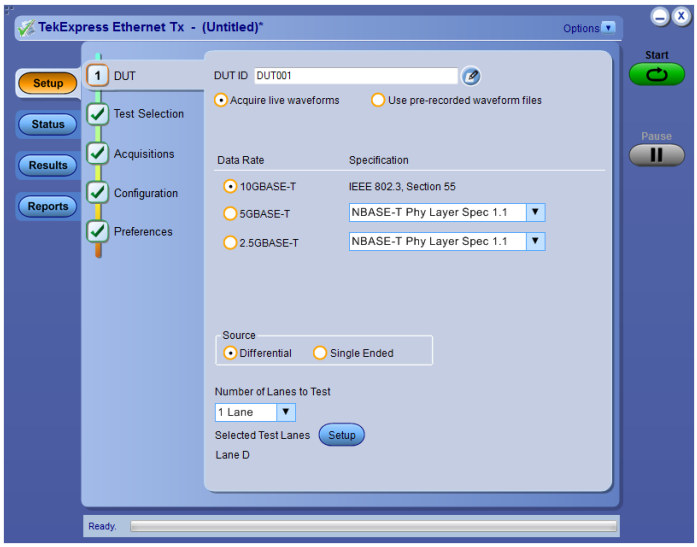
Ethernet Transmitter Test Application Software

TekExpress 10GBASE-T and NBASE-T Datasheet



The Ethernet Transmitter Test Application automates 10GBASE-T, NBASE-T, and IEEE802.3bz (2.5G/5G) physical medium attachment (PMA) physical-layer (PHY) electrical testing to provide a fast and accurate way of testing your Ethernet designs.

Notice to EU customers

This product is not updated to comply with the RoHS 2 Directive 2011/65/EU and will not be shipped to the EU. Customers may be able to purchase products from inventory that were placed on the EU market prior to July 22, 2017 until supplies are depleted. Tektronix is committed to helping you with your solution needs. Please contact your local sales representative for further assistance or to determine if alternative product(s) are available. Tektronix will continue service to the end of worldwide support life.

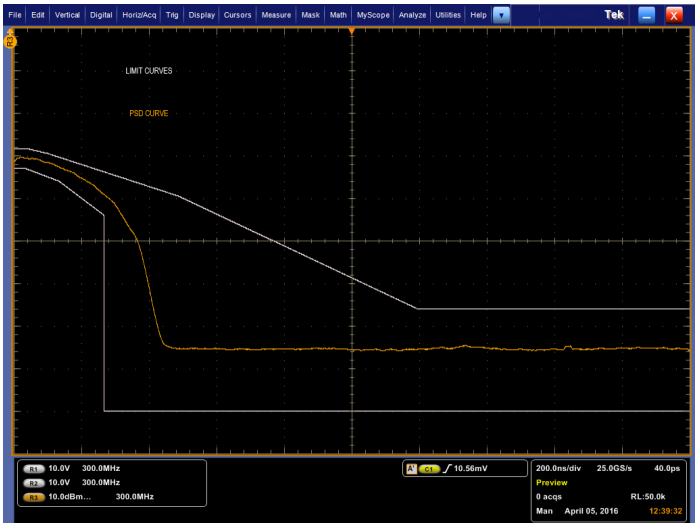
Features and benefits

- Comprehensive automated solution for 2.5GBASE-T, 5GBASE-T and 10GBASE-T PHY testing
- One-button selection of multiple tests and four-channel support
- Detailed test reports with margin and statistical information aid analysis
- User-defined mode enables flexible parameter control for characterization and margin analysis
- Efficient test execution on oscilloscopes with instrument remote control
- Single instrument analysis of time- and frequency-domain measurements
- Signal acquisition and analysis support for differential probes or direct SMA cabling

Product description

Based on the TekExpress test automation framework, the Ethernet Transmitter Test Application performs all of the PMA electrical measurements as specified by the 802.3an standard, the 802.3bz standard, and the NBASE-T specification. This allows you to quickly and efficiently test Ethernet devices running at 2.5G, 5G, and 10G data rates.

