Tektronix®

BSAPCI3
PCI 3.0 Receiver Test Software Datasheet

Applications

- PCIe 3.0 Receiver Testing for:
  - Host and device silicon validation
  - NVMe and SATA Express physical layer electrical testing
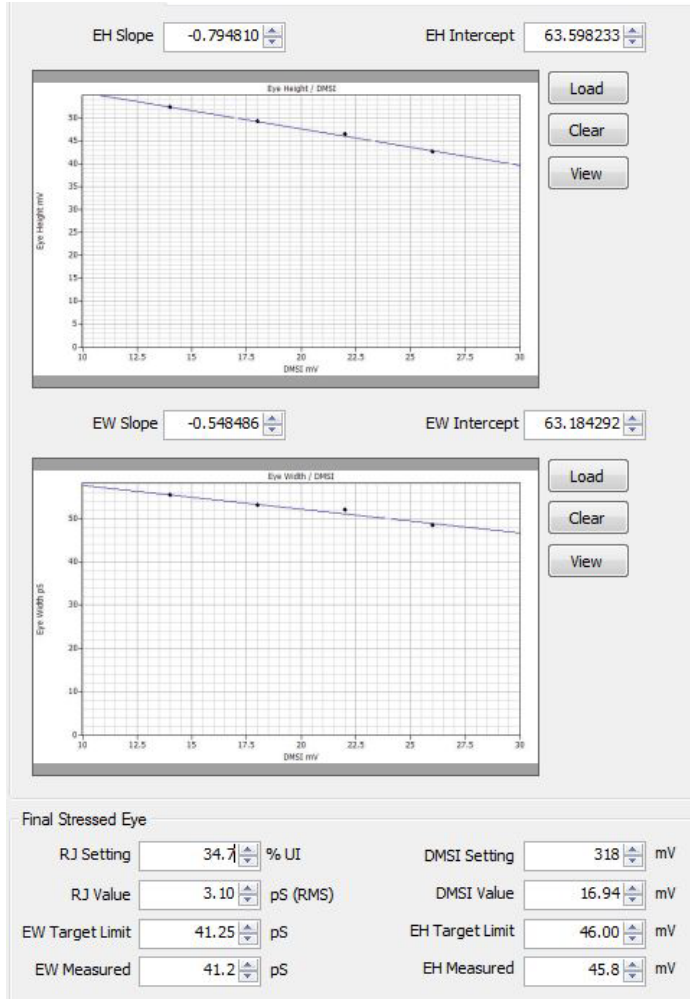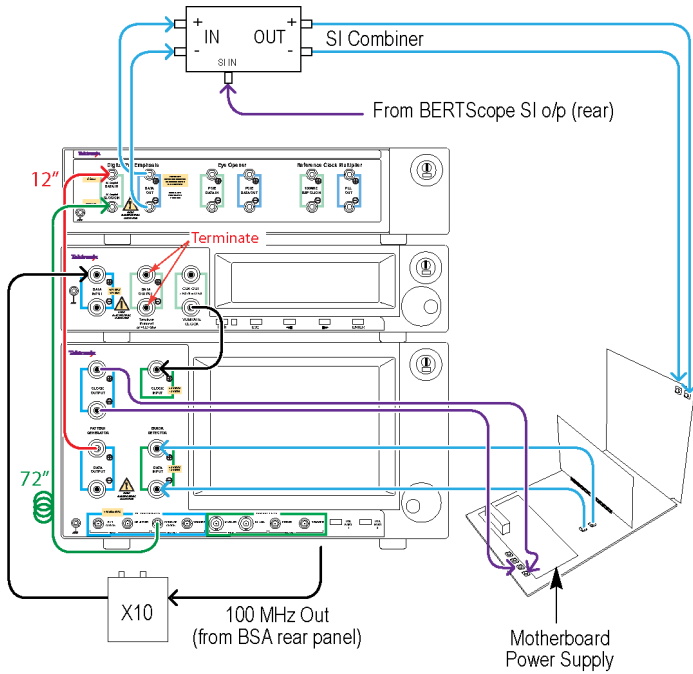 - Add-in card and system compliance testing
  - Manufacturing test

Complete BERTScope automation for receiver testing

The BERTScope BSAPCI3 Automated PCIe 3.0 Receiver Solution is designed to streamline the tedious and labor-intensive receiver test workflow. No longer is expert PCIe 3.0 domain knowledge required to configure, calibrate, test, and document the results. Fast and accurate BERT-based testing provides high test throughput, intuitive and fast margin testing, and availability of a wide range of debugging tools when further testing is required. The result is high test productivity from setup through to the documentation of results.
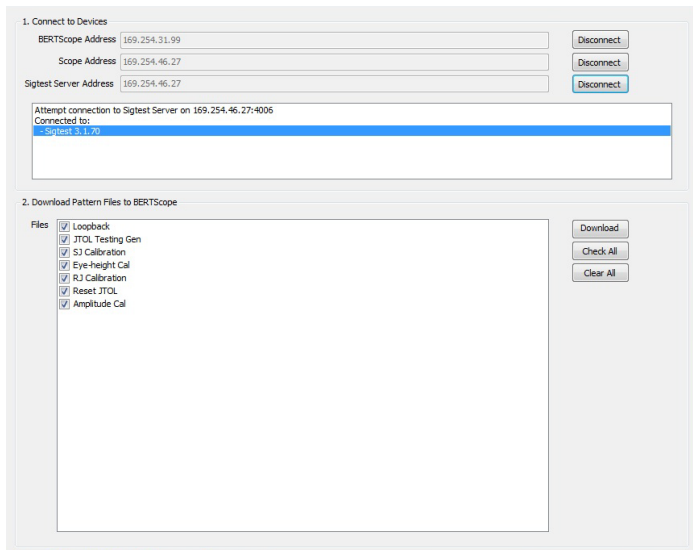
This solution can also be used for the latest, emerging storage interfaces such as next-generation SSD and host controller interfaces that utilize NVMe and SATA Express protocols that reside on top of a PCIe 3.0 physical layer.

