ARTISAN®
TECHNOLOGY GROUP

Your **definitive** source for quality pre-owned equipment.

Artisan Technology Group
(217) 352-9330 | sales@artisantg.com | artisantg.com

Full-service, independent repair center
with experienced engineers and technicians on staff.

We buy your excess, underutilized, and idle equipment
along with credit for buybacks and trade-ins.

Custom engineering
so your equipment works exactly as you specify.

- Critical and expedited services
- In stock / Ready-to-ship
- Leasing / Rentals / Demos
- ITAR-certified secure asset solutions

Expert team | Trust guarantee | 100% satisfaction

All trademarks, brand names, and brands appearing herein are the property of their respective owners.

Find the *Tektronix P5205* at our website: *Click HERE*

Instruction Manual

Tektronix

P5205
High Voltage Differential Probe

070-9472-02

www.tektronix.com

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Copyright © Tektronix, Inc. All rights reserved.

Tektronix products are covered by U.S. and foreign patents, issued and pending. Information in this publication supercedes that in all previously published material. Specifications and price change privileges reserved.

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

TEKTRONIX, TEK, and TEKPROBE are registered trademarks of Tektronix, Inc.

TekProbe is a registered trademark of Tektronix, Inc.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

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 purchase from an authorized Tektronix distributor. If any such 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. Batteries are excluded from this warranty.

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, shipping charges prepaid, and with a copy of customer proof of purchase. 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 WITH RESPECT TO THE LISTED PRODUCTS 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.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table of Contents

General Safety Summary . . . . . **v**

Service Safety Summary . . . . . **vii**
Contacting Tektronix viii

Getting Started **1**
Features and Accessories 1
Installation 6
Functional Check 7

Operating Basics **9**
Operating the Probe Safely 9
Minimizing Risk of RF Burn (probe leads) 10
Maximum Input Limits 10
Operating Characteristics and Probing Techniques 11
Operating Limits 11
Overrange Detection 12
Common-Mode Rejection 12
Twisting the Input Leads 12
Extension Leads 13
Probe Loading 14

Specifications **15**
Warranted Characteristics 15
Typical Characteristics 17
Nominal Characteristics 19

Maintenance **21**
Cleaning 21
Servicing the Compensation Box 21
Replacing TEKPROBE Interface Pins 21
Removing and Replacing the TEKPROBE Interface Collar 23
Removing the Compensation Box Covers 24
Packaging For Return Shipment 25

Performance Verification **27**
Construction of Modified BNC Adapter 28
Setup 29
Differential Gain Accuracy 30

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Bandwidth 32
DC CMRR 33

Replaceable Parts 35
Parts Ordering Information 35
Using the Replaceable Parts List 35
Abbreviations 36
Mfr. Code to Manufacturer Cross Index 36

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

List of Figures

Figure 1: P5205 High-Voltage Differential Probe 2
Figure 2: Safety limits (voltage between either input and earth ground) 11
Figure 3: Twisting the input leads 13
Figure 4: HF transient response with and without extension leads 14
Figure 5: Typical common-mode rejection ratio (50X attenuation) 18
Figure 6: Input impedance vs. frequency 19
Figure 7: Replacing TEKPROBE interface pins 22
Figure 8: Replacing the TEKPROBE collar 23
Figure 9: Removing the compensation box covers 24
Figure 10: Replacing the compensation box cover 25
Figure 11: BNC-male-to-dual binding post adapter 28
Figure 12: Removing plastic covers from binding posts 29
Figure 13: Slide probe leads onto the binding posts 31
Figure 14: P5205 Probe and replaceable accessories 37
Figure 15: Replaceable parts – compensation box 39
Figure 16: P5205 optional accessories 40

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

List of Tables

Table 1: Functional Check 8
Table 2: Warranted Electrical Characteristics 15
Table 3: Certifications and Compliances 16
Table 4: Typical Electrical Characteristics 17
Table 5: Typical Mechanical Characteristics 18
Table 6: Nominal Electrical Characteristics 19
Table 7: List of Equipment Required 27
Table 8: Parts List Column Descriptions 34

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

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.

Observe Maximum Working Voltage

Do not use the P5205 above 1,000 V_{RMS} CAT II from ground on either input or ± 1,300 V (DC + peak AC) between the leads.

To Avoid Fire or Personal Injury

Avoid RF Burns While Handling Probe. To avoid RF burns, do not handle the probe while the input leads are connected to circuits above the voltage and frequency limits specified in Figure 2 on page 11. Use only probe accessories that are rated for the application.

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.

Ground the Product. This product is indirectly grounded through the grounding conductor of the mainframe 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 markings on the product. Consult the product manual for further ratings information before making connections to the product.

Use Proper AC Adapter. Use only the AC adapter specified for this product.

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

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

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

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



WARNING
High Voltage



Double
Insulated



Protective Ground
(Earth) Terminal

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

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.

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.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Contacting Tektronix

Phone	1-800-833-9200*
Address	Tektronix, Inc. 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.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Getting Started

This section describes the High Voltage Differential Probe and gives instructions on how to install and functionally test the probe.

Features and Accessories

The P5205 probe shown in Figure 1 provides a safe means of measuring circuits with floating high voltages. The probe outputs a low-voltage, ground-referenced signal for display on instruments with the TEKPROBE interface (or any oscilloscope or other measurement instrument when used with the Tektronix 1103 TEKPROBE power supply).

To protect you from RF and high voltage, the case of the probe is nonconductive, internally shielded, and isolated. The internal shield connects to earth ground through the output lead. The case of the probe and control buttons are isolated and double insulated. This protection extends up to the full input rating of the probe.

The accessories supplied with the probe meet the same safety standards as the probe. You may use other accessories if they are approved for the maximum voltage present in your application and have the same style and size connectors.

The P5205 probe allows clear and accurate measurements of high-speed transitions and provides excellent rejection of common-mode signals. Both inputs have high impedance and low capacitance. Because of these features, the probe can safely measure the fast voltage transients in switching power devices without damaging them.

Other applications for the P5205 probe include testing high-voltage motor control circuits and line-connected circuits in switch-mode power supplies.

For a complete list of replaceable accessories and part ordering information, see the *Replaceable Parts* section, starting on page 35.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

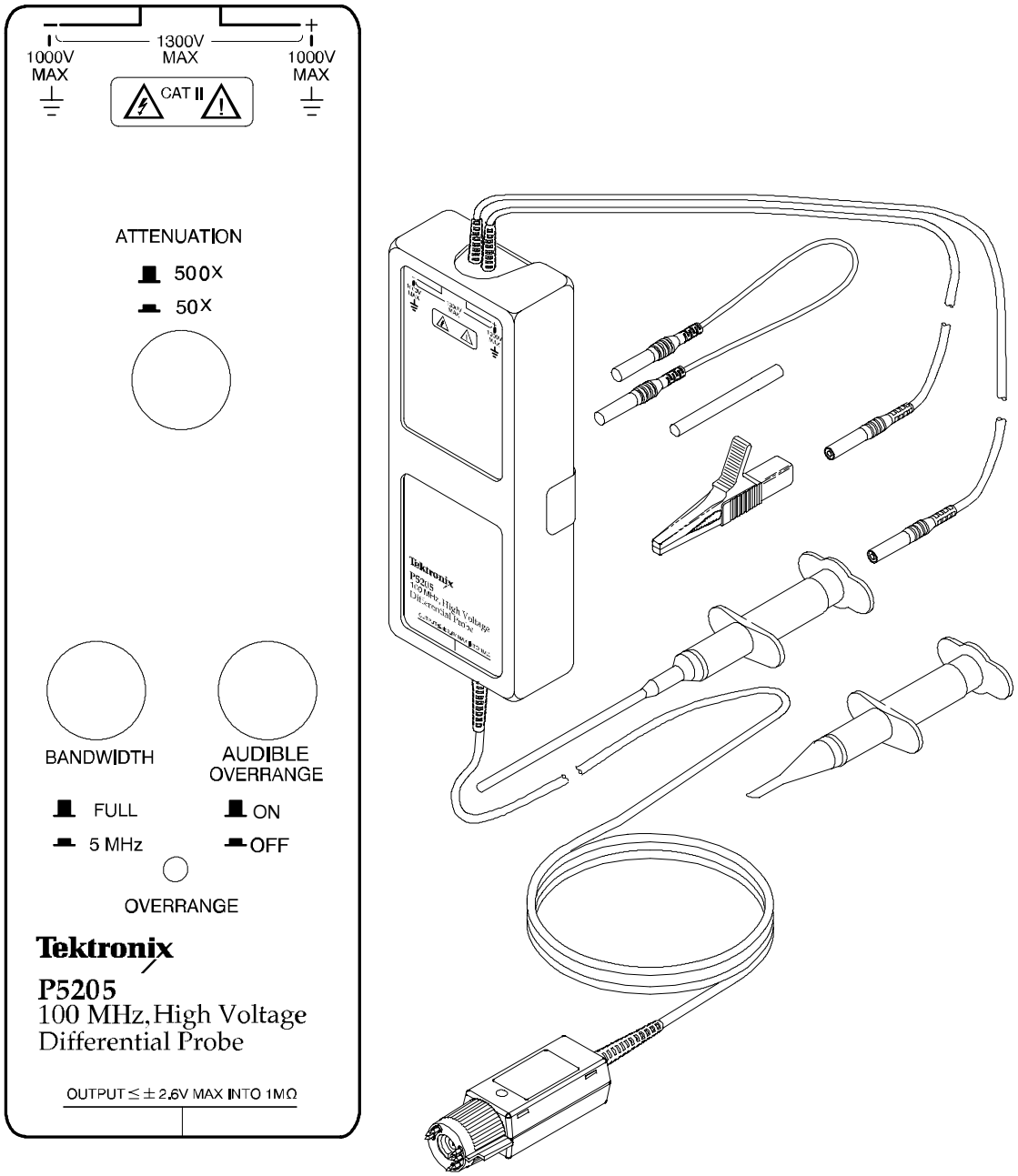
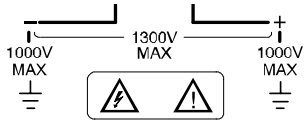
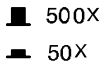


