P7600 Series
TriMode™ Probes
Quick Start User Manual

071-3026-01

Tektronix

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www.tektronix.com
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- Worldwide, visit www.tektronix.com to find contacts in your area.

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In order to obtain service under this warranty, Customer must notify Tektronix of the defect before the expiration of the warranty period and make suitable arrangements for the performance of service. Customer shall be responsible for packaging and shipping the defective product to the service center designated by Tektronix, with shipping charges prepaid. Tektronix shall pay for the return of the product to Customer if the shipment is to a location within the country in which the Tektronix service center is located. Customer shall be responsible for paying all shipping charges, duties, taxes, and any other charges for products returned to any other locations.

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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:

CAUTION
Refer to Manual

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 P7600 Series TriMode Probes. Basic probe operations and concepts are presented in this manual. All documents listed below are located on the Documentation CD that came with your product. You can also access the Tektronix Web site for these documents (www.tektronix.com/manuals).

Probe Models

The probe models covered in the P7600 Series TriMode Probes documentation are listed below.

- P7625 25 GHz
- P7630 30 GHz
- P7633 33 GHz

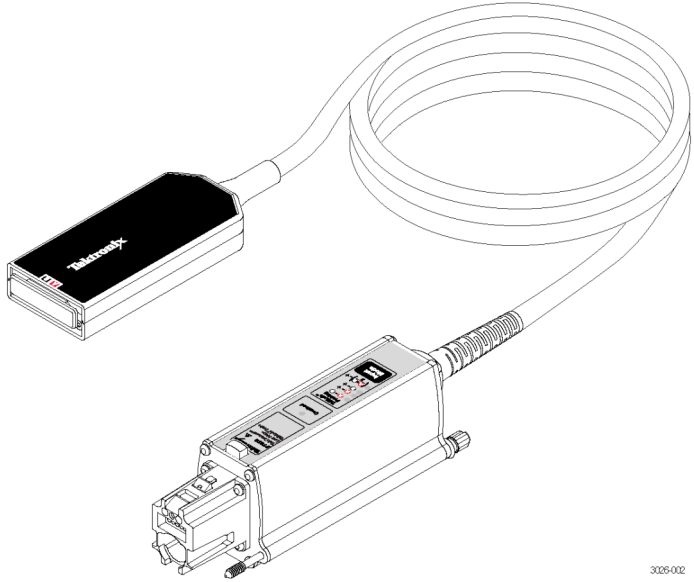
Documentation

To read about	Use these documents
Installation and operation (overviews)	Read this quick start user manual for general information about how to use your probe.
In-depth operation	Use the technical reference manual (located on your documentation CD-ROM) along with the user manual.
Specifications	Use the technical reference manual.
Reordering accessories	Use the *Accessories and Options* section in this manual.

Key Features

The P7600 Series TriMode Probes allow you to take differential, single-ended, and common mode measurements with one probe connection. Key features include:

- Revolutionary TriMode operation
- TekConnect interface
- >33 GHz Bandwidth (typical, P7633)
- 14 ps Rise time 10-90% (typical, P7633)
- <1.1 mV_{RMS} System noise with P76CA-xxx adapters
- Automatic tip adapter type identification
- DSP-corrected response provided for improved measurement fidelity



Operating Considerations

Table 1: P7600 Series TriMode Probes

Characteristic	Description	P76CA-xxx adapters	P76TA adapter
Input voltage	Dynamic range	1.2 V_{p-p} (single-ended) 2.0 V_{p-p} (differential)	6.0 V_{p-p} (single-ended) 10.0 V_{p-p} (differential)
	Input voltage range (DC + peak AC, input referenced to ground)	+4.0 V, –4.0 V	+5.0 V, –5.0 V
	Maximum nondestructive voltage	±5 V	±8 V
Temperature	Operating	0 to +40 °C (+32 °F to +104 °F)	
	Nonoperating	-20 °C to +60 °C (-4 °F to +140 °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	
Altitude	Operating	3000 meters (9842 feet)	
	Nonoperating	12000 meters (39,370 feet)	
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

Before you connect the probe to your instrument, read the *Overview* below to understand the sequence of events necessary to properly install the probe and adapters.

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.*

Overview

1. Connect a P76xxx adapter to the probe. This step should be done before you connect the probe to the oscilloscope.
2. Connect the probe to the oscilloscope.
3. The probe performs a self test, and then one Input Mode LED remains lit.
4. The oscilloscope discovers the probe (if this is the first time they are connected), and downloads S-parameter data from the probe. The oscilloscope then computes the filters. A message displays until the process is complete.
5. The Probe Setup screen displays (if this is a first-time connection).
6. Perform a functional check on the probe.
7. Use the Probe Setup screen to set the probe parameters as described in the *Basic Operation* section.

Connect TriMode Adapters to the Probe Body

TriMode adapters are required to complete the connection between the probe and your circuit, and are briefly described below. The adapters connect the P7600 Series probes to your circuit through 2.92 mm or SMP cables, or through P7500 Series solder tips, such as the P75PST Performance Solder Tip. The adapter inputs are polarized, with the A input marked in red and the B input marked in black. The adapters should be connected to the probe before the probe is connected to the instrument.

1. P76CA-292

Use this adapter with high quality, skew-matched cables that have male 2.92 mm connectors at the probe end. The other end of the cables can be customized with connectors that mate to your circuit.

2. P76CA-292C

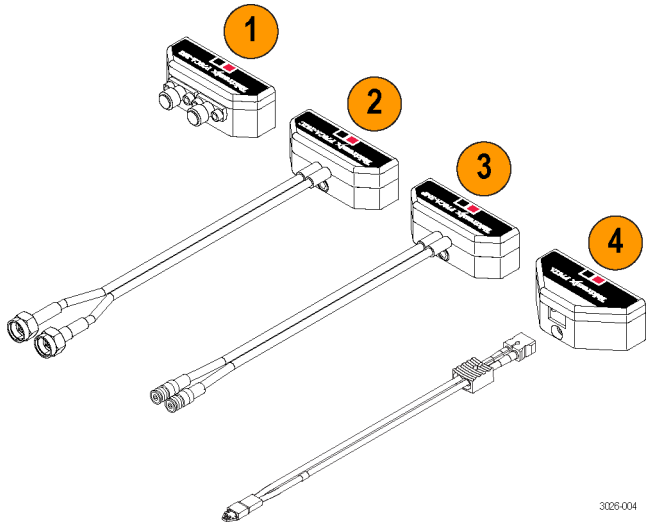
This adapter includes a pair of skew-matched, 6 inch cables with male 2.92 mm connectors.

3. P76CA-SMP

This adapter includes a pair of skew-matched, 6 inch cables with female SMP connectors.

4. P76TA

Use this adapter with P7500 Series probe solder tips. (See page 39, *Connecting to a Circuit Board*.)

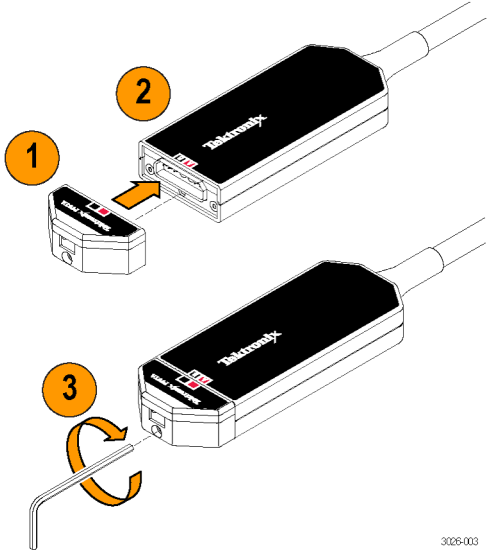


Connect the Adapters

All of the adapters mate to the P7600 Series probe head through a keyed, multi-pin connector that transfers the adapter information to the oscilloscope for automatic identification.

Connect them as follows:

1. Orient the adapter to the probe body with the A and B inputs on top, as shown.
2. Insert the adapter into the probe head.
3. Attach the adapter to the probe head with the hex tool included with the probe. Use the long end of the tool as shown, and only use enough force to ensure a secure fit.



CAUTION. *As you tighten the adapter screw, be careful not to damage the input cables on adapters with integral cables.*

CAUTION. *Do not overtighten the adapter screw. You can damage the connectors if you apply too much torque to the screw.*

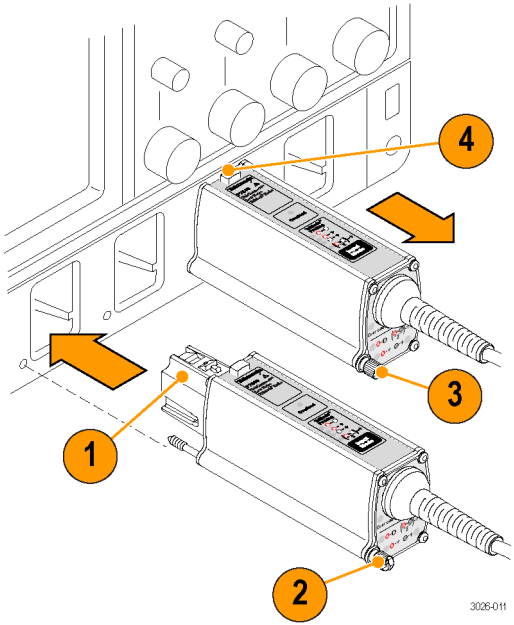
Connect to the Host Instrument

NOTE. Your TekConnect instrument may require a firmware upgrade to support full functionality of the P7600 Series probes. Before you connect the probe, check the version requirements. (See page 62, Host Instrument Firmware.)

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.

Disconnect

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

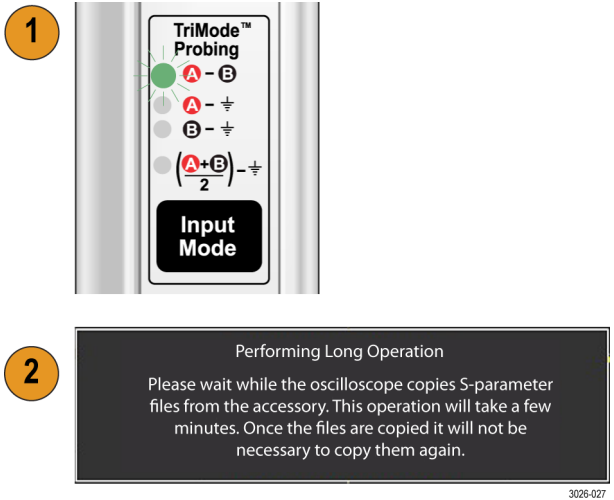


Probe Power-On

After the initial connection to the oscilloscope is made:

1. The probe briefly lights all LEDs during a self-test, and then the A – B Input Mode LED remains lit.
2. The probe transfers data to the host instrument, and a message displays on the instrument as the transfer occurs.

   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.
3. After the data transfer is done, the probe is ready for a functional check and calibration. (See page 11, *Functional Check*.)