Test configuration wizard

The BERTScope BSAPCI3 Test Configuration Wizard provides step-by-step guidance for Receiver Test equipment setup and software setup. Clearly drawn block diagrams, cabling configurations, and descriptions simplify the test configuration setup.
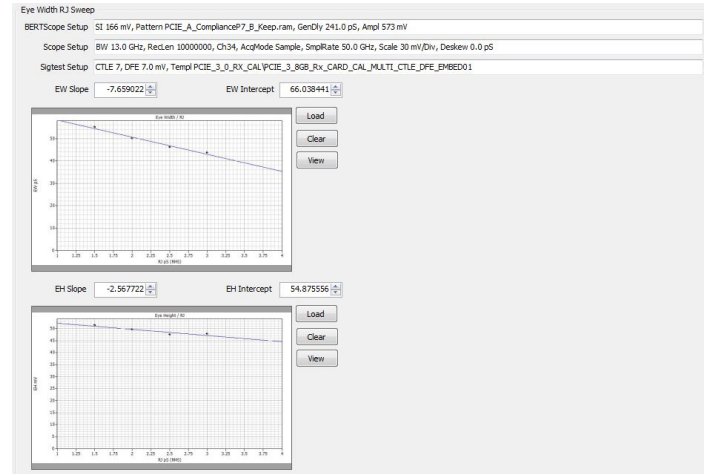
The BERTScope BSAPCI3 Automated PCIe 3.0 Receiver Solution is designed to streamline the tedious and labor-intensive receiver test workflow.

Features and benefits

- Automated calibration, link training, loopback initiation, and testing

- BER Map feature for TxEQ optimization

- Reduces the time and minimizes the skill-set required to perform the calibration and testing

- Increases the reliability and accuracy by removing inconsistencies with manual calibration

Connection diagrams to help with test setups

Connection wizard for instrumentation control and downloading of all required patterns

Automated stress calibration

An important step in preparing for receiver testing is the calibration of the stress sources to ensure that the stresss applied at the test fixture to the device under test is truly compliant with the test standard. In the past, these calibrations were often the most tedious and error-prone steps in the receiver test setup process. With the BSAPCI3 Automation Software, the calibration of the stress "recipe" is completely automated, including the calibration data. For test configurations that do not change, this step only needs to be performed once, and the stored calibration data is immediately available to be recalled. Engineers can spend less time calibrating, and more time testing.
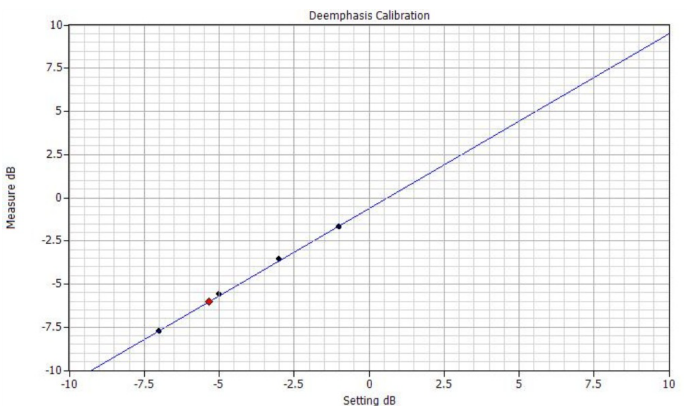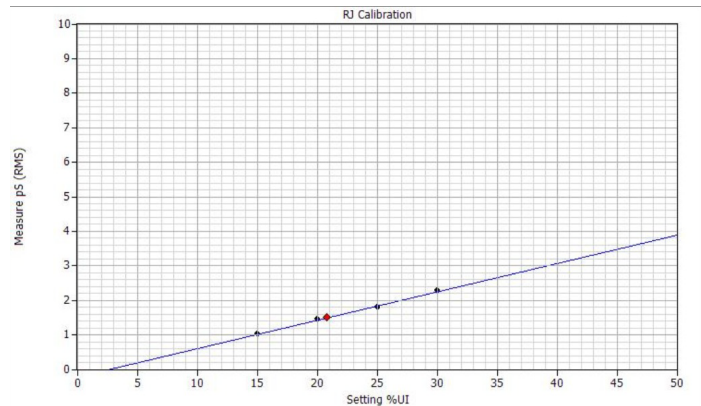

Locating EH/EW targets

Calibration to final EH/EW targets

Automatic characterization and precise calibration of de-emphasis
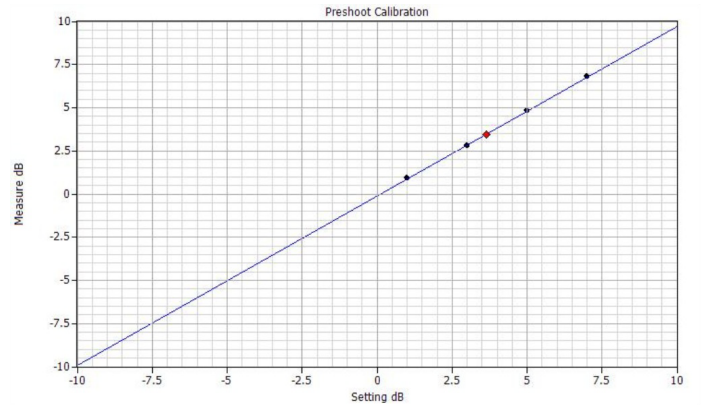
Automatic characterization and precise calibration of preshoot

Automatic characterization and precise calibration of random jitter

Loopback initiation and link training

Before the receiver test can start, the device-under-test (DUT) must be put in the proper test mode, called Loopback, where the device is re-transmitting the exact same data that was received. Entering Loopback mode is challenging because of the variety of loopback negotiation sequences across the range of PCIe 3.0 devices. The BERTScope BSAPCI3 Software provides various technique, including Link Training, to train and optimize the link for receiver testing.

Configure Loopback

Flexible link training and loopback control

BER map

One of the key challenges setting up the link is tuning or determining the optimal RxEQ settings. The BSAPCI3 BER Map feature provides an automated way to scan the PCIe 3.0 TxEQ coefficient matrix to determine the optimal TxEQ for a receiver's RxEQ settings.

