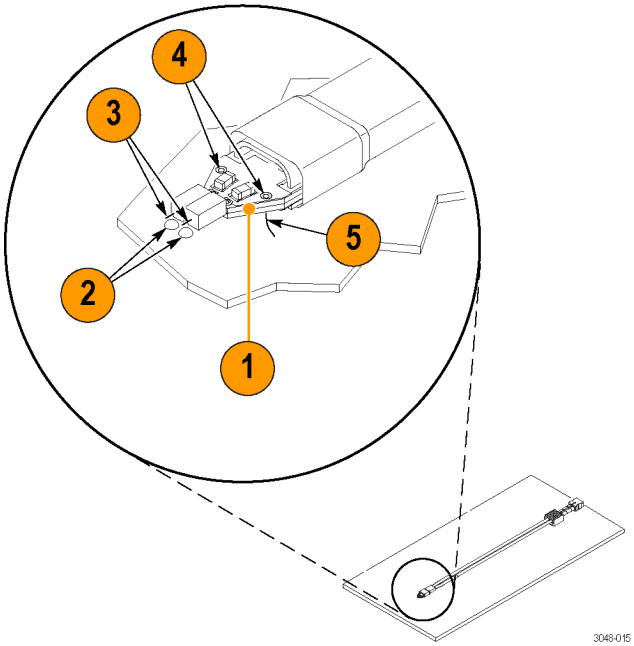
Connect the TriMode Resistor Solder Tips

Use this procedure to connect both styles of resistor tips to your circuit.

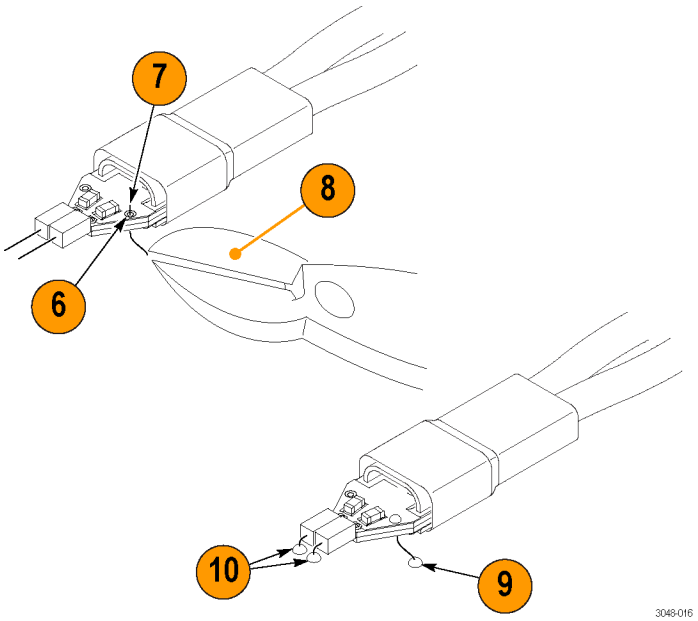
1. Choose a location where the solder tip resistor leads can reach your test points.

   If you are using a ground connection, note which solder tip ground via is closest to your circuit ground.

2. Apply solder to the test points on your circuit.
3. If you are not using the ground, solder the resistor leads to your circuit, clip off any excess, and go to step 11.
4. If you are using a ground wire, apply solder to the solder tip ground via that you chose.
5. Position a length of wire about 1-inch long under the solder tip via.



6. Heat the solder tip via and insert the wire.
7. Cut the excess wire on the other side of the solder tip, flush with the board.
8. Cut the ground wire to the length required to reach your circuit ground. Keep the ground wire as short as possible to ensure good performance.
9. Solder the ground wire to the circuit and clip off any excess wire.
10. Solder the resistor leads to the test points on your circuit and clip off any excess leads.

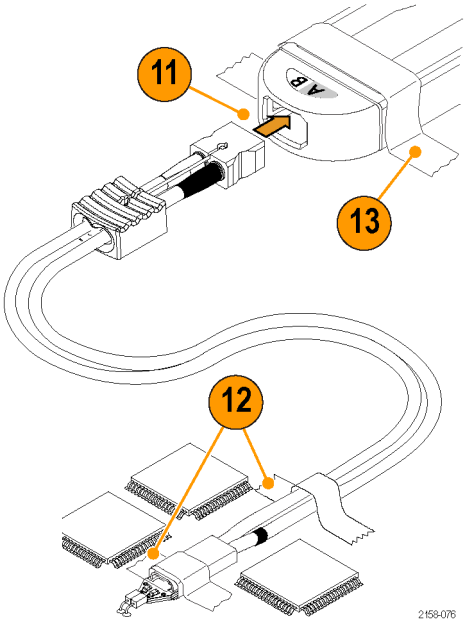


Secure the Tip

11. Push the end of the tip into the probe head until it seats in the probe head.

12. For a secure mechanical connection, use tape or hot glue to secure the tip to your circuit.

13. Secure the probe to the circuit board with tape or hook-and-loop strips.



Notes on Using the Tips.

Use the following precautions when you solder the tips:

- Use a low-wattage, temperature-controlled soldering iron and a small mass soldering iron tip. The soldering iron temperature should be set as low as possible, while still providing a reliable solder joint.
- Use SAC305 solder (included with the wire replacement kit) to attach the tip wires to the circuit under test.
- The attachment wires should be bent symmetrically to vary the interconnect spacing. Use care when you solder a tip to a circuit under test to avoid inadvertently desoldering either the attachment wires or the damping resistor.
- For optimum performance and signal integrity, keep the lead length between the DUT (Device Under Test) and the tip as short as possible, and the lead lengths the same length.

CAUTION. *To prevent damage to the circuit board or circuit board connections due to accidental movement of the probe and soldered leads, we recommend that you secure the tip to the circuit board using the adhesive tip tape provided in your accessory kit. You can also use other materials such as Kapton tape or hot glue.*

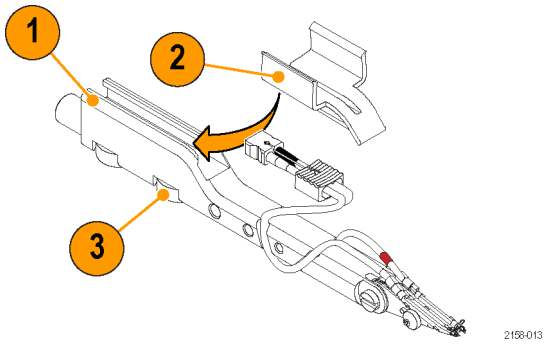
To avoid damage to the tip or the circuit under test, avoid applying excessive heat from the soldering iron. Use a low wattage, temperature-controlled soldering iron and appropriately sized soldering iron tip.

P75PDPM Precision Differential Probing Module (Handheld)

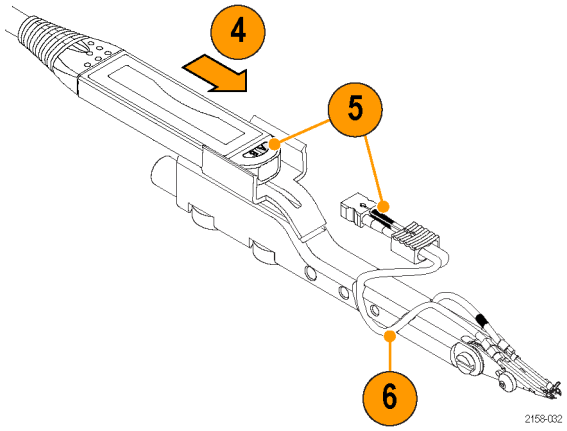
This is an optional accessory. (See page 30, *Optional Accessories*.)

Assemble the Module

1. Position the module housing as shown.
2. Slide the probing module handle adapter into the module housing.
3. Secure the handle adapter with the thumbscrew.



4. Insert the probe in the handle adapter.
5. Attach the cable to the probe body. Match the red band to the A input.
6. You can dress the cable in the channels as shown. The front channels are captive and the rear channels are guides.

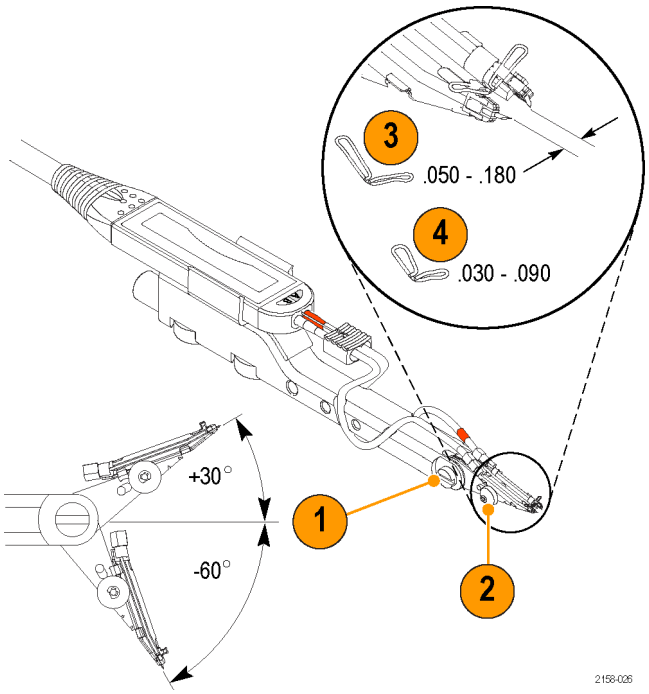


Adjustments

1. Adjust the tip angle by loosening the setscrew and pivoting the tip. Tighten the setscrew to secure the tip.
2. Adjust the tip spacing by turning the adjustment wheel.

   The probing module is shipped with a ground spring installed between the tips. The spring is necessary to pass the highest-fidelity signal to your instrument. The two available spring sizes are shown in steps 3 and 4.
3. The large spring is pre-installed on the probe and allows a tip-to-tip span from 0.050 to 0.180 inches (1.27 to 4.57 mm).
4. The small spring allows a tip-to-tip span from 0.030 to 0.090 inches (0.76 to 2.28 mm).

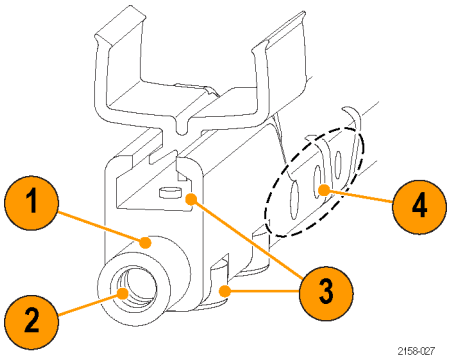
NOTE. *Spring replacement requires a special tool.* *(See page 30, Optional Accessories.)*



Mounting Features

You can mount the probing module to a variety of fixtures and custom probing arms, using the features described below:

1. The barrel at the rear of the P75PDPM fits into the end of the PPM203B probe holder.
2. The threads inside the barrel are metric (M6 x 1), and attach to the EZ-Probe Positioner from Cascade MicroTech.
3. The slot below the barrel slides onto the tab of the PPM100 Probe Positioner. Secure the module to the tab with the thumbscrew.
4. Use these threaded holes (6–32, 8–32, and 10–32) for custom-mount applications.



Connecting the Probe to Instruments without a TekConnect Interface

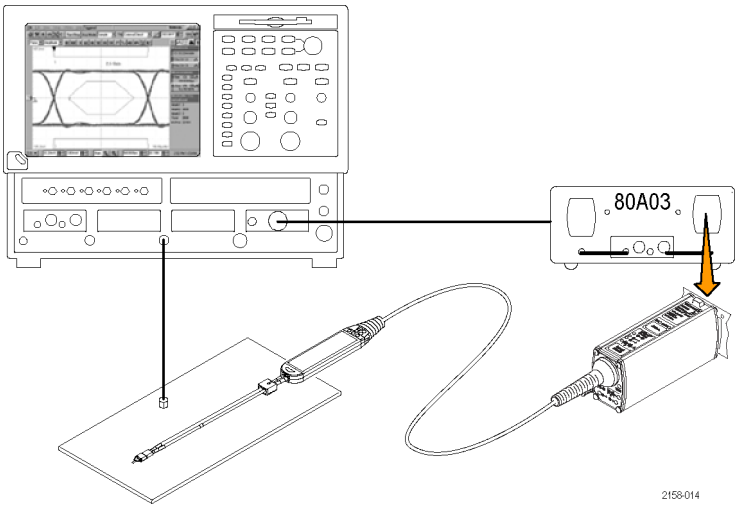
The 80A03 TekConnect Probe Interface adapts any TekConnect probe to the TDS8X00, CSA8X00, and DSA8200 Series oscilloscopes.

The RTPA2A TekConnect Probe Interface adapts any TekConnect probe to Tektronix Real-Time Spectrum Analyzers.

NOTE. *The 80A03 and RTPA2A interfaces are limited to a pass-through bandwidth of 18 GHz.*

For proper probe operation, the Probe Interface firmware must be compatible with the probe. (See page 70, Host Instrument Firmware.) The firmware version label is on the rear panel of the 80A03 instrument.

The host instrument may also require a firmware and/or operating system upgrade. See your instrument manual for more information.

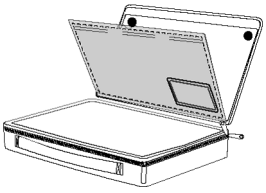
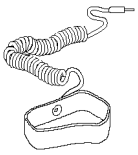
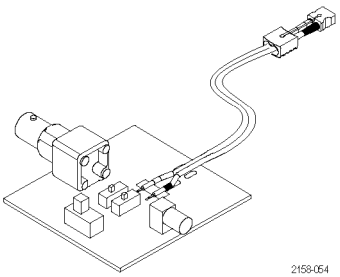


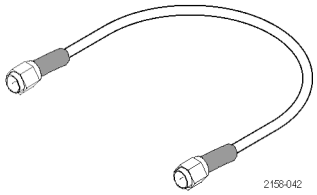
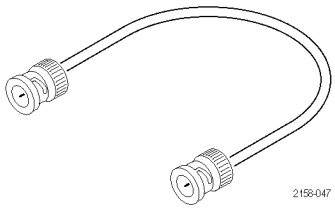
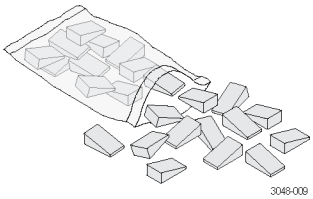
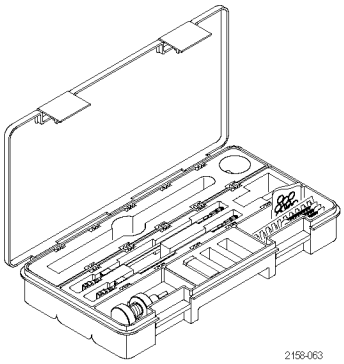
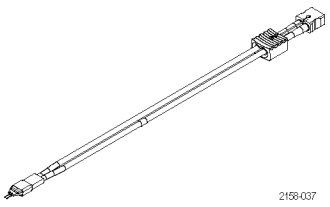
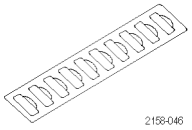
Accessories and Options

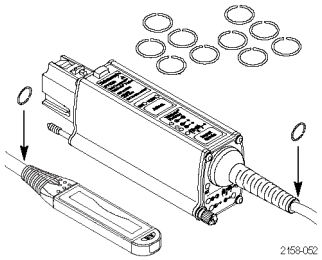
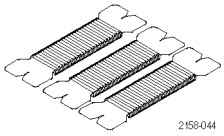
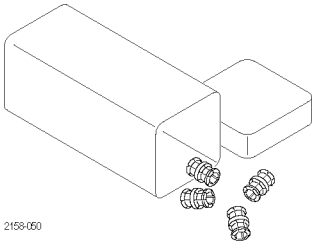
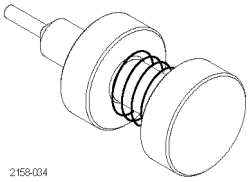
You can reorder the following replacement parts and accessories. Note that in some cases, the reorder quantities may differ from those that ship with the probe.

Standard Accessories

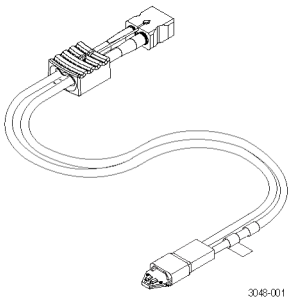
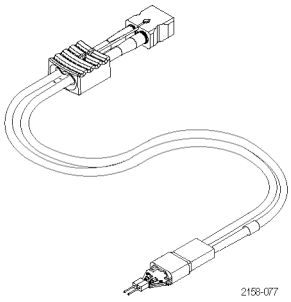
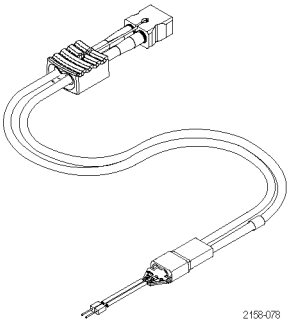
The following accessories are shipped with the P7520A probe. If no quantity is listed, only one of that item is shipped.

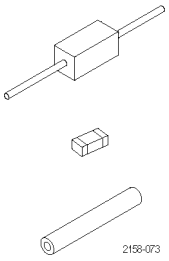
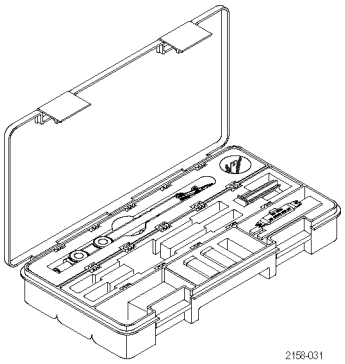
Accessory	Reorder part number and quantity	Description
	016-1997-xx	**Nylon carrying case with inserts.** This carrying case has several compartments to hold the probe and accessories.
	006-3415-xx	**Antistatic wrist strap.** When you use the probe, always work at an antistatic work station and wear the antistatic wrist strap.
	- -	**Calibration certificate.** A certificate of traceable calibration is provided with every probe.
	---	**Data calibration report.** The Data Calibration Report lists the manufacturing test results of your probe at the time of shipment and is included with every probe.
	071-3048-xx	**Instruction manual.** The instruction manual provides instructions for operating and maintaining the P7520A TriMode probe.
	067-1821-xx	**TriMode DC calibration fixture.** Use this fixture to perform a functional check and a DC calibration with the host instrument.