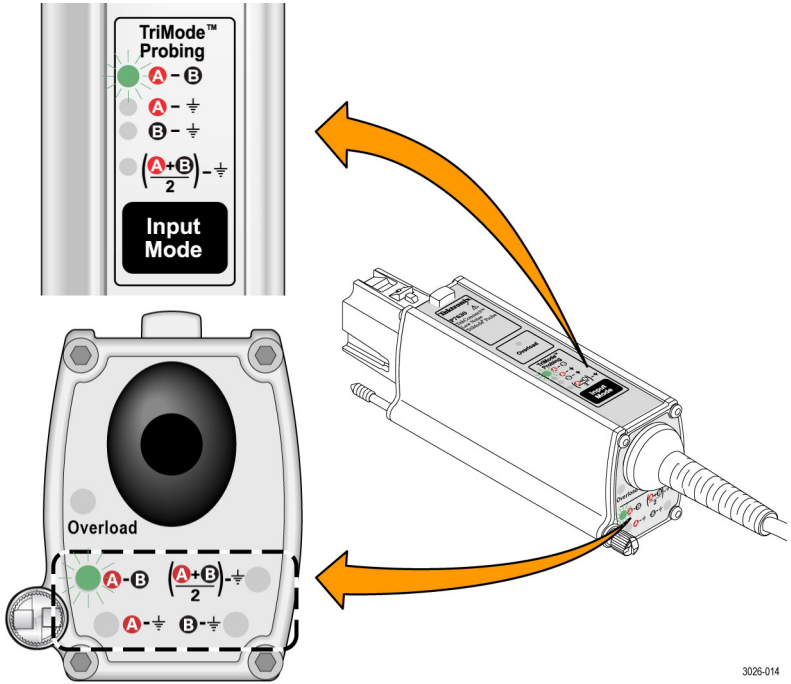
Control Box Controls and Indicators

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. *You can also change the Input Mode in the oscilloscope Probe Setup screen. (See Figure 4 on page 25.)*



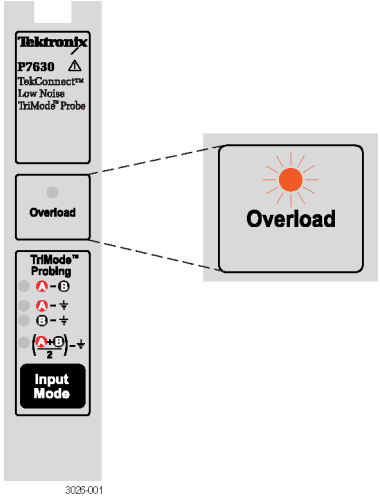
Overload LED

The Overload LED glows amber under the following conditions when using the P76CA-xxx adapters:

- the input voltage on either the A or B input exceeds ±4.5 V
- the termination voltage driver current on the A or B input exceeds 50 mA
  (See page 23, *Termination Voltage*.)

The Overload LED clears when the input signal is removed.

NOTE. *The Overload LED may flash briefly when you adjust the termination voltage levels; this is normal.*

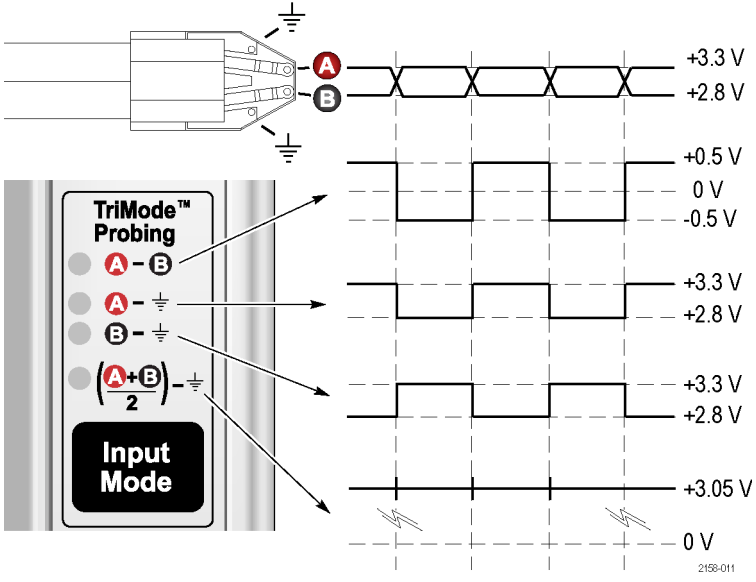


CAUTION. *Do not exceed the input voltage limits of the probe and adapters. The probe or oscilloscope circuits may be damaged if the limits are exceeded. Make sure that you understand and work within the limits of the probe and adapters.*

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.



Functional Check and Calibration

After you connect the probe to the oscilloscope, perform a functional check using the procedure below.

Functional Check

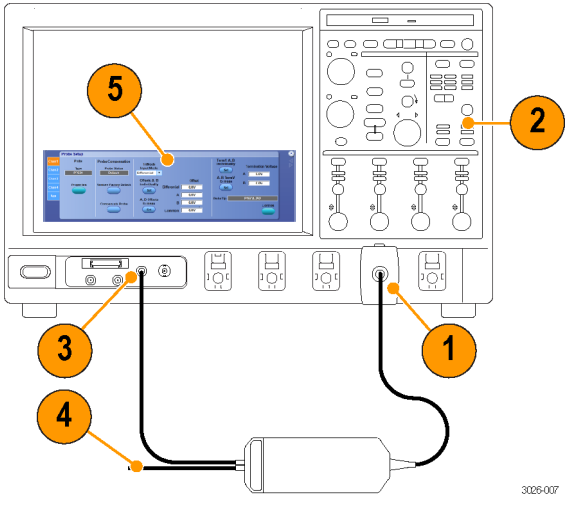
This procedure checks the four TriMode settings on the probe, using the FAST EDGE connection on the front panel of the oscilloscope. The A-B (differential mode) is set up and verified first, and then the remaining input modes are checked and compared to the differential mode measurement.

Table 2: Required Equipment

Item description	Performance requirement	Recommended example
Oscilloscope	TekConnect Interface	Tektronix DPO73304DX or DPO72504DX
Probe adapter	P76CA-xxx or P76TA probe adapter	P76CA-292C (connects directly to oscilloscope FAST EDGE connector) P76CA-292 (requires a coaxial cable) P76CA-SMP (requires an SMP-to-SMA adapter) P76TA (requires a coaxial cable and the calibration fixture listed below)
Coaxial cable	SMA, 50 Ω, male-to-male	Tektronix part number 174-1120-xx
Adapter	SMP-to-SMA	Fairview Microwave part number SM8810
Probe calibration fixture	Interconnect between P76TA adapter and oscilloscope	Tektronix part number 067-1821-xx

Test Setup

1. Connect the probe to any channel (1–4) of the oscilloscope.
2. Set the oscilloscope to display the channel.
3. Connect one of the probe inputs to the FAST EDGE output of the oscilloscope, using the P76CA-292C adapter.
   You can also make the connection with one of the other P76xxx adapters, but you must use additional equipment. Refer to the *Required Equipment* table. (See Table 2 on page 11.)
4. Leave the other probe input open.
5. Set the termination and offset voltages to 0 volts in the Probe Setup screen. (From the oscilloscope menu, select Vertical and then select Probe Cal.)

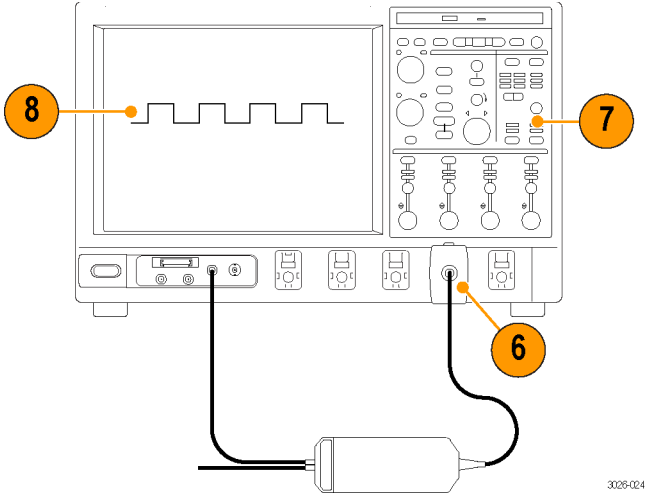


Test Procedure

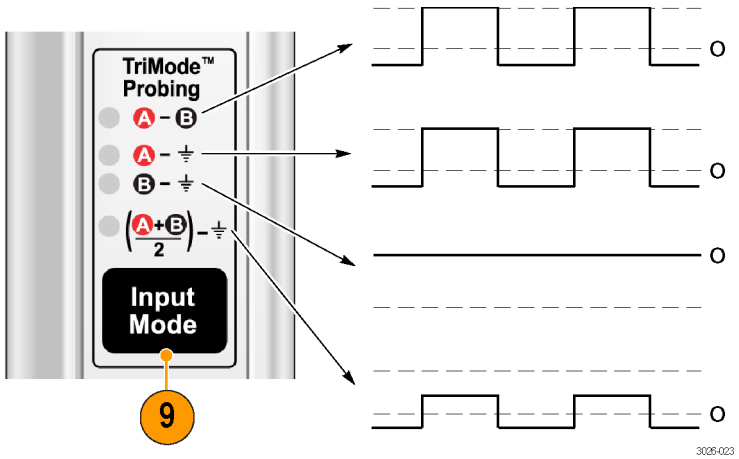
6. Set the probe Input Mode to A–B.
7. Adjust the oscilloscope to trigger on and display a stable waveform (or press the Autoset button).

NOTE. *If you do not see a waveform, check the connection at the probe body. (See page 4, Connect TriMode Adapters 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.
   - DPO73304DX: 440 mV p-p
   - DPO72504DX: 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. Repeat steps 3 through 9 for the other probe input. Note that with the FAST EDGE signal now applied to the B input and with the A input open, the polarity of the A–B waveform is inverted.



TriMode Probe DC Calibration

After you perform a functional check of the probe, run a probe calibration routine on each channel that you use. The probe calibration operation minimizes measurement errors by optimizing the DC gain and offset of the probe. Individual calibration constants are stored for all TriMode settings, 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.*

Table 3: Required Equipment for Probe Calibration

Item description	Performance requirement	Recommended example [1]
Oscilloscope	TekConnect Interface	Tektronix DPO73304DX, DPO72504DX
Test fixture	Probe DC calibration fixture	067-3259-xx [2]
Adapter (any one of the adapters listed can be used)	Interconnect between probe head and probe calibration fixture	P76CA-292C P76CA-292 and two SMA cables P76CA-SMP P76TA
Coaxial cable	BNC, 50Ω, male-to-male	012-0208-xx [2]

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

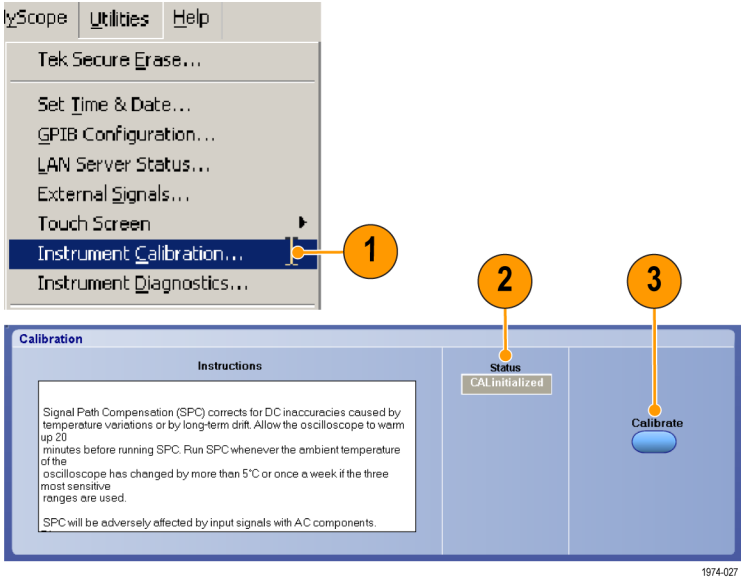
2 Standard accessory included with probe. (See page 17.)