Automated BER map result

Jitter tolerance testing

Jitter Tolerance testing is a critical part of the PCIe 3.0 receiver test and is a single-click operation with the BSAPCI3 Automation Software. With real-time stress adjustment, quick synchronization, and BER testing ability, the BERTScope provides the ideal platform for fast jitter compliance testing. Test results are stored using the built-in database for later recall and report generation.
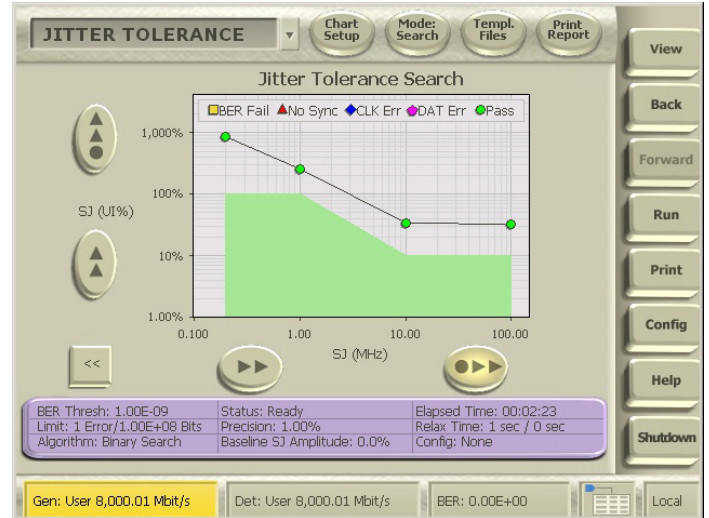
PCIe 3.0 Jitter Tolerance test results

Beyond testing compliance, the automation software also provides a single-click solution for finding the ultimate tolerance limits of the device under test, termed "search for margin".

Remote control protocol

The test software can be operated remotely through ASCII commands sent through TCP/IP, giving engineers further flexibility in designing "beyond compliance" tests.

Debugging tools

When a device fails to meet the test requirements, the operator has the power of the full range of BERTScope debugging tools. From intuitive and fast manual stress adjustment to the exclusive error analysis capability and jitter decomposition, the BERTScope can help identify subtle issues that other instruments might miss.

Test setup connection diagrams

The following diagrams show examples of some test setup connections. Icons/Item numbers in the diagrams refer to items described in the *Recommended test fixtures, cables, and tools* section towards the end of this datasheet.

CAUTION: When tightening cable connectors, to avoid damaging the connectors or cables, use only the SMA torque wrench (item 18) described in the *Recommended test fixtures, cables, and tools* section of this datasheet. When disconnecting the SMP cables from the test fixtures, use the SMP cable tool (item 19) described in the *Recommended test fixtures, cables, and tools* section of this datasheet.

Please refer to the following notes when indicated on the individual diagrams.

- **Note 1:** For PCIe Link Rx EQ capability, please connect the DPPLink cable (Tektronix part number, 174-6207-xx provided as a standard accessory to the DPP 125C) between the RS-232 connector on the rear panel of the DPP125C and the BSA-DPPLink connector on the rear of the BSA.

- **Note 2**: For system calibration, connect the SI Combiner output to CLB RX and oscilloscope to CBB TX (not shown).

- **Note 3**: For the PCIe Rx PLL Add-In-Card configuration, use 50 Ω SMA terminators on the Clock Recovery Module Data Output, standard accessory with the Clock Recovery Unit.

- **Note 4**: PCI-SIG recommends connecting a hard drive as a power load to your ATX power supply to ensure proper power delivery to your CBB3/CLB3 test fixtures.
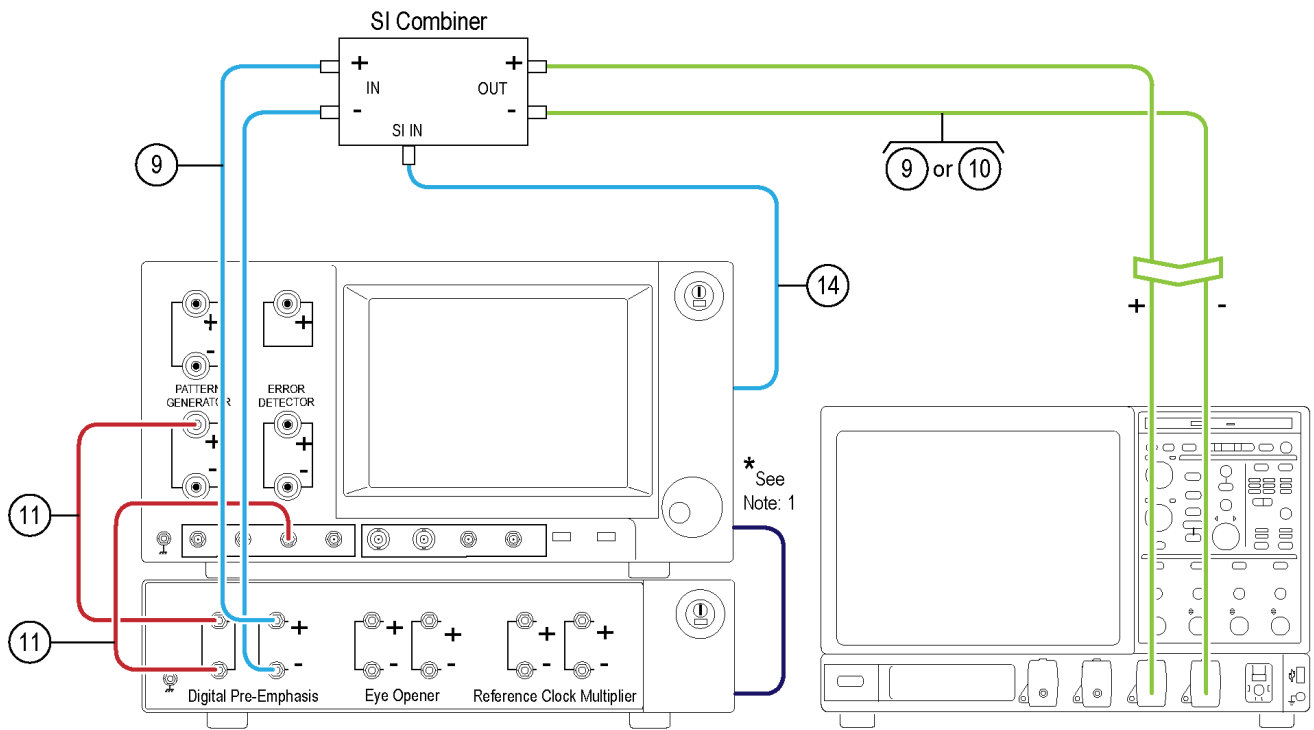
DPP 125C Calibration Configuration
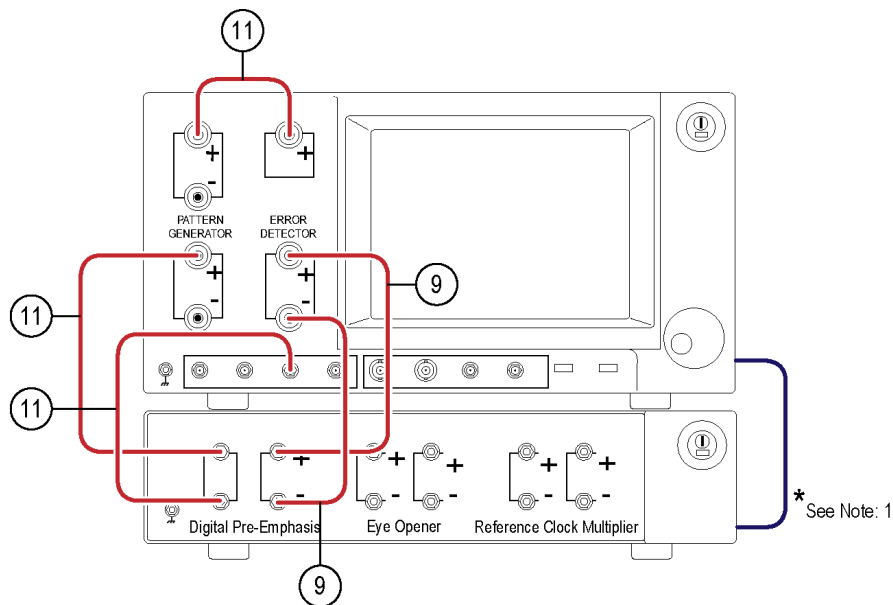
Item Description

