Tektronix®

TICP Series

IsoVu™ Isolated Current Probes

User Manual

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077-1844-04 November 2026

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Contacting Tektronix

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P.O. Box 500
Beaverton, OR 97077
USA

For product information, sales, service, and technical support:

In North America, call 1-800-833-9200.

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

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Important safety information

This manual contains information and warnings that must be followed by the user for safe operation and to keep the product in a safe condition.

To safely perform service on this product, see the *Service safety summary* that follows the *General safety summary*.

General safety summary

Use the product only as specified. Review the following safety precautions to avoid injury and prevent damage to this product or any products connected to it. Carefully read all instructions. Retain these instructions for future reference.

This product shall be used in accordance with local and national codes.

For correct and safe operation of the product, it is essential that you follow generally accepted safety procedures in addition to the safety precautions specified in this manual.

The product is designed to be used by trained personnel only.

Only qualified personnel who are aware of the hazards involved should remove the cover for repair, maintenance, or adjustment.

Before use, always check the product with a known source to be sure it is operating correctly.

This product is not intended for detection of hazardous voltages.

Use personal protective equipment to prevent shock and arc blast injury where hazardous live conductors are exposed.

This product is intended for use in nonresidential areas only. Use in residential areas may cause electromagnetic interference.

While using this product, you may need to access other parts of a larger system. Read the safety sections of the other component manuals for warnings and cautions related to operating the system.

When incorporating this equipment into a system, the safety of that system is the responsibility of the assembler of the system.

To avoid fire or personal injury

Observe all terminal ratings

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

Do not exceed the Measurement Category (CAT) rating and voltage or current rating of the lowest rated individual component of a product, probe, or accessory.

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

The measurement terminals on this product are not rated for connection to Category IV circuits.

Do not connect a current probe to any wire that carries voltages above the current probe voltage rating.

Do not operate without covers

Do not operate this product with covers or panels removed, or with the case open. Hazardous voltage exposure is possible.

Avoid exposed circuitry

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

Do not operate with suspected failures

If you suspect that there is damage to this product, have it inspected by qualified service personnel.

Disable the product if it is damaged. Do not use the product if it is damaged or operates incorrectly. If in doubt about safety of the product, turn it off. Clearly mark the product to prevent its further operation.

Before use, inspect voltage probes, test leads, and accessories for mechanical damage and replace when damaged. Do not use probes or test leads if they are damaged, if there is exposed metal, or if a wear indicator shows.

Examine the exterior of the product before you use it. Look for cracks or missing pieces.

Use only specified replacement parts.

Do not operate in wet/damp conditions

Be aware that condensation may occur if a unit is moved from a cold to a warm environment.

Do not operate in an explosive atmosphere

Keep product surfaces clean and dry

Remove the input signals before you clean the product.

Avoid using chemical contact cleaners on the probe and probe tips, as they can cause temporary or permanent damage and may compromise the probe functionality. Using compressed air is the recommended cleaning method.

Provide a safe working environment

Always place the product in a location convenient for viewing the display and indicators.

Avoid improper or prolonged use of keyboards, pointers, and button pads. Improper or prolonged keyboard or pointer use may result in serious injury.

Be sure your work area meets applicable ergonomic standards. Consult with an ergonomics professional to avoid stress injuries.

Probes and test leads

WARNING: To avoid electric shock, keep the probe wire as far from the tip and high voltage circuits as possible. The probe wire voltage rating is less than the probe tip voltage rating. Therefore the probe wire may not provide adequate protection.

To avoid electric shock, do not use the probe if the wear indicator on the cable becomes visible. Contact Tektronix at tek.com for a replacement.

Beware of high voltages

Understand the voltage ratings for the probe you are using and do not exceed those ratings. Two ratings are important to know and understand:

- The maximum measurement voltage from the probe tip to the probe reference lead.
- The maximum floating voltage from the probe reference lead to earth ground.

These two voltage ratings depend on the probe and your application. Refer to the Specifications section of the manual for more information.

WARNING: To prevent electrical shock, do not exceed the maximum measurement or maximum floating voltage for the oscilloscope input BNC connector, probe tip, or probe reference lead.

Connect and disconnect properly.

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

Use only insulated voltage probes, test leads, and adapters supplied with the product, or indicated by Tektronix to be suitable for the product.

De-energize the circuit under test before connecting or disconnecting the current probe.

Do not connect a current shunt to any wire that carries voltages or frequencies above the current shunt voltage rating

Inspect the probe and accessories

Before each use, inspect probe and accessories for damage (cuts, tears, or defects in the probe body, accessories, or cable jacket). Do not use if damaged.

Floating measurement use

Do not float the reference lead of the probe above the rated float voltage.

Service the probe and accessories

Go to tek.com/support to find information on contacting Tektronix Service Support.

Terms in this manual and on the product

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.

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



When this symbol is marked on the product, be sure to consult the manual to find out the nature of the potential hazards and any actions which have to be taken to avoid them. (This symbol may also be used to refer the user to ratings in the manual.)

The following symbols may appear on the product.



CAUTION: Refer to Manual



Protective Ground (Earth) Terminal



Earth Terminal



WARNING: High Voltage



Connection and disconnection to hazardous bare wire permitted.



Do not connect to or remove from an uninsulated conductor that is HAZARDOUS LIVE.



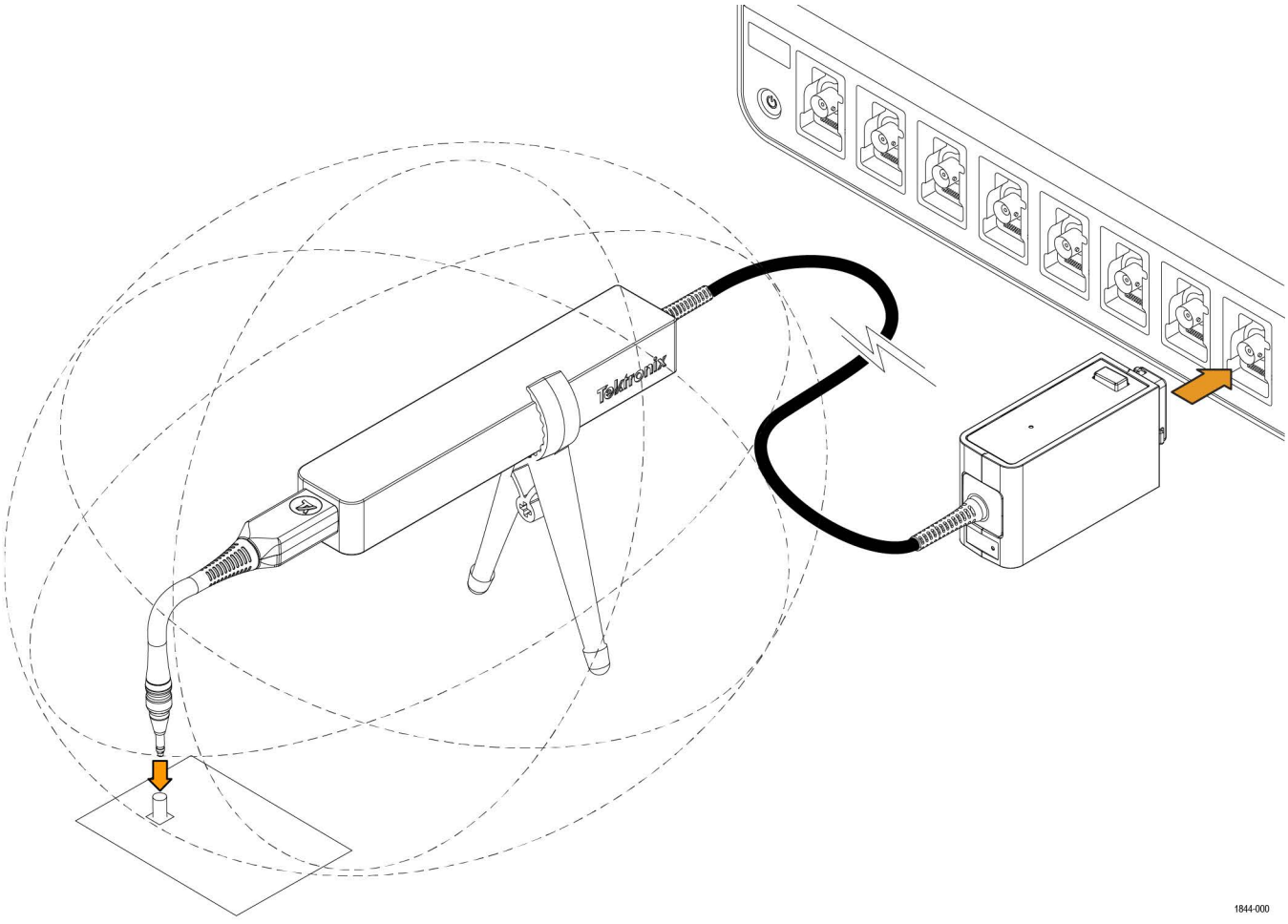
WARNING: Hot Surface

Clearance requirements

The unique common mode voltage range of the measurement system allows it to be used in the presence of high frequency/high voltage common mode signals. It is important to observe all precautions while using this product.

WARNING: Electrical shock can occur while using this measurement system. The system is intended to isolate the operator from hazardous input voltages (common mode voltages); the plastic case of the probe head and the shield on the probe tip do not supply safe isolation. Maintain the safe clearance from the probe head and probe tip while the measurement system is connected to the energized circuit as recommended in this document. Do not access the RF Burn Hazard Zone while taking measurements on a live circuit.

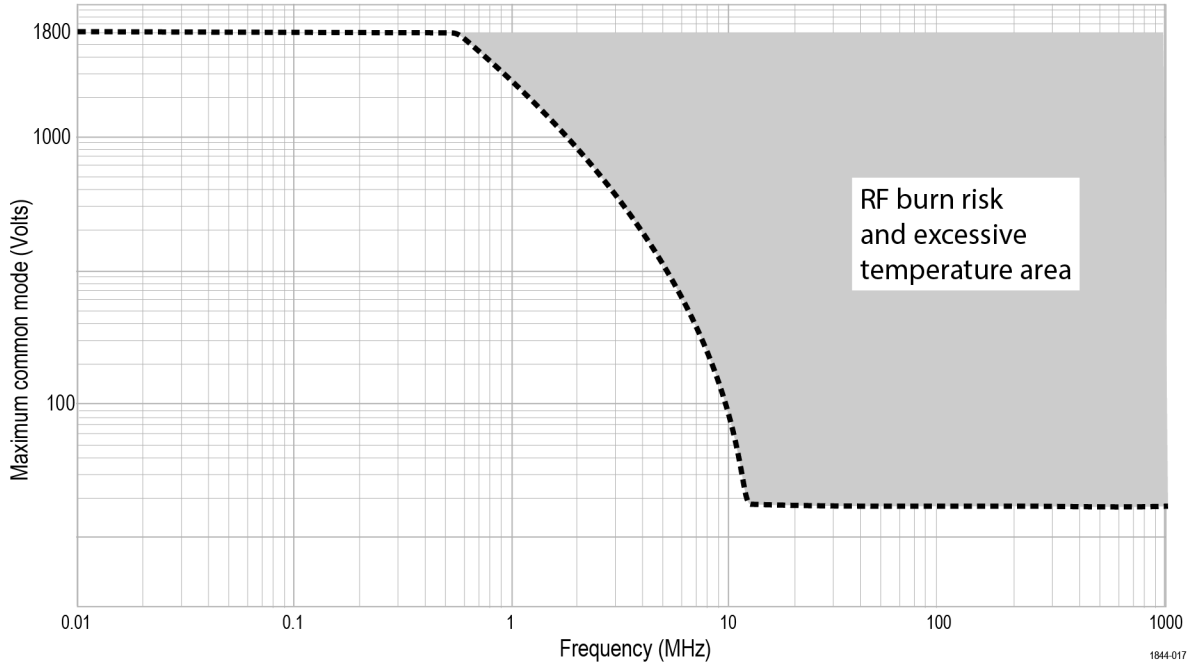
The following figure shows the components of the measurement system and the potential RF burn area when working with hazardous voltages. The RF burn area of 1 m (40 in.) is indicated by the dashed lines surrounding the probe head.



RF burn hazard zone around the probe head

WARNING: Risk of RF burns. Refer to the following derating curve to identify the danger areas. To avoid RF burns, do not operate the probe within limits of the gray shaded area in the graph.

WARNING: There is a risk of burn from elevated temperatures on the tip when continuous wave or high duty cycle burst common mode signals are between about 10 MHz and 50 MHz. This causes the tip ferrites to dissipate significant power at voltages lower than found on the following graph. To avoid the burn risk, keep the tip temperature at 85°C (185°F) or lower by limiting the applied common mode voltage and/or duty cycle, lowering the ambient temperature, and/or applying forced convection airflow.



Maximum safe handling limits for common mode voltages

Compliance information

This section lists the safety and environmental standards with which the instrument complies. This product is intended for use by professionals and trained personnel only; it is not designed for use in households or by children.

Compliance questions may be directed to the following address:

Tektronix, Inc. · PO Box 500, MS 19-045 · Beaverton, OR 97077, US

tek.com

Safety compliance

This section lists the safety standards with which the product complies and other safety compliance information.

EU declaration of conformity – low voltage

Compliance was demonstrated to the following specification as listed in the Official Journal of the European Union:

Low Voltage Directive 2014/35/EU.

- EN 61010-1. Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use – Part 1: General Requirements
- EN 61010-2-030. Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use – Part 2-030: Particular requirements for testing and measuring circuits

U.S. nationally recognized testing laboratory listing

- UL 61010-1. Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use – Part 1: General Requirements
- UL 61010-2-030. Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use – Part 2-030: Particular requirements for testing and measuring circuits

Canadian certification

- CAN/CSA-C22.2 No. 61010-1. Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use – Part 1: General Requirements
- CAN/CSA-C22.2 No. 61010-2-030. Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use – Part 2-030: Particular requirements for testing and measuring circuits

Additional compliances

- IEC 61010-1. Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use – Part 1: General Requirements
- IEC 61010-2-030. Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use – Part 2-030: Particular requirements for testing and measuring circuits

Equipment type

Test and measuring equipment.

Pollution degree description

A measure of the contaminants that could occur in the environment around and within a product. Typically the internal environment inside a product is considered to be the same as the external. Products should be used only in the environment for which they are rated.

- Pollution Degree 1. No pollution or only dry, nonconductive pollution occurs. Products in this category are generally encapsulated, hermetically sealed, or located in clean rooms.
- Pollution Degree 2. Normally only dry, nonconductive pollution occurs. Occasionally a temporary conductivity that is caused by condensation must be expected. This location is a typical office/home environment. Temporary condensation occurs only when the product is out of service.
- Pollution Degree 3. Conductive pollution, or dry, nonconductive pollution that becomes conductive due to condensation. These are sheltered locations where neither temperature nor humidity is controlled. The area is protected from direct sunshine, rain, or direct wind.
- Pollution Degree 4. Pollution that generates persistent conductivity through conductive dust, rain, or snow. Typical outdoor locations.

IP rating

IPx0 (as defined in IEC 60529).

Electrical ratings

Electrical ratings

TICP025: Current 20 mA, 250 MHz

TICP050: Current 20 mA, 500 MHz

TICP100: Current 20 mA, 1 GHz

Max voltage to Earth

1300 V; Pollution degree 2; Max with transient level not to exceed $5kV_{pk}$

1800 V; For use in a Pollution Degree 1 environment; Max with transient level not to exceed $5kV_{pk}$

600 V for CAT III; Pollution degree 2

1000 V for CAT II; Pollution degree 2

Environmental compliance

This section provides information about the environmental impact of the product.

Product end-of-life handling

Observe the following guidelines when recycling an instrument or component:

Equipment recycling

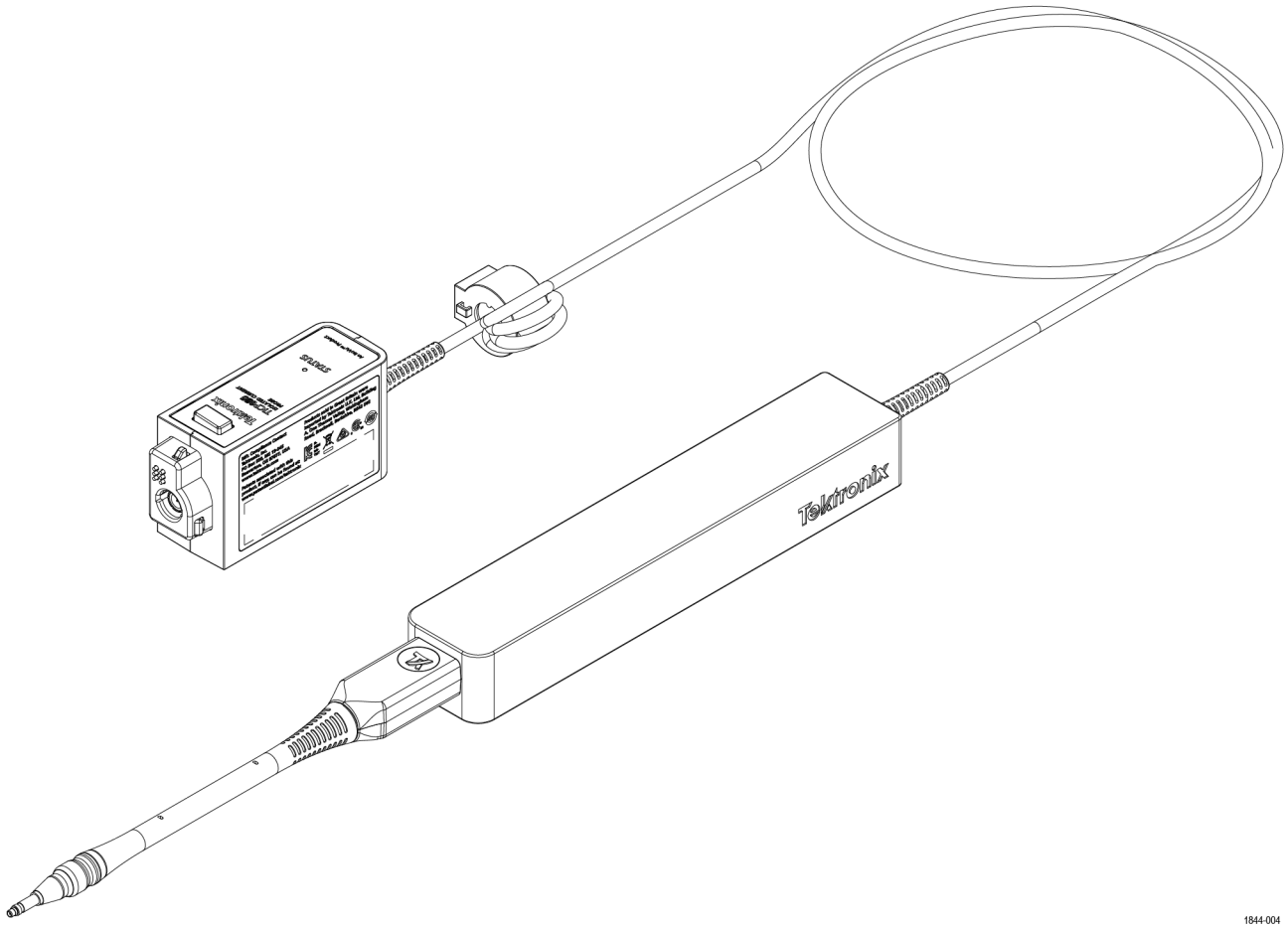
Production of this equipment required the extraction and use of natural resources. The equipment may contain substances that could be harmful to the environment or human health if improperly handled at the product's end of life. To avoid release of such substances into the environment and to reduce the use of natural resources, we encourage you to recycle this product in an appropriate system that will ensure that most of the materials are reused or recycled appropriately.



