Instruction Manual

Tektronix

P6245AD
10X Active Probe

071-0687-00

Warning
The servicing instructions are for use by qualified personnel only. To avoid personal injury, do not perform any servicing unless you are qualified to do so. Refer to all safety summaries prior to performing service.

www.tektronix.com

Tektronix, Inc., P.O. Box 500, Beaverton, OR 97077

WARRANTY

Tektronix warrants that this product will be free from defects in materials and workmanship for a period of three (3) months from the date of shipment. If any such product proves defective during the three–month period, Tektronix, at its option, either will repair the defective product without charge for parts and labor, or will provide a replacement in exchange for the defective product.

In order to obtain service under this warranty, Customer must notify Tektronix of the defect before the expiration of the respective 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.

This warranty shall not apply to any defect, failure or damage caused by improper use or improper or inadequate maintenance and care. Tektronix shall not be obligated to furnish service under this warranty a) to repair damage resulting from attempts by personnel other than Tektronix representatives to install, repair or service the product; b) to repair damage resulting from improper use or connection to incompatible equipment; c) to repair any damage or malfunction caused by the use of non–Tektronix supplies; or d) to service a product that has been modified or integrated with other products when the effect of such modification or integration increases the time or difficulty of servicing the product.

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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. Do not connect or disconnect probes or test leads while they are connected to a voltage source.

Connect and Disconnect Properly. Connect the probe output to the measurement instrument before connecting the probe to the circuit under test. Disconnect the probe input and the probe ground 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 Operate Without Covers. Do not operate this product with covers or panels removed.

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

Do Not Operate With Suspected Failures. If you suspect there is damage to this product, have it inspected by qualified service personnel.

Do Not Operate in Wet/Damp Conditions.

Do Not Operate in an Explosive Atmosphere.

Safety Terms and Symbols

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.*

Preface

This manual is divided into user information and servicing information. These sections are described below.

User Information

This section contains the information necessary to install and use the P6245AD.

- Getting Started

  This section contains the product description, description of accessories, probe setup configuration, and how to check the probe for normal operation.

- Operating Basics

  This section contains basic information and operating suggestions for optimal probe performance

- Specifications

  This sections list the specifiecations for this product.

Service Information

This section contains the information necessary to maintain and service the P6245AD.

- Theory of Operation
- Performance Verification
- Adjustments
- Maintenance
- Troubleshooting

Replaceable Parts

This section lists the replaceable parts, stadard accessories, and optional accessories that are available for this product.

Contacting Tektronix

Product support	For questions about using Tektronix measurement products, call toll free in North America: 1-800-833-9200 6:00 a.m. – 5:00 p.m. Pacific time Or contact us by e-mail: tm_app_supp@tek.com For product support outside of North America, contact your local Tektronix distributor or sales office.
Service support	Tektronix offers a range of services, including Extended Warranty Repair and Calibration services. Contact your local Tektronix distributor or sales office for details. For a listing of worldwide service centers, visit our web site.
Toll–free Number	In North America: 1-800-833-9200 An operator can direct your call.
Postal Address	Tektronix, Inc. Department or name (if known) P.O. Box 500 Beaverton, OR 97077 USA
Web site	www.tektronix.com

Getting Started

Product Description

The Tektronix P6245AD is a 10X active FET probe with less than 1 pF input capacitance. The low input capacitance and high input resistance minimize circuit loading over a wide bandwidth range. The small profile and low-mass head of the P6245AD makes probing crowded circuits by hand fast and easy. The accessory tips and adapters enable the P6245AD to be used on a wide variety of circuit architectures.

The P6245AD is powered through a TEKPROBE interface between the compensation box of the probe and the oscilloscope. The P6245AD may be used with nonTEKPROBE oscilloscopes and instruments by using the optional Tektronix 1103 Probe Power Supply.

In order to fully appreciate the probe's capabilities, please read the *Getting Started* and *Operating Basics* sections of this manual.

Standard Accessories

The P6245AD is shipped with the following standard accessories:

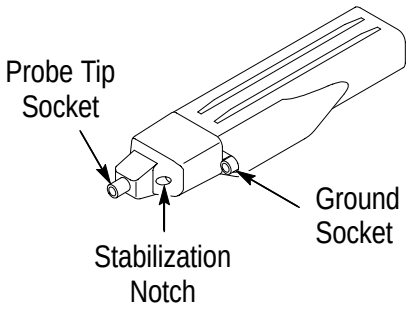
- standard probe tips
- SureFoot adapter probe tips
- SMT KlipChip microcircuit test leads
- Y-lead adapter
- right-angle adapter
- signal-ground adapters
- three- and six-inch ground leads
- low-inductance ground lead
- marker rings
- Instruction Manual

For service information, refer to the service section beginning at the yellow page.

For part number information for standard and optional accessories, refer to the *Replaceable Parts* section of this manual.

Features and Accessories

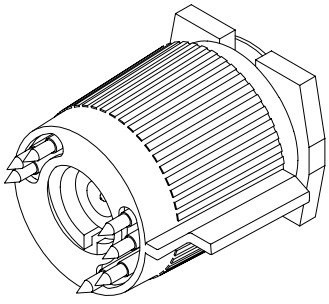
The P6245AD is provided with several features and accessories designed to make probing and measurement a simpler task. Please take a moment to familiarize yourself with these items and their uses.



Probe Head Assembly. The probe head is designed for ease of use and high performance. Its small size makes it easy to handle in tight areas.

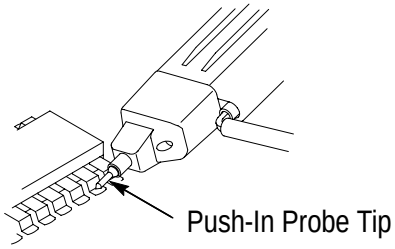
The probe tip socket is sized to easily press onto 0.025 inch pins for direct access. The ground socket provides a short ground path for high fidelity ground connections.

The stabilization notch permits you to use adjacent pins to reduce stresses on the probe and pins. See pages 1–6 and 2–8 for more information.



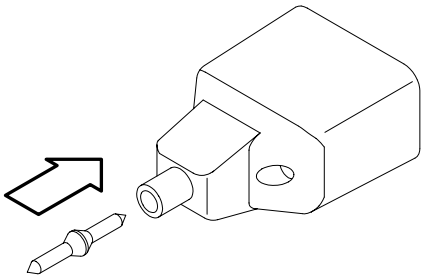
TEKPROBE Interface. The TEKPROBE interface provides a communication path between the probe and the oscilloscope. Contact pins provide power, signal, offset, and probe characteristic data transfer. See page 4–2 for more information.

If your oscilloscope does not support the TEKPROBE interface, you can use the optional 1103 probe power supply as an effective interface. Contact your local Tektronix representative for more information.

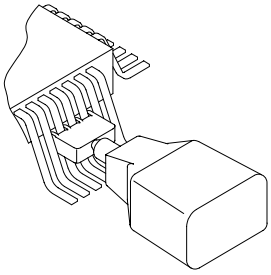


Push-in Probe Tip. Use the push-in probe tip for general purpose probing by hand. The tip may also be used as a temporary test point. See page 2–7 for more information.

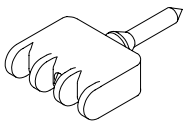
The push-in probe tip may also be used with the other socketed leads and adapters.



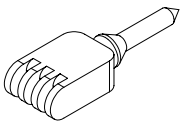
Installing the Push-in Probe Tip. Attach the push-in probe tip by seating the tip into the probe tip socket and pushing the tip in until it is seated. Either end of the tip may be used. *Do not force the tip*. Also, be careful not to poke yourself with the sharp probe-tip. To remove the tip, *gently* grab the tip with small pliers and pull the tip out.



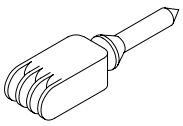
SureFoot probe tip. The SureFoot tip is an integral probe tip and miniature guide that enables fault-free probing of fine-pitch SMD packages. Attach the SureFoot adapters the same way as the push-in probe tips. They can be used with any of the socketed accessory leads.



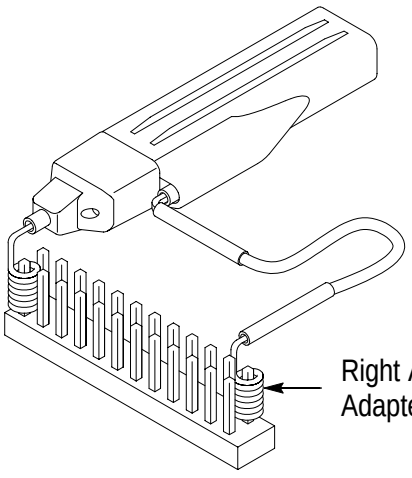
The yellow, 0.050 inch SureFoot tip is compatible with 50 mil JEDEC packages such as SOIC, PLCC, CLCC, etc.



The blue, 0.025 inch SureFoot tip is compatible with 0.65 mm JEDEC and EIAJ packages.



The red, 0.5 mm SureFoot tip is compatible with EIAJ packages.

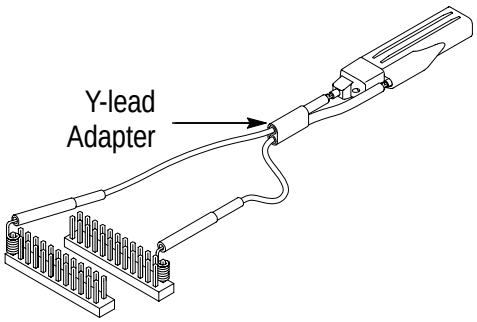


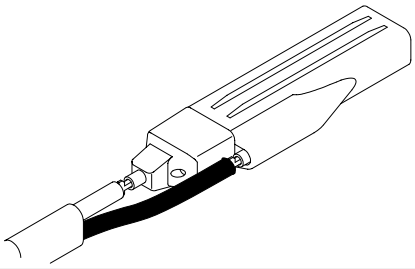
Right-angle adapter. Use the right-angle adapter for low-profile probing of 0.025 inch diameter square pins.

The right-angle adapter allows the P6245AD to lie flat against a circuit board. This enables probing in vertical circuits such as computer or communications backplanes, or in tight areas such as between circuit cards.

The right-angle adapter can be used directly with the probe head, or attached to the Y-lead adapter or ground leads.

The right-angle adapter is attached the same way as the push-in probe tip, and can be easily removed by hand.