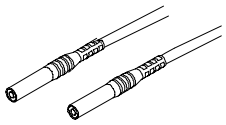
Figure 1: High Voltage Differential Probe

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

The P5205 has several features and accessories that make probing and measurement a simpler task. Take a moment to familiarize yourself with these items and their uses.

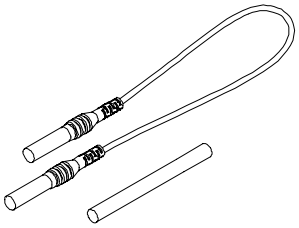
	**Differential Inputs.** The inputs are rated to safely accept a maximum of 1,000 V_{RMS} CAT II between either input and earth ground and a maximum difference of 1,300 V (DC + peak AC) between the inputs. ***NOTE.*** The input safety ratings are valid for both attenuation range settings. However, for useful measurements, the input should be kept to the operating limits of the selected attenuation range of 130 V up to 1,300 V (DC + peak AC).
	**Attenuation Range.** In the raised position the range button sets the attenuation to 500X. In the lowered position the range button sets the attenuation to 50X. Use the 500X position for measurements up to a maximum of 1,300 V (DC + peak AC) differential. Use the 50X position for better signal resolution on connections below 130 V (DC + peak AC).
	**Overrange Indicator.** The overrange indicator lights red if the voltage of the input signal exceeds the linear operating range of the probe. When this happens, the signal on the probe output does not accurately represent the signal on the probe input.
	**Audible Overrange.** In the raised position the overrange button sets the audible alarm to sound whenever the overrange indicator lights.
	**Bandwidth Select.** In the raised position the bandwidth button sets the full bandwidth (100 MHz minimum). In the lowered position the bandwidth is restricted to approximately 5 MHz.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



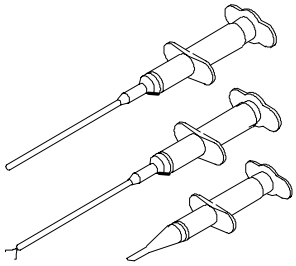
Input Leads. The input leads of the differential probe connect to the crocodile clips and plunger clamps that come with the probe. The connectors are 4 mm insulated banana plugs and are double insulated for safety.

NOTE. Use only accessories that are rated to the maximum input voltage of the P5205 probe.

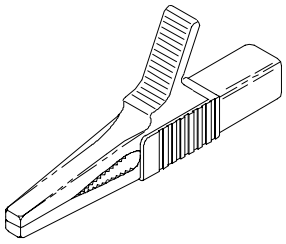


Extension Leads and Adapters. To measure the potential between widely separated points, connect the extension leads to the input leads with the supplied adapters. Use both extension leads to minimize distortion caused by mismatched lead length.

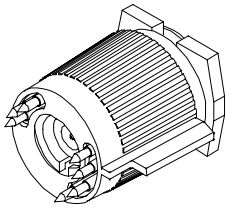
NOTE. Above 10 MHz, the extension leads degrade the high frequency performance of the P5205 probe. See Figure 4 on page 14.



Plunger Clamps. The plunger clamps have long sleeves with retracting hooks. These clamps connect safely to recessed test points that are otherwise difficult to reach. The connectors are double insulated for safety.



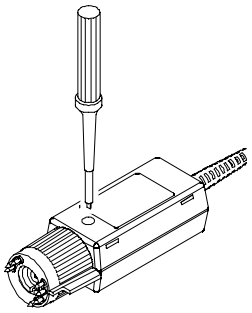
Crocodile Clips. The large insulated clips connect easily to large bolts or bus bars. The connectors are double insulated for safety.



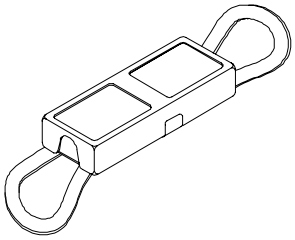
TEKPROBE Interface. The TEKPROBE interface provides power, signal, and probe characteristic data transfer.

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

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

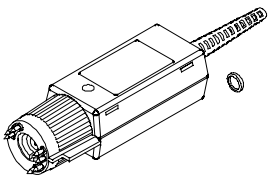


Zero Adjust. The zero adjust allows you to set the probe output to the zero reference point prior to making measurements. Use the adjustment tool provided.



Soft Case. The soft case protects the probe and allows you to hang the probe near the point of measurement. Install or remove the case by opening the access doors on the back.

When not in use, coil the leads and secure them with the strap on the back. Use one of the loops to hang the probe on a storage hook or utility belt.



Color Marker Bands. When you are using more than one probe, the bands enable you to quickly distinguish between probes and the channels they are connected to.

To use the marker bands, attach one band near the probe head and the matching band near the compensation box.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Installation

Install the P5205 probe as follows:

1. Connect the output of the probe to the TEKPROBE input of the oscilloscope or other measurement instrument. The measurement instrument input must have a ground reference.

***NOTE**. Use the 1103 TEKPROBE Power supply if the instrument does not have the TEKPROBE interface.*

---

2. Select the proper range setting. For higher resolution and less noise when measuring signals below 130 V, switch the attenuation to 50X. If the overrange indicator lights or flashes, the output signal may not be accurate. Use the 500X setting instead.
3. The probe output is adjusted to zero at the factory. Adjust the probe output to zero only if you need to measure small differential voltages. Follow steps a and b to make the adjustment.
    a. Let the probe warm up for at least 20 minutes.
    b. Connect the input leads of the probe together. Insert the adjustment tool in the access hole of the compensation box and adjust the probe to the zero reference point.

If you are using this probe for the first time, read the *General Safety Summary* on page v, and read page 9 of the *Operating Basics* section for important safety information.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Functional Check

To make a simple functional check of the P5205 probe, select a source that supplies AC line voltage and use the following procedure. This procedure verifies a majority of the circuitry within the probe. For a complete performance verification, refer to the *Performance Verification* section starting on page 27.

1. Use the installation procedure starting on page 6 to connect the output of the P5205 probe to a measurement instrument.
2. Connect the inputs, set the range, and perform the check as each line of Table 1, below, indicates.

Table 1: Functional check

Input 1 (+ or -)	Input 2 (- or +)	Mode	Range setting	Check
Hot	Ground or Neutral	Differential	500X (out)	Measurement instrument displays or indicates the line voltage
			50X (in)	Overrange indicator lights if the input is 150 Vp
	Hot (same connection)	Common Mode	50X or 500X	No signal

This completes the functional check procedure.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Operating Basics

To help you use the High Voltage Differential Probe safely and effectively, this section provides important information about safety limits, operating characteristics, and probing techniques.



WARNING. *Due to the inherent hazards associated with taking high-voltage measurements, the product is intended for use by qualified personnel who have had the training to make these types of measurements. Read and follow the precautions specified in this manual.*

Before you make any oscilloscope measurement, observe all safety precautions described in the user and service manuals for the equipment you are working on. Some general rules about using and servicing electrical equipment are worth repeating here.

