



# Open Networking Testing Service

## Open Network Systems Interoperability Test Report

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Carly Sun

April 18, 2018

10Gtek Transceivers Co. Ltd  
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Enclosed are the results from the Open Network Systems Interoperability performed on:

Module or Cable Assembly Under Test (MUT/CUT):

|                        |              |
|------------------------|--------------|
| Vendor and Device Type | 10Gtek QSFP  |
| Part Number            | ALQ28-LR4-10 |

Host Under Test (HUT):

| <b>Host System 1 Composition</b> |                |
|----------------------------------|----------------|
| Network Operating System         | Cumulus        |
| OS Version                       | 3.5            |
| Bare Metal Switch                | Edge-Core 7712 |
| Part Number                      | 7712           |
| ONIE Version                     | 2018.02        |

This testing pertains to the Open Network Systems Interoperability Test Plan, which outlines a series of tests performed on a variety of optical transceivers and cables with bare-metal open switches running Network Operating Systems from multiple vendors. The focus of these tests was basic interoperability, which aims to validate the operation of open network systems.

As always, we welcome any comments regarding this Test Suite. If you have any questions about the test procedures or results, please feel free to contact me via e-mail at [david@iol.unh.edu](mailto:david@iol.unh.edu) or by phone at +1-603-862-0090.

Regards,  
David Woolf

## Digital Signature Information

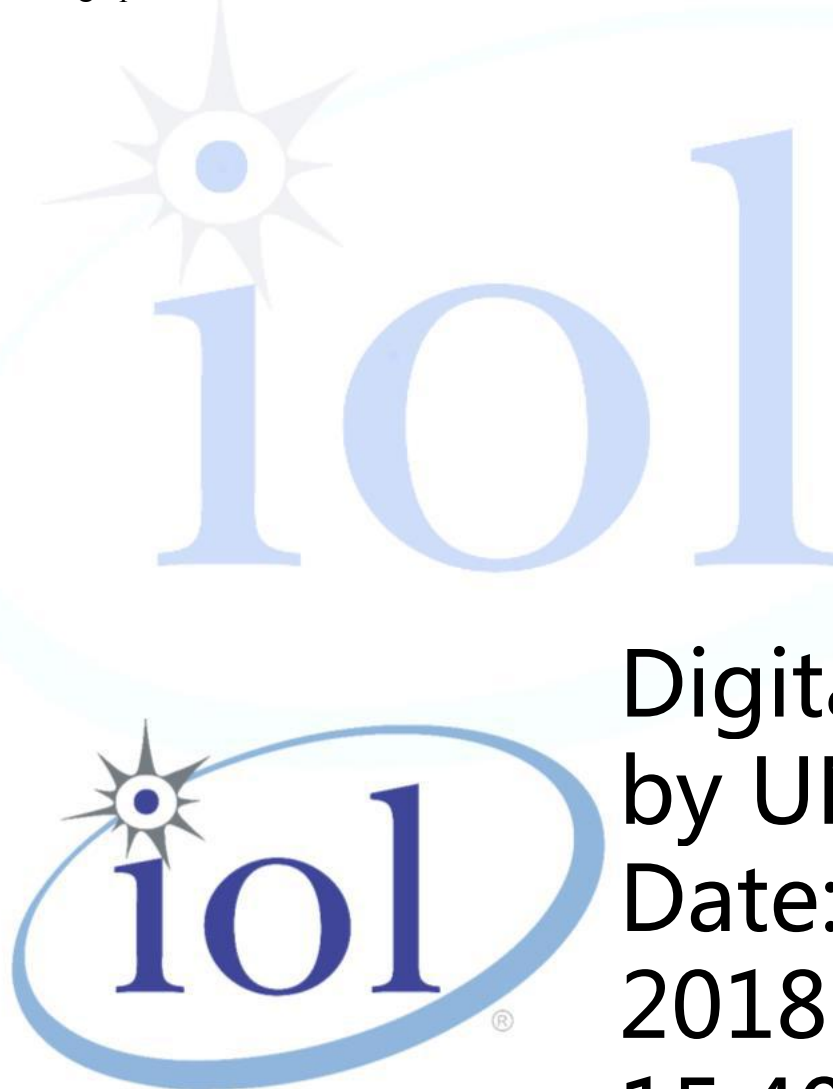
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In section 2, the following equipment was used:

| Test System Hardware |                  |
|----------------------|------------------|
| EEPROM Reader        | I2C Elite Reader |