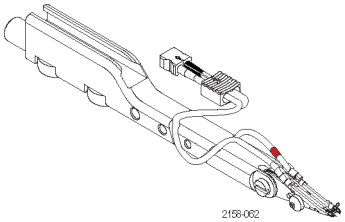
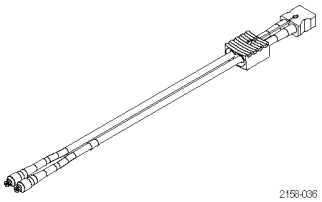
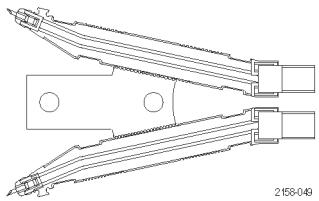
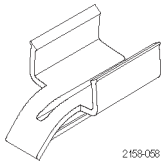
Accessory	Reorder part number and quantity	Description
	174-1120-xx	**50 Ω SMA-M to SMA-M cable assembly, 8.5 in.** To perform a functional check, use this cable to connect the DC Calibration fixture to the Fast Rise Time output connector on the host instrument.
	012-0208-xx	**50 Ω BNC-M to BNC-M cable assembly, 10 in.** To perform a probe calibration, use this cable to connect the DC Calibration fixture to the DC Probe Cal output connector on the host instrument.
	020-3118-xx (package of 25)	**Solder tip ramp kit.** These ramps help you to position the solder tips on your circuit. Glue or tape a ramp to the bottom of the solder tip so that the tip connections are as close as possible to your circuit connections (<0.032 in./0.8 mm for 25 GHz measurements). The ramps work with all of the TriMode solder tips.
	020-2729-xx	**Accessory kit.** The kit includes an assortment of accessories that are described below. A reference sheet is included as a quick guide for using and reordering the probe accessories in the kit. The foam insert includes slots for the optional P75PDPM accessories that you can order.
	P75TLRST	**TriMode Long-Reach Solder Tip.** This tip provides a soldered, multi-point connection that supports full TriMode measurement capabilities at full probe bandwidth. Two tips are included with the probe.
	006-8237-xx (Strip of 10)	**Adhesive tip tape.** Use the double-sided adhesive tip tape to secure the solder tip assembly to your circuit board.

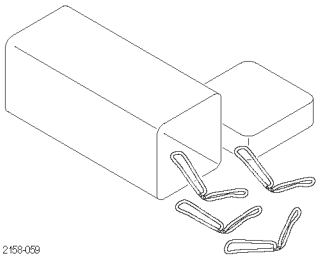
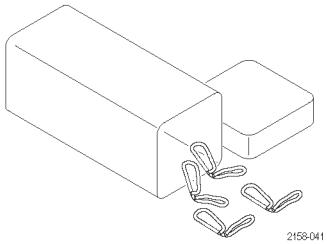
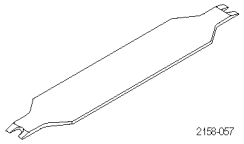
Accessory	Reorder part number and quantity	Description
	016-0633-xx (Package of five colored pairs)	**Color band kit.** This kit includes two sets of five colored pairs. When you are using more than one probe, the bands enable you to visually match the probes to the channels that they are connected to. To use the marker bands, attach one band to the indent on the molded strain relief on the probe cable. Use the matching color band on the other end of the probe, at the control box.
		Maintenance accessories listed below
	020-2754-xx (Package of 3 bobbins)	**Wire replacement kit.** This kit includes three bobbins: SAC305 lead-free solder (RoHS compliant), 4 mil wire, and 8 mil wire. Use this kit to add wire leads on the solder tips.
	013-0359-xx (Package of 4)	**Replacement bullet contacts.** To maintain the best signal integrity, replace the bullets in the probe body after 200 insertion cycles.
	003-1896-xx	**Bullet removal tool.** This tool allows you to safely remove and install the bullet contacts in the probe head.

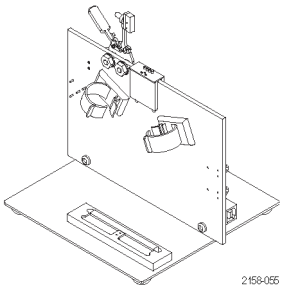
Optional Accessories

Optional accessory	Part number	Description
	P75PST	**TriMode Performance Solder Tip.** This tip provides a soldered, multi-point connection that supports full TriMode measurement capabilities at full probe bandwidth.
	020-2936-xx	**TriMode Resistor Solder Tip kit.** This tip provides solder connection points at 100 Ω resistors that extend about 0.2 in (5 mm) from the solder tip board. The resistors can withstand more solder cycles than the P75TLRST and P75PST solder tips, and can be replaced if they break. This tip can measure rise times down to <29 ps. A kit of replacement resistors is available; see below.
	020-2944-xx	**TriMode Extended Resistor Solder Tip kit.** This tip provides solder connection points at 100 Ω resistors that extend about 0.6 in (15 mm) from the solder tip board. The resistors can withstand more solder cycles than the P75TLRST and P75PST solder tips, and can be replaced if they break. This tip can measure rise times down to <32 ps. A kit of replacement resistors is available; see below.

Optional accessory	Part number	Description
	020-2937-xx	**Replacement resistor kit for TriMode solder tips.** This kit includes: ■ 100 Ω leaded resistors, quantity 50 ■ 75 Ω surface-mount, 0402 resistors, quantity 50 ■ Nonconductive tubing, quantity 50
	P75PDPM	**Probing module kit.** This kit allows you to browse multiple test points in your circuit without using a soldered connection. The kit includes the parts listed under *P75PDPM kit contents* below; some are also orderable separately.

P75PDPM kit contents	Part number	Description
	Order P75PDPM kit	**Probing module.** The Probing Module includes the P7500 Tip Cable and a large ground spring pre-attached to the tip pair, ready to connect to your probe. To order the Probing Module, order the P75PDPM kit.
	P75TC	**P7500 tip cable.** This cable connects the probe to the Probing Module Tip. When the Probing Module kit is ordered, the cable is shipped pre-installed on the Probing Module. To order the cable separately, order P75TC.
	P75PMT	**Probing module replacement tips (pair).** When the Probing Module kit is ordered, two sets of Probing Module tip boards are shipped; one set is pre-installed on the Probing Module. The replacement tips (one each left and right) are built in pairs and must be separated before installation. To order the replacement tips separately, order P75PMT.
	367-0545-xx	**Probing module handle adapter.** The Handle Adapter connects the probe body to the handheld probing module.

P75PDPM kit contents	Part number	Description
	016-1998-xx (Package of 4)	**Ground spring kit, large.** The handheld probing module requires a spring to make a ground connection between the ends of the two input tips. Use the large ground spring for general-purpose browsing, when the required span between tips is from 0.050 in. to 0.180 in. (1.27 to 4.57 mm).
	016-1999-xx (Package of 4)	**Ground spring kit, small.** Use the small ground spring when you are probing dense circuits and where you may have multiple probes in a confined area. The distance between the tips with the small spring installed is from 0.030 in. to 0.090 in. (0.76 to 2.28 mm).
	003-1900-xx	**Ground spring tool.** This tool simplifies spring removal and installation. The ends of the tool match the two springs that mount between the probe tips. A tab in the center of the tool is used to set the span of the tips to the optimum width for spring replacement.
	003-1897-xx	**Connector separator tool.** Use this tool to disconnect the P7500 Tip Cable from the Probing Module Tips. The tool protects the connectors and tips from damage by gently spreading them apart.

Optional accessory	Part number	Description
	067-1586-xx	**Deskew fixture.** Use this fixture to time-align the probe to other probes connected to your measurement system.
	PPM203B	**PPM203B Articulating Arm.** This high-precision articulating arm has fine adjustment controls for all three axes. It is designed for probing circuit boards, hybrids, and multi-chip modules (MCMs), that employ fine-pitch devices and interconnects. Use the Articulating Arm to provide stability and support for the probes when taking measurements. Use the Probe Arm Adapter to attach a probe to the PPM203B Articulating Arm.
	PPM100	**PPM100 Probe Positioner.** This general-purpose benchtop probe holder with flexible arm is designed for hands-free probing that requires adjustable fine positioning. The heavy duty base can be replaced with the clamp for securing the probe arm in a variety of situations.

Optional accessory	Part number	Description
	80A03	**80A03 TekConnect Probe Interface Module.** Use this module with 80E0X Sampling Modules to adapt TekConnect probes to TDS/CSA8000 and TDS/CSA8200 Series Sampling Oscilloscopes. ***NOTE.*** *The 80A03 interface is limited to 18 GHz pass-through bandwidth.* The interface is composed of an enclosure that houses a compartment for one 80E0X Electrical Sampling Module and two TekConnect probe inputs. The interface routes the probe signal outputs through SMA connectors on the front panel. Semi-rigid SMA cables link the probe outputs to the 80E0X module inputs. ***NOTE.*** *The 80A03 adapter firmware must be version 2.3 or above to ensure full functionality with the P7520A probe.*
	RTPA2A	**RTPA2A TekConnect Probe Adapter.** This adapter allows you to connect a TekConnect probe to a Real-Time Spectrum Analyzer. ***NOTE.*** *The RTPA2A interface is limited to 18 GHz pass-through bandwidth.* *The RTPA2A adapter firmware must be version 2.3 or above to ensure full functionality with P7500 Series Probes.*

Options

Option CA1. A single calibration event, or coverage for the designated calibration interval, whichever comes first.

Option C3. Calibration Service 3 years

Option C5. Calibration Service 5 years

Option D1. Calibration Data Report-ships standard with probe

Option D3. Calibration Data Report, 3 years (with Option C3)

Option D5. Calibration Data Report, 5 years (with Option C5)

Option G3. Gold Plan 3 years

Option G5. Gold Plan 5 years

Option R3. Repair Service 3 years

Option R5. Repair Service 5 years

-R3DW. Repair service coverage: 3 years (includes product warranty period), 3 year period starts at time of purchase.

-R5DW. Repair service coverage: 5 years (includes product warranty period), 5 year period starts at time of purchase.

Theory of Operation

This section discusses operating considerations and probing techniques.

The P7520A probe is optimized for high bandwidth; it is not a general-purpose probe. The probe tips are miniaturized for electrical characteristics and access to dense circuitry, and must be handled carefully.

CAUTION. *To prevent damage to the probe, use care when handling the probe. Rough or careless use can damage the probe.*

Attenuation and Input Mode Settings

Attenuation Selection

The Atten. (attenuation) button toggles the probe between the two nominal attenuation settings of 5X and 12.5X. The choice of attenuation setting is a tradeoff between probe dynamic range and noise. The probe dynamic range represents the operating range over which the probe is linear to within some specified percentage, such as ±1%. The probe noise is usually specified as a noise spectral density and is significant because of the wide probe bandwidth. The 5X attenuation setting provides the lowest noise performance. The 12.5X attenuation setting provides the largest dynamic range. The actual probe attenuation factor is automatically accounted for by the attached oscilloscope using the intelligent TekConnect probe interface. The attached oscilloscope also indicates the probe dynamic range with momentarily-displayed arrows when the vertical channel controls are changed at larger vertical scale factor settings.

The usual choice for attenuation setting should be 5X, if the measured signal fits within the specified dynamic range, since that provides the best noise performance. The probe Offset control can also be used with some signals to compensate for a DC bias and bring the displayed signal within the specified dynamic range. Although it is possible to measure signals that exceed the dynamic range of the probe, the measured signal performance becomes increasingly non-linear and eventually reaches a limiting level. Although probe signal limiting does not damage the probe (as long as the maximum input voltage is not exceeded), the measured response no longer accurately represents the input signal.

Input Mode Selection

The Input Mode button toggles the internal probe input selector switches between the four input mode selections. This TriMode feature allows full characterization of a differential signal from a single soldered connection.

A-B Mode. The A-B Mode is used for making differential signal measurements and represents the traditional differential probe functionality. Since the A-B Mode measures the difference between the A and B input signals, it eliminates any common mode voltage, such as a DC bias common to both inputs, within the CMRR performance capability of the probe. For P7500 probe tips, such as the P75PDPM, which do not provide a TriMode ground reference, the A-B Mode is the only useful mode for making low noise measurements. In fact, some oscilloscope models only allow the A-B Mode to be selected when the connected tip does not include a ground reference. The A-B Mode can also be used for making single-ended measurements with the P75PDPM probe tip by connecting the B input to the local circuit ground.

A-GND Mode. The A-GND mode is used for making probe A input single-ended measurements with TriMode probe tips such as the P75TLRST and P75PST. These probe tips include a solder connection for the local circuit ground. In the A-GND Mode the P7500 probe input switch is configured to measure the A input relative to this local circuit ground reference. The A input signal measurement in A-GND Mode is designed for minimal coupling from any signal present on the B input within the A input isolation performance of the probe.

The A-GND Mode is not recommended for measurement use with the P75PDPM probe tip because of the lack of a local circuit ground connection (and some oscilloscope models do not allow the A-GND Mode to be selected with the P75PDPM).

B-GND Mode. The B-GND mode is used for making probe B input single-ended measurements with TriMode probe tips such as the P75TLRST and P75PST. These probe tips include a solder connection for the local circuit ground. In the B-GND Mode the P7500 probe input switch is configured to measure the B input relative to this local circuit ground reference. The B input signal measurement in B-GND Mode is designed for minimal coupling from any signal present on the A input within the B input isolation performance of the probe.

Like the A-GND Mode, the B-GND Mode is also not recommended for measurement use with the P75PDPM probe tip because of the lack of a local circuit ground connection.

(A+B)/2 Mode. The (A+B)/2 Mode is used for making common mode measurements on a differential signal and represents a new probe feature that previously could only be made using oscilloscope math on multiple channels. For a differential signal, the common mode measurement indicates the DC bias level and also shows the degree of asymmetry between the A and B inputs. Since the (A+B)/2 Mode measures the average between the A and B input signals, it eliminates any complementary differential signal voltage, within the DMRR performance capability of the probe.

Input Voltage Limits

The P7520A probe is designed to probe low-voltage circuits. Before probing a circuit, take into account the limits for maximum input voltage, the operating voltage window, and the differential-mode signal range. (See Table 5 on page 52.)

Maximum Input Voltage

The maximum input voltage is the maximum voltage to ground that the inputs can withstand without damaging the probe input circuitry.

CAUTION. *To avoid damaging the inputs of the probes, do not apply more than ±15 V (DC + peak AC) between each input or between either probe input and ground.*

CAUTION. *To avoid ESD damage to the probe, always use an antistatic wrist strap (provided with your probe), and work at a static-approved workstation when you handle the probe.*

Operating Voltage Window

The operating voltage window defines the maximum voltage that you can apply to each input, with respect to earth ground, without saturating the probe input circuitry. (See Figure 2.) A common-mode voltage that exceeds the operating voltage window may produce an erroneous output waveform even when the differential-mode specification is met.

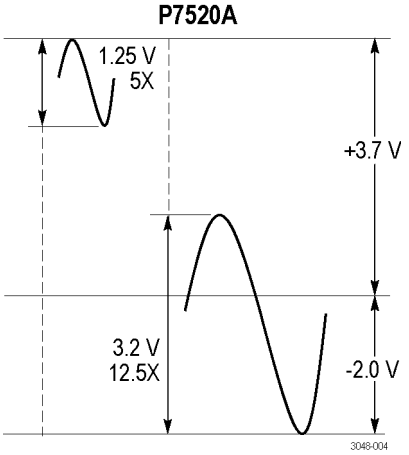


Figure 2: Operating voltage window

Differential-Mode Signal Range

The differential-mode signal range is the maximum voltage difference between the A and B inputs that the probe can accept without distorting the signal. The distortion from a voltage that exceeds this maximum can result in a clipped or otherwise inaccurate measurement. The P7520A probe has two attenuation settings, 5X and 12.5X, that allow dynamic range to be traded off against signal noise. The 12.5X attenuator setting has the largest dynamic range; the 5X attenuator setting has the lowest noise. The graphs on the following pages illustrate the linearity error over the dynamic voltage range of the probes in both attenuation settings.

Offset Voltage Range

The Offset Voltage Control, accessible from the attached oscilloscope user interface, allows the probe dynamic range to be effectively moved up and down within the limits of the offset voltage range and the operating voltage window. When the offset voltage is set to zero volts and the input signal is zero volts (inputs shorted to ground, not open), the displayed signal should be zero volts. If a noticeable zero volt offset is present under the above conditions, a Probe Cal operation should be performed.

