Instruction Manual

Tektronix

P6241
4.0 GHz 10X Active Probe

071-1188-02

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 the products that it manufactures and sells will be free from defects in materials and workmanship for a period of one (1) year from the date of shipment. If a product proves defective during this warranty 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 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.

THIS WARRANTY IS GIVEN BY TEKTRONIX IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED. TEKTRONIX AND ITS VENDORS DISCLAIM ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. TEKTRONIX' RESPONSIBILITY TO REPAIR OR REPLACE DEFECTIVE PRODUCTS IS THE SOLE AND EXCLUSIVE REMEDY PROVIDED TO THE CUSTOMER FOR BREACH OF THIS WARRANTY. TEKTRONIX AND ITS VENDORS WILL NOT BE LIABLE FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES IRRESPECTIVE OF WHETHER TEKTRONIX OR THE VENDOR HAS ADVANCE NOTICE OF THE POSSIBILITY OF SUCH DAMAGES.

Table of Contents

List of Figures

List of Tables

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. 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.

Connect the ground lead of the probe to earth ground only.

Do Not Operate Without Covers. Do not operate this product with covers or panels removed.

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.

Keep Product Surfaces Clean and Dry.

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.*

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.

Symbols on the Product. These symbols may appear on the product:

CAUTION
Refer to Manual

Service Safety Summary

Only qualified personnel should perform service procedures. Read this *Service Safety Summary* and the *General Safety Summary* before performing any service procedures.

Do Not Service Alone. Do not perform internal service or adjustments of this product unless another person capable of rendering first aid and resuscitation is present.

Disconnect Power. To avoid electric shock, switch off the instrument power, then disconnect the power cord from the mains power.

Use Care When Servicing with Power On. Dangerous voltages or currents may exist in this product. Disconnect power, remove battery (if applicable), and disconnect test leads before removing protective panels, soldering, or replacing components.

To avoid electric shock, do not touch exposed connections.

Preface

This is the Instruction Manual for the P6241 probe. This manual provides operating information, specifications, service information and a replaceable parts list.

Manual Structure

The manual includes both operating and service information. The first section of the manual contains the topics for operating the probe.

The service section of the manual begins with the *Theory of Operation.* The information in the service section of the manual is intended only for use by qualified service personnel.

Contacting Tektronix

Phone	1-800-833-9200*
Address	Tektronix, Inc. Department or name (if known) 14200 SW Karl Braun Drive P.O. Box 500 Beaverton, OR 97077 USA
Web site	www.tektronix.com
Sales support	1-800-833-9200, select option 1*
Service support	1-800-833-9200, select option 2*
Technical support	Email: techsupport@tektronix.com 1-800-833-9200, select option 3* 1-503-627-2400 6:00 a.m. – 5:00 p.m. Pacific time

*** This phone number is toll free in North America. After office hours, please leave a voice mail message.**
Outside North America, contact a Tektronix sales office or distributor; see the Tektronix web site for a list of offices.

Product Description

The Tektronix P6241 is a 4.0 GHz, 10X active probe with <0.5 pF input capacitance. The P6241 low input capacitance and high (40 kΩ) input resistance minimize circuit loading over a wide bandwidth range. The small profile and low-mass head of the P6241 make probing dense circuits by hand fast and easy. The accessory tips and adapters included with the probe enable the P6241 to be used on a wide variety of circuit architectures.

The P6241 is powered through a TEKPROBE interface between the probe compensation box and the host instrument. The P6241 can be used with nonTEKPROBE host instruments by using the optional Tektronix 1103 Probe Power Supply.

Options

The following options are available when ordering the P6241 probe:

- Option D1 — Calibration Data Report
- Option C3 — 3 years Calibration Service
- Option D3 — 3 years Calibration Data Report (requires Option C3)
- Option R3 — 3 years Repair Service
- Option C5 — 5 years Calibration Service
- Option D5 — 5 years Calibration Data Report (requires Option C5)
- Option R5 — 5 years Repair Service

Refer to *Features and Accessories* on page 3 for more information on using the probe and accessories.

For part number information for standard and optional accessories, refer to *Replaceable Parts* on page 65.

Features and Accessories

The P6241 is provided with several features and accessories designed to make probing and measurement a simpler task. Please familiarize yourself with these items and their uses.

WARNING. *To avoid injury, use care when handling accessories with sharp tips.*

Table 1: P6241 features and standard accessories

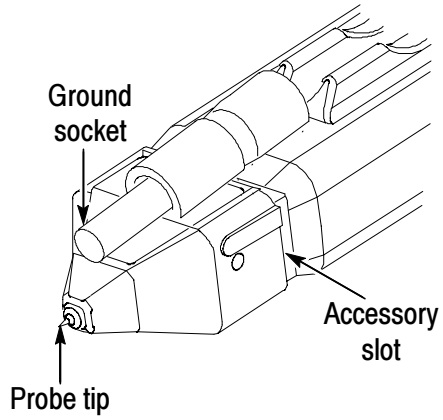
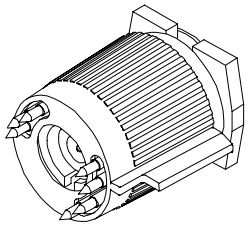
Feature/Accessory	Description
	**Probe head assembly.** The probe head is designed for ease of use and high performance. The small size makes it easy to handle in tight areas. The probe head features a slot that is designed for holding accessories in place.
	**TEKPROBE interface.** The TEKPROBE interface provides a communication path between the probe and the host instrument. Contact pins provide power, signal, offset, and probe characteristic data transfer. See page 41 for more information. If your host instrument 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.

Table 1: P6241 features and standard accessories (Cont.)

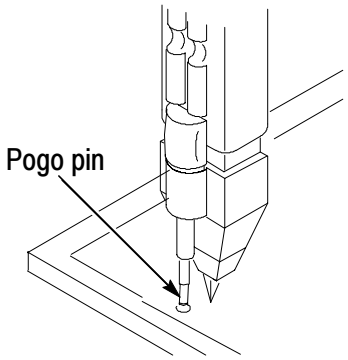
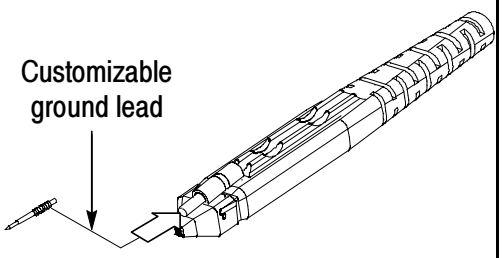
Feature/Accessory	Description
	**Short ground pogo pin.** This pogo ground pin has a flexible reach of .070 to 1.00 inches, and a .083 inch nominal center space. The pin retracts when pressure is applied. When a short ground is required for probing, insert the pogo pin into the ground socket of the probe or adapter. When selecting the grounding connection, maintain as short a ground path as possible. Refer to page 25 for more grounding information. Tektronix part number: 016-1917-XX (1 set)
	**Customizable ground lead.** This ground lead wire can be bent or cut shorter. **NOTE**: To ease insertion into the ground socket of the probe, cut the tip of this ground lead wire at a 30 to 60 degree angle. To maintain signal fidelity while probing, use as short a ground path as possible. Refer to page 25 for more grounding information. This accessory is not intended for use with the Square-pin adapter (Tektronix part number 016-1910-XX). Tektronix part number: 196-3482-XX (1 set)

Table 1: P6241 features and standard accessories (Cont.)

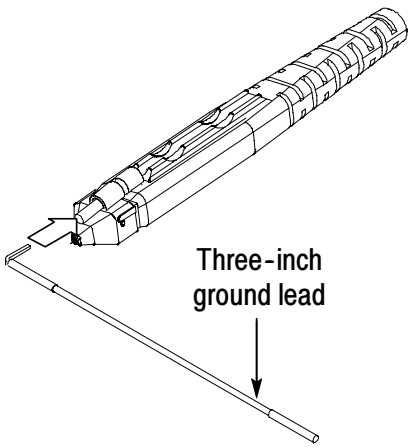
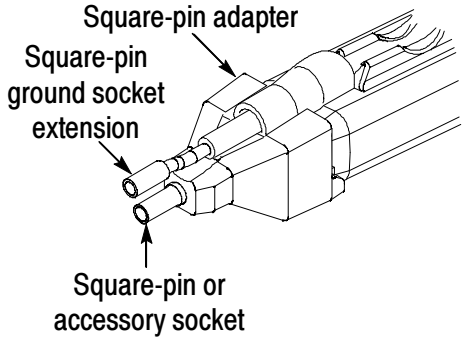
Feature/Accessory	Description
	**Three-inch ground lead.** Use the three-inch ground lead for general probing. The socketed end of the lead may be connected to any of the probe tips and adapters or fitted onto 0.025 inch square pins. To attach the ground lead, press and rotate the lead pin connector into the ground socket on the probe head. The lead may be removed by pulling the pin out by hand. When selecting the grounding connection, maintain as short a ground path as possible. Refer to page 25 for more information. Tektronix part number: 196-3437-10 (1 set)
	**Square-pin adapter.** This adapter has a socket for holding a square pin, or an adapter such as the SureToe, SMT KlipChip, and Y-lead adapters. A square-pin ground socket extension that you insert into the ground socket of the probe is included. These sockets can accept 0.100 inch or 0.080 inch centered square pins. To attach the square-pin adapter, hold it between your thumb and forefinger, and gently slip it over the probe head until the accessory slot on the probe head holds the adapter in place. Tektronix part number: 016-1910-XX (1 set)

Table 1: P6241 features and standard accessories (Cont.)

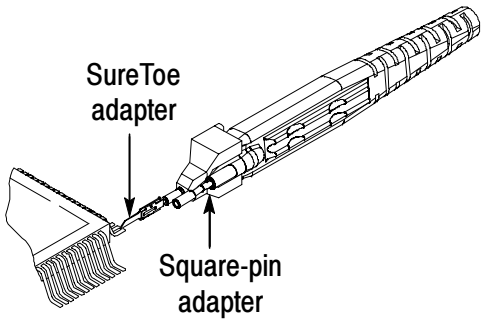
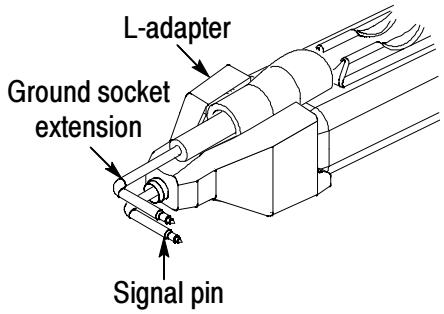
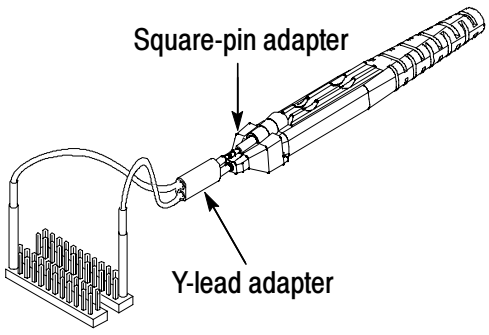
Feature/Accessory	Description
	**SureToe adapter (4 ea).** The SureToe adapter is a pointed probe tip useful for probing in IC legs. Mount the SureToe adapter in the signal pin socket of the Square-pin adapter. Attach the SureToe adapter the same way as you attach the push-in probe tips. This adapter can be used with any of the socketed accessory leads. Tektronix part number: ST501 (package of 12)
	**L-adapter.** This adapter enables you to probe and ground at right angles to the device under test (DUT), while holding the probe parallel to the DUT. A ground socket extension that you insert into the ground socket of the probe is included. To attach the L-adapter, hold it between your thumb and forefinger and gently slip it over the probe head until the accessory slot on the probe head holds the adapter in place. Tektronix part number: 016-1913-XX (1 set)
	**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 the Square-pin adapter. When selecting the grounding connection, maintain as short a ground path as possible. Refer to page 25 for more grounding information.

Table 1: P6241 features and standard accessories (Cont.)

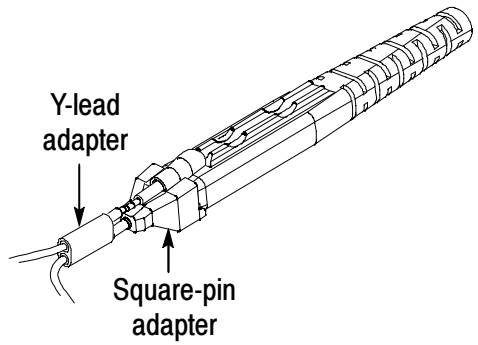
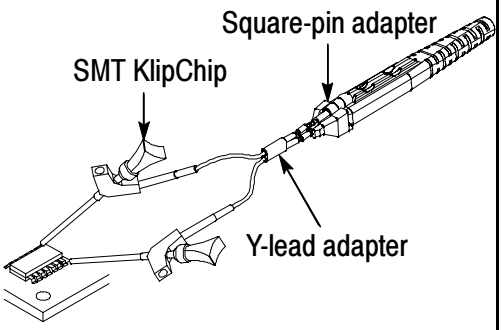
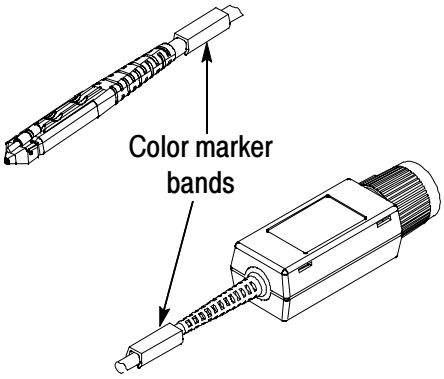
Feature/Accessory	Description
	To attach the Y-lead adapter, gently press the lead pins into the signal and ground sockets of the Square-pin adapter. Using the black lead for ground is recommended. Tektronix part number 196-3434-XX (2 each)
	**SMT KlipChip.** Use the clips of the SMT KlipChip to access fragile, dense circuitry. To use SMT KlipChips with the probe, connect the Square-pin adapter to the probe head. Plug the KlipChips into the Y-lead adapter, and then connect the Y-lead adapter to the Square-pin adapter. The SMT KlipChip body turns freely, allowing better probe orientation. To reduce stress and provide a low profile on components being tested, the flexible sleeve of the SMT KlipChip bends up to a 35 degree angle. Tektronix part number: 206-0364-XX (2 each)
	**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 identification of which probe is connected to which instrument channel. Tektronix part number: 016-1315-XX (1 set)

Table 1: P6241 features and standard accessories (Cont.)