This symbol indicates that this product complies with the applicable European Union requirements according to Directives 2012/19/EU and 2006/66/EC on waste electrical and electronic equipment (WEEE) and batteries. For information about recycling options, check the Tektronix website (https://www.tek.com/services/recycle).

Preface

This document provides information for installing and using the Tektronix TICP Series Active Isolated Current Shunt Probes. The probe provides unparalleled bandwidth, accuracy, ease of use, and isolation in current shunt measurements.



Compensation box

The TekVPI compensation (comp) box connects the measurement system to one of the input channels on the oscilloscope. Power is supplied to the measurement system through the TekVPI interface of the oscilloscope. The LEDs on the comp box provide a means for indicating the overall status of the probe.

Probe head

The probe head provides an interface between the device-under-test (DUT) and the compensation box. The probe head contains the isolation barrier that separates the DUT from the earth ground.

Probe tips

Probe tip options are available to connect the probe head to the DUT.

Key performance specifications and features

- Galvanic isolation between probe tip and the oscilloscope
- Available in three bandwidths: 1 GHz, 500 MHz, and 250 MHz
- Wide current measurement range determined by the shunt used with 1X, 10X or 100X probe tips
- Noise <4.70 nV / √Hz (<21 μV_{RMS} at 20 MHz)
- Up to 90 dB CMRR at 1 MHz
- Maximum common mode voltage: 1800 V; For use in a Pollution Degree 1 environment; transient level not to exceed 5 kV_{pk}
- 1.5% DC gain accuracy
- Compatible with the 4, 5, and 6 Series MSO instruments, including the latest B models
- TekVPI™ interface enables control and probe configuration from the oscilloscope front panel or programming interface
- Optional tips to measure currents in environmental chambers from -40ºC to +125ºC

Model overview

Model	Description
TICP025	250 MHz Tektronix Isolated Current Probe
TICP050	500 MHz Tektronix Isolated Current Probe
TICP100	1 GHz Tektronix Isolated Current Probe

Standard accessories

The following table lists the accessories that are shipped with the probe.

Accessory	Description	Part number
	1X probe tip cable with MMCX connector	TICPMM1
	10X probe tip cable with MMCX connector	TICPMM10
	SMA tip adapter	TICPSMA
	Clamp-on ferrite common mode choke	276-0905-XX

Accessory	Description	Part number
	Bipod is used to hold the probe.	020-3210-XX
	Tripod adapter for ¼ in - 20 UNC thread accessories.	103-0508-XX
	Probe tip adapter. Adapts an MMCX IsoVu tip to standard 0.100" spaced, 0.025" square pins.	131-9717-XX
	Soft carrying case with foam insert.	016-2147-XX

Recommended accessories

The following table lists optional accessories.

Accessory	Description	Part number
	100X probe tip with MMCX connector	TICPMM100
	TICP 5 mΩ low-power shunt	TICS0005 (Qty. 1)
		TICS0005PK (Qty. 10)
	TICP 50 mΩ low-power shunt	TICS0050 (Qty. 1)
		TICS0050PK (Qty. 10)
	TICP 500 mΩ low-power shunt	TICS0500 (Qty. 1)
		TICS0500PK (Qty. 10)
	TICP 5000 mΩ (5 Ω) low-power shunt	TICS5000 (Qty. 1)
		TICS5000PK (Qty. 10)
	TICP cable for shunts	TICPTWCBL (Qty. 1)
		TICPTWCBLPK (Qty 5)
	1X extreme temperature tip with MMCX connector	TICPMM1ET
	10X extreme temperature tip with MMCX connector	TICPMM10ET
	100X extreme temperature tip with MMCX connector	TICPMM100ET
	Twisted pair solder-in accessory	174-7492-XX
	Square pin to MMCX adapter, 0.062" spacing	131-9677-XX
	MMCX to IC grabber lead	196-3546-XX

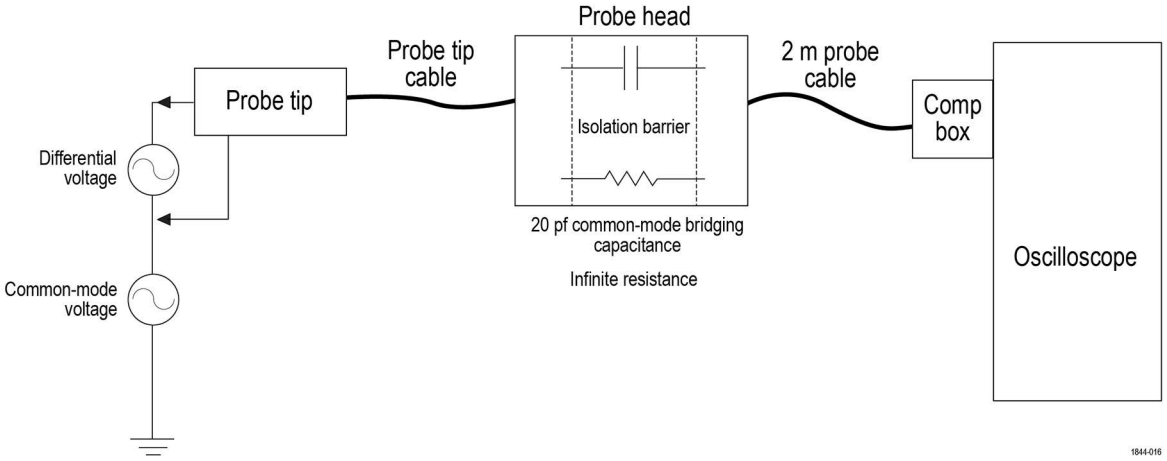
Accessory	Description	Part number
	Square pin to IC grabber lead	196-3547-XX
	MicroCKT grabbers	206-0569-XX

Operating information

Use this section to help you use the probe safely and effectively. Read all safety information before installing your measurement system to be aware of the operating and clearance requirements, including possible hazardous areas when the measurement system is connected to the device under test (DUT).

TICP block diagram

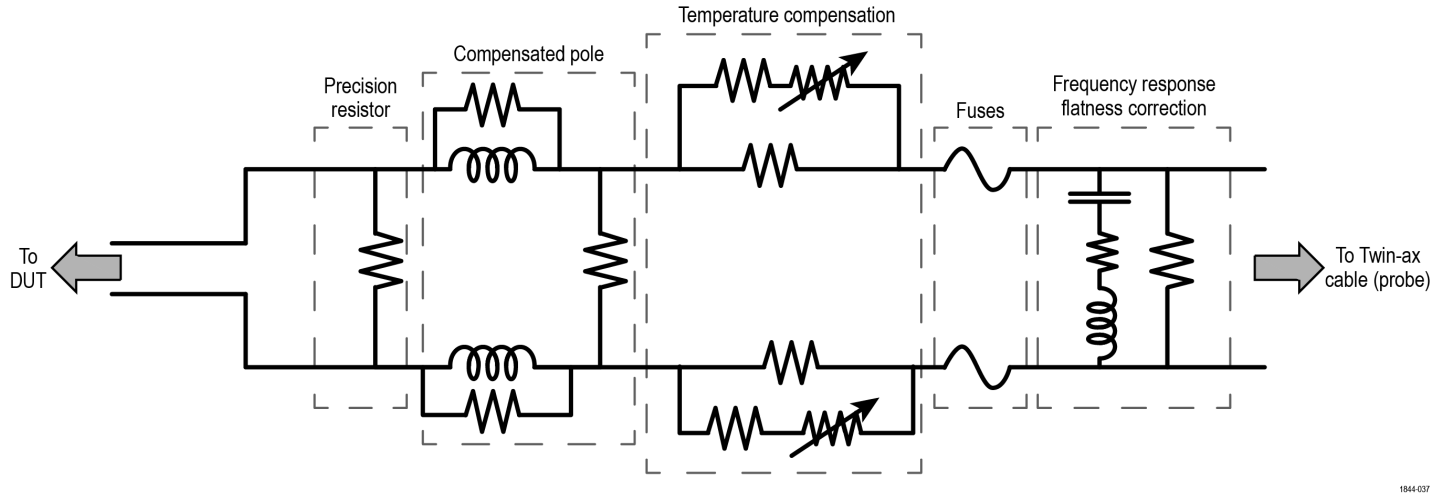
The following figure shows a block diagram of the TICP Series IsoVu Isolated Current Probe.



The common-mode resistance and capacitance to earth ground is shown in the figure. The common-mode resistance is shown as infinite with the probe since it is galvanically isolated and can be ignored. The common-mode coupling capacitance to earth ground and the surrounding circuit is shown as the bridging capacitance. This capacitance will be approximately 20 pF when the probe head is placed 6 inches (15.25 cm) above a ground plane.

To minimize the effects of common-mode capacitive loading consider the following:

- When possible, choose a reference point in the device-under-test (DUT) that is static potential with respect to earth ground.
- Connect the coaxial (common) shield of the probe tip to the lowest impedance point of the circuit.
- Increasing the physical distance between the probe head and any conductive surface will reduce the capacitance.
- When using multiple TICP probes to measure different points in the circuit that do not have the same common-mode voltages, keep the probe heads separated to minimize the capacitive coupling.



Wideband shunt block diagram

Measurement system handling best practices

The measurement system consists of quality parts and should be treated with care to avoid damage or degrading the performance due to mishandling. Consider the following precautions when handling the probe and tips.

- Do not crush, crimp, or sharply bend the probe cable.
- Do not twist the cable.
- Do not allow kinks or knots to develop in the probe cable.
- Avoid putting tension on the probe cable.
- Do not pull or jerk the cable, especially when kinks or knots are present.
- Do not drop the probe head or comp box assembly. This can result in damage and misalignment of the internal components.
- Avoid over-bending the probe tips; do not exceed the minimum bend radius of 2.0 inches (51 mm). Do not exceed the minimum bend radius of 1.5 inches (39 mm) for the extreme temperature tips (ET).
- Avoid crushing the cables by accidentally running over the cable with a chair wheel or by dropping a heavy object onto the cable.
- Store the measurement system in the supplied carrying case when not in use.

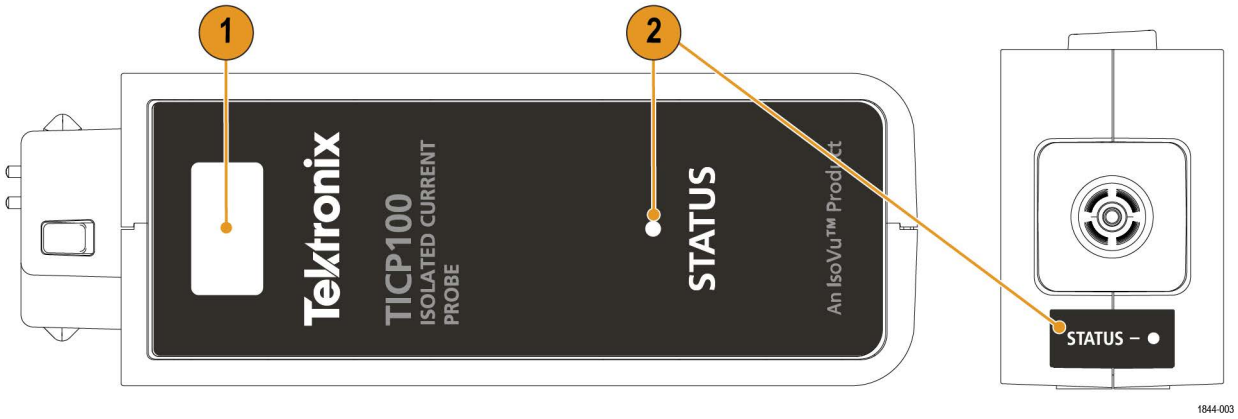
Environmental requirements

Characteristic	Component	Operating	Non-operating
Compensation box, probe head, and SMA tip adapter temperature		0°C to +50°C	-20°C to +70°C
Standard tips temperature	TICPMM1, TICPMM10, TICPMM100, TICS0005, TICS0050, TICS0500, TICS5000, TICPTWCBL	-40°C to +85°C	-40°C to +85°C
Extreme temperature tips (ET) temperature	TICPMM1ET, TICPMM10ET, TICPMM100ET	-40°C to +125°C	-40°C to +125°C; Storage temperature is -40°C to +85°C
Humidity	All components	5% to 85% relative humidity up to +40°C, 5% to 45% relative humidity up to +50°C, non-condensing	5% to 85% relative humidity up to +40°C, 5% to 45% relative humidity up to +70°C, non-condensing
Altitude	All components	Up to 3,000 meters	Up to 12,000 meters

Tektronix extreme temperature (ET) tips enable accurate current measurements in environmental testing applications across an extended operating range of –40°C to +125°C.

Controls and indicators

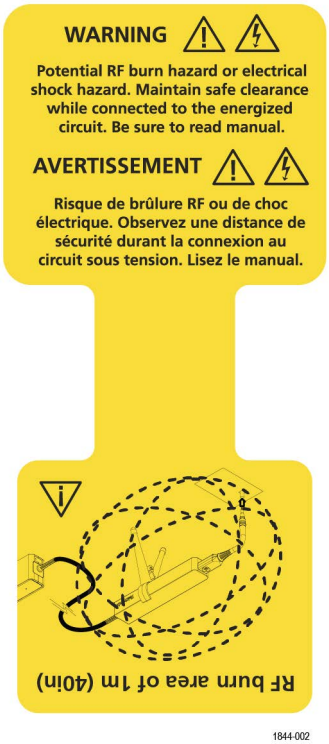
A description of the controls and indicators on the compensation box.



1. Latch release button. To disconnect the compensation (comp) box from the oscilloscope, press the latch release button and pull away from the instrument.
2. STATUS indicators. LED lights that indicates the status of the probe. There is a status indicator on the top and back of the comp box. For more information on the state of the LED, see Troubleshooting and error conditions (on page 71)

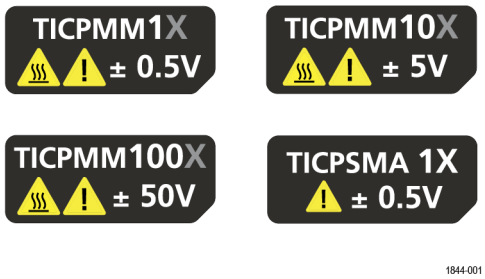
Cable flags

The flag on the cable provide a potential RF burn hazards warning.



Probe tips

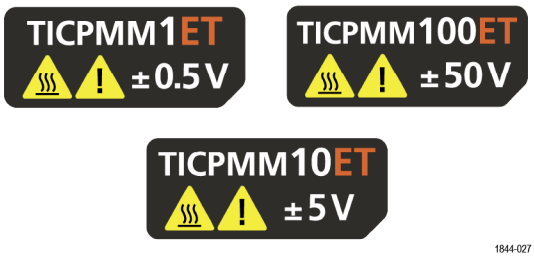
Each probe tip has a label that provides the maximum dynamic range and displays the attenuation factor.



TICPMM tip labels



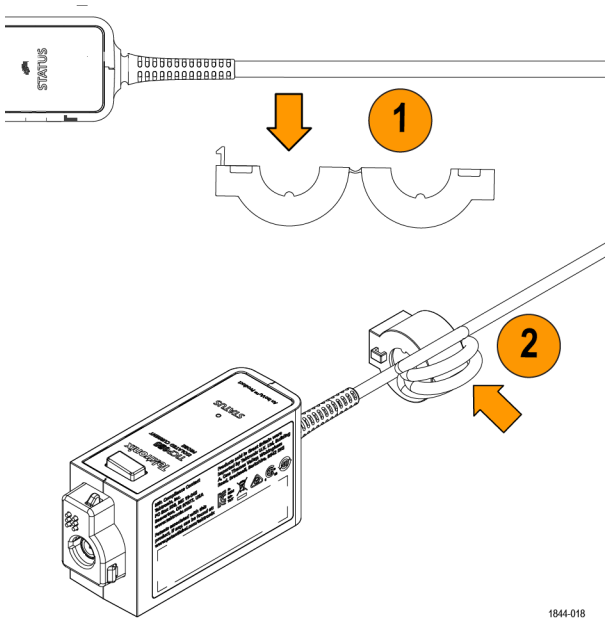
Wideband shunt labels



Extreme temperature tip labels

Ferrite clamp installation

The following steps describe installing the common mode ferrite clamp on the probe cable.



1. Position the common mode ferrite clamp within 0.25 inches of the compensation box strain relief.
2. Loop the cable around the open ferrite clamp five times and close the clamp.

   Make sure the loops are as small as possible to maximize the effectiveness of the ferrite.

To remove the ferrite clamp from the probe cable, insert a flat head screwdriver in the gap between the latches of the clamp and lift up.

Connecting to a circuit

The following steps describe the process for connecting the TICP Series probe to an oscilloscope and the device under test (DUT).

WARNING: Do not connect the measurement system to an energized circuit to avoid the risk of shock. Always de-energize the circuit-under-test before installing or removing the tip cable from the circuit-under-test. The plastic case of the probe head and the probe tip of the probe cable do not supply the isolation.

WARNING: To avoid the risk of electrical shock or RF burns while the DUT is energized, do not touch the probe head or probe tip while taking measurements. Always keep a 1 m (40 in.) clearance from the probe head during the measurement. See Clearance requirements (on page 11).

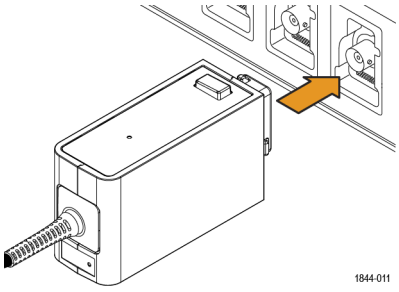
WARNING: To prevent the arc flash caused by a different potential, do not place the probe head or probe tip on the circuit that has the different voltage.

CAUTION: To avoid possible damage to the equipment, do not connect the coaxial (common) shield of the probe tip or SMA input to the high impedance portion of a circuit. The additional capacitance can cause circuit damage. Connect the coaxial (common) shield to the low impedance section of the circuit.

Touching the probe head or probe tip cable when measuring a high frequency common mode signal increases the capacitive coupling and can degrade the common mode loading on the circuit-under-test. To avoid inaccurate measurements, do not stack the separate probe heads and keep cell phones at least three feet away while taking measurements.

Verify the DUT is not connected to an energized circuit. To obtain the most accurate measurement, allow the probe to warm up for 5 minutes.