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.

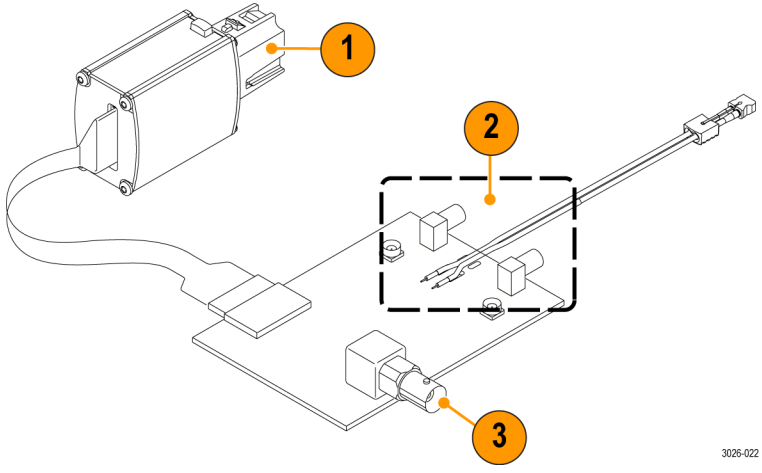
When the Signal Path compensation test status is **Pass**, calibrate the probe. (See page 18, *Calibrate the Probe*.)



DC Calibration Fixture

The DC calibration fixture is shipped with the probe and is used to automatically check and adjust the probe gain and offset to the connected oscilloscope channel.

1. The fixture is powered and automated by a TekConnect control box adapter that connects to the oscilloscope Aux In connector.
2. Output connectors on the fixture board accommodate the coaxial adapters and solder tips that are used with the probe.
3. The Probe Cal signal from the front panel of the oscilloscope connects through a cable to the BNC connector on the fixture. A BNC cable is included with the probe.



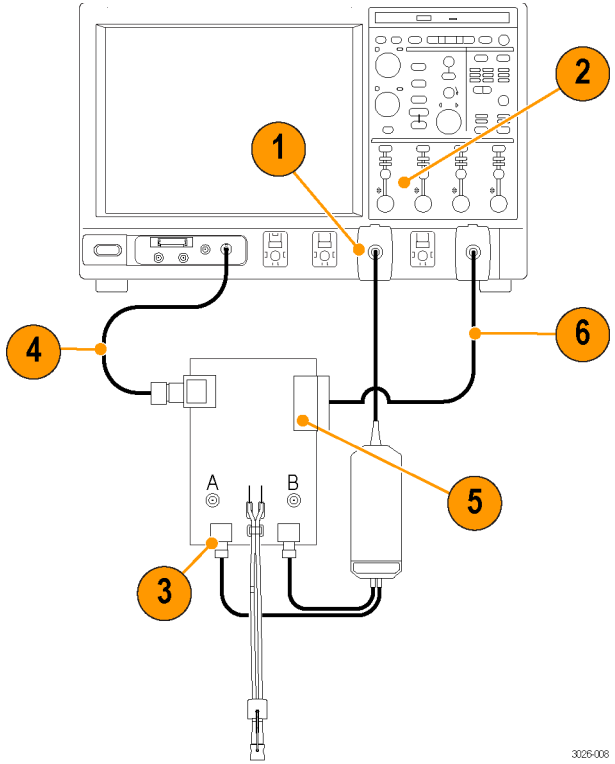
Fixture Notes. The control box should be connected to the fixture before it is connected to the oscilloscope. Although any input channel can be used, using the Aux In channel allows channels 1–4 to be used for the calibrated probe(s).

WARNING. *To avoid damaging the fixture, only apply power to the fixture when it is on a flat, nonconductive surface. The bottom of the fixture board contains exposed circuitry.*

Calibrate the Probe

You must calibrate the probe once on each oscilloscope channel that you intend to use. The probe calibration data is then stored for future use on those channels.

1. Connect the probe to any channel (1–4) of the oscilloscope.
2. Set the oscilloscope to display the channel.
3. Connect the probe A and B inputs to the A and B inputs on the TriMode DC Calibration board, using the connectors that mate to the adapter/tip you are using.
4. Connect a BNC cable from the DC Probe Cal output connector on the oscilloscope to the BNC connector on the TriMode DC Calibration board.
5. Connect the cable from the TekConnect control box adapter to the connector on the calibration board.
6. Connect the control box to the Aux In channel on the oscilloscope. Allow the fixture and probe to warm up for 20 minutes.



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

   The Probe Setup dialog box appears.

8. Select the Channel tab for the channel that the probe is plugged into.

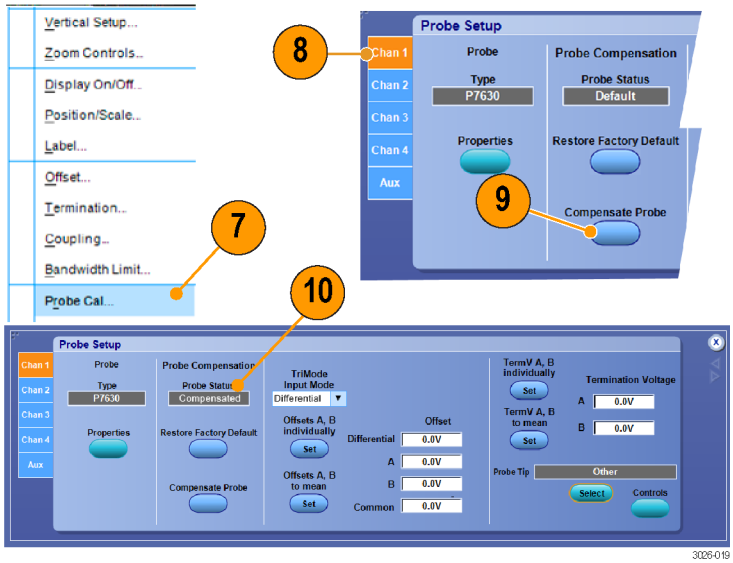
9. Select Compensate Probe.

   The probe calibration routine runs, optimizing the probe to the oscilloscope for each input mode setting.

NOTE. *A switching relay on the fixture emits a noise when the calibration runs; this is normal.*

10. When the calibration routine completes, **Compensated** appears in the Probe Status box.

NOTE. *If the Probe Cal routine fails, check the connections at the probe body and on the calibration board.*



Basic Operation

This section includes information about the probe input limits, using the probe controls, and procedures for connecting the probe to your circuit.

A simplified input model of the probe is shown below to illustrate the probe Offset Voltage and Termination Voltage controls. (The A and B input voltages shown represent the probe when used with the coaxial adapters; the P76TA adapter allows for ±5 V input levels at the P7500 probe tip.) The probe has two symmetrical signal inputs, the A input and the B input, which you can display independently or in combination by selecting the appropriate probe input mode. The probe also has independent Offset Voltage and Termination Voltage controls for the probe A and B input signals.

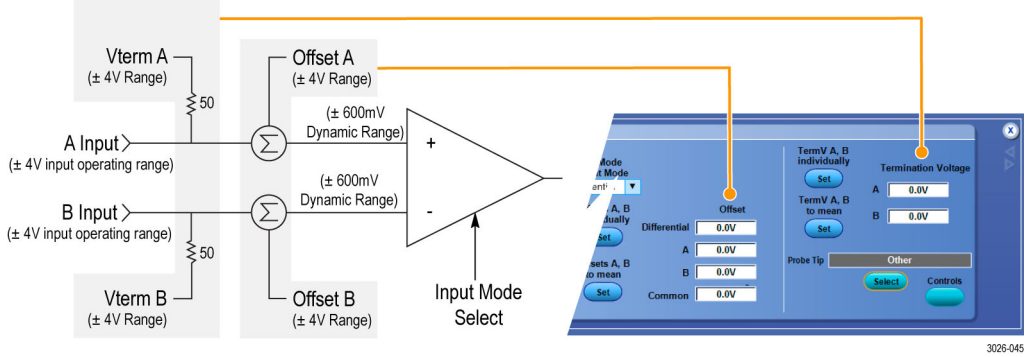


Figure 1: Simplified input model

Using the Offset and Termination Voltages

The Offset Voltage nulls out the DC bias component of an input signal, allowing the (generally smaller) AC component of the signal to be displayed. The size of the probe input dynamic range depends on the probe tip that you are using, as shown in the diagrams, and may also be dependent on the input mode selected. (See Figure 2 on page 22.) The probe input dynamic range limits are shown on the oscilloscope display with a momentary annunciating, arrow-tipped line, when the vertical scale setting is large enough.

Use the Termination Voltage to minimize the DC loading of the probe input signals. By setting the Termination Voltage equal to the DC bias voltage of the input signal, the probe DC loading is nulled out, as if a DC block had been inserted. Unlike a DC block, however, the signal DC voltage is still present at the probe input and may also require you to adjust the Offset Voltage to move the signal into the probe input dynamic range. There are also some signal measurement applications that benefit from the availability of an adjustable termination voltage and avoid the need for a pair of bias tees.

To set the offset and termination voltages on the probe, you can use the controls in the Probe Setup screen. (See Figure 4 on page 25.) To display the Probe Setup screen, select Probe Cal from the oscilloscope Vertical menu.

Offset Voltage. The Offset Voltage adjusts the probe input dynamic range within the larger probe input operating range, as shown in the diagrams below. The probe input dynamic range is the region where an input signal is within the linear operating region of the probe. The probe A and B Offset Voltages are set and stored independently for each of the four input modes.

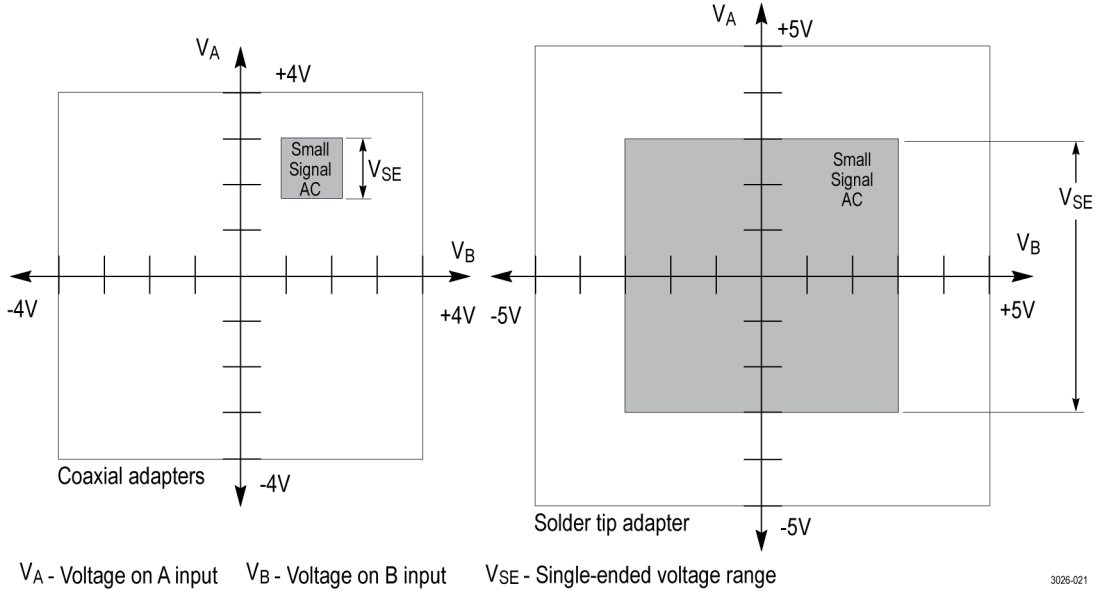


Figure 2: Input dynamic range

Termination Voltage. The termination voltage adjusts the effective probe DC loading of the 50 ohm input termination. The probe A and B Termination Voltages are set and stored independently for each of the four input modes. When P76CA-xxx coaxial adapters are used, the termination voltage can be adjusted over a limited operating range before reaching an overload condition. A graph of the operating limits of the termination voltage with respect to the input voltage is shown for the P76CA-xxx coaxial adapters. (See Figure 3 on page 24.)