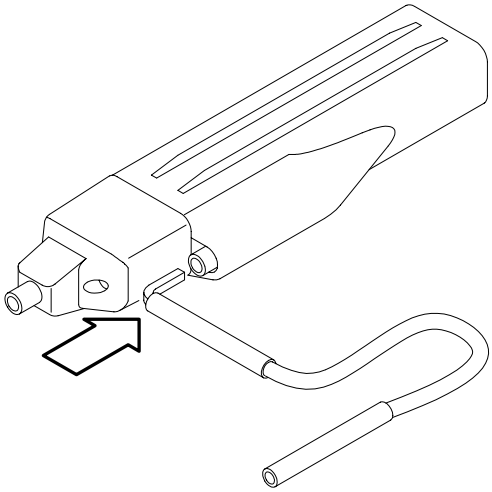




Y-lead adapter. Use the Y-lead adapter to extend the physical reach of the probe and ground when necessary. The Y-lead adapter accepts any of the probe tips or adapters, and can be pushed directly onto 0.025 inch pins.

When selecting the grounding connection, maintain as short a ground path as possible. Refer to page 2–2 for more information.

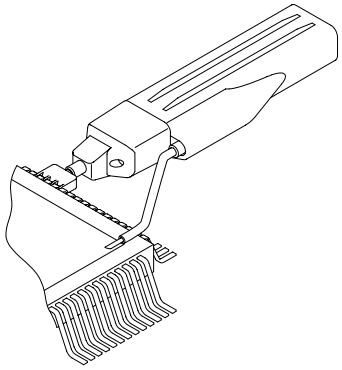
To attach the Y-lead adapter, gently press the lead pins into the probe head tip and ground receptacles. Using the black lead for ground is recommended.



3- and 6-inch ground leads. Use the three- and six-inch ground leads for general probing. The socketed end of the leads may be connected to any of the probe tips and adapters, or fitted onto 0.025 inch pins.

To attach the ground leads, press and rotate the lead pin connector into the ground socket on the probe head. The lead may be removed by simply pulling the pin out by hand.

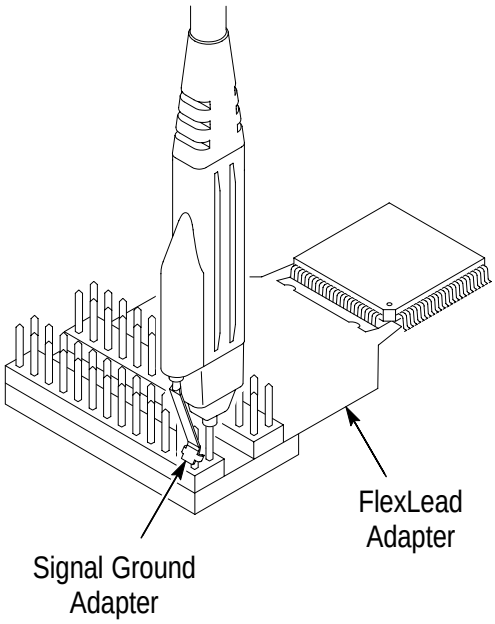
When selecting the grounding connection, maintain as short a ground path as possible. Refer to page 2–2 for more information.



Low-inductance ground lead. Use the low-inductance ground adapter to substantially reduce ground lead inductance. Because the ground lead simply touches the ground reference, you can easily move the probe to different points on the device under test.

To attach, press the ground lead into the probe head gound socket.

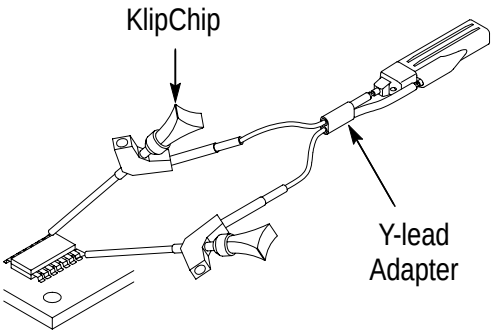
When selecting the grounding connection, maintain as short a ground path as possible. Refer to page 2–2 for more information.



Signal-Ground Adapter. The signal-ground adapter is ideal for use with signal/ground pairs on 0.100 inch header pins (such as FlexLead adapters).

Attach the signal-ground adapter by gently pressing it into the ground socket on the probe head.

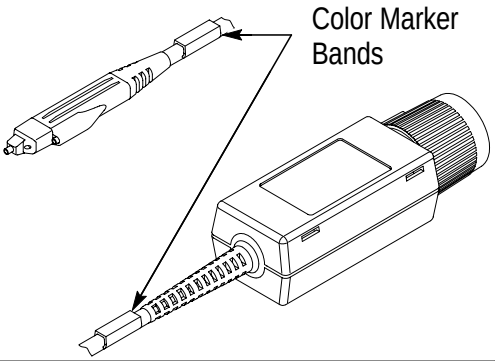
Be sure to use the stabilization notch whenever possible. See page 2–8 for further details.



SMT KlipChip. Use the SMT KlipChip test clips to access fragile, dense circuitry.

KlipChip test clips can be connected to the Y-lead or three- or six-inch ground leads. Simply press the lead socket into the KlipChip handle.

The KlipChip body freely turns, allowing better probe orientation. To reduce stress and provide a lower profile on components being tested, the flexible sleeve of the KlipChip bends up to a 35 degree angle.



Color Marker Bands. Attach matching pairs of the color marker bands onto the cable at the head and compensation box of each probe. The marker bands enable quick verification of which probe is connected to which instrument channel.

Configuration

The P6245AD provides the oscilloscope with the probe model number, serial number, and attenuation factor. When connected to a TEKPROBE oscilloscope, display readouts are corrected for the probe attenuation factor, the instrument input is set to 50 Ω, and the coupling is set to DC.

CAUTION. *Do not attempt to install the* P6245AD *on a nonTEKPROBE connector. Damage to the probe and connector may result. If your oscilloscope does not support the TEKPROBE interface, use the optional Tektronix 1103 Probe Power Supply.*

If the P6245AD *is used with the Tektronix 1103 Probe Power Supply, be sure to have a 50 Ω termination at the oscilloscope. Also, set the oscilloscope channel coupling to DC.*

The probe offset control is controlled by the oscilloscope. If the oscilloscope used does not support the TEKPROBE interface, the offset controls on the optional Tektronix 1103 Probe Power Supply can be used.

Probe Offset

The probe offset is adjustable to permit operation within the linear range of the probe. Using the offset to cancel DC signal components enables optimal probe performance. See Figure 1–1 on page 1–8.

NOTE. *See your oscilloscope manual for specific instructions on its operation and offset control.*

To set the probe offset, follow these steps:

1. Set the oscilloscope coupling to **GND**.
2. Use the vertical position control to set a zero reference level on the oscilloscope display.
3. Set the oscilloscope coupling to **DC** and **5 V/div**.
4. Attach the probe to the circuit.
5. Adjust the probe offset to bring the trace to the oscilloscope zero reference.
6. Change the volts/division setting to the desired range, adjusting the offset to keep the trace on the zero reference level.

***NOTE**. The* P6245AD *has a ±10 V offset range. The linear operating range is ±8 V. See Figure 1–1. Also, see page 2–1 for more information.*

If cursors are used on a TEKPROBE oscilloscope, the zero reference will be at the probe offset voltage.

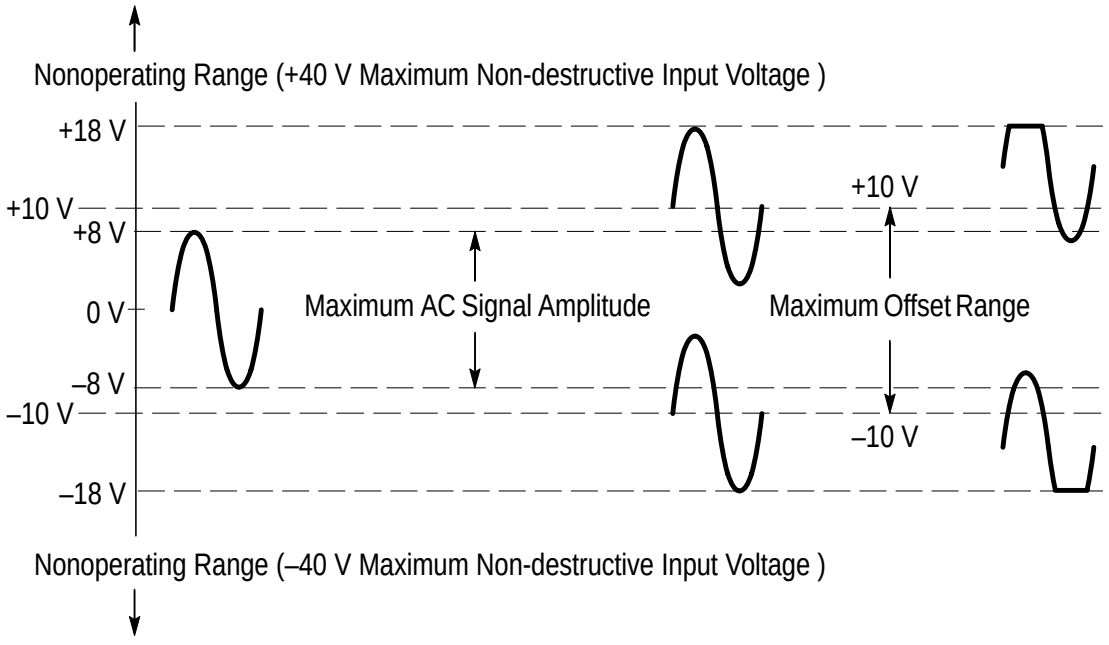


Figure 1–1: Dynamic and Offset Limitations

Functional Check

After installing the probe on the oscilloscope, a functional check may be performed using the PROBE COMPENSATION connections on the front panel of the oscilloscope. See Figure 1–2.