- Observe the safety instruction symbols for the equipment you are working on.
- Consult the instruction or service manuals for the equipment you are working on.
- Don’t operate or service an electrical device in an explosive atmosphere.
- Avoid personal injury by never touching exposed connections or components in the circuit-under-test when the power is on.

Operating the Probe Safely

Before connecting the inputs of the probe to a circuit, read the safety information in this section, and attach the appropriate accessories to the input connectors of the probe.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Minimizing Risk of RF Burn (probe leads)



WARNING. *To avoid personal injury, do not handle the probe leads when the leads are connected to a source that is above the voltage and frequency limits given in Figure 2 on page 11. The area above these limits poses a risk of radio frequency (RF) burns.*

If you need to use the probe within the risk area for RF burn, power down the source before connecting or disconnecting the probe leads.

Maximum Input Limits



CAUTION. *To avoid damaging the input circuitry of the P5205 probe, do not apply a voltage that is more than 1,000 V_{RMS} CAT II between either input and ground or more than 1,300 V (DC + peak AC) between the two inputs. Above 3 MHz, the voltage limit decreases as frequency increases. See Figure 2 on page 11. The input limit applies to both the 50X and 500X settings.*

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

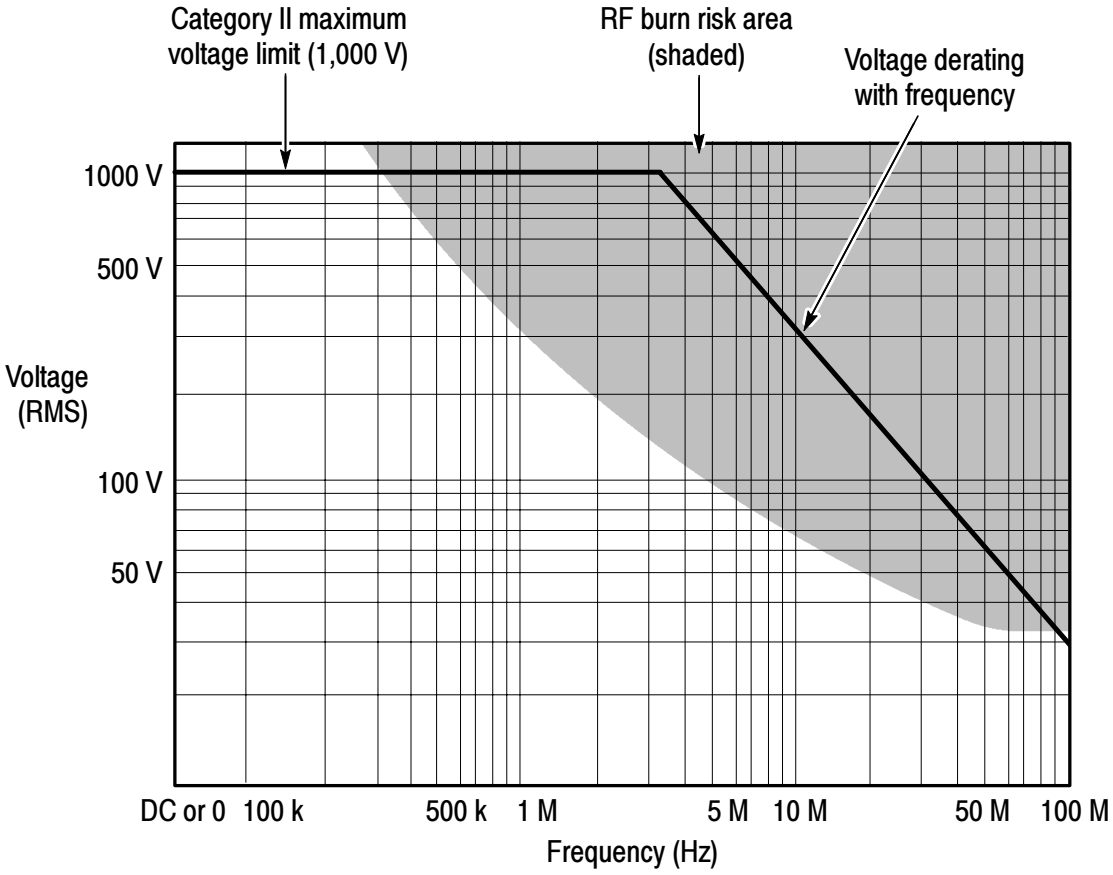


Figure 2: Safety Limits (voltage between either input and earth ground)

Operating Characteristics and Probing Techniques

This section explains the operating characteristics of the High Voltage Differential Probe along with techniques you can use to maximize the performance of the probe.

Operating Limits

The P5205 probe has two operating ranges that you select with the ATTENUATION button on the front panel:

- Select the 50X range for inputs of 0 V to 130 V (DC + peak AC).
- Select the 500X range for inputs of 130 V to 1300 V (DC + peak AC).

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Both ranges are rated for the maximum input limits, but you can obtain a useful measurement only if the voltage you apply is within the specified limits of the operating range.

Overrange Detection

Differential voltage outside the operating range will overdrive the circuitry of the probe and distort the output signal. When this differential overrange occurs, the probe detects the condition and lights the overrange indicator. With the Audible Overrange ON, the probe will also emit an audible alarm.

Common-mode voltage greater than 1,000 V_{RMS} can distort the output signal, but the probe will not indicate an overrange condition.

Common-Mode Rejection

The common-mode rejection ratio (CMRR) is the specified ability of P5205 probe 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 of probe to reject common-mode signals. For exact specifications, see pages 15 and 17.

Common mode rejection decreases as the input frequency increases. Figure 5 on page 18 is a plot of typical CMRR of the probe versus input frequency. For example, if you apply a 60 Hz line voltage of 500 V_{P-P} to both input leads of the probe, the probe rejects the signal by 80 dB (typical) and the signal appears as only a 50 mV_{P-P} signal on the oscilloscope screen.

To maximize the rejection of common-mode signals, twist the input leads together as shown in Figure 3 on page 13, and do not use the extension leads.

Twisting the Input Leads

Twisting the input leads as shown in Figure 3 helps to cancel noise that is induced into the input leads and to improve the high-frequency response of the inputs. For the best response possible, do not use the extension leads.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

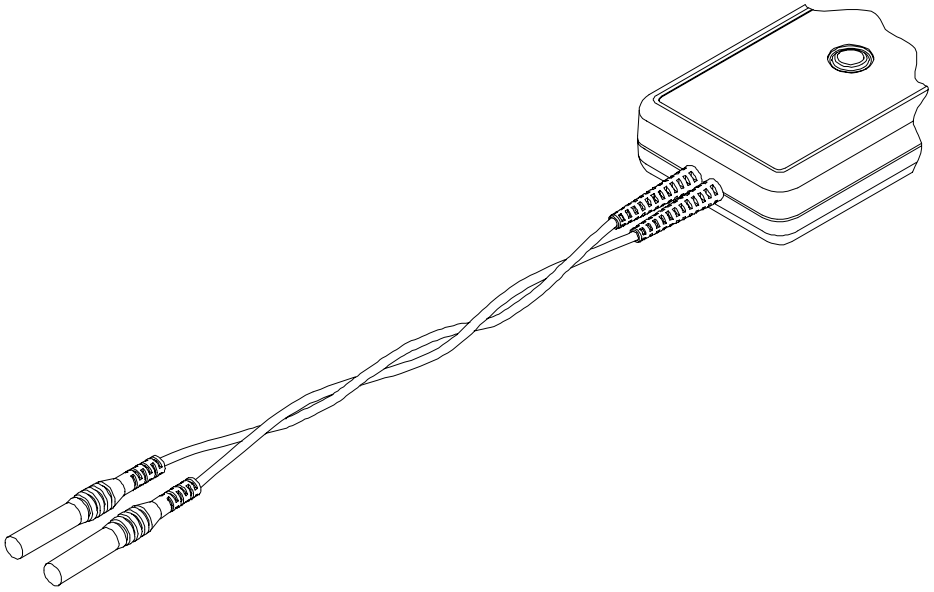


Figure 3: Twisting the input leads

Extension Leads

The extension leads allow you to reach widely spaced connection points. Connect the extension leads to the input leads using the adapters provided. Be sure to use both extension leads so that the input leads are the same length.

The extension leads, however, do affect the high-frequency performance of the probe. With longer lead length, differential noise induced into the input leads is greater. Also, because of the added inductance of the leads, voltage measurements at frequencies above approximately 10 MHz may not be as precise. Figure 4 on page 14 shows the affect on HF transient response.

