



# Open Networking Testing Service

## Open Network Systems Interoperability Test Report

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March 18, 2019

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 SFP+
Part Number	AZS85-S28-M1

Host Under Test (HUT):

Host System 1 Composition	
Network Operating System	Cumulus
OS Version	3.4
Bare Metal Switch	Accton AS5712
Part Number	5712
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,  
Kerry Munson

## Digital Signature Information

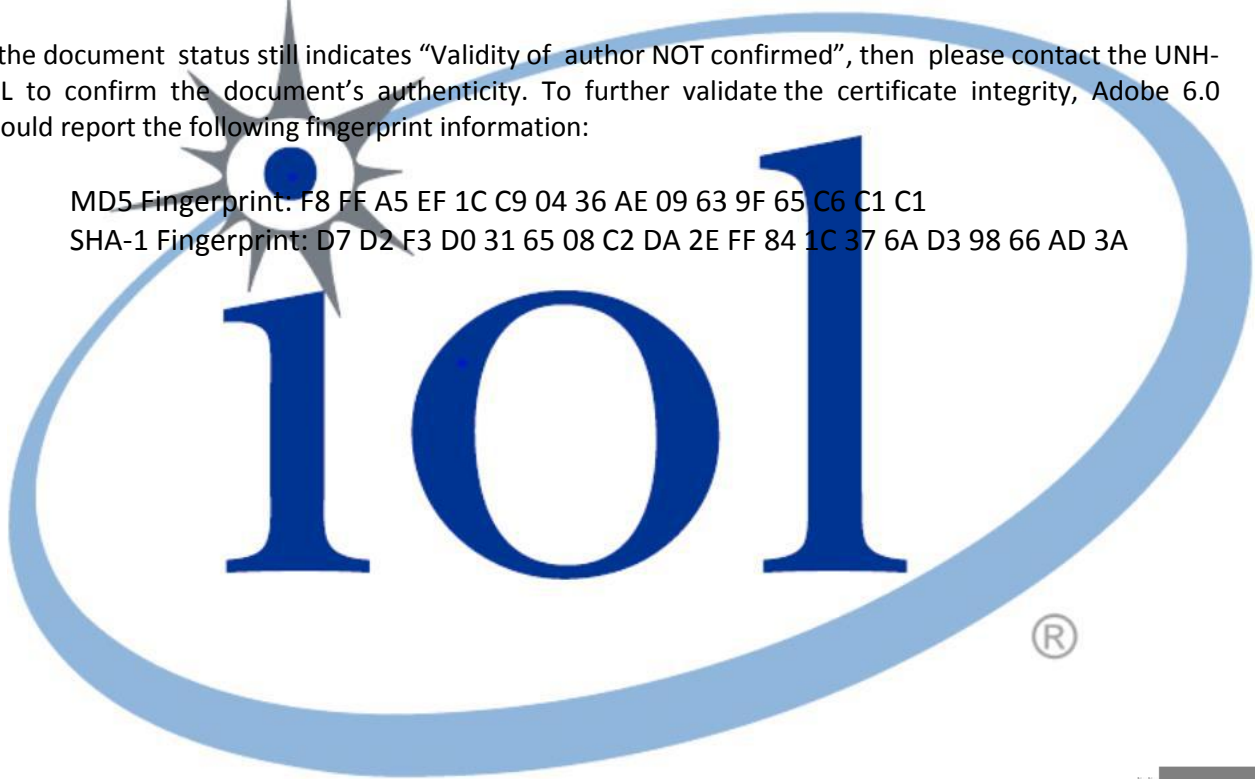
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MD5 Fingerprint: F8 FF A5 EF 1C C9 04 36 AE 09 63 9F 65 C6 C1 C1

SHA-1 Fingerprint: D7 D2 F3 D0 31 65 08 C2 DA 2E FF 84 1C 37 6A D3 98 66 AD 3A



Digitally  
signed by  
UNH-IOL

Date:

2019.03.18

10:11:47 -04'00'

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, an Ostinato was used to generate test traffic:

Test System Hardware	
Ethernet Traffic Generator	10GB Ethernet Adapter Card
Software Version	Ostinato
Port Types	10G SFP, 40G QSFP

The following table contains possible results and their meanings.

