Instructions

Tektronix

P6246 400 MHz & P6247 1 GHz Differential Probes

070-9898-02

TEK INTER-OFFICE COMMUNICATION

TO John Martin 94-540 DATE June 25, 1991

FROM Frank Gray, 50-PAT

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Francis I. Gray
Group Patent Counsel

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Repair Protection extends priority repair services beyond the product's warranty period; you may purchase up to three years of Repair Protection.

Calibration Services provide annual calibration of your product, standards compliance and required audit documentation, recall assurance, and reminder notification of scheduled calibration. Coverage begins upon registration; you may purchase up to five years of Calibration Services.

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- Eliminates unexpected service expenses

For Information and Ordering

For more information or to order Service Assurance, contact your Tektronix representative and provide the information below. Service Assurance may not be available in locations outside the United States of America.

Name	VISA or Master Card number and expiration date or purchase order number
Company	
Address	Repair Protection (1,2, or 3 years)
City, State, Postal code	Calibration Services (1,2,3,4, or 5 years)
Country	Instrument model and serial number
Phone	Instrument purchase date

Table of Contents

General Safety Summary

Review the following safety precautions to avoid injury and prevent damage to this product or any products connected to it. To avoid potential hazards, use this product only as specified.

To Avoid Fire or Personal Injury

Ground the Product. This product is grounded through the grounding conductor of the power cord. To avoid electric shock, the grounding conductor must be connected to earth ground. Before making connections to the input or output terminals of the product, ensure that the product is properly grounded.

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

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

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

Do Not Operate With Suspected Failures. If you suspect 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:

WARNING
High Voltage

Protective Ground
(Earth) Terminal

CAUTION
Refer to Manual

Double
Insulated

Preface

This manual contains instructions and specifications for using the P6246 and P6247 differential probes.

Related Manuals

For performance verification procedures, adjustment procedures, list of replaceable parts, and other service information, refer to the *P6246 & P6247 Service Manual* (070-9899-XX).

Contacting Tektronix

Product Support	For application-oriented questions about a Tektronix measurement product, call toll free in North America: 1-800-TEK-WIDE (1-800-835-9433 ext. 2400) 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	Contact your local Tektronix distributor or sales office. Or visit our web site for a listing of worldwide service locations. http://www.tek.com
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To write us	Tektronix, Inc. P.O. Box 1000 Wilsonville, OR 97070-1000

Getting Started

The P6246 and P6247 are high-bandwidth differential probes with the TekProbe II interface. The P6246 probe has a bandwidth of 400 MHz and the P6247 has a bandwidth of 1 GHz. Both probes have low circuit loading, high common-mode rejection, and come with accessories that accommodate a wide variety of applications.

The TekProbe II interface is standard on Tektronix TDS Series oscilloscopes. The Tektronix 1103 TekProbe Power Supply can be used for instruments without the TekProbe interface (refer to page 11).

Features and Accessories

Table 1 shows the features and standard accessories of the P6246 and P6247 differential probes.

Table 1: P6246 and P6247 features and standard accessories

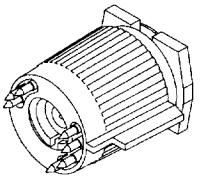
Feature/Accessory	Description
	**TekProbe II interface.** The TekProbe II interface supplies power to the probe, selects the correct display scaling, and automatically sets the 50 Ω termination on the oscilloscope input. If your oscilloscope does not have the TekProbe II interface, you can use the optional 1103 power supply (refer to page 11).
BANDWIDTH **FULL** ▭ **200 MHz**	**Bandwidth limit.** The bandwidth limit switch selects either the specified bandwidth of the probe or limits the bandwidth to 200 MHz.
ATTENUATION **÷10** ▭ **÷1**	**Probe attenuation.** The attenuation switch selects either divide by 1 (÷ 1) or divide by 10 (÷ 10).

Table 1: P6246 and P6247 features and standard accessories (Cont.)