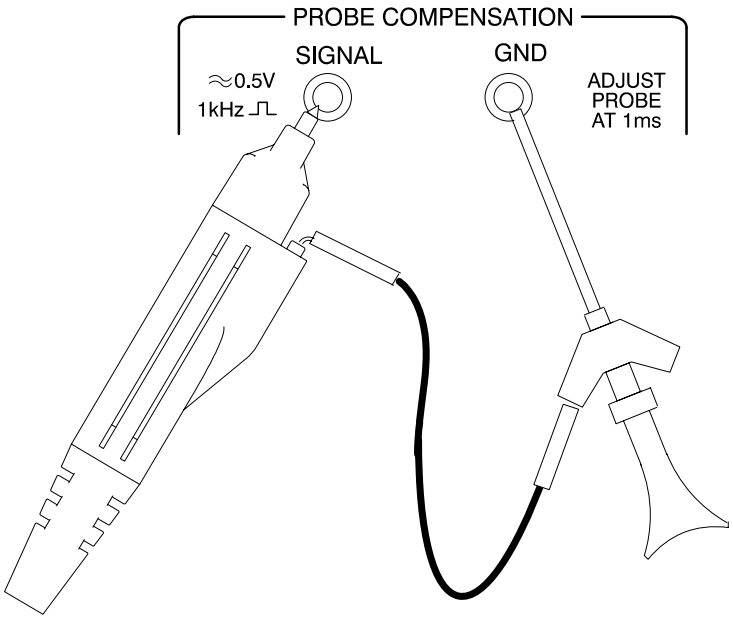


Figure 1–2: Probe Functional Check Connections

1. Connect the probe to the oscilloscope.
2. Set the oscilloscope to display the probe's channel.
3. Using a ground lead and a SMT KlipChip, connect the probe ground to the PROBE COMPENSATION ground connection on the oscilloscope.
4. Using a standard tip, hold the probe to the SIGNAL terminal on the oscilloscope.
5. Press **AUTOSET** (or adjust the oscilloscope) to display the calibration waveform.

***NOTE**. If your instrument supports probe calibration routines, now is a good time to perform them.*

6. Disconnect the probe from the SIGNAL terminal and ground the probe tip. (Connect the KlipChip to the probe tip.)
7. With the probe offset set to 0.0 V, the oscilloscope display should be at the ground reference.
8. Set the oscilloscope volts/division to 5 V.
9. Adjust the probe offset. The displayed waveform should vary between approximately +10 V and –10 V. (A +10 V offset displays a –10 V level on your instrument.)

***NOTE**. If no waveform is displayed, check the vertical coupling to be sure that it is set to DC.*

If the offset adjustment has no effect, set the vertical coupling to DC.

If you are using the Tektronix 1103 Probe Power Supply, and the waveform is distorted, check to make sure that the oscilloscope termination is 50 Ω.

If the probe does not pass this functional check, go to the *Trouble-shooting* section of this manual.

Operating Basics

Operating Basics

Please follow these operating guidelines to get optimum performance from your P6245AD.

Maximum Nondestructive Input Voltage

The P6245AD is electrically protected against static voltage; however, applying voltages above its design limits may damage the probe tip amplifier. Please refer to the *Specifications* section of this manual for the maximum operating voltage and frequency derating information.

Input Linear Dynamic Range

The probe head amplifier used by the P6245AD has a limited linear operating range. To keep the input linearity error less than 4% you must limit the signal input voltage to ±8 V (including any DC offset).

Use the DC offset adjustment to maintain the probe within its dynamic range. The nominal offset adjustment range of the P6245AD is ±10 VDC. For example: to offset a +5 VDC level in a circuit, set the offset to +5 V.

***NOTE**. The probe can tolerate input voltages of ±40 V without damage; however, the linearity error specification does not apply to input voltages exceeding ±18 V (including any DC offset). See Figure 1–1 on page 1–8.*

Ground Lead Length

When you are probing a circuit, you should always use as short a ground lead as possible between the probe head and circuit ground.

The series inductance added by the probe tip and ground lead can result in a resonant circuit; this circuit may cause parasitic ringing within the bandwidth of your oscilloscope. Refer to Figure 2–1.

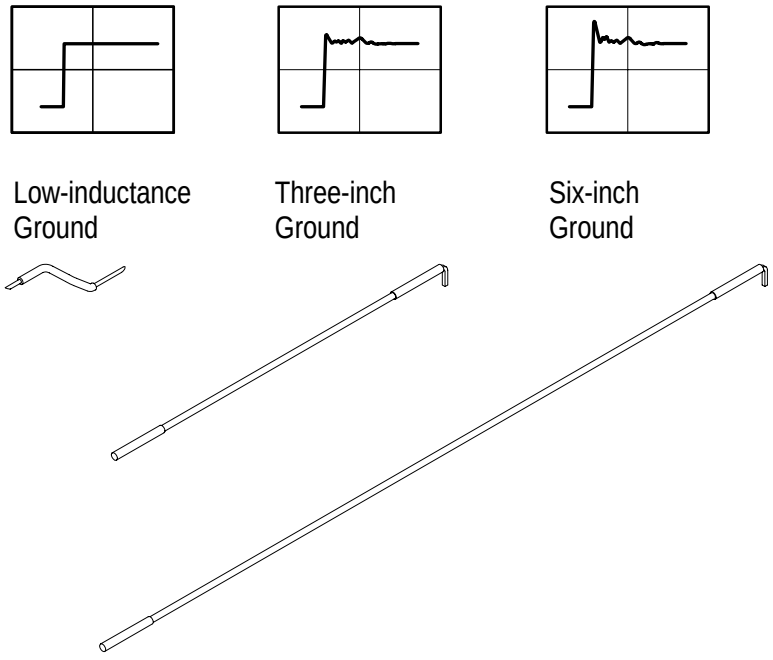


Figure 2–1: Waveform Distortion from Ground Lead Length

Ground Lead Inductance

When you touch your probe tip to a circuit element, you are introducing a new resistance, capacitance, and inductance into the circuit. Refer to Figure 2–2.

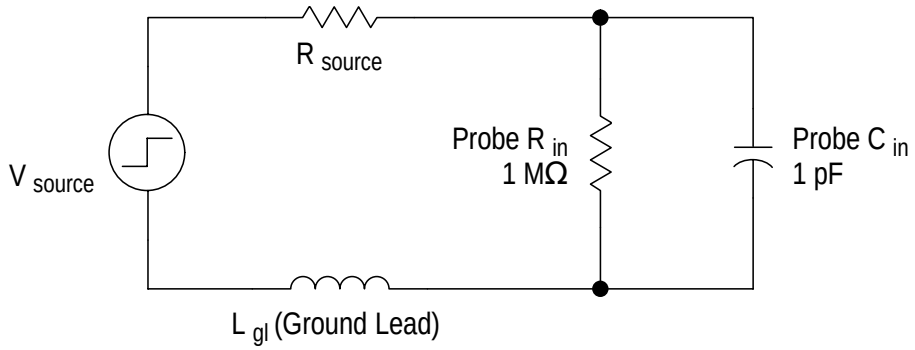


Figure 2–2: Ground Lead Equivalent Circuit

Ringing and rise time degradation can be masked if the frequency content of the signal degradation is beyond the bandwidth of the oscilloscope.

You can determine if ground lead effects may be a problem in your application if you know the self-inductance (L) and capacitance (C) of your probe and ground lead. Calculate the approximate resonant frequency (f_0) at which this parasitic circuit will resonate with the following formula:

$$f_0 = \frac{1}{2\pi\sqrt{LC}}$$

The preceding equation shows that reducing the ground lead inductance will raise the resonant frequency. If your measurements are affected by ringing, your goal is to lower the inductance of your ground path until the resulting resonant frequency is well above the frequency of your measurements.

The low-inductance ground contacts described in *Accessories* can help you reduce the effects of ground lead inductance on your measurements.

Helpful Hints

Follow these helpful hints to make probing easier and noise free.

Low-inductance Grounding

Placing a ground plane on top of a package being probed can minimize ground lead length and inductance. See Figure 2–3.

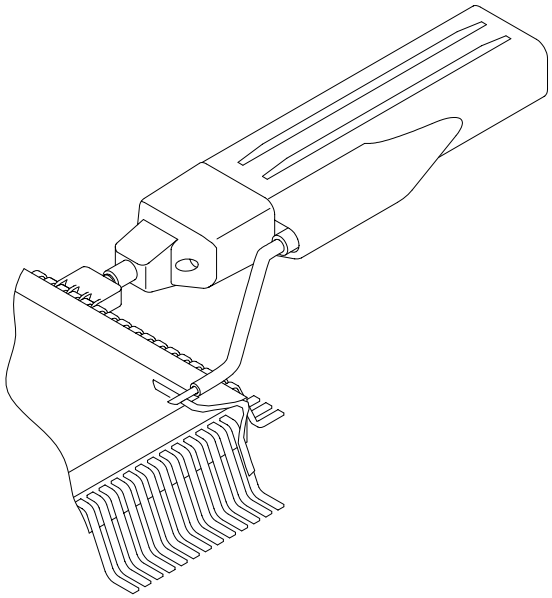


Figure 2–3: Low-inductance Grounding

Attach a small piece of copper clad on top of the package and connect it to the package ground connection. Use the low-inductance ground lead provided with the P6245AD to keep the ground lead length as short as possible.

This method is very useful when making many measurements on the same package. Using a ground plane on the package makes probing the package easier, and avoids adding unnecessary ground lead length and distortion.

SureFoot Grounding

If you cannot use the low-inductance grounding method recommended, the probe may be grounded to the package under test using a SureFoot adapter. Refer to Figure 2–4.

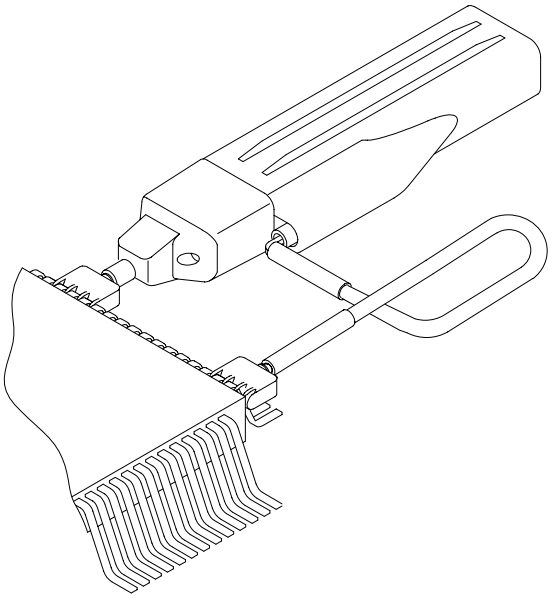


Figure 2–4: Using a SureFoot Adapter for Grounding

Use a SureFoot adapter at the end of a short ground lead to connect directly to the package ground. This method is preferred over using an adjacent circuit ground because it is the shortest ground path possible.

Probe Tip Test Points

The push-in probe tip or a 0.025 square pin can be soldered into a circuit to be used as a temporary test point. See Figure 2–5.

