Keysight E6962A
Automotive Ethernet Rx Compliance Solution
Easy and repeatable 100BASE-T1 design validation
for receiver components
Introduction

The Keysight E6962A automotive Ethernet Rx validation and conformance application provides you with an easy and accurate way to verify and debug the receiver characteristics of your BroadR-Reach and 100BASE-T1 designs.

Next-generation ADAS systems require camera and radar systems with increasingly high resolution. That means new requirements for speed and bandwidth—and automotive Ethernet provides much faster transfer of ADAS-related data. Automotive Ethernet enables faster data communication to meet the demands of today’s vehicles and the connected vehicles of the future. Unlike the slower speed backplanes of CAN and LIN, 100BASE-T1 Automotive Ethernet requires rigorous compliance testing. Keysight’s full suite of automotive Ethernet solutions automate testing and validation across Tx, Rx and link segment for 100 Mb/s or 1000 Mb/s automotive Ethernet.

The E6962A automotive Ethernet Rx test software lets you automatically execute Ethernet physical-layer (PHY) electrical tests for receiver compliance using IEEE 802.3bw. The E6962A displays the results in a text report format. In addition to the measurement data, the report includes BER measurement and pass/fail limits.

The E6962A automotive Ethernet Rx test software performs complete BER count to ensure the DUT can maintain a BER of less than $10^{-10}$ and meet the OABR BroadR-Reach V3.2 specification. To meet signal quality requirements, your product must successfully pass conformance testing against these standards. Performing this test is not only required but will give you confidence in your design. The Keysight E6962A BroadR-Reach Rx application will save you hours of valuable time with automatic configuration, instrument setup, calculations and report generation.

Using the Keysight E6962A BroadR-Reach RX Compliance Application (100BASE-T1 compliant) software greatly simplifies BroadR-Reach receiver compliance testing. The software automatically configures the required test equipment, reducing the overall test time.

The E6962A BroadR-Reach Rx compliance application is available in the following license variations:

- E6962A-1FP BroadR-Reach Rx compliance application, fixed perpetual license
- E6962A-1TP BroadR-Reach Rx compliance application, transportable perpetual license

Note: The software is installed and runs on a Keysight PXI embedded controller and works with Keysight PXI AWG/Digitizer module

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Features

The BroadR-Reach Rx compliance software offers several features to simplify the validation of automotive Ethernet designs:

The E6962A Software:
- Guides you how to make connections to the device under test.
- Automatically checks for proper configuration.
- Automatically sets up the test equipment for each test.
- Provides detailed information of each test that has been run.
- Creates a printable text report of the tests that have been run.

E6962A BroadR-Reach Rx compliance software

The E6962A BroadR-Reach Rx test software saves you time by setting the stage for automatic execution of 100BASE-T1 BER test. Some of the difficulties in performing the BER test for 100BASE-T1 are: properly understanding the specification, configuring/running the instrument/s and then analyzing the measured results by comparing them to limits published in the specification. The E6962A 100BASE-T1 electrical test software does much of this work for you.

The E6962A BroadR-Reach Rx test software automatically configures the PXI modules for the test and provides an informative results report that includes a BER measurement and a pass/fail limit. See Table 1 for a list of the measurements and specifications tested in the E6962A.
BroadR-Reach/100BASE-T1 physical layer receiver specifications for automotive applications

<table>
<thead>
<tr>
<th>Standards body</th>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IEEE 802.3bw 2015</td>
<td>Sub clause 96.5.5.1</td>
<td>Receiver differential input signals</td>
</tr>
<tr>
<td>Open Alliance BroadR-Reach Physical Layer Transceiver Specification for Automotive Application V3.2 June 24, 2014</td>
<td>5.5.1</td>
<td>Bit error rate verification</td>
</tr>
<tr>
<td>Open Alliance Automotive Ethernet ECU Test Specification (TC8 ECU and Network Test) January 15, 2016</td>
<td>OABR_PMA_RX_01</td>
<td></td>
</tr>
</tbody>
</table>

Table 1. Conformance tests performed by the E6962A compliance application software as described in IEEE 802.3bw.