The extension leads do not affect the performance of the probe when bandwidth is set to 5 MHz.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

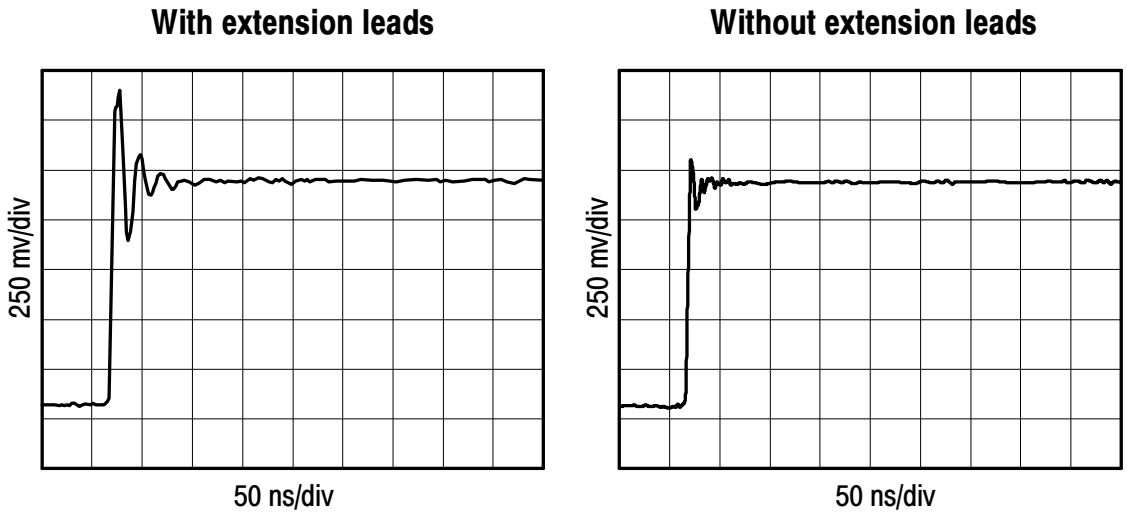


Figure 4: HF Transient response with and without extension leads

Probe Loading

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

Frequency and impedance of the source determine how much the probe loads the circuit you are measuring. As the frequency of the source starts to increase beyond 1 kHz, the input impedance of the probe begins to decrease. The lower the impedance of the probe relative to that of the source, the more the probe loads the circuit under test. For a graph of frequency versus input impedance, refer to Figure 6 on page 19.

The probe has virtually no loading effect on sources with relatively low impedance and low frequency.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Specifications

The specifications in Tables 2 through 6 apply to a P5205 probe installed on a Tektronix TDS 460A oscilloscope. When the probe is used with another oscilloscope, the oscilloscope must follow these specifications:

- An input impedance of 1 MΩ
- An input capacitance range of between 15 and 20 pF
- A bandwidth greater than 400 MHz

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 2.

Specifications for the P5205 probe fall into three categories: warranted, typical, and nominal characteristics.



WARNING. *Special fixtures are required to examine specifications at the maximum frequency and voltage levels and should be conducted only by qualified Service Personnel. See the Service section for more detail.*

Warranted Characteristics

Warranted characteristics in Tables 2 and 3 describe guaranteed performance within tolerance limits or certain type-tested requirements. Warranted characteristics that have checks in the *Performance Verification* section appear in **boldface** type.

Table 2: Warranted Electrical Characteristics

DC Common Mode Rejection Ratio	> 3000:1 at 500 VDC, 20-30° C, <70% RH
Bandwidth	DC to 100 MHz (-3 dB)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 2: Warranted Electrical Characteristics (Cont.)

Maximum Operating Input Voltage	500X differential: ± 1.3 kV (DC + peak AC) 500X common mode: ± 1 kV_{RMS} CAT II 50X differential: ± 130 V (DC + peak AC) 50X common mode: ± 1 kV_{RMS} CAT II
Maximum Nondestructive Input Voltage	500X and 50X differential: ± 1.5 kV (DC + peak AC) 500X and 50X common mode: ± 1.3 kV_{RMS} CAT II
Gain Accuracy	± 3% at 20-30° C, <70% RH
Temperature	Operating: 0 to 40° C Nonoperating: -30 to +70° C
Humidity	Operating: <85% RH at or below +35° C Nonoperating: <85% RH at or below +60° C

Table 3: Certifications and Compliances

EC Declaration of Conformity - Low Voltage	Compliance was demonstrated to the following specification as listed in the Official Journal of the European Communities: Low Voltage Directive 73/23/EEC, as amended by 93/68/EEC: EN 61010-1/A2:1995 Safety requirements for electrical equipment for measurement, control, and laboratory use EN 61010-2-031:1994 Particular requirements for hand-held probe assemblies for electrical measurement and test equipment
Approvals	UL3111-1 - Standard for electrical measuring and test equipment IEC 10106-2-031 - Particular requirements for hand-held probe assemblies for electrical measurement and test CAN/CSA-C22.2 No. 1010.1-92 and CAN/CSA-C22.2 No. 1010.2.031-94 - Safety requirements for electrical equipment for measurement, control, and laboratory use

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 3: Certifications and Compliances (Cont.)

Installation Category Descriptions	Terminals on this product may have different installation category designations. The installation categories are: CAT III — Distribution-level mains (usually permanently connected). Equipment at this level is typically in a fixed industrial location CAT II — Local-level mains (wall sockets). Equipment at this level includes appliances, portable tools, and similar products. Equipment is usually cord-connected CAT I — Secondary (signal level) or battery operated circuits of electronic equipment
Pollution Degree 2	Do not operate in environments where conductive pollutants may be present.

Typical Characteristics

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

Table 4: Typical Electrical Characteristics

Rise Time	3.5 ns
Bandwidth Limit	5 MHz
AC Common-Mode Rejection Ratio (20-30° C, <70% RH) See Figure 5 on page 18	60 Hz: > 10,000:1 100 kHz: > 300:1 100 MHz: > 300:1
AC Noise (referenced to input)	50X: < 50 mV_{RMS} 500X: < 300 mV_{RMS}
Input Impedance	8 MΩ, 3.5 pF between inputs 4 MΩ, 7 pF between each input and ground See Figure 6
Propagation Delay	17 nS

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 4: Typical Electrical Characteristics (Cont.)

Overdrive Recovery	< 50 ns to 10% of final value after 10X overdrive (50X range only)
Zero Adjust	50X: ± 0.5 V 500X: ± 5 V

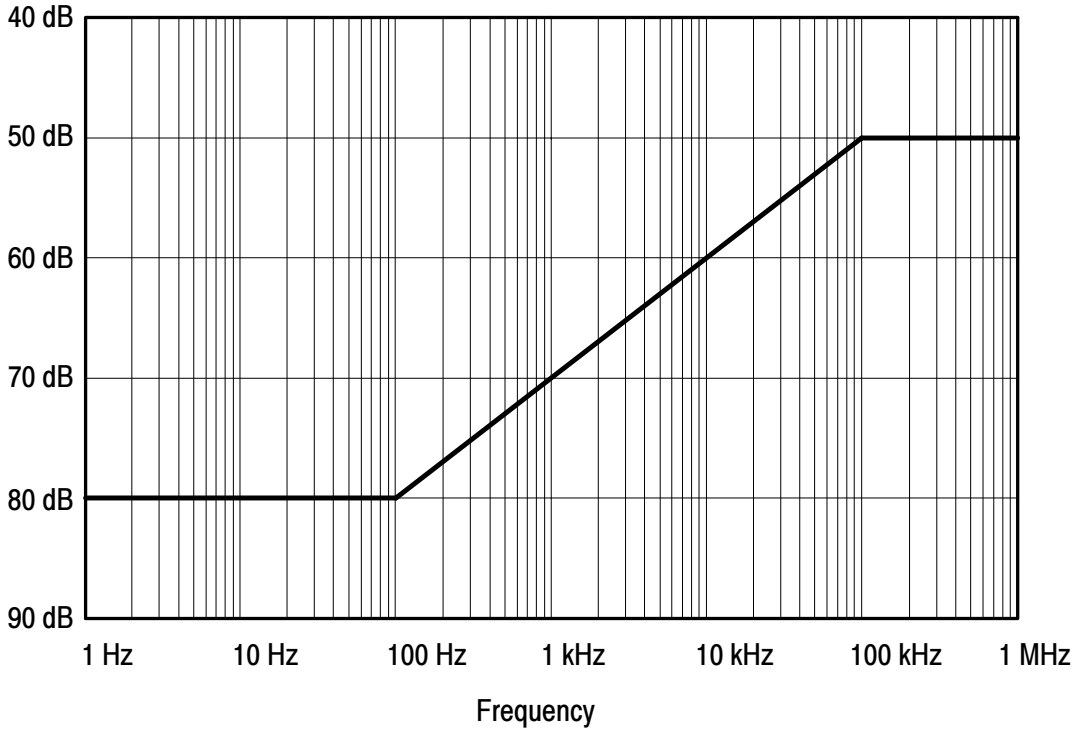


Figure 5: Typical Common-Mode Rejection Ratio (50X Attenuation)

Table 5: Typical Mechanical Characteristics

Dimensions, Case	7.2 in × 2.6 in × 1.3 in (185 mm × 66 mm × 32 mm)
Dimensions, Input Leads	12 in (30 cm)
Dimensions, Output Cable	6 ft (1.8 m)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 5: Typical Mechanical Characteristics (Cont.)