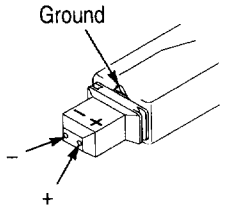
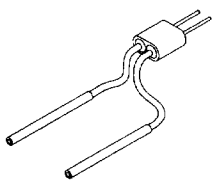
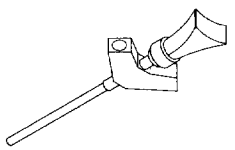
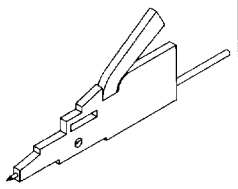
Feature/Accessory	Description
DC REJECT **ON** ▭ **OFF**	**DC reject.** The ON position passes only the AC component down to 4 Hz in the ÷ 10 setting and 0.4 Hz in the ÷ 1 setting. The OFF position passes both DC and AC components of the signal.
	**Input connections.** The (+), (–), and ground connections of the probe head accept the standard and optional probe accessories. You can also plug the head directly onto a pair of 0.025-inch square pins that have the standard spacing of 0.100-inch on center. ***CAUTION:*** *To avoid damaging the input connectors, do not insert anything larger than a 0.025-inch square pin into the inputs. To prolong the life of the connectors, use smooth gold-plated pins only.*
	**Y-lead adapter.** The Y-lead adapter plugs directly into the probe. The socketed ends of the leads may be connected to the probe tips and accessories, or fitted onto 0.025-inch pins.
	**Integrated circuit (IC) grabbers.** Use the IC grabbers to probe the leads on dual-in-line packages (DIP).
	**Micro KlipChip adapters.** Use the adapters to probe the leads on integrated circuits that are surface-mounted.

Table 1: P6246 and P6247 features and standard accessories (Cont.)

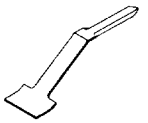
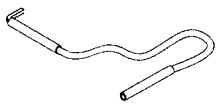
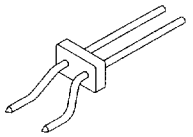
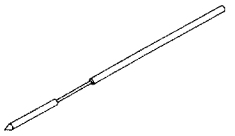
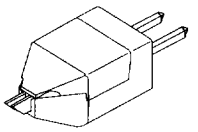
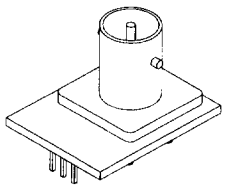
Feature/Accessory	Description
	**Short ground contact.** Use the short ground lead for probing small geometry components that have a nearby ground point. The ground easily connects to adjacent square pins when the probe is plugged directly onto 0.025-inch square pins (0.100-inch spacing). See Figure 2 on page 17.
	**Ground lead.** Use the six-inch ground lead for connecting the probe ground to the circuit. The socketed end of the lead may be connected to the probe tips and accessories, or fitted onto 0.025-inch pins.
	**TwinTip adapter.** This accessory provides two adjustable tips for probing connections that are close to each other.
	**Spring-loaded ground pin.** Use the spring-loaded ground when probing components that have a nearby ground point.
	**TwinFoot adapters.** Use the TwinFoot adapter to probe two adjacent leads on a surface-mount integrated circuit. Flexible fingers adapt to a range of lead spacings. See Figure 5 on page 19.
	**Probe-tip-to-BNC adapter.** This accessory adapts the probe to a BNC connector.

Table 1: P6246 and P6247 features and standard accessories (Cont.)

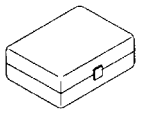
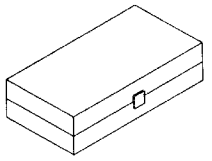
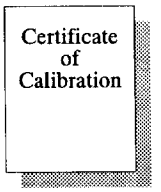
Feature/Accessory	Description
	**Probe tip accessory kit.** This kit contains the following accessories: 1 y-lead adapter 3 IC grabbers 2 micro KlipChip adapters 2 short ground contacts 1 ground lead 2 TwinTip adapters 2 spring-loaded ground pin 2 TwinFoot adapters 1 probe-tip-to-BNC-adapter Replacement part number: 020-2203-00
	**Instrument case.** The instrument case protects the probe from harsh environments and provides room for storing optional accessories. Replacement part number (P6246): 016-0156-06 Replacement part number (P6247): 016-1589-00
	**Calibration certificate.** A certificate of traceable calibration is provided with every instrument shipped.
	**Set of user instructions.** (Includes this book) Provides instructions for operating the P6246 and P6247 differential probes in English, French, German, Japanese, and Korean. Replacement part number: 070-9898-02
	**Service information.** Includes the performance verification procedure list of replaceable parts (English only). Replacement part number: 070-9899-01

Table 2 shows the optional accessories that you can order for the P6246 and P6247 differential probes.