Solder the tip onto a lead or pin with a low-power soldering iron. Press the probe head onto the tip to make a measurement, and then pull the probe head off when you are done.

The probe tip may be removed and reused by desoldering it from the circuit, and soldering it into another circuit in the future.

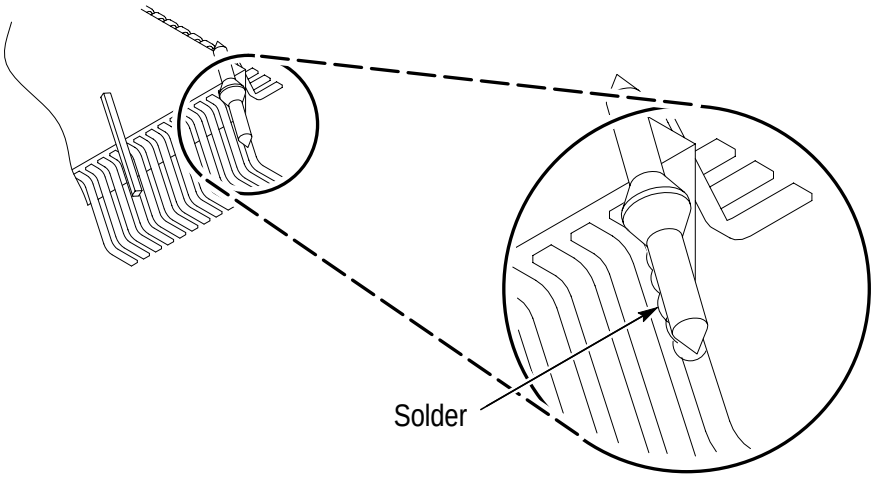


Figure 2–5: Using a Probe Tip as a Test Point

NOTE. *It is not recommended that pieces of solid-core copper wire be used as test points. If the wire breaks off in the probe tip socket, it may be impossible to remove the wire, and it will prevent insertion of other accessory tips.*

Probe Tip Stabilization

The P6245AD probe head has a stabilizing notch for use with 0.100 inch spaced header pins. See the probe head detail on page 1–3.

As the probe is pressed onto the header pin, an adjacent pin can be inserted into the probe's stabilizing notch. See Figure 2–6. This prevents unnecessary force from being applied directly to the probe tip or pins.

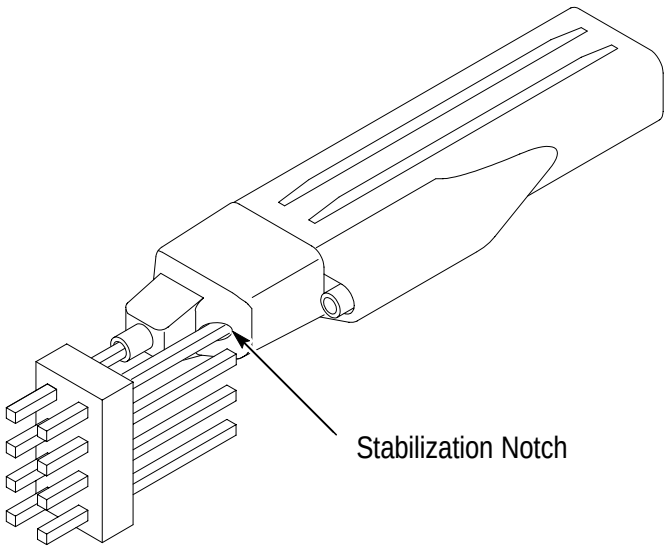


Figure 2–6: Probe Tip Stabilizing Notch

The signal-ground adapter then rests on the stabilized pin without a risk of its moving out of place.

Specifications

Specifications

These specifications apply to a P6245AD when used with a Tektronix TDS 684C (or similar) oscilloscope.

The probe and instrument must first be allowed to warm up for 20 minutes before measurements are taken.

CAUTION. *Do not apply voltages beyond the nondestructive input voltage range to the probe. Damage to the probe or circuit under test may result.*

Table 3–1: Warranted Electrical Specifications

DC Attenuation Accuracy (probe only)	10:1 ±2%
Output Zero	±5 mV or less at output of probe ±50 mV or less displayed on screen with TEKPROBE interface

Table 3–2: Typical Electrical Characteristics

Analog Bandwidth (probe only)	1.0 GHz on ≥10 GHz oscilloscope
Rise Time (probe only)	400 ps on ≥10 GHz oscilloscope
Linear Input Dynamic Range	– 8 V to + 8 V. (Equivalent to – 0.8 V to + 0.8 V at the output of the probe.)
Linearity	± 4% or less of dynamic range
Nondestructive Input Voltage Range	– 40 V to + 40 V (DC + peak AC) (See Figure 3–1.)
Input Resistance	1 MΩ at DC. (See Figure 3–3.)
Input Capacitance	≤1.0 pF
Offset Range	–10 V to +10 V
DC Offset Drift	100 µV/°C or less at output of probe 1 mV/°C or less displayed on screen with TEKPROBE interface
Delay Time	18.02 ns

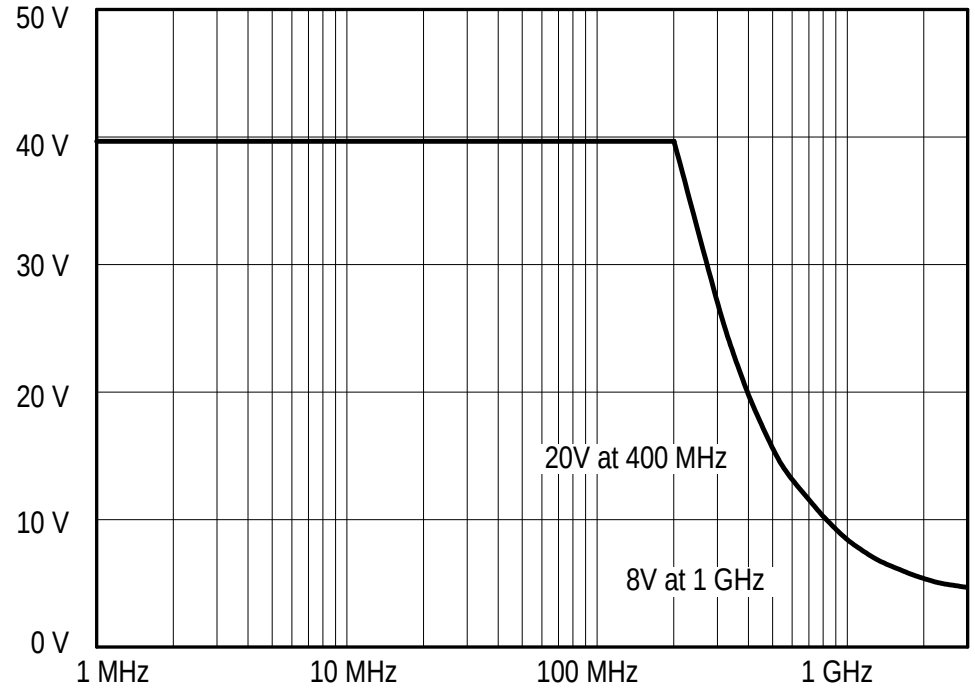


Figure 3–1: Typical Voltage Derating vs. Frequency

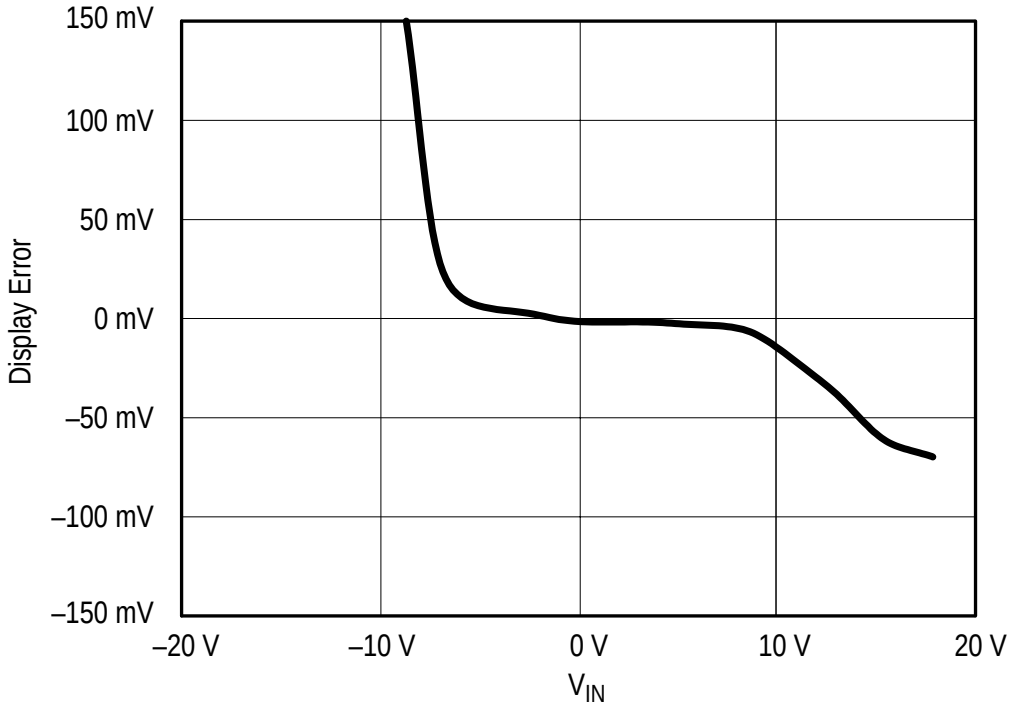


Figure 3–2: Typical Linearity Error vs V_{IN}

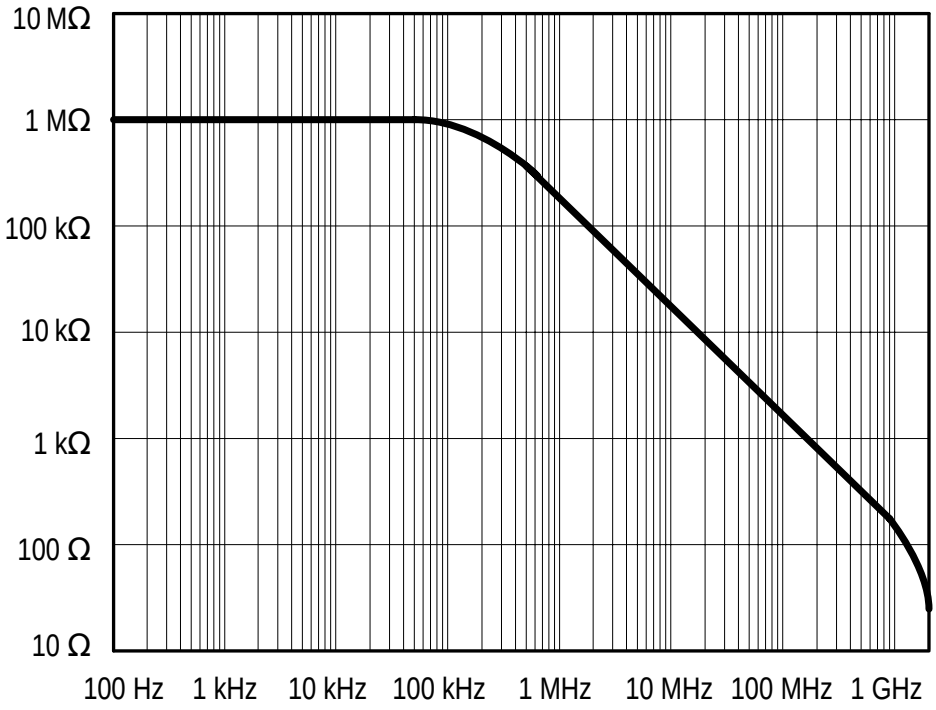


Figure 3–3: Typical Input Impedance vs. Frequency

Table 3–3: Physical Characteristics

Shipping Weight	539.4 g (1.18 lb)
Cable Length	4.6 m (15 ft)