Unit Weight (probe only)	11 oz (315 g)
Shipping Weight (with accessories)	3 lb, 2 oz (1.42 kg)

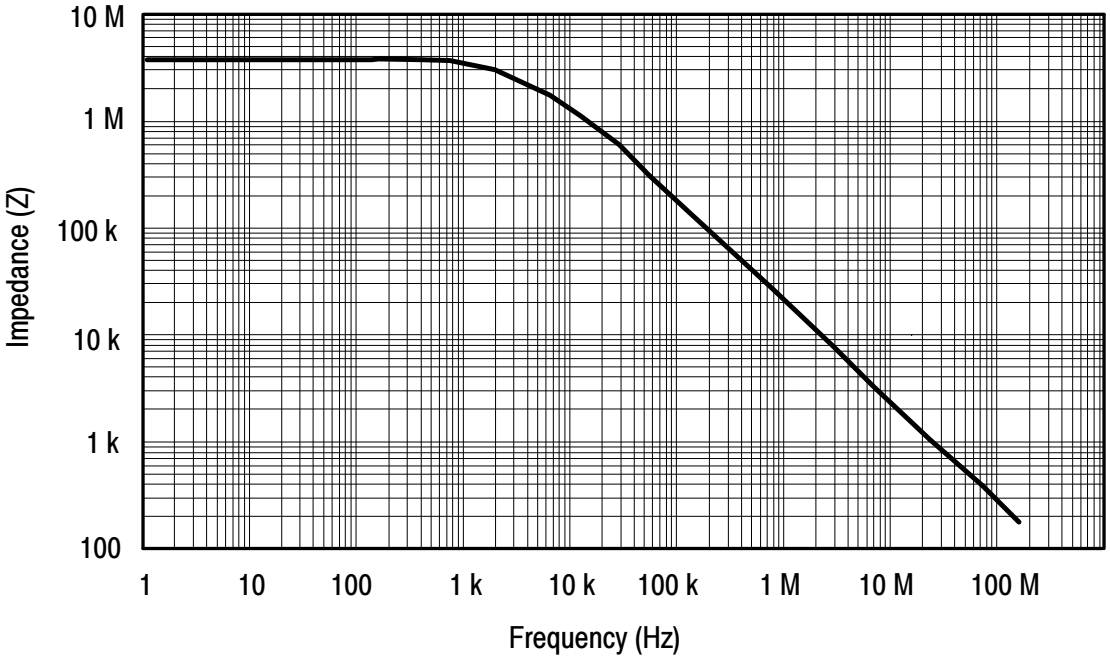


Figure 6: Input Impedance vs. Frequency

Nominal Characteristics

Nominal characteristics in Table 6 on page 19 describe guaranteed traits, but the traits do not have tolerance limits.

Table 6: Nominal Electrical Characteristics

Input Type	Balanced differential
Output Type	Single-ended. Source Impedance of 50 Ω drives 1 MΩ oscilloscope input. Load impedance must be greater than 50 kΩ for stated accuracy

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 6: Nominal Electrical Characteristics (Cont.)

Gain	Switchable: 1/50 (“50X”) and 1/500 (“500X”)
Audible Overrange	Audible over range sounds whenever ON, and over range LED is lit.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Maintenance

Refer to this section for information about maintaining and servicing the High Voltage Differential Probe.

For terms of the product warranty, refer to the front of this manual. Should the probe require replacement under terms of the warranty, return the probe to a Tektronix service center. Refer to page 25 for packaging instructions.

For a list of replaceable parts, refer to the *Replaceable Parts* section on page 35.

For further assistance, refer to *Contacting Tektronix* on page viii.

Cleaning

Remove dirt with a soft cloth dampened in a mild detergent and water solution or isopropyl alcohol.



CAUTION. *To avoid damaging the probe, use only a mild detergent and water solution or isopropyl alcohol, do not use any other solvents or abrasive cleaners. Do not immerse the probe.*

Servicing the Compensation Box

Some components of the compensation box can be serviced. These components include the TEKPROBE interface pins, the probe collar, and the compensation box covers.

Replacing TEKPROBE Interface Pins

TEKPROBE interface pins can stick and fail to make contact after time. Periodically check each of the interface pins. Replace any pin that fails to move freely and fully extend.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

To remove a TEKPROBE interface pin, firmly grasp the pointed tip with pliers and pull the pin out of the connector. See Figure 7.

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 of the pin gently but firmly against a hard surface.

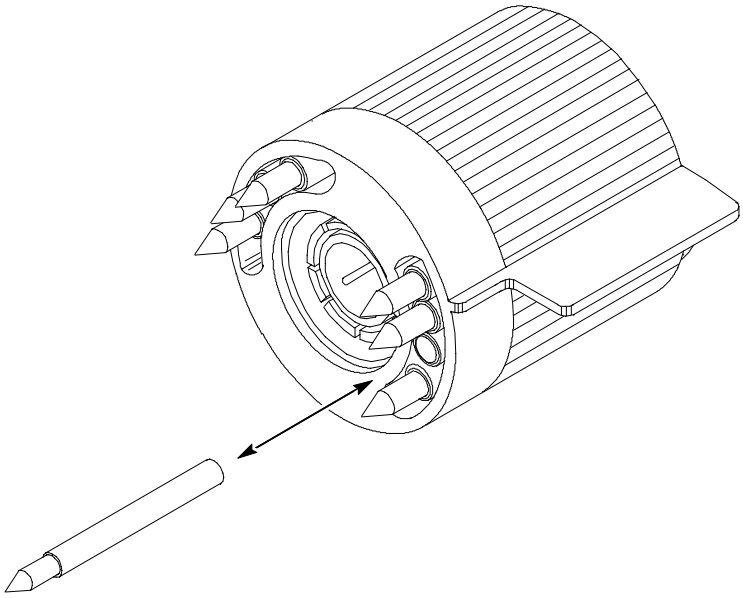


Figure 7: Replacing TEKPROBE interface pins

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Removing and Replacing the TEKPROBE Interface Collar

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

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

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

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

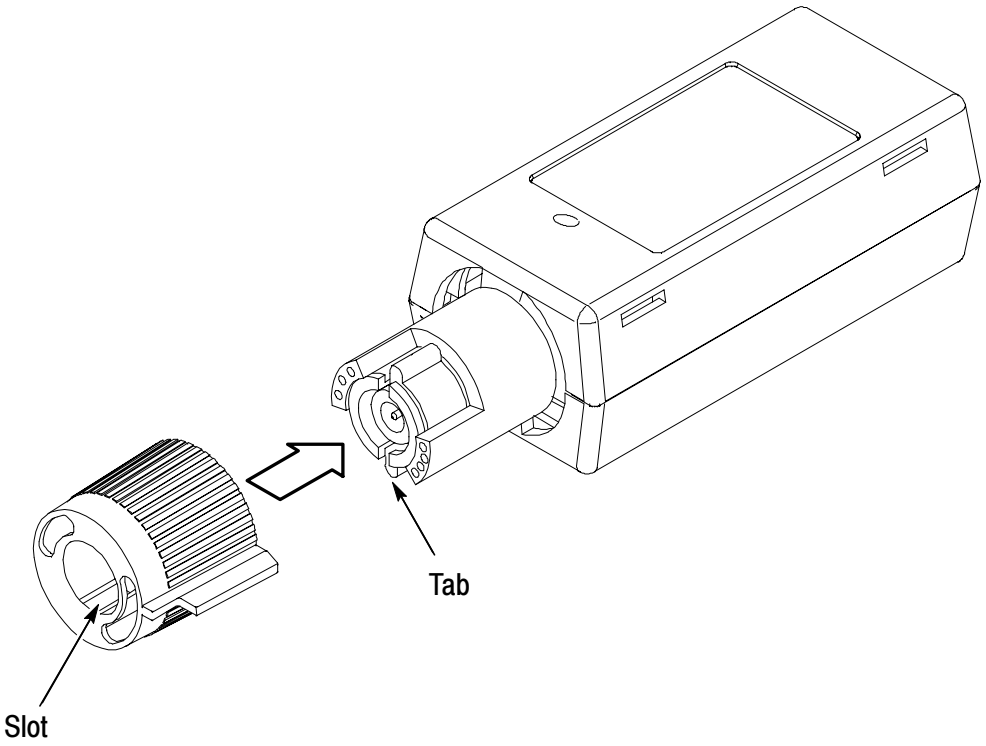


Figure 8: Replacing the TEKPROBE collar

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Removing the Compensation Box Covers

To open the compensation box, follow these steps:

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 9, below.
2. Hold the open edge apart, and use the tool to open the other side of the compensation box.
3. With both sides of the box open, gently separate the two halves of the compensation box.