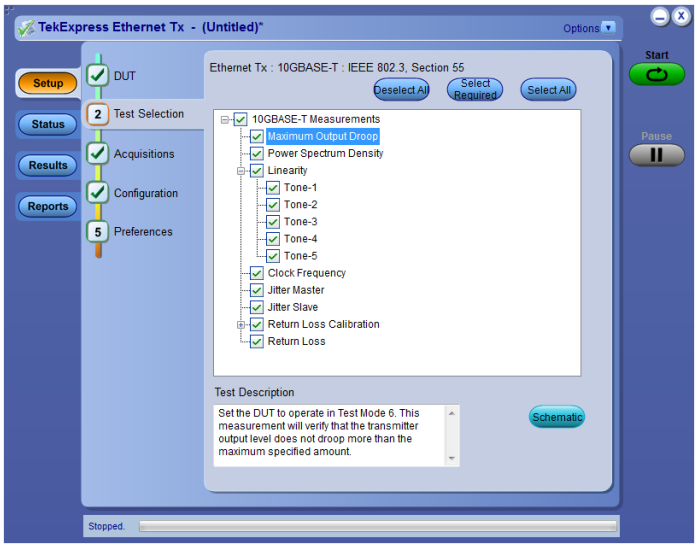
To accurately make these measurements, the Tektronix TF-XGBT test fixture is also needed. The test fixture allows you to reliable and easily access the device under test (DUT) using either differential probes or matched SMA cables.



Power spectral density measurement.

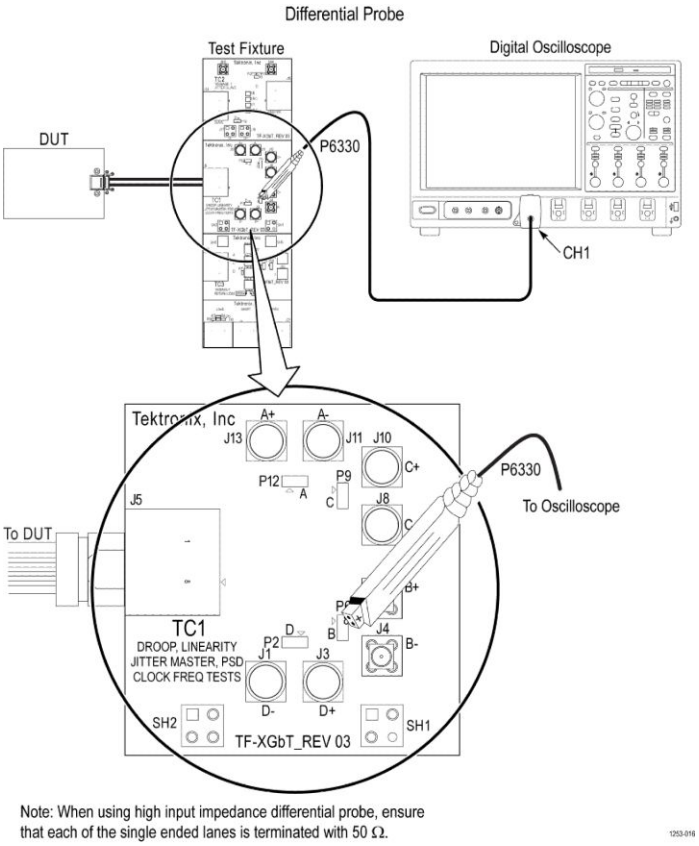
Test selection and instrument setup

Test selection is easy and straight-forward through the intuitive TekExpress workflow. Simply check the measurements you want to perform.



For each measurement selected, the Ethernet Transmitter application will then automatically set up and configure the oscilloscope saving time and ensuring repeatable, reliable results.