Table 3–4: Environmental Characteristics

Operating Temperature	0° C TO +50° C. The environmental exposure is the procedure stated in Tektronix Design Standard 062–2847–00 for Class 5 equipment.
Nonoperating Temperature	– 40° C TO + 71° C. The environmental exposure is the procedure stated in Tektronix Design Standard 062–2847–00 for Class 5 equipment.
Humidity	The environmental exposure is the procedure stated in Tektronix Design Standard 062–2847–00 for Class 5 equipment.
Packaged Product Vibration and Shock	The packaged product qualifies under the Distribution Cycle 1 Assurance Level II for packaged products 0 – 20 lbs. Test 2 for Warehouse and Vehicle Stacking (Compression) is omitted. Tektronix standard 062–2858–00, Rev. B, Class 5.
Altitude	Operating: 15,000 ft. Nonoperating: 50,000 ft.

WARNING

The following servicing instructions are for use only by qualified personnel. To avoid injury, do not perform any servicing other than that stated in the operating instructions unless you are qualified to do so. Refer to all safety summaries before performing any service.

Service Information

Theory of Operation

There are no user replaceable parts within the probe or the compensation box; however, this theory of operation is provided to assist you in isolating failures to either the probe or the host oscilloscope. Refer to Figure 4–1 for the probe's simplified schematic.

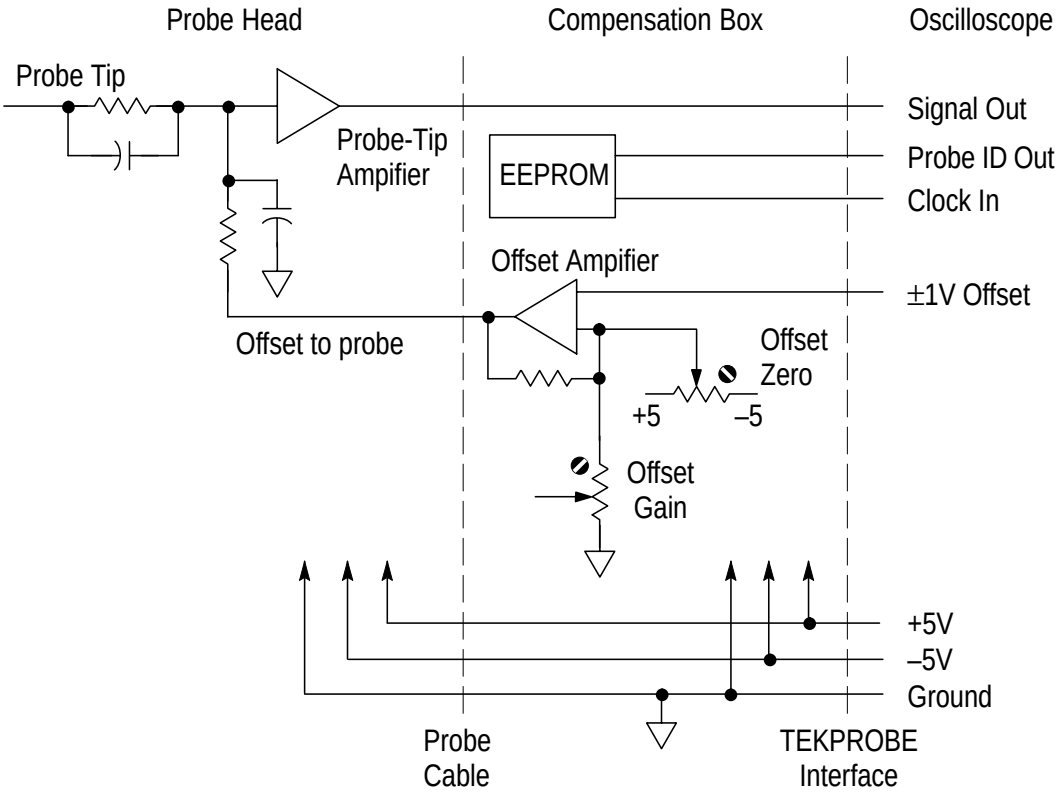


Figure 4–1: P6245AD Simplified Schematic Diagram

Probe Head and Cable Assembly

The probe head assembly contains an active amplifier circuit that buffers and amplifies the input signal. The amplifier receives power

and an offset level from the compensation box assembly via the cable assembly.

All signal amplification and buffering is performed in the probe head assembly. No further amplification takes place in the compensation box.

Compensation Box

The compensation box contains the following circuits:

- Offset amplifier
- Probe identification EEPROM
- TEKPROBE interface

Offset Amplifier

The offset amplifier is used to offset the input signal's DC component so that it stays at the optimal point of the probe's linear dynamic range. For more information on the linear dynamic range characteristic, refer to the notes on page 2–1.

The offset amplifier receives offset information as a ±1 VDC voltage from the oscilloscope. The amplfier then amplifies it to match the probe characteristics and applies it to the probe hybrid circuit.

The offset amplifier has two adjustments: offset zero and offset gain. These adjustments rarely need attention; however, detailed adjustment instructions are in the *Adjustments* section on page 4–8.

Probe Identification EEPROM

The probe identification EEPROM is used to configure the oscilloscope to the probe. The EEPROM receives a clock input from the oscilloscope, and information about the probe is passed to the oscilloscope.

TEKPROBE Interface

The TEKPROBE interface provides a communication path between the probe and the oscilloscope. Contact pins provide power, signal, offset, and data transfer for the probe identification EEPROM.

Figure 4–2 shows the TEKPROBE interface pin functions. Refer to the service documenation for your oscilloscope for more detailed specifications.

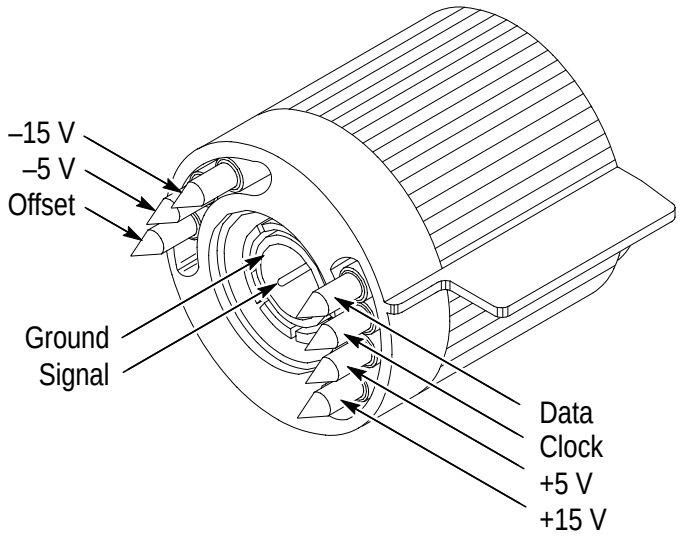


Figure 4–2: TEKPROBE Interface

Performance Verification

Equipment Required

Table 4–1: Equipment Required for Performance Verification

Item Description	Performance Requirement	Recommended Example
Oscilloscope	TEKPROBE interface	Tektronix TDS 684C
TEKPROBE Power Supply		Tektronix 1103
DC Power Supply	10.00 ±.01 VDC at 1 mA	Tektronix PS281
DC Voltmeter	0.5% accuracy at 2 VDC	Tektronix CDM250
Feedthrough Termination	50 Ω ± 0.50 Ω	011–0129–00
BNC to BNC coaxial cable	50 Ω coaxial cable	012–1342–00
BNC to Banana adapter	BNC Female to Dual Banana	103–0090–00

Equipment Setup

1. Connect the probe to the oscilloscope.
2. Connect a Y-lead adapter with KlipChip adapters attached to the P6245AD.
3. Turn on the oscilloscope and enable the channel.
4. Set the channel's vertical offset to 0.00 V.
5. Turn on the power supply and set to +2.00 VDC.
6. Connect the meter to measure the power supply output.
7. Allow 30 minutes for the equipment to warm up.

NOTE. *If your oscilloscope has a probe calibration routine, run it before making any of the following checks. Refer to the oscilloscope's instruction manual for more information.*

Offset Zero

Use this procedure to verify the offset zero of the probe.

1. Ground the probe tip by connecting the probe tip to the probe ground socket. (Connecting the two KlipChip adapters together is recommended.)
2. Set the channel's vertical offset to 0.00 V.
3. Measure the displayed DC level.

The displayed DC level should be 0.00 V ±50 mV. (±5 mV when measured directly without the probe attenuation factor.)

DC Accuracy

Use this procedure to verify the DC accuracy of the probe. Before beginning, read the procedure through completely.

1. Connect the test equipment as shown in Figure 4–3.
2. Attach the probe to a TEKPROBE interface on the 1103 power supply.
3. Set the 1103 offset **VAR/0V** to **0V**.
4. Set the multimeter to read DC volts.
5. Connect the probe tip and ground to the power supply using the Y-lead and KlipChip adapters.
6. Allow 30 minutes for the equipment to warm up.