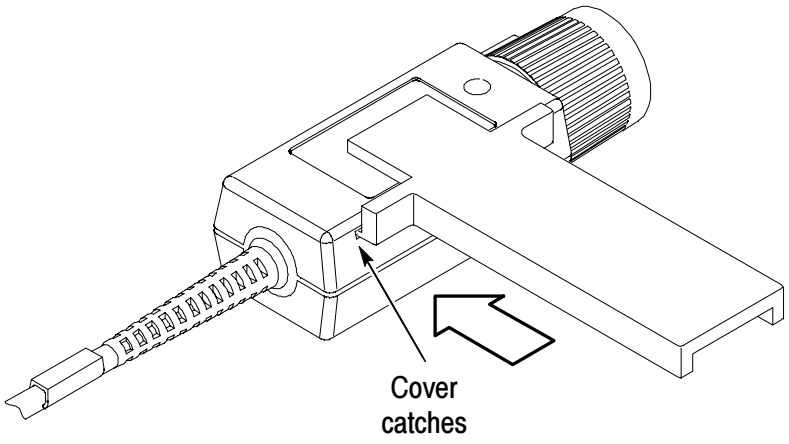


Figure 9: Removing the compensation box covers

Replacing the Compensation Box Covers

To replace the covers, follow these steps:

1. Align the TEKPROBE interface and the strain relief notches with the tabs on the cover. Refer to Figure 10 on page 25.
2. Press the catches of the bottom cover in and lower the top cover.
3. Slide the tab into the notch.
4. Firmly press the pieces together until the cover catches snap into place.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

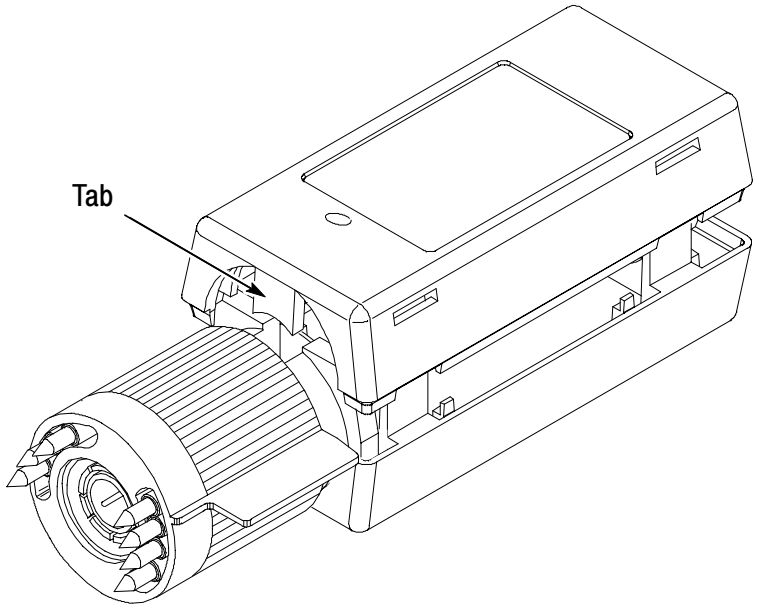


Figure 10: Replacing the compensation box cover

Packaging For Return Shipment

If possible, use the original packaging to return the probe to Tektronix. Include the following information: name of purchaser, return address, name and phone number of a person that Tektronix may contact, date of purchase, and a description of the defect.

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

1. Select a sturdy shipping carton that has inside dimensions at least one inch greater than the probe dimensions.
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. Seal the carton with shipping tape.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

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.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Performance Verification

The following procedure verifies the warranted electrical characteristics of the High Voltage Differential Probe. Table 7 itemizes the equipment required, provides an example or part number of the equipment, and explains the purpose of the equipment.

Table 7: List of equipment required

Description	Minimum requirements	Example or part number	Purpose
Test oscilloscope	Bandwidth: ≥ 400 MHz TEKPROBE interface vertical accuracy: ≤ 1.5%	TDS460A, TDS744A, or TDS784A	Display probe output
Standard amplitude generator Leveled sine wave generator DC voltage source	Amplitude accuracy: ≤ 0.75% Rise time: ≤ 3 ns	Fluke/Wavetek 9100 with oscilloscope option 250	Check probe attenuation, bandwidth, and common-mode rejection ratio
Plunger clamps (2 required)	Use clamps included in accessory kit	Accessory kit 020-2106-00	Connection to binding post
Modified BNC adapter	BNC-male-to-dual binding post	103-0035-00	Interconnection between probe and generator. (See Figure 11 on page 28).
BNC adapter	BNC-female-to-dual banana	103-0090-00	Interconnection between probe and generator
Coaxial cables (2 required)	36 in (0.9144 m), precision 50 Ω	012-0482-00	Interconnection between oscilloscope and generator
Terminator	50 Ω precision feed through	011-0049-01	Termination between probe and generator during bandwidth measurements

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Construction of Modified BNC Adapter

Construct the modified BNC Adapter from a BNC-male-to-dual binding post adapter, Tektronix part number 103-0035-00 (see Figure 11).

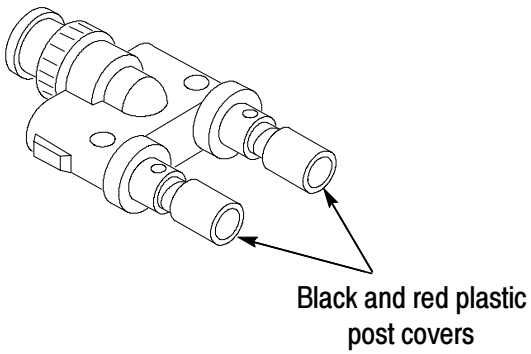


Figure 11: BNC-male-to-dual binding post adapter

To expose the posts that you will connect the P5205 High-Voltage Differential probe leads to, remove the black and red plastic post covers of the BNC-male-to-dual adapter. Use a pair of pliers and a vise to remove the plastic covers, as shown in Figure 12 on page 29.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

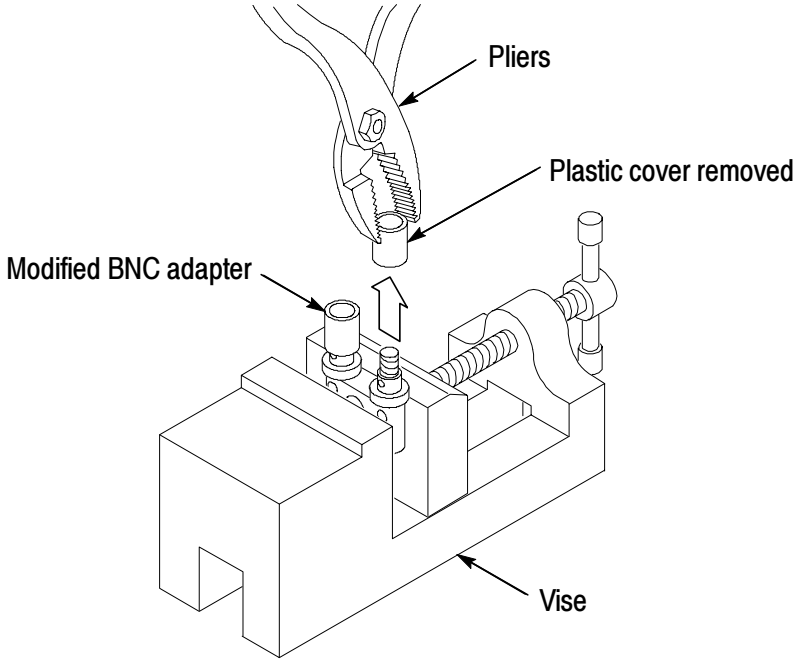


Figure 12: Removing plastic covers from binding posts

Setup

WARNING. *These procedures require the application of high voltage to the inputs of the P5205 probe. Because this adapter has exposed metal surface, only qualified personnel should perform testing with voltage levels that exceed 30 V rms. All pertinent safety rules and guidelines for elevated voltage measurements should be followed and adhered to.*