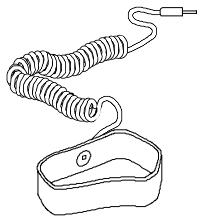
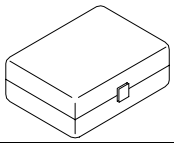
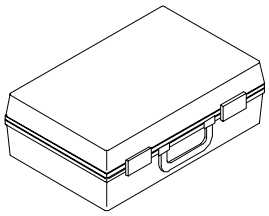
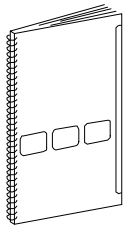
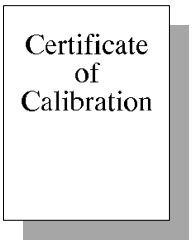
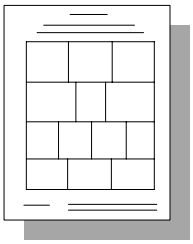
Feature/Accessory	Description
	**Antistatic wrist strap.** When using the probe, always work at an antistatic work station, and wear the antistatic wrist strap. Tektronix part number: 006-3415-XX (1 each)
	**Plastic accessory box.** Use the plastic box to store the probe accessories when not in use. Tektronix part number: 006-7164-XX
	**Instrument case.** The instrument case protects the probe from harsh environments. Tektronix part number: 016-1879-XX
	**Instruction Manual.** Provides specifications and instructions for operating the probe, and a list of accessories and adapters. Tektronix part number: 071-1188-XX
	**Calibration certificate.** A certificate of traceable calibration is provided with every instrument shipped.
	**Accessory reorder sheet.** The accessory reorder sheet provides photos and part numbers for identifying standard and optional accessories that are compatible with your probe. Tektronix part number 001-1349-XX

Table 2 lists the optional accessories that you can order for your probe.

Table 2: Optional accessories

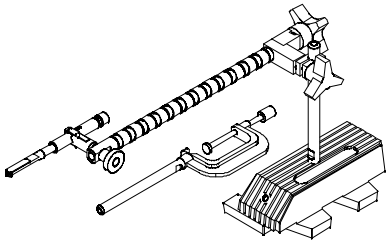
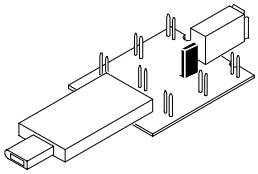
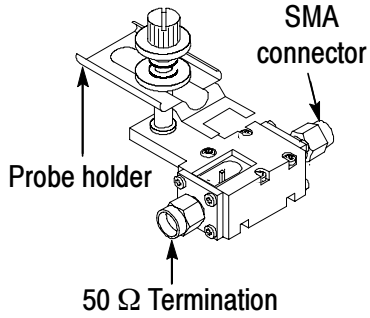
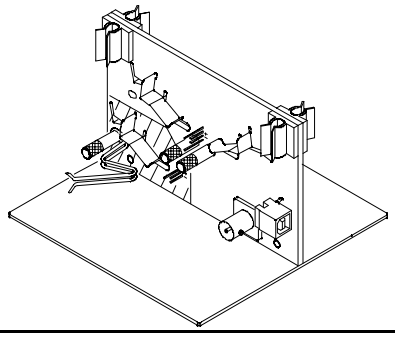
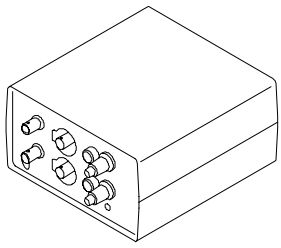
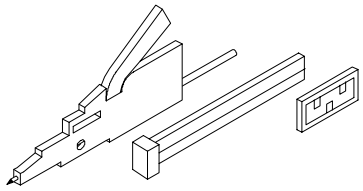
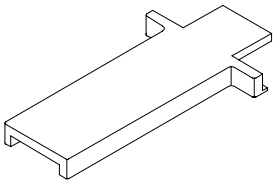
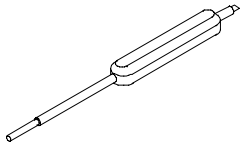
Feature/Accessory	Description
	**PPM100 Probe Positioner.** The PPM100 is a general purpose bench top probe holder with flexible arm, designed for hands-free probing and fine positioning adjustments. The heavy duty base can be replaced with the clamp for securing the probe arm in a variety of situations. Use flexible retention rings to attach the probe to the probe holder. Tektronix part number: PPM100
	**IEEE1394 Adapter.** The IEEE1394 Adapter allows you to probe signals on the bus, external to system enclosures, without disturbing system operation. The adapter maintains a balanced 50 Ω signal path and can be used in both single-ended and differential modes. Tektronix part number: 679-5027-XX
	**Probe Calibration Fixture.** Use this calibration fixture to connect the probe to SMA cables. The fixture includes a removable 50 Ω termination. The calibration fixture is required when performance verification is done for the probe. Tektronix part number: 067-1456-XX
	**Deskew Fixture.**This fixture provides a edge source to time align (deskew) and to optimize host instrument gain and offset accuracy at the probe tip. The probes are held in place allowing hands-free operation without requiring a probe arm. Tektronix part number: 067-0484-XX

Table 2: Optional accessories (Cont.)

Feature/Accessory	Description
	**1103 Power supply.** Order the 1103 power supply for performance verification procedures. Power cord options are available for the following countries or regions. **Standard.** North America and Japan **Option A1.** European **Option A2.** UK **Option A3.** Australia **Option A5.** Switzerland Tektronix part number: 1103
	**Micro KlipChip adapters.** Use the adapters to probe the leads on integrated circuits that are surface-mounted. Tektronix part number: SMK4 (2 sets of 2)
	**Release tool.** Use for opening the compensation box to access adjustments. Tektronix part number: 003-1383-XX
	**Adjustment tool.** Use for making internal adjustments to the probe. Tektronix part number: 003-1433-XX

Configuration

The P6241 provides the host instrument with the probe model number, serial number, and attenuation factor. When connected to a host instrument with a TEKPROBE interface, 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 P6241 on a nonTEKPROBE connector. Damage to the probe and connector may result.*

If your host instrument does not support the TEKPROBE interface, use the optional Tektronix 1103 Probe Power Supply. If the P6241 is used with the Tektronix 1103 Probe Power Supply, be sure to have a 50 Ω termination at the host instrument. Also, set the host instrument channel coupling to DC.

The probe offset is controlled by the host instrument. If the host instrument used does not support the TEKPROBE interface, use the offset controls on the optional Tektronix 1103 Probe Power Supply.

Probe Offset

Use the host instrument or the 1103 power supply to adjust the probe offset permitting operation within the linear range of the probe. Using the offset to cancel DC signal components enables optimal probe performance. See Figure 1 on page 13 for more information.

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

To set the probe offset, follow these steps:

1. Set the host instrument coupling to **GND**.

***NOTE**. The probe must be terminated with low impedance (<100 Ω) to correctly display offset voltage.*

---

2. Use the vertical position control to set a zero reference level on the host instrument display.
3. Set the host instrument coupling to **DC** and the vertical scale to **5 V/div**.
4. Attach the probe to the circuit.
5. Adjust the probe offset to bring the trace to the host instrument 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 P6241 has a ±10.0 V offset range. The linear operating range is* ±4.0 *V. See Figure 1. Also, see page 24 for more information.*

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

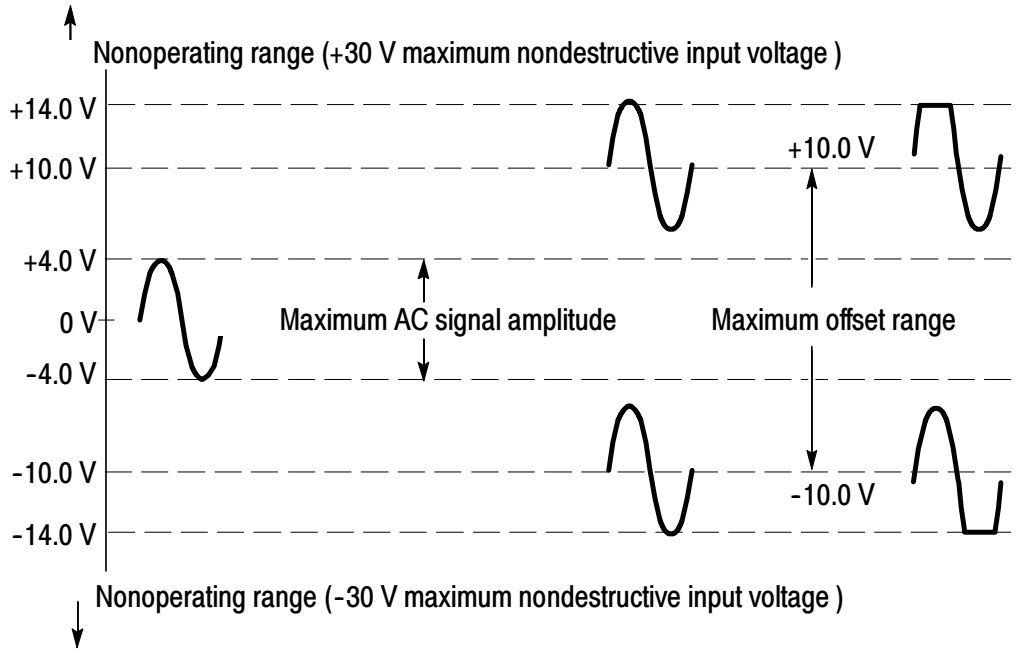


Figure 1: Dynamic and offset limitations

Functional Check

After installing the probe on the host instrument, a functional check may be performed using the PROBE COMPENSATION connections on the front panel of the host instrument.

Before you can connect the probe to the PROBE COMPENSATION on the host instrument, you must first attach the square-pin and Y-lead adapters and SMT KlipChips to the probe. See Figure 2.

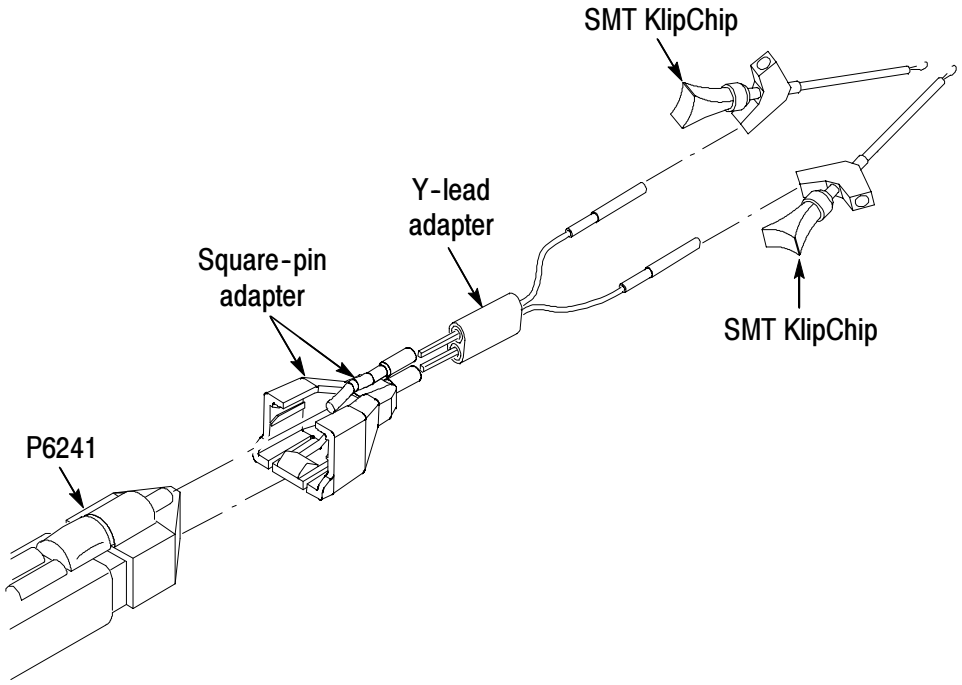


Figure 2: P6241 functional check setup

1. Hold the square-pin adapter between your thumb and forefinger and gently slip it over the probe head until the accessory slot on the probe head holds the adapter in place.
2. Gently press the lead pins from the Y-lead adapter into the signal and ground sockets of the square-pin adapter.

3. Plug the KlipChips into the Y-lead adapter.

Now you are ready to connect the probe to the PROBE COMPENSATION on the host instrument. See Figure 3. Use the optional deskew fixture for optimum connections.