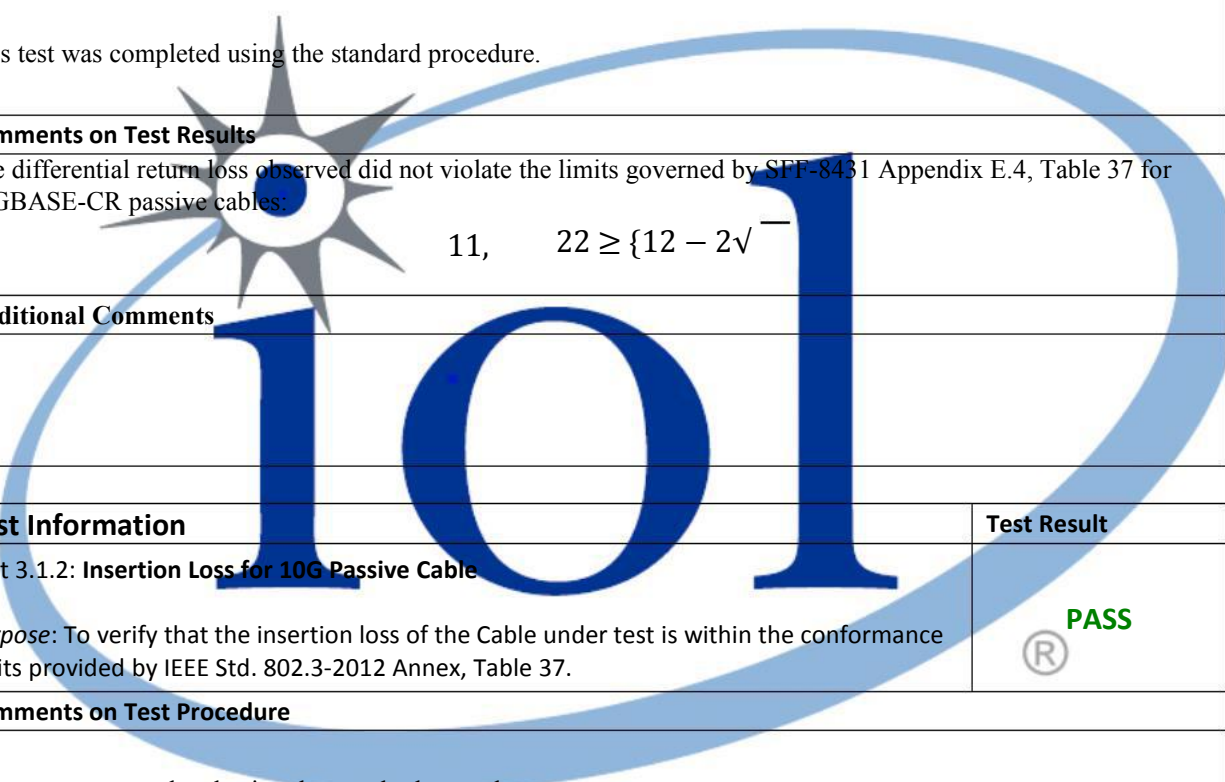
Result	Interpretation
<b>PASS</b>	The Device Under Test (DUT) was observed to exhibit conformant behavior.
<b>PASS W/ Comments</b>	The specified behavior is demonstrated by the DUT; however this result indicates that either changes were made to the standard test procedure or results other than the expected 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	<b>N/A</b>
Test 1.2: Installing and uninstalling a NOS through ONIE via HTTP server	<b>PASS</b>
Test 3.1.1: Return Loss for 10G Passive Cable	<b>PASS</b>
Test 3.1.2: Insertion Loss for 10G Passive Cable	<b>PASS</b>
Test 5.1.1: Output Rise and Fall Times for 100G Host	<b>PASS</b>
Test 5.1.2: Transmitter Eye Mask for 100G Host	<b>PASS</b>
Test 5.1.3: Total Jitter for 100G Host	<b>PASS</b>
Test 5.1.4: Input and Output Return Loss on 100G Host	<b>PASS</b>

