TriMode™ Probe Family

P7700 Series TriMode Probes Datasheet

Key features

The P7700 Series TriMode probes provide the highest probe fidelity available for real-time oscilloscopes. In addition, with connectivity innovations such as solder down tips with the probe's input buffer mounted only a few millimeters from the end of the tip, the P7700 series probes provide unmatched usability for connecting to today's most challenging electronic designs.

High bandwidth for signal fidelity

- 20 GHz P7720
- 16 GHz P7716
- 13 GHz P7713
- 8 GHz P7708

Minimal device impact

- Thin and flexible solder tips
- Lightweight and flexible probe cable
- Active buffer tip design for low probe loading

Easy to connect TekFlex™ Connector technology

- Pinch-to-Open accessory connector
- Versatile Connectivity - solder-down tips, optional browser for handheld or fixtured probing, and coaxial input (SMA adapter)
- Full Bandwidth to 20 GHz
- Probe cable and solder-down tips operate over an extended temperature range

Probe and tip specific S-parameters

- Full AC calibration of the probe and tip's signal path based upon unique s-parameter models
- Unique DSP filters created for each probe and tip

TekConnect® interface for oscilloscope/probe control and usability

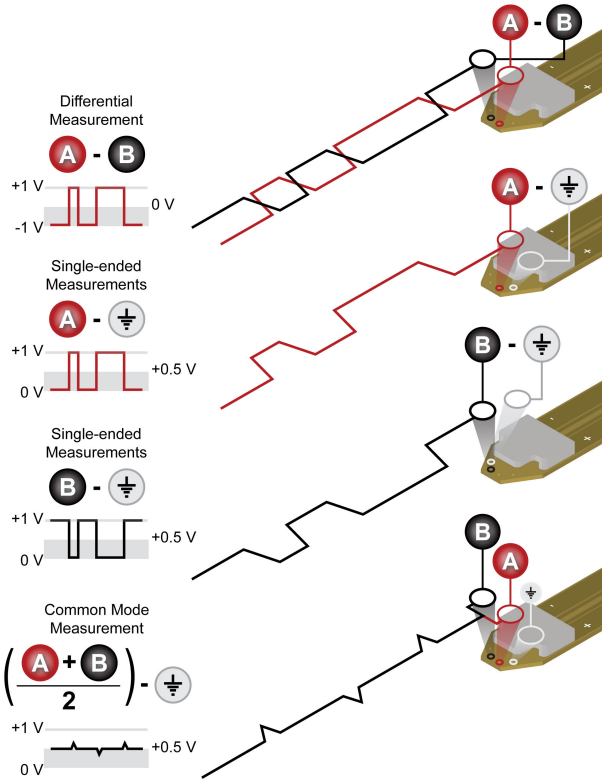
- Direct control via probe buttons or from the oscilloscope's menus
- Automated control of probe settings via the oscilloscope
- Automatic recognition of the probe and tip when attached to the oscilloscope

Applications

- DDR/LPDDR memory verification
- High speed serial bus debugging
- MIPI D-PHY/C-PHY/M-PHY conformance tests
- HDMI and DisplayPort compliance tests

P7700 Series TriMode Probes

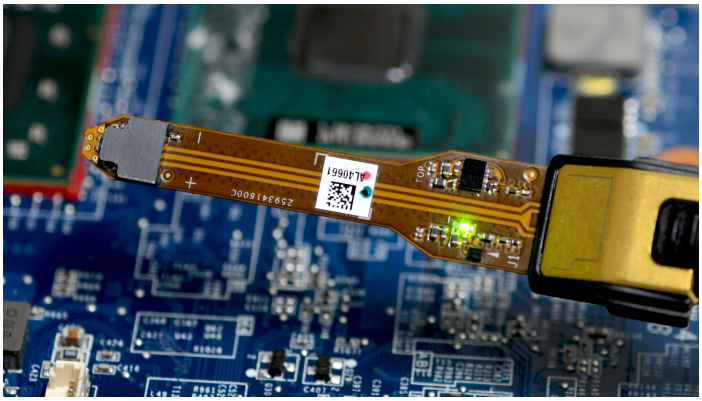
With TriMode probing one probe setup makes differential, single ended, and common mode measurements accurately. This unique capability allows you to work more effectively and efficiently, switching between differential, single ended and common mode measurements without moving the probe's connection points.