***NOTE**. Figure 3 illustrates the probe compensation connection for TDS6000 and TDS7000 instruments. Your instrument may differ from Figure 3. Please refer to your host instrument for the exact location of the probe compensation connection.*

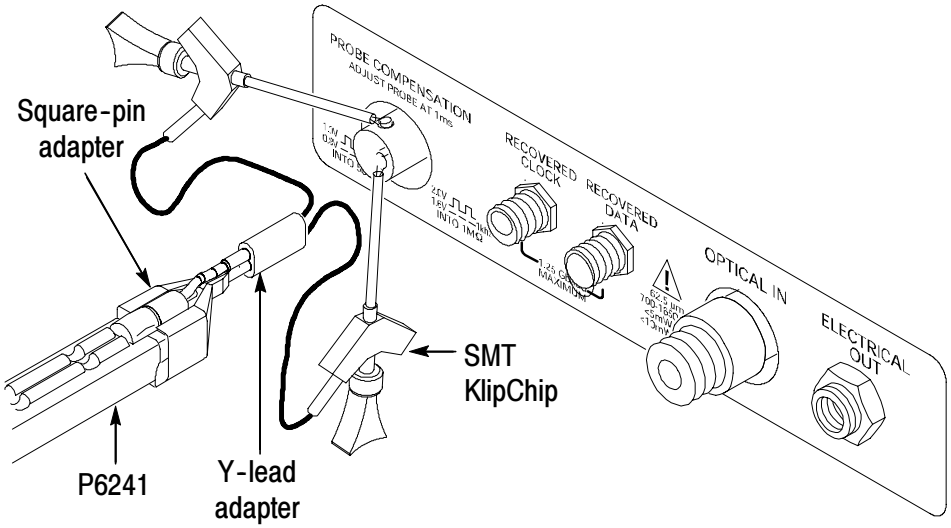


Figure 3: Probe functional check connections

1. Connect the probe to the host instrument.

2. Set the host instrument to display the probe channel.

3. If you have the optional deskew fixture, connect it to the PROBE COMPENSATION connections. Connect the probe to the deskew fixture (see Figure 4 on page 18), and proceed to step 6.

4. Using a ground lead and a SMT KlipChip, connect the probe ground to the PROBE COMPENSATION ground connection on the host instrument.
5. Using a standard tip, hold the probe to the SIGNAL terminal on the host instrument.
6. Adjust the host instrument to display a stable calibration waveform.

***NOTE**. If your instrument supports probe calibration routines, now is a good time to perform them. If your instrument returns a* Probe Cal Failed *message, refer to* Probe Calibration Errors *on page 20.*

---

7. Disconnect the probe from the deskew fixture or SIGNAL terminal, and ground the probe tip. (Connect the KlipChip to the probe tip.)
8. Set the probe offset to 0.0 V, so that the host instrument display is at the ground reference.
9. Set the host instrument V/div to 1 V.
10. Adjust V/div to keep waveform on the screen.

***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 host instrument termination is 50 Ω.

If the probe does not pass this functional check, go to *Troubleshooting* on page 61.

Deskew Fixture

The optional deskew fixture (Tektronix part number 067-0484-00) provides a convenient way to connect the probes in your system to the calibration signal for deskewing. The deskew fixture is configured to allow you to connect different probe models to the system. Refer to Figure 4 to see how two P6241 probes are connected. Figure 5 provides an enlarged view of the deskew fixture connections.

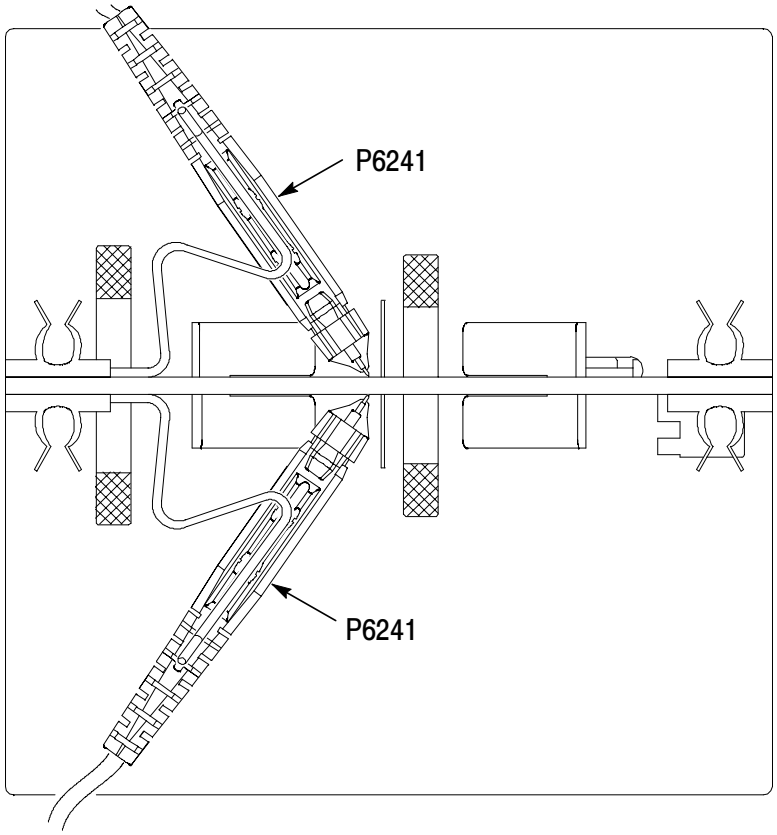


Figure 4: Deskew fixture connections (two P6241 probes shown)

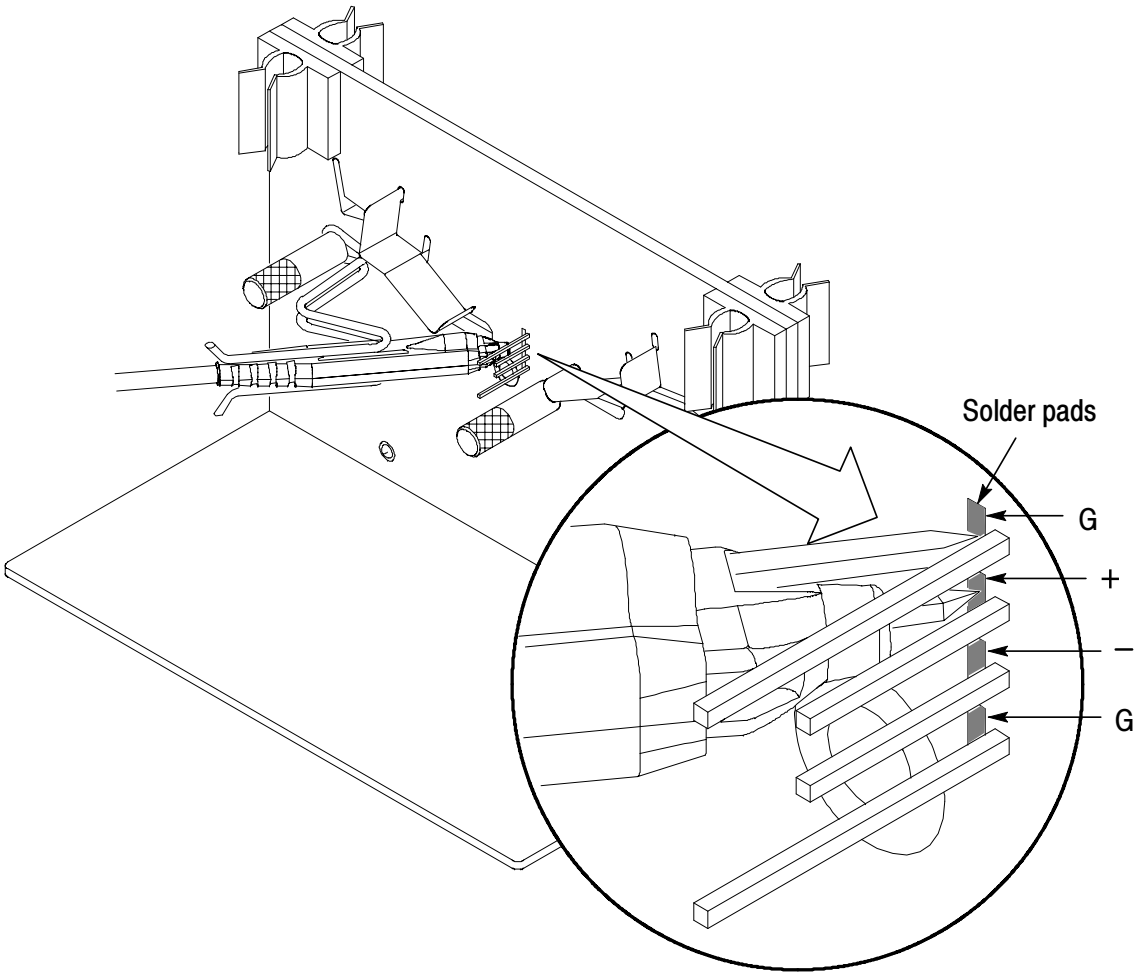


Figure 5: Detail of deskew fixture connections

For part number information for the deskew fixture, refer to *Replaceable Parts* on page 65.

Probe Calibration Errors

If you get the message “Probe Cal Failed”, or other calibration anomalies occur, you may be using a host instrument that is not fully compatible with the P6241 probe, or you may have a hardware problem.

Check Compatibility

Before suspecting a problem with your probe, compare your host instrument firmware version with those listed in Table 3.

Table 3: TDS500, 600, 700, 3000, 5000, 6000, or 7000 series instruments fully compatible with the P6241 probe

Model number	Compatible firmware versions
TDS520D	greater than FV:6.3e
TDS540D	greater than FV:6.3e
TDS580D	greater than FV:6.3e
TDS654C	FV:5.1e or above
TDS680C	FV:5.1e or above
TDS684C	FV:5.1e or above
TDS694C	All versions
TDS724D	greater than FV:6.3e
TDS754D	greater than FV:6.3e
TDS784D	greater than FV:6.3e
TDS794D	greater than FV:6.3e
TDS3000 series	All versions
TDS5000 series	All versions
TDS6000 series	All versions
TDS/CSA7000 series	All versions

***NOTE**. You can take P6241 probe measurements with any TDS500, 600, 700, 3000, 5000, 6000, or 7000 series instrument, regardless of firmware version. The fully compatible instruments listed in Table 3 give you enhanced accuracy after successfully passing the probe calibration function.*

Other TDS500, 600, or 700 series oscilloscopes may give the error message "Probe Cal Failed" when you run the probe calibration function, but the probe will still meet its warranted specifications.

Check for Hardware Problems

If the firmware version on your TDS500, 600, 700, 3000, 5000, 6000, or 7000 series oscilloscope is fully compatible with the P6241 probe, do the following:

1. Perform the Signal Path Calibration on the oscilloscope and wait for it to complete.
2. Rerun the calibration routine on the P6241 probe.
3. If the oscilloscope returns the failure message again, initialize the probe calibration, and check probe offset zero:
   - If offset zero is greater than ±25 mV, perform the *Offset Zero* adjustment on page 54 in the *Adjustments* section.
   - If offset zero is less than ±25 mV, check the *Offset Range* as instructed on page 55 in the *Adjustments* section.

***NOTE**. Step 3 does not apply to TDS3000 series instruments, because they do not support the offset zero function.*

4. Rerun the probe calibration function on the P6241 probe. If the probe calibration fails, run the calibration on another oscilloscope channel.
5. If the problem persists, there is a hardware fault. Please contact your nearest Tektronix Service Center for more information.

Operating Basics

Please follow these operating guidelines to get optimum performance from your P6241.

Handling the Probe

Exercise care when using and storing the P6241. The probe and cable are susceptible to damage caused by careless use. Always handle the probe using the compensation box and probe head, avoiding undue physical strain to the probe cable.

***NOTE**. To reduce the likelihood of creating signal aberrations be careful not to dent, kink, pull, or stretch the cable.*

Visible dents in the cable will increase signal aberrations.

***CAUTION.** Do not drop the probe or subject it to physical shock. Damage to the probe may result.*

Maximum Nondestructive Input Voltage

***CAUTION.** To avoid damage to the probe tip amplifier, do not apply voltages above the maximum nondestructive input voltage.*

Refer to *Specifications* on page 31 for the maximum operating voltage and frequency derating information.

Input Linear Dynamic Range

The probe head amplifier used by the P6241 has a limited linear operating range. The usable dynamic range is ±4.0 V however, to keep the input linearity error less than 0.1% you must limit the apparent signal input voltage to ±3.75 V.

Use the DC offset adjustment to maintain the probe within the dynamic range. The nominal offset adjustment range of the P6241 is ±10.0 VDC. For example: to offset a +2 VDC level in a circuit, set the offset to +2 V.

***NOTE**. The probe can tolerate input voltages of ±30 V without damage; however, the linearity error specification does not apply to input voltages exceeding ±14.0 V (including any DC offset). See Figure 1 on page 13.*

Electrical Effects of Adapters

The probe tip adapters included with your probe help connect to different types of components. While these adapters make connections easier, be aware the adapter that you choose may affect the signal that you are measuring, depending on a variety of factors, including signal frequency, source impedance, and lead length.

Use the probe without adapters to optimize step and frequency response. Using the probe tip adapters adds inductance and capacitance, which increase step response and aberrations, and leads to increased ripples in frequency response. These effects increase as the source impedance increases and measured waveform risetimes decrease.

Figure 6 on page 25 illustrates the typical effects on a given signal using some of the adapters included with your probe.