Table 2: Optional accessories and instrument options

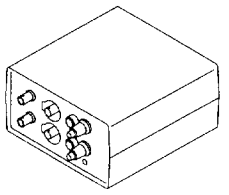
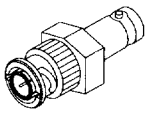
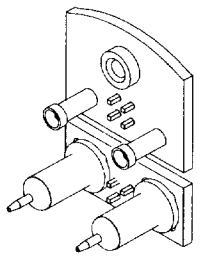
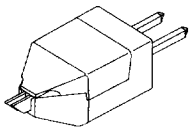
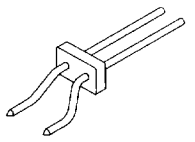
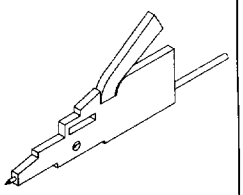
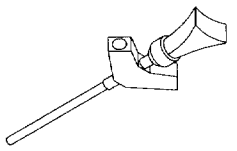
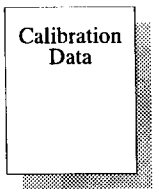
Accessory/Option	Description
	**1103 Power Supply.** Order the 1103 power supply for instruments that do not have the TekProbe II Interface. Power cord options are available for the following countries or regions. **Standard.** North America and Japan **Option A1.** European **Option A2.** UK **Option A3.** Australia **Option A5.** Switzerland
	**50 Ω Termination.** Terminates the output of the 1103 power supply to the required 50 Ω if the oscilloscope does not have a 50 Ω input setting. Order 011-0049-01. **50 Ω BNC cable.** Connects to the 1103 output Part number: 012-0076-00
	**P6046/HP1141A probe tip adapter.** This accessory adapts the probe to fit test fixtures designed for either the Tektronix P6046 or Hewlett-Packard HP1141A differential probes. Part number: 013-0304-00
	**Replacement TwinFoot adapters.** Part number: 013-0306-04 (package of 4)

Table 2: Optional accessories and instrument options (Cont.)

Accessory/Option	Description
	**Replacement TwinTip adapters.** Part number: 013-0305-04 (package of 4)
	**Replacement Micro KlipChip adapters.** Order SMK4 (package of 4)
	**Replacement IC grabbers.** Order SMG50 (package of 20)
	**Calibration data (Option 95).** Option 95, which must be ordered at the time of purchase, documents the measurements taken during calibration.

Installation

Before you connect the output of the P6246 or P6247 differential probe, determine whether or not your oscilloscope has a TekProbe II interface. See Figure 1.

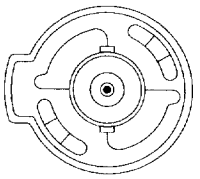


Figure 1: Input connector of TekProbe II interface

Instruments with the TekProbe II Interface (Tektronix TDS 400, 500, 600, and 700 Series Oscilloscopes)

On instruments that have the TekProbe II interface, simply connect the probe to the input. The TekProbe II interface provides power, selects the correct display scaling, and automatically sets the 50 Ω termination on the oscilloscope input.

NOTE. *TDS 400 and TDS 400A series oscilloscopes do not interpret the scale factor coding of the P6246 and P6247 differential probes. This problem is only apparent when the probe is in the ÷ 1 position. To correct for this problem, divide the measurement (or scale factor) by 10 when you use the probe in the ÷ 1 position.*

Instruments without the TekProbe II Interface

On instruments that do not have the TekProbe interface, you must order the optional 1103 power supply (refer to page 11). Each 1103 can supply power for two probes. The input of the oscilloscope must also terminate into 50 Ω. Refer to page 23 for information on the effects of extending the output of the probe.

When you set the attenuation of the probe, you must factor that attenuation into your measurement. For example, if the probe is set at ÷ 10 and the instrument displays a 0.2 V_{p-p} signal, the actual amplitude of the signal is 2 V_{p-p}.

Operating Basics

This section discusses operating considerations and probing techniques. For more detailed information about differential measurements and common-mode rejection (CMRR), see the *Reference* section on page 20.

Input Voltage Limits

The P6246 and P6247 differential probes are designed to probe low-voltage circuits. Before probing a voltage, take into account the limits for maximum input voltage, the common-mode signal range, and the differential-mode signal range.

Maximum Input Voltage

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

CAUTION. *To avoid damaging the inputs of the P6246 and P6247 differential probes, do not apply more than ± 25 V (DC + peak AC) between each input and ground.*

Common-Mode Signal Range

The common-mode signal range is the maximum voltage that you can apply to each input, with respect to earth ground, without saturating the input circuitry of the probe. A common-mode voltage that exceeds the common-mode signal range may produce an erroneous output waveform even when the differential-mode specification is met. For specifications, refer to page 25.