The P76TA adapter with P7500 probe tips will not reach an overload condition with normal operating voltages, due to the attenuation of the input signal. It is possible, however, to damage the probe tip by exceeding the maximum allowable voltage difference between the input voltage, Vin, and the termination voltage, Vterm. The maximum allowable voltage difference is defined as Vin – Vterm ≤ 5 volts. The probe Overload LED will not light if this limit is exceeded.

CAUTION. *To prevent damage to the P7500 Series solder tips, do not exceed a 5 volt difference between the input voltage, Vin, and the termination voltage, Vterm.*

WARNING. *To avoid a burn injury, do not handle the P7500 Series solder tips if the 5 volt limit has been exceeded. Allow time for the resistors to cool before handling the solder tips.*

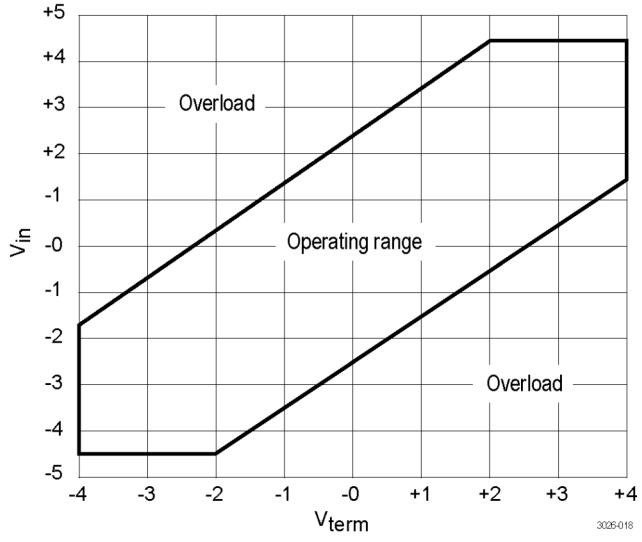


Figure 3: Termination voltage operating range for P76CA-xxx coaxial adapters

Probe Setup Screen

Use the Probe Setup screen to adjust the probe input settings for the measurement you are taking. (See Figure 4.) To display the Probe Setup screen, select Probe Cal from the oscilloscope Vertical menu. The Probe Setup screen has two sections to configure the inputs; one to select the input mode and adjust the offset voltages, and the other to set the termination voltages. The Input Mode pull-down selection and status box applies to both the Offset Voltage and to the Termination Voltage control sections.

The following pages describe the controls and status fields in the Probe Setup screen.

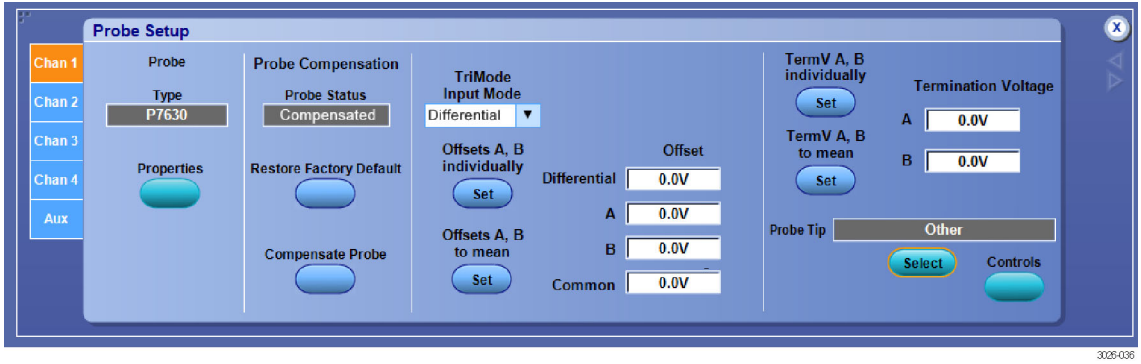


Figure 4: Probe Setup screen

Selecting the TriMode Input Mode

The Input Mode button on the probe toggles the internal probe input selector switches between the four input mode selections. The input mode can also be selected from the drop-down menu in the Probe Setup screen. This TriMode feature allows full characterization of a differential signal from a single 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.

A-GND Mode. The A-GND mode is used for making probe A input single-ended measurements with P76CA-xxx coaxial adapters, which connect the ground through the coaxial connector and the cable shield. When the P76TA adapter is used, TriMode probe tips such as the P75PST solder tip can be soldered directly to the circuit under test. The P75PST probe tip includes a solder connection for the local circuit ground. In the A-GND Mode the internal 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.

B-GND Mode. The B-GND mode is used for making probe B input single-ended measurements with the P76CA-xxx coaxial adapters, which connect the ground through the coaxial connector and the cable shield. When the P76TA adapter is used, TriMode probe tips such as the P75PST solder tip can be soldered directly to the circuit under test. The P75PST probe tip includes a solder connection for the local circuit ground. In the B-GND Mode the internal 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.

(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. This measurement also requires a ground connection to the probe.

Selecting the Offset Voltage

You can set both the offset and termination voltages to levels that are unique for each input mode. For reference, the TriMode Input Mode field displays the active input mode in the Offset area of the Probe Setup screen. The input mode can be selected from the drop-down menu next to the input field, or from the Input Mode button on the probe control box.

Offset voltages may be automatically generated by the probe and can be selected using the two Set buttons in the Offset section of the Probe Setup screen. You can also enter specific offset values directly in the Offset fields.

There are four manual Offset Voltage value entry fields which also display the current Offset Voltage settings. Although all four Offset Voltage value entry fields are active, only two of the control pairs are independent. The manual controls interact with each other as follows:

Adjusting the A or B settings affects the Differential and Common settings

- Differential = (A – B)
- Common = (A + B)/2

Adjusting the Differential or Common settings affects the A and B settings

- A = Common + (Differential/2)
- B = Common – (Differential/2)

Offset Voltage Set Buttons

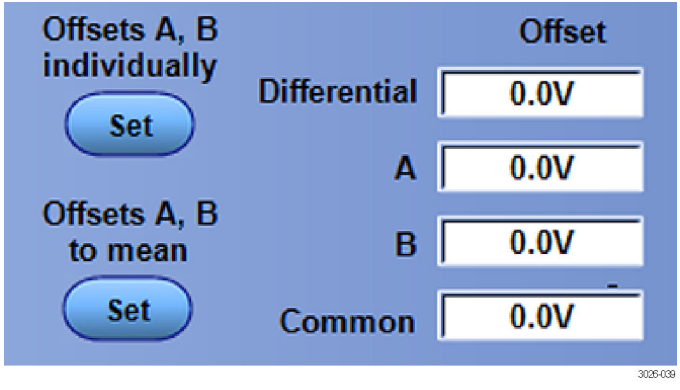
The probe A and B signal inputs are sensed, monitored, and averaged by probe internal circuitry and the sensed values are used by the automatic Offset Voltage Set control buttons.

Offsets A, B Individually. Click this Set button to set the A Offset to the average value of the A signal and the B Offset to the average value of the B signal.

Offsets A, B to mean. Click this Set button to set the A and B Offset fields to the mean value between the average A and B signal levels.

Offset. Click on the separate Offset fields to enter a specific value for that mode. For example, you may want to offset the A input by an amount that differs from the predetermined values that the Set buttons provide.

The oscilloscope vertical channel offset control adjusts the selected Offset field.



Set button examples. With a 50% duty cycle signal that varies from 0 to 1 volt on input A, and another 50% duty cycle signal that varies from 1 to 3 volts on input B, clicking the Offsets A, B Individually button will display the A signal 0.5 volt above and

below the average signal level. The B signal will appear 1 volt above and below the average signal level. The A signal is offset by +0.5 volt and the B signal is offset by +2 volts.

Using the signal example from above, with a signal that varies from 0 to 1 volt on input A, and another from 1 to 3 volts on input B, clicking the Offsets A, B to Mean button will offset both signals by 1.25 volts (0.5 V + 2 V/2).

Selecting the Termination Voltage

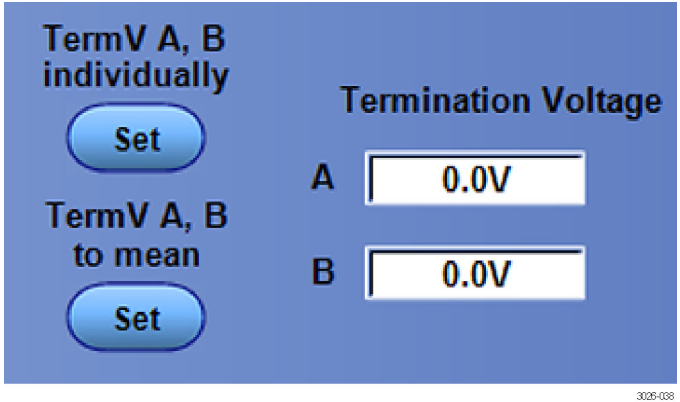
The probe A and B Termination Voltages are set and stored independently for each of the four input modes. A drop-down menu selection control for the Input Mode is available in the Offset selection area of the Probe Setup screen. The Input Mode selection control box also displays the selected Input Mode to which the display of stored Termination Voltages is associated. Termination voltages may be automatically generated by the probe and can be selected using the two Set buttons in the Termination Voltage section of the Probe Setup screen. You can also enter specific values for the A and B inputs directly in the Termination Voltage fields.

Termination Voltage Set Buttons

TermV A, B individually. Click the Set button to set the A Termination Voltage to the average value of the A signal and the B Termination Voltage to the average value of the B signal.

TermV A, B to mean. Click the Set button to set the A and B Termination Voltage fields to the mean value between the average A and B signal levels.

Termination Voltage. Click on the separate A or B Termination Voltage fields to enter a specific value for that input.



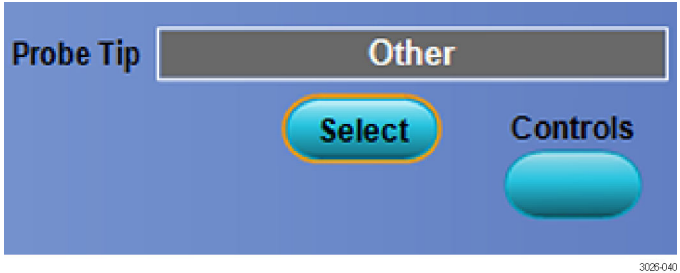
Probe Adapter and Tip Information

When the probe is first connected to the oscilloscope channel, the oscilloscope queries the probe for status information, including the probe type and serial number, and the model number of the adapter that is connected to the probe head. However, solder tips that are attached to the P76TA adapter must be identified manually. (See page 33, *Selecting the Probe Tip*.) The oscilloscope retains the probe solder tip information for that channel only; if you move the probe to another channel, you must select the solder tip again.