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

<b>Notes</b>

Conformance Test Results	
<b>Test Information</b>	<b>Test Result</b>
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.	
<b>Test Information</b>	<b>Test Result</b>
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.	(R) 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>	

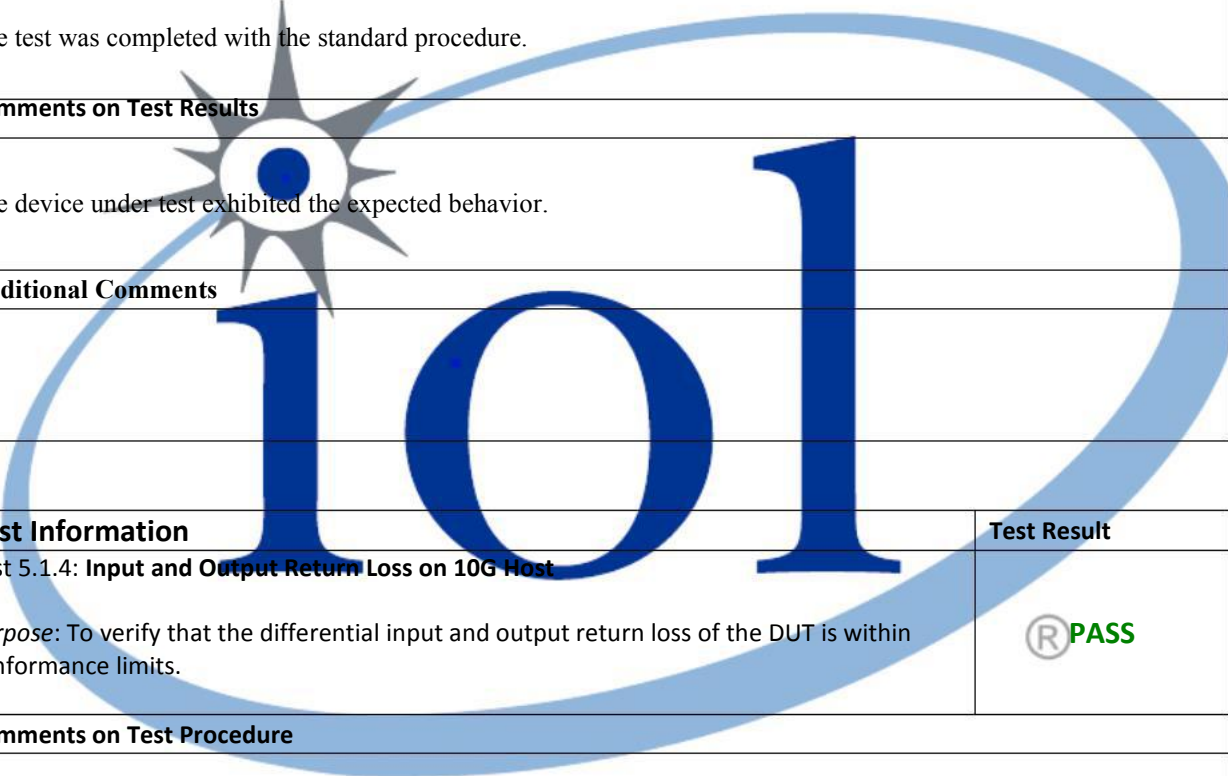

Test Information	Test Result
<p><b>Test 3.1.1: Return loss for 10G Passive Cable</b></p> <p><i>Purpose:</i> To verify that the return loss of the DUT is within the conformance limits provided by SFF-8431 Appendix E, Table 37.</p>	<p><b>PASS</b></p>
<p><b>Comments on Test Procedure</b></p>	
<p>This test was completed using the standard procedure.</p>	
<p><b>Comments on Test Results</b></p>	
<p>The differential return loss observed did not violate the limits governed by SFF-8431 Appendix E.4, Table 37 for 10GBASE-CR passive cables:</p> $11, \quad 22 \geq \{12 - 2\sqrt{\quad}$	
<p><b>Additional Comments</b></p>	
	
