



# Open Networking Testing Service

## Open Network Systems Interoperability Test Report

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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	AOC-Q1Q1- 010

Host Under Test (HUT):

<b>Host System 1 Composition</b>	
Network Operating System	Cumulus
OS Version	3.5.2
Bare Metal Switch	Wedge 100S
Part Number	100S
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

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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 should be set up to transmit PRBS9 at 10.3125Gbps
De-Emphasis Signal Converter	Agilent N4916B

\*Two modules used during testing

In section 6, an MLNX NICS was used to generate test traffic:

Test System Hardware	
Ethernet Traffic Generator	MLNX NICS
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/ 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: ONIE Compliance Environment	N/A
Test 1.2: Installing and uninstalling a NOS through ONIE via HTTP server	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: Link Detection on Power Up	PASS
Test 6.3: Packet Error Rate Estimation	PASS
Test 6.4: Packet Loss/Stress Test	PASS

<b>Notes</b>

Conformance Test Results	
Test Information	Test Result
Test 1.1: ONIE Compliance Environment  <i>Purpose:</i> To verify that a host can pass a random sampling of ONIE Compliance Environment tests.	N/A
<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.	
Test Information	Test Result
Test 1.2: Installing and un installing a NOS through ONIE via HTTP server  <i>Purpose:</i> To verify that a NOS can be successfully installed through ONIE.	PASS
<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. <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>  <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: $11, \quad 22 \geq \left\{ \begin{array}{ll} 12 - 2\sqrt{\phantom{x}}, & 0.01 \leq \phantom{x} < 4.1 \\ 6.3 - 13 \log_{10} \phantom{x}, & 4.1 \leq \phantom{x} \leq 11.1 \end{array} \right\} ( \phantom{x} )$	
<b>Additional Comments</b>	

Test Information	Test Result
<b>Test 3.1.2: Insertion Loss for 10G Passive Cable</b>  <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>	

<b>Test Information</b>	<b>Test Result</b>
<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>	<b>PASS</b>
<b>Comments on Test Procedure</b>	
<p>The test was completed with the standard procedure.</p>	
<b>Comments on Test Results</b>	
<p>The device under test exhibited the expected behavior.</p>	
<b>Additional Comments</b>	

<b>Test Information</b>	<b>Test Result</b>
<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>	<b>PASS</b>
<b>Comments on Test Procedure</b>	
<p>The test was completed with the standard procedure.</p>	
<b>Comments on Test Results</b>	
<p>The device under test exhibited the expected behavior.</p>	
<b>Additional Comments</b>	



Test Information	Test Result
Test 5.1.3: Total Jitter for 10G Host  <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>	

Test Information	Test Result
Test 5.1.4: Input and Output Return Loss on 10G Host  <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>
Test 2.1: <b>Physical Compatibility with Supporting Devices</b>  <i>Purpose:</i> To verify that the mechanical form factor is compatible with devices for interoperability purposes.	<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 was able to be inserted into the Host. <b>Part B:</b> This test is not applicable to Cable Assemblies. <b>Part C:</b> The MUT/CUT was able to be removed from the Host.	
<b>Additional Comments</b>	

<b>Test Information</b>	<b>Test Result</b>
Test 2.2: <b>Host Management of Module or Cable Assembly</b>  <i>Purpose:</i> To verify that the MUT/CUT is manageable 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 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.	
<b>Additional Comments</b>	

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

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

<b>Test Information</b>	<b>Test Result</b>
<b>Test 6.4: Packet Loss/Stress Test</b>  <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.	<b>PASS</b>
<b>Comments on Test Procedure</b>	
This test was completed using the standard procedure.	
<b>Comments on Test Results</b>	
<b>Parts A-D:</b> All 1,000,000,000 64-byte frames transmitted by TS1 were received by TS2. All 1,000,000,000 1518-byte frames transmitted by TS1 were received by TS2.	
<b>Additional Comments</b>	

## Appendix A: EEPROM Data

```
10Gtek QSFP+ module
Part Number: AOC-Q1Q1- 010 Serial Number: WTQ10HA0009
10Gtek__WTQ10HA0009_____EEPROMdecode_20171205165746.txt
SERIAL_ID Keys:
BR NOMINAL: 10300
CONNECTOR: 35
CU_ATTENUATE_2_5: 0
CU_ATTENUATE_5_0: 0
DEVICE TECH: 0x0
ENCODING: 5
EXTENDED_MODULE: 0x7
EXT_IDENTIFIER: 0
EXT_RATE_COMPLY: 0
IDENTIFIER: 13
LENGTH_OM1_62_5UM: 0
LENGTH_OM2_50UM: 0
LENGTH_OM3_50UM: 0
LENGTH_OM4_OR_CU: 20
LENGTH_SMF_KM: 0
MAX_CASE_TEMP: 70
SPEC_COMPLIANCE: 0x1 0x0 0x0 0x0 0x0 0x0 0x0 0x0
VENDOR_NAME: 10Gtek
VENDOR_OUI: 0x0 0x0 0x0
VENDOR_PN: AOC-Q1Q1- 010
VENDOR_REV: 01
WAVELENGTH: 850.0
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 0x0 0x0 0x0
I2C Address A0h, bytes 0-127, in hex
0000x: 0d000200 00000000 00000000 00000000
0010x: 00000000 00000000 00000000 00000000
0020x: 00000000 00000000 00000000 00000000
0030x: 00000000 00000000 00000000 00000000
0040x: 00000000 00000000 00000000 00000000
0050x: 00000000 00000000 00000000 00000000
0060x: 00000000 00000000 00000000 00000000
0070x: 00000000 00000000 00000000 00000000
I2C Address A0h, page 0, bytes 128-255, in hex
0000x: 0d002301 00000000 00000005 67000000
0010x: 00000a00 31304774 656b2020 20202020
0020x: 20202020 07000000 414f432d 51315131
0030x: 2d303130 20202020 30314268 0000466d
0040x: 00000000 57545131 30484130 30303920
0050x: 20202020 31373130 30312020 080000c1
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



1001

### Appendix C: Host Electrical Data