(9) SMA-to-SMA, Straight, 500 mm, 1.5 ps phase-matched

(11) SMA-to-SMA, Right Angle, 200 mm

Amplitude Calibration Configuration

SI Combiner

IN   OUT

SI IN

⑨

⑨ or ⑩

⑭

PATTERN
GENERATOR

ERROR
DETECTOR

*See
Note: 1

⑪

⑪

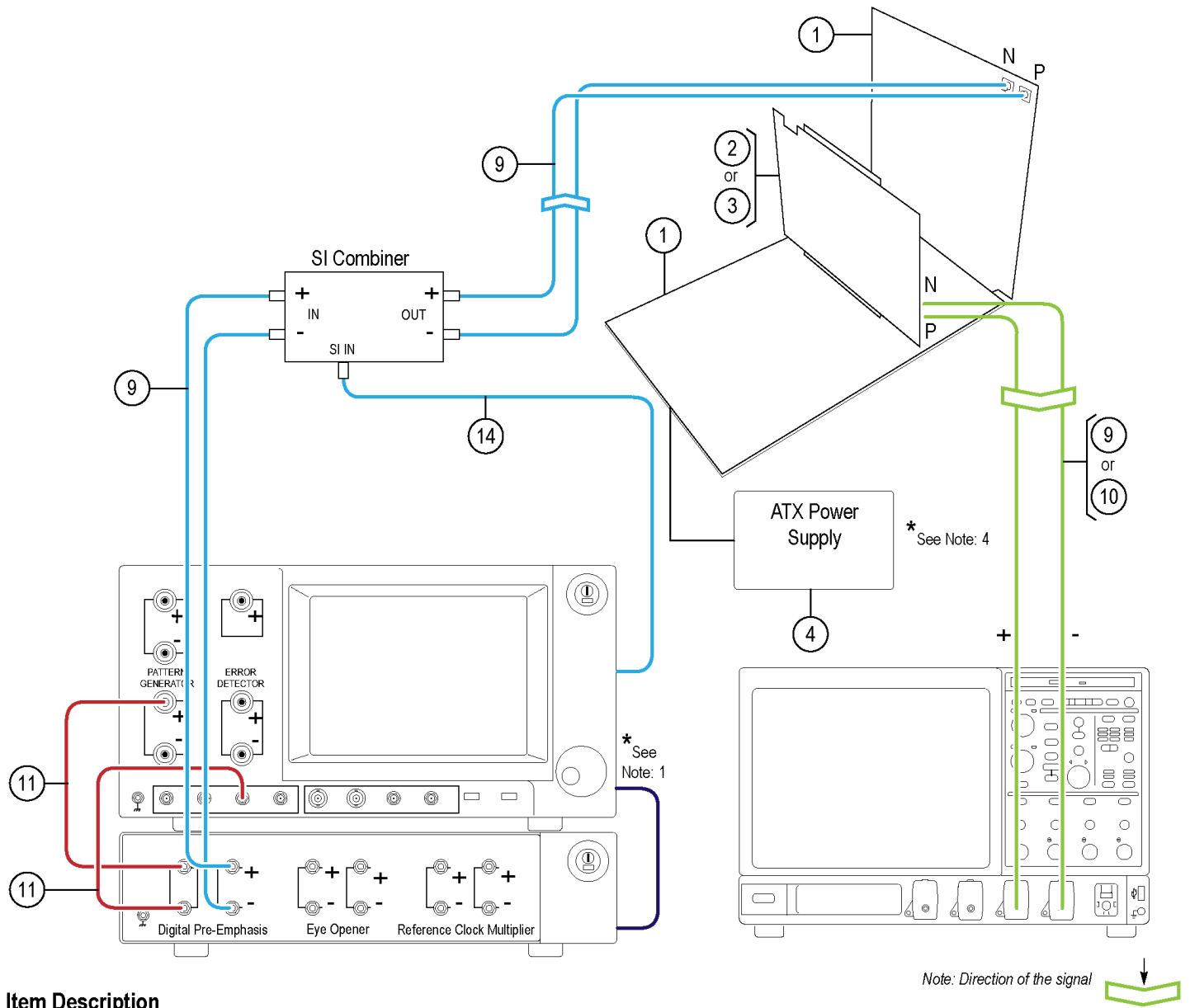Digital Pre-Emphasis   Eye Opener   Reference Clock Multiplier