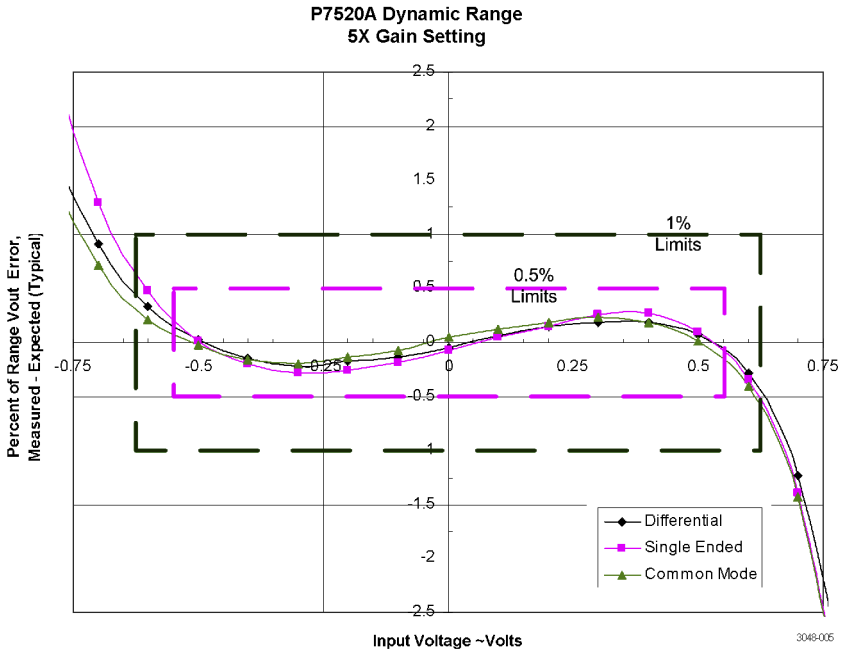


Figure 3: Dynamic range versus linearity, 5X range

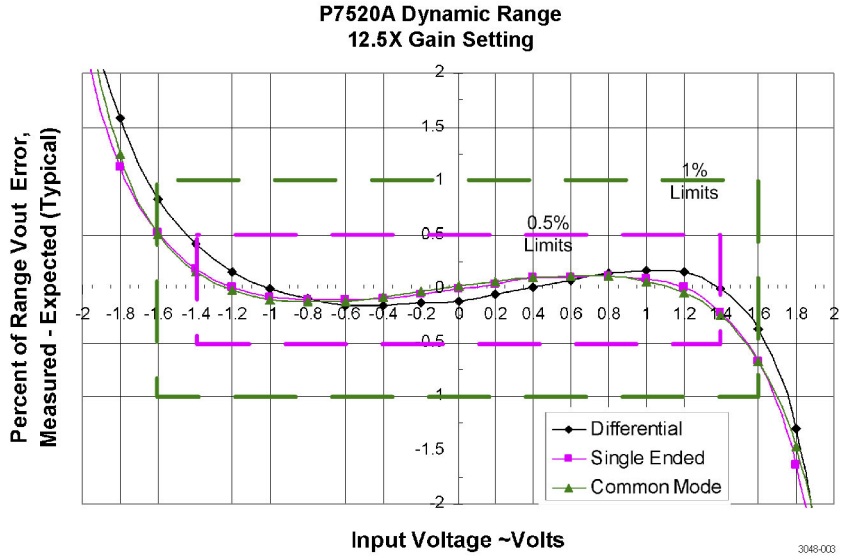


Figure 4: Dynamic range versus linearity, 12.5X range

TriMode Operation

The TriMode feature of the P7500 Series probe family is designed for improved convenience and enhanced capability in measuring differential signal quality. Since a differential signal is composed of two complementary single-ended signals, full characterization of differential signal quality requires more than a simple differential measurement. A TriMode probe features three Input Modes that allow a differential signal to be fully characterized with four measurements: differential, positive polarity and negative polarity single-ended, and common mode.

A TriMode probe provides improved efficiency and convenience by enabling full differential signal characterization from a single soldered connection. Using one of the solder tips available for the TriMode probes, (for example, the P75TLRST probe tip), probe connections are soldered to the two complementary signals (the A signal and the B signal) and a ground reference. From this single DUT (device under test) connection, the internal electronic switching control of the TriMode probe allows any one of the three probe Input Modes (four measurements) to be selected at a time. The TriMode probe inputs are routed on the probe ASIC (application-specific integated circuit) to a set of four independent input amplifiers that perform the following signal calculations:

- A – B (for differential signal measurement)
- A – GND (for positive polarity single-ended measurement)
- B – GND (for negative polarity single-ended measurement)
- [A+B]/2 - GND (for common mode measurement)

NOTE. *In the B – GND Mode, the negative polarity B input is not inverted.*

The four input amplifiers are multiplexed together and only the selected Input Mode function is output to the connected oscilloscope. (See Figure 5 on page 41.) The figure shows a conceptual view of the TriMode probe input structure, where the C input provides the probe ground reference and is connected to the probe tip ground interconnect using the probe tip cable coaxial shields.

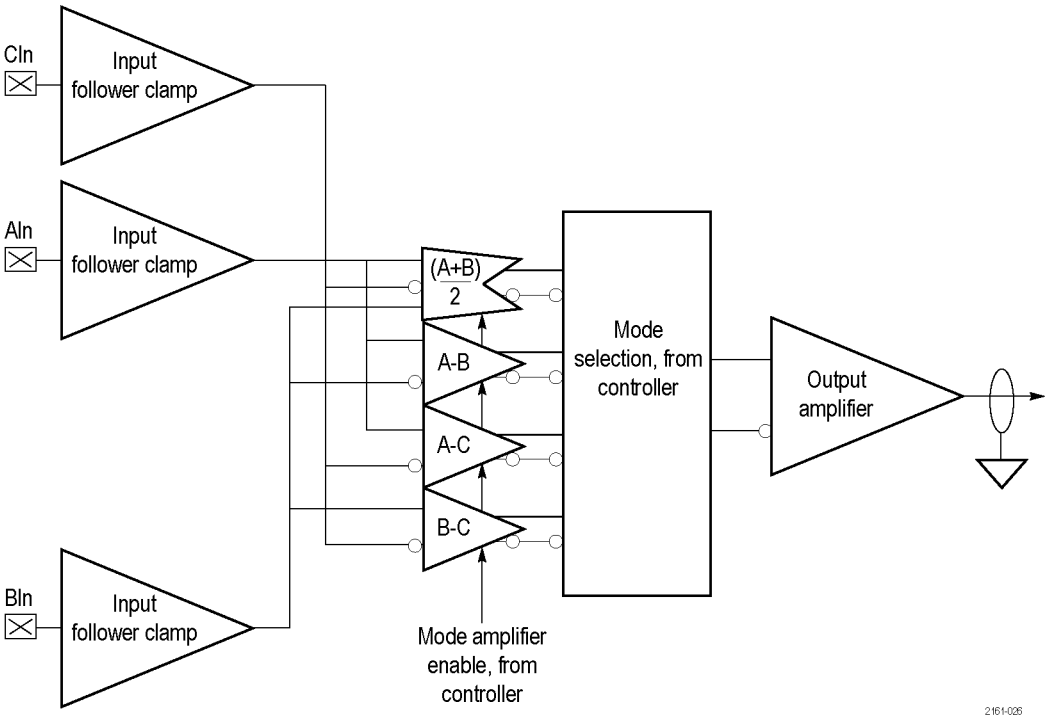


Figure 5: TriMode input structure

On oscilloscopes that do not provide full TriMode support, the TriMode features are controlled by the probe Control Box switches, which allow oscilloscope features like Probe Cal to be exercised only for the selected probe Input Mode.

On oscilloscopes that provide full TriMode support, the oscilloscope-controlled probe GUI (graphical-user interface) can perform a Probe Cal operation on all Input Modes and Attenuation Settings at once using the TriMode Probe Cal fixture that is supplied with P7500 Series probes. Full TriMode support will also allow storage and automatic recall of relevant settings like Offset. (See Figure 6.)

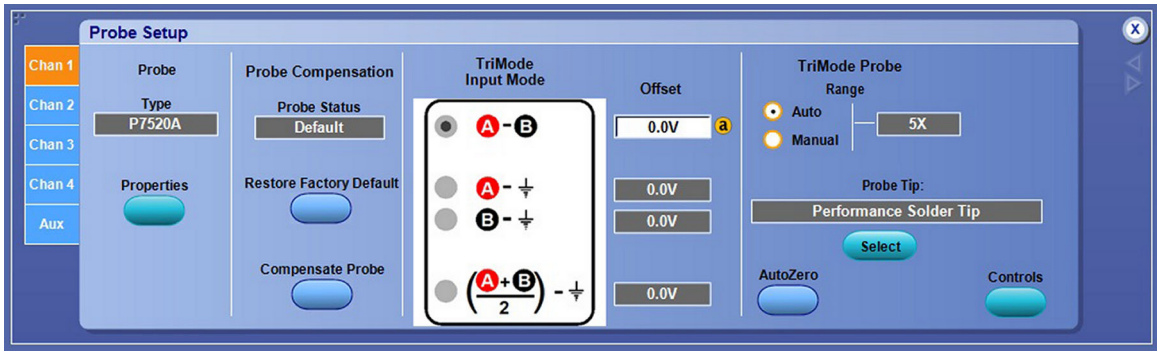


Figure 6: Typical TriMode Probe Setup screen

Probing Techniques to Maximize Signal Fidelity

Signal fidelity is an indication of how accurately a probe represents the signal being measured. The signal fidelity of the probe is best when the probe is applied properly to the circuit with the P7520A probe tips. Recommendations for connecting the probe tips are given in the following section.

Probe Tip Cables and Connectors. Attached to the probe tip circuit board is a pair of very low skew (<1 ps) coaxial cables and a polarized G3PO dual connector block. The 3GPO connectors use a miniature, high frequency design that enables quick and easy installation of the P75TLRST solder tip. The G3PO connector block of the probe tip is inserted into the input nose piece on the end of the probe body of the P7500 family probes. The probe body contains a mating, polarized G3PO connector block with attached G3PO connector bullets.

The connector bullets are a part of the G3PO connector design, providing a self-aligning interconnect mechanism between G3PO connectors. The G3PO connector in the probe body is designed to have higher detent force than the probe tip connectors, which is intended to ensure that the G3PO bullets remain in the probe body connector when disconnected. The probe body nose piece, with its integral spring mechanism, helps to provide a self-aligning mechanism for hand insertion of the probe tip. The probe body nose springs also give a secure capture of the probe tip connector after insertion. Release of the probe tip is assisted by using the wire-connected cable release holder on the probe tip connector. This probe tip release holder should always be used rather than pulling on the probe tip cables, which may cause tip cable damage.

The following four figures illustrate the signal integrity effect on the P75TLRST solder tip when used with different lengths of tip wire. Signal fidelity is best when the wire length is kept as short as possible. The step generator that was used as a signal source for these screenshots has a 30 ps 10-90% rise time. The table in each figure contains data for two rise time measurements (10-90% and 20-80%). These screenshots can be used as a rough guide to gauge the effects of wire length, but actual results may vary depending on the other factors like characteristics of the device under test (for example, rise time and impedance), precision of the solder connection, and the model of oscilloscope.

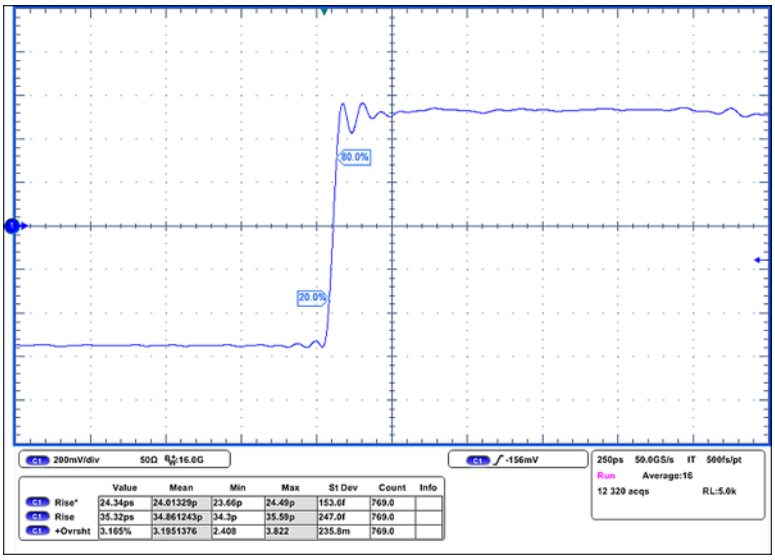


Figure 7: P75TLRST solder tip with 0.010 in. of tip wire

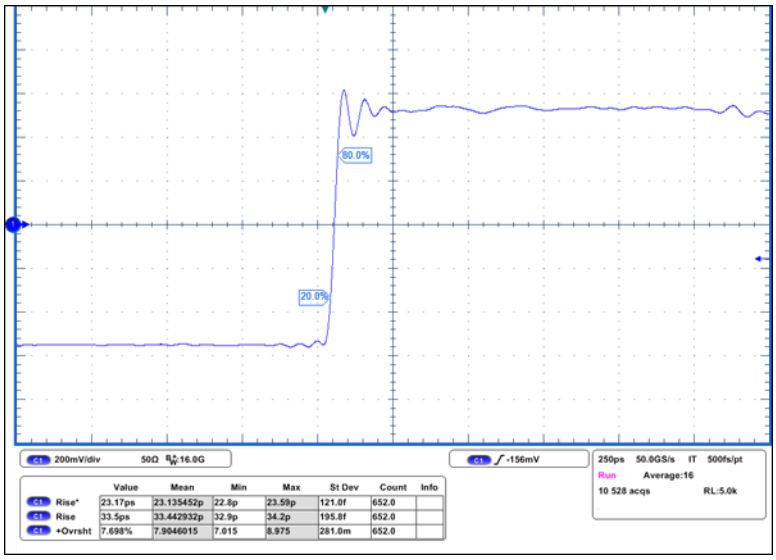


Figure 8: P75TLRST solder tip with 0.050 in. of tip wire

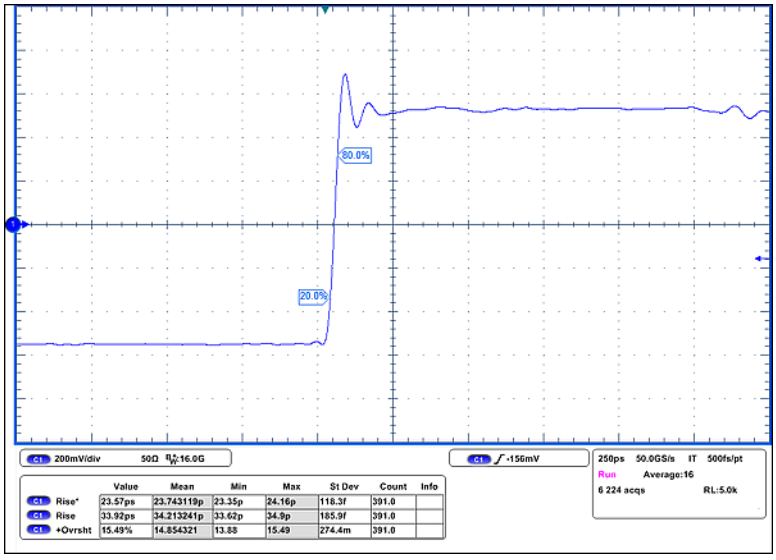


Figure 9: P75TLRST solder tip with 0.100 in. of tip wire

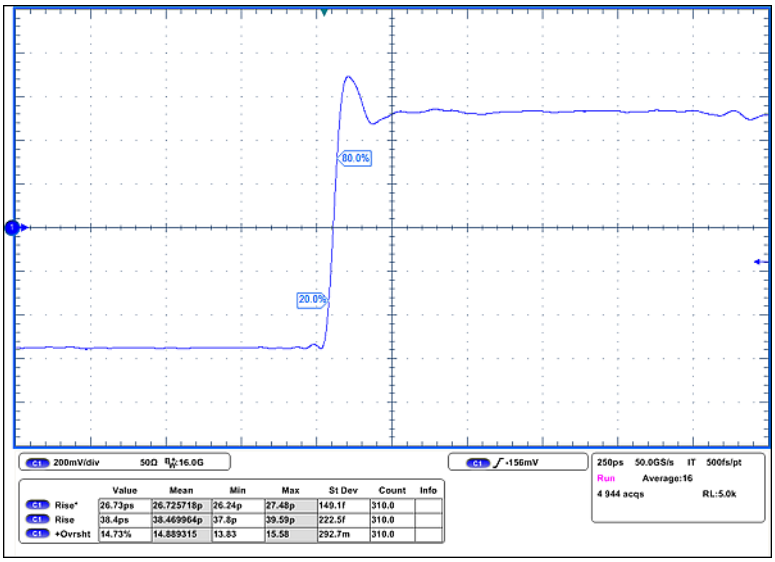
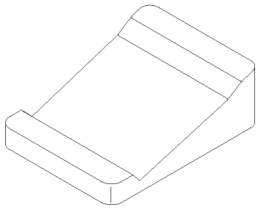


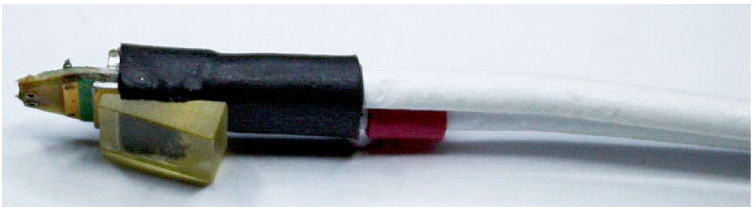
Figure 10: P75TLRST solder tip with 0.200 in. of tip wire

Solder Tip Ramp

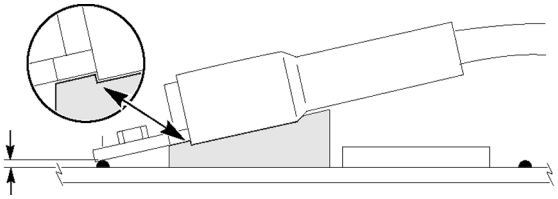
For best performance, the solder tip must be placed very close to the circuit (within 0.032 in./0.8 mm). The solder tip ramp is designed to hold the solder tips 0.025 in. (0.6 mm) away from your circuit connections.



Align the body of the tip to the notch in the ramp as shown. This alignment to the notch ensures the tip-to-circuit gap is 0.025 in. (0.6 mm). Glue or tape the tip to the ramp.



Thread the soldered wires from your circuit test point through the vias on the tip. Glue or tape the tip to your circuit, and then solder the wires from your circuit to the tip.



P75PDPM Precision Differential Probing Module

The P75PDPM Probing Module is designed for handheld and fixtured probing applications. The P75PDPM probe tip is composed of two replaceable probe tip circuit boards with a pin on one end and a G3PO socket connector on the other. Damping resistors on the tip boards near the input pins and a 50 Ω transmission line on the board transmit the signal from the input pin to the G3PO socket connector. The probe tip boards are connected to the P7500 probe body with a very low skew (<1 ps) cable assembly (P75TC).

The left-side and right-side probe tip boards mount at an angle in the P75PDPM adjustment housing. The probe tip spacing is adjustable from 0.030 – 0.180 in. (0.76 – 4.57 mm) using the thumb-operated screw. Because of the variable spacing between the two probe tip boards, a gold-plated ground spring is connected between the probe tip boards to ensure a good common mode ground return near the probe tip pins.