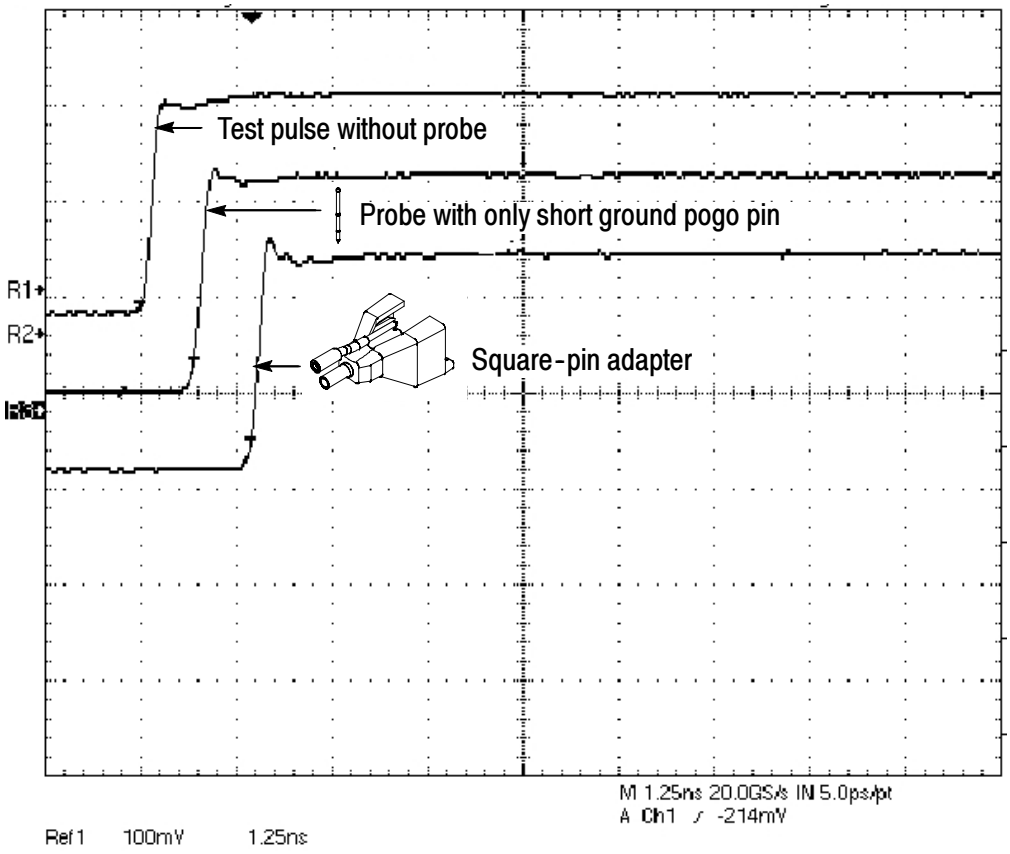


Figure 6: Typical effects of using probe tip adapter

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. When you touch your probe tip to a circuit element, you are introducing a new resistance, capacitance, and inductance into the circuit. This represents the characteristics of your probe and ground lead.

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 path. A portion of the ground lead path is uncontrollable since it is hardwired on the circuit board under test.

Calculate the approximate resonant frequency (f_0) at which this parasitic circuit will resonate, using 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 at least 3 times greater than the frequency of your measurements.

Either the short ground pogo pin or the customizable ground lead described in Accessories on page 4 can help you reduce the effects of ground lead inductance on your measurements.

Electrical Effects of Ground Lead Length

When you are probing a circuit, 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 host instrument. Refer to Figure 7 on page 27.

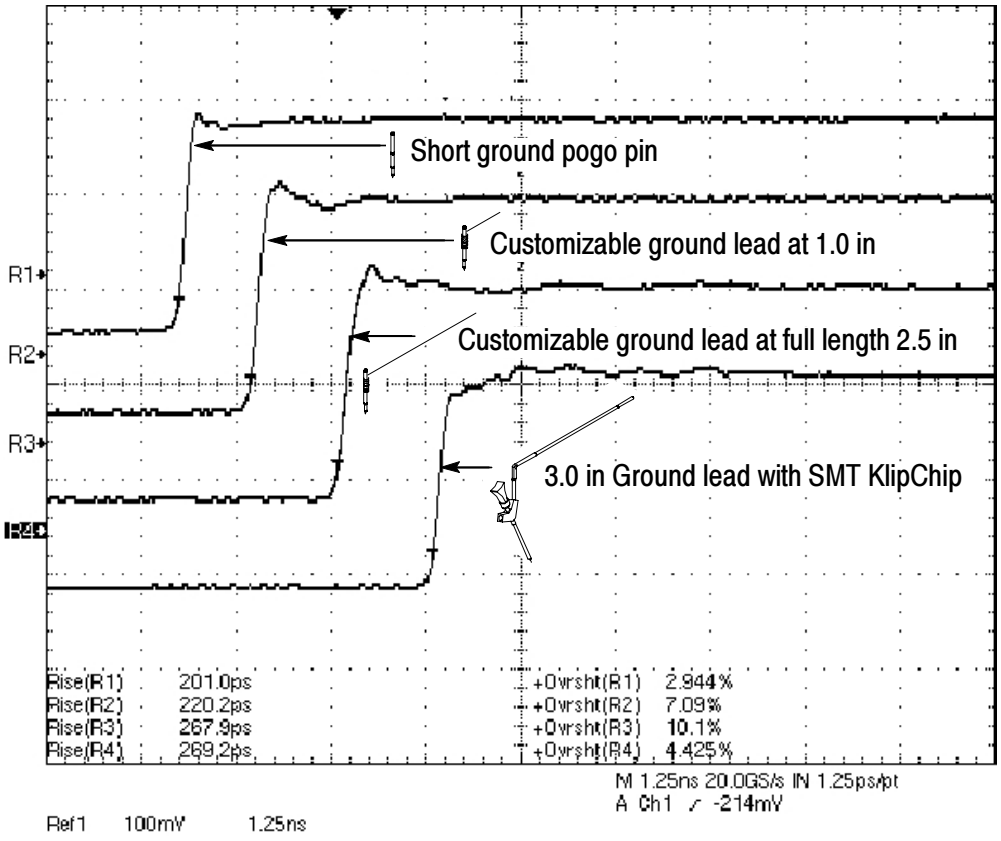


Figure 7: Waveform distortion from ground lead length

Helpful Hints

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

Low-Inductance Grounding

Placing a ground plane on top of the IC package being probed can minimize ground lead length and inductance. See Figure 8.

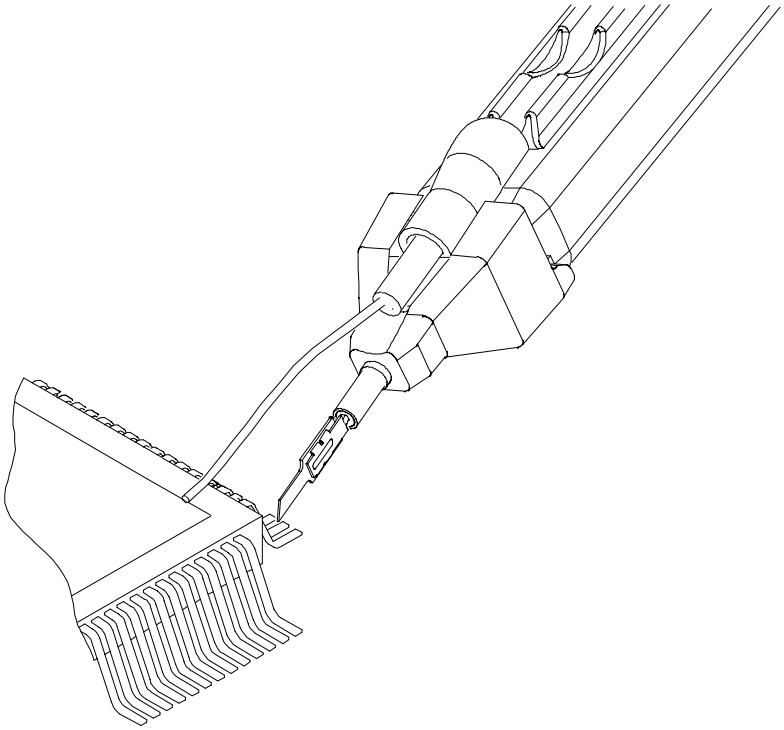


Figure 8: Low-inductance grounding

Attach a small piece of copper clad wire on top of the IC package and connect it to the IC package ground connection. Use the short pogo pin ground lead or the customizable ground lead to keep the ground lead length as short as possible.

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

SureToe Grounding

If you cannot use the recommended low-inductance grounding method, you may ground the probe to the IC package under test using a SureToe adapter. Refer to Figure 9.

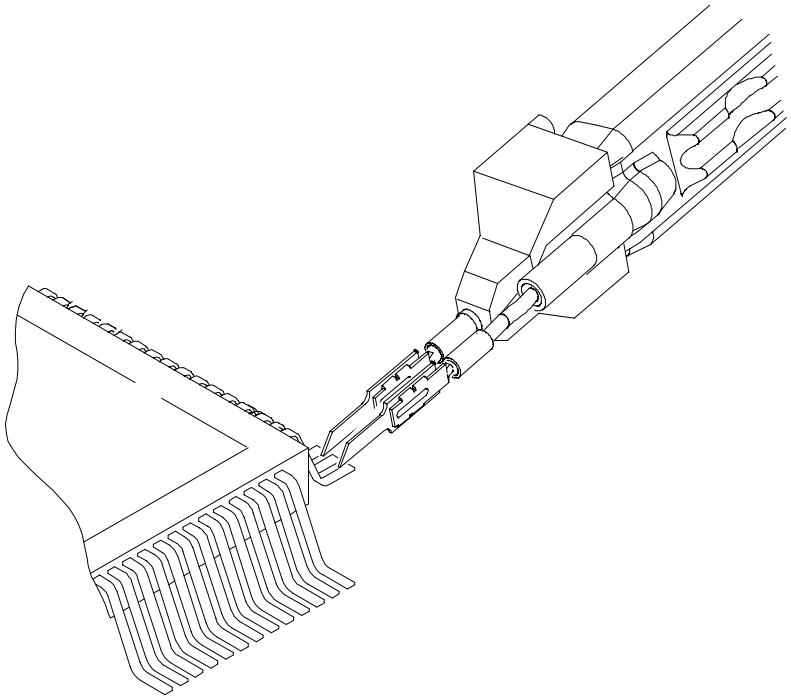


Figure 9: Using a SureToe adapter for grounding

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

Specifications

The probe and host 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 4: Warranted electrical specifications

Characteristic	Description
DC Gain Accuracy (probe only)	0.1 ±2% (excludes offset error)
Output Zero	±10 mV or less at output of probe
Rise Time (probe only)	≤120 ps

Table 5: Typical electrical characteristics

Characteristic	Description
Bandwidth, (probe only)	4.0 GHz (See Figure 11 on page 34)
Linear Input Dynamic Range	-4.0 V to +4.0 V. (Equivalent to -0.4 V to +0.4 V at the output of the probe.)
Offset Range	-10.0 V to +10.0 V
Delay Time	5.3 ns ±0.2 ns
System Noise	300 μV rms or less at output of probe with probe tip grounded

Table 5: Typical electrical characteristics (Cont.)

Characteristic	Description
Linearity	± 0.1% over a dynamic range of -3.75 V to +3.75 V ± 1.0% over a dynamic range of -4.0 V to +4.0 V
Nondestructive Input Voltage Range	-30 V to +30 V (DC + peak AC)
Input Resistance	40 kΩ (See Figure 10 on page 33 for impedance vs. frequency)
Input Capacitance	< 0.5 pF
DC Offset Drift	150 μV/°C or less at output of probe 0.75 mV/°C or less displayed on screen with TEKPROBE interface
DC Offset Scale Accuracy	±2% (of 10X actual probe gain)
DC Voltage Measurement Accuracy, referred to input	±(2% of input + (2% of offset) + 100 mV output offset + 80 mV linearity error)

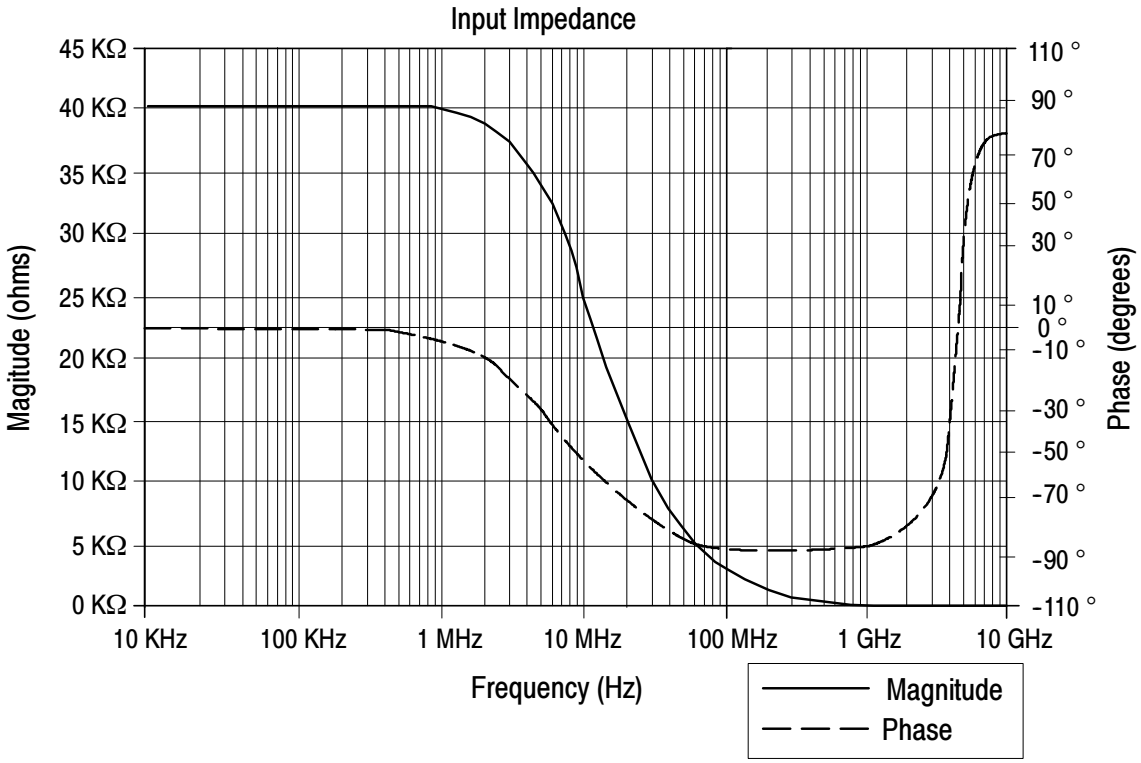


Figure 10: Typical input impedance and phase versus frequency

Table 6: Physical characteristics

Characteristic	Description
Net Shipping Weight	1.41 kg (3.1 lb)
Cable Length	1.3 meters (51.18 in)

