Tektronix®

TPR1000 and TPR4000 Active Power Rail Probes

Compliance and Safety Instructions

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071-3637-00

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, additional information is provided at the end of this section in the *Service 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.

Probes and test leads

Before connecting probes or test leads, connect the power cord from the power connector to a properly grounded power outlet.

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.

High temperature probe tips

⚠ ***WARNING.*** *To prevent a burn injury, when using a solder micro-coax or flex tip in a high temperature application, be sure to allow the tip to cool down before handling the tip.*

Service safety summary

The *Service safety summary* section contains additional information required to safely perform service on the product. 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.

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.*

Symbols and terms 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 symbol(s) may appear on the product:

CAUTION
Refer to Manual

Compliance information

This product is intended for use by professionals and trained personnel only; it is not designed for use in households or by children.

Questions about the following compliance information may be directed to the following address:

Tektronix, Inc.
PO Box 500, MS 19-045
Beaverton, OR 97077, USA
www.tek.com

Environmental considerations

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

Restriction of hazardous substances

Complies with RoHS2 Directive 2011/65/EU.

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 Web site (www.tek.com/productrecycling).

Operating overview

The TPR1000 and TPR4000 probes provide a low noise, large offset range solution for measurement of ripple on DC power rails ranging from –60 to +60 VDC and measurement of AC ripple between 200 μV_{p-p} and 1 V_{p-p} at up to 4 GHz.

Refer to one of the following TPR1000 and TPR4000 Instruction Manuals for complete operating information and product specifications. The manuals are available for download at www.tek.com\downloads.

Language	Tektronix part number
English	077-1542-xx
Japanese	077-1543-xx
Simplified Chinese	077-1544-xx

Environmental specifications

Specification	Description
Maximum input voltage	DC: ±60 V AC: ±30 V RMS Pk-Pk: ±42 V peak
Temperature	Probe body: 0 to +55 °C Standard accessories: –40 to +125 °C High-temp accessories: –55 to +155 °C
Humidity	5 to 95% up to +40 °C, derate to 85% above +40 °C
Altitude	0 to 3000 m

Key performance specifications

Specification	Description
Oscilloscope compatibility	6 series MSO, 5 series MSO, MSO/DPO3000, MDO/DPO4000, MSO/DPO5000, DPO7000, and DPO70000 [1] oscilloscopes
Bandwidth in DC coupling mode [2 3]	TPR1000: DC to 1 GHz TPR4000: DC to 4 GHz
Bandwidth in DC reject mode [2 3]	TPR1000: 10 kHz to 1 GHz TPR4000: 10 kHz to 4 GHz
Linear dynamic range	Up to 60 V DC, ±1 V_{p-p} to bandwidth [4]
Offset range	±60 V
Attenuation	1.25x [2]
Measurement accuracy	DC linearity: <0.1% Step response long-term aberrations: ±1%
Noise	<300 μV_{p-p} noise on 6 Series MSO (20 MHz BW Limit) <1 mV_{p-p} noise on 6 Series MSO (Full Bandwidth)
Input impedance	50 kΩ DC to 10 kHz 50 Ω AC > 100 kHz
Offset	±60 V offset range Offset setting error: ±2 mV max, ±0.4 µV typical

1 DPO70000 oscilloscopes require the optional TCA-VPI50 adapter.
2 Frequency response optimized for <1 Ω source impedance.
3 Through SMA-to-SMA cable or Solder Micro-Coax tip.
4 Max AC RMS of 1 V.

Standard accessories

Each probe is shipped with one TPR4KIT accessory kit containing the following items:

Item	Description
1.3 m cable, SMA male-to-MMCX male, 50 Ω	
1.3 m cable, SMA male-to-SMA male, 50 Ω	
Y-lead adapter, MMCX female-to-0.8 mm sockets	
Adapter cable, MMCX female-to-U.FL female, 50 Ω	
Adapter, MMCX female-to-square pin (0.062 centers)	
DUT interface solder pins, set of 20	
Soldering aide tool, 0.062 solder pins over SMT	
Solder-in cable adapter, MMCX female-to-solder micro-coax tip, 50 Ω, set of 3	
Solder-in cable adapter, MMCX female-to-solder flex-paddle tip, 50 Ω, set of 3	
Wire card, solderable enameled self-fluxing copper wire (for use with the solder-in tips)	
Probe tip tripod support (with living hinge)	
Marker bands, set of 5 (for probe identification)	

Optional high-temperature accessory kit

If you ordered the optional TPR4KITHT high-temperature accessory kit, you received the following items:

Item	Description
2 m high-temperature cable, SMA male-to-MMCX male, 50 Ω	
Solder-in cable adapter, MMCX female-to-solder micro-coax tip, 50 Ω, set of 3	
Solder-in cable adapter, MMCX female-to-solder flex-paddle tip, 50 Ω, set of 3	