+   -

Note: Direction of the signal

Item Description

⑨ SMA-to-SMA, Straight, 500 mm, 1.5 ps phase-matched

⑩ SMA-to-SMA, Straight, 1000 mm, 1.5 ps phase-matched

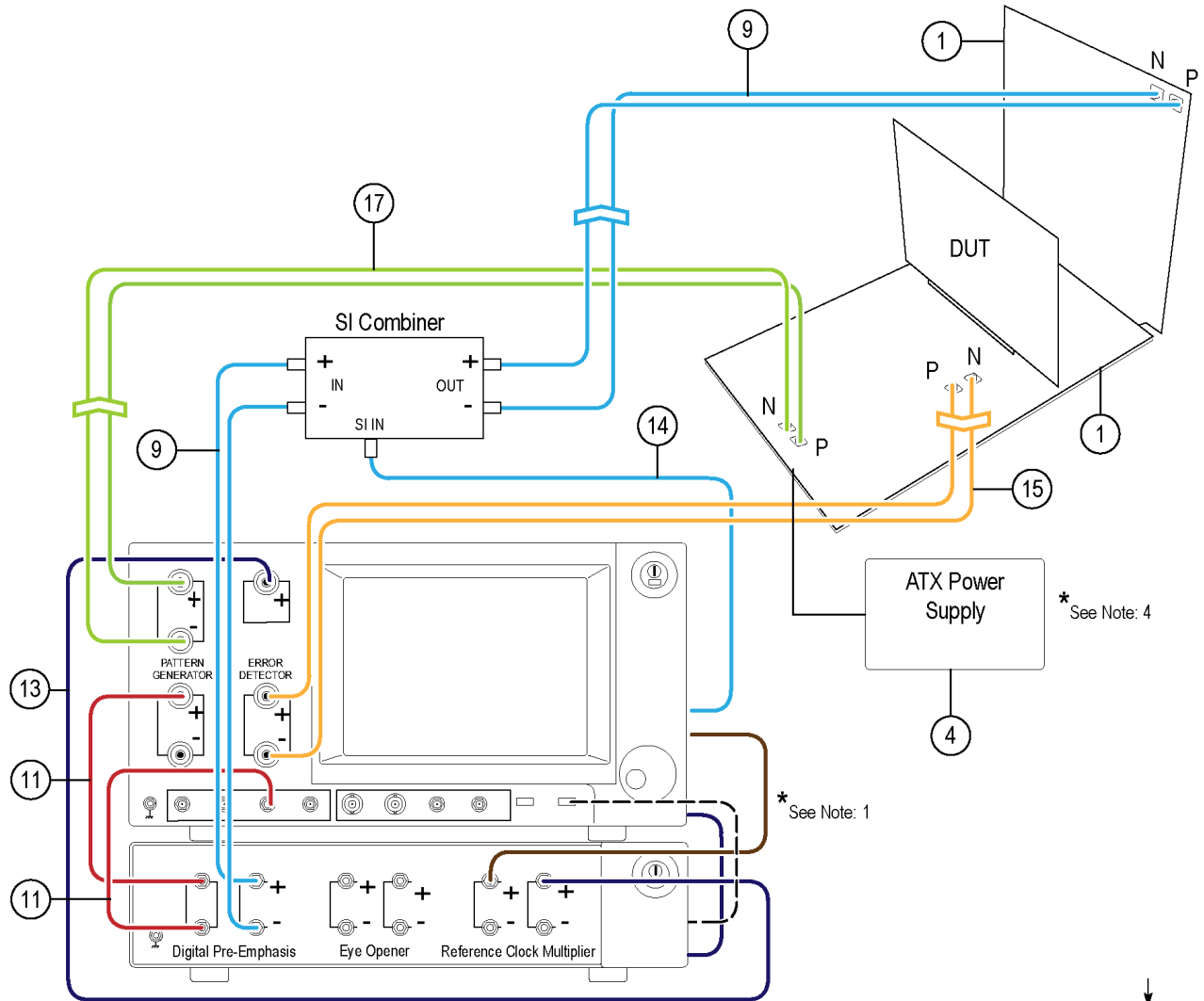⑪ SMA-to-SMA, Right Angle, 200 mm

⑭ SMA-to-SMA, 1.829 m

Add-In Card Eye Height/Width Calibration (See Note 2)

