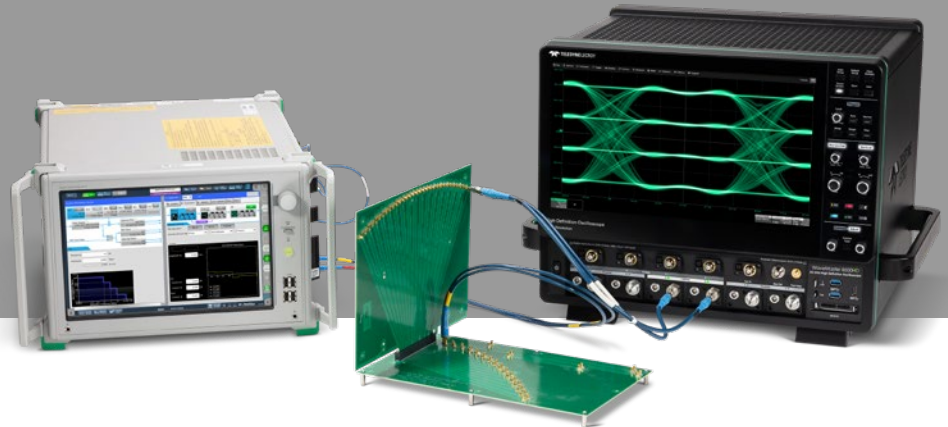


PCI Express® 6.0 Electrical Test Solutions

QPHY2-PCIE6-TX-RX
QPHY2-PC



Key Features

- Automated collection and analysis of captured waveforms
- QPHY2-PC offline compliance test software enables remote analysis and offline post-processing of test data
- Comprehensive report generation with all pertinent test information
- Receiver link equalization analysis
- Transmitter link equalization analysis
- Preset, jitter, and signal quality measurements
- SNDR and RLM measurement
- Automated stressed-eye calibration for BER testing
- SDA Expert measurement toolset available:
 - Eye Diagrams
 - Fixture De-embedding
 - Channel Emulation

PCI Express 6.0 introduces a new set of physical-layer testing demands at a transfer rate of 64 Gb/s. Teledyne LeCroy addresses these challenges with a fully automated test solution for both Transmitter (Tx) and Receiver (Rx) testing to the PCI Express 6.0 Base and CEM specifications. PCI Express 5.0, 4.0, and 3.0 transmitter, receiver and link equalization testing are also supported, for complete PCIe® ecosystem coverage.

Base and Compliance Testing

QPHY2-PCIE6-TX-RX PCI Express 6.0 electrical transmitter and receiver software is a fully automated test solution meeting the PCIe 6.0 Base and CEM specifications' requirements for characterizing and compliance testing both transmitters and receivers.

Transmitter Characterization

RLM and SNDR measurements are new PCIe 6.0 measurements included with QPHY2-PCIE6-TX-RX. Compensate for the oscilloscope's noise contribution in the SNDR measurements by simple characterization of baseline noise, or a more sophisticated attenuator-based methodology.

Receiver Test Calibration

To test a PCI Express receiver, the signal applied must meet stipulated voltage swing and preset levels, precisely calibrated noise and jitter impairments, and a prescribed level of eye closure due to channel loss. For Rx testing, QPHY2-PCIE6-TX-RX controls both the oscilloscope and BERT to automate the iterative calibration process.

Increased Lab Efficiency

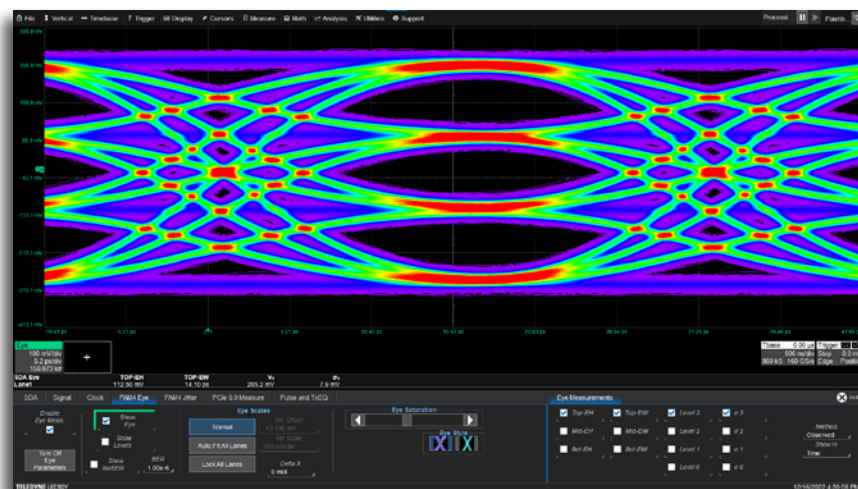
Once calibration is complete, QPHY2-PC enables BER testing to be performed with just a PC and BERT, freeing up the oscilloscope to perform other testing. For Tx testing, QPHY2-PCIE6-TX-RX can capture waveforms for later offline processing with QPHY2-PC, again increasing the oscilloscope's availability in the lab.