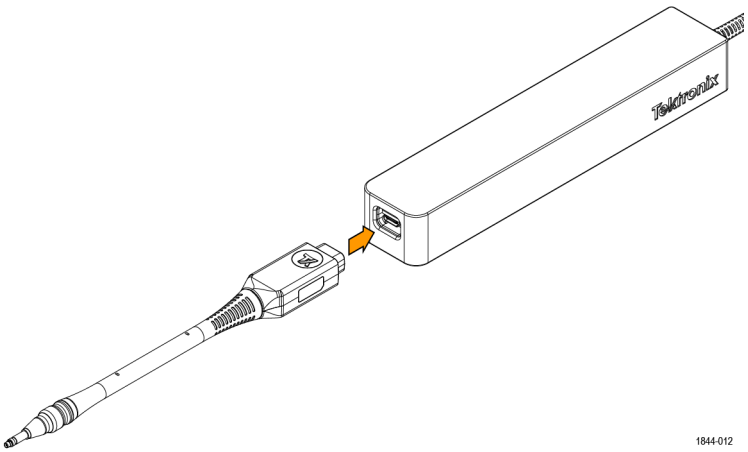
1. Connect the compensation box an available channel on the oscilloscope.



2. Line up the probe tip and probe head IsoConnect™ connectors.

   Take care to avoid bending or twisting the probe tip assembly during this process.

3. Connect the probe tip to the probe head.



Connect the probe head to a bipod, tripod (with adapter), or a similar support. Using a support keeps the probe head steady, reducing the potential mechanical stresses at the electrical connection point of the DUT. The support also keeps the probe head away from surrounding circuits and conductive objects to minimize the parasitic capacitive coupling to these surroundings. The supplied tripod adapter is required to attaching the TICP Series probe to a tripod.

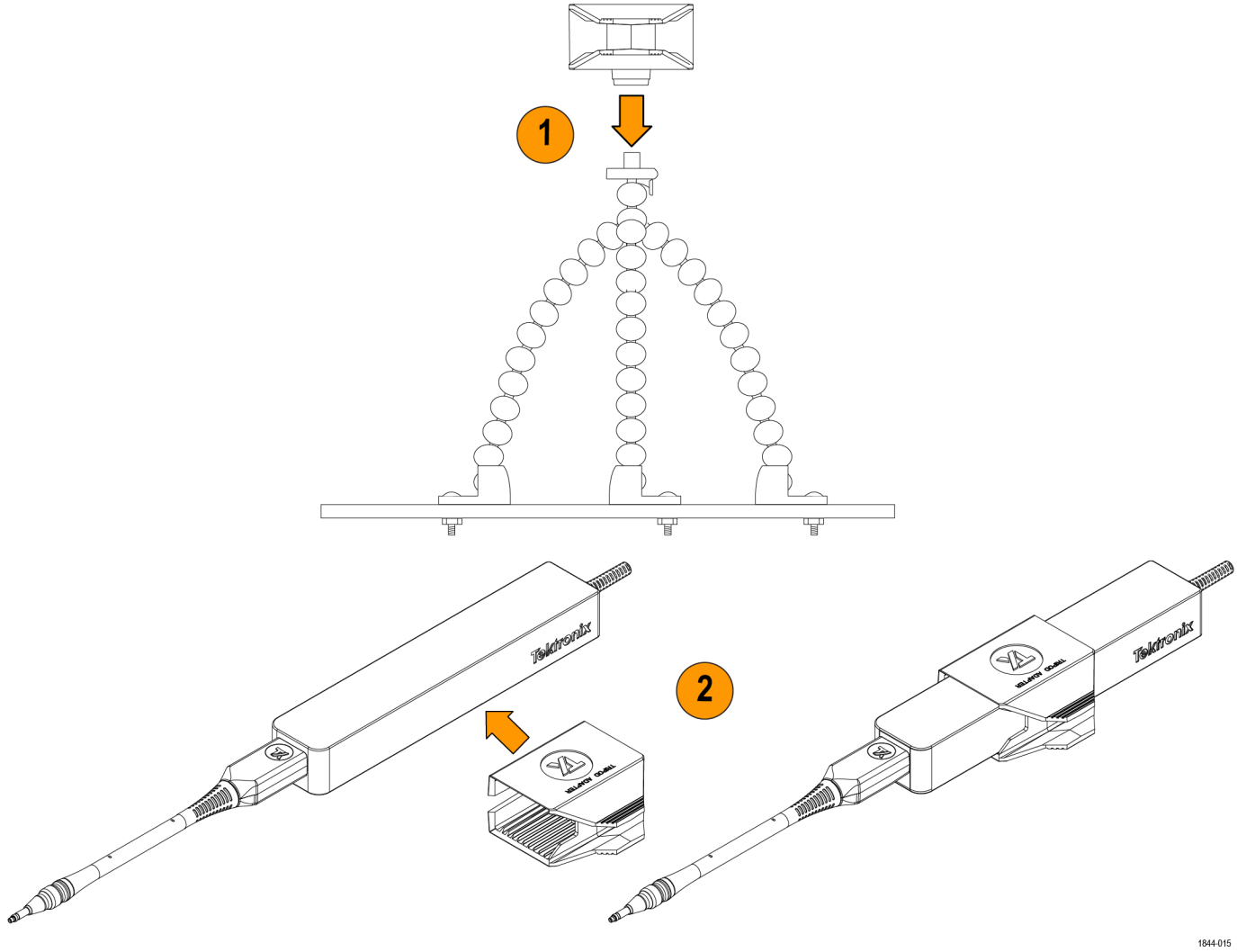
4. Connect the probe tip end to the DUT.

   If you are using MMCX tip, connect the tip to an MMCX connector or to a square pin adapter before connecting to the DUT. The adapters connect to square pins with either 0.100-inch (2.54 mm) spacing or 0.062-inch (1.57 mm) spacing.

5. Set up the controls on the oscilloscope.
6. Apply power to the DUT to take the measurement.

Tripod adapter installation

The following steps describe installing the tripod adapter to the probe head and attaching it to a tripod.

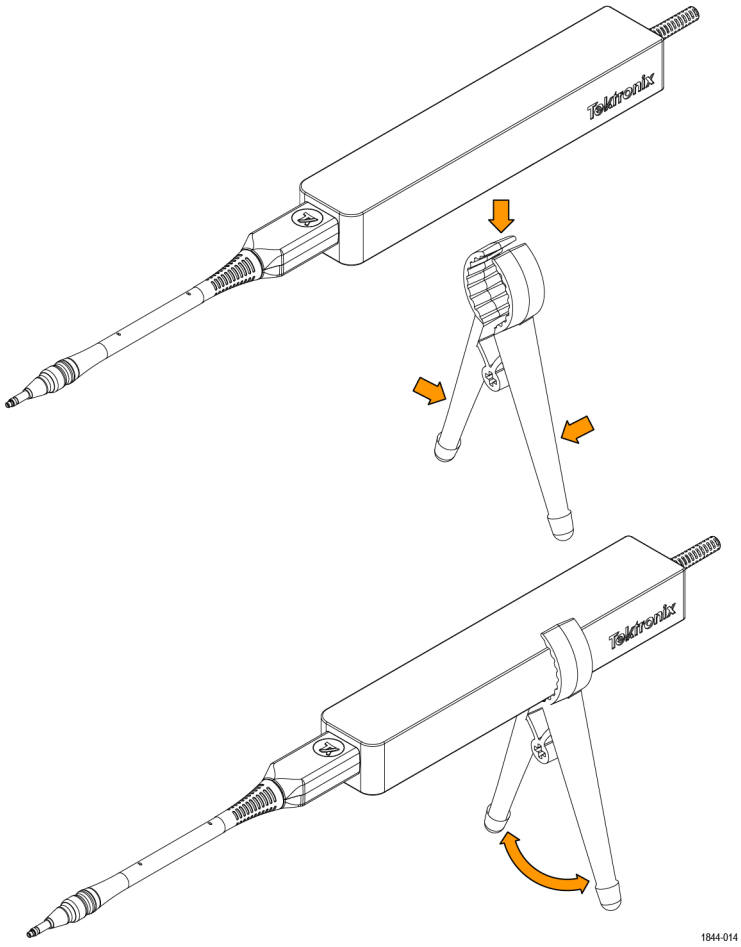


1. Attach the adapter to a compatible tripod.
   The thread in the adapter is UNC¼-20. Make sure that the thread of the tripod is also UNC¼-20.
2. Open the clamp on the tripod adapter and attach it to the probe head.

Bipod installation

The following steps describe installing the bipod to the probe head.

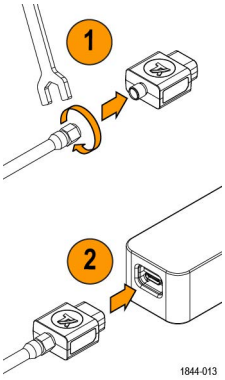
The tripod is recommended when using wideband shunts (TICS) or the extreme temperature tips (ET) with your TICP Series probe. The bipod may not fully support the probe body due to the flexibility of the TWCBL or ET tips.



1. Squeeze the handles of the bipod together to open the clamp.
2. Place the probe head into the clamp and release the handle so the probe is as the angle needed to connect to the DUT.

Connecting the SMA adapter

The following steps describe the process for connecting the TICPSMA SMA tip adapter to the probe head and SMA cable. It is recommended to connect the SMA cable to the SMA adapter first and then connect the SMA adapter to the probe head.

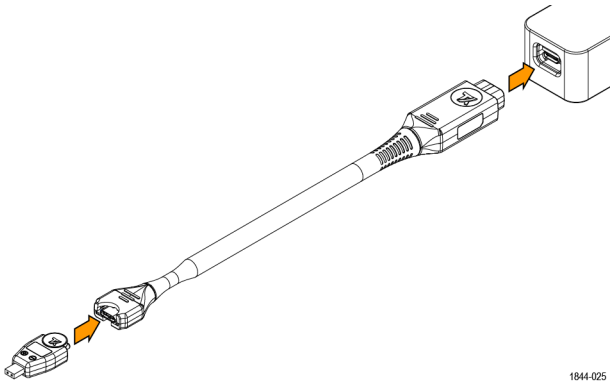


1. Connect a SMA cable to the SMA adapter.

   Use a SMA wrench to tighten the SMA cable to 8 in lbs.
2. Connect the SMA adapter to the probe head.

Connecting the wideband shunts

The following steps describe the process for connecting the wideband shunts and Twin-ax cable to the TICP probe. It is recommended to use the tripod adapter when using the Twin-ax cable and shunts with the TICP probe. The flexible Twin-ax cable does not support the probe head when the bipod is installed.

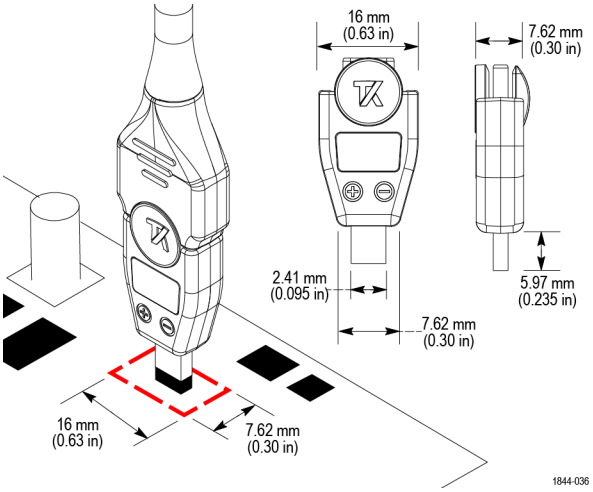


1. Connect a shunt to the Twin-ax cable.
2. Connect the cable to the probe head.

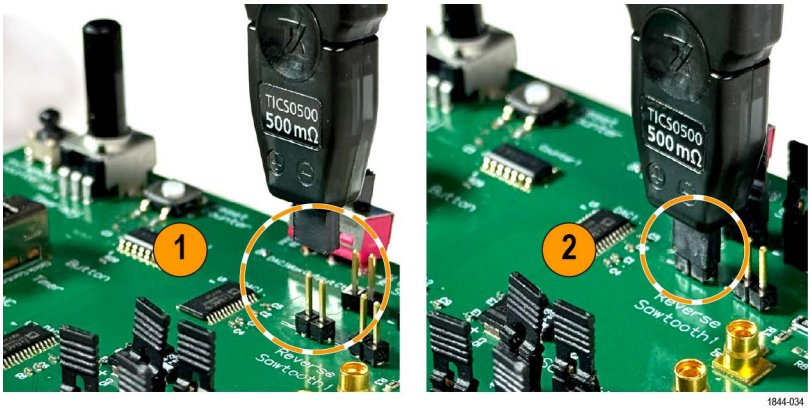
Installing the wideband shunt on a square pin

The following steps describe the process for installing the wideband shunt on a 0.1 inch square pin. The square pins are provided with your wideband shunts and to be soldered with the gold plated side mating with the shunts. The recommended alternates should have a minimum of 30µm Au plating.

The following illustration shows the recommended clearance requirements for connecting a wideband shunt to a 0.1 inch square pin on the circuit board.



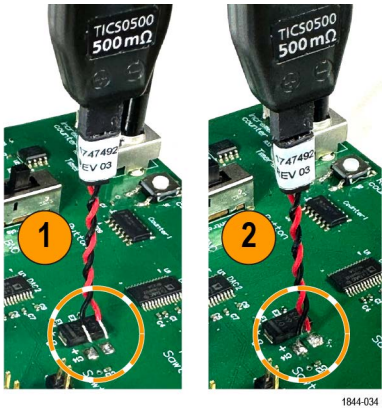
Connect the wideband shunt to the Twin-ax cable before or after connecting the shunt to a square pin on your circuit board.It is recommended to use the 0.1 inch pitch square pin headers provided in the shunt kit or use an equivalent 30µm Au plated square pin for best reliability.



1. To install the wideband shunt on a square pin, line up the shunt connector to with the square pin.
2. Gently push down on the shunt to seat it in place on the square pin.

Installing the wideband shunt with the twisted-pair solder

The following steps describe the process for installing the wideband shunt with a twisted pair solder onto a circuit board. Solder the twisted-pair accessory to the circuit board before you connect the shunt.



1. Align the twisted pair solder accessory over a via, pads, or cut traces on the circuit board. The image above demonstrates the soldering of the twisted pair to pads.
2. Solder the exposed ends of the twisted pair wires to the via pads, or cut traces. If necessary apply a small amount of adhesive to further strengthen the connection to the circuit board.

Connecting the extreme temperature tips

The extreme temperature (ET) tips allow access to make current measurements across a temperature range of -40°C to +125°C.

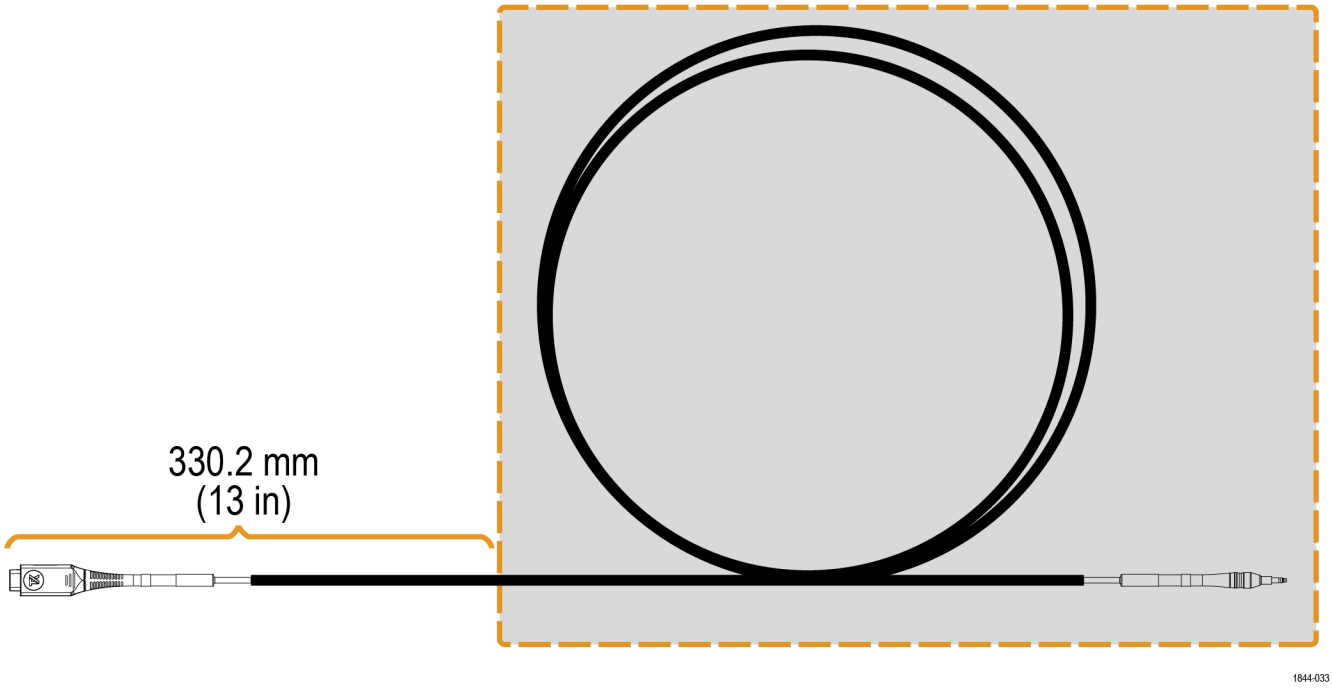
The extreme temperature tip cables connect to the TICP probe head the same as the standard tips using the MMCX connector. See Connecting to a circuit (on page 27). These six-foot tip cables provide connectivity between a device under test (DUT) positioned inside a temperature chamber and a Tektronix oscilloscope and TICP current probe located outside the chamber.

CAUTION: To avoid possible damage to the extreme temperature tip accessory, do not disconnect the tip from the probe or DUT by holding onto the cable and pulling. If you are disconnecting the tip from the probe, hold on to the plastic part of the connector. If you are disconnecting the tip from the DUT, hold onto the plastic part of the tip.

The ET tip is intended for use in environmental chambers. This tip is not designed for use under local heater heads.

CAUTION: To avoid possible damage to the extreme temperature tip cable, do not exceed the minimum bend radius of 1.5 inches (39 mm).

In the illustration below, the shaded region within the dashed boundary indicates the recommended working zone for extreme temperature operation. To prevent environmental chamber access-port leakage from impacting the probe head, this working zone should begin at least 13 inches (330.2 mm) from the probe head.



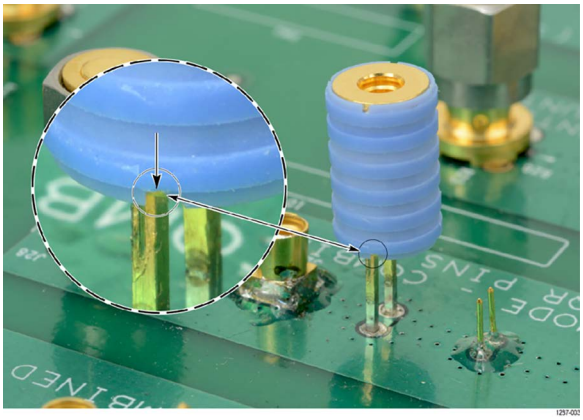
Installing the probe tip adapters

There are two Tektronix probe tip adapters to connect the MMCX probe tips to pins on the circuit board. The MMCX-to-0.1-inch (2.54 mm) pitch adapter and the MMCX-to-0.062-inch (1.57 mm) pitch adapter.