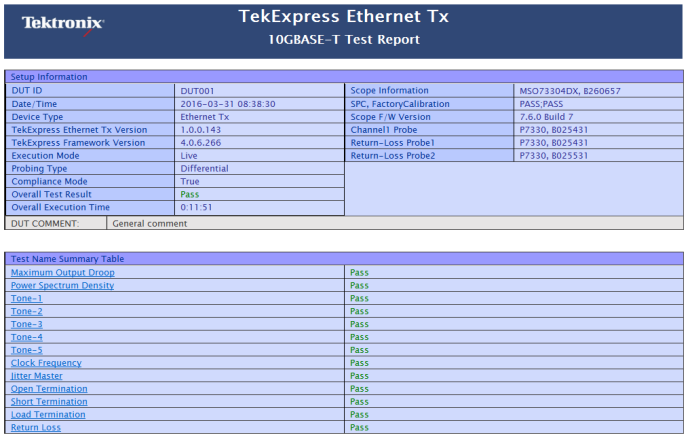
As each test is performed, the application will also show you with detailed diagrams how to properly make the needed connections.



Connection diagram

Reports

A summary report with Pass/Fail status for each test is created after the tests are complete. This report includes test configuration details, waveform plots, and margin analysis to provide more insight into your design.



Tektronix

TekExpress Ethernet Tx
10GBASE-T Test Report

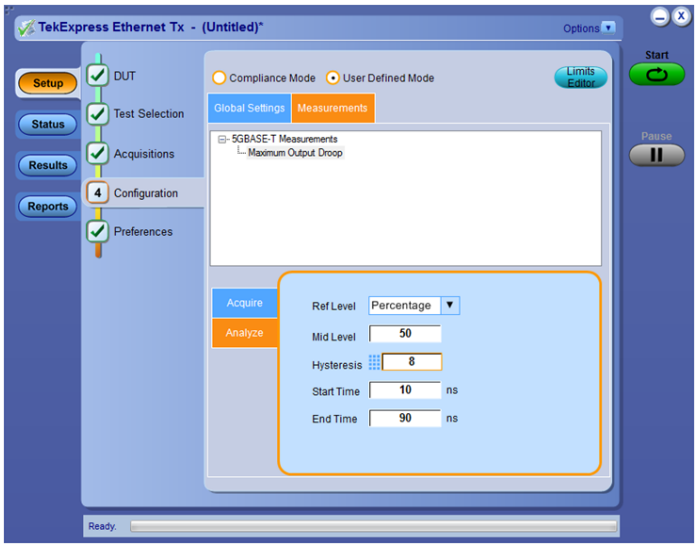
Setup Information			
DUT ID	DUT001	Scope Information	MSO73304DX, B260657
Date/Time	2016-03-31 08:38:30	SPC, FactoryCalibration	PASS;PASS
Device Type	Ethernet Tx	Scope F/W Version	7.6.0 Build 7
TekExpress Ethernet Tx Version	1.0.0.143	Channel1 Probe	P7330, B025431
TekExpress Framework Version	4.0.6.266	Return-Loss Probe1	P7330, B025431
Execution Mode	Live	Return-Loss Probe2	P7330, B025531
Probing Type	Differential		
Compliance Mode	True		
Overall Test Result	Pass		
Overall Execution Time	0:11:51		
DUT COMMENT:	General comment		

Test Name Summary Table	
Maximum Output Droop	Pass
Power Spectrum Density	Pass
Tone-1	Pass
Tone-2	Pass
Tone-3	Pass
Tone-4	Pass
Tone-5	Pass
Clock Frequency	Pass
Jitter Master	Pass
Open Termination	Pass
Short Termination	Pass
Load Termination	Pass
Return Loss	Pass

Pass/Fail report

Margin testing

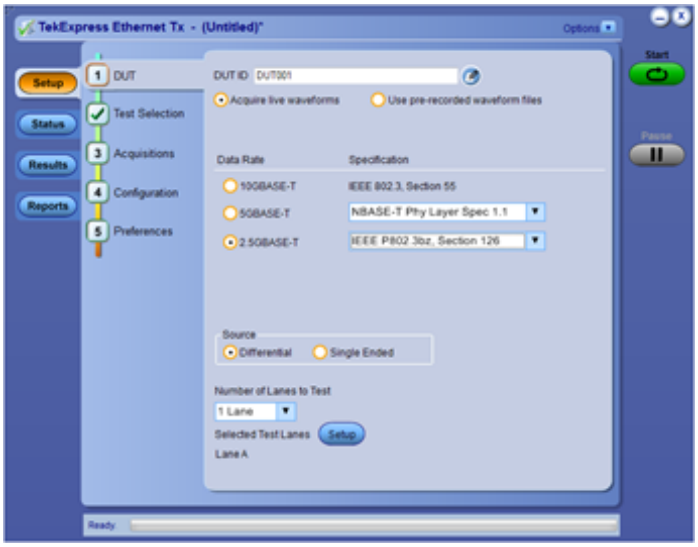
You can also make changes to test limits and other test parameters in order to do margin analysis to see how well your device is performing.