![E6962A 100BASE-T1 Rx Compliance Application](image)

Figure 1. The main screen of the E6962A.
E6962A Software saves you time

It can be difficult to build the bit error rate verification system to characterize the Rx signals and get an accurate BER count. Keysight takes the complexity away and offers a clear validation of the BER count objectively. This saves you time and hassle in understanding the specifications, setting up the tests and interpreting the results.

The E6962A BroadR-Reach Rx test software extends Keysight’s PXIe modular equipment to do a complete BER count. The Keysight E6962A quickly walks you through the steps required to set up the tests, perform the tests, and view the results.

The E6962A BroadR-Reach Rx test software requires that your DUT be set to remote loopback mode.
Test Reports

In addition to giving you measurement results, the E6962A BroadR-Reach Rx test software also provides a report format that shows you if your product passes or fails.
## Instruments and accessory requirements

### 1. Software

<table>
<thead>
<tr>
<th>Option name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>E6962A-1FP</td>
<td>BroadR-Reach receiver compliance software, fixed perpetual license</td>
</tr>
<tr>
<td>E6962A-1TP</td>
<td>BroadR-Reach receiver compliance software, transportable license</td>
</tr>
</tbody>
</table>

### 2. Accessories

<table>
<thead>
<tr>
<th>Option name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>E6962A-PWD</td>
<td>11636B power divider, 3.5 mm (f), DC to 26.5 GHz ¹</td>
</tr>
<tr>
<td>E6962A-SMA</td>
<td>Cable, SMA (m) -SMA (m) ²</td>
</tr>
</tbody>
</table>

### 3. Hardware

*Note: it is optional to order the hardware through the E6962A; however, it is necessary to have this equipment to fully test compliance to the specification.*

<table>
<thead>
<tr>
<th>Option name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>E6962A-PXC</td>
<td>PXIe chassis and filler panels, M9010A, Y1212Ax2, Y1213Ax2</td>
</tr>
<tr>
<td>E6962A-PXD</td>
<td>M3302A PXIe AWG and digitizer combination with sampling clock, FPGA and HVI programming memory and FPGA M3302A, M3302-C22, M3302-CLV, M3302-FP1, M3302-HV1, M3302-K41, M3302-M20</td>
</tr>
<tr>
<td>E6962A-CBL</td>
<td>Cables for a monitor</td>
</tr>
<tr>
<td>E6962A-KYM</td>
<td>Keyboard and mouse</td>
</tr>
</tbody>
</table>

¹ Two power dividers are necessary for testing. The E6962A-PWD comes with 1, please order quantity 2 for full compliance.

² Six SMA cables are necessary for testing. The E6962A-SMA comes with 1, please order quantity 6 for full compliance.
Ordering Information

3 Ways to order

- Single part number for a complete solution; E6962A
- Order just software and accessories through E6962A; hardware orderable separately through standalone model number.
- Software orderable through E6962A, hardware and accessories through standalone model number.