To verify the common-mode signal is within specification, set the probe to ÷ 10, temporarily connect one of the probe inputs to ground, and connect the other probe input to one output of the

differential signal. Repeat the procedure to test the other output of the differential signal.

Differential-Mode Signal Range

The differential-mode signal range is the maximum voltage difference between the (+) and (–) inputs that the probe can accept without distorting the signal. The distortion from a voltage that is too large can result in an invalid measurement. For specifications, refer to page 25.

Attenuation Settings

The differential probe has two attenuation settings: ÷ 1 and ÷ 10. The ÷ 1 setting provides the best signal-to-noise performance with low amplitude signals. The ÷ 10 setting increases the differential-mode signal range by a factor of 10.

DC Reject

The DC Reject mode eliminates the DC component from the probe output. DC reject is useful when using the probe with instruments that do not allow DC to be applied to their inputs (such as spectrum analyzers), or when measuring small amplitude signals superimposed on a large differential offset component.

DC reject generates an internal offset that cancels the DC component of the signal. This nulling method eliminates the need for input coupling capacitors which would greatly degrade CMRR performance and require plug-on attachments for the probe tip.

Because the input is always directly coupled, the DC reject mode does not increase the common and differential mode dynamic ranges for DC components. The DC reject mode also disables any capability of external offset adjustment.

Probe Grounding

Differential measurements are not the same as "floating" measurements. In addition to the (+) and (–) inputs on the probe head, there is also a ground (common) input. (See Figures 2 and 3.)

CAUTION. *To avoid damaging the circuitry under test, connect the probe ground (common) to a ground-reference point only.*

You can use the probe to take a differential measurement regardless of whether or not the ground (common) is connected.

There are some applications that may require a ground reference connection to maintain measurement accuracy. Generally this is necessary when probing circuits which are fully isolated from ground such as battery operated devices. In most applications, however, the common-mode impedance to ground is greater than the differential impedance. Hence, adding the probe ground lead does not improve the high-frequency performance of the measurement.

In addition to the 6-inch ground lead, there are other ground lead accessories that are useful in certain applications. Figure 2 on page 17 shows how to use the short ground contact. Figure 4 on page 19 shows the spring-loaded ground pin.

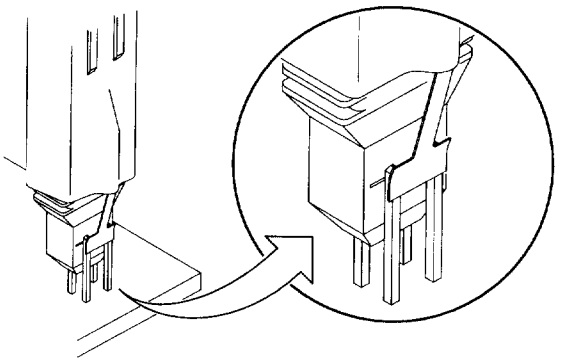


Figure 2: Using the short ground contact

Input Impedance and Probe Loading

When you connect the probe inputs to a circuit, you are introducing a new resistance, capacitance, and inductance into the circuit. Each input of the P6246 and P6247 differential probes has a characteristic input impedance of 100 kΩ to ground in parallel with less than 1 pF. See Figure 3.

For signals with low source impedance and frequency, the 100 kΩ input impedance on each input is large enough to prevent the inputs from loading the signal sources. The greater the source impedances and the higher the signal frequencies, the more you should take these factors into account.

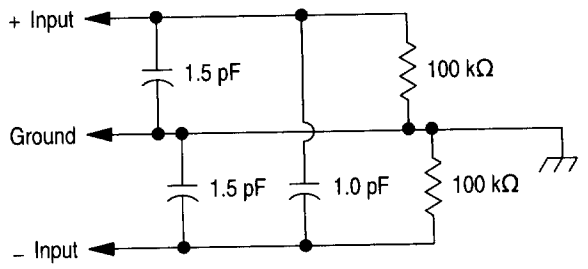


Figure 3: Typical probe input model

As the impedance of the signal source on an input increases, the more the probe loads the source and reduces the signal amplitude.