The Probe Tip field and buttons described below are located beneath the Termination Voltage section of the Probe Setup screen.

Probe Tip identifier field. The Probe Tip field indicates the model number of the attached adapter, and automatically updates if the adapter is changed while the probe is connected to the oscilloscope.

When the P76TA solder tip adapter is first connected, the Probe Tip field displays “Other”, regardless of which (or if a) P7500 Series solder tip is connected to the adapter. You must select the tip that you are using from the Probe Tip Selection screen.



Select button. Click on this button to display the Probe Tip Selection screen. (See page 33, *Selecting the Probe Tip*.) Next, click on the tip that you have connected to the P76TA adapter, and then click OK.

Controls. Click on this button to display the Probe Controls screen. (See Figure 5.) This screen displays a subset of the selections that are available in the Probe Setup screen, and the shorter display height allows more room for the waveform display area.

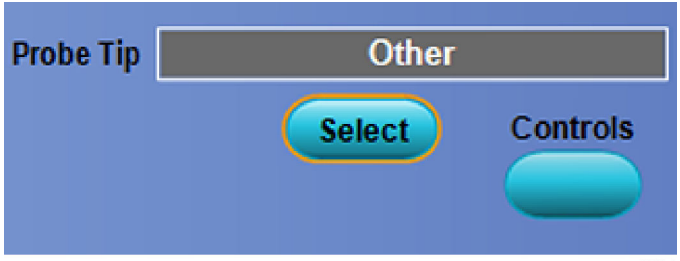


Figure 5: Probe Controls screen

Selecting the Probe Tip

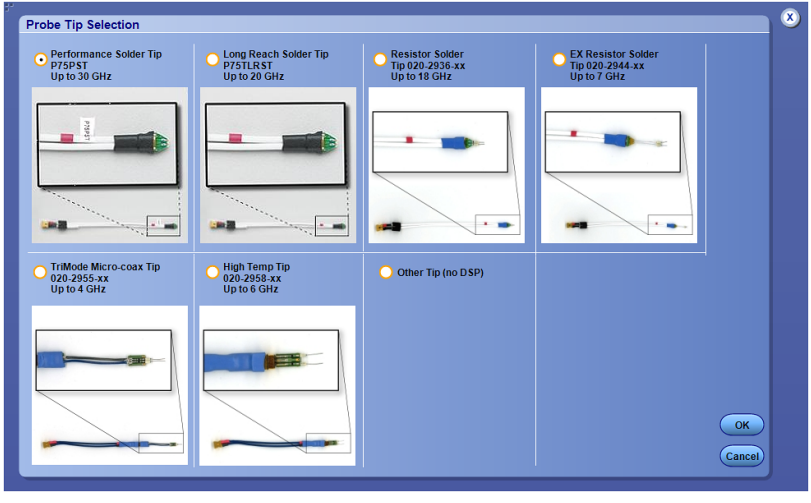
Use the Probe Tip Selection screen shown below to identify and select the solder tip that you are using with the P76TA adapter. To display the Probe Tip Selection screen, click the Select button in the Probe Setup screen. (See page 25, *Probe Setup Screen*.) The P76TA adapter accepts the P7500 Series TriMode solder tips shown in the screen below.

Click on the radio button next to the solder tip that you are using, and then click OK.

After you click OK, the oscilloscope applies appropriate DSP (Digital Signal Processing) signal correction to the measurements that you take with that probe/probe tip combination on that channel.

You must match the tip selection on-screen to the tip that you are using because the oscilloscope uses a unique DSP filter for each solder tip. Inaccurate measurements will result if the wrong tip is selected.

If you change the solder tip or move the probe to another channel, you must update the Probe Tip Selection screen.



Improving Measurement Accuracy

This section covers some of the features and characteristics of the probe that can affect the accuracy of your measurements, and some steps that you can take to improve the performance of the probe.

Temperature Compensation

The P7600 Series probes employ temperature compensation to optimize measurement accuracy. Whenever a probe setting is changed, such as Input Mode, Offset Voltage, or vertical scale factor, a temperature compensation update occurs. Continuous temperature compensation is not done to avoid introducing noise into the probe amplifiers.

When the probe is first powered on from a cold start condition, you must allow the probe and oscilloscope a 20 minute warm-up period. After the warm-up period, you should adjust or toggle a probe setting, such as the vertical scale factor, to trigger the temperature compensation update. Otherwise, a cold temperature compensation value may be used, which would result in a small gain error.

DSP Correction

The P7600 Series probes contain S-parameter characterization data for the probe, which is downloaded to the attached oscilloscope when the probe is first connected. This probe-specific data is used along with nominal probe adapter data to generate DSP correction filters that are used for improved high frequency measurement accuracy. After the probe adapter is attached to the probe, the adapter transfers identification data which is used as part of the generated filter process.

The Effect of DUT Source Impedance on Measurement Accuracy

The input impedance of the combined P76TA adapter and P7500 Series solder tip differs from that of the P76CA-xxx coaxial adapters. When the P76TA adapter is used, this impedance difference affects the probe amplifier gain and must be accounted for by including the DUT (Device Under Test) source impedance when calculating circuit loading effects. For most measurement applications, this difference is automatically compensated for by the oscilloscope gain circuitry, and is not a concern to the user. The following pages briefly describe the two measurement configurations to help you understand these differences when probing 50 ohm transmission line systems.

Coaxial Adapter Measurement Configuration

In the coaxial adapter measurement configuration, each signal of the differential signal pair from the DUT is transmitted to a matched termination at the probe input. (See Figure 6 on page 36.) The signal gain is calibrated to the probe tip, which results in measuring one half of the source AC component shown in the figure, due to the matched termination. If there is a DC bias component of the signal source, it is also attenuated by half due to the matched termination, but you can use the termination voltage control to null out the DC loading effect of the probe.

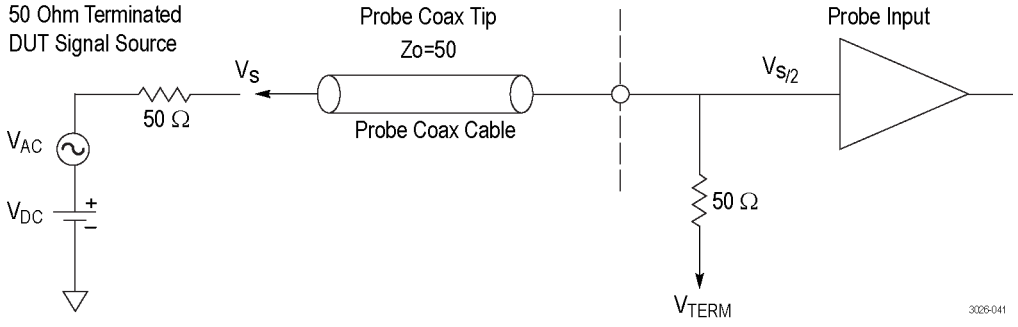


Figure 6: Coaxial adapter measurement configuration

Solder Tip Adapter Measurement Configuration

In many of the high-frequency signaling standards that the P7600 Series probes are designed for, a 50 ohm termination at the transmitter is in parallel with another 50 ohm termination at the end of the transmission line path, effectively making a 25 ohm signal source impedance. (See Figure 7 on page 37.) In this application, the solder tip adapter measurement configuration is designed to pick off the transmitted signal at a location in the signal transmission path. However, the P7500 Series solder tip connection loads the signal and reduces the signal amplitude by about 10%. To correct for this loading loss, the gain of the probe is increased by about 10% when the P76TA adapter is sensed on the probe head.

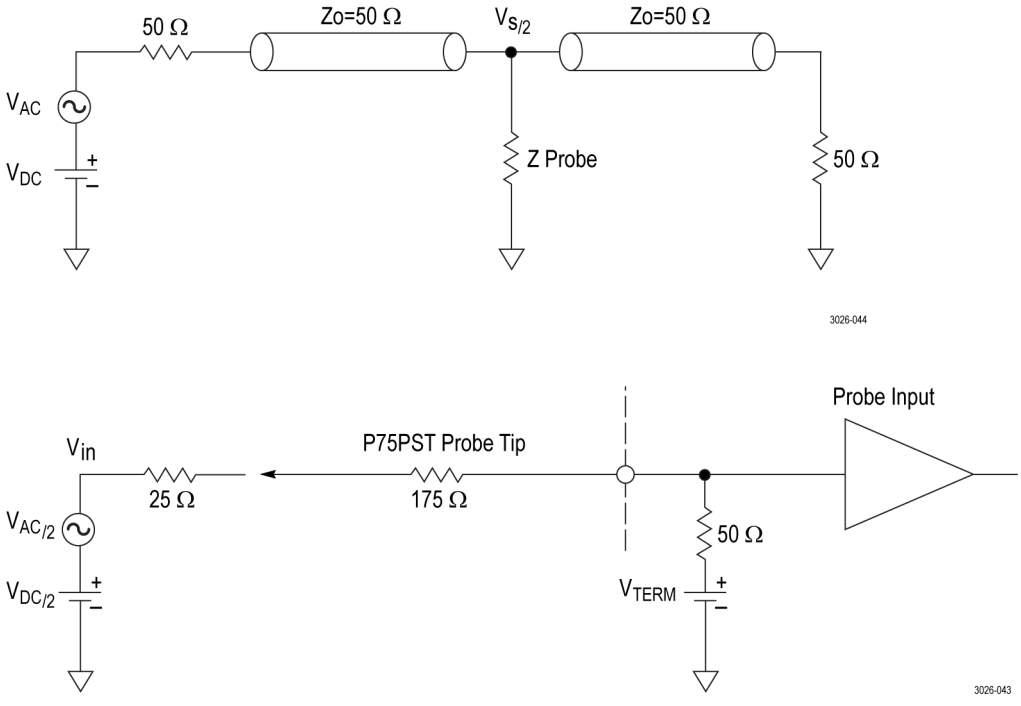


Figure 7: Solder tip adapter measurement configuration and equivalent model

For systems with source impedances not equal to 25 ohms, it may be necessary to adjust the oscilloscope EXT ATTEN scale factor and the offset voltage to optimize the measurement accuracy. You may also need to adjust the probe termination voltage control to null out the DC loading effect of the probe. More detail, including input circuit topologies and scale factor calculations, can be found in the *P7600 Series TriMode Probes Technical Reference*, included on the documentation CD that ships with the probe.

CAUTION. *To prevent damaging the P7500 Series solder tips, do not exceed the maximum allowable voltage difference between the input voltage, Vin, and the termination voltage, Vterm. The maximum allowable voltage difference is defined as Vin – Vterm ≤ 5 volts.*

Connecting to a Circuit Board

TriMode adapters are necessary to complete the connection between the P7600 Series probes and your circuit. The adapters are available as optional accessories and provide several connection options. You can use coaxial adapters with SMP or 2.92 mm connectors, or the P76TA adapter, which allows you to use P7500 Series solder tips such as the P75PST Performance Solder Tip. All of the adapters and tips provide the signal and ground connections necessary to take full TriMode measurements with one setup. All of the adapters secure to the probe head with a 2 mm hex screw. (See page 5, *Connect the Adapters*.)