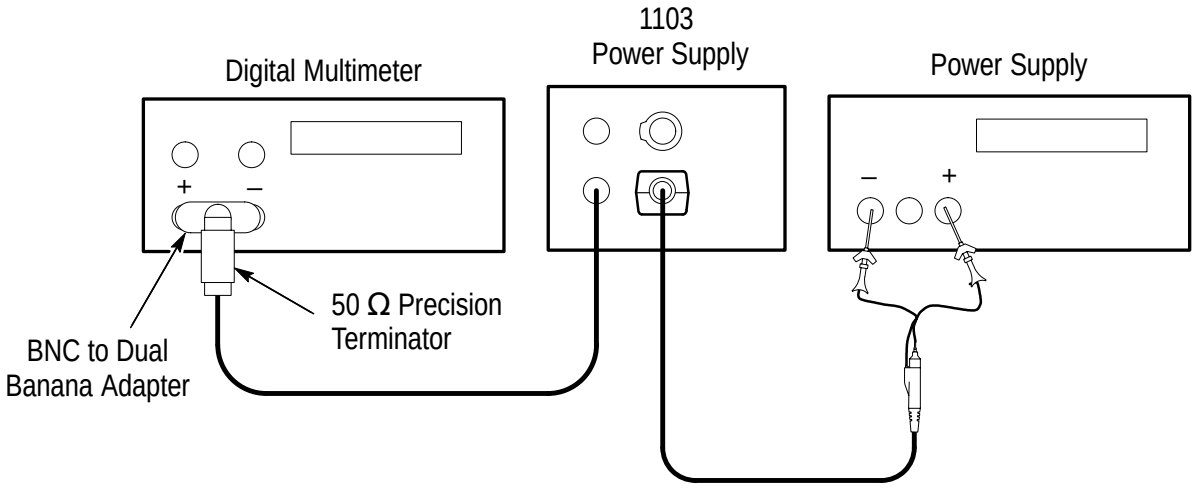


Figure 4–3: P6245AD DC Accuracy Setup

7. Set the power supply to +2.000 V. Record the power supply output as Vmax.
8. Measure and record the multimeter reading as M1.
9. Set the power supply to –2.000 V. Record the power supply output as Vmin.

10. Measure and record the multimeter reading as M2.

NOTE. *If you are unable to set the power supply precisely, record the actual readings and determine the absolute difference.*
|Vmax – Vmin| = difference.

Divide the difference by 10 to account for the probe's ideal attenuation factor. For example: 0.4 is the difference between +2 and –2, divided by 10.

11. Determine the percent error by using the formula below:

$$\%Error = [\frac{M1 - M2}{0.4} - 1] \times 100\%$$

The calculated error should be ≤2%.

NOTE. *An unaccceptable error value may result if a low tolerance termination is substituted for the recommended termination.*

Adjustments

The P6245AD has two internal controls: offset zero and offset range. These controls rarely need to be adjusted, and only should be changed after a probe calibration and functional check has been performed on the oscilloscope.

To make adjustments to the probe, the compensation box top cover needs to be removed with the optional release tool. Refer to page 4–12. Use the optional adjustment tool for making any adjustments.

Adjustment Locations

Refer to Figure 4–4 for the location of the offset zero and offset range controls.

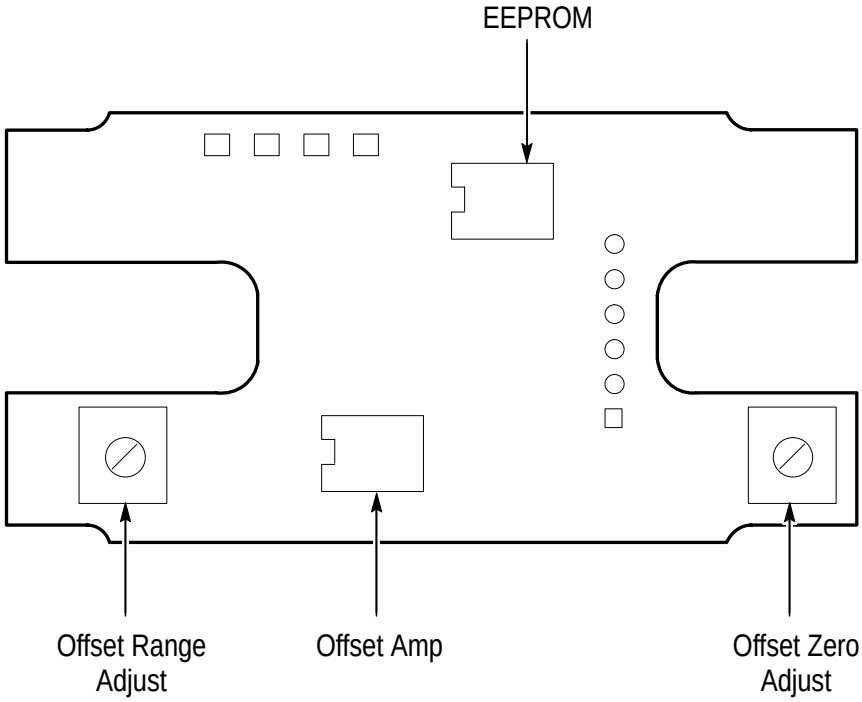


Figure 4–4: P6245AD Adjustment Locations

Offset Zero

Use this procedure to adjust the offset zero of the probe.

***NOTE**. If your oscilloscope supports a probe calibration routine, clear the probe calibration constants at this time.*

If the offset zero is adjusted, perform a functional check of the offset range before closing the compensation box.

1. Ground the probe tip by connecting the probe tip to the probe ground socket.
2. Set the vertical offset of the channel to 0.00 V.
3. Measure the displayed DC level.
4. Adjust **Offset Zero** for 0.00 ± 50 mV. (±5 mV when measured directly without attenuation factor.)

Offset Range

Use this procedure to adjust the offset range of the probe. The offset zero of the probe should be checked before making any adjustment to the offset range.

The offset range of the probe is approximately –10 to +10 volts. The offset range is not warranted; however, this adjustment procedure is provided for your convenience.

***NOTE**. If you are using an 1103 Probe Power Supply, make sure that the oscilloscope is set to 50 Ω termination with DC coupling.*

See Figure 4–4 for the location of the offset range adjustment.

1. Set the power supply (using the DMM) to +10.00 VDC. (If 10.00 V cannot be set exactly, set the power supply just below 10.00 V.)
2. Connect the probe to the power supply as shown in Figure 4–3.
3. Set the channel's vertical offset to match the DMM reading.
4. Set the vertical range of the channel to 0.1 V/div.
5. Observe the DC value of the displayed trace.
6. Adjust **Offset Range** for an oscilloscope reading that matches the DMM reading.

***NOTE**. After the offset zero and offset range have been adjusted, perform a probe calibration and functional check to verify performance.*

Maintenance

This section details the maintenance and repair procedures for the P6245AD.

Replacing TEKPROBE Interface Pins

TEKPROBE interface pins can stick and fail to make contact after time. Periodically check to see that each of the interface pins move freely and fully extends out of the interface. If any pin fails to move freely and fully extend, it should be replaced.

To remove a TEKPROBE interface pin, firmly grasp the pointed tip with pliers and pull the pin out of the connector. See Figure 4–5.

No tools are required to install a replacement pin. Insert a new pin into the connector socket as far as possible using finger pressure. If necessary, seat the pin into the connector by pressing the tip gently but firmly against a hard surface, such as a wood block or table top.

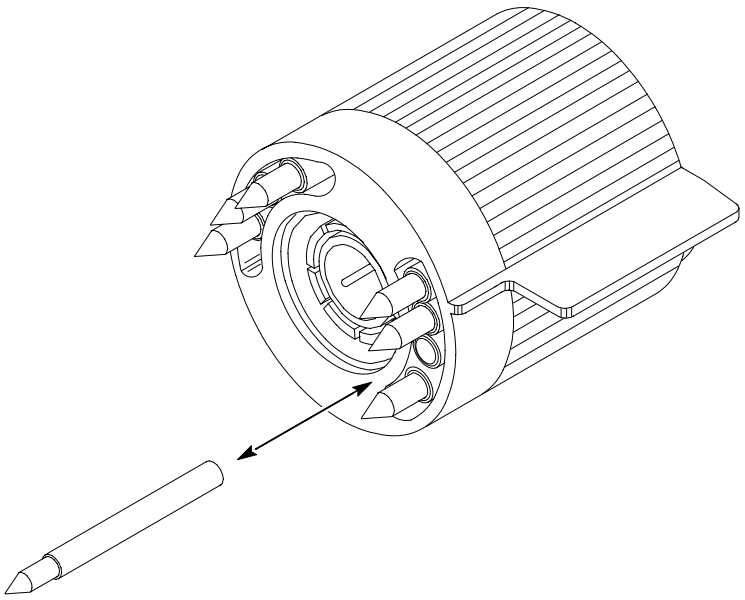


Figure 4–5: Replacing TEKPROBE Interface Pins

Removing and Replacing the Compensation Box Covers

Follow these steps to open the compensation box.

1. Press the optional release tool pins into the compensation box cover catches and gently lift the cover off a small distance. Refer to Figure 4–6.
2. Hold the open edge apart, and use the tool to open the other side of the compensation box.
3. With both sides of the box open, gently separate the two halves of the compensation box.

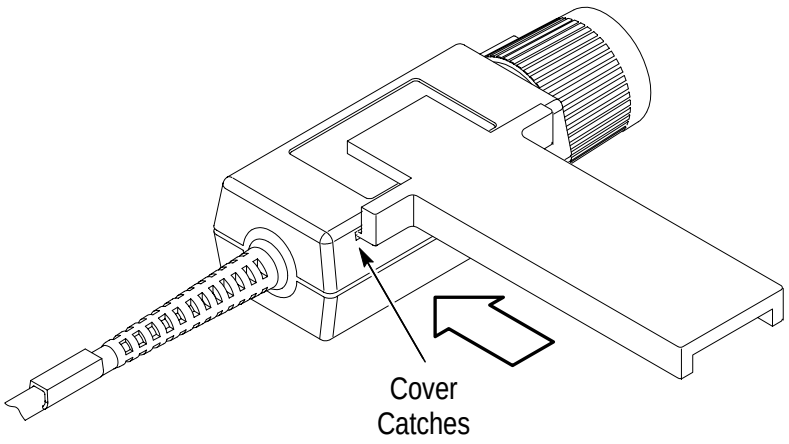


Figure 4–6: Removing the Compensation Box Covers

To replace the covers, follow these steps:

1. Align the TEKPROBE interface and the strain relief notches with the tabs on the cover. Refer to Figure 4–7.
2. Press the cover catches in so that the cover can be lowered.
3. Slide the tab into the notch.
4. Firmly press the pieces together until the cover catches snap into place.