QPHY2-PCIE6-TX-RX AUTOMATES PCIE 6.0 TESTING

PCI Express 6.0 introduces PAM4-specific measurements that are new to PCIe. QPHY2-PCIE6-TX-RX automates both transmitter/receiver tests and receiver calibration by seamlessly integrating class-leading instruments to create the most capable PCI Express solution available, with capabilities spanning all PCIe generations - up to the Gen6 rate of 64 Gb/s.

Transmitter Testing

Simple yet powerful transmitter equalization analysis software guides the user through setting up the physical test setup connections. Clear, informative connection diagrams help simplify complex test setups and reduce mistakes. QPHY2-PCIE6-TX-RX automatically configures the test equipment and device under test to perform transmitter base specification measurements.

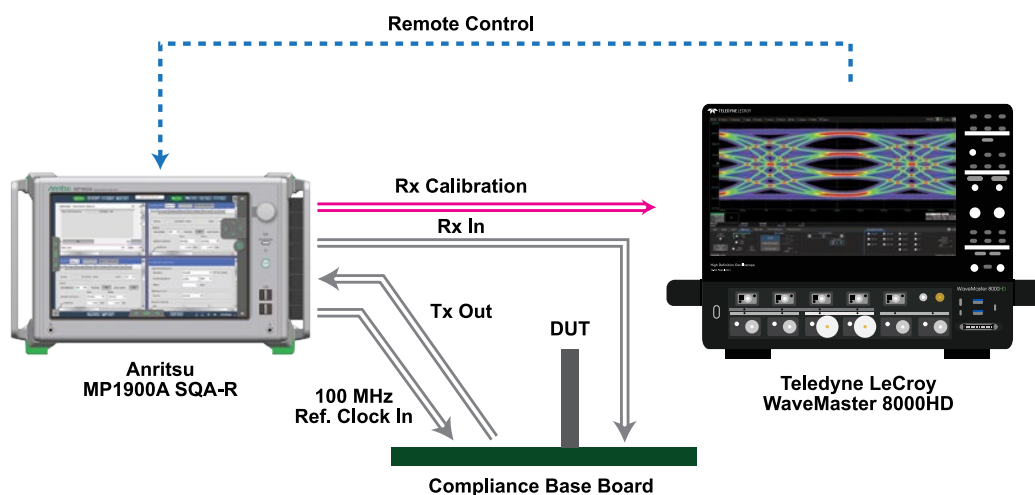


Supported PCIe 6.0 Tx and Rx Measurements

Symbol	Parameter
TX Presets	Tx Equalization Preset (Pre-shoot, De-emphasis, and Boost)
TTX-RJ	Tx Random Jitter
TTX-UTJ	Tx Uncorrelated Total Jitter
TTX-UDJDD	Uncorrelated Deterministic Jitter (Dual Dirac Model)
TTX-UPW-TJ	Total Uncorrelated Pulse Width Jitter
TTX-CH-UPW-RJ	Uncorrelated Pulse Width Random Jitter
TTX-CH-UPW-DJ	Pulse Width DDj
TTX-UPW-DJDD	Uncorrelated Pulse Width Deterministic Jitter (Dual Dirac Model)
SNDR	Signal-to-Noise-and-Distortion Ratio
RLM	Level Separation Mismatch Ratio
VTX-DIFF-PP	Differential Peak-Peak Tx Voltage Swing
PS21TX	Pseudo Package Loss
VTX-EIEOS	Minimum Voltage Swing During Electrical Idle Exit Order Set
VTX-AC-CM-PP	AC Peak-Peak Common Mode Voltage

Receiver Calibration and Testing

QPHY2-PCIE6-TX-RX integrates class-leading instruments to create the most capable PCI Express solution available. The Teledyne LeCroy WaveMaster 8000HD oscilloscope provides the necessary bandwidth for PCIe receiver test calibration for next-generation serial standards at 64 Gb/s and higher. The Anritsu SQA MP1900A can conduct highly sophisticated receiver test and analysis from 2.4 Gbaud to 64.2 Gbaud with full signal stress, emphasis and CTLE capabilities.



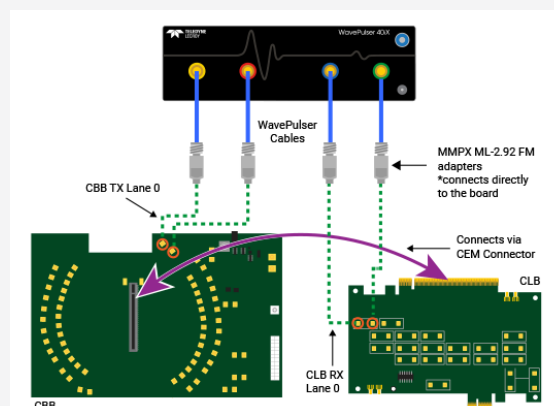
Supported PCIe 6.0 Rx Calibration and LEQ Test Measurements