Coaxial Adapters

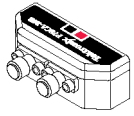
Three coaxial adapters are available for the probe and are described on the following pages. All of the adapters mate to the P7600 Series probe head through a multi-pin connector that transfers the adapter information to the oscilloscope for automatic identification. The connector also provides a 50 ohm signal path for each of the probe inputs. The A and B inputs on the adapters carry the circuit ground connections through the outer shield on the coaxial cables and connectors.

Precautions when connecting to the circuit. To achieve the best performance and service life of the probe and adapters, observe the best practices below when you make connections:

- Wear the antistatic wrist strap that is supplied with the probe and work at an antistatic-approved workstation.
- Use two wrenches to tighten the coaxial connectors; one to prevent the cable from twisting, and another to tighten the cable connector to the adapter or circuit connection.
- When you tighten cable connectors that are close to each other (as on the P76CA-292 adapter), be careful not to strike adjacent connectors with the wrench.
- To preserve the adapter cables and maintain the highest signal fidelity, never kink the wires or put undue stress on them. Support the adapter/probe head by taping it to your circuit or providing a means to prevent strain on the circuit connection.

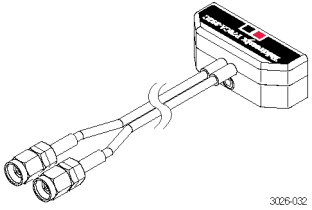
P76CA-292

Use this adapter with high quality, skew-matched cables that have male 2.92 mm connectors at the probe end. The other end of the cables can be customized with connectors that mate to your circuit.



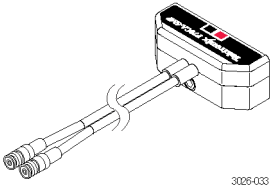
P76CA-292C

This adapter includes a pair of skew-matched, 6 in (15.2 cm) cables with male 2.92 mm connectors. Use this adapter to connect to 2.92 mm or SMA connectors in your system.



P76CA-SMP

This adapter includes a pair of skew-matched, 6 in (15.2 cm) cables with female SMP connectors.

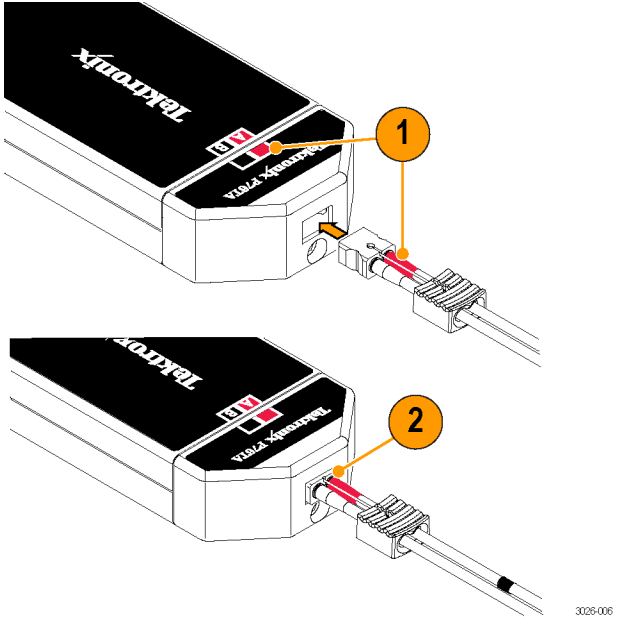


P76TA Adapter

1. Align the red cable band to the red A input and then push the cable into the probe adapter until you feel a click.
2. The connector is fully seated when it is flush with the edge of the adapter.

CAUTION. *The P76TA adapter has replaceable contacts inside the probe tip connector that may stick to the probe tip when it is disconnected. (See page 65, Bullet Contacts.)*

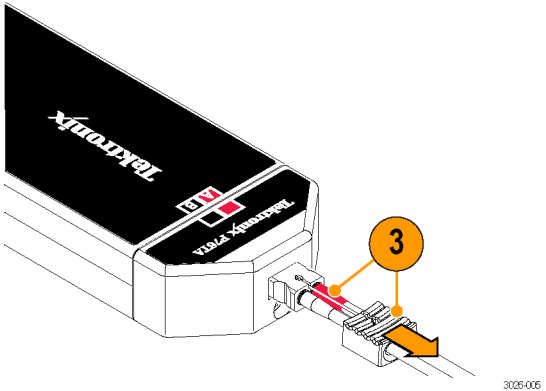
To prevent damage to the adapter, before you connect probe tips to the adapter, always check that the contacts are located in the adapter only.



3. To remove the tip, pull the cable tab straight out from the probe adapter.

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

Soldering instructions for the tips are described later in this section. (See page 45, *Connect the P75PST or P75TLRST Solder Tip*.)



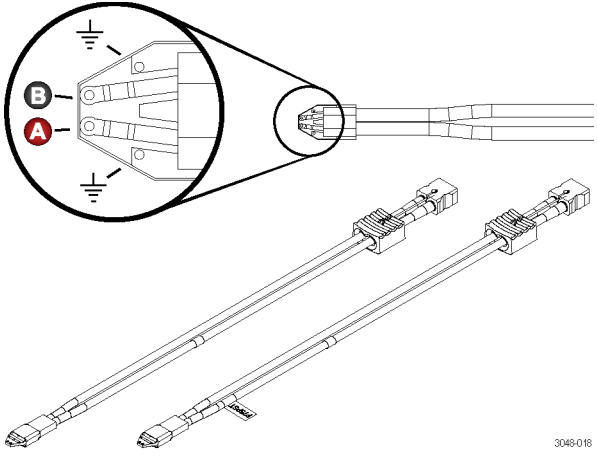
P75PST TriMode Performance Solder Tip

P75TLRST TriMode Long Reach Solder Tip

The Performance and Long Reach solder tips enable you to make full signal characterizations from a multi-point soldered connection. The P75PST tip is optimized for ≥25 GHz performance. The P75TLRST tip provides up to 20 GHz bandwidth.

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 internal electronic switching control of the TriMode probe allows any one of the four probe Input Modes to be selected at a time.



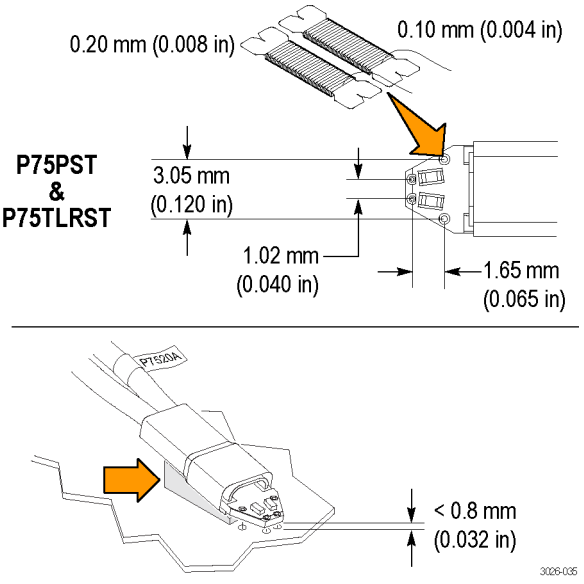
The dimensions of the solder tip connections are provided here for reference. You can also design the tip footprint into your circuit board layout for easier test connections.

To connect the probe tip to your circuit, order the optional wire replacement kit. (See page 54, *Optional Accessories*.)

The solder ramps that are supplied with the P76TA adapter are recommended as an aid to keep the probe tip wire connections as short as possible (<0.032 in./0.8 mm).

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.



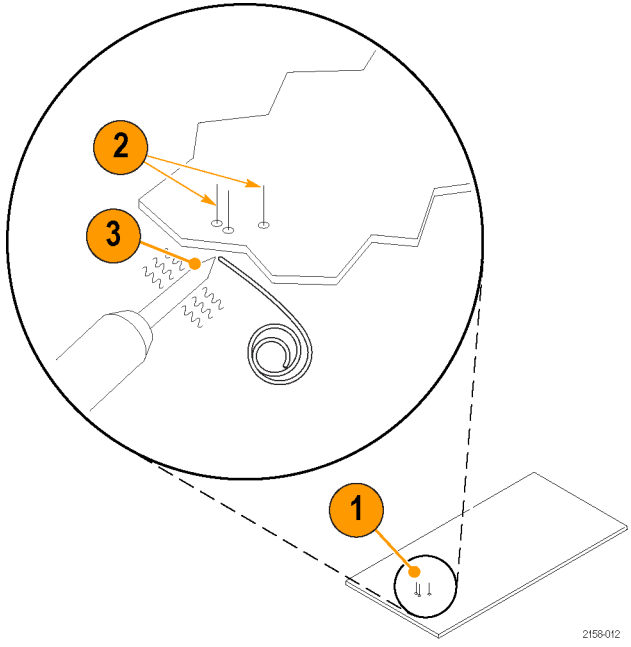
Connect the P75PST or P75TLRST Solder Tip

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

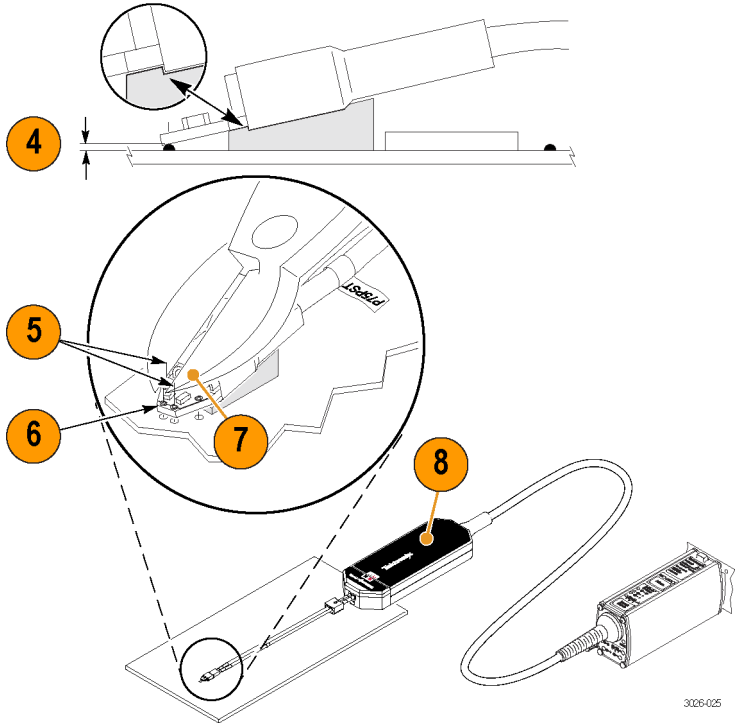
NOTE. *You can work with long wires (~1 inch), but keep the finished wire lengths of the signal and ground connections as short as possible.*

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. (Solder ramps are included with the P76TA adapter or a kit of 25 can be ordered separately.) 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 quickly 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 solder tip to the probe adapter. (Note polarity).
9. For a secure mechanical connection, use tape or hot glue to secure the tip to your circuit. (See page 47, *Secure the Tip*.)