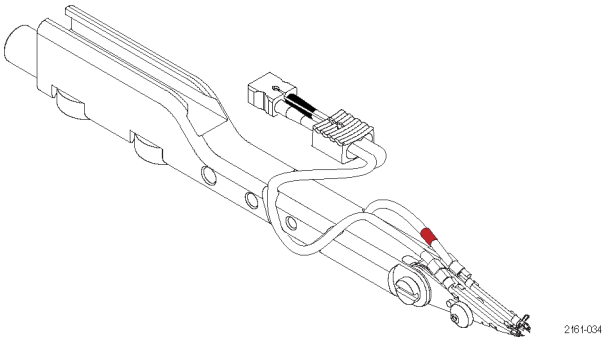


Figure 11: P75PDPM Precision Differential Probing Module

The P75PDPM probe tip circuit boards mount in an articulating metal housing that also supports the variable spacing control. The angle of the probe tip housing can be adjusted and locked in place using an articulation screw in the probe holder bar. The probe holder bar contains mechanical details for retaining the probe tip cable assembly as well as a retaining clamp for the probe body. The probe holder bar can be held manually or can be mounted for fixtured probing on an articulating probe arm using mechanical features in the holder bar.

The P75PDPM design features improved mechanical compliance in probe tip attachment to the DUT. Mechanical compliance is a significant issue for differential probes because of the difficulty in making reliable contact with two DUT connections at the same time. The reliability in making this dual point connection can be improved by a tip structure with good mechanical compliance, in which there is sufficient give in the probe tips to absorb interconnect surface irregularity.

The P75PDPM does not have a local DUT ground connection because of the great difficulty in making a good three-point interconnect without soldering. As a result, the only low-noise TriMode Input Mode available with the P75PDPM is the A-B (DIFF) mode, since for differential signals, there is an inherent virtual ground present in the measurement circuit.

The following four figures illustrate the signal integrity effect of changing the spacing on the P75PDPM Probing Module. Signal fidelity is best with the tips at the smallest spacing. The step generator that was used as a signal source for these screen shots has a 30ps 10-90% rise time. The table in each figure contains data for two rise time measurements (10-90% and 20-80%). These screen shots can be used as a rough guide to gauge the effects of probe tip spacing, but actual results may vary depending on the other factors like characteristics of the device under test (for example, rise time and impedance) and the model of oscilloscope.

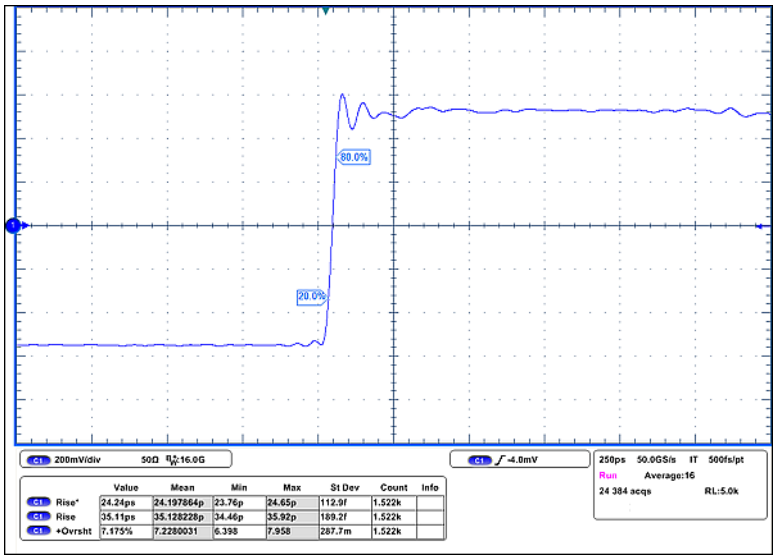


Figure 12: P75PDPM with short ground spring, 0.030 in. spacing

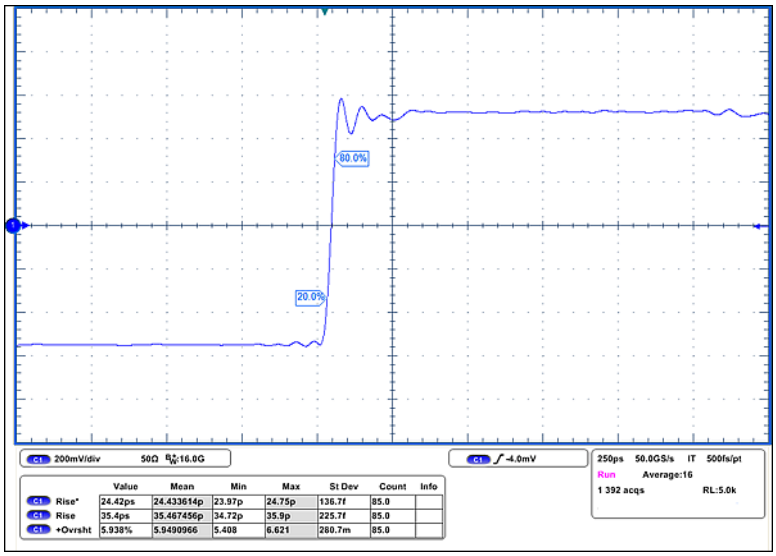


Figure 13: P75PDPM with short ground spring, 0.050 in. spacing

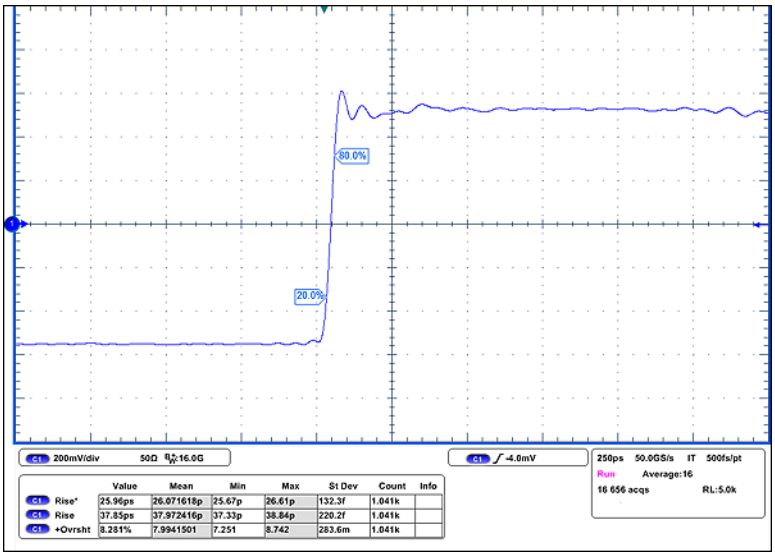


Figure 14: P75PDPM with short ground spring, 0.090 in. spacing

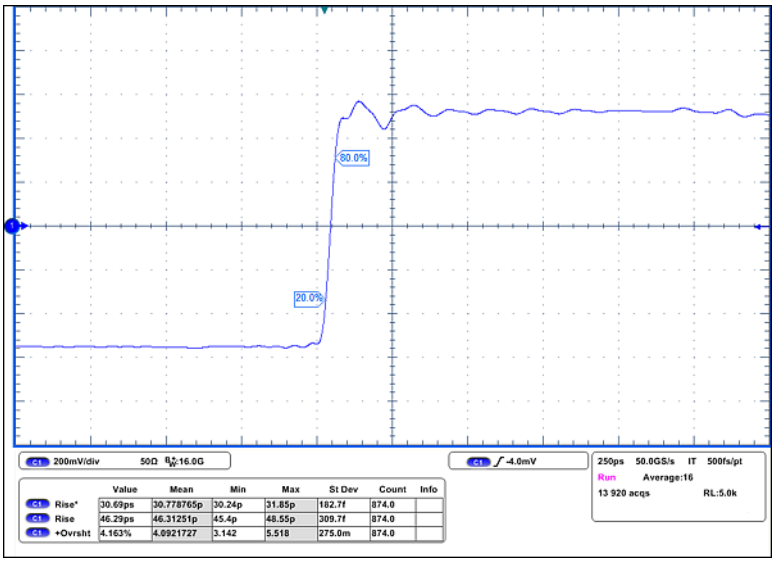


Figure 15: P75PDPM with short ground spring, 0.180 in. spacing

Input Impedance and Probe Loading

When you connect the probe inputs to a circuit, you are introducing a new resistance, capacitance, and inductance into the circuit. Each input of the differential probe has a DC input impedance of 50 kΩ to ground. (See Figure 16.)

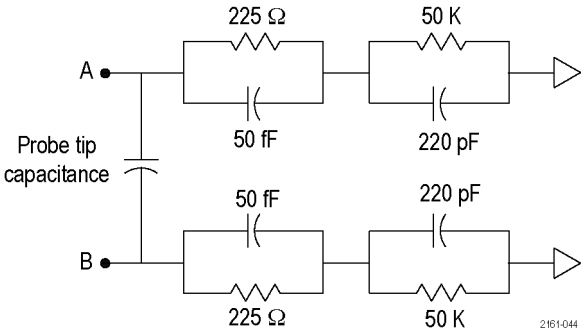


Figure 16: TriMode probe input model

For signals with low source impedance and frequency, the 50 kΩ input impedance on each input is large enough to prevent the inputs from loading the signal sources. The more the signal source impedance on an input increases, the more the probe loads the source and reduces the signal amplitude. The greater the source impedances and the higher the signal frequencies, the more you must take these factors into account.

The frequency of the signal also affects signal measurement. As the frequency of the signal increases, the input impedance of the probe decreases. The lower the impedance of the probe relative to that of the source, the more the probe loads the circuit under test and reduces the signal amplitude. A high frequency input impedance model is shown below. (See Figure 17.)

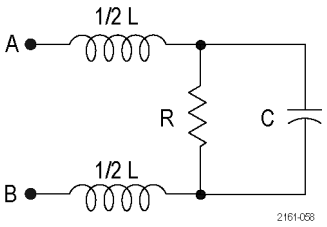


Figure 17: TriMode probe high frequency input impedance model

For plots and representative R-L-C values of the individual TriMode solder tips, refer to the specifications. (See page 56, *Tip Specifications*.)

Embedded Probe

It is possible to acquire signals with the P7500 Series TriMode probes by including an embedded connection in your circuit. (See Figure 18.) Connectors that mate to the P75TC Tip Cable can be incorporated in the circuit board design and carefully placed to balance any reflections or other characteristics that may affect the circuit or measurement. An embedded probe connection will generally provide optimum probe performance because the signal interconnect lead length can be minimized if implemented correctly. For more information about embedded probe connections, contact Tektronix. (See page , *Contacting Tektronix*.)

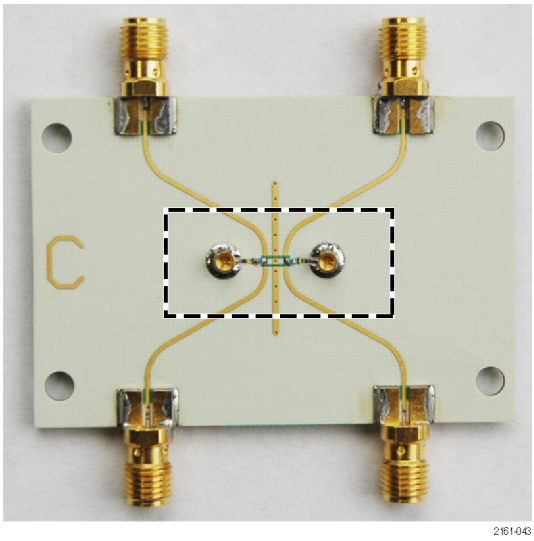


Figure 18: Embedded probe fixture

Specifications

These specifications apply to the P7520A TriMode Probe when it is installed on an oscilloscope that has the supporting firmware, DSP capabilities, and a TekConnect interface. The probe must have a warm-up period of at least 20 minutes and be in an environment that does not exceed the allowed limits. (See Table 1.)

Specifications for the P7520A TriMode Probe fall into three categories: warranted, typical, and nominal characteristics.

Warranted Characteristics

Warranted characteristics describe guaranteed performance within tolerance limits or certain type-tested requirements.

Table 4: Warranted electrical characteristics

Characteristic	Specification
DC attenuation accuracy	0.200 ±2% (5X) 0.0800 ±2% (12.5X)
Output Offset Zero	±3 mV (+20 to +30 °C, +68 to +86 °F) (5X) ±15 mV on oscilloscope ±3 mV (+20 to +30 °C, +68 to +86 °F) (12.5X) ±37.5 mV on oscilloscope
Temperature	Operating: 0 to +40 °C (+32 to +104 °F), Nonoperating: –20 to +71 °C (-4 to +160 °F)
Humidity	Operating: 20–80% RH, at up to +40 °C (+104 °F) Nonoperating: 5–90% RH
Altitude	Operating: 3000 meters (10,000 feet) Nonoperating: 12,000 meters (40,000 feet)

Typical Characteristics

Typical characteristics describe typical, but not guaranteed performance with an embedded probe only. Refer to *Tip Specifications* for specifications when using TriMode accessory tips. Highest performance is achieved when using the P75PST tip with the probe. (See page 56, *Tip Specifications*.)

Table 5: Typical electrical characteristics

Characteristic		Specification
Bandwidth (DSP corrected) [1]		≥25 GHz, differential mode, 100 GS/s ≥23 GHz, differential mode, 50 GS/s ≥18 GHz, A, B, and common modes
Rise time	10–90%	<20 ps, differential mode, 100 GS/s <23.5 ps, differential mode, 50 GS/s <29 ps, A, B, and common modes
	20–80%	<18 ps, A–B mode <20 ps, other modes
Operating voltage window		-2.0 V to +3.7 V
Differential signal range (DC coupled)	5X	±0.625 V
	12.5X	±1.60 V
Linearity	5X	±1% over a dynamic range of –0.625 V to +0.625 V
	12.5X	±1% over a dynamic range of –1.60 V to +1.60 V
Offset voltage range	Differential	–1.5 V to +2.5 V
	Single-ended and common-mode	–1.8 V to +3.4 V
Offset scale accuracy (referred to input)	Differential	0.093 ±2%, referred to input
	Single-ended and common-mode	0.186 ±2%, referred to input
DC offset drift (referred to input)	Differential	–0.100 µV/ °C (5X) –0.60 µV/ °C (12.5X)
	Single-ended and common-mode	+0.100 µV/ °C (5X) +0.30 µV/ °C (12.5X)
DC voltage measurement accuracy	5X	±(2% of input + 2% of offset + 15 mV + 6.25 mV)
	12.5X	±(2% of input + 2% of offset + 37.5 mV + 16 mV)
Maximum nondestructive input voltage		±15 V (DC + peak AC) between each input or between either probe inputs and ground
Input impedance		(See page 29, Tip Specifications.)
Differential input resistance, DC coupled		100 kΩ ±6 kΩ
Input resistance matching		±250 Ω side-to-side with respect to ground
Common-mode input resistance, DC coupled		50 kΩ ±3 kΩ

Characteristic		Specification
Delay time		4.4 ns ±0.1 ns
Common-mode rejection ratio, differential-mode [2]		>60 dB at DC >40 dB to 50 MHz >30 dB to 1 GHz >20 dB to 10 GHz >12 dB to 20 GHz
Differential-mode rejection ratio, common-mode [2]		>40 dB to 50 MHz >30 dB to 1 GHz >20 dB to 9 GHz >12 dB to 18 GHz
Channel isolation, single-ended mode [2]		>40 dB to 50 MHz >30 dB to 1 GHz >15 dB to 9 GHz >6 dB to 18 GHz
Noise, probe only (all modes)		<33 nV/ $\sqrt{Hz}$ (5X) <48 nV/ $\sqrt{Hz}$ (12.5X)
System noise [1]	5X	20 GHz: 4.6 mV_{RMS} 23 GHz, 50 GS/s: 5.2 mV_{RMS} 25 GHz, 100 GS/s: 6.2 mV_{RMS}
	12.5X	20 GHz: 8.9 mV_{RMS} 23 GHz, 50 GS/s: 10.0 mV_{RMS} 25 GHz, 100 GS/s: 12.5 mV_{RMS}

1 Measured using a ≥25 GHz oscilloscope @100 GS/s and a P75PST solder tip. The probe input mode is set to A-B (differential).

2 Embedded probe only. Refer to Tip Specifications for specifications when using TriMode accessory tips. (See page 90, Tip Specifications.)

Table 6: Typical mechanical characteristics

Characteristic	Description
Dimensions, control box	125.4 mm × 41 mm × 35 mm (4.9 in × 1.6 in × 1.4 in)
Dimensions, probe body	101.6 mm × 8.89 mm × 19 mm (4.0 in × 0.350 in × 0.750 in)
Dimensions, cable length	1.0 m (39.3 in) (from the probe body to the control box)
Unit weight	1.550 g (3.1 lbs) (probe, accessories and packaging)

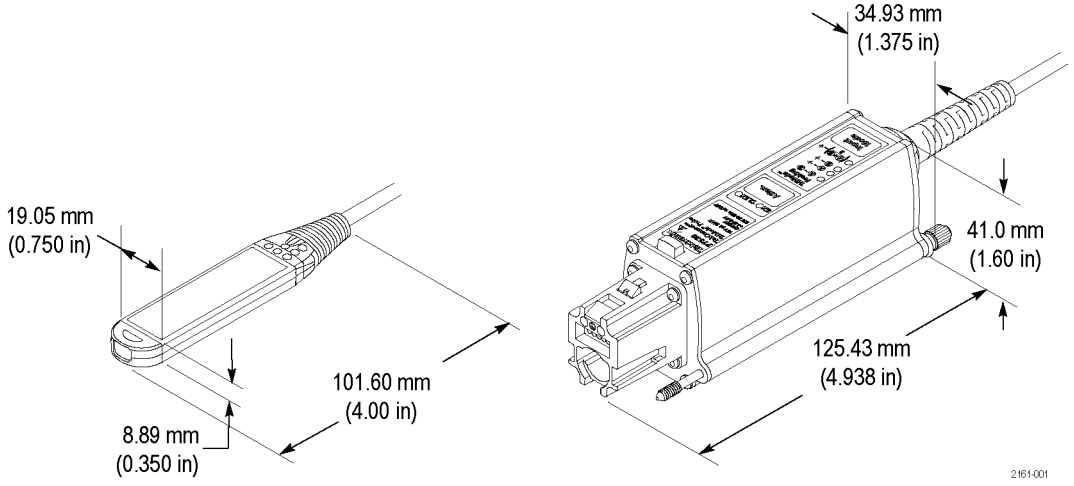


Figure 19: Probe body and control box dimensions

Nominal Characteristics

Nominal characteristics describe guaranteed traits, but the traits do not have tolerance limits.