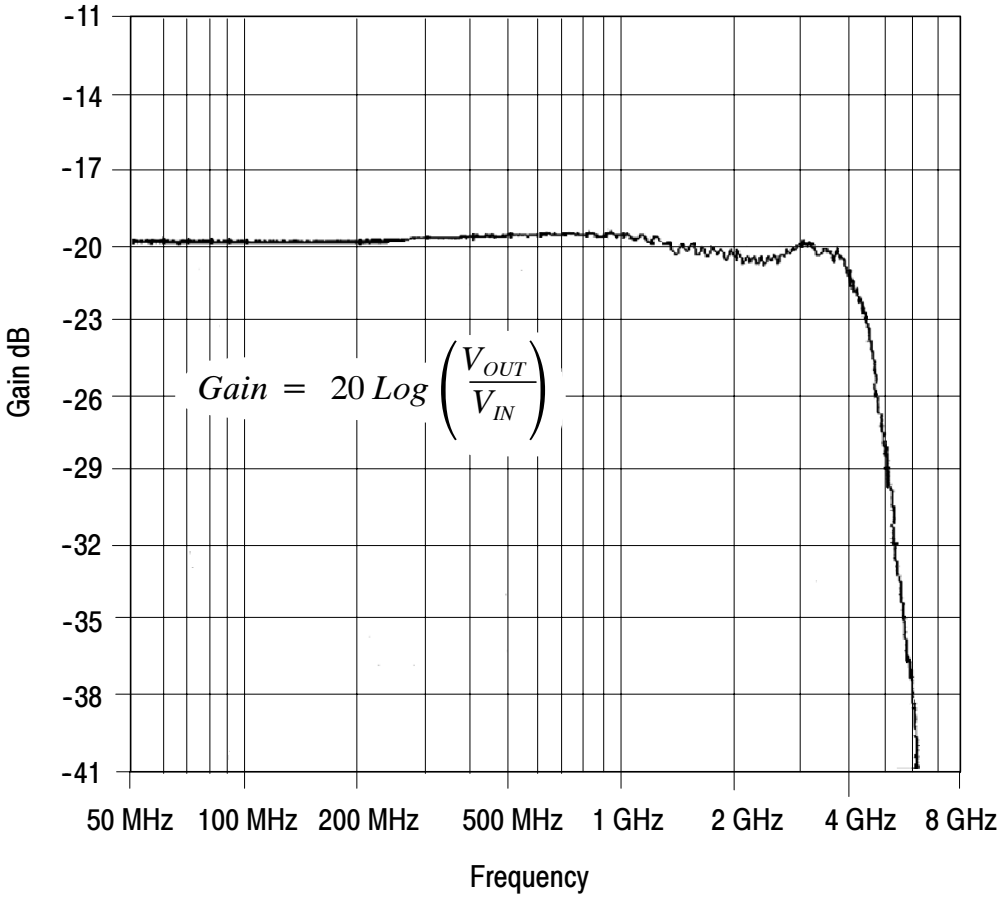


Figure 11: Typical bandwidth

Table 7: Environmental characteristics

Characteristic	Description
Operating Temperature	0 °C to +40 °C.
Nonoperating Temperature	-55 °C to +75 °C.
Humidity	0-90% RH at 40 °C.
Packaged Product Vibration and Shock	The packaged product qualifies under the Distribution Cycle 1 Assurance Level II for packaged products 0 to 20 lbs. Test 2 for Warehouse and Vehicle Stacking (Compression) is omitted.
Electrostatic Immunity	IEC 61000-4-2
EMC	IEC 801-3
Pollution Degree	Pollution Degree 2 as defined in IDC61010-1

Table 8: Certifications and compliances

Category	Standards or description
EMC Compliance	This product has been reviewed to the conditions and provisions of Directive 89/336EEC for products of the EN61326 product family and determined to be exempt from the EMC directive.

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.

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 instrument. Refer to Figure 12 for the simplified schematic.

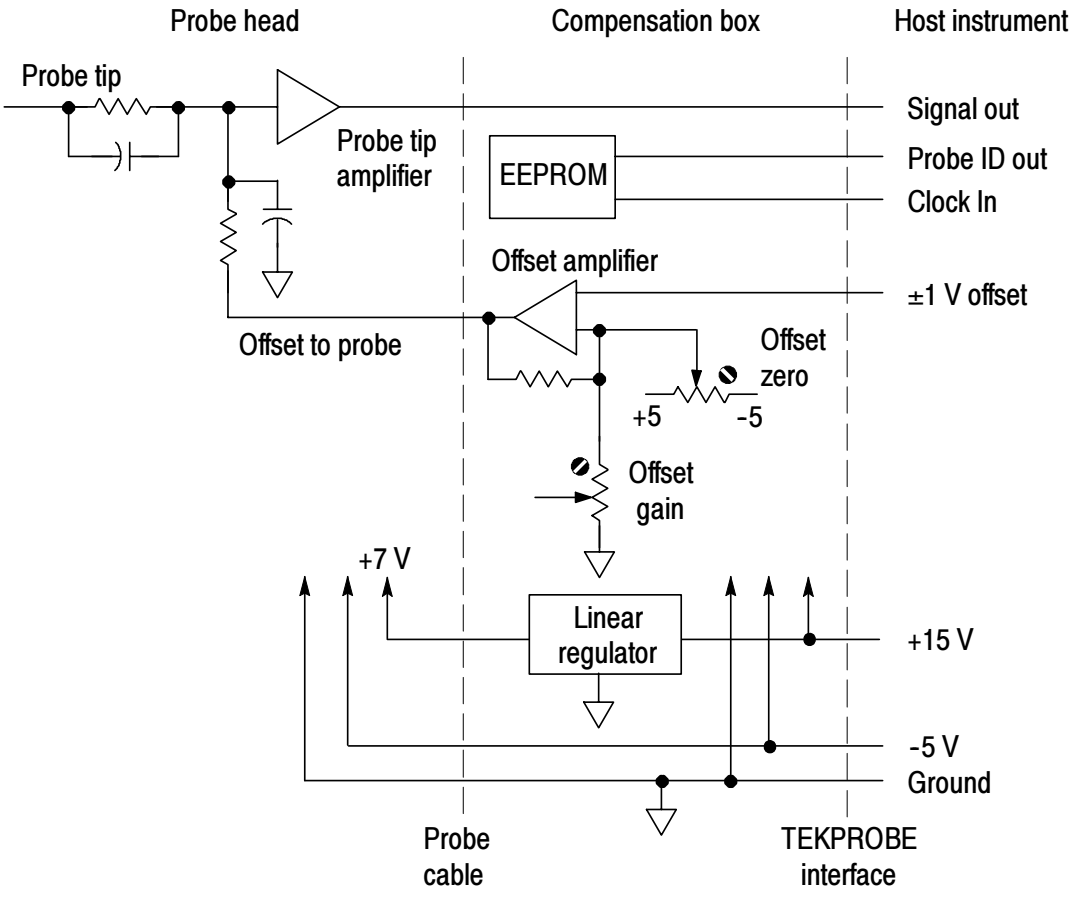


Figure 12: P6241 simplified schematic diagram

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
- V_{CC}, +7 V linear regulator

Offset Amplifier

The offset amplifier is used to offset the input signal DC component so that it stays at the optimal point of the probe linear dynamic range. For more information on the linear dynamic range characteristic, refer to *Input Linear Dynamic Range* on page 24.

The offset amplifier receives offset information as a ±1 VDC voltage from the host instrument. The amplifier then amplifies it to match the probe characteristics and applies it to the probe head 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 53.

Probe Identification EEPROM

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

TEKPROBE Interface

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

V_{CC}, +7 V Regulator

The +15 V input is regulated to +7 V to supply the V_{CC} for the IC.

Figure 13 shows the TEKPROBE interface pin functions. Refer to your host instrument service documentation for more detailed specifications.

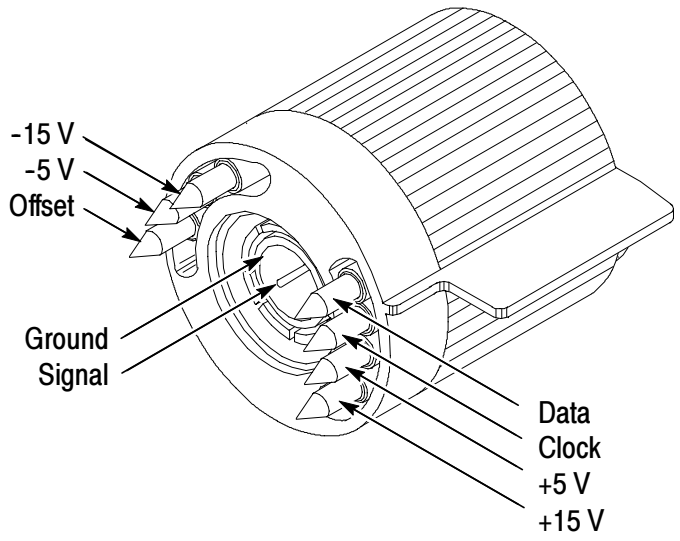


Figure 13: TEKPROBE interface

Performance Verification

Use the following procedures to verify the warranted specifications of the P6241 probe. Before beginning these procedures, photocopy the test record on page 52, and use it to record the performance test results. The recommended calibration interval is one year.

These procedures test the following specifications:

- Output offset voltage
- DC gain accuracy
- Rise time

Equipment Required

Refer to Table 9 for a list of the equipment required to verify the performance of your probe.

Table 9: Equipment required for performance verification

Item description	Performance requirement	Recommended example
Sampling instrument		Tektronix CSA8000
Sampling head		Tektronix 80E0X
TEKPROBE power supply		Tektronix 1103
Calibration step generator		067-1338-XX
Probe cal fixture	Probe tip	067-1456-XX
DC power supply	1 VDC at 1 mA	Tektronix PS280
DMM	0.5% accuracy at 2 VDC	
Feedthrough termination	50 Ω ±0.05 Ω	Tektronix 011-0129-XX
BNC-to-BNC coaxial cable	50 Ω coaxial cable	Tektronix 012-1342-XX
Coaxial cable	Male-to-Male SMA, 508 mm	Tektronix 174-1427-XX

Table 9: Equipment required for performance verification (Cont.)

Item description	Performance requirement	Recommended example
Precision coaxial cable	Male-to-Male SMA, 1 ns delay	Tektronix 015-0562-XX
Adapter	SMA Female-to-Female	Tektronix 015-1012-XX
Adapters (2)	SMA Female-to-BNC Male	Tektronix 015-0572-XX
Adapter	BNC Female-to-dual banana	Tektronix 103-0090-XX
Adapter	Y-lead adapter	Tektronix 196-3434-XX
Adapters (2)	KlipChip adapter	Tektronix 206-0364-XX
Adapter	Square pin adapter	Tektronix 016-1910-XX
Lead (2)	Banana to banana, red	Tektronix 012-0031-XX
Lead (2)	Banana to banana, black	Tektronix 012-0039-XX

Equipment Setup

Use this procedure to set up the equipment to test the probe.

1. Connect the probe to the 1103 power supply.
2. Connect a Y-lead adapter with KlipChip adapters attached to the P6241.
3. Turn on the 1103 power supply, and ensure that offset is turned off.
4. Allow 30 minutes for the equipment to warm up.

***NOTE**. If your host instrument has a probe calibration routine, run it before making any of the following checks. If your probe fails the probe calibration routine, see* Probe Calibration Errors *on page 20 for more information.*

Output Zero

Use this procedure to verify the probe output zero.

1. Connect the test equipment as shown in Figure 14.
2. Attach the probe to a TEKPROBE interface on the 1103 power supply.
3. Ground the probe tip by connecting the probe tip to the probe ground socket. (Connecting two KlipChip adapters together is recommended.)
4. Set the 1103 offset **VAR/0V** to **0V**.
5. Observe the multimeter display, and record the results on the test record.

The displayed DC level should be 0.00 V ±10 mV.