PCIe3-003

Item Description

1 CBB3 (Main)+(Riser)

2 x1/x16 CLB3

3 x4/x8 CLB3

4 Power supply

9 SMA-to-SMA, Straight, 500 mm, 1.5 ps phase-matched

10 SMA-to-SMA, Straight, 1000 mm, 1.5 ps phase-matched

11 SMA-to-SMA, Right Angle, 200 mm

14 SMA-to-SMA, 1.829 m

15 SMA-to-SMP, Right Angle, 102 mm, 1 ps phase-matched
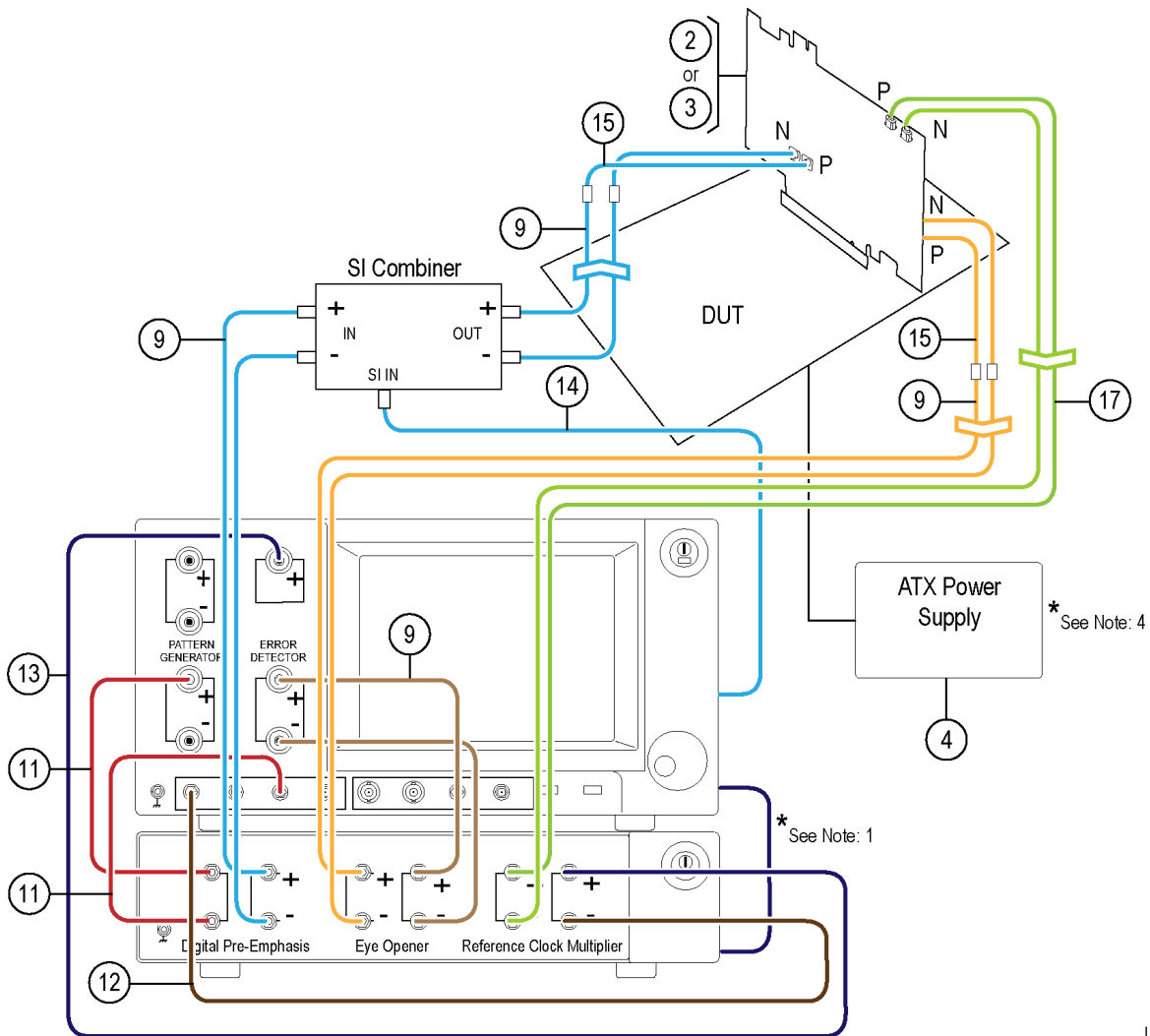
Add-In Card: Receiver Stressed Eye Testing

Note: Direction of the signal

PCIe3-004

Item Description

① CBB3 (Main)+(Riser)

④ Power supply

⑨ SMA-to-SMA, Straight, 500 mm, 1.5 ps phase-matched

⑪ SMA-to-SMA, Right Angle, 200 mm

⑬ SMA-to-SMA, Right Angle, 500 mm

⑭ SMA-to-SMA, 1.829 m

⑮ SMA-to-SMP, Right Angle, 102 mm, 1 ps phase-matched

⑰ SMA-to-SMP, Right Angle, 1000 mm, 1 ps phase-matched
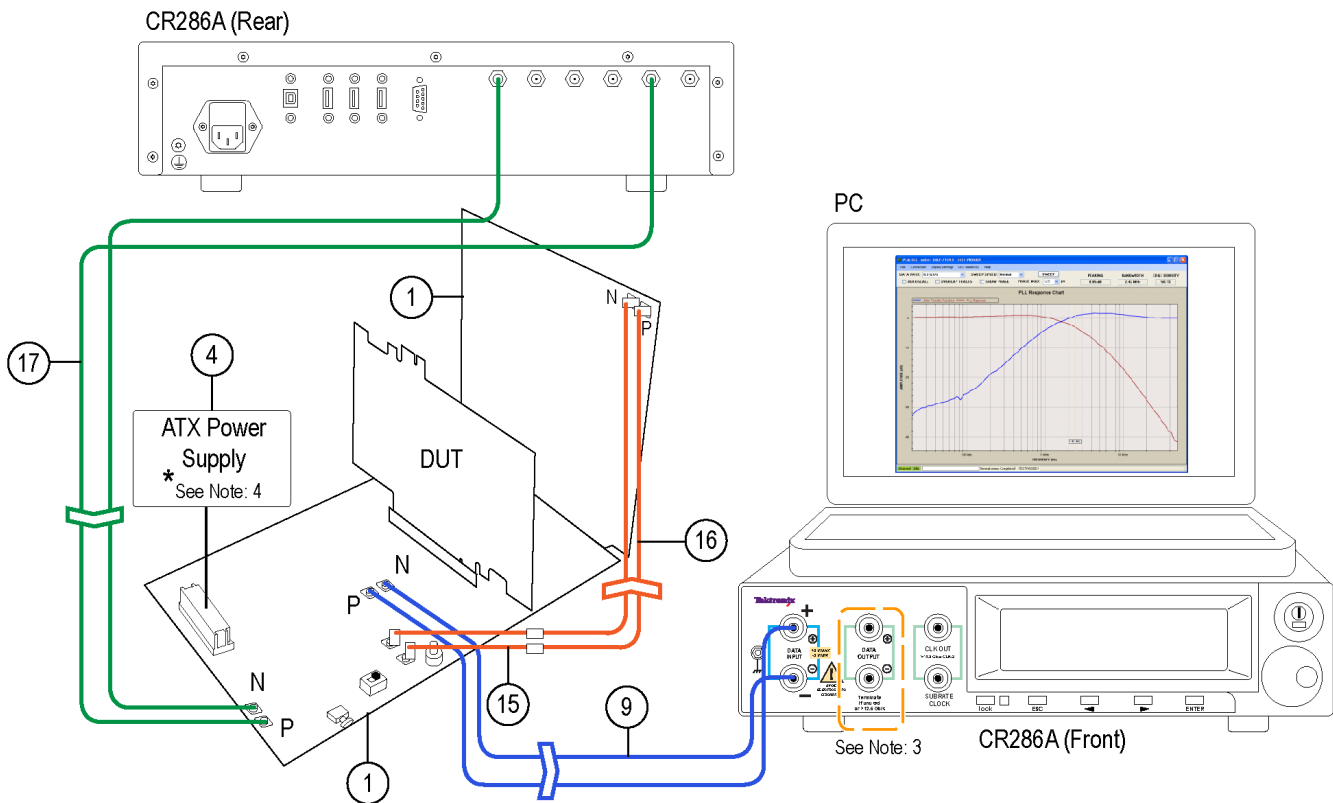
Host (System): Receiver Stressed Eye Testing