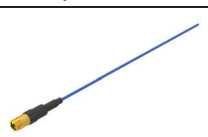
Optional 1 GHz browser accessory kit

If you ordered the optional TPRBRWSR1G browser accessory kit, you received the following items:

Item	Description
Browser	
Ground leads (blade, 0.5 mm spring, 15 cm alligator)	
Y-lead adapter, browser tip-to-0.8 mm sockets	
Micro-SMD clip	
Replacement 0.5 mm browser tips (2 solid tips, 2 spring tips)	

Optional solder-in, micro-coax tip accessory kit

If you ordered the optional TPR4SIACOAX accessory kit, you received the following items:

Item	Description
Solder-in cable adapter, MMCX female-to-solder micro-coax tip, 50 Ω, set of 3	

Optional solder-in, flex-paddle tip accessory kit

If you ordered the optional TPR4SIAFLEX accessory kit, you received the following items:

Item	Description
Solder-in cable adapter, MMCX female-to-solder flex-paddle tip, 50 Ω, set of 3	

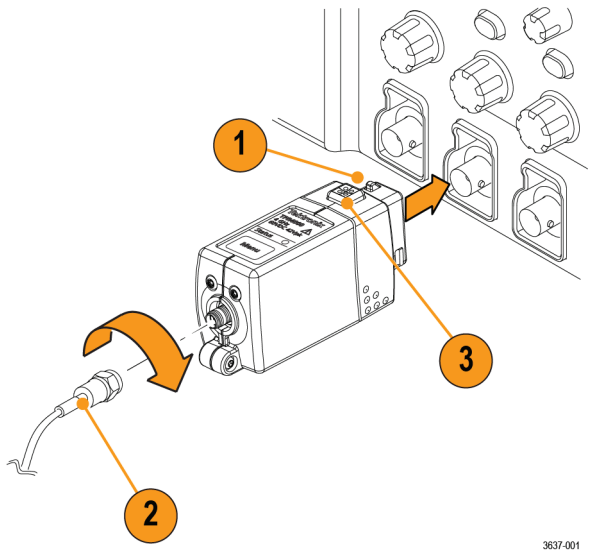
Installation

NOTE. *Your FlexChannel or VPI instrument may require a software upgrade to support full functionality of the TPR1000 and TPR4000 probes. Before you connect the probe to an oscilloscope, refer to the required software versions table at the end of this document to check the version requirements.*

1. To install the probe, slide the probe body into the FlexChannel or VPI receptacle. The probe clicks into place when fully engaged.
2. Attach one of the following probe cables to the SMA connector on the probe body:
   - SMA-to-SMA standard cable (standard accessory)
   - SMA-to-MMCX standard cable (standard accessory)
   - SMA-to-MMCX high-temperature cable (optional accessory)
   - 1 GHz browser probe cable (optional accessory)

CAUTION. *To prevent damage to the probe, do not exceed 8 in-lbs torque on the SMA nut.*

3. To disconnect the probe, press the latch release button and pull away from the instrument.



Attaching MMCX accessories

Gently insert the MMCX end of the cable into one of the following accessories: micro-coax tip, solder flex tip, u.fl adapter or MMCX to square pin Y-lead adapter, until you feel the connector engage. To remove an accessory, gently pull from the MMCX connection point.

Attaching solder-in accessories

Micro-coax tip. For convenient first-time use, the solder micro-coax tips are shipped pre-trimmed and ready to be soldered to the test point. You can reuse a tip by removing the tip from the solder joint and then trimming the wire insulation back to expose the center pin and ground shield on the tip cable. To achieve the best measurements results with a trimmed tip, refer to the *TPR1000 and TPR4000 User Manual* for guidelines and a description of best practices.

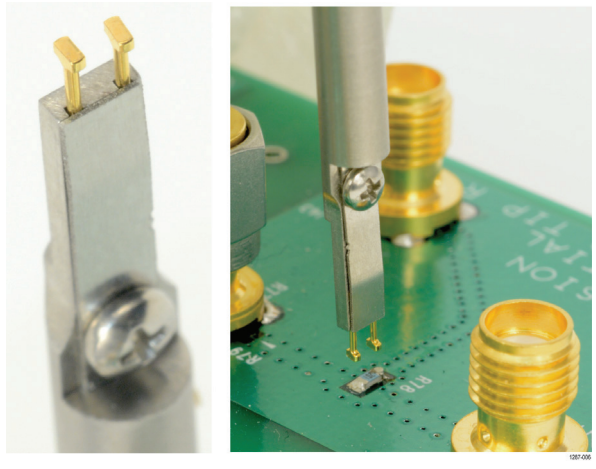
Flex tip. To attach the solder flex tip, first solder the enameled self-fluxing copper wire (standard accessory) to the test point. Feed the wire through the vias on the end of the flex tip, and then apply a small amount of solder to the vias to attach the wire to the tip.