The frequency of the signal also affects signal measurement. As the frequency of the signal increases, the input impedance of the probe decreases. The lower the impedance of the probe relative to that of the source, the more the probe loads the circuit under test and reduces the signal amplitude. For a graph of frequency versus input impedance, refer to Figure 9 on page 29.

Common-Mode Rejection

The common-mode rejection ratio (CMRR) is the specified ability of P6246 and P6247 differential probes to reject signals that are common to both inputs. More precisely, CMRR is the ratio of the differential gain to the common-mode gain. The higher the ratio, the greater the ability to reject common-mode signals.

Common mode rejection decreases as the input frequency increases. Figure 8 on page 28 is a plot of typical CMRR of the probe versus input frequency. For a more extended discussion of CMRR, see page 21.

Probing Techniques to Maximize CMRR

The common-mode rejection of the probe is highest when using the accessories shown in Figures 4 and 5. These accessories minimize the distance between the probe head and the signal source.

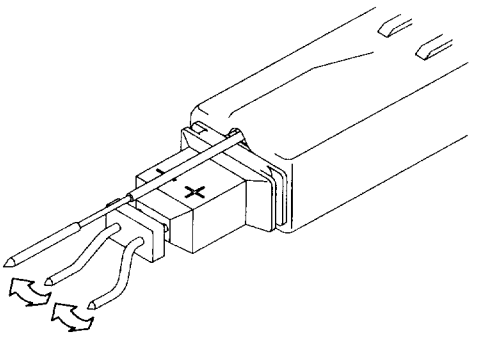


Figure 4: Using the input lead accessories to achieve high CMRR

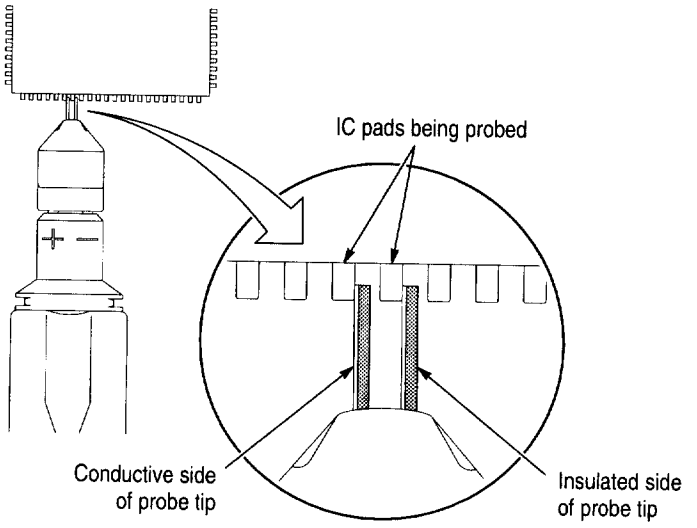


Figure 5: Using the TwinFoot adapter

Reference

This section contains important reference information about differential measurements and how to increase the accuracy of your measurements.

Problems with Single-Ended Measurements

While suitable in many applications, single-ended measurements can present problems in the following situations:

- when the signal is not referenced to earth ground
- when connecting or disconnecting the probe ground distorts the signal
- when connecting the signal reference to ground damages or upsets the circuit

Differential Measurements

Devices designed to make differential measurements avoid the problems posed by single-ended systems. These devices include a variety of differential probes, differential amplifiers, and isolators.

The differential amplifier (Figure 6) is at the heart of any device or system designed to make differential measurements. Ideally, the differential amplifier rejects any voltage that is common to the inputs and amplifies any difference between the inputs. Voltage that is common to both inputs is often referred to as the Common-Mode Voltage (V_{CM}) and voltage that is different as the Differential-Mode Voltage (V_{DM}).

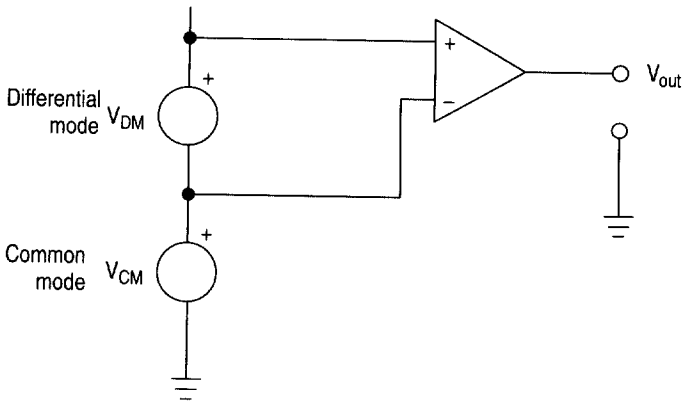


Figure 6: Simplified model of a differential amplifier

Common-Mode Rejection Ratio

In reality, differential amplifiers cannot reject all of the common-mode signal. The ability of a differential amplifier to reject the common-mode signal is expressed as the Common-Mode Rejection Ratio (CMRR). The CMRR is the differential-mode gain (A_{DM}) divided by the common-mode gain (A_{CM}). It is expressed either as a ratio or in dB.