In section 3, the following equipment was used:

| Test System Hardware |                                   |
|----------------------|-----------------------------------|
| Network Analyzer     | PNA –Performance Network Analyzer |

In section 4, the following equipment was used:

| Test System Hardware         |  |
|------------------------------|--|
| Wide Bandwidth Oscilloscope  | Keysight DCA-X 86100D Wide Bandwidth Oscilloscope              |
| Waveform Analyzer            | Keysight 86105C Optical Waveform Analyzer                      |
| 50GHz Waveform Analyzer      | Keysight 86108B Mega Module, 50GHz Bandwidth Waveform Analyzer |
| Clock Recovery Module        | Keysight 83496B Optical/Electrical Clock Data Recovery Unit    |
| High Performance Serial BERT | Tektronix BERTScope  |
| Signal Quality Analyzer      | BERTScope PRBS9 at 10.3125Gbps                                 |
| De-Emphasis Signal Converter | Agilent N4916B   |

\*Two modules used during testing

In section 6, Ostinato software was used to generate test traffic:

| Test System Hardware       |          |
|----------------------------|----------|
| Ethernet Traffic Generator | Ostinato |
| Software Version           | Ostinato |
| Port Types                 | 40/100G  |

The following table contains possible results and their meanings.

| <b>Result</b>               | <b>Interpretation</b>   |
|-----------------------------|---|
| <b>PASS</b>                 | The Device Under Test (DUT) was observed to exhibit conformant behavior.  |
| <b>PASS W/<br/>Comments</b> | The specified behavior is demonstrated by the DUT; however this result indicates that either changes were made to the standard test procedure or results other than the expected results were observed. |
| <b>FAIL</b>                 | The DUT was observed to exhibit non-compliant behavior.   |
| <b>INFO</b>                 | This Test is designed for informational purposes only. While the results may help ensure the interoperability of the DUT, a PASS/FAIL is not given for this test.                                       |
| <b>WARN</b>                 | The DUT was observed to exhibit behavior that is not recommended.   |
| <b>N/A</b>                  | Not Applicable. This test is not applicable for the DUT.  |
| <b>N/S</b>                  | Not Supported. This test was not run due to features not implemented on the DUT.  |
| <b>N/T</b>                  | Not tested. This test was not run.  |

| <b>Summary of Results- Conformance</b>                |               |
|---|---------------|
| <b>Test</b>   | <b>Result</b> |
| Test 1.1:   | N/A           |
| Test 1.2:   | PASS          |
| Test 3.1.1: Return Loss for 10G Passive Cable         | PASS          |
| Test 3.1.2: Insertion Loss for 10G Passive Cable      | PASS          |
| Test 5.1.1: Output Rise and Fall Times for 100G Host  | PASS          |
| Test 5.1.2: Transmitter Eye Mask for 100G Host        | PASS          |
| Test 5.1.3: Total Jitter for 100G Host                | PASS          |
| Test 5.1.4: Input and Output Return Loss on 100G Host | PASS          |

| <b>Summary of Results - Interoperability</b>             |               |
|--|---------------|
| <b>Test</b>  | <b>Result</b> |
| Test 2.1: Physical Compatibility with Supporting Devices | PASS          |
| Test 2.2: Host Management of Module or Cable Assembly    | PASS          |
| Test 2.3: Diagnostic Optical Monitor Support             | PASS          |
| Test 6.1: Establish Baseline Performance Analysis        | PASS          |
| Test 6.2:  | PASS          |
| Test 6.3: Packet Error Rate Estimation                   | PASS          |
| Test 6.4: Packet Loss/Stress Test                        | PASS          |

| <b>Notes</b> |
|--------------|
|              |

| <b>Conformance Test Results</b>   |                    |
|---|--------------------|
| <b>Test Information</b>   | <b>Test Result</b> |
| Test 1.1:<br><br><i>Purpose:</i> To verify that a host can pass a random sampling of ONIE Compliance Environment tests.   | <b>N/A</b>         |
| <b>Comments on Test Procedure</b>   |                    |
| The random sampling of tests from the ONIE Compliance Environment was not used.   |                    |
| <b>Comments on Test Results</b>   |                    |
|   |                    |
| <b>Additional Comments</b>  |                    |
| This test is only applicable to Hosts which have not performed ONIE compliance testing previously.  |                    |
| <b>Test Information</b>   | <b>Test Result</b> |
| Test 1.2:<br><br><i>Purpose:</i> To verify that a NOS can be successfully installed through ONIE.   | <b>PASS</b>        |
| <b>Comments on Test Procedure</b>   |                    |
| This test was completed using the standard procedure as written in the Test Plan. The random sampling of tests from the ONIE Compliance Environment was not used. |                    |
| <b>Comments on Test Results</b>   |                    |
| <b>Part A:</b> The DUT was able to install the NOS via ONIE.<br><b>Part B:</b> The DUT was able to uninstall the NOS via ONIE.                                    |                    |
| <b>Additional Comments</b>  |                    |
|   |                    |