PCIe3-005

Note: Direction of the signal

Item Description

(2) x1/x16 CLB3

(3) x4/x8 CLB3

(4) Power supply

(9) SMA-to-SMA, Straight, 500 mm, 1.5 ps phase-matched

(11) SMA-to-SMA, Right Angle, 200 mm

(12) SMA-to-SMA, Right Angle, 300 mm

(13) SMA-to-SMA, Right Angle, 500 mm

(14) SMA-to-SMA, 1.829 m

(15) SMA-to-SMP, Right Angle, 102 mm, 1 ps phase-matched

(17) SMA-to-SMP, Right Angle, 1000 mm, 1 ps phase-matched

PCIe Rx PLL Add-In Card

CR286A (Rear)

PC

ATX Power Supply
* See Note: 4

DUT

See Note: 3

CR286A (Front)

Note: Direction of the signal

PCIe3-006

Item Description

① CBB3 (Main)+(Riser)

④ Power supply

⑨ SMA-to-SMA, Straight, 500 mm, 1.5 ps phase-matched

⑮ SMA-to-SMA, Right Angle, 102 mm, 1 ps phase-matched

⑯ SMA-to-SMP, Right Angle, 305 mm, 2.5 ps phase-matched
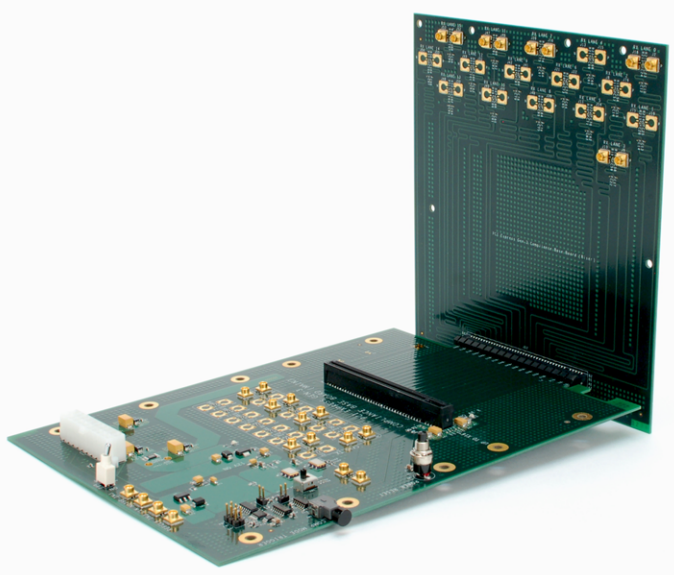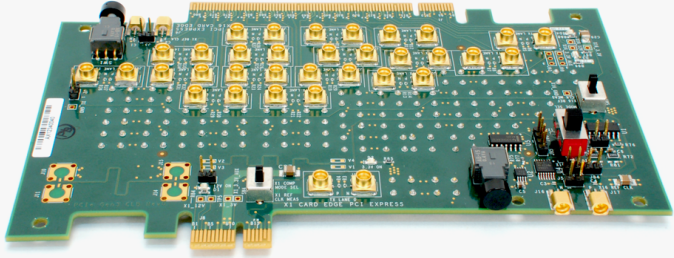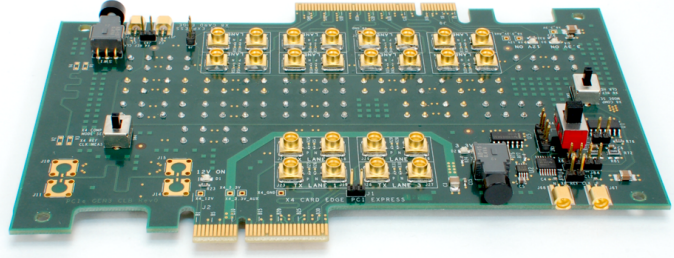
⑰ SMA-to-SMP, Right Angle, 1000 mm, 1 ps phase-matched

Ordering information

BSAPCI3 PCI 3.0 receiver test software	Automated calibration, link training, loop-back initiation, and test software for PCI 3.0 receiver test
Product requirements	Tektronix BERTScope BSA85C or faster with Option STR
	Tektronix DPP125C DPP with Option ECM
	Tektronix CR125A or faster clock recovery with Option PCIE8G
	Tektronix DPO/DSA/MSO71604C or faster Real-Time oscilloscope with Option DJA
	For customers who need to perform Rx Link Eq testing, the RS-232 connector on the back of the BERTScope instrument must be labeled DPP LINK. BERTScope BSAxxxC instruments with serial numbers 280515 and above should already have DPP LINK installed. For BERTScope BSAxxxC instruments with serial numbers 280514 and below, the BSAxxxCUP COMUP upgrade must be installed by Tektronix Service to enable the DPP LINK high speed serial connection. Please contact your local Tektronix representative for more information.
Host system software requirements	Microsoft XP OS with SP2 or later
	Microsoft Explorer 6.0 SP1 or later
	Microsoft Access

Accessories
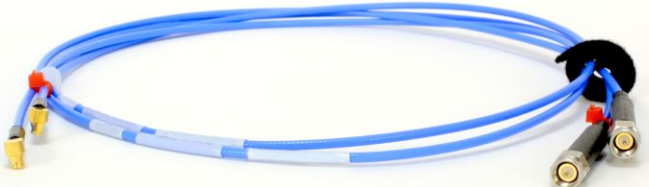
Recommended test fixtures, cables, and tools

The icon numbers in the following table refer to the items in the *Test setup connection diagrams*.