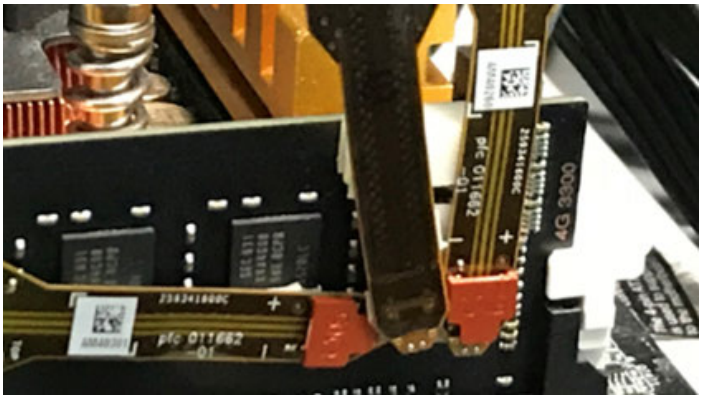
TekFlex connector technology

The P7700 Series TriMode probes use the new TekFlex connector technology that combines a high speed signal path with power and communication support for an active buffer tip in a single, easy to connect accessory connector. The TekFlex connector has a pinch-to-open design that when open requires minimal force to attach an accessory tip. When the TekFlex connector is closed, it provides a secure connection to the accessory to avoid accidental disconnections.

With the TekFlex connector, the P7700 series probes offer a set of active probe tips with the probe's buffer amplifier only millimeters from the input connections. The short signal path enabled with the active tips provides high fidelity and a high impedance input. It also minimizes signal loss, capacitance, and additive noise.

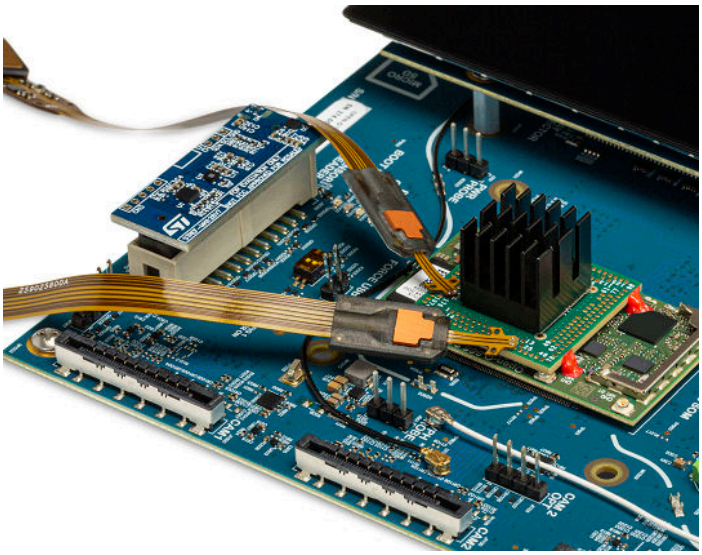


P77STFLXA solder down, flex-circuit accessory with an active buffer amplifier on its tip.



P77STFLXB solder down, flex-circuit accessory provides a probing solution for DDR4 and LPDDR4 electrical validation when used with Nexus XH Series Interposers.

P77STCABL solder down accessory with a long reach, flexible cable combined with an active buffer amplifier on the tip.