Test Information	Test Result
<p><b>Test 3.1.2: Insertion Loss for 10G Passive Cable</b></p> <p><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.</p>	<p><b>PASS</b></p> <p>®</p>
<p><b>Comments on Test Procedure</b></p>	
<p>This test was completed using the standard procedure.</p>	
<p><b>Comments on Test Results</b></p>	
<p>The insertion loss of the cable under test does not violate the requirements passive cable assemblies.</p> $3 \leq 21, \quad 12 \leq 17.04, \quad 5.15625$	
<p><b>Additional Comments</b></p>	



Test Information	Test Result
<p>Test 5.1.1: <b>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>	

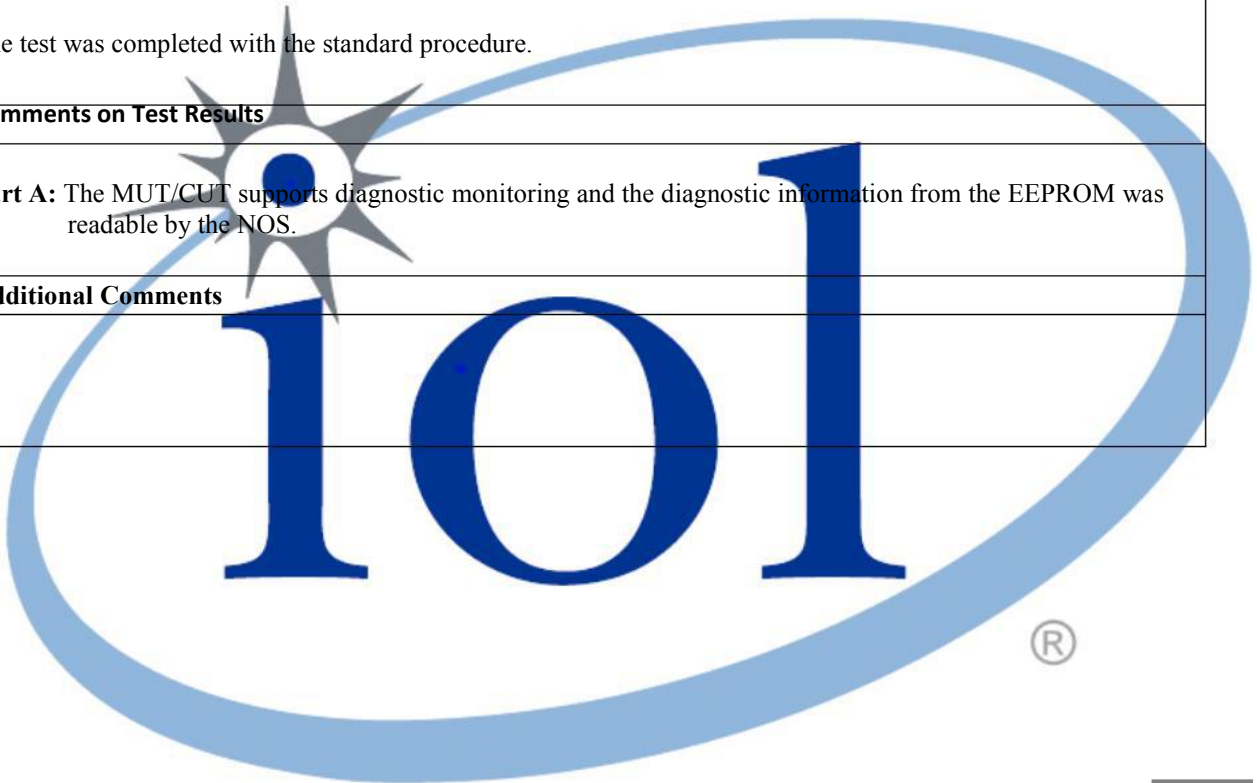
Test Information	Test Result
<p>Test 5.1.2: <b>Transmitter Eye Mask on 10G Host</b></p> <p><i>Purpose:</i> To verify that the Eye Mask Hit Ratio is within the conformance limits.</p>	<p>® <b>PASS</b></p>
<p><b>Comments on Test Procedure</b></p>	
<p>The test was completed with the standard procedure.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