Table 7: Nominal electrical characteristics

Characteristic		Description
Input configuration	P75PST solder tip	Differential (two signal inputs, A and B; shared with single-ended)
	P75TLRST solder tip TriMode Resistor & Extended Resistor solder tips	Single-ended (one each A and B signal input and two ground inputs)
	P75PDPM handheld module	Differential (two inputs, A and B)
Output coupling		DC
Probe attenuation settings		5X and 12.5X

Tip Specifications

This section lists specifications that are applicable to the probe when used with the accessory tips available for the probe. All solder tips must be connected to the circuit with the shortest leads possible (typically <0.032 in./0.8 mm). Solder ramp accessories are included with the probe to help you minimize the lead lengths. The solder ramps position the probe tip connections as close as possible to your circuit test points.

P75PST Performance Solder Tip

Specifications are typical and apply to all ranges and input modes unless specified otherwise. To achieve the highest performance in differential (A–B) mode, the host instrument bandwidth must be ≥25 GHz with a sample rate of 100 GS/s. The soldered wires between the tip and your circuit must be kept as short as possible (typically <0.032 in./0.8 mm). The bandwidth is less than 25 GHz for the other measurement modes (A, B, and common mode).

Bandwidth	Rise time	CMRR	DMRR	Channel isolation
>25 GHz, A–B mode, 100 GS/s ≥23 GHz, A–B mode, 50 GS/s >18 GHz, A, B, CM modes	10%–90%: <20 ps, A–B mode, 100 GS/s <23.5 ps, A–B mode, 50 GS/s <29 ps, A, B, CM modes 20%–80%: <15 ps, A–B mode <20 ps, A, B, CM modes	>60 dB at DC >40 dB at 50 MHz >30 dB at 1 GHz >20 dB at 10 GHz >12 dB at 20 GHz	>40 dB at 50 MHz >30 dB at 1 GHz >20 dB at 9 GHz >15 dB at 18 GHz	>40 dB at 50 MHz >30 dB at 1 GHz >15 dB at 9 GHz >6 dB at 18 GHz

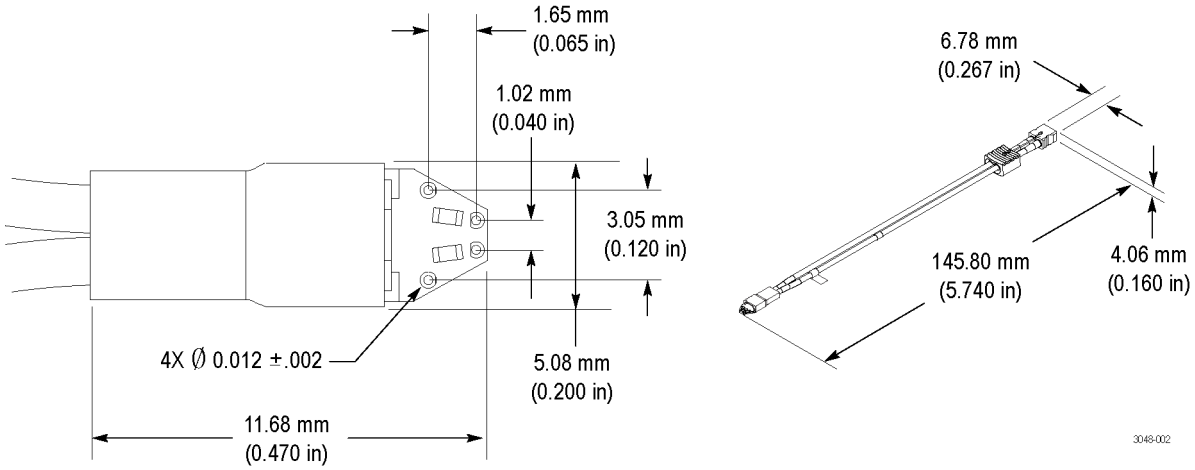


Figure 20: P75PST Performance Solder Tip dimensions

The following figure shows the typical step response of the probe with the P75PST solder tip. A 25 ps rise time pulse source was used for this measurement.

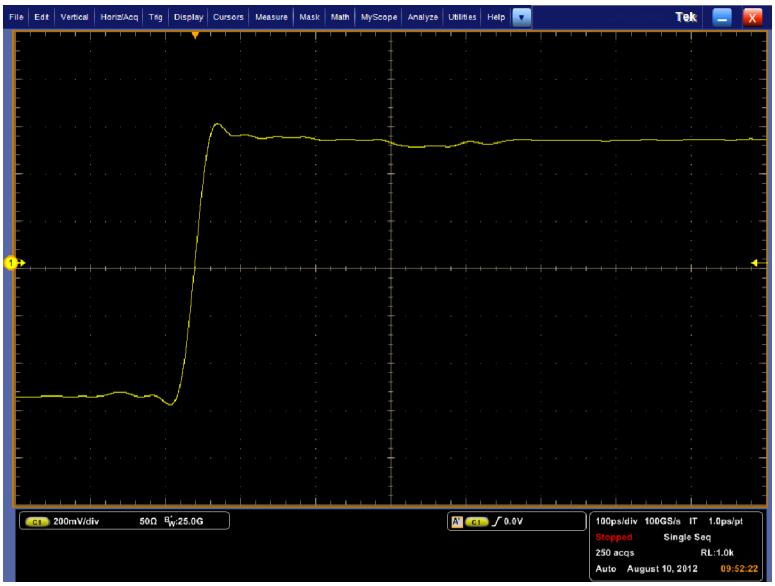


Figure 21: TriMode probe with the P75PST solder tip

The following figure shows a typical impedance plot of the probe with the P75PST solder tip.

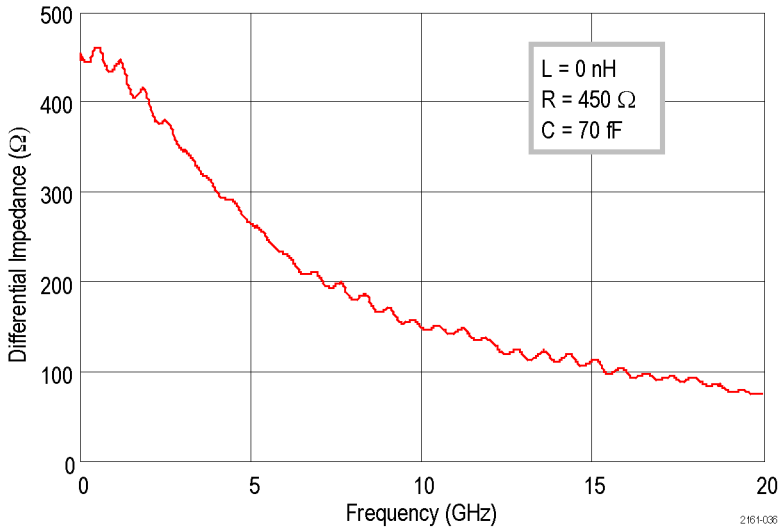


Figure 22: P75PST differential impedance

P75TLRST TriMode Long Reach Solder Tip

Bandwidth	Rise time	CMRR	DMRR	Channel isolation
>20 GHz, A–B mode >18 GHz, A, B, CM modes	10%–90%: <27 ps, A–B mode <29 ps, A, B, CM modes 20%–80%: <18 ps, A–B mode <20 ps, A, B, CM modes	>60 dB at DC >40 dB at 50 MHz >30 dB at 1 GHz >20 dB at 10 GHz >15 dB at 20 GHz	>40 dB at 50 MHz >30 dB at 1 GHz >20 dB at 9 GHz >15 dB at 18 GHz	>40 dB at 50 MHz >30 dB at 1 GHz >15 dB at 9 GHz >6 dB at 18 GHz

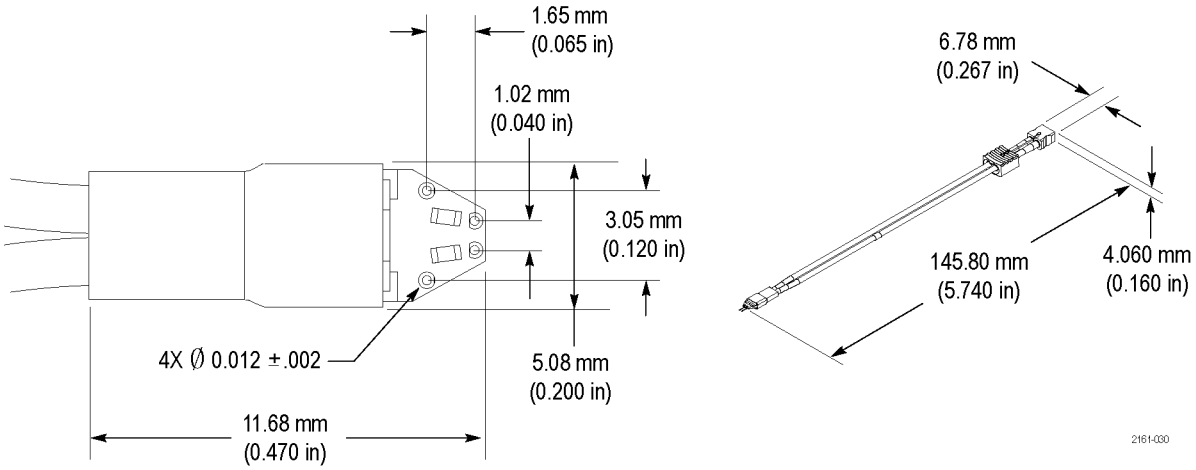


Figure 23: P75TLRST TriMode Long Reach Solder Tip dimensions

The following figure shows the typical step response of the probe with the P75TLRST solder tip. A 50 ps rise time pulse source was used for this measurement.

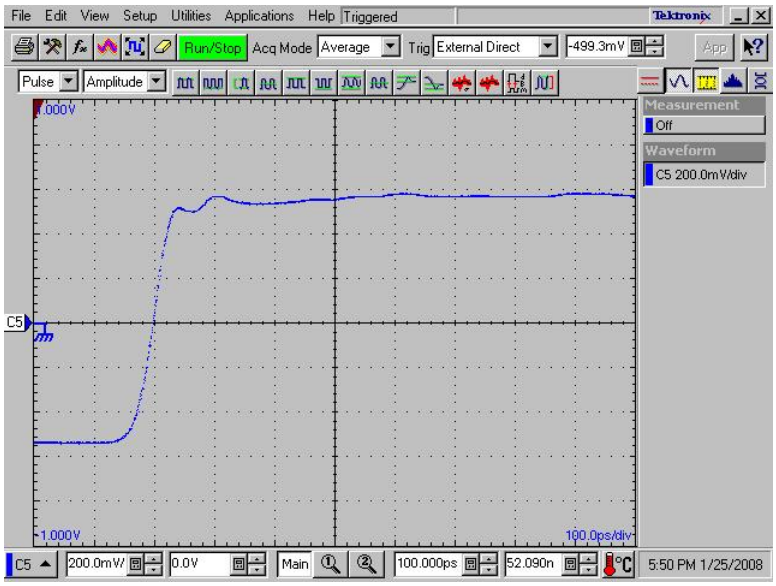


Figure 24: TriMode probe with the P75TLRST solder tip

The following figure shows a typical impedance plot of the probe with the P75TLRST solder tip.

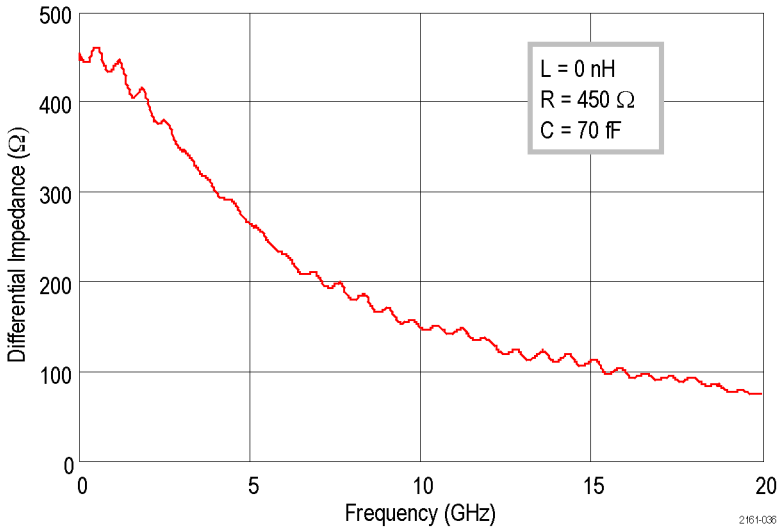


Figure 25: P75TLRST differential impedance

TriMode Resistor Solder Tip

Specifications are typical and apply to all ranges and input modes unless specified otherwise.

Bandwidth	Rise time	CMRR	DMRR	Channel isolation
>18.0 GHz, A–B mode >15.0 GHz, A, B modes >12.0 GHz, CM mode	10%–90%: <29 ps, A–B mode <32 ps, A, B modes <34 ps, CM mode 20%–80%: <20 ps, A–B mode <22 ps, A, B modes <24 ps, CM mode	>60 dB at DC >40 dB at 50 MHz >30 dB at 1 GHz >20 dB at 10 GHz >15 dB at 20 GHz	>40 dB at 50 MHz >30 dB at 1 GHz >20 dB at 9 GHz >15 dB at 18 GHz	>40 dB at 50 MHz >30 dB at 1 GHz >15 dB at 9 GHz >10 dB at 18 GHz

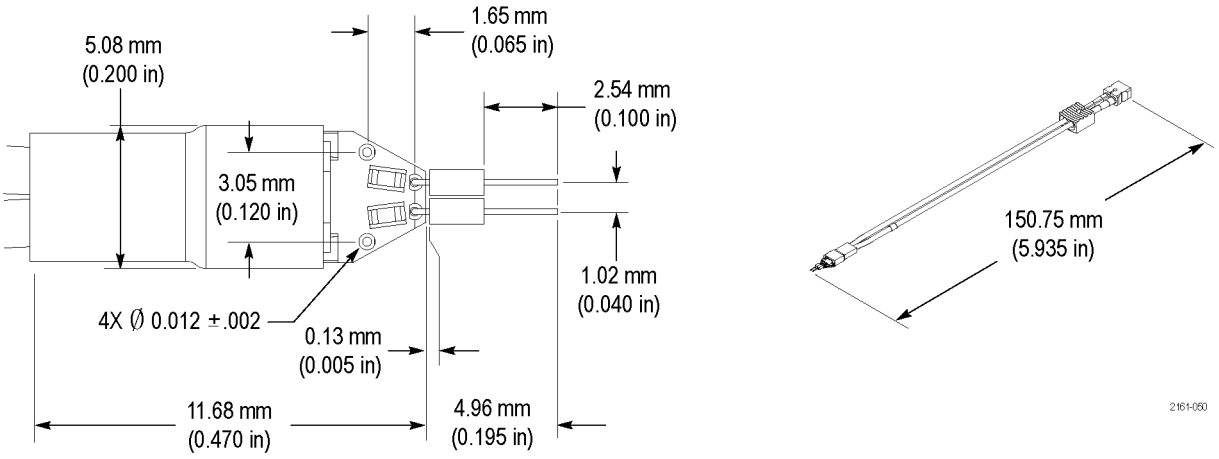


Figure 26: TriMode Resistor solder tip dimensions

The following figure shows the typical step response of the probe with the TriMode resistor solder tip. A 50 ps rise time pulse source was used for this measurement.

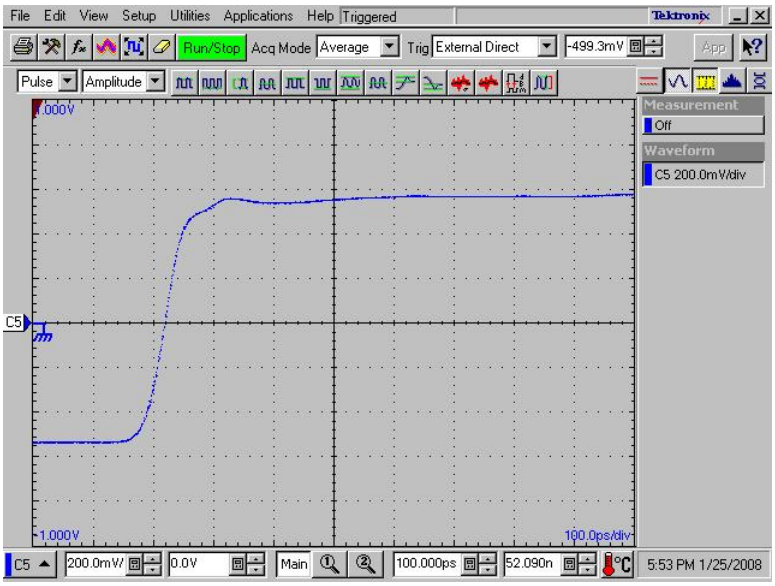


Figure 27: Step response with the TriMode Resistor solder tip

The following figure shows a typical impedance plot of the probe with the TriMode resistor solder tip.

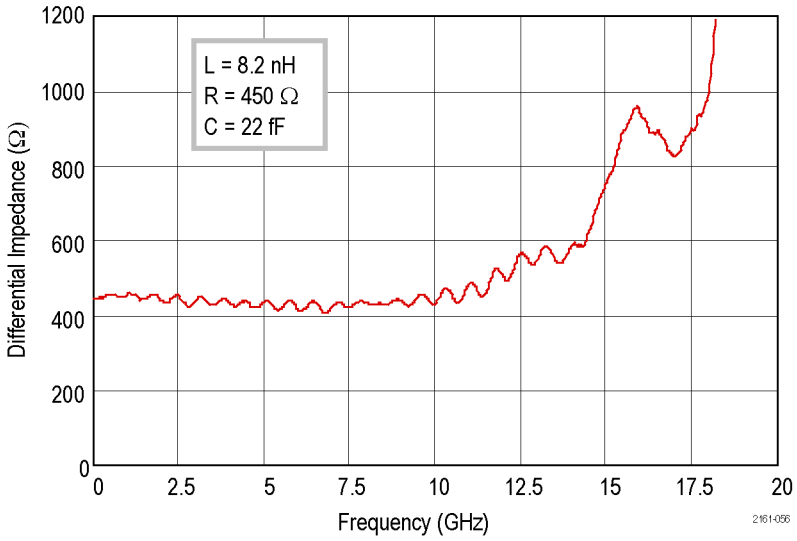


Figure 28: TriMode Resistor solder tip differential impedance

TriMode Extended Resistor Solder Tip

Specifications are typical and apply to all ranges and input modes unless specified otherwise.