Single part number inclusive of all applicable hardware and software

<table>
<thead>
<tr>
<th>Required for compliance</th>
<th>Description</th>
<th>Option number through E6961A</th>
<th>Stand alone model/part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Required</td>
<td>BroadR-Reach Rx compliance application license</td>
<td>E6962A-1FP or E6962A-1TP</td>
<td>E6962A</td>
</tr>
<tr>
<td>Required</td>
<td>Power divider, 3.5 mm (f), DC to 26.5 GHz</td>
<td>E6962A-PWD</td>
<td>11636B</td>
</tr>
<tr>
<td>Required</td>
<td>Cable, SMA(m) -SMA(m)</td>
<td>E6962A-SMA</td>
<td>E6961-20001</td>
</tr>
<tr>
<td>Required</td>
<td>PXIe chassis and filler panels</td>
<td>E6962A-PXC</td>
<td>M9010A, Y1212A, Y1213A: PXIe chassis 10-slot, 3U, 24 GB/s, Gen 3, PXI slot blockers: (x5); single slot (x2), PXI EMC filler panel kit: 5 slots (x2)</td>
</tr>
<tr>
<td>Required</td>
<td>PXIe embedded controller with memory and windows OS</td>
<td>E6962A-PXE</td>
<td>M9037A, M9037A-M16, M9037A-WE6: High performance embedded controller, memory, 16 GB, Windows Embedded Standard 7 (64 bit)</td>
</tr>
<tr>
<td>Required</td>
<td>PXIe digitizer with sampling clock, FPGA and HVI programming memory</td>
<td>E6962A-PXD</td>
<td>M3302A, M3302-C22, M3302-CLV, M3302-FP1, M3302-HV1, M3302-K41, M3302-M20: PXIe AWG and digitizer combination 500 MSa/s, 16 bit, and 500 MSa/s, 14 bit, two + two channels, variable sampling clock, enabled FPGA programming, enabled HVI programming, FPGA Xilinx 7K410T, 2 GB memory, 1 Gsamples</td>
</tr>
</tbody>
</table>

1 Two power dividers are necessary for testing. The E6962A-PWD comes with 1, please order quantity 2 for full compliance.
2 Six SMA cables are necessary for testing. The E6962A-SMA comes with 1, please order quantity 6 for full compliance.

For example, a completely configured order for full compliance with one part number

The main components required for 100BASE-T1 receiver testing:

Qty (1) E6962A
  opt Qty (1) E6962A-1FP
Qty (2) E6962A-PWD
Qty (6) E6962A-SMA
Qty (1) E6962A-PXC
Qty (1) E6962A-PXE
Qty (1) E6961A-PXD
Below is an example of a completely configured order for full compliance with standalone part numbers:

Qty (1) E6962A
  opt Qty (1) E6962A-1FP
Qty (2) 11636B power divider, 3.5 mm (f), DC to 26.5 GHz x 2
Qty (6) E6961-20001 SMA cable SMA (m) -SMA (m)
Qty (1) M9010A PXIe chassis 10-slot, 3U, 24 GB/s, Gen 3
  opt Qty (2) Y1212A PXI slot blockers: qty 5, single slot
  opt Qty (2) Y1213A PXI EMC filler panel kit: 5 Slots
Qty (1) M9037A high performance embedded controller,
  opt Qty (1) M16 memory, 16 GB
  opt Qty (1) WE6 Windows embedded standard 7 (64 bit)
  opt Qty (1) Y1206A
  opt Qty (1) Y1261A
  opt Qty (1) Y1263A
Qty (1) M3302A PXIe AWG and digitizer combination 500 MSa/s, 16 bit, and 500 MSa/s
  opt Qty (1) C22 two + two channels
  opt Qty (1) CLV variable sampling clock
  opt Qty (1) M20 memory, 2 GB, 1 Gsamples
  opt Qty (1) K41 Xilinx 7K410T
  opt Qty (1) FP1 enabled FPGA programming
  opt Qty (1) HV1 enabled HVI programming
Evolving Since 1939

Our unique combination of hardware, software, services, and people can help you reach your next breakthrough. We are unlocking the future of technology. From Hewlett-Packard to Agilent to Keysight.

myKeysight
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Register your products to get up-to-date product information and find warranty information.

Keysight Services
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Keysight Services can help from acquisition to renewal across your instrument’s lifecycle. Our comprehensive service offerings—one-stop calibration, repair, asset management, technology refresh, consulting, training and more—helps you improve product quality and lower costs.

Keysight Assurance Plans
www.keysight.com/find/AssurancePlans
Up to ten years of protection and no budgetary surprises to ensure your instruments are operating to specification, so you can rely on accurate measurements.

Keysight Channel Partners
www.keysight.com/find/channelpartners
Get the best of both worlds: Keysight’s measurement expertise and product breadth, combined with channel partner convenience.

www.keysight.com/find/E6962A