Droop configuration parameters

Differential single-ended acquisition support

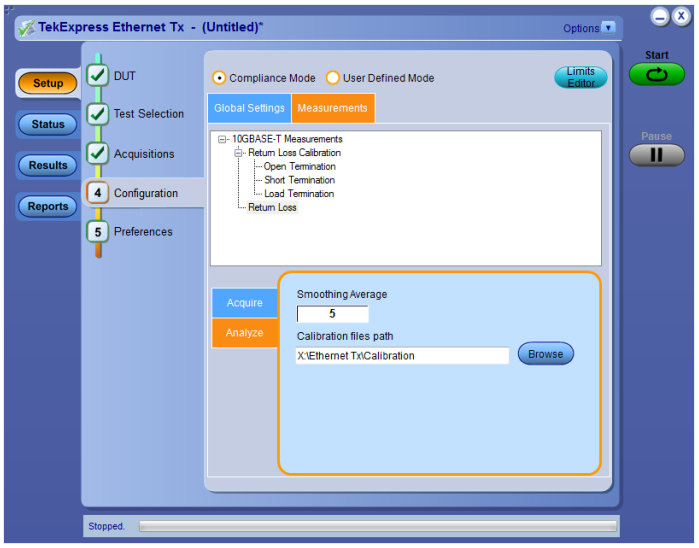
The application allows signal acquisition and analysis with either matched-pair SMA cables or differential probes.



Differential and single-ended support.

Return loss

The Ethernet Transmitter Test Application simplifies Return Loss testing and eliminates the need for a Vector Network Analyzer by using a patented oscilloscope-based measurement along with a Tektronix AWG. Calibration data for Open, Load, and Short can be stored in a file and recalled.



Return loss

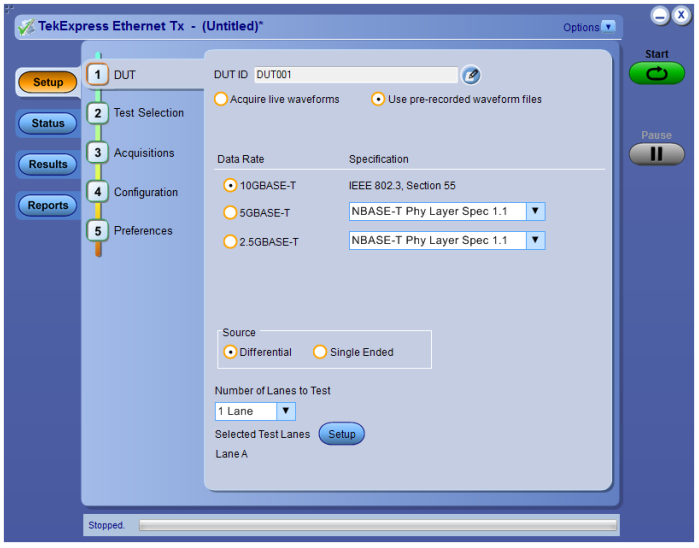
Complete programming interface

The programmatic interface seamlessly integrates the Ethernet Transmitter Test application with a high-level automation layer such as Visual Basic, MicrosoftNet, C#, C++, Python, or a Web application. This lets you control the state of the TekExpress application running on a local or a remote computer.

Programming examples are found in the application examples folder.

Prerecorded waveform

Prerecorded Waveform support will provide customers an option to use prerecorded waveforms when an oscilloscope is not available. This feature allows waveforms to be shared across multiple locations and removes end-user dependency from using scopes all the time.