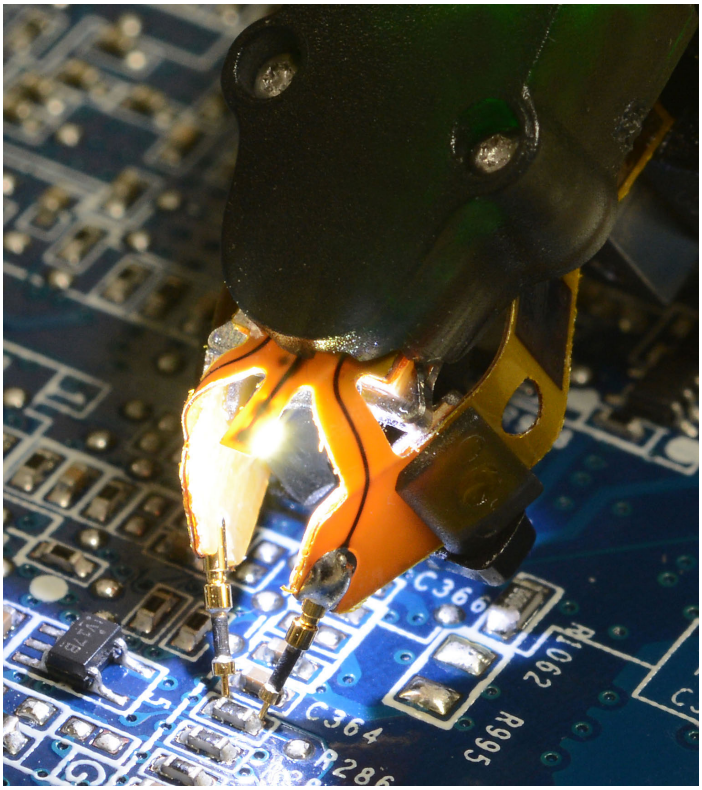
P77STFLRB Solder down, flex-circuit accessory provides improved signal access and mechanical strain relief for DDR and LPDDR electrical validation with Nexus XH interposers.

Browser accessory for handheld probing

When you need to make a quick measurement or debug a problem, the P7700 series browser accessory provides a simple to use option. With precision engineered tips that are easy to see and position accurately, the P77BRWSR handheld browser accessory enables hand or fixtured probing and is ideal for probing fine pitch components and differential traces with spacing as narrow as 0.2 mm (.008 in).

P77BRWSR handheld browser accessory enables hand or fixtured probing with adjustable tip spacing. Up to 16 GHz bandwidth.

The browser's tips have a full range of compliance and are adjustable in spacing using a convenient thumb wheel. A headlight on the tip enhances visibility of the probe point and can be switched on and off as needed. The browser tips are constructed of high strength BeCu and super-ceramic resistors (patent pending pin technology). With 16 GHz bandwidth performance, the P77BRWSR handheld browser accessory enables hand or fixtured probing with signal fidelity and convenience.

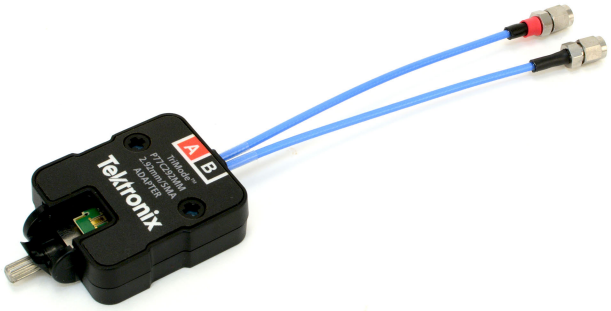


Headlight on P77BRWSR handheld browser accessory enables hand or fixtured probing and enhances visibility of the probe point.

Coaxial input (SMA) adapter

RF/coaxial connectors, such as SMA, are often found on test fixtures or on prototype board designs. Attaching a P7700 series probe to these on-board connectors is easy with the SMA adapter. The P77C292MM adapter allows you to connect to 2.92 mm, 3.5 mm or SMA connectors with full bandwidth and low noise. The P77C292MM adapter includes TriMode functionality enabling differential, single ended, and common mode measurements.

For compliance testing of the HDMI and DisplayPort standards, the P77C292MM and P7700 series probes are fully supported in Tektronix automated measurement suites for these standards. With the P77C292MM adapter attached, a P7700 series probe can provide the DC termination voltage required by HDMI and other high-speed communication standards. The termination voltage can be set manually or automatically using voltage sense circuitry in the P7700 probe and covers a range of ±4 V.