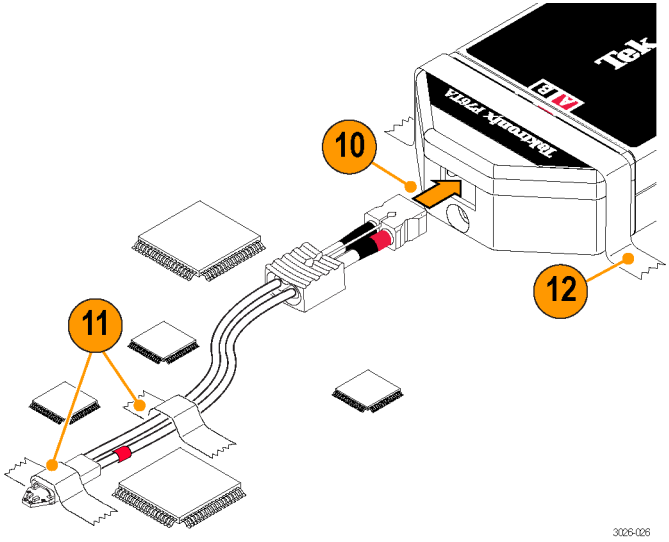


Secure the Tip

10. Push the end of the tip into the probe adapter until it seats in the probe adapter.

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

12. 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 optional 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 the attachment wires.
- For optimum performance and signal integrity, use the solder tip ramps to help you to 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.

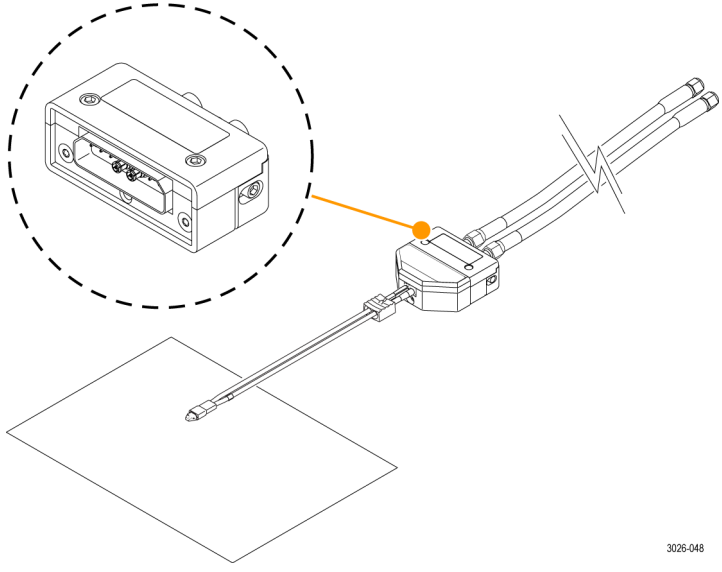
P76CA-BTI292 Coax Adapter

The P76CA-BTI292 Coax Adapter allows you to convert the output of the P76TA or P76CA adapters to a pair of 2.92 mm connectors.

Using this adapter, the distance between the circuit under test and the oscilloscope, switching matrix or other equipment can be extended. This is useful when you are testing in an environmental chamber or when you have multiple test points set up through a switched SMA system.

High bandwidth, low skew cable pairs should be used with the adapter. See *Optional Accessories* for a recommended cable pair.

NOTE. *Signal fidelity is diminished with extended lead length.*

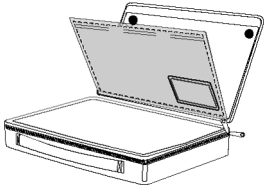
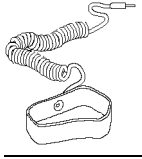


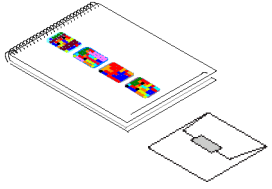
Accessories and Options

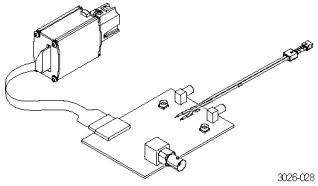
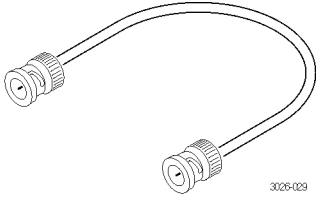
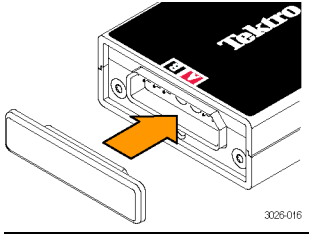
You can reorder the following replacement parts and accessories. Note that in some cases, the reorder quantities may differ from those that ship with the probe.

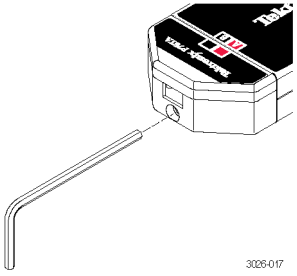
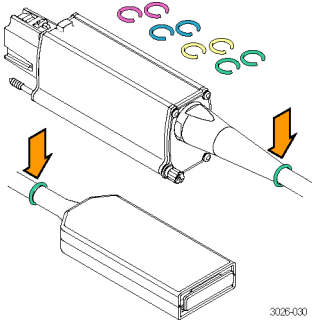
Standard Accessories

The following accessories are shipped with the P7600 Series probes. If no quantity is listed, only one of that item is shipped.

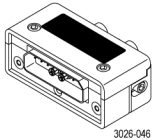
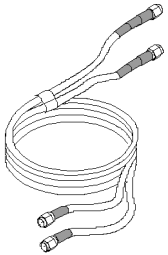
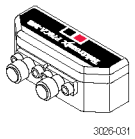
Standard accessory	Reorder part number and quantity	Description
	024-3610-xx	**Pouch, nylon carrying case with inserts.** This carrying case has several compartments to hold the probe and accessories.
	006-3415-xx	**Antistatic wrist strap.** When you use the probe, always work at an antistatic work station and wear the antistatic wrist strap.

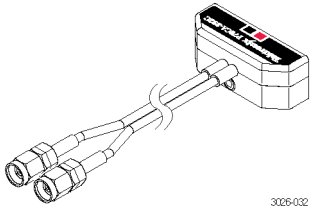
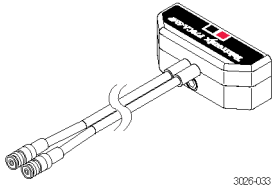
Standard accessory	Reorder part number and quantity	Description
	—	**Calibration certificate.** A certificate of traceable calibration is provided with every probe.
	—	**Data calibration report.** The Data Calibration Report lists the manufacturing test results of your probe at the time of shipment and is included with every probe.
	020-3104-xx	**Quick start user manual and CD-ROM.** The user manual provides instructions for operating the P7600 Series TriMode Probes. The documentation CD-ROM contains PDFs of primers, basic probe and measurement literature, and the probe manuals (the user manual and a probe-specific technical reference).

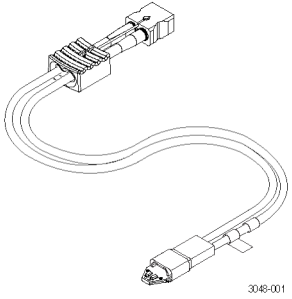
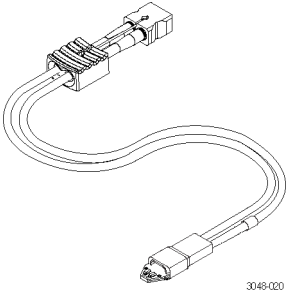
Standard accessory	Reorder part number and quantity	Description
	067-3259-xx	**DC probe calibration fixture.** Use this fixture to perform a functional check and a DC calibration with the host instrument.
	012-0208-xx	**50 Ω BNC-M to BNC-M cable assembly, 10 in.** To perform a probe calibration, use this cable to connect the DC Calibration fixture to the DC Probe Cal output connector on the host instrument.
	276-1152-xx	**ESD protective cap.** The probe is shipped with a protective cap on the probe body connectors. The cap prevents dirt, moisture, and electrostatic discharge from damaging the probe and connectors. Keep the protective cap on the probe when it is not in use. Two extra ESD protective caps are included with the probe.

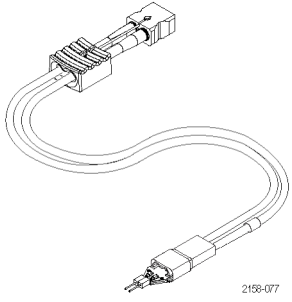
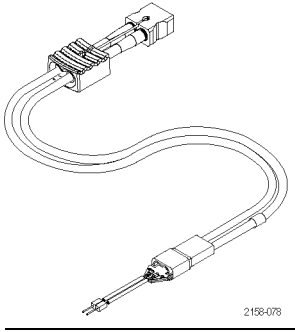
Standard accessory	Reorder part number and quantity	Description
	129-2781-xx	**Hex wrench.** Use this 2 mm hex wrench to secure the TriMode adapters to the probe body.
	016-0633-xx (Package of five colored pairs)	**Color band kit.** This kit includes two sets of five colored pairs. When you are using 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.

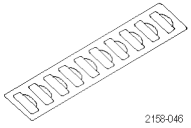
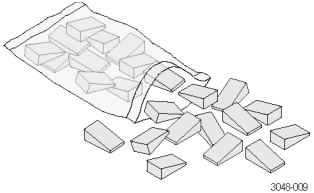
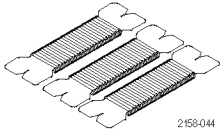
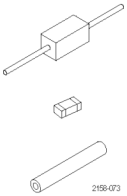
Optional Accessories

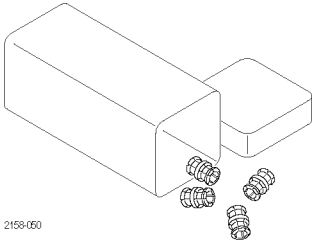
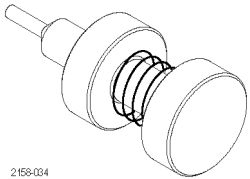
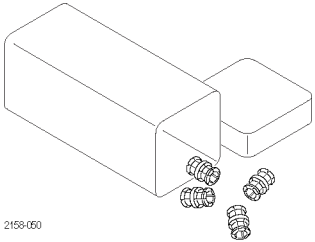
Optional accessory	Part number	Description
	P76CA-BTI292	**P76CA-BTI292 Coax Adapter.** Use this adapter to convert the P7600 custom tip interface on the optional P76TA or P76CA adapters (shown below), to a pair of 2.92 mm connectors. Using this adapter, the distance between the circuit under test and the oscilloscope can be extended. High bandwidth, low skew cable pairs should be used for this extended reach.
	174-5771-xx	**Phase-matched Dual SMA Cables (38 in.)** Extend the reach of the P76CA adapters with this high bandwidth, low skew cable pair.
	P76CA-292	**P76CA-292 Adapter.** Use this adapter with high quality, skew-matched cables that have male 2.92 mm connectors at the probe end. The other end of the cables can have custom connectors to your circuit.

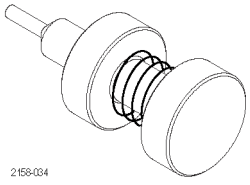
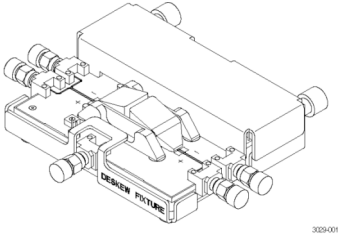
Optional accessory	Part number	Description
	P76CA-292C	**P76CA-292C Adapter.** This adapter includes a pair of skew-matched, 6 in (15.2 cm) cables with male 2.92 mm connectors.
	P76CA-SMP	**P76CA-SMP Adapter.** This adapter includes a pair of skew-matched, 6 in (15.2 cm) cables with female SMP connectors.
	P76TA	**P76TA Adapter.** Use this adapter with the P7500 Series probe solder tips shown below.