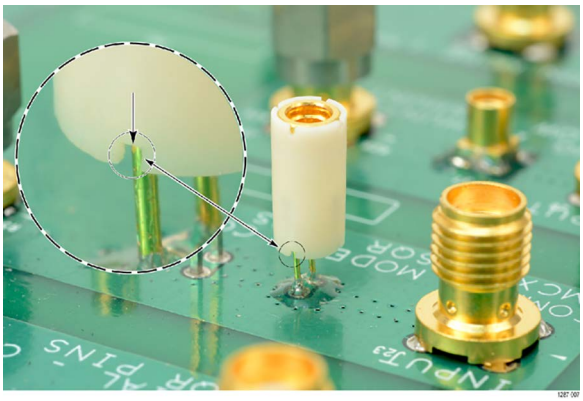
One end of each adapter has an MMCX socket for connection to an IsoVu MMCX tip cable. The other end of the adapter has a center pin socket and four common (shield) sockets around the outside of the adapter. Notches on the adapters can be used to locate the shield sockets. The procedure for installing these adapters are the same, the main difference is the spacing of the pins on the circuit board.

To install the adapters onto the square pins, line up the center of the adapter with the signal source pin on the circuit board. Use the notch on the adapter to align one of the shield sockets to the common pin on the circuit board. The following figures show examples of lining up the adapters on the circuit board.

To achieve the best electrical performance, especially the CMRR performance and EMI susceptibility, place the probe tip adapter as close as possible to the circuit board.

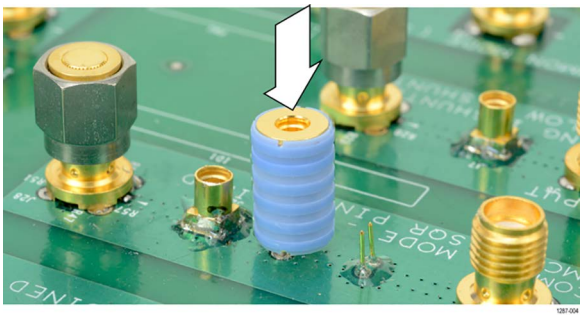


Lining up the MMCX-to-0.1-inch (2.54 mm) adapter on the circuit board

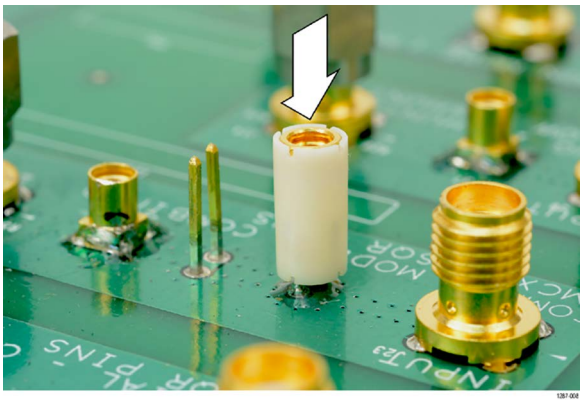


Lining up the MMCX-to-0.062-inch (1.57 mm) adapter on the circuit board

After lining up the adapters gently push down on the adapter to seat it in place on the circuit board.



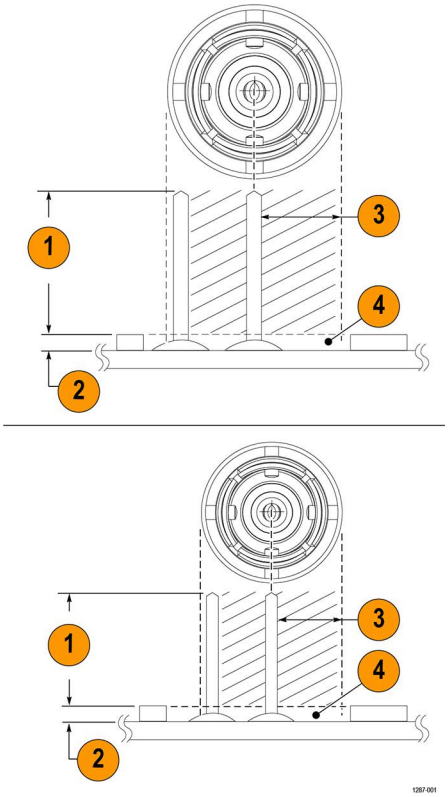
Pushing the MMCX-to-0.1-inch (2.54 mm) adapter in place



Pushing the MMCX-to-0.062-inch (1.57 mm) adapter in place

Installing the square pins on the circuit board

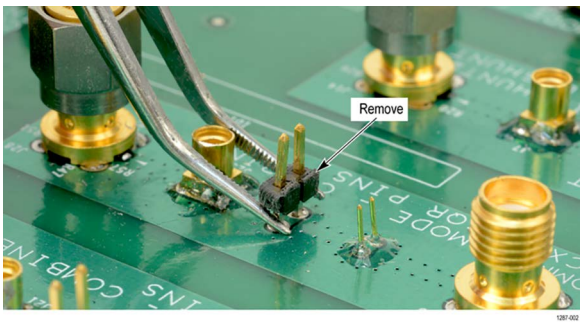
The following figure and table shows the recommended clearance requirements for connecting the adapters to the square pins on the circuit board. The bottoms of the adapters are shown at the top.



Adapter clearance requirements

Figure reference	Probe Tip Adapter, MMCX to 0.1" pitch sq. pin 0.635 mm (0.025 in) sq. pins	Probe Tip Adapter, MMCX to 0.062 in pitch sq. pin 0.406 mm (0.016 in) sq. pins
1	Recommend maximum pin length 6.00 mm (0.235 in)	Recommend maximum pin length 4.40 mm (0.170 in)
2	Minimize area between adapter and circuit board	
3	Keep out area (diameter of each adapter)	
4	Avoid or minimize components within keep out area	

The 0.025-inch (0.635 mm) square pins should already be located on the circuit board. Some square pins might have headers installed on the circuit board. Tektronix recommends removing the plastic spacer from the square pins to gain closer access to the circuit board as shown in the following figure to achieve the best electrical performance, especially CMRR. You might need to use a pair of tweezers to remove the spacer as shown in the figure.



Removing the header from square pins on the circuit board

Tektronix provides a set of solder pins (0.018-inch (0.46 mm) diameter) to install on the circuit board for use with the MMCX to 0.062-inch (1.57 mm) adapter. Use the soldering aide tool accessory (Tektronix part number, 003-1946-xx) to install these pins on the circuit board.

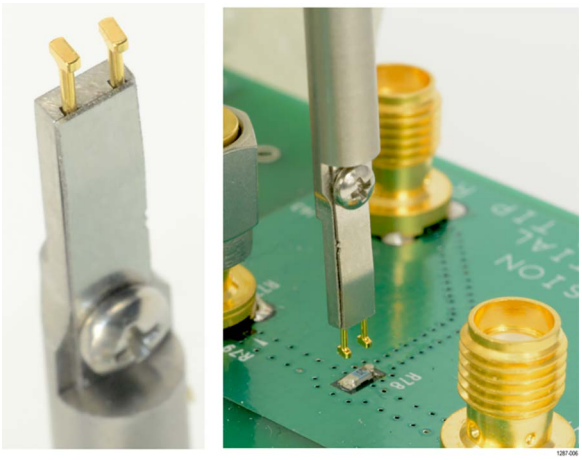
The solder pins are extremely small and can be challenging to handle. Tektronix recommends using tweezers and a magnifying tool when installing the pins on the circuit board.

The solder pins can be installed around a surface mounted component on the circuit board, but adequate clearance should be maintained for a good electrical connection for the adapter. See the adapter clearance figure.

The coaxial (common) shield of the probe tip and tip adapters should always be connected to the lowest impedance point (usually a circuit common or power supply rail) in the circuit-under-test (relative to the probe tip cable/center conductor) to obtain the most accurate waveform.

Use the following steps to install the solder pins using the soldering aide on the circuit board:

1. Carefully insert the solder pins into the soldering aide as shown in the following illustration.



Using the soldering aide to install the square pins on the circuit board

2. Use the soldering aide to hold the square pins in place while soldering the square pins to the circuit board.
3. If necessary apply a small amount of adhesive to further strengthen the connection to the circuit board. However, keep the height of the adhesive to a minimum to provide good electrical contact for the adapter.See the adapter clearance figure.

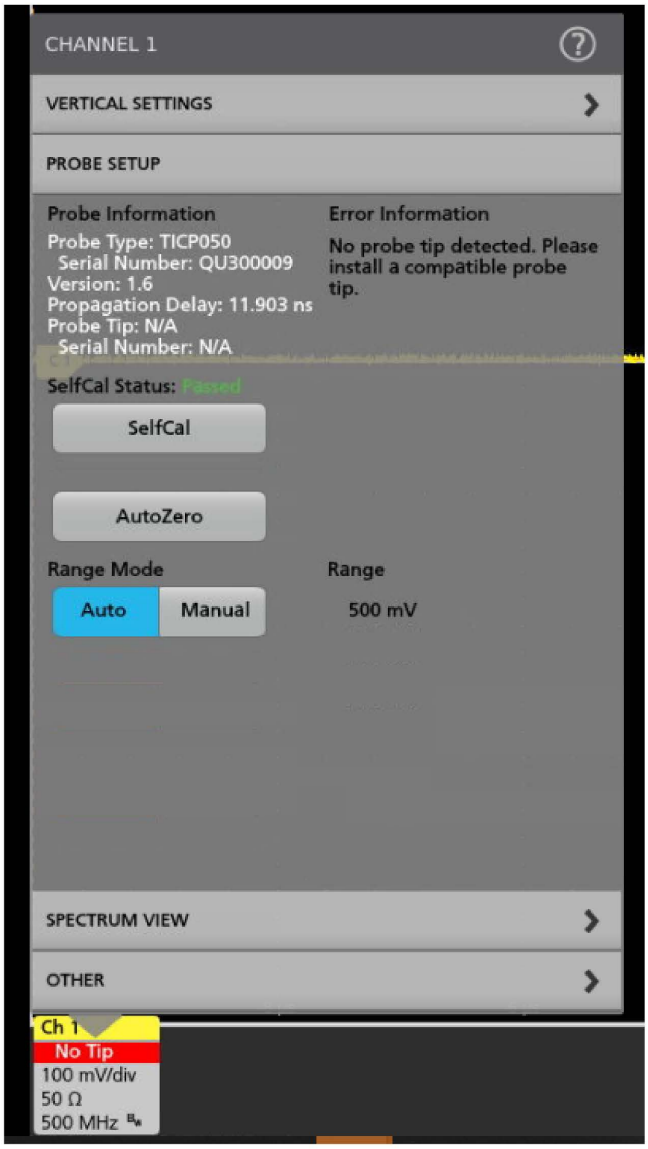
Probe Setup menu

Use the probe setup menu to see probe information, perform self-calibration (SelfCal), perform AutoZero, change the range mode, and configure the range.

To access the Probe Setup menu on the oscilloscope, double-tap the corresponding analog channel badge on the settings bar and tap **Probe Setup**.

You will receive a warning message if you connect the probe to the oscilloscope without a probe tip attached. The following images display the menu with and without the tip warning.





Self-calibration

The self-calibration (SelfCal) function that corrects gain accuracy and DC offset. These parameters change as the probe warms up to the operating temperature and remain constant once the temperature reaches steady-state.

Check the **SelfCal Status** in the **Probe Setup** menu. The status indicates when SelfCal has **Passed**, **Failed** or if it is **Recommended** to run SelfCal.

To check the status of the SelfCal remotely, use the `SELFCAL:STATE?` PI command to determine self-calibration is `RECOMMENDED`, `RUNNING`, or `PASSED`.

It is recommended to run SelfCal again when there is a 10°C change in ambient temperature or when the status is **Recommended**. To run a self-calibration use perform the following steps:

1. Tap the channel badge corresponding to the channel you connected the probe to.
2. In the channel menu, expand the **Probe Setup** tab.
3. Tap the **SelfCal** button.

To run the self-calibration remotely, use the `CH<x>:PROBE:SELFCAL EXECUTE` PI command. The connected channel is specified by "x".

NOTE: For the best results, run self-calibration while the probe is connected to the powered down DUT.

When using vertical scales of 10 mV/div or less, probe self-calibration should be run with the probe tip still attached and with no signal applied to the probe tip. Additionally, for the TICPSMA and TICPMX1X tips, it is recommended to leave a representative drive impedance (a powered-down DUT) connected to the probe tip during self-calibration.

At higher vertical scales, or in the particular use case of a TICPSMA or TICPMX1X tip driven by a very low impedance (a shunt resistor ≤5 Ω), an alternate approach of disconnecting the tip from the probe head may be used to insure no signal is applied during self-calibration.

The TICP Series probe takes five minutes to warm up and self-calibration takes less than two minutes to complete. The **SelfCal Status** will change to **Passed** or **Failed**.

AutoZero

AutoZero and self-calibration work on different parts of the measurement system. Self-calibration optimizes measurements through adjusting parameters in the probe. AutoZero is an oscilloscope function and is used when a displayed waveform is not centered correctly (for example; due to a small DC offset error). AutoZero automatically runs after self-calibration.

It is important to power-down the DUT or disconnect your probe from the DUT before running AutoZero.

Auto Range

The **Range Mode** is selectable for either **Auto** or **Manual**. When the Range Mode is set to **Auto**, the probe range is automatically selected when the V/div knob on the oscilloscope is turned. The relationship between probe range and V/div setting matches that shown in Ranges and 4/5/6 Series MSO Volts/div settings table.

Ranges

The measurement system has a variety of ranges available for you to select, whether the probe is being used with or without a tip. This allows for tradeoffs to be made between noise and dynamic range depending on the needs of the measurement being made.

CAUTION: To avoid damaging the probe, do not exceed the Peak Voltage rating for a given tip or the probe head. The Maximum Non-Destruct Voltage limit (Peak Voltage) does not increase when the Probe Ranges are changed.

In 4, 5, and 6 Series MSO Instruments, the ranges are selectable when **Range Mode** is set to **Manual**. The recommended V/div settings are displayed in the table below. The ranges shown are for the probe SMA input and 1X tip. Multiply the range and V/div setting by the tip attenuation to get the values for a probe tip.

Ranges and 4/5/6 Series MSO Volts/div settings

4/5/6 Series MSO probe ranges	Recommended V/div setting
20 mV	2 mV/div
30 mV	5 mV/div
45 mV	5 mV/div
65 mV	10 mV/div
90 mV	10 mV/div
125 mV	20 mV/div
175 mV	20 mV/div
250 mV	20 mV/div
350 mV	50 mV/div
500 mV	100 mV/div

When using a tip, the label of each probe tip shows the maximum dynamic range and the attenuation factor. When more sensitive ranges are selected, dynamic range is limited. Refer to the Linear differential input voltage range in the specifications table for more information.

Selecting a probe tip

CAUTION: Avoid over-voltage conditions that can damage or degrade the probe head input termination by selecting the correct probe tip. Selecting the correct probe tip attenuation factor is crucial to ensure that the probe head input termination is not degraded or damaged by an over-voltage condition. Select the probe tip that will provide the lowest attenuation possible for the signal being measured.

When selecting a probe tip for a particular application, consider the following questions:

- What is the maximum RMS/Peak Voltage at the test point being measured (for example, under a fault condition)?
- What is the minimum single-ended input resistance that my circuit can tolerate?
- How large of a signal do I want to display at one time on the oscilloscope?
- What sensitivity do I need (for example, the minimum V/div setting)?

Refer to the Input voltage range (input impedance) tables in the Probe and tip overview (on page 44) section to help select the correct probe tip.Start at the top of the tables and work down. Choose the first tip that meets all of your criteria.

For maximum non-destruct voltage refer to the Maximum differential input voltage vs frequency derating graph.

Deskew

Each probe comes loaded with nominal propagation delay values that can be automatically applied through the **Vertical** menu on the oscilloscope. Deskew accuracy can be improved using a known signal and a deskew fixture. When the timing relationships between waveforms is critical, always deskew your test system with known equipment.

Input offset

The measurement system provides an adjustable input referred offset voltage.This enables viewing a portion of the signal that is off-screen or examining sensitive behavior riding on a larger differential voltage. For example, a 0 V to 0.6 V step would normally exceed a ±0.5 V input range. By applying 250 mV of offset, the 600 mV step is brought into the dynamic range of the probe and can be viewed accurately. Offset is applied by the probe.

Voltage range

The probe is designed to enable characterization of high frequency circuits with a wide range of differential voltages in the presence of common mode voltages. Understanding the limits and differences between the voltage ratings as discussed in this section is essential to optimize signal fidelity and measurement accuracy.

Although the common mode voltage range of the probe is very large (1000 V CATII), the differential input range is limited and depends on the tip attenuation, the gain range selected, and the applied offset.

The input voltage conditions are divided into several different input ranges.

Common mode voltage range

The probe head is isolated from earth ground, making the common mode input range 1000 V CATII. The differential input range is more limited and refers to the signal that can be applied across the probe tip, regardless of the common mode voltage.

Differential voltage range refers to the actual measurement that will appear on the oscilloscope screen when using IsoVu™. For accurate results, the measurement must fall within the range of any applied offset $\pm V_{diff}$ range of the tip.

$V_{meas} = V_{offset} \pm V_{diff}$

Offset voltage range

Offset voltage can be applied through the oscilloscope **Vertical** menu settings. The input offset capability of the probe extends from ±0.5 V to ±50 V depending on the tip used. This offset is applied at the probe head and can be useful to bring applied signals within the dynamic range (V_{diff}) of the probe.

Maximum non-destruct differential voltage range

The maximum non-destruct differential input range is the maximum differential voltage that can be applied to the input without damaging the probe. This is a DC +peak AC rating (no portion of the differential input signal should exceed this value). The maximum non-destruct differential voltage varies from ±3 V to ±60 V depending of the probe tip being used. Exceeding these levels will cause permanent damage to components of the probe head.

Specifications

This chapter contains specifications for the instrument. All specifications are typical unless noted as guaranteed. Typical specifications are provided for your convenience but are not guaranteed. Specifications that are marked with the ✔ symbol are guaranteed and checked in Performance Verification.

All specifications are typical and apply to all models unless noted otherwise.

To meet specifications, these conditions must first be met:

- The instrument must be operating within the environmental limits described in this manual.
- The instrument must have been operating continuously for at least five minutes within the specified operating temperature range.
- The measurement system is powered from a TekVPI compatible oscilloscope.

Warranted specifications describe guaranteed performance with tolerance limits or certain type-tested requirements.