P77C292MM SMA/2.92mm adapter for connecting to coaxial connectors.

Automatic probe and tip identification and AC calibration

The P7700 Series probes automatically identify the accessory connected to the probe. When the probe and tip are attached to an oscilloscope, they are recognized and a unique DSP filter providing a calibrated response is enabled. All calibration and filter calculation is based upon a unique set of s-parameters stored in the probe and tip.

These unique filters also de-embed probe parasitics from the measurement. Creating probe and tip specific filters is critical as bandwidths increase. At high bandwidth, small variations in the signal path can lead to significant variation in frequency response which cannot be corrected using a nominal DSP filter.

The P77BRWSR accessory extends the calibration further. As the spacing of the browser's tips is adjusted, the change in opening is automatically recognized by the probe and oscilloscope. Using the value of the tip spacing, a width specific DSP filter is used to calibrate the probe's response.

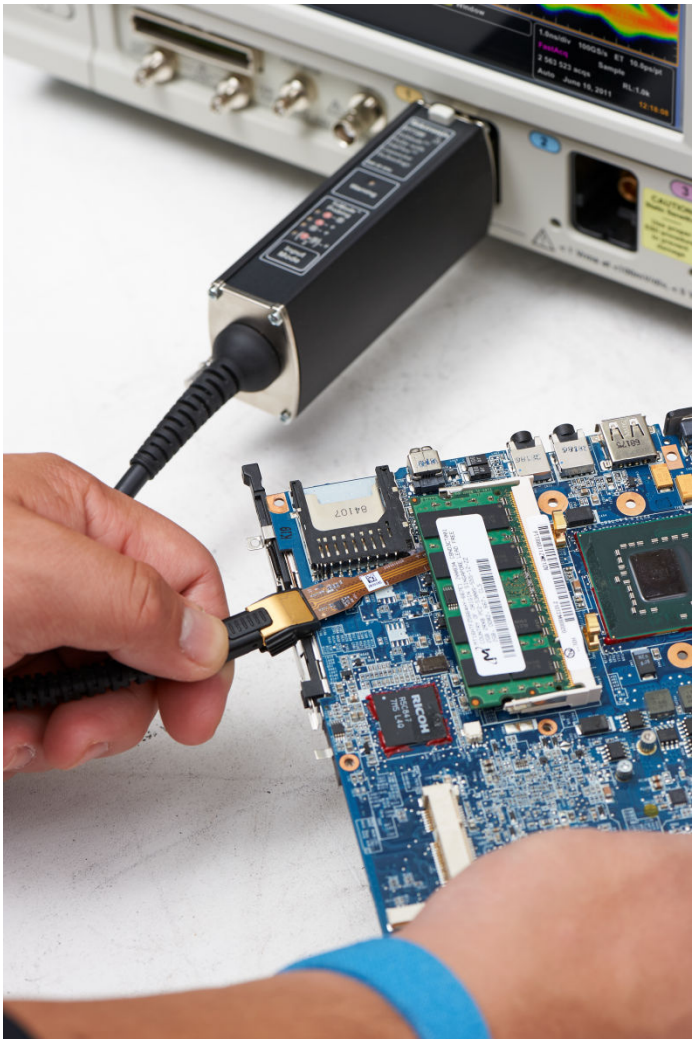
The automatic recognition of the probe and tips and the automatic filter selection eliminates the risk of manually selecting the wrong filter and improves your efficiency.

Signal fidelity

You can be confident in the signal fidelity of your measurements. The innovative new probe design uses SiGe technology to provide the bandwidth and fidelity needed today and in the future.

The P7700 Series probe architecture provides:

- An active buffer amplifier on the tips with the solder-in tips probe input only 3.2 mm from the input
- Excellent step response and low insertion loss up to 20 GHz
- Low-DUT loading with 100 kΩ (DC) and 0.4 pF (AC) performance
- High CMRR
- Low noise



Performance you can count on

Depend upon Tektronix to provide you with performance you can count on. In addition to industry leading service and support, these probes are backed by a one year warranty.