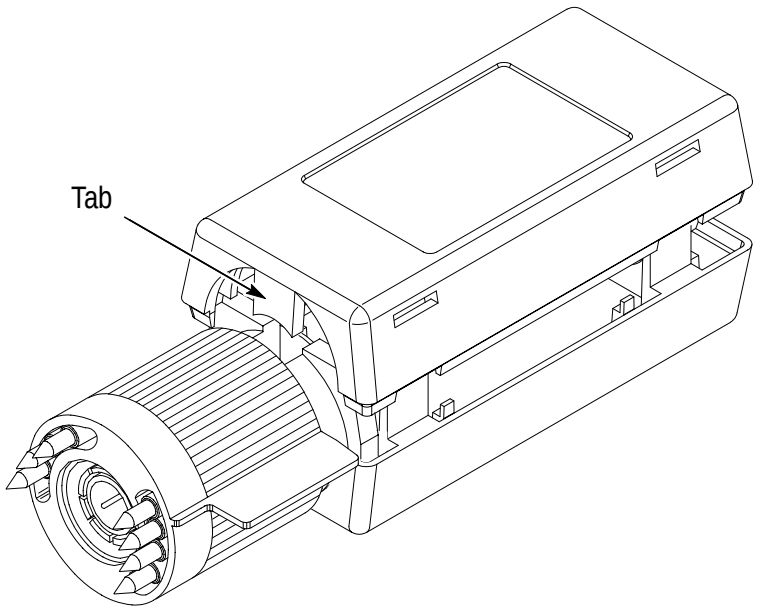


Figure 4–7: Replacing the Compensation Box Cover

Removing and Replacing the TEKPROBE Interface Collar

To remove the TEKPROBE interface collar, firmly grasp the compensation box body with one hand, and the TEKPROBE interface collar with the other hand. Firmly pull the interface collar off.

To replace the collar, first note the pin configuration on the compensation box, and their holes in the interface collar. The group of three pins fit through the smaller of the two holes in the interface collar. See Figure 4–8.

Align the tab to the slot and gently press the two pieces together. See Figure 4–8.

Once installed, the TEKPROBE collar should rotate freely to lock and unlock.

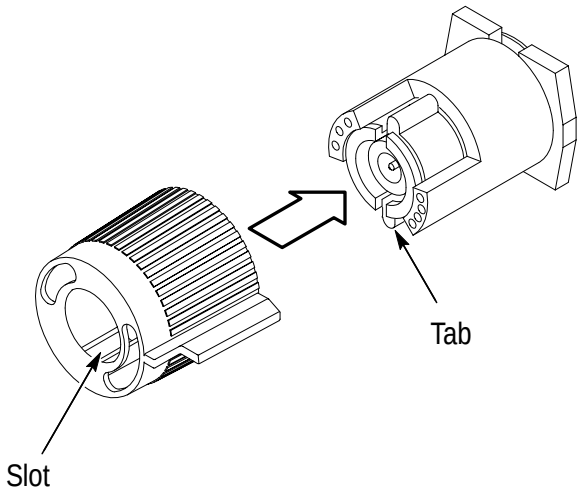


Figure 4–8: Replacing the TEKPROBE collar

Inspection and Cleaning

To prevent damage to probe materials, avoid using chemicals that contain benzine, benzene, toluene, xylene, acetone, or similar solvents.

Do not immerse the probe or use abrasive cleaners.

Dirt may be removed with a soft cloth dampened with a mild detergent and water solution, or isopropyl alcohol.

Replacement Parts

Refer to the Replaceable Parts section for a list of customer replacement parts. Due to the sophisticated design of the P6245AD, there are no user replaceable parts within the probe.

Preparation for Shipment

If the original packaging is unfit for use or not available, use the following packaging guidelines:

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 a plastic bag or wrap 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.

Troubleshooting

This troubleshooting documentation details isolation to either the probe or the TEKPROBE oscilloscope.

To troubleshoot the P6245AD, the probe must be attached to an operating TEKPROBE interface oscilloscope with the top cover of the compensation box removed. Refer to page 4–12 for instructions on opening the compensation box.

The host instrument should be set to the following settings:

- 50 Ω termination at instrument.
- DC coupling

CAUTION. *Observe caution when probing in the compensation box. Operating voltages will be present. Be careful not to touch or ground energized components.*

Work at a Level 1 ESD workstation when performing troubleshooting. The compensation box contains static sensitive devices.

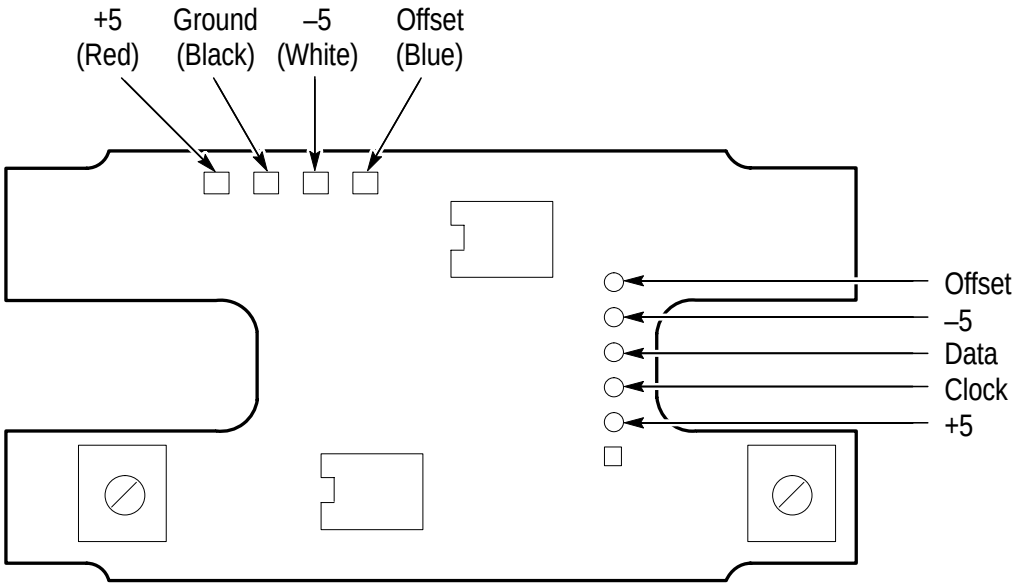


Figure 4–9: Compensation Box Test Point Locations

Refer to Table 4–2 for troubleshooting proceedures, and Figure 4–9 for troubleshooting test points.

Table 4–2: Troubleshooting Guide

Symptom	Checks	Result	Action
No Signal Out	Check known signal	No signal.	Continue checks
	Go to Probe Power	Probe power OK.	Turn in probe.
Distorted or nonlinear signal	Instrument set to 50 Ω termination?	No	Set termination to 50 Ω, or install a feedthrough termination at the instrument input.
		Yes	Continue
Distorted or nonlinear signal	Signal within linear dynamic range? See page 2–1.	No	Set channel's vertical offset to match signal characteristic.

Table 4–2: Troubleshooting Guide (Cont.)

Symptom	Checks	Result	Action
No Offset Adjust (Signal present)	Go to Probe Power	Probe power OK	Continue checks
	Check variation of offset input from host instrument. See Figure 4–9. Signal should vary between +1 V and –1 V.	Offset input OK	Turn in probe.
		Offset input bad	Check TEKPROBE interface pins on the compensation box. See page 4–11.
			Check TEKPROBE interface on host instrument. (Try an adjacent channel.)
			Repair host instrument
Probe Power	Check the power test points in the compensation box. See Figure 4–9.	Power OK	Continue checks.
		Power bad	Check TEKPROBE interface pins on the compensation box. See page 4–11.
			Check TEKPROBE interface on host instrument. (Try an adjacent channel.)
			Repair host instrument

Replaceable Parts

Replaceable Parts

This section contains a list of the replaceable parts for the P6245AD. Use this list to identify and order replacement parts.

Parts Ordering Information

Replacement parts are available from or through your local Tektronix, Inc. service center or representative.

Changes to Tektronix instruments are sometimes made to accommodate improved components as they become available and to give you the benefit of the latest circuit improvements. Therefore, when ordering parts, it is important to include the following information in your order:

- Part number
- Instrument type or model number
- Instrument serial number
- Instrument modification number, if applicable

If a part you order has been replaced with a different or improved part, your local Tektronix service center or representative will contact you concerning any change in the part number.

Using the Replaceable Parts List

The tabular information in the Replaceable Parts List is arranged for quick retrieval. Understanding the structure and features of the list will help you find the all the information you need for ordering replacement parts.

Item Names

In the Replaceable Parts List, an Item Name is separated from the description by a colon (:). Because of space limitations, an Item Name may sometimes appear as incomplete. For further Item Name identification, U.S. Federal Cataloging Handbook H6-1 can be used where possible.

Indentation System

This parts list is indented to show the relationship between items. The following example is of the indentation system used in the Description column:

1 2 3 4 5 Name & Description
Assembly and/or Component
Attaching parts for Assembly and/or Component
(END ATTACHING PARTS)
Detail Part of Assembly and/or Component
Attaching parts for Detail Part
(END ATTACHING PARTS)
Parts of Detail Part
Attaching parts for Parts of Detail Part
(END ATTACHING PARTS)

Attaching parts always appear at the same indentation as the item it mounts, while the detail parts are indented to the right. Indented items are part of, and included with, the next higher indentation. Attaching parts must be purchased separately, unless otherwise specified.