Bandwidth	Rise time	CMRR	DMRR	Channel isolation
>7 GHz, A–B mode >4 GHz, A, B modes >2.5 GHz, CM mode	10%–90%: <32 ps, A–B mode <50 ps, A, B modes <120 ps, CM mode 20%–80%: <24 ps, A–B mode <30 ps, A, B modes <40 ps, CM mode	>60 dB at DC >40 dB at 50 MHz >30 dB at 1 GHz >20 dB at 10 GHz >15 dB at 20 GHz	>40 dB at 50 MHz >30 dB at 1 GHz >20 dB at 9 GHz >15 dB at 18 GHz	>40 dB at 50 MHz >30 dB at 1 GHz >15 dB at 9 GHz >10 dB at 18 GHz

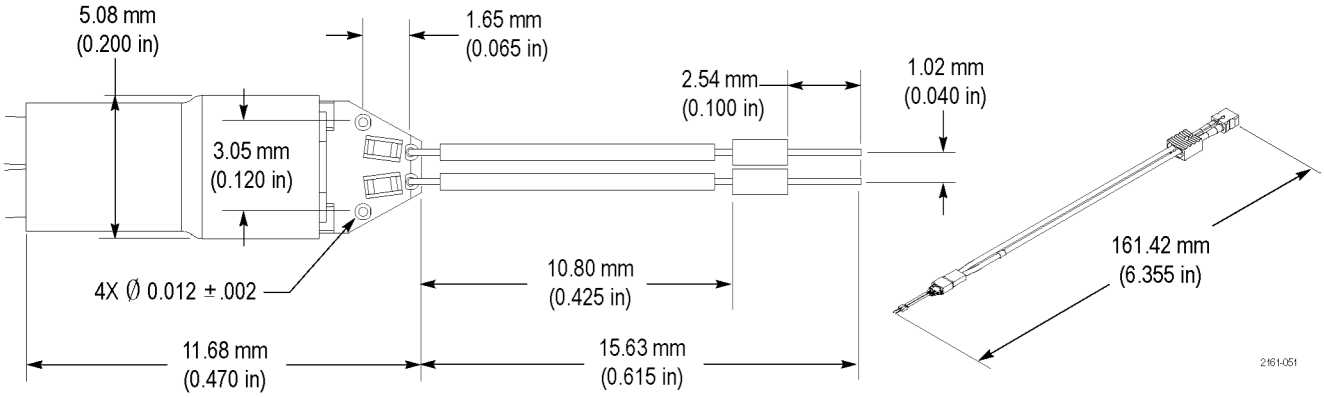


Figure 29: TriMode Extended Resistor solder tip dimensions

The following figure shows the typical step response of the probe with the TriMode extended resistor solder tip. A 50 ps rise time pulse source was used for this measurement.

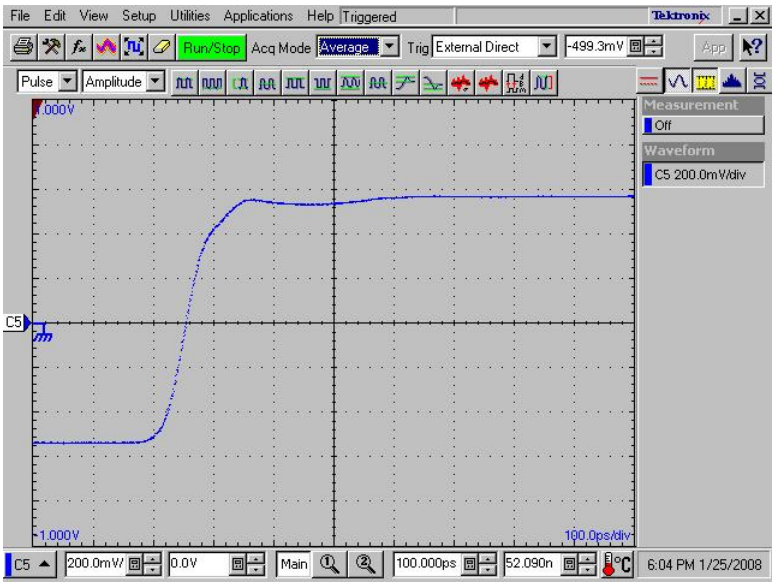


Figure 30: Step response with the TriMode Extended Resistor solder tip

The following figure shows a typical impedance plot of the probe with the TriMode extended resistor solder tip. The L=0 value gives a simplified model that follows the lower impedance limit envelope.

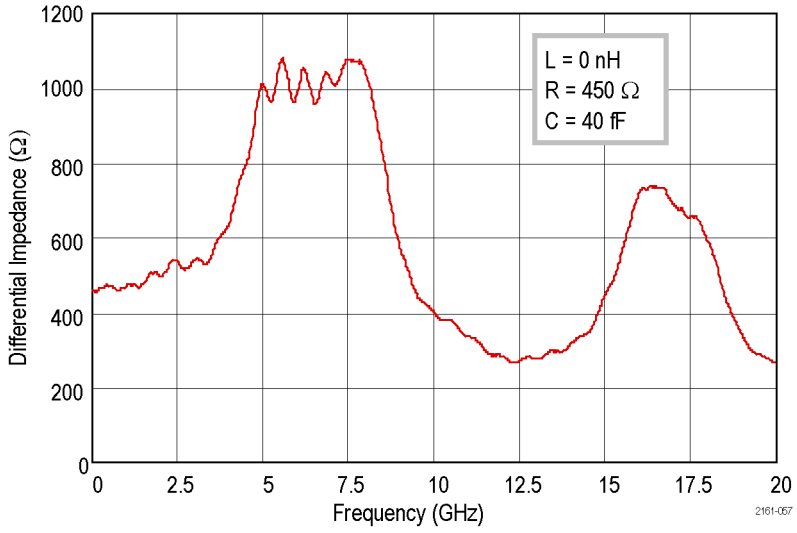


Figure 31: TriMode Extended Resistor solder tip differential impedance

P75PDPM Precision Differential Probing Module

Specifications are typical and apply to all ranges and input modes unless specified otherwise.

Bandwidth	Rise time	CMRR
>18.0 GHz	10%–90%: <29 ps 20%–80%: <20 ps	>60 dB at DC >40 dB at 50 MHz >30 dB at 1 GHz >20 dB at 10 GHz >15 dB at 20 GHz

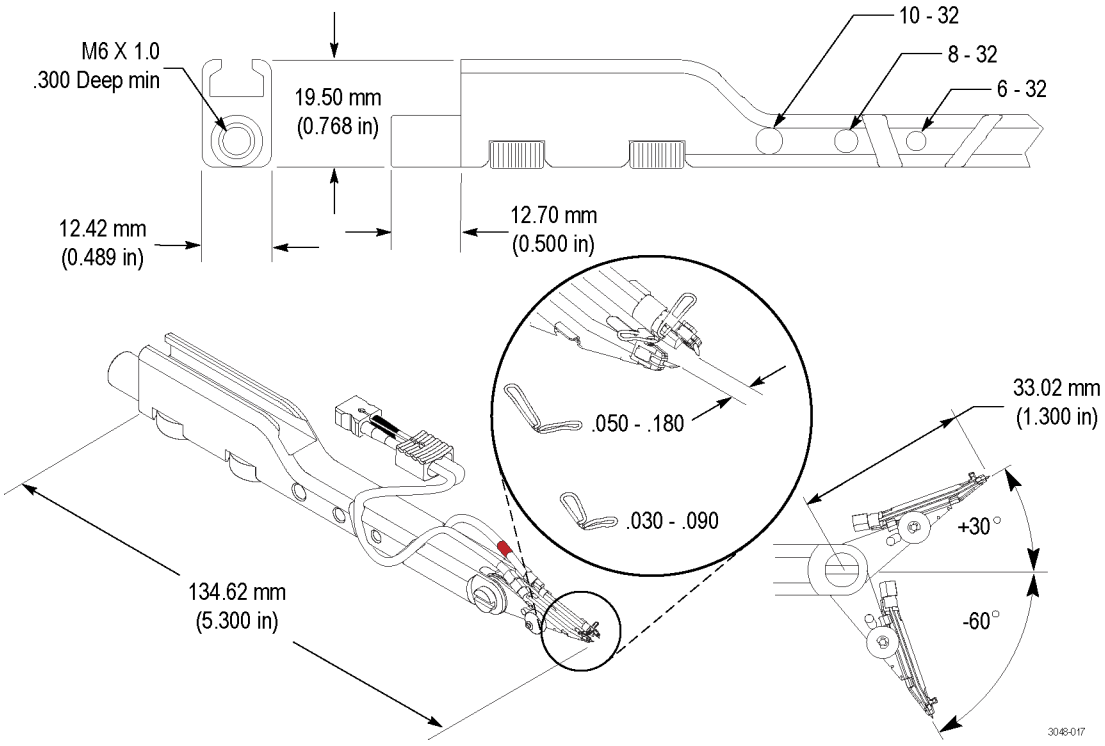


Figure 32: P75PDPM Precision Probing Module dimensions

The following figure shows the typical step response of the probe with the P75PDPM probing module. A 50 ps rise time pulse source was used for this measurement.

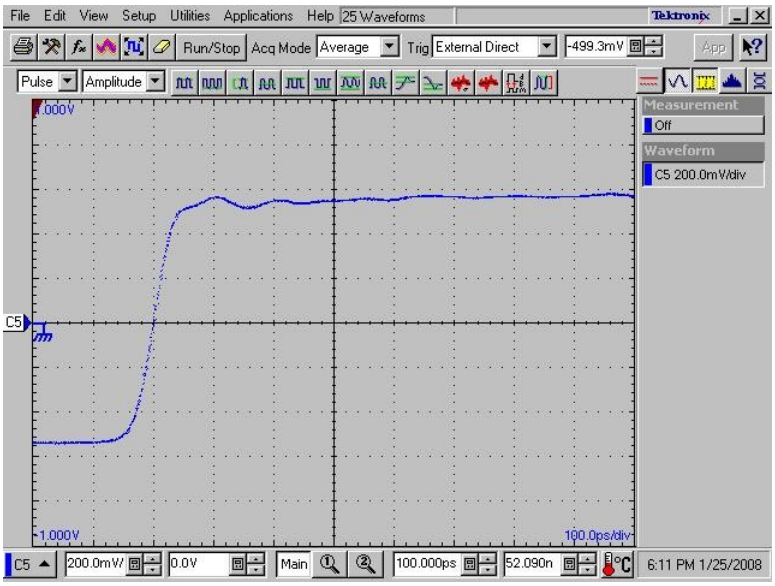


Figure 33: TriMode probe with the P75PDPM probing module

The following figure shows the typical differential impedance of the probe with the P75PDPM probing module.

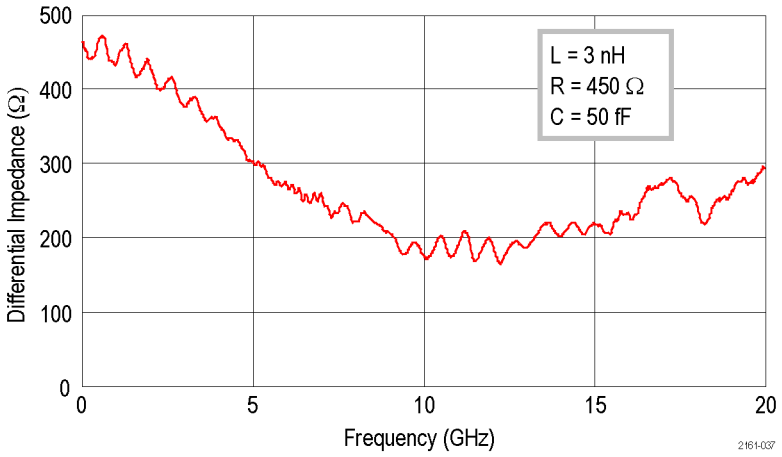


Figure 34: P75PDPM differential impedance

Service

This section covers care, troubleshooting, and maintenance of your probe.

Host Instrument Firmware

Some instruments may require a firmware upgrade to support full functionality of the P7520A probe. Instruments with lower versions of firmware may not display all probe controls and indicators on screen, and in some cases may require you to power-cycle the instrument to restore normal instrument operation.

The following table lists the required versions of instrument firmware for some of the instruments that currently support the P7520A probe.

Instrument	Firmware Version
DPO/DSA70000D series oscilloscopes	V 6.4.4 or higher
DPO/DSA/MSO70000C series oscilloscopes with Windows 7, 64-bit OS	V 6.4.0 or higher
DPO/DSA/MSO70000B, C series oscilloscopes with Windows XP, 32-bit OS	V 5.3.5 or higher
80A03 TekConnect Probe Adapter	V 2.3 or higher
RTPA2A TekConnect Probe Adapter	V 2.3 or higher

To check the firmware version on Windows-based instruments, from the menu bar, click Help/About TekScope. On Linux-based instruments, press the Utilities button on the front panel. If you need to upgrade your instrument firmware, go to www.tektronix.com/software to download the latest firmware.

Error Conditions

LED Indicators

If one of the Range or TriMode LEDs does not remain lit after you connect the probe, an internal probe diagnostic fault exists. Disconnect and reconnect the probe to restart the power-on diagnostic sequence. If the symptoms continue, the probe is defective, and must be returned to Tektronix for repair.

Atten (Range) Setting

If you cannot change the attenuation by pressing the Atten. button on the probe, the host instrument may be in Auto Range mode. Change the range mode from Auto to Manual in the Probe Setup or Probe Controls screen. From the oscilloscope menu bar, select Vertical/Probe Cal or Vertical/Probe Setup and then select Manual in the TriMode Probe Range or Attenuation section.

Signal Display

If the probe is connected to an active signal source and you do not see the signal displayed on the oscilloscope:

- Check the probe tip connection on your circuit. (See page 17, *Connecting to a Circuit Board*.)
- Check the probe tip connection at the probe body. (See page 5, *Connecting Accessories to the Probe Body*.)

- Perform a functional check using the TriMode calibration board included with the probe. (See page 9, *Functional Check*.)
- Check that the bullet contacts are present and intact in the probe body. (See page 75, *Inspecting the Bullets and Connectors*.)

Input Mode/Probe Tip Selection

If you cannot select an Input Mode other than A – B, and you are using a TriMode tip that does not provide a circuit ground connection (such as the P75PDPM handheld module), this is normal operation. The other input modes refer to circuit ground and are only valid when a TriMode tip that provides a circuit ground connection is selected.

If you are using a TriMode tip that provides a circuit ground connection (such as the P75TLRST) and you cannot select an Input Mode other than A – B, check the Probe Tip Selection screen on the oscilloscope. (See Figure 35 on page 71.) An incorrect probe tip might be selected. To access the Probe Tip Selection screen, select Vertical/Probe Cal from the menu bar, and then click Select in the Probe Tip section.

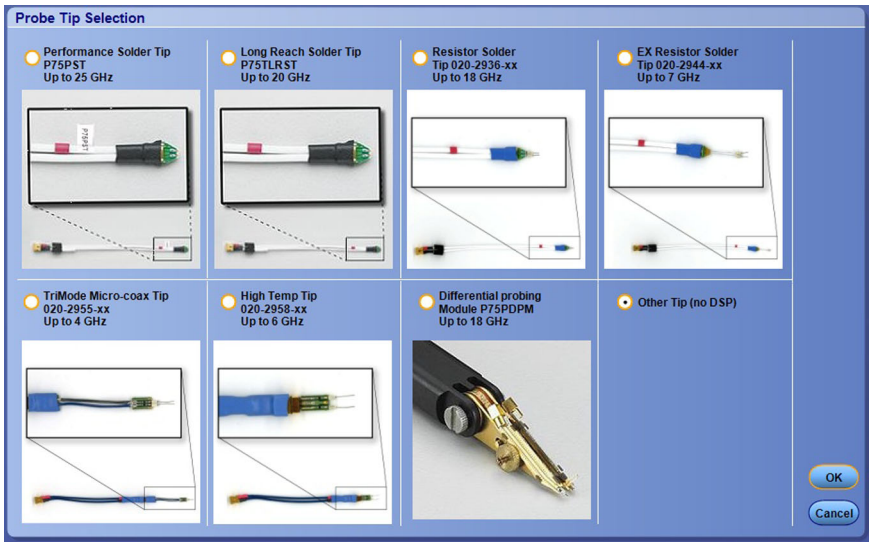


Figure 35: Probe Tip Selection screen

Replaceable Parts

The following parts may need to be replaced due to normal wear and damage. When you replace these components, secure the probe in a small vise or positioner to simplify the procedure.

Table 8: TriMode probes replaceable parts

Description	Replacement part number
Probe body bullet contacts	013-0359-xx, kit of 4
P75TLRST and P75PST solder tip wires	020-2754-xx, Wire Replacement Kit, includes one bobbin each: 4 mil wire, 8 mil wire, and SAC305 solder
TriMode Resistor (020-2936-xx) & TriMode Extended Resistor (020-2944-xx) solder tip resistors	020-2937-xx Replacement Resistor Kit, includes 50 each: 100 Ω leaded resistors, 75 Ω surface mount resistors, nonconductive tubing
P75PDPM Probing Module springs	016-1998-xx, kit of 4 (large springs) 016-1999-xx, kit of 4 (small springs)
P75PMT Probing Module tips (left and right)	P75PMT, one pair
P75TC Probing Module tip cable	P75TC, qty. 1

Table 9: Required equipment

Description	Minimum requirement	Recommended example [1]
Connector separator tool	Custom tool	003-1897-xx
Ground spring tool	Custom tool	003-1900-xx
Tweezers	General purpose	
Magnifying glass or microscope	Free standing to allow hands-free use	
Probe positioner or bench vise	Able to hold probe	PPM203B or PPM100

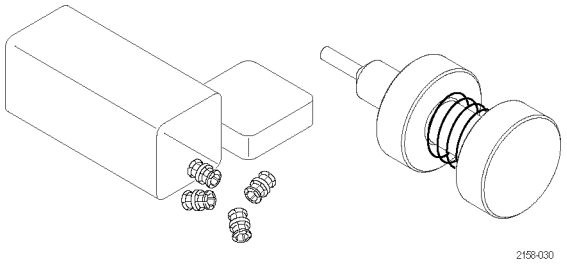
1 Nine-digit part numbers (xxx-xxxx-xx) are Tektronix part numbers.