Specifications

Specifications are typical unless noted otherwise.

All specifications apply to all models unless noted otherwise.

P7700 Series TriMode probe models

	P7720			P7716		P7713	P7708
	P77STFLXA, P77STCABL, P77C292MM, P77STFLRA, P77HTFLRA	P77STFLXB, P77STLRCB	P77BRWSR, P77STFLRB, P77HTFLRB	P77STFLXA, P77STCABL, P77C292MM, P77BRWSR, P77STFLRB, P77HTFLRB, P77STFLRA, P77HTFLRA	P77STFLXB, P77STLRCB	P77STFLXA, P77STFLXB, P77STCABL, P77C292MM, P77BRWSR, P77STLRCB, P77STFLRB, P77HTFLRB, P77STFLRA, P77HTFLRA	P77STFLXA, P77STFLXB, P77STCABL, P77C292MM, P77BRWSR, P77STLRCB, P77STFLRB, P77HTFLRB, P77STFLRA, P77HTFLRA
Bandwidth (typical)	20 GHz Differential and single ended modes only. Bandwidth is 19 GHz in the common mode setting.	15 GHz	16 GHz	16 GHz	15 GHz	13 GHz	8 GHz
Rise time (10-90%)	27 ps Rise times in common mode setting: 29 ps (10 - 90%), 19 ps (20 - 80%).	36 ps	32 ps	32 ps	36 ps	40 ps	55 ps
Rise time (20-80%)	18 ps	24 ps	24 ps	24 ps	24 ps	28 ps	35 ps

Electrical characteristics

Attenuation

Solder-in tips	4x
Browser	10x
Coaxial input (SMA) adapter	0.7x/1.3x/2.7x/5x/10x

Input range

Solder-in tips

Single-ended	Differential
2.5 V_{pp}	5.0 V_{pp}

Browser

Single-ended	Differential
6.0 V_{pp}	12.0 V_{pp}

SMA adapter

Single-ended	Differential
1.2 V_{pp}	2.0 V_{pp}

Operating voltage window

Solder-in tips	±5.25 V
Browser	±10 V
SMA adapter	±4 V

Offset voltage range

Solder-in tips	-4 V to +4 V
Browser	-10 V to +10 V
SMA adapter	-4 V to +4 V

SMA adapter termination voltage range -4 V to +4 V

DC gain accuracy ±2.0%

DC input resistance, differential

Solder-in tips	100 kΩ
Browser	150 kΩ
SMA adapter	100 Ω

Noise

P77STFLXA, P77STFLXB, P77STCABL, and P77STLRCB tips	< 32 nV/rt-Hz
P77STFLRB, P77HTFLRB, P77STFLRA, and P77HTFLRA	< 35 nV/rt-Hz
Browser	< 80 nV/rt-Hz
SMA adapter	< 11 nV/rt-Hz

Low frequency input capacitance (differential, typical)

P77STFLXA, P77STFLXB, P77STCABL, and P77STLRCB tips	0.4 pF
P77STFLRB and P77HTFLRB	0.7 pF
P77STFLRA and P77HTFLRA	0.44 pF
Browser	0.23 pF @ 50 mil spacing

0.22 pF @ 200 mil spacing

CMRR/DMRR, typical

Frequency range	Min. CMRR/DMRR
≤ 50 MHz	34 dB
> 50 MHz, ≤ 800 MHz	24 dB
> 800 MHz, ≤ 4 GHz	14 dB
> 4 GHz, ≤ 10 GHz	10 dB

CMRR, typical

DC	34 dB
50 MHz	34 dB
1 GHz	24 dB
10 GHz	14 dB
20 GHz	10 dB

Non-destructive input range, typical

Solder-in tips, Browser	-15 V to +15 V
SMA adapter	-5 V to +5 V

Nominal characteristics

Oscilloscope interface	Tekconnect®
Oscilloscope interface	Tekconnect®
Accessory connector	TekFlex
Cable length	1.3 m (4.3 feet)