Test name	Description
Preset Calibration	Calibration of Presets Q0 through Q9
RJ Calibration	Random Jitter Impairment Calibration
SJ Calibration	Sinusoidal Jitter Impairment Calibration
DMI Calibration	Differential Mode Interference Calibration
CMI Calibration	Common Mode Interference Calibration
Final Eye Calibration	Final Eye Convergence to PCIe 6.0 Eye Requirements
BER Test	Receiver Link Equalization Bit Error Rate Test
JTOL Test	Receiver Jitter Tolerance Test
Response Time Test	Transmitter Link Equalization Response Time Test
Initial Preset Test	Transmitter Link Equalization Initial Preset Test

PCIe Test Fixture Characterization using WavePulser

The PCIe fixture characterization feature in the QPHY2-PCIE6-TX-RX compliance test software option automates the entire fixture characterization process and reduces errors.

- Sets up and controls the Teledyne LeCroy WavePulser 40iX during measurements
- Guides the user with a connection diagram at each step of the process
- Automatically makes the measurements and transfers measured data to QualiPHY 2 compliance test software
- Performs all the necessary additional calculations within the QualiPHY 2 compliance test software
- Generates a complete report for the PCIe fixture characterization, equivalent to the existing manual process



ORDERING INFORMATION

QualiPHY® 2 and QualiPHY Automated Test Frameworks

QualiPHY automated compliance test frameworks perform standardized physical layer tests on high-speed serial buses and other interfaces.

QualiPHY or QualiPHY 2 software runs on Teledyne LeCroy oscilloscopes and is available for PCI Express®, USB, Thunderbolt™, DDR, DisplayPort™, HDMI®, and other technologies.



QualiPHY 2 software installed on your PC is compatible with oscilloscope software options (prefixed with QPHY2) and provides remote testing capabilities and offline testing (with the purchase and installation of a QPHY2-PC license on your PC).



QualiPHY software installed on your PC is compatible with oscilloscope software options (prefixed with QPHY) and provides remote testing capabilities only and does not support off-line testing.

Ordering Information

Product Description

PCI Express 6.0 Tx and Rx Compliance Testing and CXL 3.1 Transmitter Compliance Testing
(Includes PCIe 6.0 through 1.0)

PC Off-line Analysis Software

PCI Express 6.0 Transmitter Measurements Option for WaveMaster 8000HD

Bundle - Multi-Lane SDA Expert Framework, incl. Eye, Jitter, Noise, Xtalk Meas and VirtualProbe
for WaveMaster 8000HD

PAM Serial Data Analysis, Eye, Jitter and Noise Measurements for WaveMaster/SDA 8000HD

Product Code

QPHY2-PCIE6-TX-RX

QPHY2-PC

WM8KHD-SDAX-PCIE6

WM8KHD-SDAX-COMplete

WM8KHD-SDAX-PAM

Oscilloscope

WaveMaster 8500HD or higher (Required for Tx and Rx testing)

Bandwidth	50 GHz
Sample Rate	320 GS/s
Rise Time (20-80%)	6.2 ps
Standard Acquisition memory	400 Mpts per channel
Maximum Acquisition memory	16,000 Mpts per channel

Anritsu MP1900A BERT (Required for Rx testing)

Synthesizer MU181000B

Buffered Output	10 MHz
Reference Input	10 MHz
Clock Outputs	4

Jitter Modulation Source MU181500B

Differential Clock Output	1/8 to 1/256 divided clock output
Dual-system Clock Output	Generated from 1/1, 1/2, or 1/4 divided jitter clock output
Jittered Clock Outputs	2

PAM4 PPG MU196020A

Bit Rate	2.4 Gbit/s to 64.2 Gbaud
Number of Channels	1
Output Amplitude	140 mVp-p to 16000 mVp-p (differential)
Emphasis	4 Taps -20 to +20 dB
Rise/Fall Time (20-80%)	Typ. 8 ps

PAM4 ED MU196040B

Bit Rate	2.4 Gbit/s to 64.2 Gbaud
Number of Channels	1
Input Amplitude	1.0 Vp-p max. (differential)
Input Sensitivity	Typ. 36 mVp-p (53.125 Gbaud)
Clock Recovery (Option)	2.4 Gbit/s to 58.2 Gbaud
Low-frequency Equalizer (Option)	(≤1 GHz, 2 dB typ.) + DFE (1.4 dB typ.)

Noise Generator MU195050A

Number of Channels	2
Insertion Loss	-3 dB
CMI frequency	0.1 GHz to 6 GHz
DMI frequency	2 GHz to 10 GHz

32 Gbaud NRZ/PAM Re-Driver MU196060A

Number of Channels	2
Operating Baud Rate	32 Gbaud
Input Amplitude	Max 1.4 Vp-p Differential Max 1.0 Vp-p Single-ended
Termination Connector	1.85mm



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Local sales offices are located throughout the world.
Visit our website to find the most convenient location.