Probe and tip overview

IsoVu isolated current probe overview

Characteristic	TICP100	TICP050	TICP025
Bandwidth	1 GHz	500 MHz	250 MHz
Rise time	400 ps	700 ps	1.4 ns
DC gain accuracy	±1.5%		
Maximum common mode voltage	1800 V; For use in a Pollution Degree 1 environment; Max with transient level not to exceed $5kV_{pk}$		
	1300 V; Pollution degree 2; Max with transient level not to exceed $5kV_{pk}$		
	600 V for CAT III; Pollution degree 2		
	1000 V for CAT II; Pollution degree 2		
RMS noise spectral density	4.70 nV / √Hz (<21 μV_{RMS} at 20 MHz)		
Probe cable length	2 meters		

TICS wideband shunts overview

Characteristic	TICS0005	TICS0050	TICS0500	TICS5000
Resistance	5 mΩ	50 mΩ	500 mΩ	5 Ω
Bandwidth	250 MHz	250 MHz	250 MHz	250 MHz

Characteristic	TICS0005	TICS0050	TICS0500	TICS5000
Rise time	1.6 ns	1.6 ns	1.6 ns	1.6 ns
Maximum pulse current (derates based on current pulse width. Refer to pulsed current curve graph)	200 A	20 A	2 A	200 mA
Maximum current (A DC)	12 A	4.5 A	1.4 A	200 mA
Minimum current (A) equals two times the noise floor at full bandwidth	30 mA	3 mA	300 µA	30 µA
Noise Floor (A RMS) at full bandwidth	15 mA	1.5 mA	150 µA	15 µA
Dynamic range	±100 A	±10 A	±1 A	±0.1 A
Power rating	0.69 W	1.0 W		
DC gain accuracy	<2%			
Insertion inductance	2 nH to 3 nH for square pins with jumper			
	4 nH to 5 nH for square pins with shunt			
	9 nH to 10 nH for twisted pair accessory with shunt			
Twin-ax cable length	229 mm (9 in.)			
The built-in fuses have a maximum interruptible voltage rating of 400 V; above this potential, arcing can occur across the open fuse element, allowing current to continue flowing.				

Input voltage range, input impedance (IsoVu isolated current probes with serial numbers at or above B020000)

Differential input voltage range + offset range will not exceed maximum measurable input voltage.

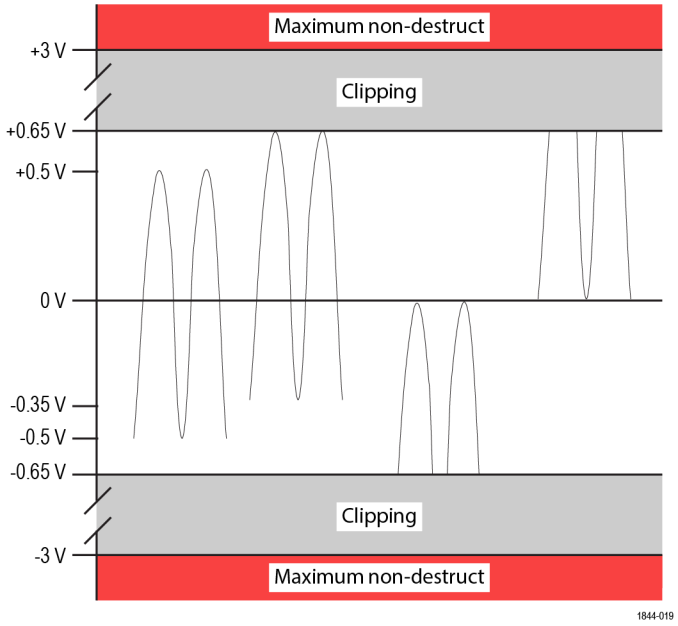
Probe tips	Differential input voltage range	Offset range	Maximum measurable input voltage (Vpk)	Maximum non-destructive differential voltage	Input impedance
TICPSMA	±0.5 V	±0.5 V	1 V	±3 V DC + peak AC	50 Ω || N.A.
TICPMM1 TICPMM1ET	±0.5 V	±0.5 V	1 V	±3 V DC + peak AC	50 Ω || N.A.
TICPMM10 TICPMM10ET	±5 V	±5 V	10 V	±15 V DC + peak AC	500 Ω || <3 pF

Probe tips	Differential input voltage range	Offset range	Maximum measurable input voltage (Vpk)	Maximum non-destructive differential voltage	Input impedance
TICPMM100 TICPMM100ET	±50 V	±50 V	50 V	±60 V DC + peak AC	5000 Ω || <3 pF

Input voltage range, input impedance (IsoVu isolated current probes with serial numbers below B020000)

Differential input voltage range + offset range should not exceed maximum measurable input voltage. For example, offset is limited to ±0.15 V in TICPSMA's ±0.5 V range.

Probe tips	Differential input voltage range	Offset range	Maximum measurable input voltage (Vpk)	Maximum non-destructive differential voltage	Input impedance
TICPSMA	±0.5 V	±0.5 V	0.65 V	±3 V DC + peak AC	50 Ω || N.A.
TICPMM1 TICPMM1ET	±0.5 V	±0.5 V	0.65 V	±3 V DC + peak AC	50 Ω || N.A.
TICPMM10 TICPMM10ET	±5 V	±5 V	6.5 V	±15 V DC + peak AC	500 Ω || <3 pF
TICPMM100 TICPMM100ET	±50 V	±50 V	50 V	±60 V DC + peak AC	5000 Ω || <3 pF
Full ±0.5 V offset available in probe's ±0.125 V.					



Differential input voltage range

Noise floor (A RMS)

$$\text{Noise Floor (A RMS)} = \frac{4.70\frac{nV}{\sqrt{Hz}} \times \sqrt{Bandwidth}}{R_{shunt}}$$

IsoVu isolated current probe noise floor (A RMS)

Shunt selection	20 MHz	250 MHz	1 GHz
50 Ω TICP as shunt	420 nA	1.5 µA	3.0 µA
5 Ω shunt	4.2 µA	14.9 µA	29.7 µA
1 Ω shunt	21 µA	74.3 µA	149 µA
500 mΩ shunt	42 µA	149 µA	297 µA
50 mΩ shunt	420 µA	1.5 mA	3.0 mA
5 mΩ shunt	4.2 mA	14.9 mA	29.7 mA
500 µΩ shunt	42 mA	149 mA	297 mA
50 µΩ shunt	420 mA	1.5 A	3.0 A
15 µΩ shunt	1.4 A	5.0 A	9.9 A

Wideband shunts noise floor (A RMS)

Shunt selection	20 MHz	120 MHz	250 MHz
5 Ω (TICS5000)	4.2 µA	10 µA	15 µA
500 mΩ (TICS0500)	42 µA	100 µA	150 µA
50 mΩ (TICS0050)	420 µA	1.0 mA	1.5 mA
5 mΩ (TICS0005)	4.2 mA	10 mA	15 mA
The wideband shunt noise floor is dependent on TICP input range, bandwidth, and shunt value. Numbers above calculated with TICP in the ±20 mV range.			

Maximum measurable current

Maximum depends on shunt power rating.

$$Maximum\ Measurable\ Current\ (A) = \frac{Maximum\ Measurable\ Input\ V_{pk}}{R_{shunt}}$$

The IsoVu isolated current probe maximum measurable current

Shunt selection	TICPMM1	TICPSMA	TICPMM10	TICPMM100
50 Ω TICP as shunt	13 mA		-	-
5 Ω shunt	130 mA		1.3 A	10 A
1 Ω shunt	650 mA		6.5 A	50 A
500 mΩ shunt	1.3 A		13 A	100 A
50 mΩ shunt	13 A		130 A	1.0 kA
5 mΩ shunt	130 A		1.3 kA	10 kA
500 µΩ shunt	1.3 kA		13 kA	100 kA
50 µΩ shunt	13 kA		130 kA	1000 kA
15 µΩ shunt	43.3 kA		433.3 kA	3300 kA

Wideband shunts maximum measurable current

Shunt selection	10 µs	1 ms	100 ms	1 s	100 s
5 Ω (TICS5000)	0.2 A	0.2 A	0.2 A	0.2 A	0.2 A
500 mΩ (TICS0500)	2 A	2 A	2 A	1.8 A	1.5 A
50 mΩ (TICS0050)	20 A	20 A	7.6 A	5.7 A	4.6 A
5 mΩ (TICS0005)	195 A	63 A	23 A	16 A	12 A
Derates based on current pulse width. Pulse Width durations are based on a Square Wave input. For Triangle Wave input (as in Double Pulse Test), the Maximum Pulse Width can be multiplied by 3.5. For example, for a double-pulse test that peaks at 20 A, the 50 mΩ TICS can withstand a 3.5 ms ramp. A 20 A square wave impulse could only be held for 1 ms.					

Probe Ranges (IsoVu isolated current probes with serial numbers at or above B020000)

These numbers are published for TICPSMA and TICPMM1 tips. For 10X or 100X tips, multiply by 10 or 100 respectively.

Input range	Offset range	RMS noise spectral density (V_{RMS})	Noise floor at 20 MHz (V_{RMS})
±0.5 V	±0.5 V	22.9 nV / √Hz	102.5 μV_{RMS}
±0.35 V	±0.5 V	17.4 nV / √Hz	77.8 μV_{RMS}
±0.25 V	±0.5 V	15.0 nV / √Hz	67.2 μV_{RMS}
±0.175 V	±0.5 V	9.5 nV / √Hz	42.4 μV_{RMS}
±0.125 V	±0.5 V	8.7 nV / √Hz	38.9 μV_{RMS}
±0.09 V	±0.5 V	6.3 nV / √Hz	28.3 μV_{RMS}
±0.065 V	±0.5 V	5.5 nV / √Hz	24.7 μV_{RMS}
±0.045 V	±0.5 V	4.7 nV / √Hz	21.2 μV_{RMS}
±0.03 V	±0.5 V	4.7 nV / √Hz	21.2 μV_{RMS}
±0.02 V	±0.5 V	4.7 nV / √Hz	21.2 μV_{RMS}

Probe Ranges (IsoVu isolated current probes with serial numbers below B020000)

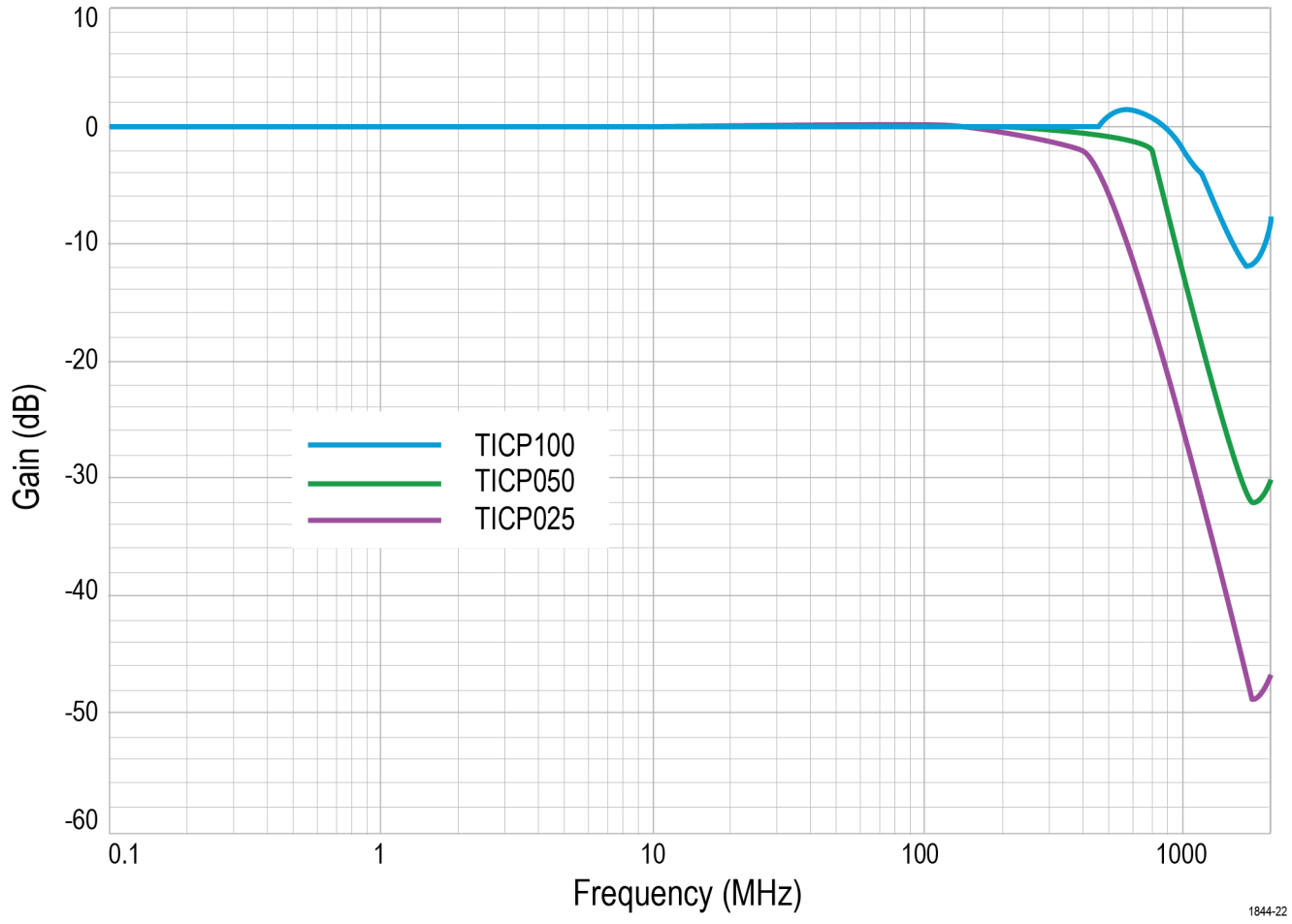
These numbers are published for TICPSMA and TICPMM1 tips. For 10X or 100X tips, multiply by 10 or 100 respectively

.Input range	Offset range	RMS noise spectral density (V_{RMS})	Noise floor at 20 MHz (V_{RMS})
±0.5 V	±0.15 V	22.9 nV / √Hz	102.5 μV_{RMS}
±0.35 V	±0.30 V	17.4 nV / √Hz	77.8 μV_{RMS}
±0.25 V	±0.40 V	15.0 nV / √Hz	67.2 μV_{RMS}
±0.175 V	±0.475 V	9.5 nV / √Hz	42.4 μV_{RMS}
±0.125 V	±0.5 V	8.7 nV / √Hz	38.9 μV_{RMS}
±0.09 V	±0.5 V	6.3 nV / √Hz	28.3 μV_{RMS}
±0.065 V	±0.5 V	5.5 nV / √Hz	24.7 μV_{RMS}
±0.045 V	±0.5 V	4.7 nV / √Hz	21.2 μV_{RMS}
±0.03 V	±0.5 V	4.7 nV / √Hz	21.2 μV_{RMS}

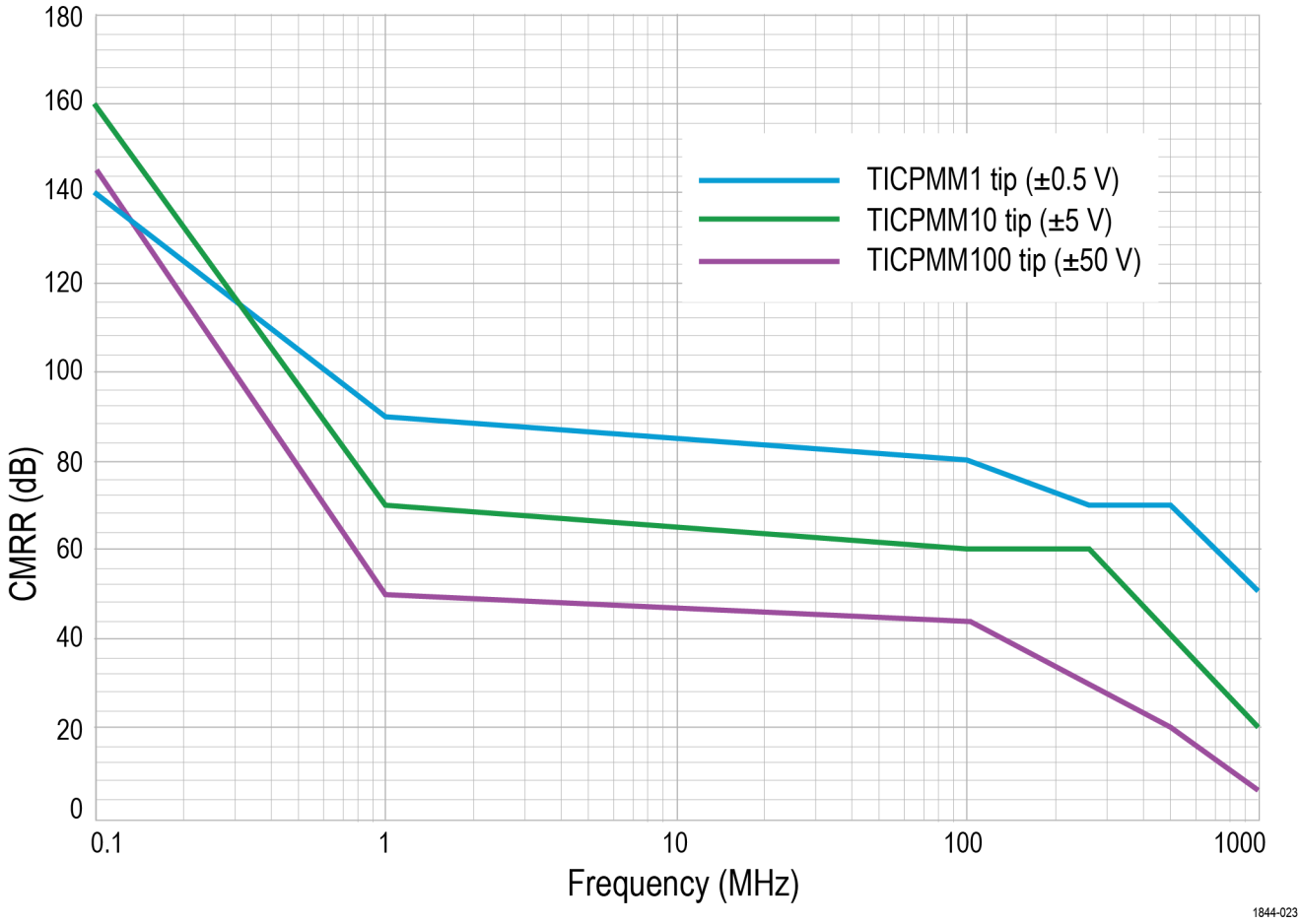
.Input range	Offset range	RMS noise spectral density (V_{RMS})	Noise floor at 20 MHz (V_{RMS})
±0.02 V	±0.5 V	4.7 nV / √Hz	21.2 μV_{RMS}

