

Automotive Ethernet Test Solutions

QPHY-BroadR-Reach



Key Features

Support for BroadR-Reach V3.2 and 100Base-T1 (IEEE 802.3bw)

Highly automated and easy-to-use

Report generation with pass/fail results and fully annotated screenshot

Unique software clock recovery algorithm for the distortion test which greatly simplifies test setup

Supports all PMA Transmitter Tests

- Output Droop
- Master and Slave Timing Jitter
- Clock Frequency
- Distortion (with and without TX_TCLK access)
- Power Spectral Density (PSD)
- Peak Differential Output

Advanced debugging ability with “Stop on Test”

Automotive Ethernet enables faster data communication to meet the demands of today’s vehicles and the connected vehicles of the future. QPHY-BroadR-Reach automates testing and validation of 100 Mb/s Automotive Ethernet, which is described in both the BroadR-Reach and 100Base-T1 (IEEE 802.3bw) specifications.

Automated Compliance Testing

QPHY-BroadR-Reach performs electrical compliance testing of the Physical Media Attachment (PMA) according to the BroadR-Reach and 100Base-T1 specifications. Detailed connection diagrams ensure the proper setup and provide information about the required test pattern for each test. Upon completion of the test session, results are automatically compiled into a comprehensive report including screenshots.

Automotive Solutions Experts

Teledyne LeCroy has worked with industry leaders to create the first physical layer test package for the BroadR-Reach. As active participants in OPEN Alliance Technical Committees our test solutions stay up-to-date on evolving test requirements. In addition to Automotive Ethernet, Teledyne LeCroy provides solutions for CAN, CAN FD, LIN, SENT, MOST, FlexRay, and more.

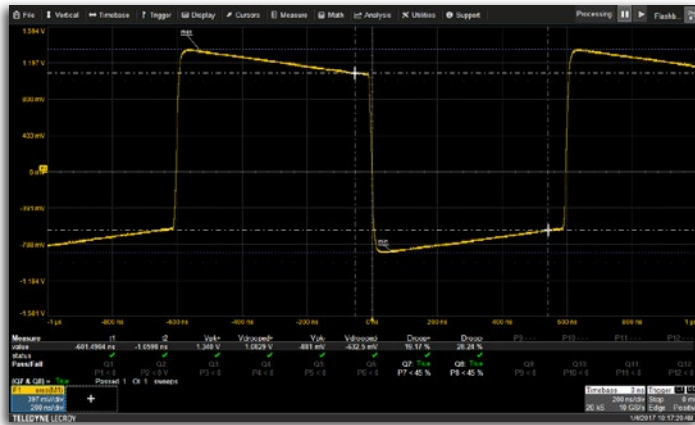
Simplified Distortion Test

To properly perform the Distortion test, the DUT (Device Under Test), disturbing sine wave, and oscilloscope all need to be synchronized. In practice this proves to be a difficult task since the DUT has a clock of 66 2/3 MHz and test equipment uses a 10 MHz reference clock. Teledyne LeCroy has developed a unique algorithm which performs software clock recovery on the Test Mode 4 signal, enabling the test to be completed without requiring a hardware frequency converter board.

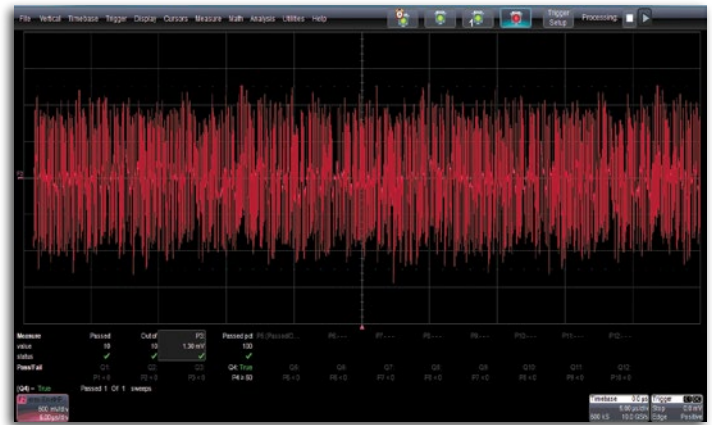
Flexible Debug Environment

Using the “Stop on Test” feature, the user can pause testing after each individual test and observe the results. At that point, any of the oscilloscope’s tools can be leveraged for further debug and upon completion, testing can be seamlessly resumed with a click of a button.