Item	Image
Description: PCI Express Compliance Base Board (CBB) test fixture, revision 3.0. For testing PCI Express Add-in Cards, x1/x4/x8/x16. **Vendor**: PCI-SIG www.pcisig.com/specifications/order_form **Vendor PN**: CBB3 **Tektronix PN**: Only available from PCI-SIG **Quantity**: 1	
Description: PCI Express Compliance Load Board (CLB3) test fixture, revision 3.0. For testing PCI Express Platforms, x1 & x16 PCIe connectors. **Vendor**: PCI-SIG www.pcisig.com/specifications/order_form **Vendor PN**: x1/x16 CLB3 **Tektronix PN**: Only available from PCI-SIG **Quantity**: 1	
Description: PCI Express Compliance Load Board (CLB3), Revision 3.0. For testing PCI Express Platforms, x4 & x8 PCIe connectors. **Vendor**: PCI-SIG www.pcisig.com/specifications/order_form **Vendor PN**: x4/x8 CLB3 **Tektronix PN**: Only available from PCI-SIG **Quantity**: 1	

Item	Image
Description: Any ATX PC power supply **Vendor**: Tektronix recommends "PC Power & Cooling 750W Silencer MK III Series" or similar. **Quantity**: 1	
Description: Sinusoidal Interference Combiner. **Vendor**: Contact your local Tektronix representative for more information. www.tektronix.com **Quantity**: 1	
Description: SMP terminator, 50 Ω, limited detent. **Vendor**: Fairview Microwave www.fairviewmicrowave.com/rf-load-0.25-watts-26.5-ghz-smp-female-st2645-p.aspx **Vendor PN**: ST2645 **Tektronix PN**: 131-9399-xx **Quantity**: 2	

Item	Image
Description: SMA Female to BNC Male adapter. **Vendor**: Tektronix **Tektronix PN**: 015-0572-xx www.tektronix.com **Quantity**: 2	7
Description: DC Block, SMA, 26 GHz **Vendor**: Tektronix www.tektronix.com **Tektronix PN**: PSPL5500A, PSPL5501A, or PSPL5508 **Quantity**: 2 **Note**: This is an optional accessory and not shown in any of connection diagrams, but can be used if DC offset is encountered in any signal path.	8
Description: SMA-to-SMA, Straight, 500 mm, 1.5 ps phase-matched **Vendor**: HUBER+SUHNER www.hubersuhner.com/en **Vendor PN**: 84210099, T+M SF104PE/11PC35/11PCC35/500mm **Tektronix PN**: 174-6663-xx **Quantity**: 3 cable pairs	9
Description: SMA-to-SMA, Straight, 1000 mm, 1.5 ps phase matched **Vendor**: HUBER+SUHNER www.hubersuhner.com/en **Vendor PN**: 84210103, T+M SF104PE/11PC35/11PCC35/1000mm **Tektronix PN**: PMCABLE1M **Quantity**: 2 cable pairs	10

Item	Image
Description: SMA-to-SMA, Right-Angle, 200 mm **Vendor**: HUBER+SUHNER www.hubersuhner.com/en **Vendor PN**: 84210137, T+M MF141/16SMA/16SMA/200mm **Tektronix PN**: 174-6664-00 **Quantity**: 3	
Description: SMA-to-SMA, Right-Angle, 300 mm **Vendor**: HUBER+SUHNER www.hubersuhner.com/en **Vendor PN**: 84210131, T+M MF141/16SMA/16SMA/300mm **Tektronix PN**: 174-6665-00 **Quantity**: 1	
Description: SMA-to-SMA, right-angle, 500 mm **Vendor**: HUBER+SUHNER www.hubersuhner.com/en **Vendor PN**: 84210139, T+M MF141/16SMA/16SMA/500mm **Tektronix PN**: 174-6666-00 **Quantity**: 1	
Description: SMA-to-SMA, right-angle, 1.829 m **Vendor**: HUBER+SUHNER www.hubersuhner.com/en **Vendor PN**: 85007127, T+M MF141/11SMA/16SMA/1.829M **Tektronix PN**: 174-6667-00 **Quantity**: 2	

Item	Image
Description: SMA-to-SMP right-angle cable pair, 102 mm, 1 ps phase-matched. **Vendor**: Rosenberger www.rosenberger.com/us_en **Vendor PN**: 71L-19K2-32K1-00102B **Tektronix PN**: 174-6657-xx **Quantity**: 3 cable pairs	
Description: SMP to SMP right-angle cable pair, 305 mm, 2.5 ps phase-matched set. **Vendor**: Rosenberger www.rosenberger.com/us_en **Vendor PN**: 71L-19K2-19K2-00305C **Tektronix PN**: 174-6658-xx **Quantity**: 1 cable pair	
Description: SMA-to-SMP right-angle cable pair, 1 m, 1 ps phase-matched **Vendor**: Rosenberger www.rosenberger.com/us_en **Vendor PN**: 71M-19K2-32S1-01000D **Tektronix PN**: 174-6659-xx **Quantity**: 1 cable pair	
Description: SMA torque wrench, 8.0 in-lbs. **Vendor**: Fairview Microwave www.fairviewmicrowave.com/sma-fixed-torque-wrench-click-st-sma3-p.aspx **Vendor PN**: ST-SMA3 **Tektronix PN**: 003-1940-xx **Quantity**: 1	

Item	Image
Description: SMP right-angle cable extraction tool. **Vendor**: Fairview Microwave www.fairviewmicrowave.com/undefined-mmtl2682-p.aspx **Vendor PN**: MMTL2682 **Tektronix PN**: 003-1941-xx **Quantity**: 1	(19)
Description: SMP terminator installation/extraction tool. **Vendor**: Fairview Microwave www.fairviewmicrowave.com/undefined-mmtl4991-p.aspx **Vendor PN**: MMTL4991 **Tektronix PN**: 003-1939-xx **Quantity**: 1	(20)

CE Marking Not Applicable.

Tektronix is registered to ISO 9001 and ISO 14001 by SRI Quality System Registrar.

Datasheet

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.tektronix.com.

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