Wideband shunts CMRR

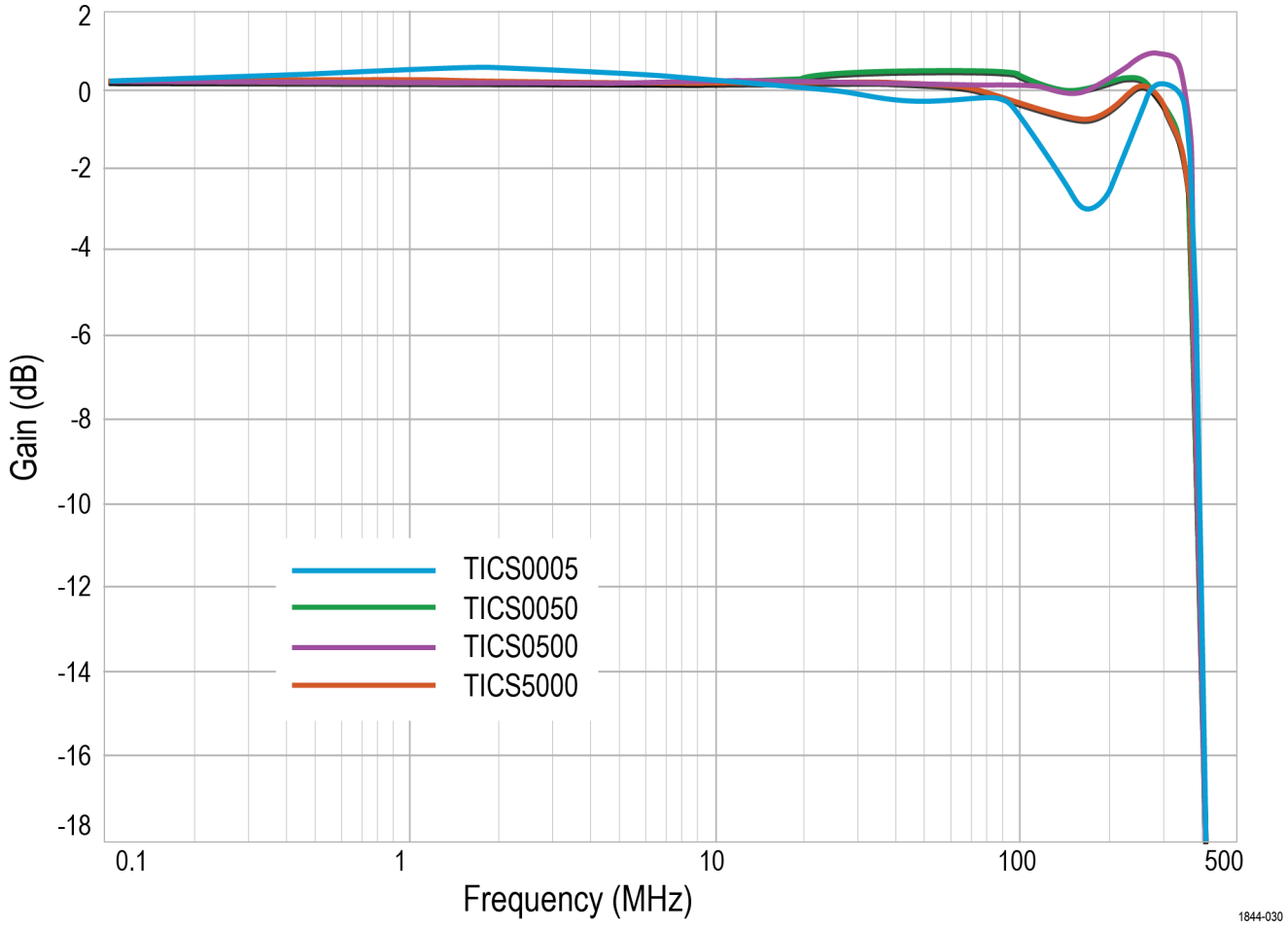
Sensor Tip Cable	DC	1 MHz	100 MHz	250 MHz
5 Ω (TICS5000)	120 dB	105 dB	52 dB	40 dB
500 mΩ (TICS0500)	120 dB	105 dB	67 dB	55 dB
50 mΩ (TICS0050)	120 dB	110 dB	80 dB	70 dB
5 mΩ (TICS0005)	120 dB	110 dB	90 dB	82 dB



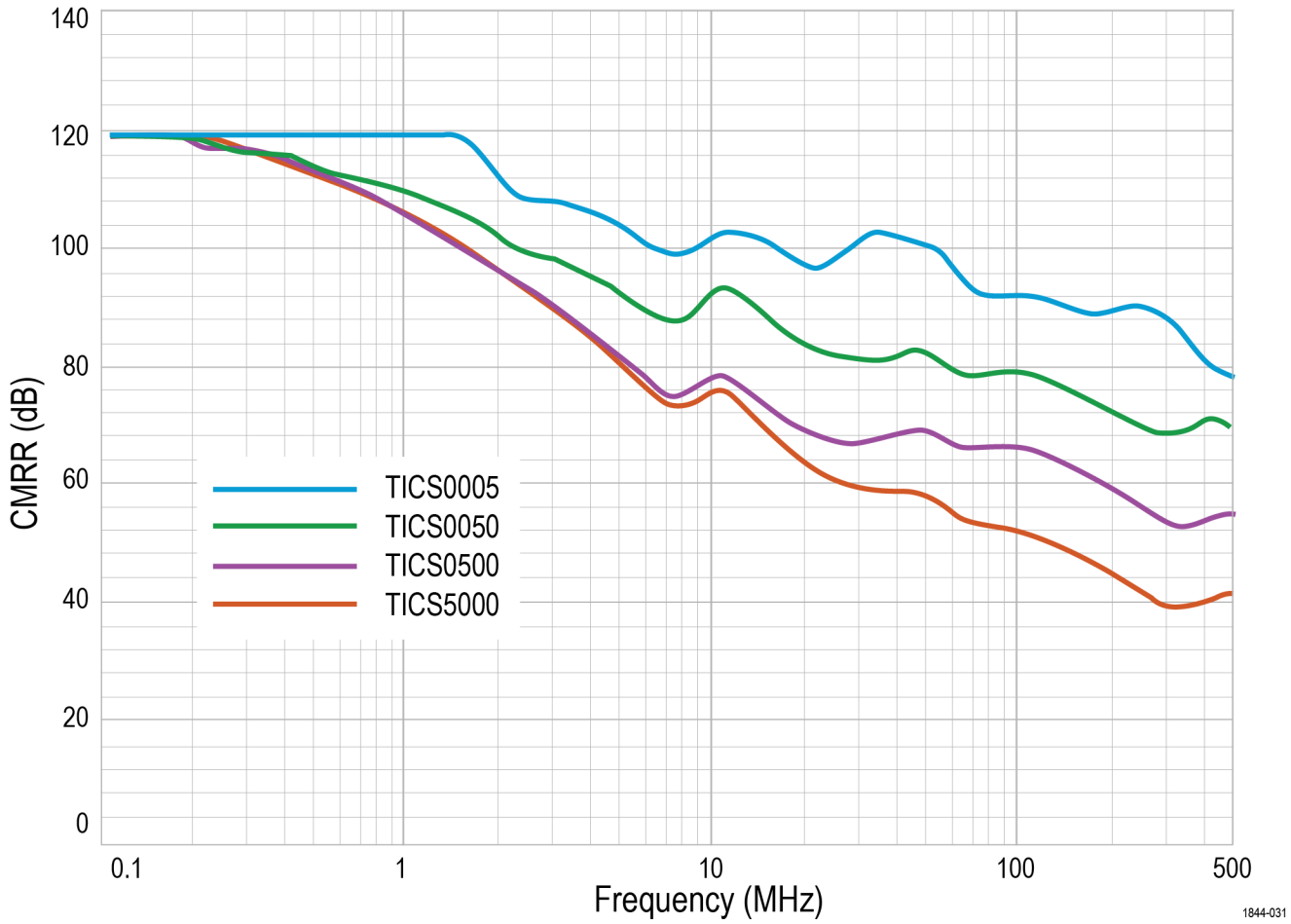
IsoVu isolated current probes frequency response



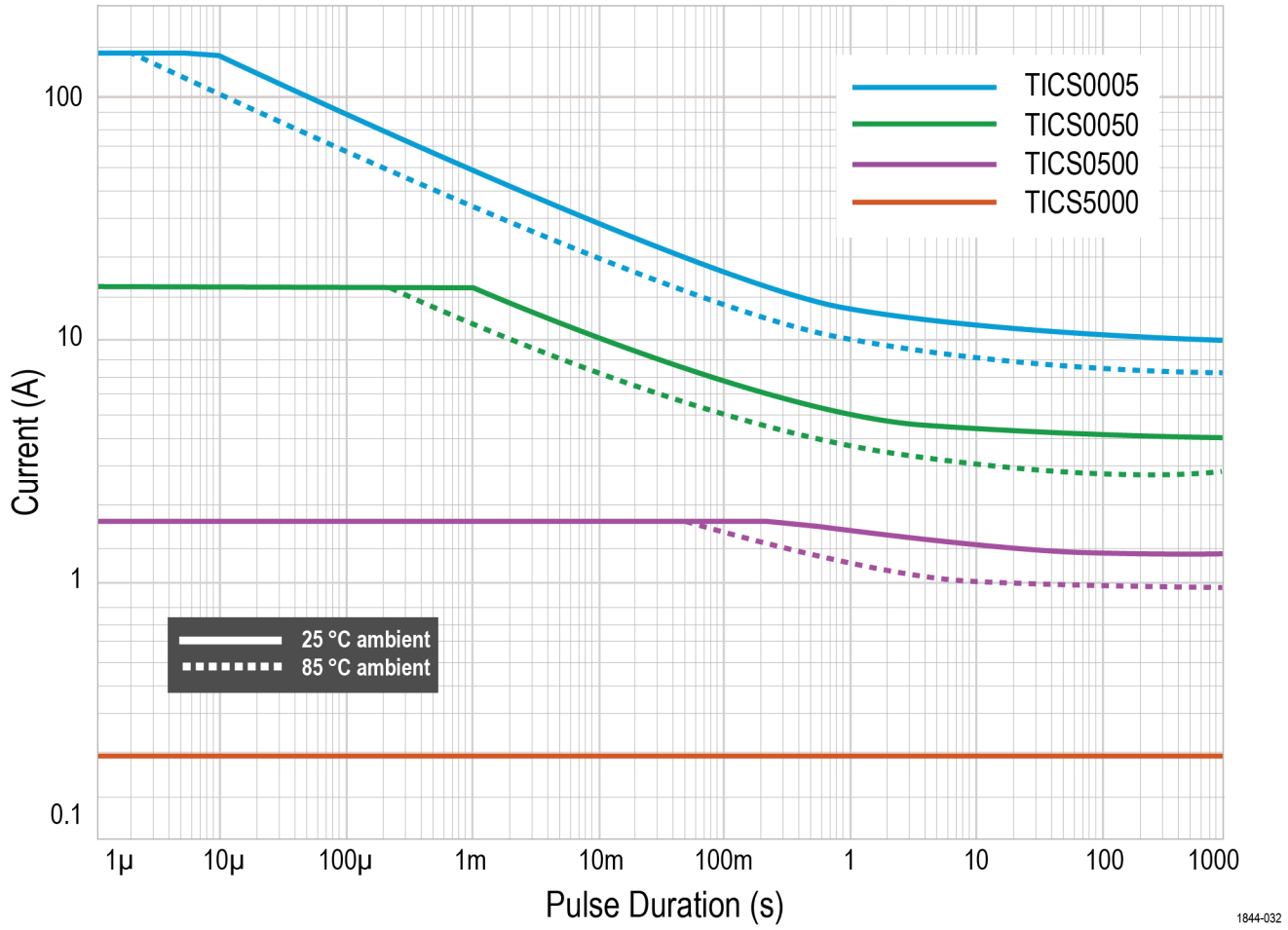
IsoVu isolated current probes common mode rejection ratio (CMRR)



Wideband shunts frequency response



Wideband shunts CMRR



Wideband shunts square-wave pulse current derating curve

Pulse Width durations are based on a Square Wave input. For Triangle Wave input (as in Double Pulse Test), the Maximum Pulse Width can be multiplied by 3.5. For example, for a double-pulse test that peaks at 20 A, the 50 mΩ TICS can withstand a 3.5 ms ramp. A 20 A square wave impulse could only be held for 1 ms.

Wideband shunts pulse current derating calculations

Calculate max current for a square current pulse of width *t* using the following equation:

$$I_{max} = min\left(\sqrt{\frac{P_{max}}{R_{shunt}}}, \frac{1V}{R_{shunt}}\right)$$

For an isolated pulse or ramp (effectively zero duty cycle):

$$P_{max} = P_d + \frac{C}{\sqrt{t}}$$

For repetitive operation with duty cycle $0 < D \leq 1$, P_{max} is further reduced according to the duty-cycle derating expression below:

$$P_{max} = \frac{P_d}{P_d + D \cdot \frac{C}{\sqrt{t}}} \cdot \left(P_d + \frac{C}{\sqrt{t}} \right)$$

The coefficients P_d and C are tabulated by ambient temperature and shunt model; refer to the following table for values.

Shunt	25°C		85°C	
	C	P_d	*C*	P_d
5 mΩ	0.6	0.69	0.31	0.36
50 mΩ	0.6	1.0	0.31	0.52
500 mΩ	0.6	1.0	0.31	0.52
5 Ω	0.6	1.0	0.31	0.52

Example

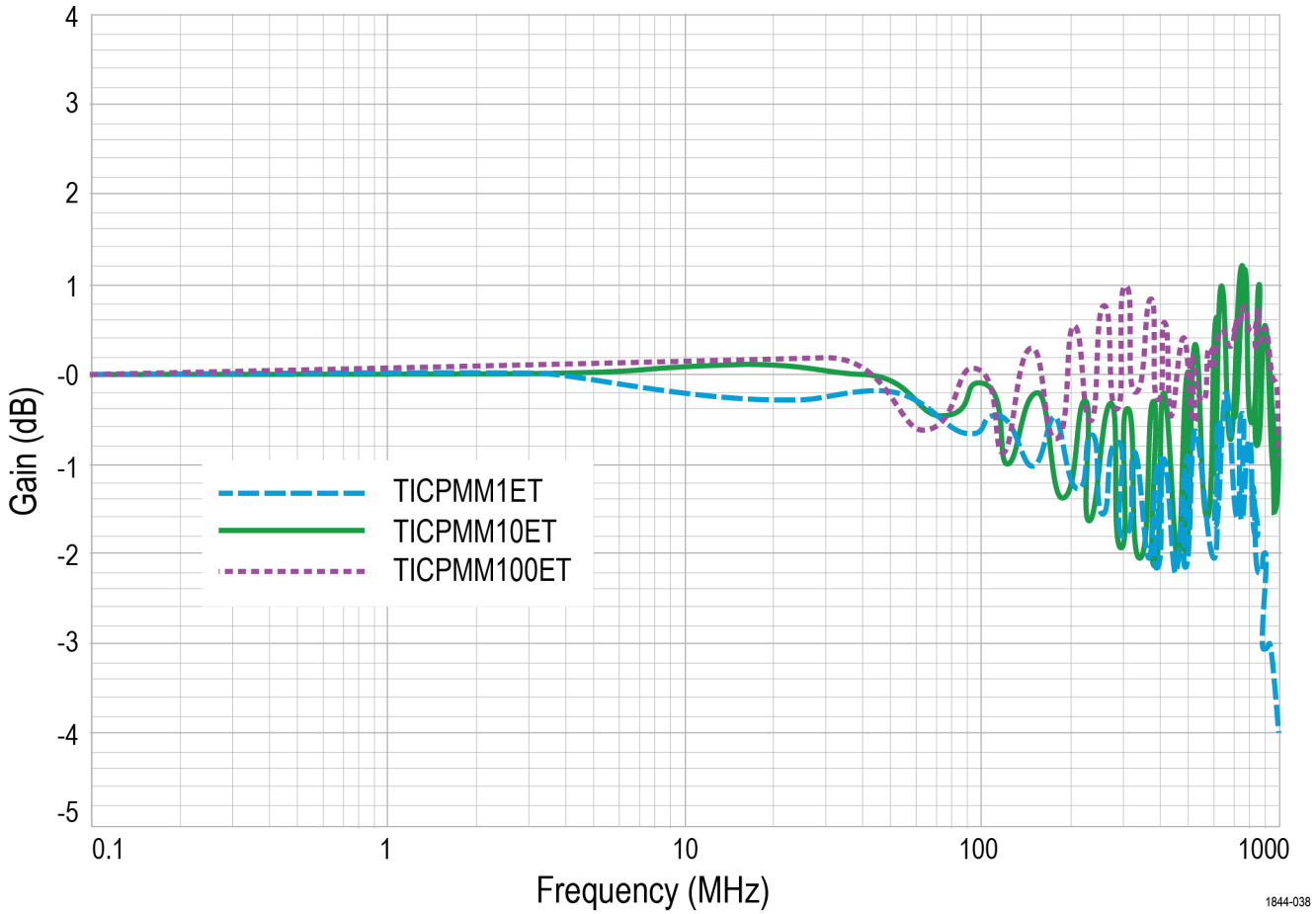
A pulse train double pulse test with 5 pulses starts at 0 A and ramps over a period of 100 µs. Though there are short OFF periods between the pulses, it is more conservative to calculate the pulse width assuming that those periods do not exist and model the ramp as a continuous signal. In addition, because the double pulse test is a ramp waveform, the 3.5X scaling factor is applied to *t*.

$$R_{shunt} = 5\ m\Omega, t = \frac{100\ \mu s}{3.5} = 28.6\ \mu s, P_d = 0.69, C = 0.6$$

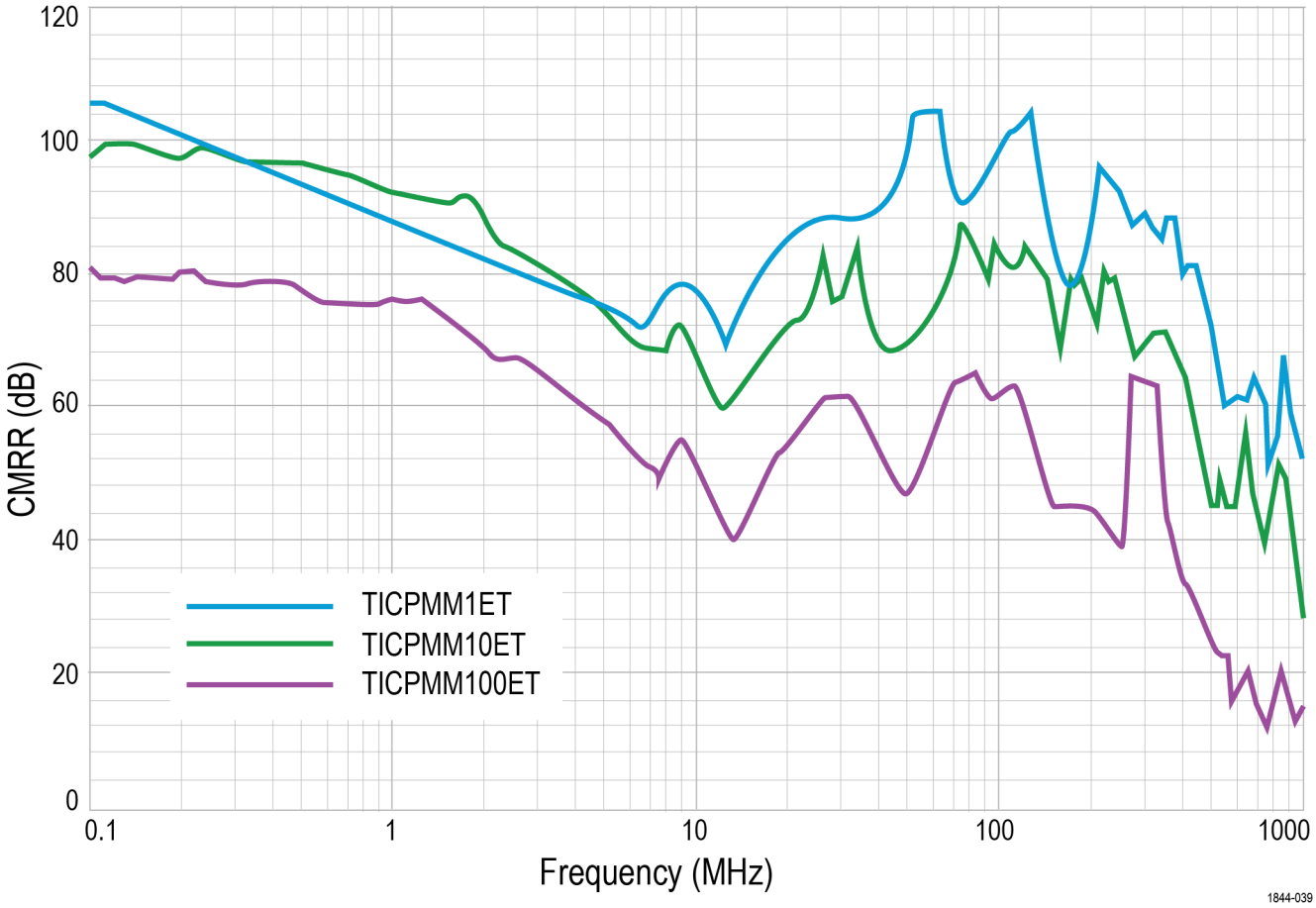
$$P_{max} = P_d + \frac{C}{\sqrt{t}} = 0.69 + \frac{0.6}{\sqrt{28.6 \cdot 10^{-6}}} = 113\ W$$

$$I_{max} = \sqrt{\frac{P_{max}}{R_{shunt}}} = \sqrt{\frac{113\ \mathrm{W}}{5 \cdot 10^{-3}\ \Omega}} = 150\ A$$

The calculation above shows the 5 mΩ TICS0005 will survive a 150 A ramp that lasts less than 100 µs.