Prerecorded waveform

Specifications

10GBASE-T Measurements

The following tests are performed per the IEEE802.3-2012 standard. The device under test (DUT) must be able to provide the test mode signals as indicated in IEEE802.3-2012 Subclause 55.5.2.

Measurement	Standard reference and Test mode
Maximum Output Droop	IEEE802.3-2012 Subclause 55.5.3.1
Transmitter Timing Jitter - Master	IEEE802.3-2012 Subclause 55.5.3.3
Transmit Clock Frequency	IEEE802.3-2012 Subclause 55.5.3.5
Transmitter Timing Jitter - Slave	IEEE802.3-2012 Subclause 55.5.3.3
Transmitter Linearity	IEEE802.3-2012 Subclause 55.5.3.2
Transmitter Power Spectral Density (PSD) and Power	IEEE802.3-2012 Subclause 55.5.3.4
Return Loss	IEEE802.3-2012 Subclause 55.8.2.1

2.5GBASE-T and 5GBASE-T Measurements (requires NBASET option)

The following tests are performed per IEEE802.3bz/D3.3 draft standard. The device under test (DUT) must be able to provide the test mode signals as indicated in IEEE802.3bz/D3.3 Subclause 126.5.2.

Measurement	Test mode
Maximum Output Droop	IEEE80.bz/D3.3 Subclause 126.5.3.1
Transmitter Timing Jitter - Master	IEEE80.bz/D3.3 Subclause 126.5.3.3
Transmit Clock Frequency	IEEE80.bz/D3.3 Subclause 126.5.3.5
Transmitter Timing Jitter - Slave	IEEE80.bz/D3.3 Subclause 126.5.3.3
Transmitter Nonlinear Distortion	IEEE80.bz/D3.3 Subclause 126.5.3.2
Transmitter Power Spectral Density (PSD) and Power	IEEE80.bz/D3.3 Subclause 126.5.3.4
Return Loss	IEEE80.bz/D3.3 Subclause 126.8.2.1

NBASE-T Measurements (requires NBASET option)

The following tests are performed per the NBASE-T Physical Layer Specification. The device under test (DUT) must be able to provide the test mode signals as indicated in NBASE-T Physical Layer Specification version 1.1 Subclause 2.9.

Measurement	Test mode
Maximum Output Droop	Subclause 55.5.3.1, Test Mode 6
Transmitter Timing Jitter - Master	Subclause 55.5.3.3, Test Mode 2
Transmit Clock Frequency	Subclause 55.5.3.5, Test Mode 2
Transmitter Timing Jitter - Slave	Subclause 55.5.3.3, Test Mode 1 and Mode 3
Transmitter Nonlinear Distortion	Subclause 55.5.3.2, Test Mode 4, Tones 1-5
Transmitter Power Spectral Density (PSD) and Power	Subclause 55.5.3.4, Test Mode 5
Return Loss	Subclause 55.8.2.1, Test Mode 5

Ordering information

10GBASE-T

New instrument orders

Product	Option	Description
DPO/MSO70000	XGBT2	TekExpress Automated 10GBASE-T Solution
DPO7354C	XGBT2	TekExpress Automated 10GBASE-T Solution

For users with existing DPO/DSA/MS070000C/D/DX/SX Series Oscilloscope or DPO7354C Oscilloscope

Product	Option	Description
DPO-UP	XGBT2	TekExpress Automated 10GBASE-T Solution Upgrade
DPOFL-XGBT2	-	TekExpress Automated 10BASE-T Solution - Floating License
DPOFT-XGBT2	-	TekExpress Automated 10BASE-T Solution - Floating Trial

NBASE-T and IEEE802.3bz

New instrument orders

Product	Option	Description
DPO/MSO70000	NBASET	TekExpress Automated NBASE-T and IEEE802.3bz Solution
DPO7354C	NBASET	TekExpress Automated NBASE-T and IEEE802.3bz Solution
DPO7254C	NBASET	TekExpress Automated NBASE-T and IEEE802.3bz Solution

For users with existing DPO/DSA/MSO70000C/D/DX/SX Series Oscilloscope or DPO7254C/DPO7354C Oscilloscope