Bullet Contacts

The input sockets in the probe body assembly are protected by replaceable bullet contacts. (Replaceable bullets are included in the accessory kit.)

The bullet contacts protect the input sockets by absorbing the wear from repeated connect/disconnect cycles of the accessory tips.

A bullet tool is shipped with the probe and is used to replace the bullet contacts from the probe body assembly.



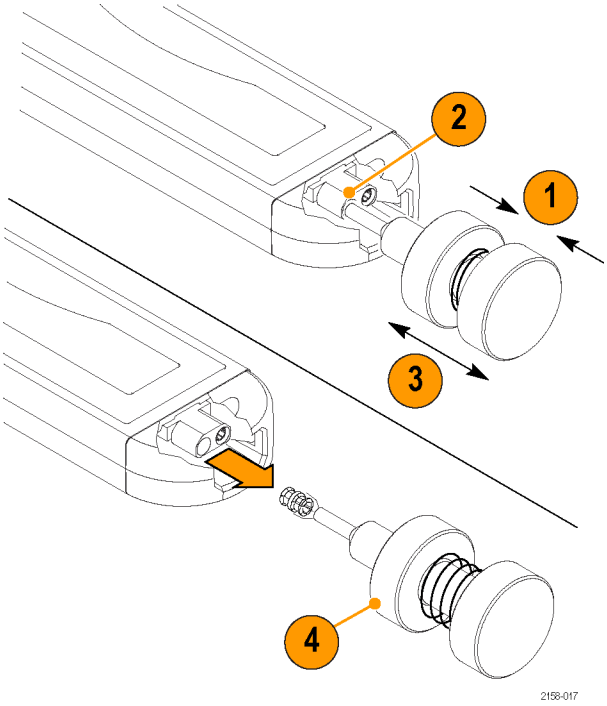
CAUTION. *To prevent wear to the probe housing, use only the Bullet tool provided to remove and install the bullets from the probe body assembly. To prevent damage to the probe, before you connect accessories to the probe body, always check that the contacts are located in the probe body only.*

Removing the Bullets

Follow these steps to remove the bullets by using the removal tool:

1. Squeeze the tool plunger to extend the holder tangs.
2. Insert the tool into the probe body so that the holder tangs surround one of the bullets.
3. Release the plunger to secure the holder tangs on the bullet.
4. Gently pull the tool outward to remove the bullet.
5. Repeat for the other bullet.

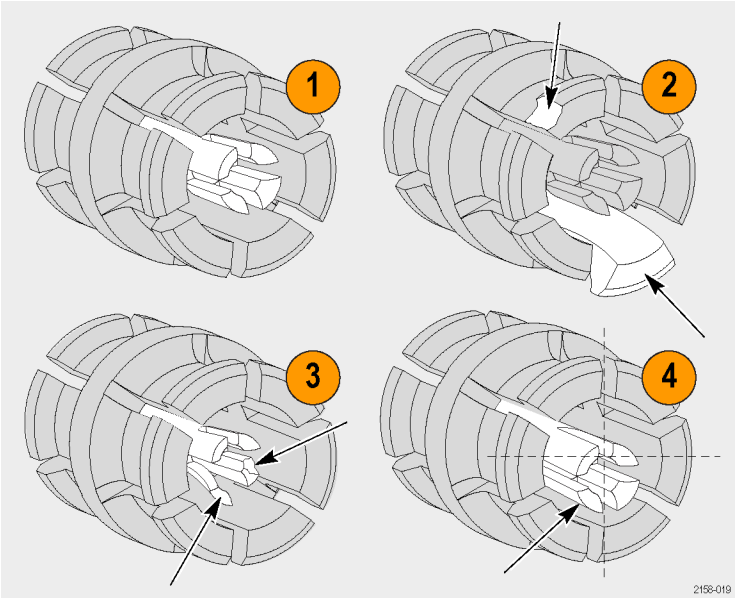
NOTE. *Discard the used bullets to prevent accidental reuse.*



Inspecting the Bullets and Connectors

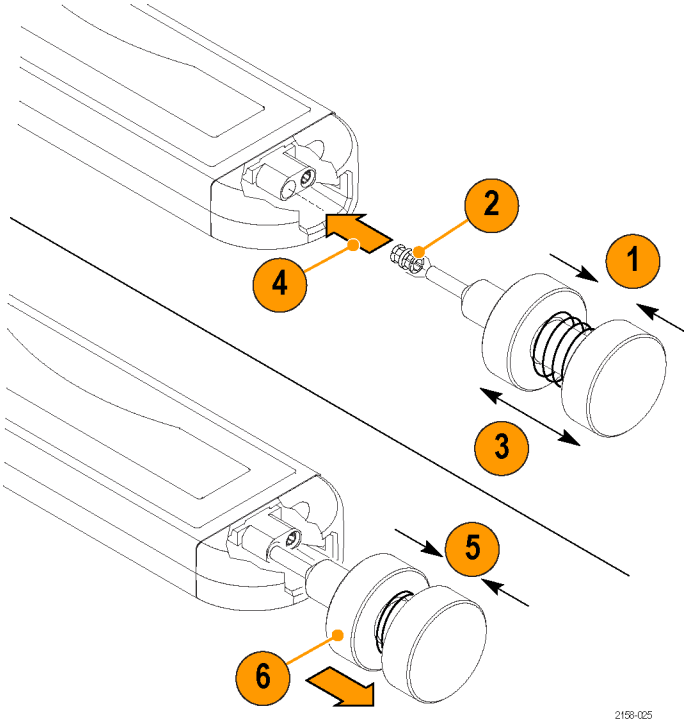
Use a microscope to closely examine the bullets and connectors. Use the illustrations to determine if the contacts appear worn or broken, and always replace them in pairs.

1. Good
2. Chipped or bent ground contacts (outer conductor)
3. Chipped or bent signal contacts (inner conductor)
4. Inner contacts misaligned to outer conductor



Installing the Bullets

1. Squeeze the tool plunger to extend the holder tangs.
2. Insert a new bullet into the tool so that the holder tangs surround the bullet.
3. Release the plunger to secure the holder tangs on the bullet.
4. Insert the tool into the probe body and seat the bullet in the recess.
5. Squeeze the tool plunger to release the bullet.
6. Gently pull the tool out of the probe body.
7. Repeat for the other bullet.
8. Connect and remove a probe tip on the probe body. Verify that the bullets are retained in the probe body.



Solder Tip Wires and Resistors

The solder vias on the circuit board at the end of the P75TLRST and P75PST Solder Tips are small (0.012 in.), and require small wires to attach to your circuit. (Use the 4-mil and 8-mil wires included with the Wire Replacement kit to make the connections.) Because of the small dimensions, the solder tips have a limited number of solder cycles that the vias can withstand before the Solder Tips become unusable. If you expect to make frequent soldering changes, consider using the optional TriMode Resistor solder tips. The resistors that extend off of these tips can accept a higher number of solder cycles and can be replaced when necessary.

NOTE. *Axial-leaded tip resistors (included in the TriMode resistor replacement kit, Tektronix part number 020-2937-xx), should not be used in place of wires with the P75TLRST or P75PST probe tips unless the surface-mount, SMD0402 resistors are also changed. The total probe tip resistance for the P7500 Series probes is designed to be 175 Ω.*

CAUTION. *To prevent damage to the circuit board or circuit board connections due to accidental movement of the probe and soldered leads, we recommend that you secure the tip to the circuit board using the adhesive tip tape provided in your accessory kit. You can also use other materials such as Kapton tape or hot glue.*

To avoid damage to the tip or the circuit under test, avoid applying excessive heat from the soldering iron. Use a low wattage, temperature-controlled soldering iron and appropriately sized soldering iron tip.

To prolong the life of your solder tips, consider the following points before you use the solder tips.

Consider the types of measurements that you plan to take. If you are going to take a few measurements at one location and then move to another, you may be able to use longer wires. Longer wires may degrade your measurement slightly (which may not matter), but the wires can then be cut or desoldered at your circuit and reused, rather than subjecting the solder tip to a desolder/solder cycle.

Perhaps the optional P75PDPM Precision Differential Probing Module is a better choice for the test points that you do not measure as often. The probing module can take both single-ended and differential measurements, and when used with a probe positioner, can provide hands-free access to tight spaces. Depending on your measurement requirements and circuit geometries, the probing module might be a preferable alternative.

At critical test points such as circuit outputs, you might need to keep the wires as short as possible. If possible, use the solder tip dimensions shown in the *Specifications* section to lay out a matching footprint on your circuit board.

Use the following precautions when you solder the tips:

- For best soldering results, use a microscope to examine the quality of the solder joints.
- Use a low-wattage, temperature-controlled soldering iron and a small mass soldering iron tip. The soldering iron temperature should be set as low as possible, while still providing a reliable solder joint.
- Use SAC305 solder (included with the wire replacement kit) to attach the tip wires to the circuit under test.
- When replacing tip wires or axial-lead resistors, solder wick can be used to remove the excess solder from the probe tip circuit board via holes. Be careful not to overheat the via and damage the board.
- The attachment wires should be bent symmetrically to vary the interconnect spacing. Use care when you solder a tip to a circuit under test to avoid inadvertently desoldering either the attachment wires or the damping resistor.
- For optimum performance and signal integrity, keep the lead length between the DUT (Device Under Test) and the tip as short as possible, and the lead lengths the same length.

Replacing the TriMode Solder Tip Resistors

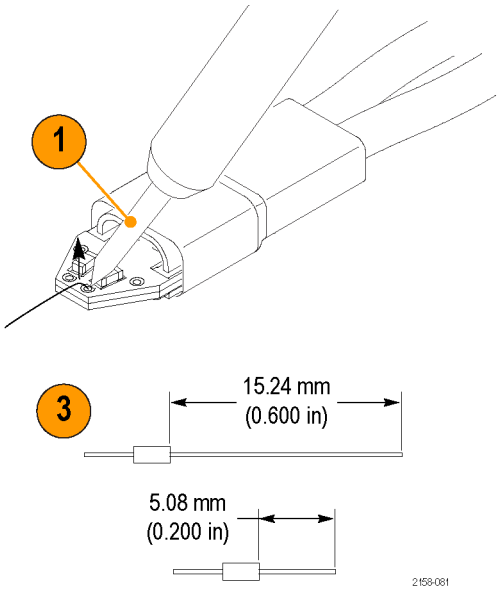
The resistors that are presoldered to the tips can break off during normal use. A kit of replacement resistors is available. (See page 30, *Optional Accessories*.) To replace the resistors, do the following:

1. Carefully apply a soldering iron to the via on the tip board and remove the resistor lead. Work quickly with a low-heat soldering iron.

   If a small piece of wire is in the via, heat the solder and use another piece of wire to push the wire fragment from the via.

2. Add fresh solder to the via, if necessary.

3. Cut one lead of the replacement resistor to approximately 0.6" (15 mm) for the long tip, or 0.2" (5 mm) for the short tip.



4. If you are replacing the resistor on the extended resistor tip, slide a piece of tubing included with the resistor kit over the lead. This will insulate the resistor lead.

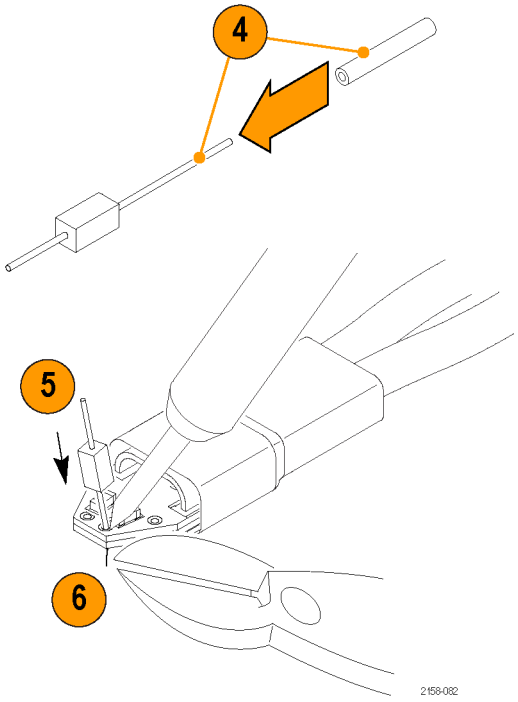
5. Heat the solder in the via and insert the resistor lead into the via until the:

   insulating tube comes into contact with the tip board, if you are replacing the resistor on the extended resistor tip.

   resistor body almost touches the tip board, if you are replacing the resistor on the (short) resistor tip.

6. Cut the excess lead on the bottom of the board.

7. Cut the remaining resistor lead to 0.1" (2.5 mm).

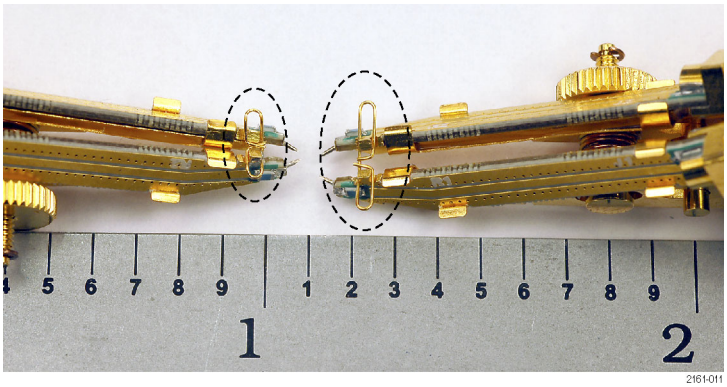


P75PDPM Probing Module Springs

Equipment Required:

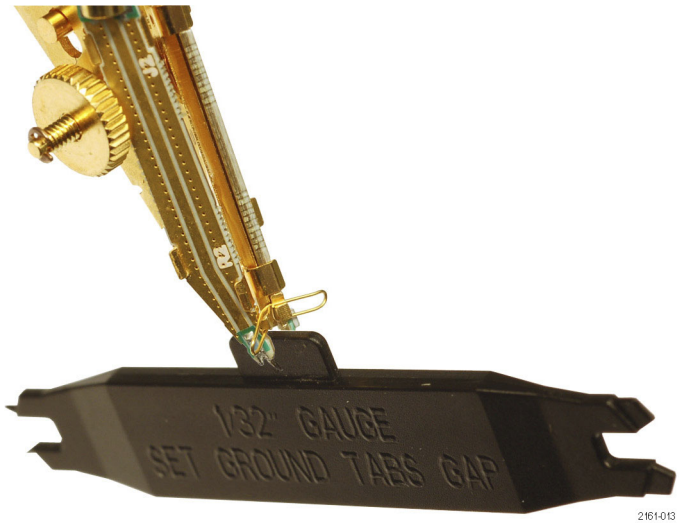
- ground spring tool
- tweezers
- probe holder
- magnifying glass or microscope

Large and small springs shown installed

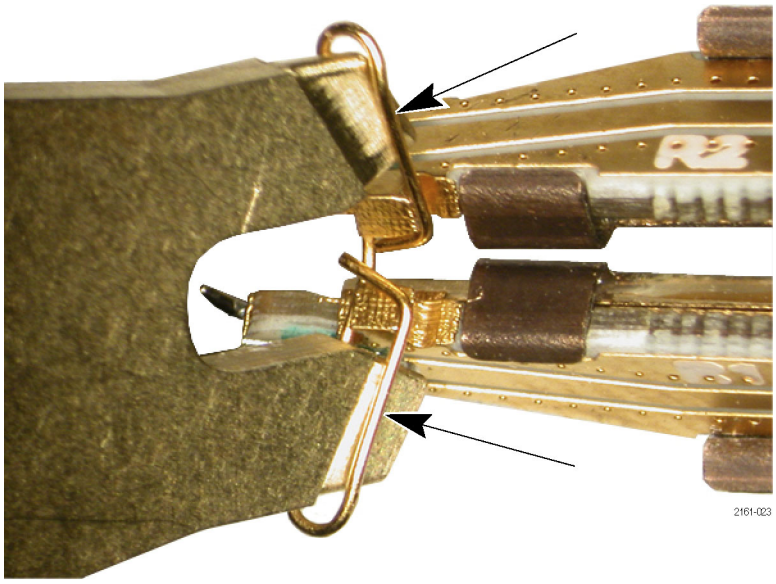


Remove the Spring

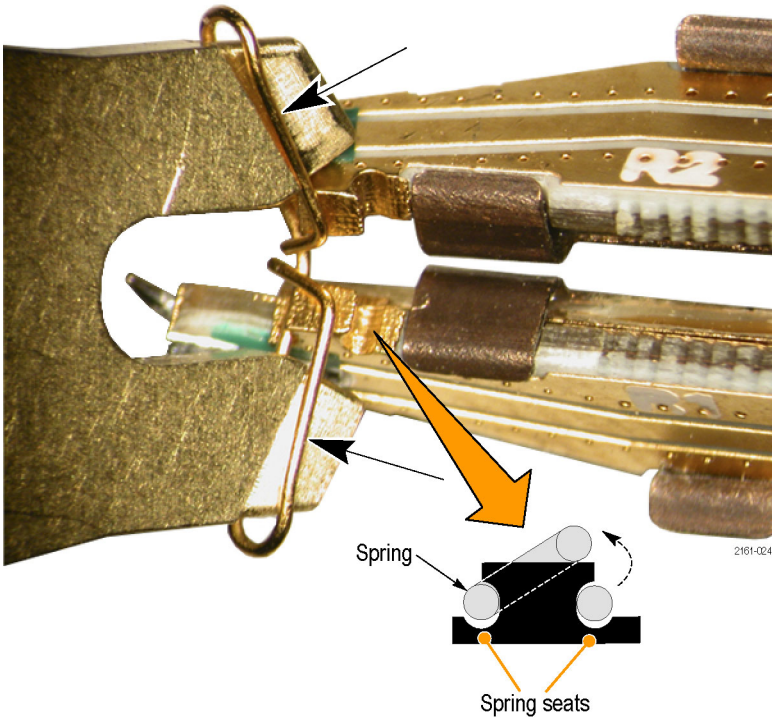
1. Adjust the tip gap using the gap measurement tab on the spring tool. Set the tool between the tip circuit boards, not the tips.