Connect the output of the probe to the Channel 3 input of the test oscilloscope. Let the probe warm up for 20 minutes.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

***NOTE**. These procedures assume that you are using an oscilloscope that automatically displays the correct volts/division scale factor for the attenuation setting of the probe. If not, you must take the attenuation setting of the probe into account when setting the volts/division on the oscilloscope.*

Differential Gain Accuracy

1. Set the volts/division on channel 2 of the oscilloscope to 2 V.
   - Trigger on channel 2.
   - Select 1 MΩ impedance (if option exists on oscilloscope).
   - Connect coaxial cable between TRIG OUT of the generator (rear of Wavetek 9100) and channel 2 of the oscilloscope.
2. Set the volts/division on channel 1 of the oscilloscope to 50 mV/div.
3. Set the seconds/div to 200 µs, and the acquisition mode to average 32.
4. Connect the coaxial cable from SIG OUT of the generator (rear of Wavetek 9100) to channel 1 of the oscilloscope.
5. Set the generator to 0.1 V and 1 kHz (AUX, square wave, 1 MΩ load). Enable the output.
6. Select the amplitude measurement on the oscilloscope and record the DC amplitude (~ 100 mV) of square wave. This measurement is only the oscilloscope.
7. Disable the generator output. Disconnect the coaxial cable from channel 1 of the oscilloscope and SIG OUT of the generator.
8. Connect the output of the probe to channel 1 of the oscilloscope.
9. Attach the Modified BNC adapter to the SIG OUT of the generator.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

10. Attach the differential probe input leads (without attachment accessories) by sliding the banana plug of the leads onto the binding posts metal sleeves on the Modified BNC adapter (see Figure 13).

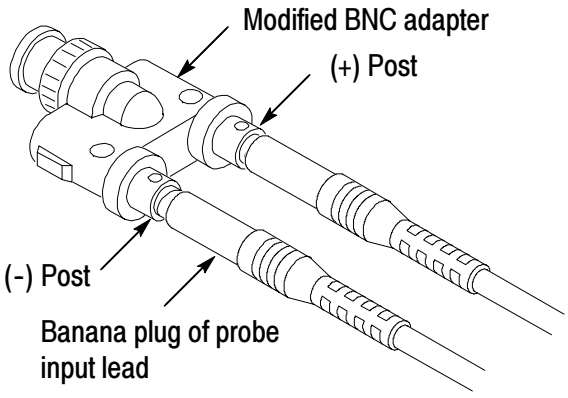


Figure 13: Slide probe leads onto the binding posts

WARNING. *To reduce the risk of electric shock, ensure the generator output is disabled before modifying/disconnecting test setup or connections since exposed metal may at a hazardous potential. It is recommended that the generator output amplitude be reduced to minimum prior to disabling the output.*

11. Set the probe to 500X (out). Set the generator for a 100 V and 1 kHz standard amplitude output (AUX, square wave, 1 MΩ load).

12. Reduce the amplitude on the generator to minimum then enable the output.

13. Adjust the zero offset on the compensation box of the probe for zero offset.

14. Record the DC amplitude of the square wave (~100 V) and divide 1/1000th of this into the amplitude of just the oscilloscope (refer to step 6). Verify that only the probe gain accuracy is ±3%.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

15. Set the calibration generator for 10 V output. Set the attenuation button on the probe to 50X (in).

16. Record the DC amplitude of the square wave (~10V) and divide 1/100th of this into only the amplitude of the oscilloscope (refer to step 6). Verify that only the probe gain accuracy is ±3%.

17. Reduce the amplitude on the generator to minimum then disable the generator output, leaving the setup connected for the next procedure.

Bandwidth

1. Connect the Modified BNC adapter through a 50 Ω terminator to the leveled sine wave output of the generator (AUX, Sine, 50 Ω load).



WARNING. *To reduce the risk of electric shock, ensure the generator output is disabled before modifying/disconnecting test setup or connections since exposed metal may at a hazardous potential. It is recommended that the generator output amplitude be reduced to minimum prior to disabling the output.*

2. Attach the differential probe input leads (without attachment accessories) by sliding the banana plug of the leads onto the binding posts metal sleeves on the Modified BNC adapter (see Figure 13 on page 31).

3. Set the bandwidth on the probe to FULL and the attenuation button to 50X.

4. Set the Volts/Division on channel 1 of the oscilloscope to 500 mV, and sec/div to 20 µs. Set the trace to the center of the oscilloscope.

5. Reduce the amplitude on the generator to minimum then enable the output.

6. Set the sine wave generator to 50 kHz, and adjust the amplitude to 3.00 V as measured on the oscilloscope.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

7. Set the generator to 100 MHz, and set the oscilloscope to 5 ns/division. Check for ≥ 2.1 V amplitude.
8. Disconnect the setup.

DC CMRR

1. Set the attenuation of the probe to 50X.
2. Set the oscilloscope input coupling to DC, the vertical to 50 mV/div, and the seconds/div to 200 µs. Center the trace on the display. Set the acquisition mode to average 32.
3. Attach the BNC-female-to-dual-banana adapter to the DC output of the generator (front of Wavetek 9100). Attach the modified BNC adapter to the BNC-female-to-dual-banana adapter.
4. Attach the plunger clamps on the differential probe input leads.
5. Twist the input leads together as shown in Figure 3 on page 13, and connect both probe inputs to the positive terminal of the modified BNC adapter.
6. Adjust the offset on the probe output to zero.



WARNING. *Generator produces hazardous voltages. To avoid risk of shock, do not touch exposed metal parts after the generator output is enabled.*

7. Set the output of the generator to 500 VDC.
8. Enable the output.
9. Check that the trace on the oscilloscope shifts less than 3.33 divisions (167 mV) from center.
10. Disable the generator output.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



WARNING. *To reduce the risk of electric shock, ensure the generator output is disabled before modifying/disconnecting test setup or connections since exposed metal may at a hazardous potential. It is recommended that the generator output amplitude be reduced to minimum prior to disabling the output.*

11. Disconnect all test equipment.

This completes the performance verification procedure.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Replaceable Parts

This section contains a list of the replaceable modules for the P5205 probe. Use this list to identify and order replacement parts.

Parts Ordering Information

Replacement parts are available through your local Tektronix field office 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 you order a part that has been replaced with a different or improved part, your local Tektronix field office or representative will contact you concerning any change in part number.

You may exchange your module for a remanufactured module. These modules cost significantly less than new modules and meet the same factory specifications. For more information about the module exchange program, refer to *Contacting Tektronix* on page viii.

Using the Replaceable Parts List

This section contains a list of the mechanical and/or electrical components that are replaceable for the P5205 probe. Use this list to identify and order replacement parts. Table 8 describes each column in the parts list.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 8: Parts List Column Descriptions

Column	Column Name	Description
1	Figure & Index Number	Items in this section are referenced by figure and index numbers to the exploded view illustrations that follow.
2	Tektronix Part Number	Use this part number when ordering replacement parts from Tektronix.
3 and 4	Serial Number	Column three indicates the serial number at which the part was first effective. Column four indicates the serial number at which the part was discontinued. No entries indicates the part is good for all serial numbers.
5	Qty	This indicates the quantity of parts used.
6	Name & Description	An item name is separated from the description by a colon (:). Because of space limitations, an item name may sometimes appear as incomplete. Use the U.S. Federal Catalog handbook H6-1 for further item name identification.
7	Mfr. Code	This indicates the code of the actual manufacturer of the part.
8	Mfr. Part Number	This indicates the actual manufacturer or vendor part number.

Abbreviations

Abbreviations conform to American National Standard ANSI Y1.1-1972.