Product	Option	Description
DPO-UP	NBASET	TekExpress Automated NBASE-T and IEEE802.3bz Solution Upgrade
DPOFL-XGBT2	-	TekExpress Automated NBASE-T and IEEE802.3bz Solution - Floating License
DPOFT-XGBT2	-	TekExpress Automated NBASE-T and IEEE802.3bz Solution - Floating Trial

Supported probes

Oscilloscopes	For Droop, PSD, Linearity, Clock Frequency, Jitter-Master, and Jitter-Slave measurements	For Return Loss measurement
DPO7254C/DPO7354C	P6300 - Minimum of one and maximum of four required	P6300 - Minimum of two required
	TDP3500 - Minimum of one and maximum of four required	TDP3500 - Minimum of two required
	SMA Cables - Minimum of two required	NA
DPO/DSA/MSO70000C/D/DX/SX Series	P6300 - Minimum of one and maximum of four required	P6300 - Minimum of two required
	P7330, P7340A, P7350, P7360A, P7380A, and P7313 - Minimum of one and maximum of four required	P7330, P7340A, P7350, P7360A, P7380A, and P7313 - Minimum of two required
	TriMode Probes (P7504, P7506, P7508, P7513A, P7516, and P7520) - Minimum of one and maximum of four required	TriMode Probes (P7504, P7506, P7508, P7513A, P7516, and P7520) - Minimum of two required
	P7350SMA, P7380SMA, and P7313SMA - Minimum of one and maximum of four required	NA
	SMA Cables - Minimum of two required	NA

Oscilloscope compatibility

10GBASE-T	Recommended bandwidth
DPO7354C	3.5 GHz
DPO/DSA/MSO70000C/D/DX/SX Series	≥ 4 GHz

NBASE-T and IEEE802.3bz (2.5G and 5G)	Recommended bandwidth
DPO7000C	≥ 2.5 GHz
DPO/DSA/MSO70000C/D/DX/SX Series	≥ 4 GHz

AWG compatibility (for Return Loss Measurements)

An AWG7122C is required to perform return loss measurements at all data rates.

IEEE 2.5GBASE-T Transmitter Nonlinear Distortion Test (Section 126.5.3.2)

When performing this test, the IEEE specification requires a 45 MHz sine wave to be injected. This is only required for 2.5GBASE-T. It is not required for 5GBASE-T. Supported signal sources are:

- AFG3052C, AFG3102C, AFG3152C, AFG3252C, AWG5002C, AWG5012C, AWG5014C, AWG7082C, AWG7122C

The recommended power splitter is: PSPL5331.

TF-XGbt 10GBASE-T, NBASE-T, and IEEE802.3bz Transmitter Electrical test fixture

The TF-XGbt test fixture is required to perform all measurements and is designed to meet the test fixture requirements in each of the applicable specifications/standards.

TF-XGbt contains	Quantity	Description
Test fixture main board	1	Main test fixture consists of 3 sections, namely TC1, TC2, and TC3
		Test Fixture TC1: For Droop, Transmitter Timing Jitter - Master, Transmit Clock Frequency, Transmitter Linearity, Transmitter Power Spectral Density (PSD), and Power Level Compliance test measurements **Note:** Includes SMA Male-to-Female Adapter × 8 and 50 Ω SMA Terminator × 8 mounted on the SMA connectors
		Test Fixture TC2: Transmitter Timing Jitter – Slave compliance test measurement **Note:** Includes SMA Male-to-Female Adapter × 2 mounted on the SMA connectors
		Test Fixture TC3: Return Loss compliance test measurement **Note:** Includes SMA Male-to-Female Adapter × 2 mounted on the SMA connectors
Test fixture calibration board	1	For Return Loss calibration
RJ45 patch cord	2	0.08 meter, shielded RJ45 cable to connect the test fixture to the Return Loss calibration board and device under test
China RoHS sheet	1	

TF-XGbt test fixture

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

Product(s) complies with IEEE Standard 488.1-1987, RS-232-C, and with Tektronix Standard Codes and Formats.

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