Optional accessory	Part number	Description
	P75PST	**P7500 TriMode Performance Solder Tip.** This tip provides a soldered, multi-point connection that supports full TriMode measurement capabilities at full probe bandwidth.
	P75TLRST	**P7500 TriMode Long Reach Solder Tip.** This tip provides a soldered, multi-point connection that supports full TriMode measurement capabilities.

Optional accessory	Part number	Description
	020-2936-xx	**TriMode Resistor Solder Tip.** 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 P75PST and P75TLRST solder tips, and can be replaced if they break. A kit of replacement resistors is available; see below.
	020-2944-xx	**TriMode Extended Resistor Solder Tip.** 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 P75PST and P75TLRST solder tips, and can be replaced if they break. A kit of replacement resistors is available; see below.

Optional accessory	Part number	Description
	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.
	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.
	020-2754-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.
	020-2937-xx	**Replacement resistor kit for TriMode resistor solder tips.** This kit includes: ■ 100 Ω leaded resistors, quantity 50 ■ 75 Ω surface-mount, 0402 resistors, quantity 50 ■ Nonconductive tubing, quantity 50

Optional accessory	Part number	Description
	020-3105-xx (Package of 4)	**Replacement SMPM bullet contacts (P7600 Series probe head).** To maintain the best signal integrity, replace the bullets in the probe head after 200 insertion cycles.
	003-1934-xx	**SMPM bullet removal tool (P7600 Series head).** This tool allows you to safely remove and install the bullet contacts from the probe head.
	013-0359-xx (Package of 4)	**Replacement G3PO bullet contacts (P76TA adapter).** To maintain the best signal integrity, replace the bullets in the probe adapter after 200 insertion cycles.

Optional accessory	Part number	Description
	003-1896-xx	**G3PO bullet removal tool (P76TA adapter).** This tool allows you to safely remove and install the bullet contacts in the adapter.
	067-2431-xx	**Deskew fixture.** Use this fixture to time-align the probe to other probes connected to your measurement system. The fixture is powered by a USB port on the oscilloscope. A USB A–B cable and an SMA cable are included with the fixture.

Options

Option C3. Calibration Service 3 years

Option C5. Calibration Service 5 years

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.

Maintenance

This section contains maintenance and support information for your probe.

Host Instrument Firmware

Some instruments may require a firmware upgrade to support full functionality of the P7600 Series probes. 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 P7600 Series probes.

Instrument	Firmware Version
MSO/DPO73304DX oscilloscope	V 6.8 or higher
MSO/DPO72504DX oscilloscope	V 6.8 or higher
DPO/DSA73304D oscilloscope	V 6.8 or higher
DPO/DSA72504D oscilloscope	V 6.8 or higher

To check the firmware version on your instrument, from the menu bar, click Help/About TekScope. 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 Input Mode 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, connect the probe to another oscilloscope channel or oscilloscope. If the symptoms remain, the probe must be returned to Tektronix for repair.

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 adapter connection at the probe body. (See page 4, *Connect TriMode Adapters to the Probe Body*.)
- Check the probe tip or probe cable connection on your circuit. (See page 39, *Connecting to a Circuit Board*.)
- Perform a functional check using the FAST EDGE output of the oscilloscope. (See page 11, *Functional Check*.)
- Check that the bullet contacts are present and intact in the probe body (and in the P76TA adapter, if using). (See page 67, *Inspecting the Bullets and Connectors*.)

Measurement Errors

If you suspect that your measurement may not be accurate, and you are using the P76TA adapter:

- Check that the solder tip signal and ground connections are correct and intact.
- Check that the solder tip that you are using on the adapter is what is selected in the Probe Tip Selection screen. (See page 33, *Selecting the Probe Tip*.)

User-Replaceable Parts

This section describes the components that are replaceable in the P7600 Series probe head and the P76TA adapter.

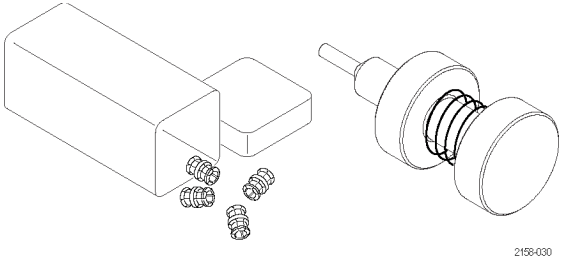
Bullet Contacts

The input sockets in the P7600 Series probe head and in the P76TA adapter are protected by replaceable bullet contacts.

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

Two sizes are used; the bullet contacts in the probe head are larger than those for the adapter, but all of the inspection and replacement procedures are identical.

A larger tool is used to replace the bullet contacts in the probe head. The bullet tools and bullet contacts are optional accessories for the probe.



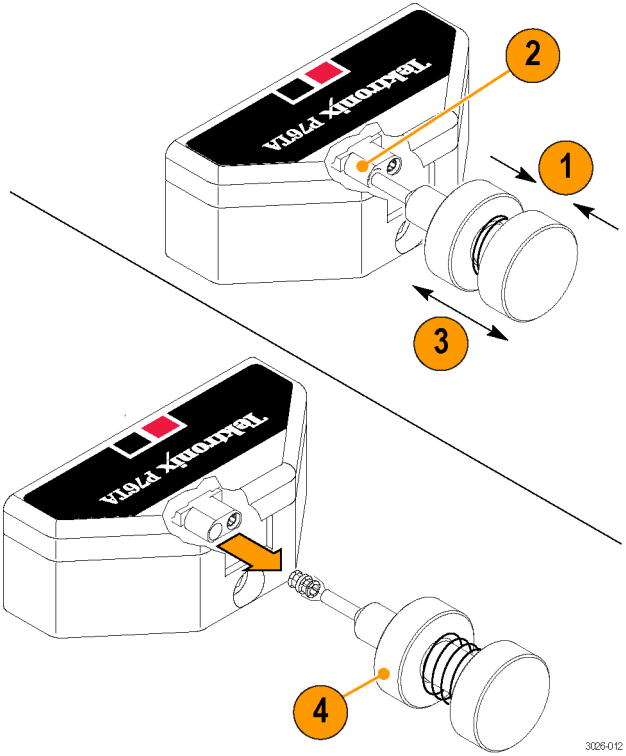
CAUTION. *To prevent wear to the probe head and adapter, use only the correct bullet tool to remove and install the bullets.*

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 head or adapter 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.

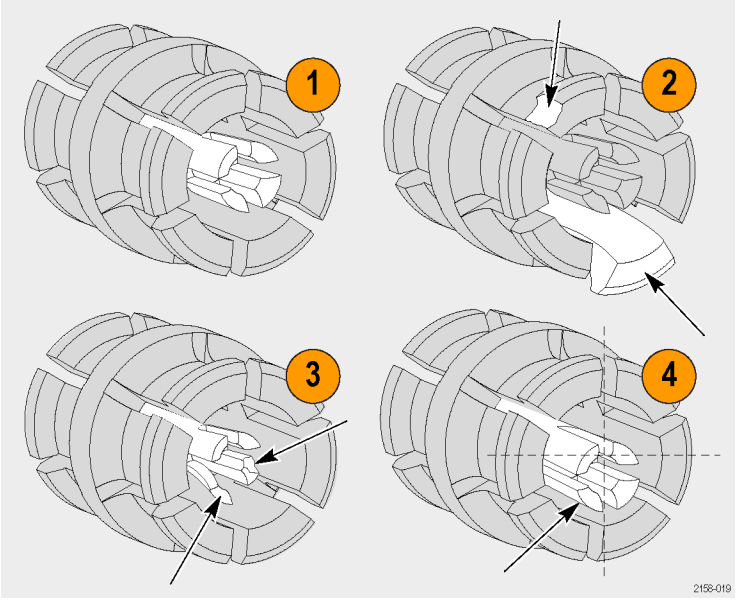
NOTE. *Discard the used bullets to prevent accidental reuse.*



Inspecting the Bullets and Connectors

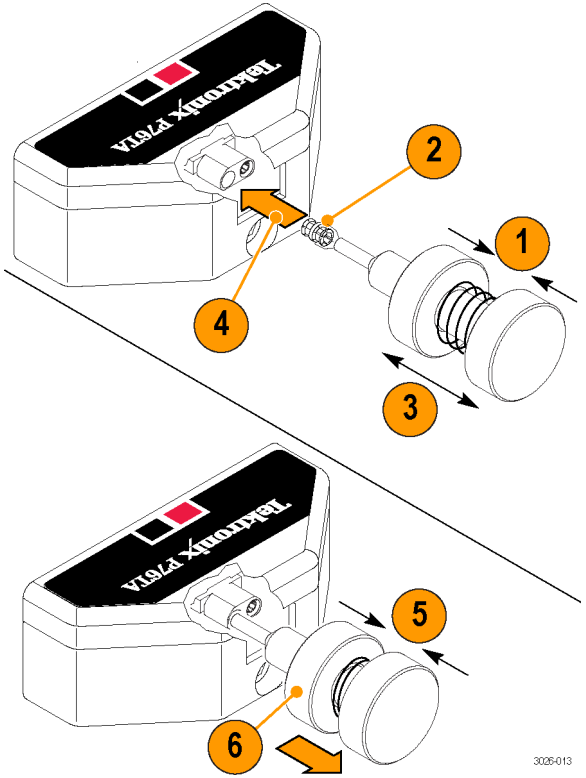
Use a microscope to closely examine the bullets and connectors. Use the illustrations to determine if the contacts appear worn or broken, and always replace them in pairs.

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 head or adapter 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 adapter.
7. Repeat for the other bullet.
8. Connect and remove the probe adapter on the probe head, or a solder tip on the P76TA probe adapter, depending on which bullets you replaced.
9. Verify that the bullets remain in the recess in which you installed them.



Handling the Probe

The P7600 Series probes are precision high-frequency devices; 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

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.

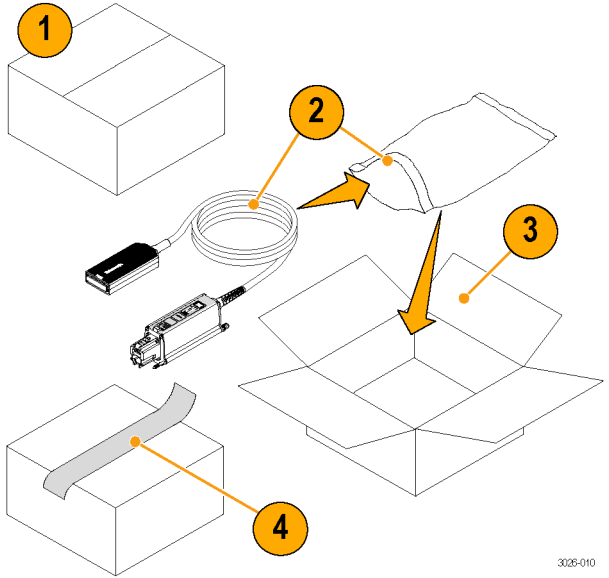
Clean the exterior surfaces of the probe with a dry, lint-free cloth or a soft-bristle brush. If dirt remains, use a soft cloth or swab dampened with a 75% isopropyl alcohol solution and then rinse with a cloth or swab dampened with deionized water. A swab is useful to clean narrow spaces on the probe; 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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