| Test Information   | Test Result |
|--|-------------|
| <b>Test 3.1.1: Return loss for 10G Passive Cable</b><br><br><i>Purpose:</i> To verify that the return loss of the DUT is within the conformance limits provided by SFF-8431 Appendix E, Table 37.  | <b>PASS</b> |
| <b>Comments on Test Procedure</b>  |             |
| This test was completed using the standard procedure.  |             |
| <b>Comments on Test Results</b>  |             |
| The differential return loss observed did not violate the limits governed by SFF-8431 Appendix E.4, Table 37 for 10GBASE-CR passive cables: $11, \quad 22 \geq \left\{ \begin{array}{ll} 12 - 2\sqrt{\phantom{x}}, & 0.01 \leq \phantom{x} < 4.1 \\ 6.3 - 13 \log_{10} \phantom{x}, & 4.1 \leq \phantom{x} \leq 11.1 \end{array} \right\} ( )$ |             |
| <b>Additional Comments</b>   |             |
|  |             |

| Test Information  | Test Result |
|---|-------------|
| <b>Test 3.1.2: Insertion Loss for 10G Passive Cable</b><br><br><i>Purpose:</i> To verify that the insertion loss of the Cable under test is within the conformance limits provided by IEEE Std. 802.3-2012 Annex, Table 37. | <b>PASS</b> |
| <b>Comments on Test Procedure</b>   |             |
| This test was completed using the standard procedure.   |             |
| <b>Comments on Test Results</b>   |             |
| The insertion loss of the cable under test does not violate the requirements passive cable assemblies. $3 \leq 21, \quad 12 \leq 17.04, \quad 5.15625$  |             |
| <b>Additional Comments</b>  |             |
|   |             |

| Test Information   | Test Result        |
|--|--------------------|
| <p><b>Test 5.1.1: Output Rise and Fall Times for 10G Host</b></p> <p><i>Purpose:</i> To verify that the Eye Mask Hit Ratio is within the conformance limits.</p> | <p><b>PASS</b></p> |
| <p><b>Comments on Test Procedure</b></p>   |                    |
| <p>The test was completed with the standard procedure.</p>   |                    |
| <p><b>Comments on Test Results</b></p>   |                    |
| <p>The device under test exhibited the expected behavior.</p>  |                    |
| <p><b>Additional Comments</b></p>  |                    |
|  |                    |

| Test Information  | Test Result        |
|---|--------------------|
| <p><b>Test 5.1.2: Transmitter Eye Mask on 10G Host</b></p> <p><i>Purpose:</i> To verify that the Eye Mask Hit Ratio is within the conformance limits.</p> | <p><b>PASS</b></p> |
| <p><b>Comments on Test Procedure</b></p>  |                    |
| <p>The test was completed with the standard procedure.</p>  |                    |
| <p><b>Comments on Test Results</b></p>  |                    |
| <p>The device under test exhibited the expected behavior.</p>   |                    |
| <p><b>Additional Comments</b></p>   |                    |
|   |                    |



| <b>Test Information</b>  | <b>Test Result</b> |
|--|--------------------|
| Test 5.1.3:<br><br><i>Purpose:</i> To verify that the Total Jitter (TJ) is within the conformance limit. | <b>PASS</b>        |
| <b>Comments on Test Procedure</b>  |                    |
| The test was completed with the standard procedure.  |                    |
| <b>Comments on Test Results</b>  |                    |
| The device under test exhibited the expected behavior.   |                    |
| <b>Additional Comments</b>   |                    |
|  |                    |

| <b>Test Information</b>  | <b>Test Result</b> |
|--|--------------------|
| Test 5.1.4: <b>Input and Output Return Loss on 10G Host</b><br><br><i>Purpose:</i> To verify that the differential input and output return loss of the DUT is within conformance limits. | <b>PASS</b>        |
| <b>Comments on Test Procedure</b>  |                    |
| The test was completed with the standard procedure.  |                    |
| <b>Comments on Test Results</b>  |                    |
| The device under test exhibited the expected behavior.   |                    |
| <b>Additional Comments</b>   |                    |
| See Appendix B   |                    |