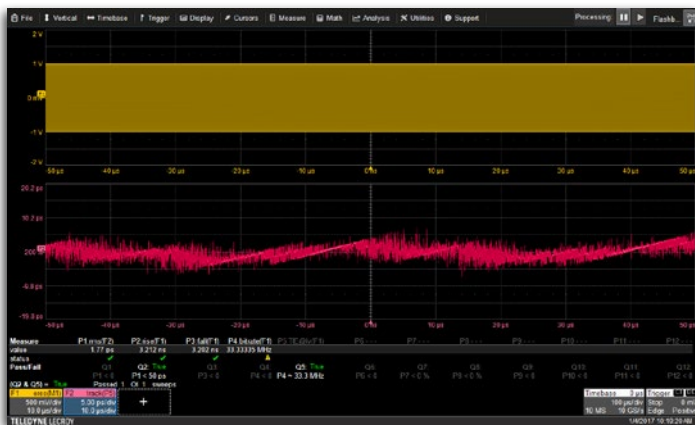
COMPREHENSIVE AUTOMOTIVE ETHERNET TESTING



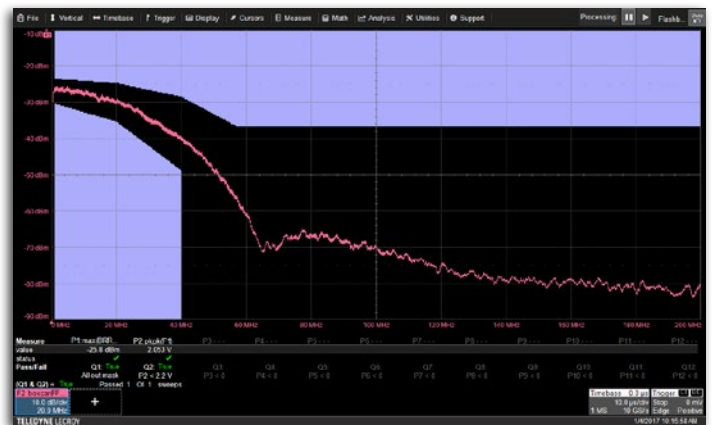
Maximum Transmitter Output Droop — The output droop is calculated on both the “+1” and “-1” symbols in the Test Mode 1 waveform. The magnitude of the droop is measured with respect to an initial peak value after the zero crossing (indicated by Max and Min parameters) and the value 500 ns after the initial peak value (indicated by the cursors).



Transmitter Distortion — The peak distortion is determined by capturing output from the DUT while it is in Test Mode 4. The MATLAB script provided in the specification removes the disturbing sine wave and measures peak distortion at equally spaced phases of the symbol period. To pass, the script must report less than 15 mV distortion for 10 records.



Transmitter Jitter Timing & Transmit Clock Frequency — The Transmitter Master Jitter Timing and Transmit Clock Frequency are tested simultaneously while the DUT is in Test Mode 2. The Slave Jitter is measured by directly probing the DUT’s TX_TCLK while the DUT is configured as a slave.



Transmitter PSD & Peak Differential Output — The Power Spectrum Density (PSD) of the transmitter is tested against the specified limits defined by the mask while the DUT is transmitting Test Mode 5. Using the oscilloscope for the PSD test removes the need to purchase a spectrum analyzer. The Test Mode 5 waveform is also used to test the Peak Differential Output.

QualiPHY

QualiPHY is designed to reduce the time, effort, and specialized knowledge needed to perform compliance testing on high-speed serial buses.

- Guides the user through each test setup
- Performs each measurement in accordance with the relevant test procedure
- Compares each measured value with the applicable specification limits
- Fully documents all results
- QualiPHY helps the user perform testing the right way—every time!

Compliance Reports contain all of the tested values, the specific test limits and screen captures. Compliance Reports can be created as HTML, PDF or XML.



BroadR-Reach Test Report

Overall result: **Pass**

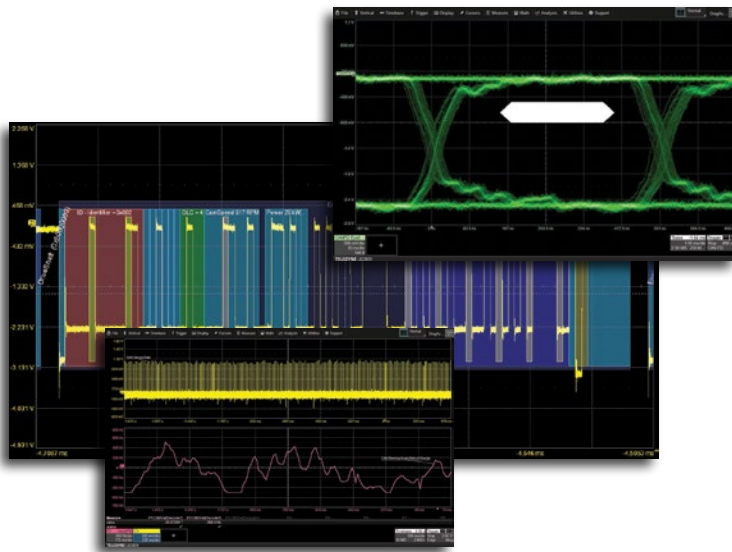
DUT: LCRY2801N5683
 Comment: BroadR-Reach PMA Test
 Time of session start: 05/11/2015 09:39:23
 Operator: BM
 Temperature: 59 C
 Standard in use: BroadR-Reach