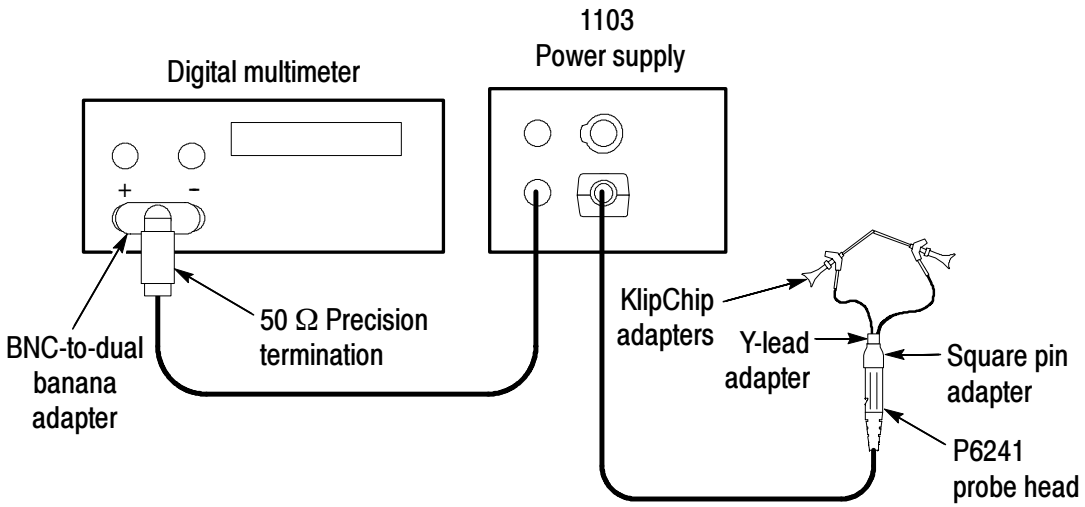


Figure 14: Setup for output zero

DC Gain Accuracy

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

1. Connect the test equipment as shown in Figure 15 on page 47.
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.

Record the results of steps 7 through 10 separately. Use the results to calculate the DC accuracy of the probe in step 11.

7. Set the DC power supply to +1.000 V. Record the power supply output as Vmax.
8. Measure and record the multimeter reading as M1.
9. Set the DC power supply to -1.000 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 ideal probe attenuation factor. For example: 0.4 is the difference between +2 and -2, divided by 10.

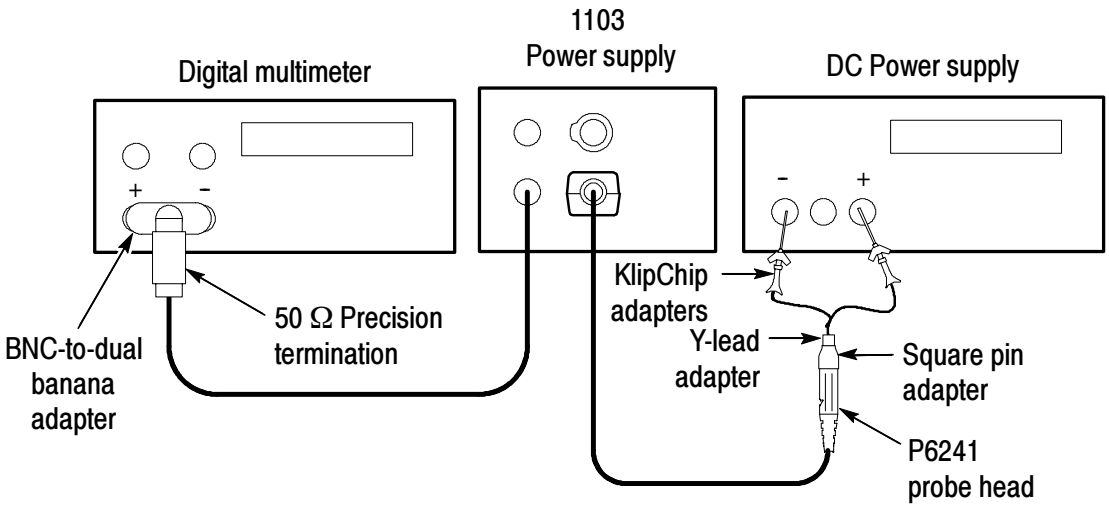


Figure 15: Setup for DC gain accuracy

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

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

The calculated error should be ≤2%.

12. Record the results on the test record.

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

Rise Time

This procedure verifies that the probe meets rise time specifications.

The probe rise time is calculated from rise times obtained by measuring the test system without the probe attached, and the test system plus the probe.

1. Connect the test equipment as shown in Figure 16.
2. Set the oscilloscope trigger to internal clock.
3. Turn on channel 1 on the 80E0X, and then set the oscilloscope vertical scale to 50 mV/div.
4. Set the oscilloscope horizontal scale to 100 ps/div.
5. Adjust the oscilloscope horizontal and vertical position controls to display a signal similar to that shown in Figure 16.

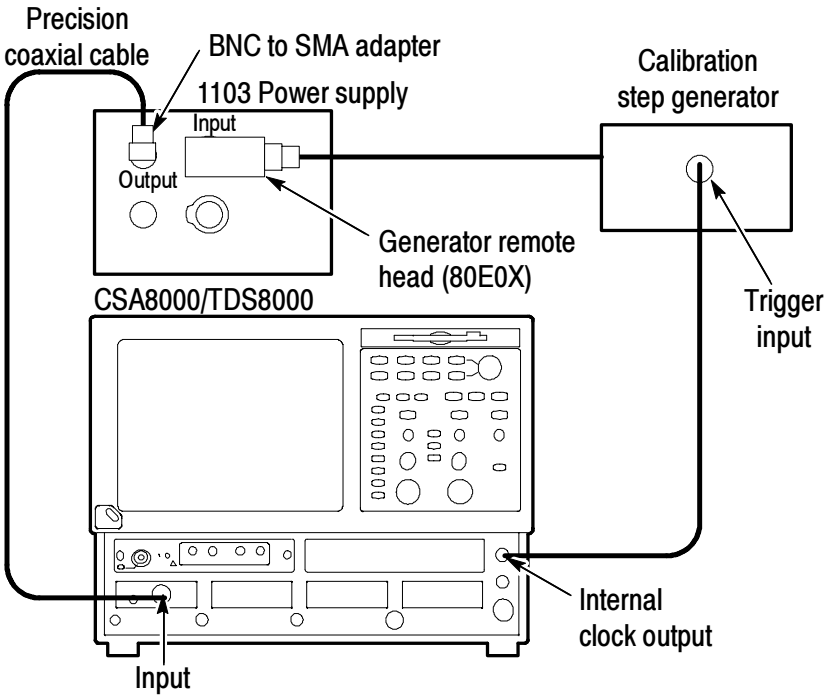


Figure 16: Test system rise time setup

6. Use the oscilloscope measurement capability to display rise time. Rise time is determined from the 10% and 90% amplitude points on the waveform. Record the rise time as t_s.

The system rise time (t_s) that you measured in step 6 represents the rise time of the test system without the probe.

The following steps are for assembling the test setup that includes the probe, as shown in Figure 17 on page 50. The system and probe rise time (t_{s+p}) that you measure in step 12 is used to calculate the probe rise time (t_p) in step 13.

7. Turn the calibration generator remote head off, and then disconnect it from the 1103 power supply input. Remove the SMA-BNC adapter from the 1103 power supply input.
8. Use the BNC locking ring to connect the probe to the 1103 power supply channel 1 input. Disable the offset control on channel 1 of the 1103 power supply.
9. Turn the calibration generator remote head on, and then connect the probe tip adapter to it using the SMA female-female adapter. Insert the probe tip into the probe tip adapter.

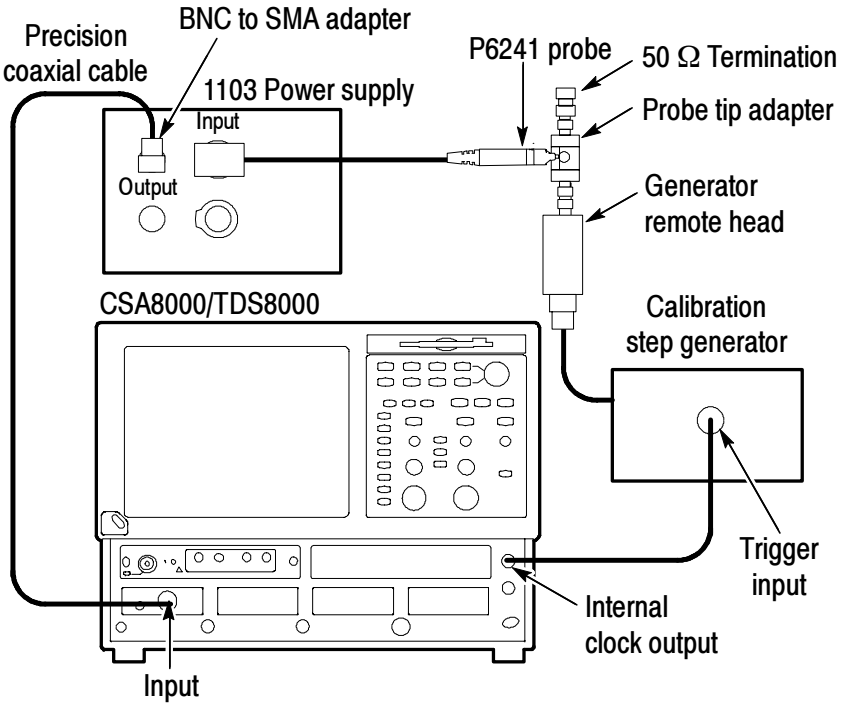


Figure 17: Test system and probe rise time setup

10. Press the **AUTOSET** button. Set the vertical to 5 mV/div and horizontal to 100 ps/div. Turn on averaging.

11. Adjust the oscilloscope horizontal and vertical position controls to display a signal similar to that shown in Figure 17.

***NOTE**. Do not touch the probe tip adapter when making calibration measurements. Measurement accuracy is degraded when the probe tip adapter is handled.*

---

12. Use the oscilloscope measurement capability to display rise time. Rise time is determined from the 10% and 90% amplitude points on the waveform. Record the rise time as t_{s+p}.

13. Calculate the probe only rise time using the following formula:

$$t_p = \sqrt{t_{(s+p)}^{\ 2} - t_s^{\ 2}}$$

14. Check that the calculated rise time meets the probe specification. The rise time (t_p) must be $\leq$120 ps.

15. Record the results on the test record.

Test record

Probe Model: _____

Serial Number: _____

Certificate Number: _____

Temperature: _____

RH %: _____

Date of Calibration: _____

Technician: _____

Performance test	Minimum	Incoming	Outgoing	Maximum
Output zero voltage (at probe output) ± 10 mV (20 °C to 30 °C)	- 10 mV	_____	_____	+ 10 mV
DC gain accuracy	N/A	_____	_____	≤2%
Rise time	N/A	_____	_____	≤120 ps

Adjustments

The P6241 has two internal controls: offset zero and offset range. These controls rarely need to be adjusted, and should only be changed after a probe calibration and functional check have been performed on the host instrument.

To make adjustments to the probe, the compensation box top cover needs to be removed with the optional release tool. Refer to page 58. Use the optional adjustment tool for making any adjustments.

Adjustment Locations

Refer to Figure 18 for the location of the offset zero and offset range controls.

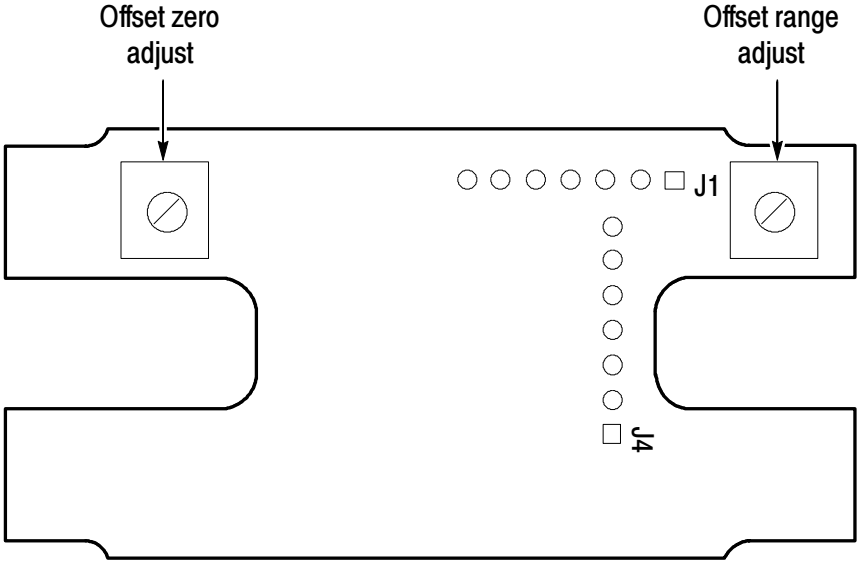


Figure 18: P6241 adjustment locations

Offset Zero

Use this procedure to adjust the probe offset zero.

***NOTE**. If your host instrument has 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 channel vertical offset to 0.00 V.
3. Measure the displayed DC level.
4. Adjust **Offset Zero** for 0.00 ± 15 mV.

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 –10 V to +10 V.

1. Power on the 1103 power supply, and turn on the offset.
2. Using a DMM, adjust the 1103 offset voltage to –0.25 V. Refer to Figure 19 for the location of the offset voltage test point.