| <b>Interoperability Test Results</b>  |                    |
|---|--------------------|
| <b>Test Information</b>   | <b>Test Result</b> |
| <p>Test 2.1: <b>Physical Compatibility with Supporting Devices</b></p> <p><i>Purpose:</i> To verify that the mechanical form factor is compatible with devices for interoperability purposes.</p>                   | <b>PASS</b>        |
| <b>Comments on Test Procedure</b>   |                    |
| The test was completed with the standard procedure.   |                    |
| <b>Comments on Test Results</b>   |                    |
| <p><b>Part A:</b> The MUT/CUT was able to be inserted into the Host.<br/> <b>Part B:</b> This test is not applicable to Cable Assemblies.<br/> <b>Part C:</b> The MUT/CUT was able to be removed from the Host.</p> |                    |
| <b>Additional Comments</b>  |                    |
|   |                    |

| <b>Test Information</b>  | <b>Test Result</b> |
|--|--------------------|
| <p>Test 2.2:</p> <p><i>Purpose:</i> To verify that the MUT/CUT is manageable via the Host complex.</p>   | <b>PASS</b>        |
| <b>Comments on Test Procedure</b>  |                    |
| The test was completed with the standard procedure.  |                    |
| <b>Comments on Test Results</b>  |                    |
| <p><b>Part B:</b> The EEPROM data of the MUT/CUT was readable. The serial number and vendor information extracted from the EEPROM data matches the serial number and vendor information of the part.</p> |                    |
| <b>Additional Comments</b>   |                    |
|  |                    |

| Test Information  | Test Result |
|---|-------------|
| Test 2.3:<br><br><i>Purpose:</i> To verify that the MUT/CUT (active optical cable only) supports diagnostic functions via the Host complex. | <b>PASS</b> |
| <b>Comments on Test Procedure</b>   |             |
| The test was completed with the standard procedure.   |             |
| <b>Comments on Test Results</b>   |             |
| <b>Part A:</b> The MUT/CUT supports diagnostic monitoring and the diagnostic information from the EEPROM was readable by the NOS.           |             |
| <b>Additional Comments</b>  |             |
|   |             |

| Test Information   | Test Result |
|--|-------------|
| <p><b>Test 6.1: Establish Baseline Performance Analysis</b></p> <p><i>Purpose:</i> To establish a baseline performance analysis of the HUT.</p>      | <b>PASS</b> |
| <b>Comments on Test Procedure</b>  |             |
| <p>This test was completed using a modified procedure. Because of a lack of 40G Golden Modules, the Host was baselined using each 40G MUT/CUT.</p>   |             |
| <b>Comments on Test Results</b>  |             |
| <p>The baseline performance of the Host was determined to be 90% line rate. All proceeding tests in Group 6 were conducted using this line rate.</p> |             |
| <b>Additional Comments</b>   |             |
|  |             |

| Test Information   | Test Result |
|--|-------------|
| <p><b>Test 6.2:</b></p> <p><i>Purpose:</i> To determine if the MUT/CUT, HUT and LP establish a link while varying the power up sequence.</p>   | <b>PASS</b> |
| <b>Comments on Test Procedure</b>  |             |
| <p>This test was completed using the standard procedure.</p>   |             |
| <b>Comments on Test Results</b>  |             |
| <p><b>Part A:</b> The Host and Link Partner were able to establish a valid link with this MUT/CUT while fully powered and operational.</p> <p><b>Part B:</b> The Host and Link Partner were able to establish a valid link with this MUT/CUT when the Link Partner was powered on after the Host.</p> <p><b>Part C:</b> The Host and Link Partner were able to establish a valid link with this MUT/CUT when the Host was powered on after the Link Partner.</p> |             |
| <b>Additional Comments</b>   |             |
|  |             |

| Test Information  | Test Result |
|---|-------------|
| <p><b>Test 6.3: Packet Error Rate Estimation</b></p> <p><i>Purpose:</i> To determine if a Host can exchange packets with a Module or Cable Assembly such that a bit error rate of <math>10^{-12}</math> is achieved</p> | <b>PASS</b> |
| <b>Comments on Test Procedure</b>   |             |
| <p>This test was completed using the standard procedure.</p>  |             |
| <b>Comments on Test Results</b>   |             |
| <p><b>Part A:</b> All 247,000,000 frames transmitted by TS1 were received by TS2.<br/> <b>Part B:</b> All 10,506,539,320 frames transmitted by TS1 were received by TS2.</p>  |             |
| <b>Additional Comments</b>  |             |
|   |             |