Weight

Probe cable and head	3.5 oz
Probe (comp box, cable, head)	9.6 oz

Temperature

Operating

Item	Specification
Compensation box and browser	0 °C to 45 °C (32 °F to 113 °F)
P77C292MM (SMA adapter)	-35 °C to 85 °C (-31 °F to 185 °F)
P77STFLXA, P77STFLXB, P77STCABL, P77STLRCB tips, and probe cable	-35 °C to 105 °C (-31 °F to 221 °F)
P77STFLRB, P77STFLRA tips	-40 °C to 105 °C (-40 °F to 221 °F)

Table continued…

Item	Specification
P77HTFLRB, P77HTFLRA tips	-40 °C to 125 °C (-40 °F to 257 °F)

Non-operating

Item	Specification
Compensation box and browser	-20 °C to 60 °C (-4 °F to 140 °F)
P77C292MM (SMA adapter)	-35 °C to 85 °C (-31 °F to 185 °F)
P77STFLXA, P77STFLXB, P77STCABL, P77STLRCB tips, and probe cable	-40 °C to 105 °C (-40 °F to 221 °F)
P77STFLRB, P77STFLRA tips	-40 °C to 105 °C (-40 °F to 221 °F)
P77HTFLRB, P77HTFLRA tips	-40 °C to 125 °C (-40 °F to 257 °F)

Compatibility

Compatible oscilloscopes

The P7700 Series probes are compatible with the following oscilloscopes running Microsoft Windows 7 and TekScope firmware version 10.6 or higher:

DPO70000C Series

DSA70000C Series

MSO70000C Series

DPO70000D Series

DSA70000D Series

DPO70000DX Series

MSO70000DX Series

MSO70000SX Series

DPO714AX Series

Ordering information

P7720	20 GHz TriMode probe with TekFlex connector technology
P7716	16 GHz TriMode probe with TekFlex connector technology
P7713	13 GHz TriMode probe with TekFlex connector technology
P7708	8 GHz TriMode probe with TekFlex connector technology

Standard accessories

All probes include the following items: Accessory kit, Manual, solder-in tips, Magnetic cable holder for strain relief, Certificate of traceable calibration, Calibration data report, One-year warranty.

Below is the list of standard accessories:

Component description	Part number	Quantity per assembly
Strap, Wrist; Adjustable, 6 Ft coiled cord	006341505	1
Marker Band set; Probe identification, 2 each of 5 colors	016194800	
Wire, Elect; Solid, 38 AWG, on Spool	017010300	
Adhesive tape; Double sided, 4 Inch * 0.5 Inch Strips, Quantity 4	020316700	
Assembly; Set of 2 P77AFLXST SIA tips	020318400	
Case, Soft assembly, Case; Probe with inserts	024002401	
Bar, Cable mount magnetic	121100300	
Magnetic cable band, 270 ID	129185700	
Magnetic cable band, 450 ID	129186700	
Label, Spine P7713 soft case	335355800	

Service options

Opt. C3	Calibration Service 3 Years
Opt. C5	Calibration Service 5 Years
Opt. D3	Calibration Data Report 3 Years (with Opt. C3)
Opt. D5	Calibration Data Report 5 Years (with Opt. C5)
Opt. G3	Complete Care 3 Years (includes loaner, scheduled calibration, and more)
Opt. G5	Complete Care 5 Years (includes loaner, scheduled calibration, and more)
Opt. R3	Repair Service 3 Years (including warranty)
Opt. R3DW	Repair Service Coverage 3 Years (includes product warranty period). 3-year period starts at time of instrument purchase
Opt. R5	Repair Service 5 Years (including warranty)
Opt. R5DW	Repair Service Coverage 5 Years (includes product warranty period). 5-year period starts at time of instrument purchase

Recommended accessories

P77HTFLXA	Active, solder-in tip with TekFlex connector technology, 20 GHz (5 tips/kit) up to 125 ºC.
P77HTFLXB	Active, 75 Ω solder-in tip with TekFlex connector technology for DDR/LPDDR electrical validation, 15 GHz (5 tips/kit). For use with Nexus Technology XH Series Interposers. Up to 125 ºC.
P77STFLXA	Active, solder-in tip with TekFlex connector technology, 20 GHz (5 tips/kit). Each probe ships with two of these solder-in tips as standard accessories.

