Automotive Ethernet Solutions

- E6961A Automotive Ethernet Tx Compliance Solution
  - E6959A TC8 ECU Tx Compliance
  - E6960A 1000BASE-T1 Tx Compliance Application
  - N6467B 100BASE-T1 Compliance Application
  - N8847A 100BASE-T1 Protocol Trigger & Decode
- E6962A Automotive Ethernet Rx Compliance Solution
- E6963A Automotive Ethernet Link Segment Compliance Solution

Compliance and protocol application are compliant to BroadR-Reach V3.2 and 100BASE-T1 (IEEE 802.3bw), OPEN Alliance TC8 ECU, or 1000BASE-T1 (IEEE 802.3bp) specifications respectively.
Automotive Ethernet—Driving the Future

Autonomous vehicles promise to change the nature of commercial and passenger transportation over the roadways. Within new vehicles, data speed and bandwidth requirements are increasing. With the development of automotive Ethernet, faster data communications are now possible and the increasing demands for today’s vehicles and future connected vehicles can be met. 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 and 1000 Mb/s automotive Ethernet providing increased test accuracy and saving time.

Connected Car

Automotive electronics are increasingly complex with more sensors, controls, and interfaces using higher bandwidth, which requires faster data throughput and more reliable networks.

Ethernet has proven itself as a secure transfer medium that can move large amounts of data as well as reduce connectivity costs and cabling weight.

BroadR-Reach, developed by Broadcom Corporation, is an Ethernet physical layer standard designed for use in automotive connectivity applications. IEEE standardized the technology with 802.3bw (100BASE-T1) expanded to add 802.3bp (1000BASE-T1) and now OPEN (One Pair EtherNet) Alliance maintains the automotive Ethernet standards.
The Challenge

The standards for automotive Ethernet demand rigorous testing: IEEE 802.3bw, IEEE 802.3bp, OABR 3.2 and the OPEN Alliance TC8 ECU. System tests required to meet these standards covers transmitters, receivers, and harness/connector assemblies. Test instruments needed for the required measurements include vector network analysis (S-parameters), bit error ratio (BER) testing, and protocol analysis of high-speed digital signals.

When you move to an evolving technology, like automotive Ethernet, with complex test requirements, your team is in unfamiliar territory, expertise with low-speed buses like CAN/LIN is less relevant than you or they may want to believe. It takes a tremendous amount of time to review and understand the details of each new standard. Additional time is needed to fully understand the test cases, required equipment, and test procedures. Interoperability can be a very time consuming issue, testing to the standards prevents some of those issues surfacing after a product ships. Keysight provides a solution that has thousands of hours invested in understanding the standards and creating automated, repeatable compliance tests. Ready to help you understand, integrate and deploy these new technologies.

Achieve Reliable, High-Performance Automotive Ethernet

Keysight has removed the complexity and headache involved in setting up and executing the tests necessary for compliance with automotive Ethernet standards for transmission, the harness and connector, and receiving connectivity. Keysight automotive Ethernet solutions provide software, instruments, fixtures and cables so you have everything you need for complete testing of 100BASE-T1 and 1000BASE-T1 standards. Whether you’re focused on design or validation, our automotive Ethernet solutions will accelerate your innovations from debug to characterization, to compliance, to completion.

Keysight 100BASE-T1 and 1000BASE-T1 test solutions perform end-to-end functional and standards-compliance conformance testing of automotive Ethernet devices, with optional protocol decoding. Our Automotive Ethernet solutions suite not only give you all of the hardware, software, cables and accessories you need to enable compliance tests, they also provide:

- A setup wizard for quick and easy setup, configuration and test
- A wide range of tests enabling faster and easier standards conformance
- Accurate and repeatable results from Keysight precision instrumentation
- Automated reporting with margin analysis

Keysight is fully invested in the creation of complete solutions for compliance testing, and we’ve built these solutions on upgradeable platforms. Our worldwide team of application and field engineers are is trained and ready to respond when you and your teams need assistance.
Faster, More Efficient Automotive Ethernet Testing

Keysight’s automotive Ethernet compliance solutions perform a complete set of conformance tests to meet the BroadR-Reach, 100BASE-T1, 1000BASE-T1, or TC8 ECU specifications.

Automotive Ethernet Compliance Solutions

Transmitter  Link Segment  Receiver

Solution component overview

Key Features

- Test software applications including:
  - Protocol trigger and decode compliant to BroadR-Reach V3.2 as well as 100BASE-T1 (IEEE 802.3bw) standards
  - 100% test coverage for harness and connector tests using BroadR-Reach/100BASE-T1 (IEEE 802.3bw) definitions for communications channel version 2.0
  - Bit error rate verification for Rx tests against BroadR-Reach V3.2 as well as 100BASE-T1 (IEEE 802.3bw) standards
  - All required BroadR-Reach 100BASE-T1 (IEEE 802.3bw), OPEN Alliance TC8 ECU, and 1000BASE-T1 Tx (IEEE 802.3bp) tests
  - Highly automated and easy-to-use
  - Report generation with pass/fail test results

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  - N8847A 100BASE-T1 Protocol Trigger & Decode
- E6962A 100BASE-T1 Receiver Solution
- E6963A 100BASE-T1 Link Segment Application
Bundle Details

Bundles give you the licensed application software and the option to purchase connectors, cables, and hardware for each solution. Choose from the application bundle model number listed in Table 1. Please note that the table lists bundle configurations that apply to E6961A (which is a superset of both 1000BASE-T1, 100BASE-T1 and TC8 OPEN Alliance compliance software). Therefore, the hardware requirements are more than it would be for just N6467B or E6959A standalone. If you are interested in the 100BASE-T1 or TC8 software, please see those individual data sheets for hardware configuration information.

Automotive Ethernet Solution Bundles

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<thead>
<tr>
<th></th>
<th>E6961A 100BASE-T1 Tx ¹</th>
<th>E6960A 1000BASE-T1 Tx</th>
<th>E6962A 100BASE-T1 Rx</th>
<th>E6963A 100BASE-T1 Harness &amp; Connector</th>
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<tbody>
<tr>
<td><strong>Software</strong></td>
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<td>N6467B100BASE-T1</td>
<td>E6960A 100BASE-T1</td>
<td>E6962A receiver</td>
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<td>E6959A TC8 compliance</td>
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<td><strong>Accessories</strong></td>
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<td>E6961A-FDB (E6960A-66600) frequency divider board</td>
<td>11636B power splitters</td>
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<td>N5395C Ethernet compliance test fixture (optional)¹</td>
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<td>Energy efficient Ethernet test fixture (applies only to protocol)</td>
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<td>DSOS254A S-Series Oscilloscope 2.5 GHz, 4 analog channels</td>
<td>M9010A PXi Chassis</td>
<td>E5071C Network Analyzer with option TDR and N4431B Ecal 4 ports and connectors</td>
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<td>M9037A PXi Embedded Controller</td>
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<tr>
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<td>M3302A PXi PXi AWG and Digitizer Combination</td>
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Table 1.

¹ IEEE 802.3bw does not specify a connector, users may have different means to connect D+ and D- signals to the oscilloscope. For DUTs that use standard RJ-45 Ethernet connections, Keysight's E5395C Ethernet compliance test fixture can be used for differential signal breakout. Alternatively, a differential probe or SMA cables can be used to access D+ and D- signals.