| Test Information  | Test Result |
|---|-------------|
| <p><b>Test 6.4: Packet Loss/Stress Test</b></p> <p><i>Purpose:</i> To verify that no obvious buffer management problems occur when directing a large volume of traffic at the Host and Module/Cable Assembly combination.</p> | <b>PASS</b> |
| <b>Comments on Test Procedure</b>   |             |
| <p>This test was completed using the standard procedure.</p>  |             |
| <b>Comments on Test Results</b>   |             |
| <p><b>Parts A-D:</b> All 1,000,000,000 64-byte frames transmitted by TS1 were received by TS2.<br/> All 1,000,000,000 1518-byte frames transmitted by TS1 were received by TS2.</p>   |             |
| <b>Additional Comments</b>  |             |
|   |             |

## Appendix A: EEPROM Data

10Gtek                    QSFP28 module  
Part Number: ALQ28-LR4-10                    Serial Number: WTZLRHA0002  
10Gtek\_\_WTZLRHA0002\_\_\_\_\_EEPROMdecode\_20180320202711.txt

### SERIAL ID Keys:

BR\_NOMINAL: 25750  
CONNECTOR: 7  
CU\_ATTENUATE\_2\_5: 0  
CU\_ATTENUATE\_5\_0: 0  
DEVICE\_TECH: 0x0  
ENCODING: 0  
EXTENDED\_MODULE: 0x1f  
EXT\_IDENTIFIER: 0  
EXT\_RATE\_COMPLY: 0  
IDENTIFIER: 17  
LENGTH\_OM1\_62\_5UM: 0  
LENGTH\_OM2\_50UM: 0  
LENGTH\_OM3\_50UM: 0  
LENGTH\_OM4\_OR\_CU: 0  
LENGTH\_SMF\_KM: 10000  
MAX\_CASE\_TEMP: 70  
SPEC\_COMPLIANCE: 0x80 0x0 0x0 0x0 0x0 0x0 0x0 0x0  
VENDOR\_NAME: 10Gtek  
VENDOR\_OUI: 0x0 0x0 0x0  
VENDOR\_PN: ALQ28-LR4-10  
VENDOR\_REV: 01  
WAVELENGTH: 1310.0  
WAVELEN\_TOLERANCE: 0.0

Vendor Specific: 0x0 0x0 0x0 0x0 0x0 0x0 0x0 0x0 0x0 0x0 0x0 0x0 0x0 0x0  
0x0 0x0 0x0 0x0 0x0 0x0 0x0 0x0 0x0 0x0 0x0 0x0 0x0 0x0 0x0

### I2C Address A0h, bytes 0-127, in hex

0000x: 1107020f 00000000 00000000 00000000  
0010x: 00000000 00001b0d 00007dde 00000000  
0020x: 00000001 00010001 00015cd0 60775498  
0030x: 566c397b 3e9b43ba 4d3b0000 00000000  
0040x: 00000000 00000000 00000000 00000000  
0050x: 00000000 000000aa aa000000 00000000  
0060x: 0000ff00 00000000 00000000 00000000  
0070x: 00000000 00000000 00000000 00000000

### I2C Address A0h, page 0, bytes 128-255, in hex

0000x: 11000780 00000000 00000000 ff000a00  
0010x: 00000000 31304774 656b2020 20202020  
0020x: 20202020 1f000000 414c5132 382d4c52  
0030x: 342d3130 20202020 30316658 000046a6  
0040x: 03000000 57545a4c 52484130 30303220  
0050x: 20202020 31373130 30312020 0800676a  
0060x: 00000000 00000000 00000000 00000000  
0070x: 00000000 00000000 00000000 00000000

## Appendix B: Pluggable Module / Cable Electrical Data

Optics Self-Test Report - Port 1: 100GigE Layer 2 Traffic Term

Generated by Viavi 5800-100G

# Optics Self-Test

|                |    |
|----------------|----|
| Customer Name  | -- |
| Technician ID  | -- |
| Test Location  | -- |
| Work Order     | -- |
| Comments/Notes | -- |

Overall Test Result: Pass

## Appendix C: Host Electrical Data