P77STFLXB	Active, 75 Ω solder-in tip with TekFlex connector technology for DDR/LPDDR electrical validation, 15 GHz (5 tips/kit). For use with Nexus Technology XH Series Interposers.
P77STCABL	Active, coaxial cable based, solder-in tip with TekFlex connector technology, 20 GHz
P77STFLRB	Active, long reach 55 Ω Solder-in tip with TekFlex Connector technology for DDR/LPDDR electrical Validation with interposers, 16 GHz
P77STFLRA	Active, long reach solder-in tip with TekFlex connector technology, 20 GHz
TDP77BRWSR	Browser accessory with TekFlex connector technology, 16 GHz
P77C292MM	SMA Coaxial adapter with TekFlex connector technology, 20 GHz
090-0103-02	DC probe calibration fixture
P77DESKEW	Deskew fixture. Download the instructions from tek.com; search for P77DESKEW.
407-6019-xx	Probe adapter to attach the browser to the PPM203B articulated arm/positioner

Replacement parts

Tektronix part number	Description	
P77HTFLXA		Active, solder-in tip with TekFlex connector technology, 20 GHz (5 tips/kit) up to 125 ºC.
P77HTFLXB		Active, 75 Ω solder-in tip with TekFlex connector technology for DDR/LPDDR electrical validation, 15 GHz (5 tips/kit). For use with Nexus Technology XH Series Interposers. Up to 125 ºC.
P77STFLXA		Active, solder-in tip with TekFlex connector technology, 20 GHz (5 tips/kit). Each probe ships with two of these solder-in tips as standard accessories.
P77STFLXB		Flex circuit based DDR/LPDDR memory solder in tips. These tips use flex circuit material and provide soldered, multi-point connections. They support full TriMode measurement capabilities and full probe bandwidth, 15 GHz (5 tips/kit).
P77STCABL		Active, coaxial cable based, solder-in tip with TekFlex connector technology, 20 GHz
P77STFLRB		Active, long reach Flex circuit based, solder-in tip with TekFlex technology for DDR electrical validation with interposers
P77HTFLRB		Active, long reach Flex circuit based, solder-in tip with TekFlex technology for High-temperature DDR electrical validation with interposers (up to 125 ºC)
P77STFLRA		Active, long reach Flex circuit based, solder-in tip with TekFlex connector technology, 20 GHz
P77HTFLRA		Active, long reach high temperature Flex circuit based, solder-in tip with TekFlex connector technology, 20 GHz
TDP77BRWSR		Browser accessory with TekFlex connector technology, 16 GHz

Table continued…

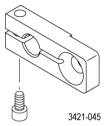
Tektronix part number	Description	
P77C292MM		SMA Coaxial adapter with TekFlex connector technology, 20 GHz
407-6019-xx		Probe adapter to attach the browser to the PPM203B articulated arm/positioner
020-3162-xx		Replacement tip for browser accessory
020-3160-xx		Browser pen wand
020-3161-xx		Browser hands-free tripod
020-3163-xx		Browser adapters
121-1003-xx		Magnetic cable holder
129-1867-xx		Large metal cable band
129-1857-xx		Small metal cable band
196-3436-xx		Browser ground lead
016-1948-xx		Color bands

Table continued…

Tektronix part number	Description	
017-0103-xx		38 AWG wire spool
020-3167-xx		Double-sided adhesive tape

Tektronix is registered to ISO 9001:2015 and ISO 14001:2015.

* European toll-free number. If not accessible, call: +41 52 675 3777

For Further Information. Tektronix maintains a comprehensive, constantly expanding collection of application notes, technical briefs and other resources to help engineers working on the cutting edge of technology. Please visit *www.tek.com*.

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