Mfr. Code to Manufacturer Cross Index

The table titled Manufacturers Cross Index shows codes, names, and addresses of manufacturers or vendors of components listed in the parts list.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

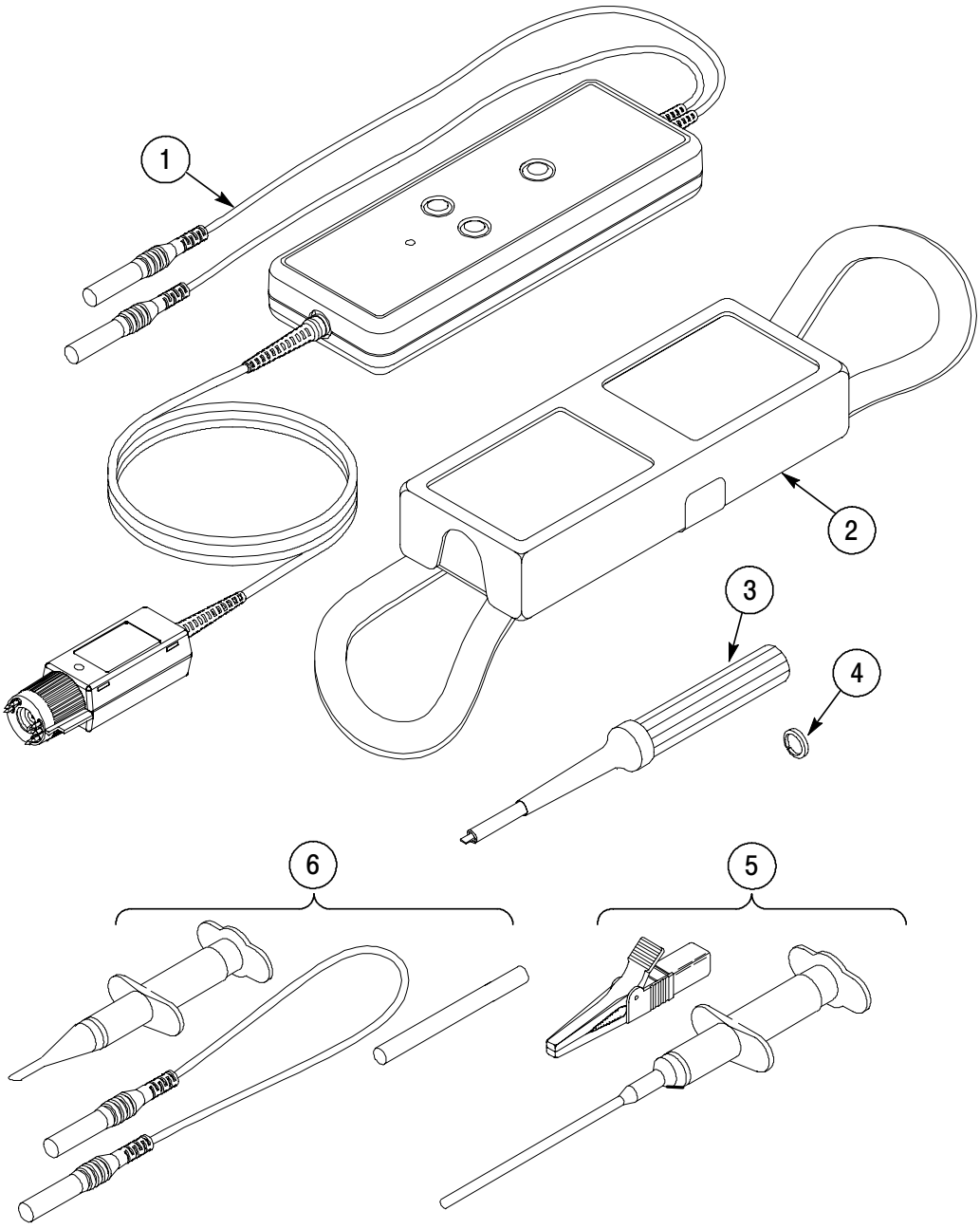


Figure 14: P5205 Probe and replaceable accessories

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

P5205 and Replaceable Accessories

Fig. & Index Number	Tektronix Part Number	Serial No. Effective	Serial No. Discont'd	Qty	Name & Description	Mfr. Code	Mfr. Part Number
14-1				1	PROBE, DIF ACT:TEK PROBE	80009	
-2	016-1461-00			1	STRAP:STRAP FOR SOFT CASE, HOLDS PROBE IN CASE AS WELL AS SECURE ALL CORDS & COMP-BOX T	80009	016-1461-00
-3	003-1433-00			1	SCREWDRIVER:ADJUSTMENT TOOL,METAL TIP PLASTIC,BLACK	TK2565	003-1433-00
-4	016-0633-00			1	MARKER SET,CA:2 EA VARIOUS COLORS	80009	016-0633-00
-5	020-2106-00			1	ACCESS PKG:(1) RED,(1) BLACK CROCODILE CLIP & (1) RED, (1) BLACK INSULATED PLUNGER CLAMP	76545	KT-39411
-6	020-2140-00			1	ACCESS PKG:ACCESSORIES FOR P5205	76545	020-2140-00
	070-9472-XX			1	MANUAL, TECH:INSTRUCTION,P5205,DP	80009	070-9472-XX

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

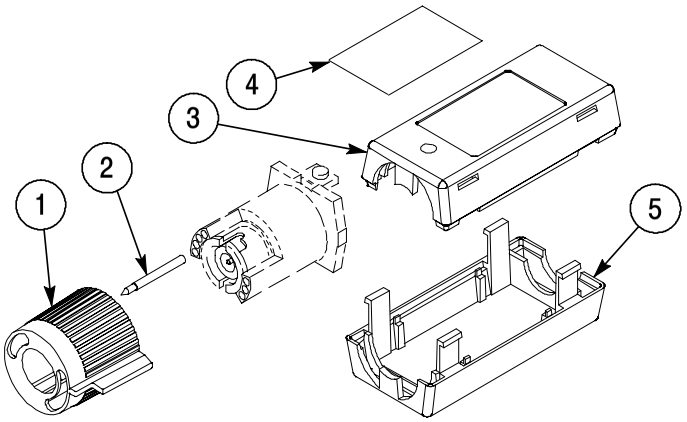


Figure 15: Replaceable parts - compensation box

NOTE: Parts illustrated with dashed lines are not replaceable

Replaceable Parts - Compensation Box

Fig. & Index Number	Tektronix Part Number	Serial No. Effective	Serial No. Discont'd	Qty	Name & Description	Mfr. Code	Mfr. Part Number
15-1	205-0191-00			1	SHELL,ELEC CONN:BNC,ABS,DOVE GRAY	80009	205-0191-00
-2	131-3627-01			1	CONTACT,ELEC:GOLD PLATED TIP	18359	P-6158-1
-3	206-0429-08			1	COMP BOX HALF:TOP HALF COMP BOX,W/MACHINED HOLE,PLASTIC,P5205	80009	206-0429-08
-4	334-9117-00			1	MARKER, IDENT:COMP BOX ID LABEL,P5205	80009	334-9117-00
-5	206-0430-00			1	COMP BOX:COVER,BOTTOM HALF	80009	206-0430-00

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

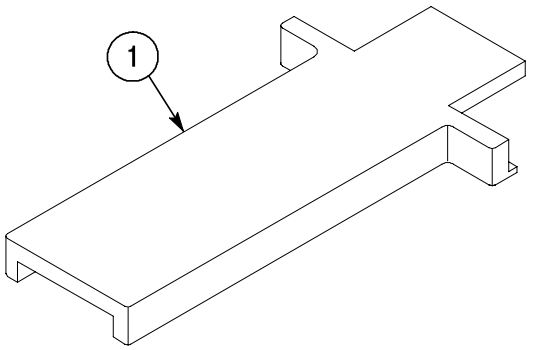


Figure 16: P5205 optional accessories

Optional Accessories

Fig. & Index Number	Tektronix Part Number	Serial No. Effective	Serial No. Discont'd	Qty	Name & Description	Mfr. Code	Mfr. Part Number
16-1	003-1383-00			1	RLSE TOOL,COVER:COMP BOX,POLYCARBONATE	TK2565	003-1383-00
	1103			1	TEKPROBE IF PS:W/OFFSET 2 CONN	80009	1103

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Manufacturers Cross Index

Mfr. Code	Manufacturer	Address	City, State, Zip Code
18359	PYLON CO. INC.	51 NEWCOMB ST	ATTLEBORO, MA 02703-1403
76545	MUELLER ELECTRIC CO	1583 EAST 31ST ST	CLEVELAND, OH 44114
80009	TEKTRONIX INC	14150 SW KARL BRAUN DR PO BOX 500	BEAVERTON, OR 97077-0001
TK2565	VISION PLASTICS INC	26000 SW PARKWAY CENTER DRIVE	WILSONVILLE, OR 97070

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group is an independent supplier of quality pre-owned equipment

Gold-standard solutions

Extend the life of your critical industrial, commercial, and military systems with our superior service and support.

We buy equipment

Planning to upgrade your current equipment? Have surplus equipment taking up shelf space? We'll give it a new home.

Learn more!

Visit us at **artisantg.com** for more info on price quotes, drivers, technical specifications, manuals, and documentation.

Artisan Scientific Corporation dba Artisan Technology Group is not an affiliate, representative, or authorized distributor for any manufacturer listed herein.

We're here to make your life easier. How can we help you today?

(217) 352-9330 | sales@artisantg.com | artisantg.com

ARTISAN® TECHNOLOGY GROUP