Extreme temperature tip frequency response



Extreme temperature tip CMRR

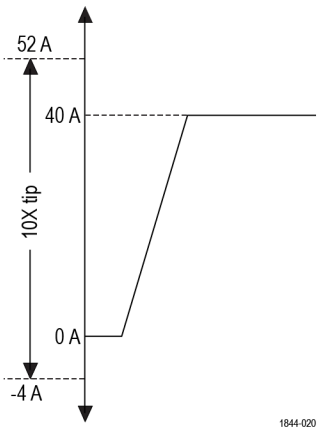
Application Examples

Application examples for Wide Bandgap (WBG) and PMIC power integrity.

WBG example (800V, 40 A typical; 0.125 Ω shunt)

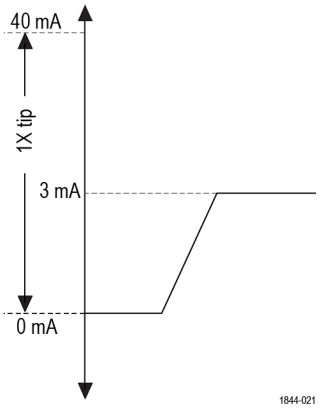
In a 800 V SiC circuit switching at 40 A, a 125 mΩ shunt will produce a 5 V signal. To measure this using the IsoVu isolated current probe the 10X tip must be used. In the ±3.5 V range apply 24 A of offset.

The measurable current range goes from 52 A to -4 A. At these settings, the RMS noise floor at 250 MHz bandwidth is 2.2 mA RMS



PMIC power integrity (48 V, 3 mA typical; 1 Ω shunt)

On a 48 V PMIC bus, the standby current of 3 mA will produce a 3 mV signal on a 1 Ω shunt. Use the 1X tip in the most sensitive ±20 mV range, apply offset to view the 3 mA current and capture transients from 0 A to 40 mA with a RMS noise floor of 21.2 µA



Electrical specifications

Analog bandwidth

Probe tip	Bandwidth
TICPSMA	>1 GHz
TICPMM1	>1 GHz
TICMM10	>1 GHz
TICPMM100	>1 GHz
TICPMM1ET	>700 MHz
TICPMM10ET	>700 MHz
TICPMM100ET	>700 MHz

Linearity

Deviation of from best line is < ±2% of peak FS

Maximum deviation from linear regression expressed as a percentage of the specified dynamic range.

Input impedance

Probe tip	Input resistance	Input capacitance
TICPMM1/TICPMM1ET	50 ±0.5%, 49.75 to 50.25	
TICMM10/TICPMM10ET	500 ±2%, 490 to 510	<3 pF
TICPMM100/TICPMM100ET	5000 ±2%, 4900 to 5100	<3 pF

Isolated guard line impedance (to earth ground)

>120 MΩ, ~17 pF

Offset gain accuracy

±0.5%

Offset linearity

±0.1%

Operating voltage input range

±0.65 V maximum differential

Input coupling

DC

DC balance

< 0.1 divs

Operating random vibration

0.31 GRMS, 5-500 Hz, 10 minutes per axis, 3 axes (30 minutes total)

Regulatory compliance

EMC

Conforms to European Union EMC Directive (CE-marked)

Safety

Conforms to European Union Low Voltage Directive (CE-marked)

Conforms to ANSI/UL61010-1 (CSA-marked)

Conforms to ANSI/UL61010-2-030 (CSA-marked)

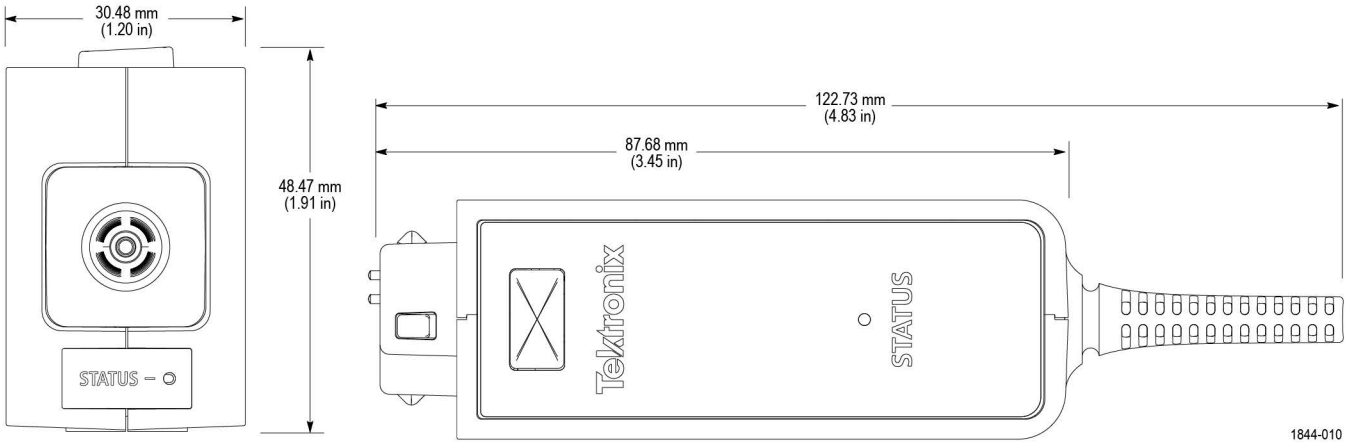
Certified to CAN/CSA C22.2 No.61010-1 (CSA-marked)

Certified to CAN/CSA C22.2 No.61010-2-030 (CSA-marked)

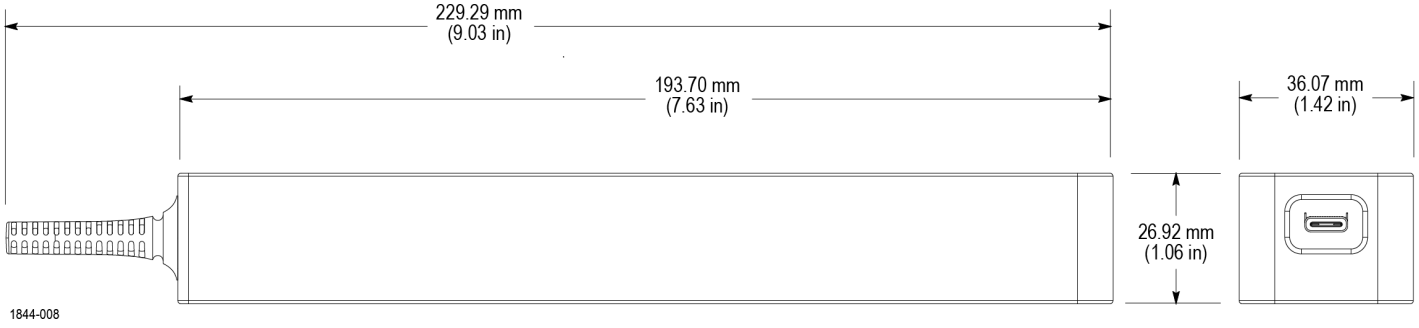
RoHS

Conforms to European Union Restrictions on Hazardous Substances (CE-marked)

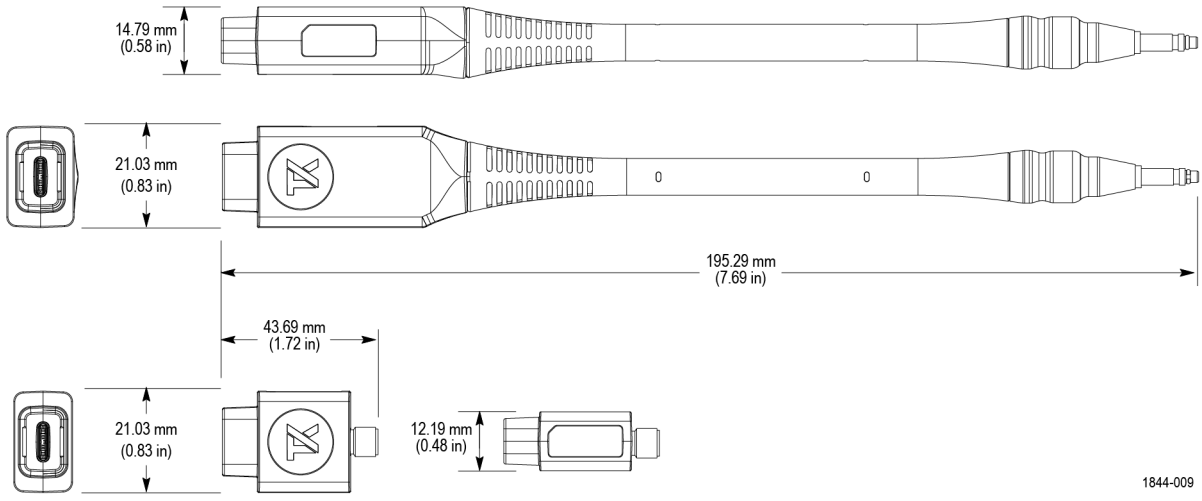
Probe dimensions



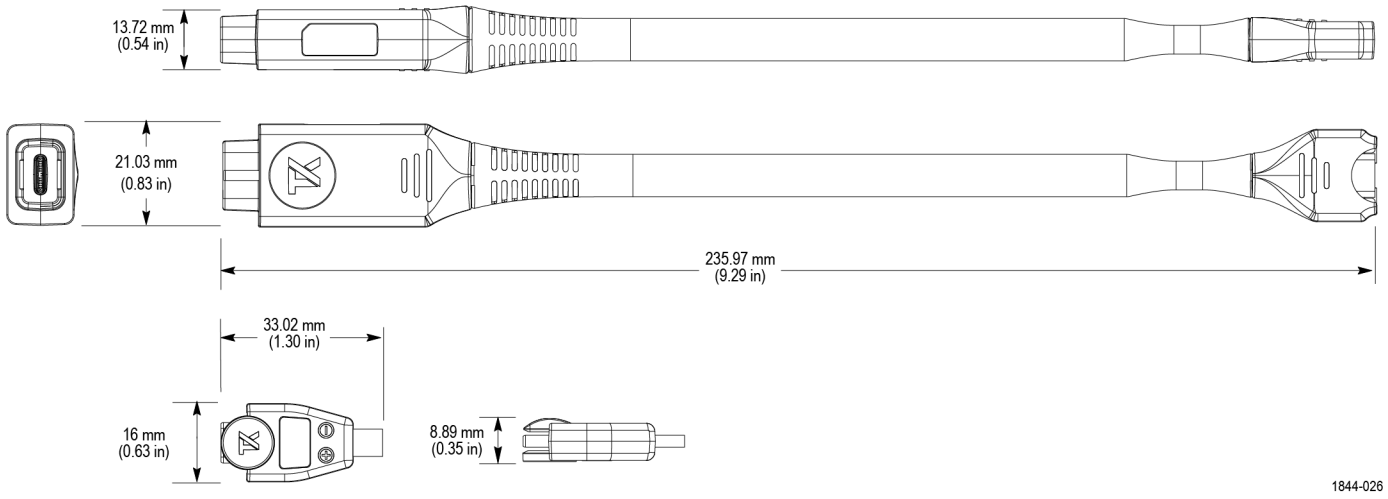
Compensation box



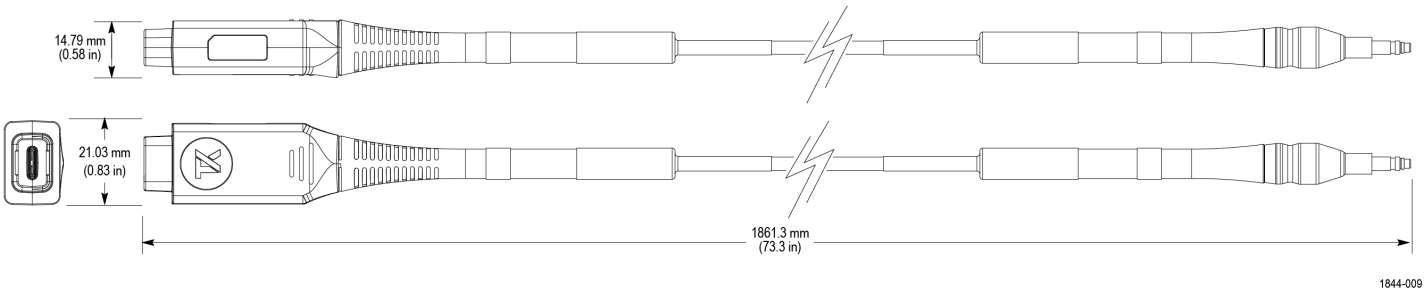
Probe head



Probe tips



Wideband shunts and Twin-ax cable



Extreme temperature tips

Performance verification procedures

Use the following procedures to verify the performance of the IsoVu measurement system. Before beginning the procedures, print the test record and use it to record the performance results.

Required equipment

The equipment required to perform the performance verification procedures are shown in the following table.

Description	Minimum requirements	Example product
Supported oscilloscope with TekVPI interface	50 Ω input support, fully compatible with TekVPI interface	Tektronix 5 Series B MSO
DC voltage source	3 mV to 4 V, ±0.1% accuracy	Fluke 9500C Oscilloscope Calibrator with a Fluke 9540 Active Head
SMA male short circuit connector cap (optional)	Internally shorted, copper plated contact	Fairview Microwave SC2135
Digital multimeter (DMM)	0.1% accuracy or better	Tektronix DMM6500
Precision termination test fixture		Tektronix part number 067-3281-XX
TekVPI calibration performance verification fixture		Tektronix part number 067-1701-XX

System RMS Noise

This procedure verifies that the TICP Series probes are functioning and meet the warranted noise specification. The noise will be measured with no input signal at the most sensitive range.

Before you begin

1. Turn on the TekVPI oscilloscope.
2. Connect the TICP probe to the oscilloscope on channel 1 and remove the TICP probe tip (if attached).
3. Allow the test equipment to warm up for 30 minutes at an ambient temperature of about 20 °C (68 °F).

Procedure

This procedure is valid for all versions of the TICP Series probe.

1. Tap **File > Default Setup**.
2. Run **Signal Path Compensation**, if recommended in **Utility > Calibration...**
3. Run self-calibration (Self-calibration (on page 40)).
4. Connect the TICPSMA probe tip to TICP probe.
5. Connect the SMA short connector cap to TICPSMA.

6. Enable the TICP channel and use the following **Vertical** menu settings:
   a. Vertical Scale: **1 mV/div**
7. Edit **Trigger** menu settings as follows:
   a. Type: **Edge**
   b. Source: **AC Line**
   c. Slope: **Rising**
   d. Level: **0 V**
   e. Coupling: **DC**
8. Edit **Horizontal** menu settings as follows:
   a. Horizontal Scale: **100 µs/div**
   b. Record Length: **6.25 M**
9. Edit the following Acquisition menu setting:
   a. Single Sequence Stop After: **1 Acquisitions**
10. Add a measurement with the following settings:
    a. Amplitude Measurement: **AC RMS**
    b. Source: **CH 1**
11. Press the **Single / Seq** button to perform the measurement.
12. Record the AC RMS measurement result in the test record table.

System RMS noise test record

Use the test record table for recording the results of the system RMS noise performance verification procedure.

Model number: Procedure performed by:

Serial number: Date:

Probe	Maximum noise	Measured noise
TICP025	75 μV_{rms}	
TICP050	125 μV_{rms}	
TICP100	155 μV_{rms}	

DC Gain Accuracy

This procedure verifies that the TICP Series probes are functioning and meet the warranted DC gain accuracy.

Before you begin

1. Turn on the TekVPI oscilloscope.
2. Connect a 067-3281-XX 50 Ω precision termination to the output of the 067-1701-XX fixture.
3. Connect a DMM to the 50 Ω precision output with a BNC tee.
4. Connect a BNC cable from the tee at the output of the 50 Ω precision termination to any other oscilloscope channel. Verify the channel is in 1 MΩ mode and 200 mV/div. This is used for proper grounding only.
5. Connect the 067-1701-XX fixture into channel 1 on the oscilloscope.
6. Connect the TICP Series probe into the 067-1701-XX fixture.
7. Turn on the Fluke 9500B Oscilloscope Calibrator.
8. Connect the Fluke 9530 Active Head to the Fluke 9500B on channel 1.
9. Allow the test equipment to warm up for 30 minutes at an ambient temperature of about 20 °C (68 °F).

Procedure

This procedure is valid for all versions of the TICP Series probe.