2. Insert the ground spring tool under the top of the spring.

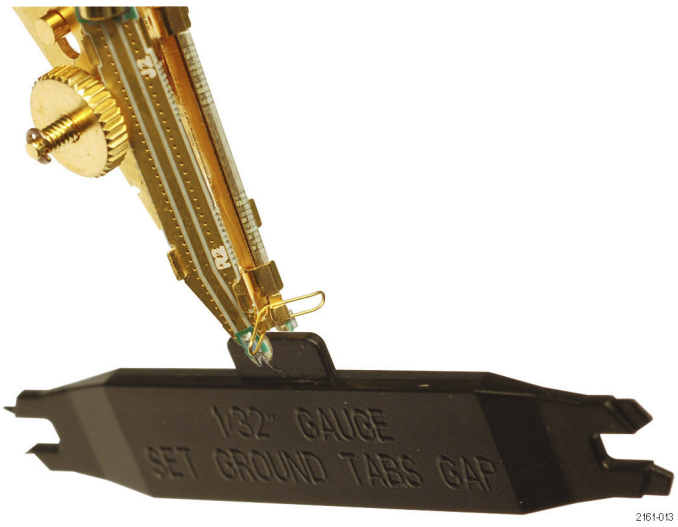


3. Rock the tool away from the tips so that the spring clears the seat edge.
4. Gently pull the tool away; the spring should come away with the tool.
5. Put the spring in the accessory container or a safe place to avoid losing the spring.

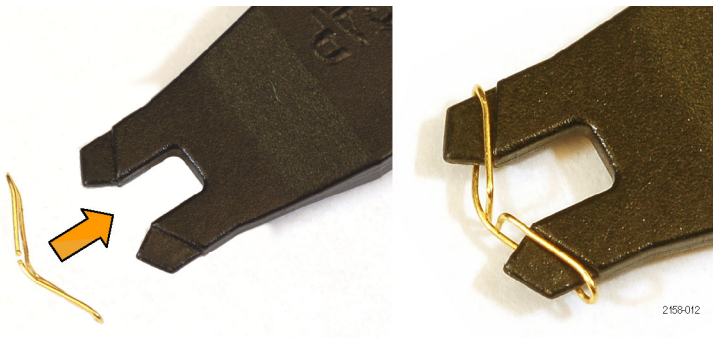


Install. Two spring sizes are available: the small spring allows 0.030 – 0.090 in. (0.76 – 2.28 mm) tip span, the large spring allows 0.050 – 0.180 in. (1.27 – 4.57 mm) tip span.

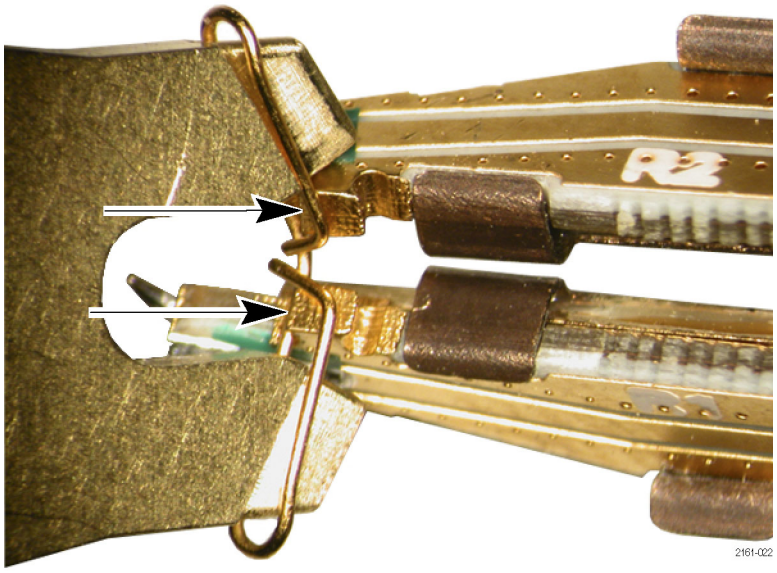
1. Check that the tip gap is .032 in. using the gap measurement tab on the spring tool. Adjust if necessary.



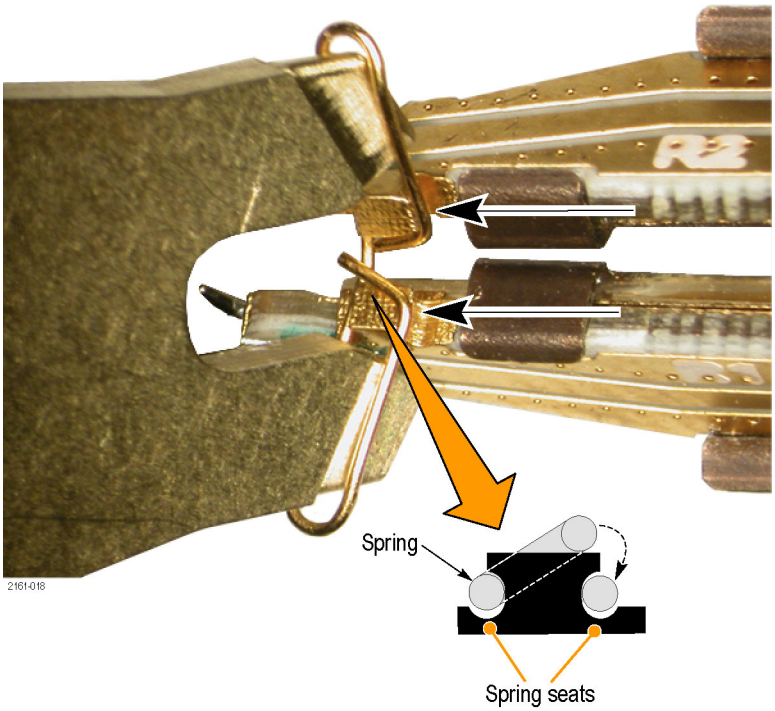
2. Using tweezers, install the spring on the tool. The tool has a large and small side, one for each size spring. Make sure the gap in the spring is on the top of the tool as shown.



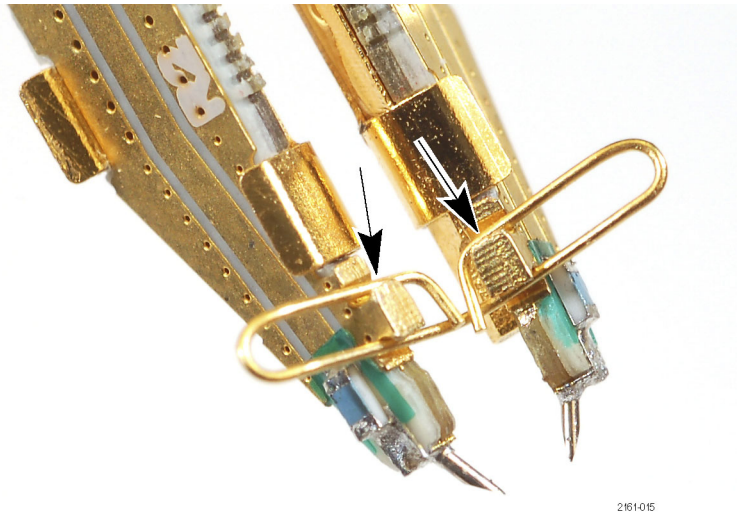
3. Set the bottom of the spring in the front seats (those closest to the tip ends). Maintain a slight pressure on the spring to keep it in the front seats.



4. Set the top of the spring in the rear seats by lifting the tool to clear the edge of the rear seat with the top of the spring.



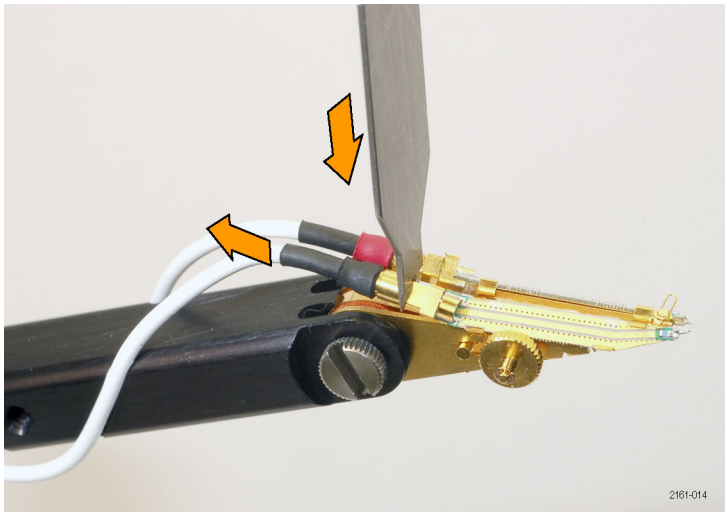
5. Gently retract the tool from the spring. Verify that the spring is seated as shown.



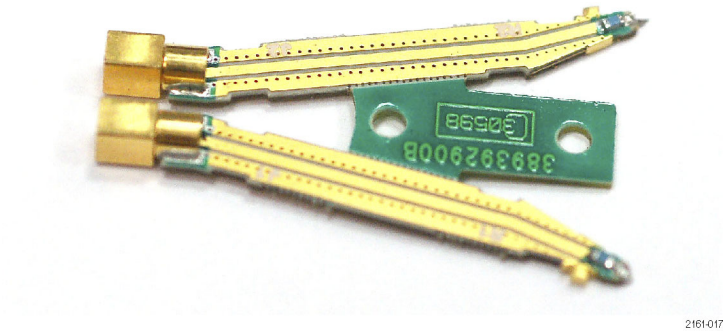
P75TC Probing Module Tip Cable

Equipment Required: connector separator tool

1. Disconnect the Cable Tip by the inserting the tool between the connectors. The tapered edges of the tool gently separate the cable connector from the tip connector.
2. Repeat for the other cable and then pull both cables away from the tip connectors.



P75PMT Probing Module Tips (Left and Right)

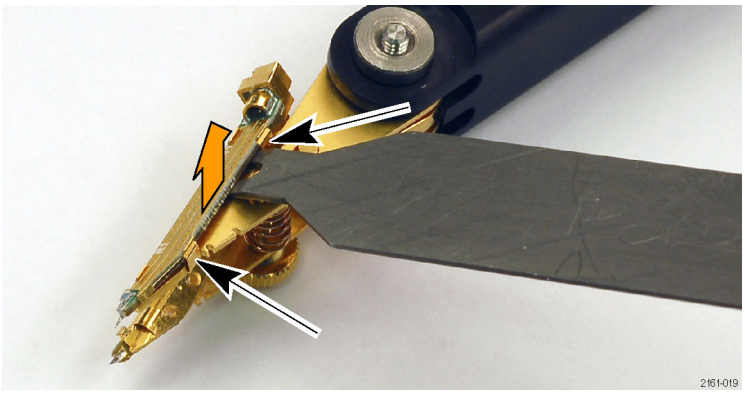


Equipment Required:

- connector separator tool
- tweezers
- probe holder
- magnifying glass or microscope (preferred)

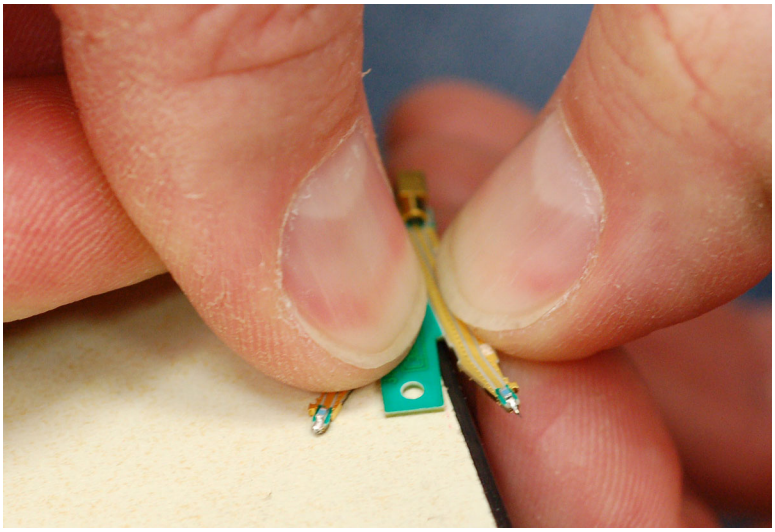
NOTE. *The probing module tips are electrically matched pairs and should be replaced together. Failure to do so may degrade the performance of your probe.*

Remove.



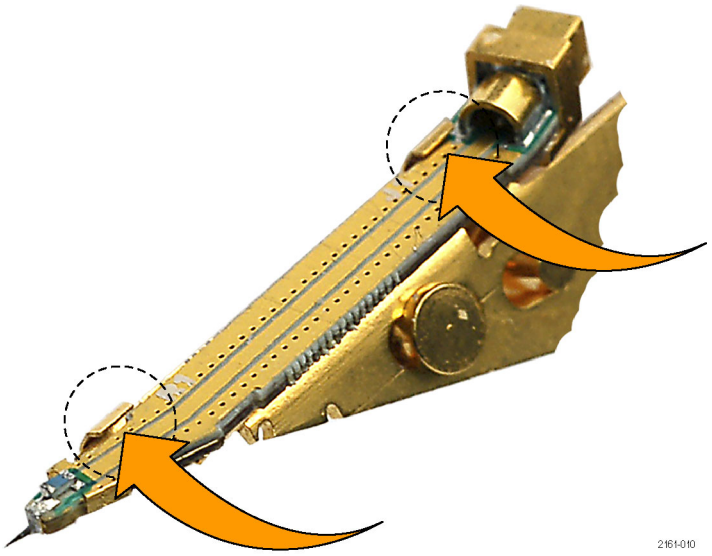
1. Disconnect the Cable Tips.
2. Remove the spring.
3. Adjust the tip gap to maximum width.
4. Use the connector separator tool or a small screwdriver to pry the board up from the bottom. The bottom tabs are designed to flex; the top tabs are not.
5. Repeat for the other tip.

Install.

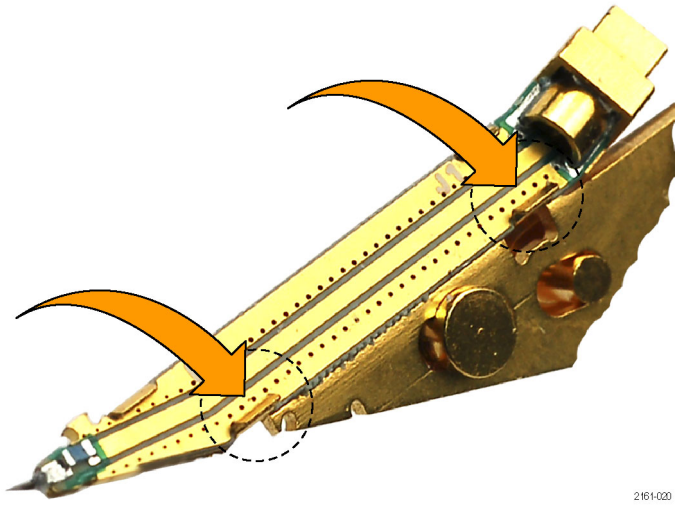


6. Separate the new tip board pair by snapping the board against a sharp edge.

7. Select the correct board (left or right), and seat the board in the top tabs. The board is notched to align it to the tip body.



8. Press the bottom of the board to snap it past the bottom tabs.
9. Repeat the previous two steps for the other tip.
10. Attach the spring.
11. Reattach the cable pair.



Handling the Probe

This probe is a precision high-frequency device; exercise care when you use and store the probe. The probe and cable are susceptible to damage caused by careless use. Always handle the probe at the control box and probe body to avoid undue physical strain to the probe cable, such as kinking, excessive bending, or pulling. Visible dents in the cable will increase signal aberrations.

CAUTION. *To prevent damage to the probe, always use an antistatic wrist strap connected to a static-controlled workstation when you handle the probe. The probe input contains electronic components that can be damaged by contact with high voltages, including static discharge.*

Observe the following precautions when using the probe. Do not do any of the following:

- Drop the probe or subject it to physical shock
- Subject the probe to adverse weather conditions
- Kink or fold the probe cable tighter than a 2 inch radius
- Solder the tips with excessive heat or duration
- Injure yourself with the sharp tips

Cleaning the Probe

CAUTION. *To prevent damage to the probe, do not expose it to sprays, liquids, or solvents. Avoid getting moisture inside the probe during exterior cleaning.*

Do not use chemical cleaning agents; they may damage the probe. Avoid using chemicals that contain benzine, benzene, toluene, xylene, acetone, or similar solvents.

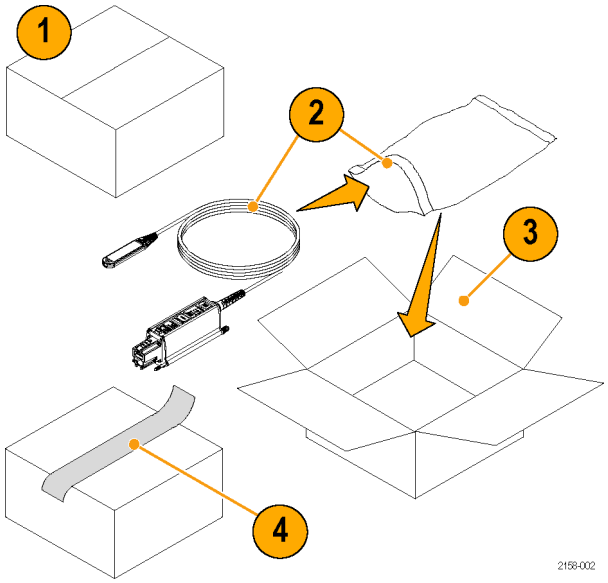
Clean the exterior surfaces of the probe with a dry, lint-free cloth or a soft-bristle brush. If dirt remains, use a soft cloth or swab dampened with a 75% isopropyl alcohol solution and rinse with deionized water. A swab is useful to clean narrow spaces on the probe; use only enough solution to dampen the swab or cloth. Do not use abrasive compounds on any part of the probe.

Returning the Probe for Servicing

If your probe requires servicing, you must return it to Tektronix. If the original packaging is unfit for use or not available, use the following packaging guidelines:

Preparation for Shipment

1. Use a corrugated cardboard shipping carton having inside dimensions at least one inch greater than the probe dimensions. The box should have a carton test strength of at least 200 pounds.
2. Put the probe into an antistatic bag or wrap it to protect it from dampness.
3. Place the probe into the box and stabilize it with light packing material.
4. Seal the carton with shipping tape.
5. Refer to *Contacting Tektronix* at the beginning of this manual for the shipping address.



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