Run1:
 Time of run: 2015/05/11 09:40:44
 Configuration in use: Demo
 Limits in use: Default
 Oscilloscope Name: BMART-NBW7 Model: WM8042I
 Oscilloscope Serial #: BMART-NBW7
 Computer: BMART-NBW7
 Oscilloscope firmware version: 7.7.1.3f (Build 207730)
 QualiPHY core version: 7.7.1.3a (Build 207465)

QualiPHY script version: 7.7.1.3
 Stylesheet version: 1.2.0.6
 AcquireLiveData: TRUE
 SignalDiff: FALSE
 DifferentialSignalSource: M3
 SignalSourceN: M3
 SignalSourceP: M4

Summary Table

Pass	Run #	Test	Measurement	Current Value	Test Criteria
✓	1	1.0	Drop on "+1" symbols	19.17 %	x < 45.00 %
✓	1	1.0	Drop on "-1" symbols	28.24 %	x < 45.00 %
✓	1	2.0	Symbol Rate	33.3333300126278 MHz	x = 33.3333300 MHz +/- 3.3333330 MHz
✓	1	2.0	Test Mode 2 - rms of Jbitout_Master	1.772 ps	x < 50.000 ps
?	1	2.0	Rise time (10%-90%)	3.212 ns	Informational Only
?	1	2.0	Fall time (90%-10%)	3.202 ns	Informational Only
✓	1	3.0	Symbol Rate	33.3333301126278 MHz	x = 33.3333300 MHz +/- 3.3333330 MHz
✓	1	3.0	Test Mode 3 - Slave TX_TCLK jitter_rms	1.772 ps	x < 150.000 ps
?	1	3.0	Rise time (10%-90%)	3.212 ns	Informational Only



Advanced Debug Capability

If a compliance failure is found, Teledyne LeCroy offers a variety of packages which are fully integrated into the oscilloscope to help find the root cause quickly and easily.

The JitKit, Jitter and Timing Analysis package, makes it simple and easy to understand the basic system jitter performance of clock signals. Visual tools such as jitter histograms and trends can be used to uncover root cause failure.



Wide Range of Supported Automotive Protocols

Teledyne LeCroy oscilloscopes offer industry leading trigger, decode, measure/graph and eye diagram capabilities to simplify the design and debug of automotive systems.

Additionally, a number of compliance test packages are offered for test validation.

Solutions are offered for an array of automotive protocols including CAN, CAN FD, LIN, SENT, MOST, FlexRay, and more.

ORDERING INFORMATION

BroadR-Reach/100Base-T1 Test Coverage

Maximum Transmitter Output Droop

Transmitter Distortion (with and without access to Tx_TCLK)

Transmitter Timing Master Jitter

Transmitter Timing Slave Jitter

Transmitter Power Spectral Density

Transmitter Clock Frequency

Transmitter Peak Differential Output

Product Description

100Base-T1 and BroadR-Reach
Compliance Software

Product Code

QPHY-BroadR-Reach

Recommended Oscilloscopes and Probes

1 GHz, 20 GS/s, 4 Ch, 16 Mpts/Ch DSO with 12.1" WXGA Color Display	WaveRunner 8104
1 GHz, 10-bit, 40 GS/s, 4 Ch, 64 Mpts/Ch High Definition Oscilloscope w/ 15.4" WXGA Color Display	HDO9104
1 GHz, 1.0 pF Active Differential Probe, ±8 V	ZD1000

Test Fixture

10/100/1000Base-T Compliance Test Fixture	TF-ENET-B*
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Cables and Adapters

2 x 18 inch SMA to SMA Cable	ENET-2CAB-SMA018†
2 x BNC to SMA Adapter	ENET-2ADA-BNCSMA†

† Included with TF-ENET-B.

* RJ45 Input, may require user-created device to attach to this fixture.

Note: Select cable based on desired length.



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Visit our website to find the most convenient location.