Abbreviations

Abbreviations conform to American National Standards Institute (ANSI) standard Y1.1

CROSS INDEX – MFR. CODE NUMBER TO MANUFACTURER

Mfr. Code	Manufacturer	Address	City, State, Zip Code
80009	TEKTRONIX INC	14150 SW KARL BRAUN DR PO BOX 500	BEAVERTON OR 97077–0001

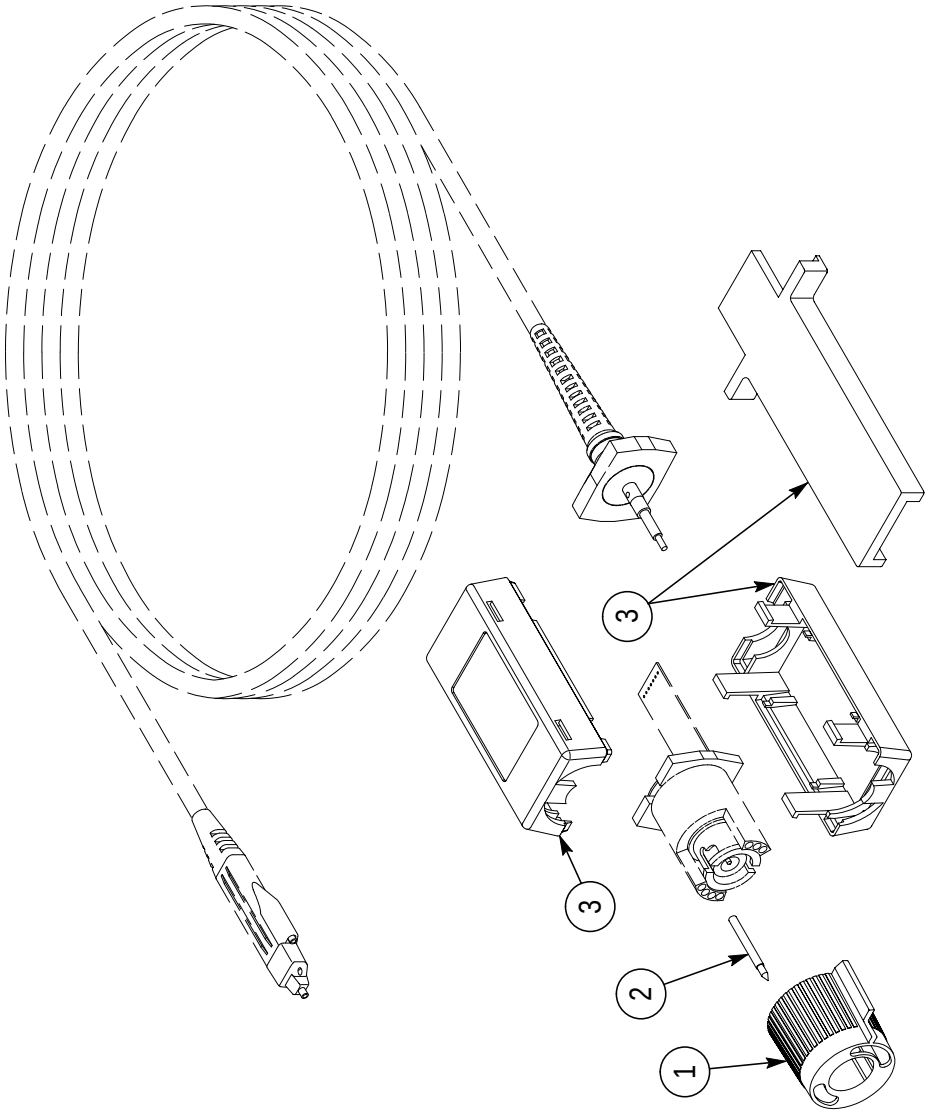


Figure 5–1: P6245AD Replaceable Parts

Fig. & Index No.	Tektronix Part No.	Serial No. Effective	Dscont	Qty	12345 Name & Description	Mfr. Code	Mfr. Part No.
5–1	P6245AD			1	PROBE, FET ACT:10X,<1PF,TDS SERIES	80009	P6245AD
–1	205–0191–00			1	.SHELL,ELEC CONN:BNC,ABS,DOVE GRAY	80009	205019100
–2	131–3627–01			1	.CONTACT,ELEC:GOLD PLATED TIP	80009	131362701
–3	200–4195–00			1	.COVER,COMP BOX:TOP AND BOTTOM, W/LABELS & .RELEASE TOOLS	80009	200419500

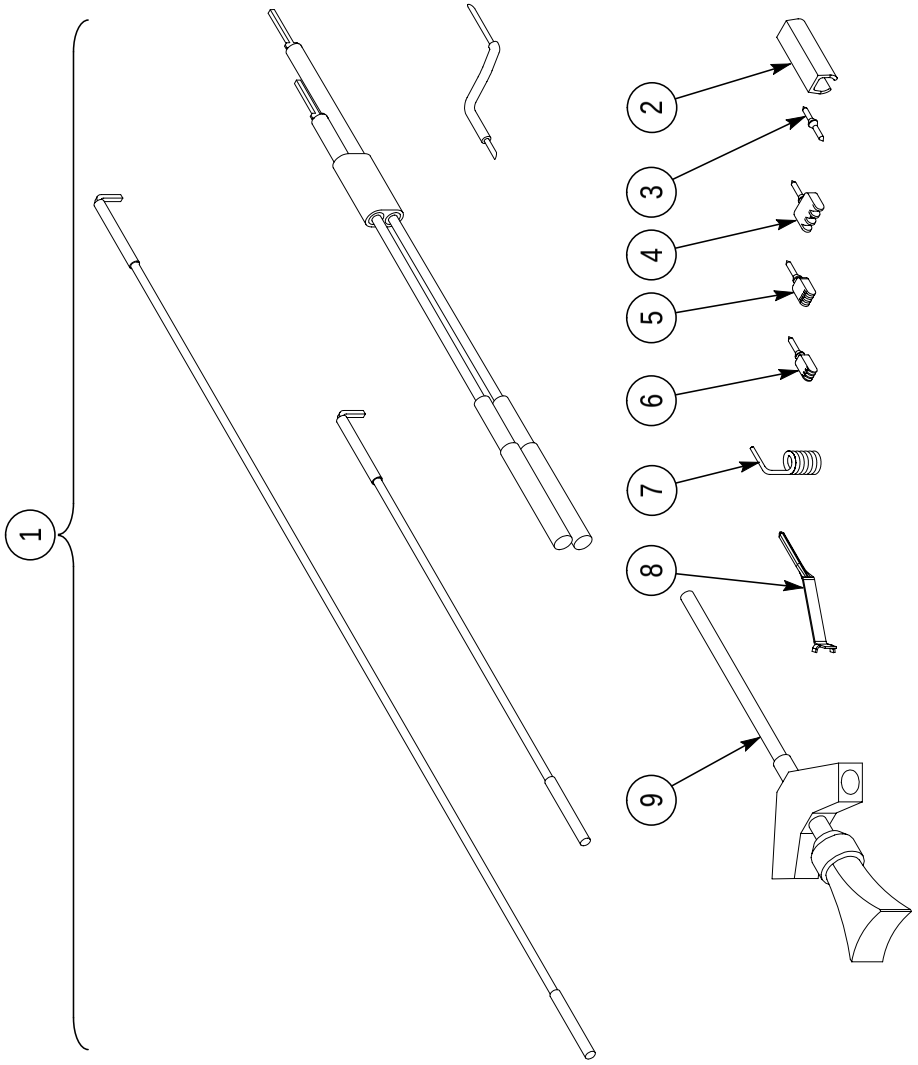


Figure 5–2: P6245AD Standard Accessories

Fig. & Index No.	Tektronix Part No.	Serial No. Effective	Dscont	Qty	12345 Name & Description	Mfr. Code	Mfr. Part No.
5–2					**STANDARD ACCESSORIES**		
–1	196–3410–00			1	LEAD,SET:TWO 3.0 L & 6.O L,STRD,22 AWG & TW O 3.0 L BLACK & WHITE 22 AWG,JACK TIP,TERM CONN MALE PIN,TWO Z–LEAD	80009	196341000
–2	016–1315–00			1	MARKER KIT,ID:CABLE MARKER BAND,2 EACH, VARIOUS COLORS	80009	016131500
–3	131–5638–11			1	PROBE,TIP:PACKAGE OF 10	80009	131563811
–4	————			2	ADAPTER,PROBE:0.050 HOUSING		
–5	————			2	ADAPTER,PROBE:0.025 HOUSING		
–6	————			2	ADAPTER,PROBE:0.0196 HOUSING		
–7	214-4227-00			2	SPRING ADAPTER:RIGHT ANGLE	80009	214-4227-00
–8	131-5777-00			2	CONN,CONTACT:	80009	131-5777-00
–9	————			4	TIP,PROBE:MICROCKT TEST		
	071–0687–00			1	MANUAL,TECH:INSTRUCTION,P6245AD,DP	80009	071–0687–00

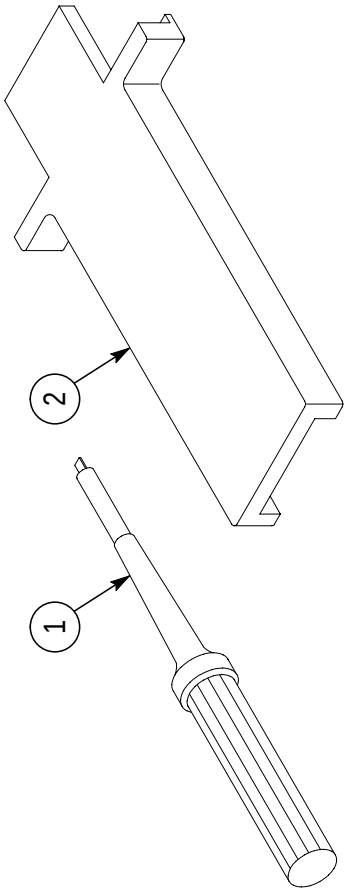


Figure 5–3: P6245AD Optional Accessories

Fig. & Index No.	Tektronix Part No.	Serial No. Effective	Serial No. Dscont	Qty	12345 Name & Description	Mfr. Code	Mfr. Part No.
5−3					**OPTIONAL ACCESSORIES**		
−1	003−1433−02			1	SCREWDRIVER:ADJUSTMENT TOOL,PKG OF 1	80009	003143302
−2	003−1383−00			1	RLSE TOOL,COVER:COMP BOX, POLYCARBONATE (SEE FIGURE 5−1−3)	80009	003138300
	1103			1	TEKPROBE IF PS:W/OFFSET 2 CONN	80009	1103
	SF501			1	ADPTR,SUREFOOT:50 MIL JEDEC,PKG OF 12 (SEE 5−2−5)	80009	SF501
	SF502			1	ADPTR,SUREFOOT:25 MIL JEDEC,PKG OF 12 (SEE 5−2−6)	80009	SF502
	SF503			1	ADPTR,SUREFOOT:0.5 MM EIAJ,PKG OF 12 (SEE 5−2−4)	80009	SF503
	SMG50			1	PKG OF 20 (SEE 5−2−9)	80009	SMG50