$$CMRR = \frac{A_{DM}}{A_{CM}} \qquad dB = 20\ log\frac{V_{DM}}{V_{CM}}$$

CMRR generally is highest (best) at DC and degrades with increasing frequency.

Assessing CMRR Error

Figure 8 on page 28 shows the CMRR of the P6246 and P6247 differential probes. This derating chart assumes a common-mode signal that is sinusoidal.

A quick way to assess the magnitude of CMRR error when the common-mode signal is not sinusoidal is to connect both leads to the same point in the circuit. The oscilloscope will display only the common-mode component which is not fully rejected by the probe. While this technique may not give you entirely accurate measurements, it does allow you to determine if the magnitude of the common-mode error signal is significant.

Input Impedance Effects on CMRR

The lower the input impedance of the probe relative to the source impedance, the lower the CMRR. See Figure 8 on page 28. Significant differences in the source impedance driving the two inputs will also lower the CMRR.

Extending the Input Leads

At times it may be necessary to extend the probe inputs with wires or a probe tip adapter. When you do this, you should minimize the lead lengths to optimize common-mode rejection and twist the input leads together as shown in Figure 7.

Twisting the input leads together does increase capacitance that may degrade high-frequency performance. You should take into account any effects caused by the extended leads when you take a measurement.

CAUTION. *To avoid damaging the input connectors, do not insert anything larger than a 0.025-inch square pin into the inputs.*

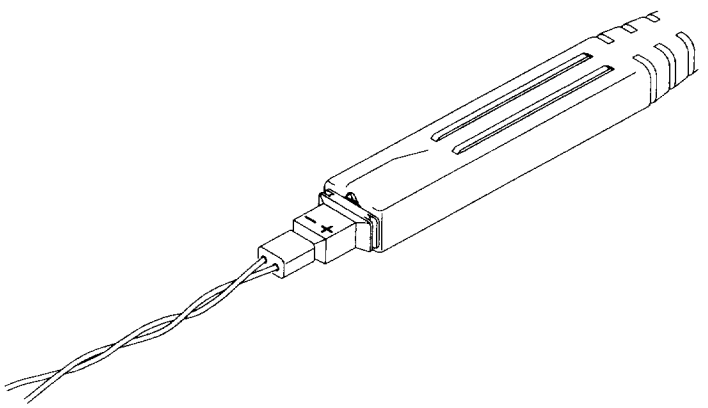


Figure 7: Twisting the Input Leads

Extending the Ground Lead

Extending the ground lead will have little, if any, affect on your measurements. In most circuits, the ground path from the differential source has sufficiently high impedance to damp out any ringing caused by lead inductance.

Extending the Probe Output

With the 1103 TekProbe power supply, it is possible to extend the output of the probe in order to connect the probe to other types of measurement instruments or simply to connect the probe to a signal source that is outside the reach of the probe.

Terminating the Probe

The probe must terminate into 50 Ω at the input of the measurement instrument. Use the 1103 TekProbe power supply to adapt the differential probe and set the input impedance of the measurement instrument to 50 Ω. If the measurement instrument does not support 50 Ω input termination, connect a 50 Ω coaxial terminator on the input.

Effect of Extending the Output Cable

As the frequency of a signal increases, current flow concentrates at the outer edges of the conductor, effectively increasing the impedance. This effect is known as skin loss. The P6246 and P6247 probes contain circuitry to compensate for skin loss.

The compensation provides flat response with the probe cable. Extending the length of the output cable increases the amount of skin loss beyond the range of compensation correction. Minimizing the length of cable extension reduces the attenuation.

In critical applications which require high amplitude accuracy, the response of the probe with the extension should be characterized with a leveled signals source and power meter. The characterization results can then be factored into the measurement.

Using the Probe with Other Instruments

Besides the oscilloscope, it is possible to use the P6246 and P6247 differential probes with other types of measurement instruments. These instruments include, but are not limited to spectrum analyzers, time internal analyzers, and network analyzers.