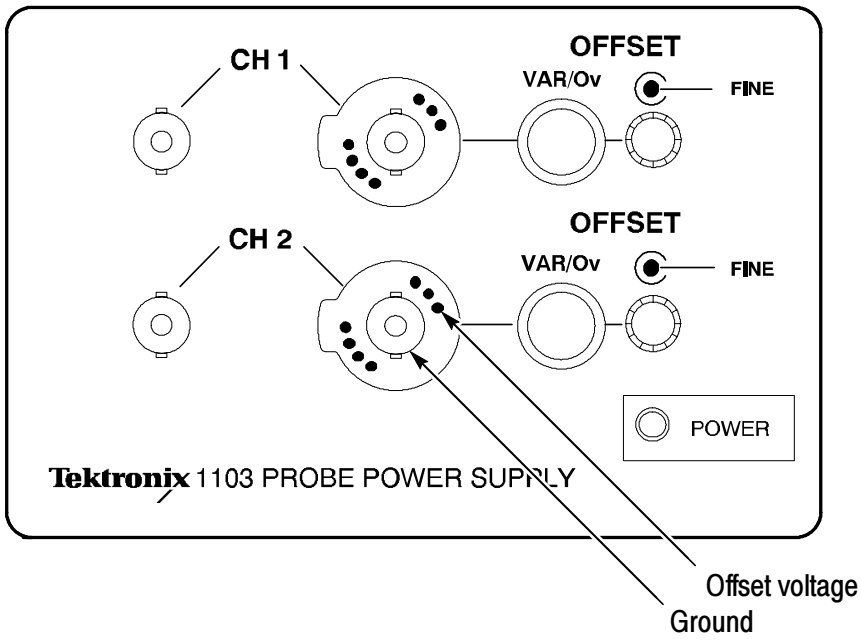


Figure 19: 1103 power supply offset voltage location

3. Connect the equipment as shown in Figure 20. Take care not to disturb the offset level setting on the 1103 power supply.

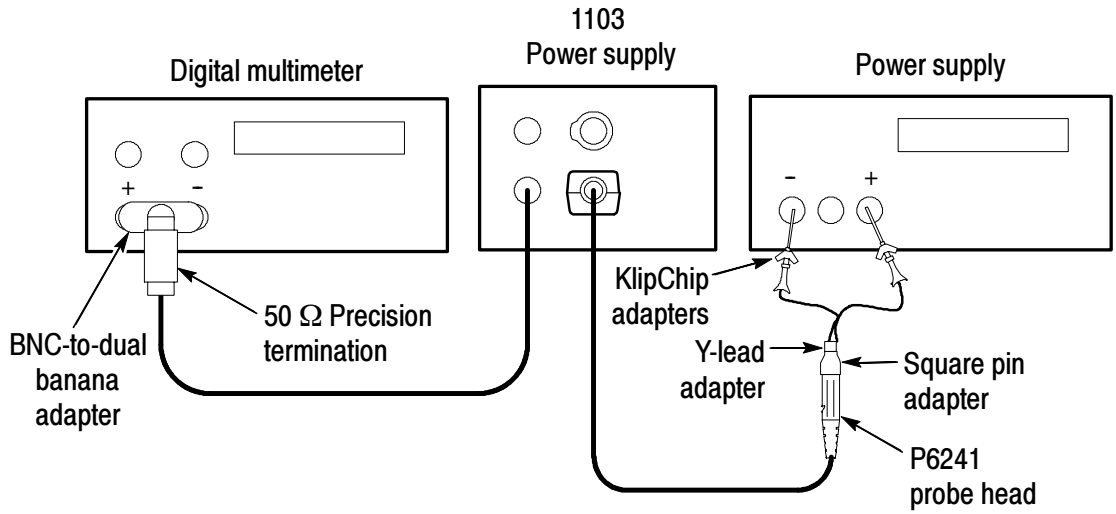


Figure 20: P6241 offset range setup

4. Set the DC power supply (using the DMM) to +2.5 VDC.
5. Observe the DC value on the DMM.
6. Adjust **Offset Range** for a DMM reading of 0 V ±5 mV. Refer to Figure 18 on page 53 for the location of the offset range adjustment.

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

Maintenance

This section describes the maintenance and repair procedures for the P6241.

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, replace the pin.

To remove a TEKPROBE interface pin, firmly grasp the pointed tip with pliers and pull the pin out of the connector. See Figure 21.

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.

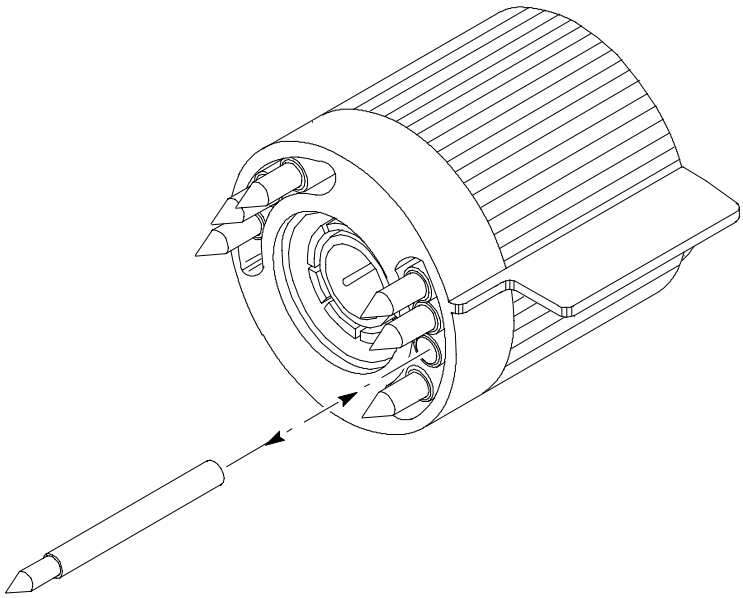


Figure 21: Replacing TEKPROBE interface pins

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 22.
2. Hold the open edge apart, and use the optional release 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.

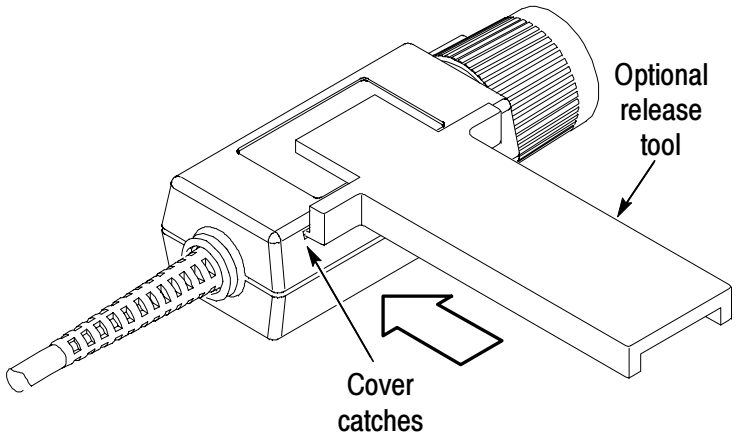


Figure 22: Removing the compensation box covers

To replace the covers, follow these steps:

1. Align the tabs with the notches on the cover halves. Refer to Figure 23.
2. Press the cover tabs in so that the cover can be lowered.
3. Slide the tabs into the notches.
4. Firmly press the pieces together until the cover catches snap into place.

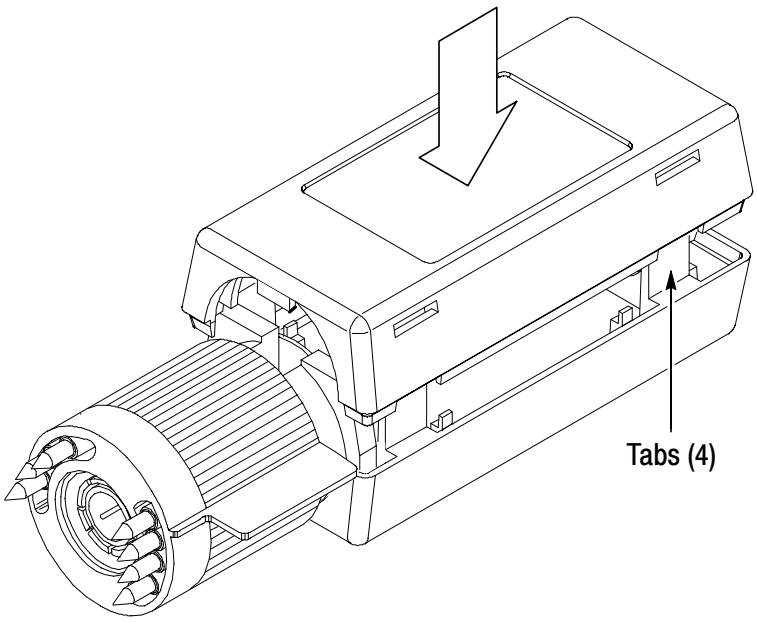


Figure 23: Replacing the compensation box cover

Inspection and Cleaning

CAUTION. *To prevent damage to probe materials, do not use 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 75% isopropyl alcohol and water solution.

Replacement Parts

Refer to *Replaceable Parts* on page 65 for a list of customer replaceable parts. Due to the sophisticated design of the P6241, 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 must have a carton test strength of at least 200 pounds (90.72 kg).
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 section will help you determine whether the source of the problem is either the probe or the host instrument.

***NOTE**. If your instrument displays a Probe Cal Failed message after running the probe calibration routine, refer to* Probe Calibration Errors *on page 20.*

To troubleshoot the P6241, the probe must be attached to an operating TEKPROBE interface host instrument with the top cover of the compensation box removed. Refer to page 58 for instructions on opening the compensation box.

Set the host instrument to the following settings:

- 50 Ω termination at instrument.
- DC coupling

***CAUTION.** To prevent damage to the P6241 when probing in the compensation box, be careful not to touch or ground energized components.*

The compensation box contains static sensitive devices.

***CAUTION.** To prevent damage to the P6241 when troubleshooting, work at a Level 1 ESD workstation.*

Refer to Table 10 for troubleshooting procedures, and Figure 24 for troubleshooting test points.

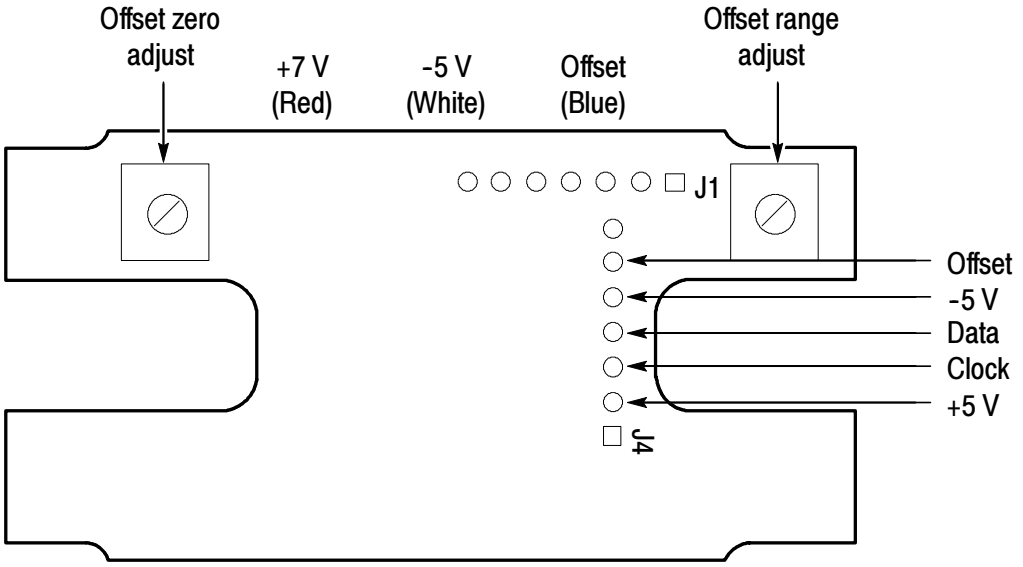


Figure 24: Compensation box test point locations

Table 10: Troubleshooting guide

Symptom	Checks	Result	Action
No Signal Out	Check known signal	No signal.	Continue checks
	Go to *Probe Power*	Probe power OK.	Replace probe.
Distorted or nonlinear signal	Is the instrument set to 50 Ω termination?	No	Set termination to 50 Ω, or install a feedthrough termination at the instrument input.
		Yes	Continue.

Table 10: Troubleshooting guide (Cont.)

Symptom	Checks	Result	Action
Distorted or nonlinear signal	Is the signal within linear dynamic range?	No	Set channel vertical offset to match signal characteristic.
		Yes	See page 24.
No Offset Adjust (Signal present)	Go to *Probe Power* row.	Probe power OK	Continue checks.
	Check variation of offset input from host instrument. See Figure 24. Signal should vary between +1 V and -1 V.	Offset input OK	Replace probe.
		Offset input bad	Check TEKPROBE interface pins on the compensation box. See page 57.
			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 24.	Power OK	Continue checks.
		Power bad	Check TEKPROBE interface pins on the compensation box. See page 57.
			Check TEKPROBE interface on host instrument. (Try an adjacent channel.)
			Repair host instrument.