1. Tap **File > Default Setup**.
2. Run **Signal Path Compensation**, if recommended in **Utility > Calibration...**
3. Run self-calibration (Self-calibration (on page 40)).
4. Connect the TICPSMA probe tip to TICP probe.
5. Connect the TICPSMA to the Fluke 9500 Active Head.
6. Enable the TICP channel and use the following **Vertical** menu settings:
   a. Range Mode: **Manual**
   b. Range: **500 mV**
   c. Offset: **0 V**
7. On the Fluke 9500B, select **Mode: Manual Waveform** with the following settings:
   a. Select **Waveform: DC**
   b. Select **400 mV/div**
   c. Turn output **ON**
8. Press the **Single / Seq** button to perform the measurement.
9. Record the DC voltage on the precision 50 Ω resistor in the table.
10. Press **invert voltage (+/-)** button on the Fluke 9500B to apply -400 mV to the probe and record the output voltage in the table.
11. Repeat the entire procedure for the remaining ranges and record the values in the test record table.

DC Gain Accuracy test record

Use the test record table for recording the results of the DC gain accuracy performance verification procedure.

Model number: Procedure performed by:

Serial number: Date:

Probe gain is defined as the change in Output divided by the change in input.

Gain=(Measurement1-Measurement2)/(Input1-Input2)

Range	Input 1	Input 2	Measured output 1	Measured output 2	Calculated gain	Upper gain limit	Ideal gain	Lower gain limit
500 m	+0.400 V	-0.400 V				1.010	1.000	0.990
350 m	+0.280 V	-0.280 V				1.443	1.429	1.415
250 m	+0.200 V	-0.200 V				2.020	2.000	1.980
175 m	+0.140 V	-0.140 V				2.886	2.857	2.828
125 m	+0.100 V	-0.100 V				4.040	4.000	3.960
90 m	+0.072 V	-0.072 V				5.612	5.556	5.500
65 m	+0.052 V	-0.052 V				7.769	7.692	7.615
45 m	+0.036 V	-0.036 V				11.222	11.111	11.000
30 m	+0.024 V	-0.024 V				16.834	16.667	16.500
20 m	+0.016 V	-0.016 V				25.250	25.000	24.750

DC Balance

This procedure verifies that the TICP Series probes are functioning and meet the warranted residual offset when input is zero and offset is zero.

Before you begin

1. Turn on the TekVPI oscilloscope.
2. Connect a 067-3281-XX 50 Ω precision termination to the output of the 067-1701-XX fixture.
3. Connect a DMM to the 50 Ω precision output with a BNC tee.
4. Connect a BNC cable from the tee at the output of the 50 Ω precision termination to any other oscilloscope channel. Verify the channel is in 1 MΩ mode and 200 mV/div. This is used for proper grounding only.
5. Connect the 067-1701-XX fixture into channel 1 on the oscilloscope.
6. Connect the TICP Series probe into the 067-1701-XX fixture.
7. Allow the test equipment to warm up for 30 minutes at an ambient temperature of about 20 °C (68 °F).

Procedure

This procedure is valid for all versions of the TICP Series probe.

1. Tap **File > Default Setup**.
2. Run **Signal Path Compensation**, if recommended in **Utility > Calibration...**
3. Run self-calibration (Self-calibration (on page 40)).
4. Attach the TICPSMA probe tip to TICP probe.
5. Enable the TICP channel and use the following **Vertical** menu setting:
   a. Range mode: **Manual**
   b. Probe range: **500 mV**
6. Press the **Single / Seq** button to perform the measurement.
   a. Measure the voltage on the output side of the precision 50 Ω termination with the DMM.
7. Repeat the entire procedure for the remaining ranges and record the values in the test record table.

DC Balance test record

Use the test record table for recording the results of the DC balance performance verification procedure.

Model number: Procedure performed by:

Serial number: Date:

The residual output for any range should be less than ±10 mV.

Range	Limit	Measured
500 mV	±10 mV	
350 mV	±10 mV	
250 mV	±10 mV	
175 mV	±10 mV	
125 mV	±10 mV	
90 mV	±10 mV	
65 mV	±10 mV	
45 mV	±10 mV	
30 mV	±10 mV	
20 mV	±10 mV	

Offset Gain Accuracy

This procedure verifies that the TICP Series probes are functioning and meet the warranted offset gain accuracy.

Before you begin

1. Turn on the TekVPI oscilloscope.
2. Connect a 067-3281-XX 50 Ω precision termination to the output of the 067-1701-XX fixture.
3. Connect a DMM to the 50 Ω precision output with a BNC tee.
4. Connect a BNC cable from the tee at the output of the 50 Ω precision termination to any other oscilloscope channel. Verify the channel is in 1 MΩ mode and 200 mV/div. This is used for proper grounding only.
5. Connect the 067-1701-XX fixture into channel 1 on the oscilloscope.
6. Connect the TICP Series probe into the 067-1701-XX fixture.
7. Allow the test equipment to warm up for 30 minutes at an ambient temperature of about 20 °C (68 °F).

Procedure

This procedure is valid for all versions of the TICP Series probe.

1. Tap **File > Default Setup**.
2. Run **Signal Path Compensation**, if recommended in **Utility > Calibration...**
3. Run self-calibration (Self-calibration (on page 40)).
4. Attach the TICPSMA probe tip to TICP probe.
5. Attach the TICPSMA to the Fluke 9500 Active Head.
6. Enable the TICP channel and use the following **Vertical** menu settings:
   a. Range: **20 mV**
   b. Offset: **20 mV/div**
7. On the Fluke 9500B, select **Mode: Manual Waveform** with the following settings:
   a. Select **Waveform: DC**
   b. Select **20 mV/div**
   c. Turn output **ON**
8. Press the **Single / Seq** button to perform the measurement.
   a. Add the offset with value measured on the DMM.
9. Repeat the entire procedure with all of the following oscilloscope offset and Fluke input voltage settings: **0.25 V**, **0 V**, **-0.25 V**, and **-0.5 V**.

Offset Gain Accuracy test record

Use the test record table for recording the results of the offset gain accuracy performance verification procedure.

Model number: Procedure performed by:

Serial number: Date:

1. Input the offset voltages and corresponding measured mean result into Excel.
2. Create a scatter plot of the data with offset voltages in the Y-axis and mean voltages in the X-axis.
3. Add a trend line to the plot and select to show the equation .

The best fit of the data should have a slope between 0.995 and 1.005 to meet a 1% accuracy.

Range	500 mV measurement	250 mV measurement	0 V measurement	-250 mV measurement	-500 mV measurement	Limits	Calculated
20 mV						0.995 < x < 1.005	

Maintenance

Information to isolate possible failures and procedures for maintaining your probe.

Service offerings

Tektronix provides service to cover repair under warranty and other services that are designed to meet your specific service needs.

Tektronix service technicians are well equipped to service your probe. Services are provided at Tektronix Service Centers and on-site at your facility, depending on your location. Visit tek.com/service to view all available services. Check the status of your warranty at tek.com/warranty-status-search.

Cleaning

CAUTION: To prevent damage to the measurement system, do not expose it to sprays, liquids, or solvents. Avoid getting moisture inside the comp box or sensor head when cleaning the exterior.

Maintain the integrity of the connectors by keeping them free of contamination. Remove any debris from the connectors using low-pressure, clean, dry, compressed air.

Troubleshooting and error conditions

The following describes the state of each LED and possible problems that you might encounter when taking measurements with the probe. Use this as a quick troubleshooting reference before contacting Tektronix for service.

STATUS LED descriptions

LED		Status	Action
●	Green (Solid)	Normal operation	-
✳	Green (Blinking)	Bulk power failure	Try unplugging and plugging back in. Inspect probe/oscilloscope interface. Service of probe may be required.
●	Red (Solid)	Probe application failure	Try unplugging and plugging back in. Service of probe may be required.
✳	Red (Blinking)	Probe application failure and bulk power failure	Try unplugging and plugging back in. Inspect probe/oscilloscope interface. Service of probe and/or oscilloscope may be required.
✳	Red (Blinking • • –)	No power to the isolated side of the probe	Try unplugging and plugging back in. Service of probe may be required.

Measurement problems and possible solutions

Problem	Solution
DC offset is present in signal	Run self calibration
	Ensure the input signal is within the selected dynamic range of the selected tip
The Square Wave edge appears “smoothed”, rolled off, or uncompensated	Run self calibration
	Make sure the oscilloscope bandwidth filter is set to full bandwidth
	Make sure the input signal is not overdriving the probe input
The measured amplitude is smaller than expected	The input signal may be “railed”
	Make sure the input signal is within the dynamic range of the selected probe tip
	Apply offset to bring the input signal within the dynamic range of the selected probe tip
DC measurement inaccuracy	Run self calibration
	Set the record length to at least 200 µs (longer is better)
There is too much noise and you cannot accurately measure small signals	Select a tip with lower attenuation
	Set the oscilloscope vertical scale to a smaller value
	Manually select a lower range to lower noise
There is no signal detected; the waveform is a flat line	Remove the tip and check its continuity, referencing the input impedance table.
The probe head loses power intermittently	Make sure the probe head is within its operating temperature range
	Add external cooling; such as a small desktop fan
There is too much common mode noise	Try to remove any accessories, flying leads, or exposed wires between the test point and the probe tip
	Use an MMCX tip with an MMCX test point either designed into the board or as an unplanned test point
No tip detected warning	Detach and reattach the tip

Repack the measurement system for shipment

If you need to return the measurement system to Tektronix for repair, use the original packaging. If this is unavailable or not fit for use, contact your Tektronix representative to obtain new packaging.

When you return the measurement system to Tektronix, attach a tag showing the following information:

- Name of the product owner
- Address of the owner
- Instrument serial number
- A description of problems encountered and/or service required

Remote programming

This sections describes commands and queries that can be sent to the sensor head when attached to a Tektronix oscilloscope. Long-form and short-form keywords are indicated with upper/lower case letters. The commands and queries are supported by most oscilloscopes; differences in supporting oscilloscopes, if any, are described with the commands.

For additional information, refer to the programmer documentation for your oscilloscope.

CH<x>:PRObe? (Query Only)

This query-only command returns all information concerning the probe that is attached to the specified channel. The channel is specified by x.

Syntax

CH<x>:PRObe?

Examples

CH2:PROBE? might return **1.0000E-01; RESISTANCE 1.0000E+07;UNITS "V";ID:TYPE "10X"'SERNUMBER "N/A"** for a 10X probe, indicating that (among other parameters) the attenuation factor for the probe attached to Channel 2 is 100.0 mV (assuming that probe units are set to volts).

CH<x>:PRObe:AUTOZero (No Query Form)

This command executes the AutoZero function. The operation is entirely performed by the oscilloscope. The channel is specified by x.

Refer to the self-calibration procedure for information on performing the self calibration. Self-calibration

Syntax

CH<x>:PRObe:AUTOZero EXECute

Arguments

EXECute sets the probe attached to the specified channel to AutoZero.

Examples

CH1:PROBE:AUTOZERO EXECUTE sets the probe attached to the Channel 1 to autozero.

CH<x>:PRObe:FORCEDRange

The command selects the dynamic range of probe (1 of 9) in +/-V. It is dependent on the attached probe tip. The channel is specified by x. The command should only be used when **CH<x>:PROBECONTROL** is set to **MANUAL**

Probe tip cables and dynamic ranges

Probe tip cable	Dynamic Range +/-V
No tip or 1X tip	0.02 | 0.03 | 0.045 | 0.065 | 0.09 | 0.125 | 0.175 | 0.25 | 0.35 | 0.5
10X	0.2 | 0.3 | 0.45 | 0.65 | 0.9 | 1.25 | 1.75 | 2.5 | 3.5 | 5.0
100X	2 | 3 | 4.5 | 6.5 | 9 | 12.5 | 17.5 | 25 | 35 | 50

The query returns the dynamic range of the probe tip in +/-V.

Syntax

CH2:PRObe:FORCEDRange <NR3>

CH2:PRObe:FORCEDRange?

Arguments

<NR3> specifies the probe dynamic range

Examples

If a current probe is attached to the Channel 1 input, **CH1:PROBE:FORCEDRANGE 5.0** sets the attached probe to its 5 V range.

CH3:PROBE:FORCEDRANGE? might return **5.0000**, indicating that the range of the probe attached to the Channel 3 is set to 5 V.

CH<x>:PRObe:GAIN? (Query Only)

The command returns the gain factor of the currently selected range (inverse of attenuation). The channel is specified by x.

Syntax

CH<x>:PRObe:GAIN?

Examples

CH2:PROBE:GAIN? might return **100.0000E-3**, indicating that the attached 10X probe delivers 0.1 V to the Channel 2 BNC for every 1.0 V applied to the probe input.

CH<x>:PRObe:ID? (Query Only)

This query-only command returns the type and serial number of the probe that is attached to the specified channel. The channel is specified by x.

Syntax

CH<x>:PRObe:ID?

Examples

CH2:PROBE:ID? might return **"B010289";"TICP100"**, indicating that a TICP100 probe with serial number B010289 is attached to Channel 2.

CH<x>:PRObe:ID:SERnumber? (Query Only)

This query-only command returns the serial number of the probe that is attached to the specified channel. The channel is specified by x. For Level 0 and 1 probes, the serial number will be “N/A”.

Syntax

CH<x>:PRObe:ID:SERnumber?

Examples

CH1:PROBE:ID:SERNUMBER? might return **"B010289"**, indicating that the serial number of the probe attached to Channel 1 is B010289.

CH<x>:PRObe:ID:TYPe? (Query Only)

This query-only command returns the type of probe that is attached to the specified channel. The channel is specified by x.

Syntax

CH<x>:PRObe:ID:TYPe?

Examples

CH1:PROBE:ID:TYPE? might return **"TICP100"**, indicating that a TICP100 probe is attached to Channel 1.

CH<x>:PRObe:SELFCal:State? (Query Only)

This query-only command returns the self-calibration state of RECOMMENDED, RUNNING, or PASSED. The channel is specified by x.

Syntax

CH<x>:PRObe:SELFCal:State?

Examples

CH1:PRObe:SELFCal:State? might return **RUNNING**, indicating that the Channel 1 probe is currently running a self-calibration.

CH<x>:PRObe:SELFCal

This query-only command initiates self-calibration on the probe. The channel is specified by x.

Syntax

CH<x>:PRObe:SELFCal EXECUTE

Examples

CH1:PRObe:SELFCal EXECUTE runs self-calibration on the Channel 1 probe.

CH<x>:PRObe:STATus? (Query Only)

This command queries the probe unsigned integer error value. The channel is specified by x.

Conditions

Requires a probe that supports the relevant error messages.

Syntax

CH<x>:PRObe:STATus?

Returns

Returns an integer number that represents the sum total of binary error bits B0 – B15. The error bits are not displayed; they are concatenated into the integer value. The following is a list of the error for each bit.

- B0 – Probe disabled
- B1 – Jaws open
- B2 – Over range
- B3 – Probe temperature out of limits
- B4 – Degauss needed
- B5 – Probe tip missing
- B6 – Probe tip failed
- B7 – Probe tip not supported
- B8 – self-calibration is needed or recommended (the query will return 256 in decimal format)
- B9 through B15 – Reserved

Examples

CH4:PROBE:STATus? might return **2**, indicating that the probe is reporting an open jaws error.

CH<x>:PRObe:UNIts? (Query Only)

This query-only command returns a string describing the units of measure for the probe attached to the specified channel. The channel is specified by x.

Syntax

CH<x>:PRObe:UNIts?

Examples

CH4:PROBE:UNITS? might return **"V"**, indicating that the unit of measure for the probe attached to Channel 4 is Volts.

CH<x>:PROBECOntrol

This command sets or queries multirange probe range-control policy preference of the probe that is attached to CH<x>. The channel number is specified by x.

Syntax

CH<x>:PROBECOntrol {AUTO|MANual}

CH<x>:PROBECOntrol?

Arguments

AUTO sets the values. The probe range is automatically calculated.

MANual allows you to select various valid values for the probe connected to a particular channel.

Examples

CH2:PROBECONTROL AUTO sets the values and the probe range is automatically calculated.

CH2:PROBECONTROL? might return **MANUAL** indicating that you can select various valid values for the probe connected to channel 2

CH<x>:PROBEFunc:EXTAtten

This command is used to specify the attenuation value as a multiplier to the given scale factor on the specified channel. The channel is specified by x.

The query form of this command returns the user-specified attenuation.

Syntax

CH<x>:PROBEFunc:EXTAtten <NR3>

CH<x>:PROBEFunc:EXTAtten?

Arguments

<NR3> is the attenuation value, which is specified as a multiplier in the range from 1.00E-10 to 1.00E+10.

Examples

CH1:PROBEFUNC:EXTATTEN 167.00E-3 specifies an external attenuation, which is connected between the your input signal and the input of the probe attached to Channel 1.

CH2:PROBEFUNC:EXTATTEN? might return **1.0000E+00**, indicating that the probe attached to Channel 2 is connected directly to the user's signal.

CH<x>:PROBEFunc:EXTDBatten

This command sets or queries the input-output ratio (expressed in decibel units) of external attenuation or gain between the signal and the instrument input channels. The channel is specified by x.

The query form of this command returns the user-specified attenuation in decibels.

Syntax

CH<x>:PROBEFunc:EXTDBatten <NR3>

CH<x>:PROBEFunc:EXTDBatten?

Arguments

<NR3> is the attenuation value, which is specified in the range from -200.00 dB to 200.00 dB.

Examples

CH3:PROBEFUNC:EXTDBATTEN 2.5 specifies an external 2.5 dB attenuator on Channel 3.

CH1:PROBEFUNC:EXTDBATTEN? might return **2.5000E+00**, indicating that the attenuation for Channel 1 is 2.5 dB.

CH<x>:PROBEFunc:EXTUnits

This command sets the unit of measurement for the external attenuator of the specified channel. The channel is specified by x. The alternate units are used if they are enabled. Use the **CH<x>:PROBEFunc:EXTUnits:STATE** command to enable or disable the alternate units.

Syntax

CH<x>:PROBEFunc:EXTUnits <QString>

CH<x>:PROBEFunc:EXTUnits?

Arguments

<QString> indicates the attenuation unit of measurement for the specified channel.

Examples

CH4:PROBEFUNC:EXTUNITS "Pascals" sets the unit of measurement for the Channel 4 external attenuator.

CH2:PROBEFUNC:EXTUNITS? might return **"Pascals"**, indicating that the Channel 2 external attenuator unit of measurement is Pascals.

CH<x>:PROBEFunc:EXTUnits:STATE

This command sets or queries the custom units enable state for the specified channel. The channel is specified by x.

Syntax

CH<x>:PROBEFunc:EXTUnits:STATE {ON|OFF|<NR1>}

CH<x>:PROBEFunc:EXTUnits:STATE?

Arguments

OFF argument turns off external units.

ON argument turns on external units.

<NR1> = 0 turns off external units; any other value turns on external units.

Examples

CH2:PROBEFunc:EXTUnits:STATE ON turns on external units.

CH2:PROBEFunc:EXTUnits:STATE? might return **0**, indicating that external units are off for the specified channel.

CH<x>:PROBE:DYNAMICRANGE? (Query Only)

This command queries the dynamic range of the probe that is attached to the specified channel. The channel is specified by x.

Syntax

CH<x>:PROBE:DYNAMICRANGE?

Returns

The returned value is the delta between the current minimum and maximum range with some tolerance. It is also the delta between the probe range indicators (if currently displayed).

Examples

CH1:PROBE:DYNAMICRANGE? might return **1.3056** , indicating that the dynamic range of the probe attached to the Channel 1 is set to 1.3056 V.