When using the differential probes with these instruments you must normalize the probe with the instrument before making a measurement.

Specifications

The specifications in Tables 3 through 6 apply to a P6246 or P6247 probe installed on a Tektronix TDS 784A oscilloscope. When the probe is used with another oscilloscope, the oscilloscope must have an input impedance of 50 Ω and a bandwidth of 1 GHz. The probe must have a warm-up period of at least 20 minutes and be in an environment that does not exceed the limits described in Table 3. Specifications for the P6246 and P6247 differential probes fall into three categories: warranted, typical, and nominal characteristics.

Warranted Characteristics

Warranted characteristics (Tables 3) describe guaranteed performance within tolerance limits or certain type-tested requirements. Warranted characteristics that have checks in the *Performance Verification* section of the service manual (070-9899-XX) are marked with the ✓ symbol.

Table 3: Warranted electrical characteristics

✓ DC attenuation accuracy	± 2% for input voltages as follows: ± 750 mV (÷ 1) and ± 7.5 V (÷ 10) ± 5% for input voltages as follows: ± 850 mV (÷ 1) and ± 8.5 V (÷ 10)
Maximum non destructive input voltage	± 25 $V_{(DC + peak\ AC)}$ between signal and common of the same channel.
✓ Differential signal range (DC coupled)	± 8.5 V at attenuation setting of ÷ 10 ± 850 mV at attenuation setting of ÷ 1
Common-mode signal range (DC coupled)	± 7 V
✓ Output offset voltage	± 10 mV (+ 20° C to + 30° C) ± 50 mV (0° C to + 60° C)
Rise time (probe only)	P6246: < 875 ps P6247: < 350 ps

Table 3: Warranted electrical characteristics (Cont.)

✓ Common-mode rejection ratio	45 dB at 1 MHz in ÷ 10 25 dB at 100 MHz in ÷ 10 20 dB at 500 MHz in ÷ 10 18 dB at 1 GHz in ÷ 10 60 dB at 1 MHz in ÷ 1 38 dB at 100 MHz in ÷ 1 35 dB at 500 MHz in ÷ 1 30 dB at 1 GHz in ÷ 1
✓ Bandwidth (probe only)	P6246: DC to ≥ 400 MHz (– 3dB) P6247: DC to ≥ 1 GHz (– 3dB)
Temperature	Operating: 0 to + 50° C 0 to + 60° C[1] (probe head) Nonoperating: – 55 to + 75° C[1]
Humidity	Operating: 0–90% RH, tested at + 30 to + 50° C Nonoperating: 0–90% RH, tested at + 30 to + 60° C

1 **See warning that follows.**

WARNING. *To avoid a burn hazard at high ambient temperatures, do not touch the probe with bare hands at operating temperatures above + 50° C or at nonoperating temperatures above + 70° C.*

Typical Characteristics

Typical characteristics (Tables 4 and 5) describe typical but not guaranteed performance.

Table 4: Typical electrical characteristics

Differential input resistance, DC coupled	200 kΩ
Input resistance, DC coupled	100 kΩ ± 2%
Differential input capacitance	< 1 pF at 1 MHz
Common-mode input capacitance	< 2 pF at 1 MHz
Harmonic distortion	≤ 1.5% measured using 495 mV_{RMS} (or 1.4 V_{P-P}) output at 100 MHz
Differential offset range	± 700 mV (÷ 1 setting) ± 7 V (÷ 10 setting)
Common mode rejection ratio	See Figure 8
Random noise	< 50 $nV/\sqrt{Hz}$ at 100 MHz
Input impedance	See Figure 9
Bandwidth limit	−3 dB at 200 MHz
DC reject bandwidth	−3 dB at 4 Hz (÷ 10 setting) −3 dB at 0.4 Hz (÷ 1 setting)
Pass band ripple	P6246: ≤ ± 0.25 dB to the 3 dB bandwidth (deviation from a nominal slope) P6247: ≤ ± 0.25 dB to 850 MHz (deviation from a nominal slope)