Replaceable Parts

This section contains a list of replaceable parts for the P6241. 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 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

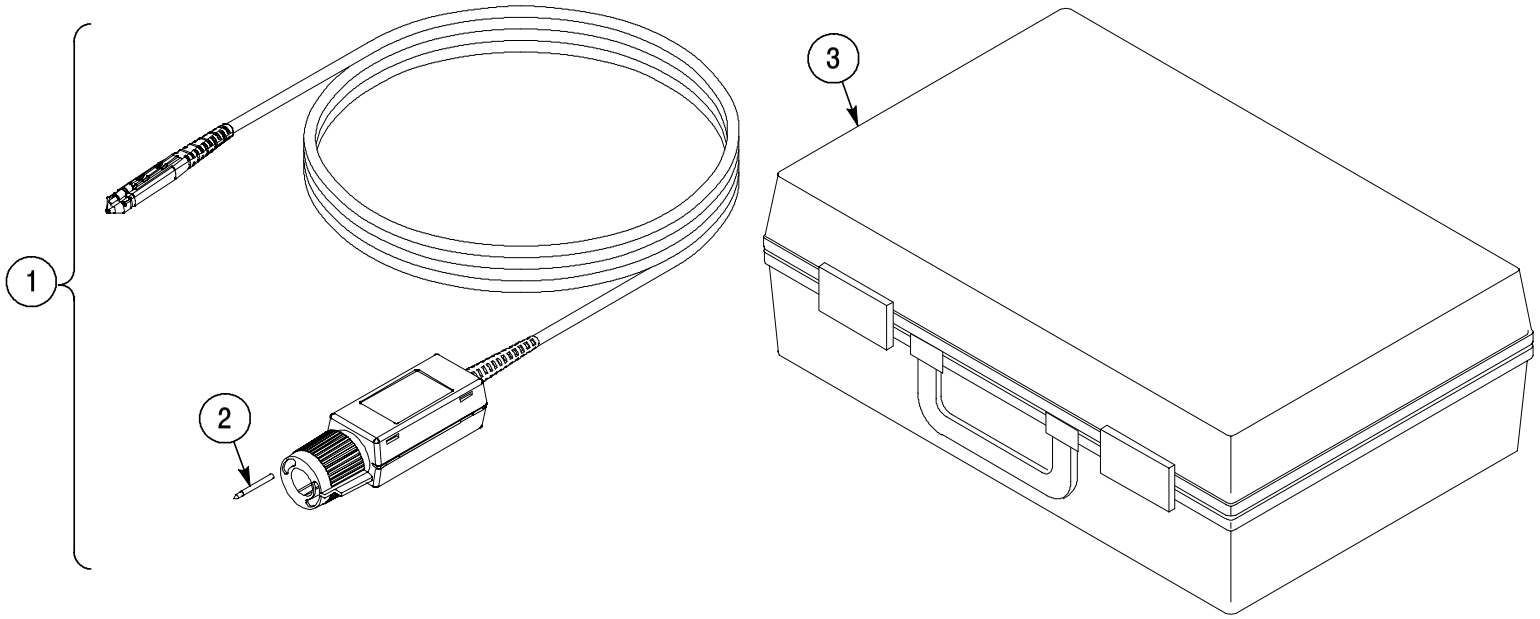


Figure 25: P6241 replaceable parts

Fig. & index no.	Tektronix part no.	Serial no. Effective	Dscont	Qty	12345 name & description	Mfr. code	Mfr. part no.
25-1	010-0693-XX			1	PROBE, FET ACT:>4.0 GHZ,10X,1PF,TDS SERIES	80009	010-0693-XX
-2	131-3627-XX			1	CONTACT,ELEC:GOLD PLATED TIP	18359	P-5703-1
-3	016-1879-XX			1	CASE,STORAGE:PLASTIC,W/FOAM	TK6108	016-1879-XX

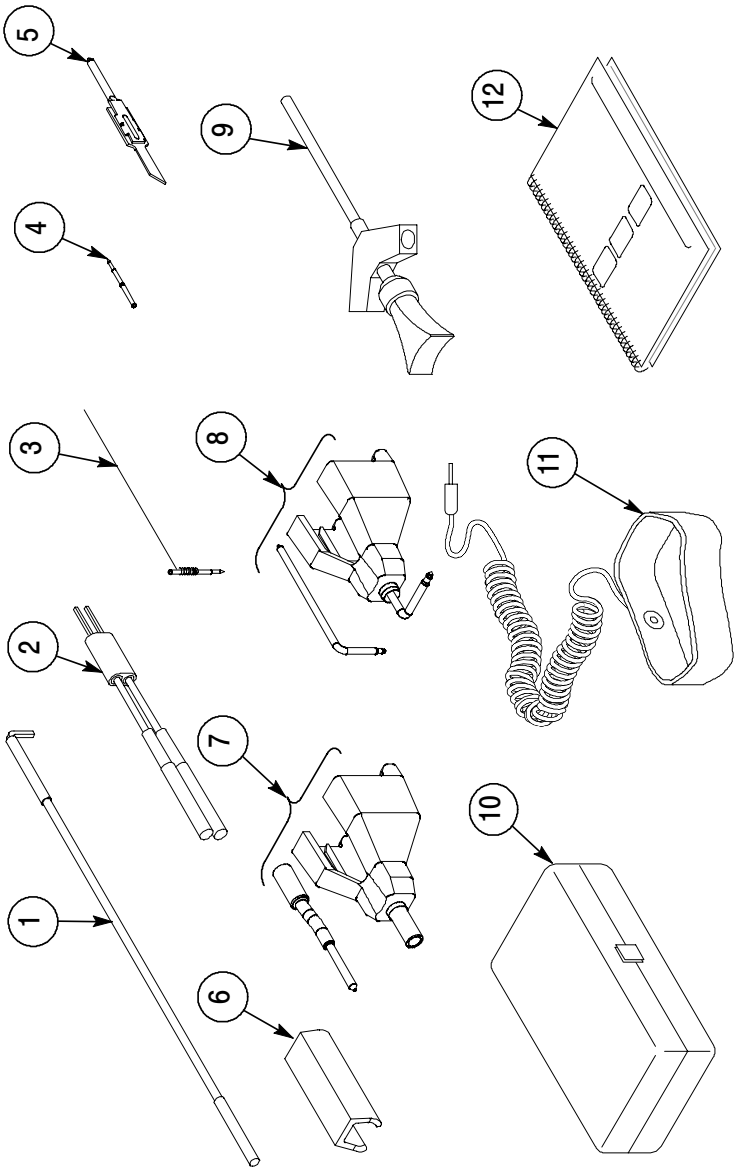


Figure 26: P6241 standard accessories

Fig. & index no.	Tektronix part no.	Serial no. Effective	Dscont	Qty	12345 name & description	Mfr. code	Mfr. part no.
					STANDARD ACCESSORIES		
26-1	196-3437-10			1	LEAD, GROUND; DESCRETE, SDI, 23AWG, 3.0 L, 0.325, SET OF 2	060D9	196-3437-10
-2	196-3434-XX			2	LEAD, ELEC; DESCRETE, CPD, 2 23 AWG, RED & BLACK, 2300 L, 1 X 2, 0.1 CTR, 0.025 SQ PIN X 2, JACK TIP	060D9	196-3434-XX
-3	196-3482-XX			1	CUSTOMIZABLE GROUND LEAD, SET OF 5	060D9	196-3482-XX
-4	016-1917-XX			1	ACCESSORY KIT; POGO PIN, SET OF 8	060D9	016-1917-XX
-5	----------			1	PROBE,TIP,SURETOE, SET OF 4 (REORDER ST501 PACKAGE OF 12)	060D9	----------
-6	016-1315-XX			1	MARKER KIT,ID:CABLE MARKER BAND,2 EA, VAR COLRS	7X318	1134
-7	016-1910-XX			1	ACCESSORY KIT; SQUARE PIN ADAPTER, SET OF 4	060D9	016-1910-XX
-8	016-1913-XX			1	ACCESSORY KIT; L-ADAPTERS, SET OF 2	060D9	016-1913-XX
-9	206-0364-XX			2	TIP,PROBE:MICROCKT TEST,SMT KLIP CHIP	TK2565	206-0364-XX
-10	006-7164-XX			1	BOX, PLASTIC: 4.625 X 2.875 X 1.0	53718	K226
-11	006-3415-XX			1	STRAP, WRIST: 3M TYPE 2214, ADJUSTABLE, 6 FT COILED CORD	TK0623	3M TYPE 2064
-12	071-1188-XX			1	MANUAL,TECH:INSTRUCTION,P6241	TK2548	071-1188-XX

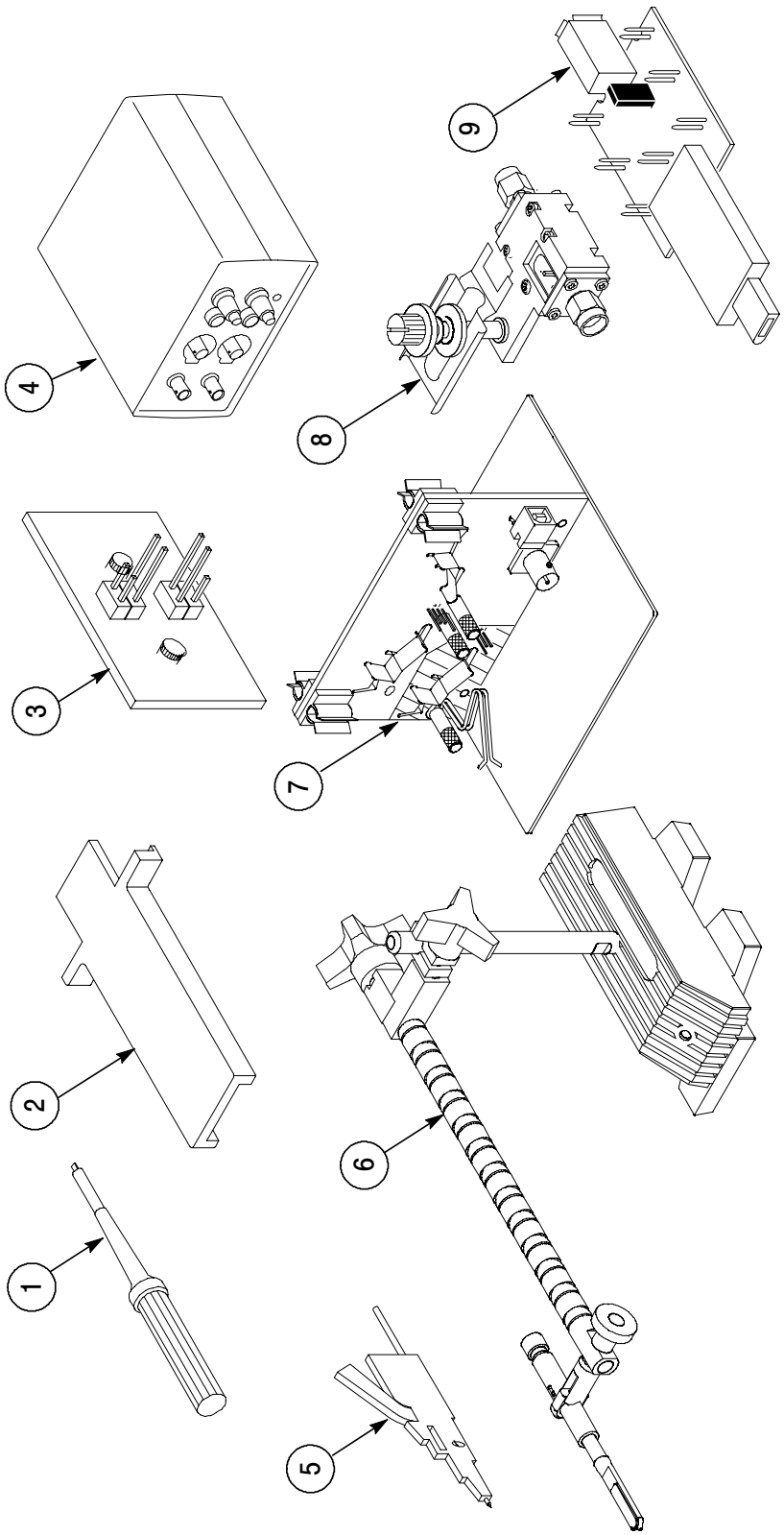


Figure 27: P6241 optional accessories

Fig. & index no.	Tektronix part no.	Serial no. Effective	Dscont	Qty	12345 name & description	Mfr. code	Mfr. part no.
					OPTIONAL ACCESSORIES		
27-1	003-1433-XX			1	ADJUSTMENT TOOL	TK2565	003-1433-XX
-2	003-1383-XX			1	RELEASE TOOL,COVER:COMP BOX, POLYCARBONATE	TK2565	003-1383-XX
-3	679-4809-XX			1	CKT BD SUBASSY:CALIBRATION	80009	679-4809-XX
-4	1103			1	TEKPROBE IF PS:W/OFFSET 2 CONN	80009	1103
-5	SMK4			1	IC GRABBER; MICRO CLIP, 0.025 DIA LEAD, PKG OF 4	0HHL8	SMK4
-6	PPM100			1	POSITIONER; PROBE POSITIONER; CLAMP, BASE, POSITIONING ARM, PROBE HOLDER)	TK2545	62683000
-7	067-0484-XX			1	FIXTURE, CAL; PROBE CAL DESKEW	80009	067-0484-XX
-8	067-1456-XX			1	FIXTURE; PROBE CAL	80009	067-1456-XX
-9	679-5027-XX			1	CKT BD SUBASSY:1394 ADAPTER	80009	679-5027-XX

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
060D9	TENSOLITE COMPANY	PRECISION HARNESS AND ASSEMBLY~3000 COLUMBIA HOUSE BLVD~#120	VANCOUVER, WA 98661
0HHL8	EMULATION TECHNOLOGY INC	2344 WALSH AVE, BLDG F	SANTA CLARA, CA 95051
53718	FLAMBEAU AIRMOLD CORP	100 GRACE DRIVE~PO BOX 610	ROANOKE RAPIDS, NC 27870
7X318	KASO PLASTICS INC	5720-C NE 121ST AVE, STE 110	VANCOUVER, WA 98682
TK0623	GENERAL TOOL & SUPPLY CO	2705 NW NICOLAI ST	PORTLAND, OR 97210
TK2548	XEROX CORPORATION	14181 SW MILLIKAN WAY	BEAVERTON, OR 97005
TK2565	VISION PLASTICS INC	26000 SW PARKWAY CENTER DRIVE	WILSONVILLE, OR 97070
TK6108	KENT H LANDSBERG CO	27929 SW 95TH, SUITE 101	WILSONVILLE, OR 97070
18359	PYLON CO. INC.	51 NEWCOMB ST	ATTLEBORO, MA 02703-1403