Using the solder-pin installation tool

The supplied set of solder pins are intended to be installed on DUT circuit boards and used with the supplied MMCX-to-square-pin adapter. To install the solder pins, use the supplied soldering-aide tool as described below .

NOTE. *The solder pins are extremely small and can be challenging to handle. It is recommended to use tweezers and a magnifying tool when installing pins on a circuit board.*

1. Carefully insert the solder pins into the soldering aide tool as shown below.



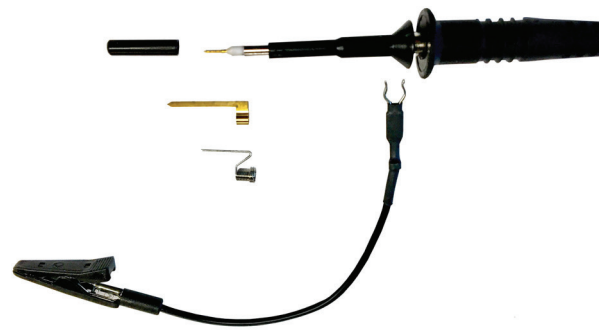
2. Use the soldering aide tool to hold the solder pins in place while soldering the pins to the circuit board.
3. If necessary, apply a small amount of adhesive to further strengthen the connection to the circuit board. However, keep the height of the adhesive to a minimum to provide good electrical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

Using the optional 1 GHz browser

The optional 1 GHz browser kit contains the following parts: 1 GHz browser probe, square pin Y-lead adapter, micro-SMD clip, three ground leads (alligator, blade, spring), and four replacement probe-tip pins (two rigid, two spring loaded).

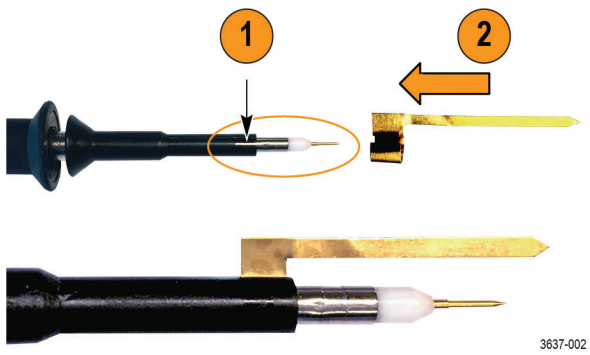
WARNING. *To prevent injury to the operator or damage to the probe, oscilloscope and device under test, do not touch the probe ground to any point that is not at the same potential as the chassis ground of the oscilloscope. The probe ground must be connected to the same potential as the chassis ground of the oscilloscope.*

Installing ground leads. To obtain accurate measurements, always attach a ground lead to the probe tip before making measurements. It is recommended that you use the shortest ground lead that will function in your electrical application. The following illustration shows the browser probe tip, the tip cover and the three types of grounds leads supplied with the browser.

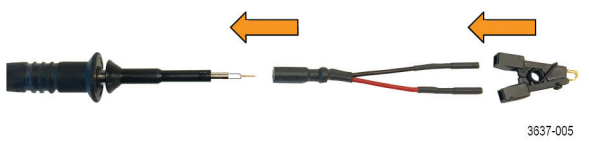


To install the ground leads:

- Spring: Slide the ground lead over the probe tip until it seats around the metal portion of the probe-tip housing.
- Alligator: Slide the ground lead prongs over the exposed metal between the plastic probe-tip sections.
- Blade: Locate the slot in the probe-tip housing as shown below. Slide the ground lead over the probe tip until the blade slides into the slot.



Connecting the Y-lead adapter and micro-SMD clip. The browser kit includes a Y-lead adapter and a micro-SMD clip that connect as shown below. The Y-lead adapter can also connect to square pins.



Replacing browser-tip pins. To remove the browser-tip pin, use pliers to grasp the pin and gently pull it out of the tip housing. To install a new browser-tip pin, select between a solid (silver colored) or spring-loaded (gold colored) pin, and then use pliers to gently insert the pin into the browser-tip housing until you feel the pin press against the bottom of the housing.

Required oscilloscope software versions

Oscilloscope	Required software version [1]
5 and 6 Series MSO	1.12.5
MSO/DPO3000	1.27462
MDO/DPO4000	1.09354
MDO/DPO5000	10.8.3.3
DPO7000	10.8.3.3
DPO70000	10.9.1

[1] The probe may operate with older versions of oscilloscope software. However, older software versions than those listed are not guaranteed to provide full probe functionality.