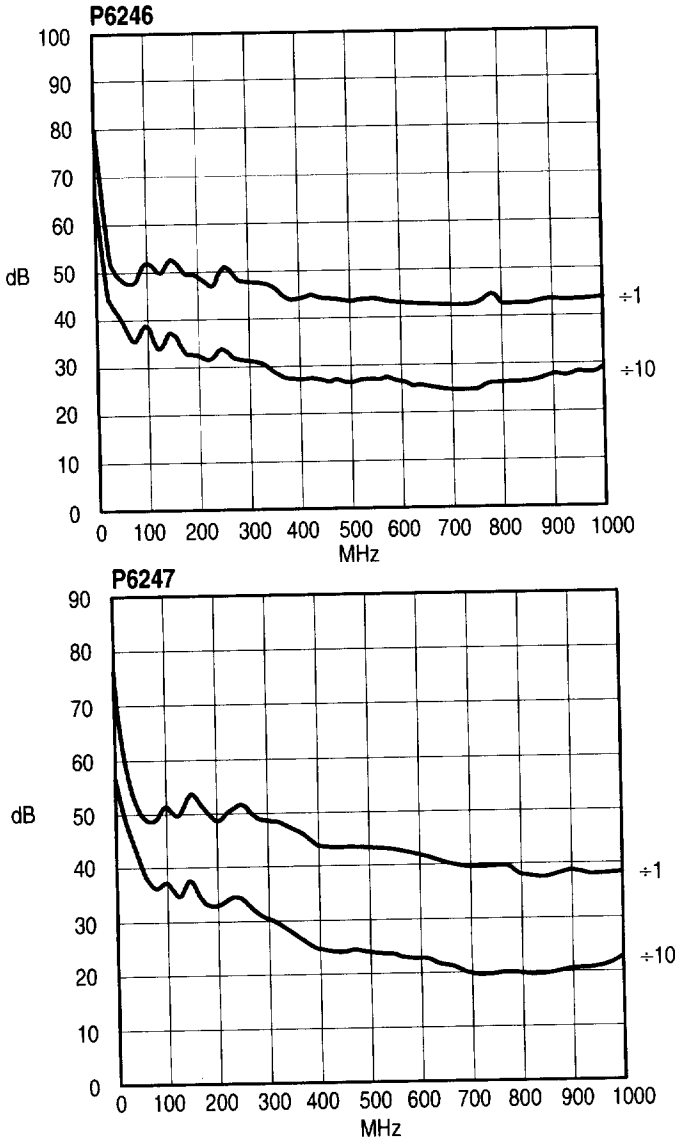


Figure 8: Typical Common-Mode Rejection Ratio (÷ 1 and ÷ 10 attenuation)

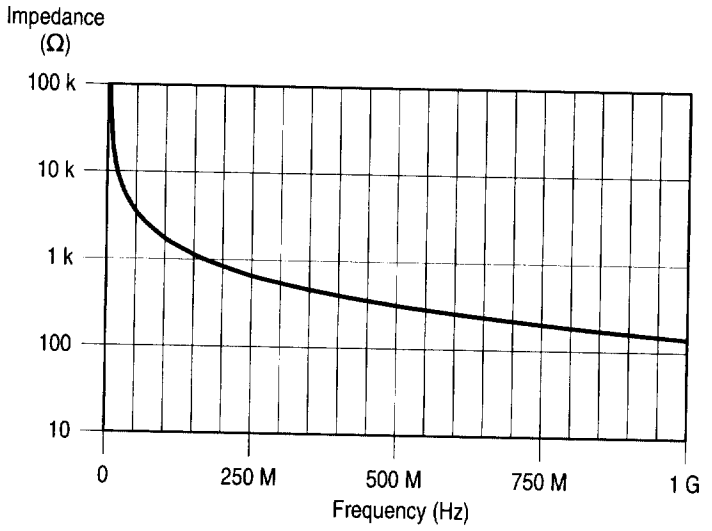


Figure 9: Typical input impedance versus frequency

Table 5: Typical mechanical characteristics

Dimensions, input connection	0.63 mm (0.025 in) square pin on 2.54 mm (0.100 in) centers
Dimensions, control box	107 mm × 41 mm × 26 mm (4.2 in × 1.6 in × 1.0 in)
Dimensions, probe head	78 mm × 12 mm × 9.3 mm (3.0 in × 0.47 in × 0.36 in)
Dimensions, output cable	1.2 m (47 in)
Unit weight (probe only)	160 g (5.4 oz)

Nominal Characteristics

Nominal characteristics (Table 6) describe guaranteed traits, but the traits do not have tolerance limits.

Table 6: Nominal electrical characteristics

Input configuration	Differential (two inputs, + and –), with case ground
Output coupling	DC and DC Reject
Attenuation settings	÷ 1 and ÷ 10
Termination	Terminate output into 50 Ω