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	

Interoperability Test Results	
Test Information	Test Result
<b>Test 2.1: 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>	
: The MUT/CUT was able to be inserted into the Host. : This test is not applicable to Cable Assemblies. : The MUT/CUT was able to be removed from the Host.	
<b>Additional Comments</b>	
Test Information	Test Result
<b>Test 2.2: 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>
<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><b>Part A:</b> The MUT/CUT supports diagnostic monitoring and the diagnostic information from the EEPROM was readable by the NOS.</p>	
<p><b>Additional Comments</b></p>	



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>	<p><b>PASS</b></p>
<p><b>Comments on Test Procedure</b></p>	
<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>	
<p><b>Comments on Test Results</b></p>	
<p>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>	
<p><b>Additional Comments</b></p>	
Large 'IOI' watermark is present here	
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>	<p><b>PASS</b></p>
<p><b>Comments on Test Procedure</b></p>	
<p>This test was completed using the standard procedure.</p>	
<p><b>Comments on Test Results</b></p>	
<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>	
<p><b>Additional Comments</b></p>	
Empty row for additional comments	

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>	<p><b>PASS</b></p>
<p><b>Comments on Test Procedure</b></p> <p>This test was completed using the standard procedure.</p>	
<p><b>Comments on Test Results</b></p> <p>All 247,000,000 frames transmitted by TS1 were received by TS2.                  All 10,506,539,320 frames transmitted by TS1 were received by TS2.</p>	
<p><b>Additional Comments</b></p>	

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>	<p><b>PASS</b></p>
<p><b>Comments on Test Procedure</b></p> <p>This test was completed using the standard procedure.</p>	
<p><b>Comments on Test Results</b></p> <p><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.</p>	
<p><b>Additional Comments</b></p>	

## Appendix A: EEPROM Data

Port: swp22  
10Gtek SFP/SFP+/SFP28 module  
Part Number: AZS85-S28-M1 Serial Number: WTZSRI80652  
10Gtek\_\_WTZSRI80652\_\_EEPROMdecode\_20180905141116.txt

SERIAL\_ID Keys:  
BR\_MAX: 26000.0  
BR\_MIN: 26000.0  
BR\_NOMINAL: 26000  
CABLE\_SPEC: 0x0 0x0  
CONNECTOR: 7  
DATE\_CODE: 180801  
DIAGNOSTIC\_MONITORING\_TYPE: 104  
ENCODING: 6  
ENHANCED\_OPTIONS: 240  
EXT\_IDENTIFIER: 4  
IDENTIFIER: 3  
LENGTH\_50UM: 0  
LENGTH\_62\_5UM: 0  
LENGTH\_OM3: 70  
LENGTH\_OM4\_OR\_CU: 100  
LENGTH\_SMF: 0  
LENGTH\_SMF\_KM: 0  
OPTIONS: 0x8 0x1a  
RATE\_IDENTIFIER: 0  
SFF\_8472\_COMPLIANCE: 8  
TRANSCIEVER: 0x0 0x0 0x0 0x0 0x0 0x0 0x0 0x0  
TRANSCIEVER\_EXT: 2  
VENDOR\_NAME: 10Gtek  
VENDOR\_OUI: 0x0 0x0 0x0  
VENDOR\_PN: AZS85-S28-M1  
VENDOR\_REV: 01  
VENDOR\_SN: WTZSRI80652  
WAVELENGTH: 850



Vendor Specific: 0x0 0x0 0x2 0x0 0x0 0x0 0x0 0x0 0x0 0x0 0x0 0x0 0x0 0x0 0x0 0x0

I2C Address A0h, bytes 0-127, in hex  
0000x: 03040700 00000000 00000006 ff000000  
0010x: 00000a07 31304774 656b2020 20202020  
0020x: 20202020 02000000 415a5338 352d5332  
0030x: 382d4d31 20202020 30312020 035200b8  
0040x: 081a6800 57545a53 52493830 36353220  
0050x: 20202020 31383038 30312020 68f008f4  
0060x: 00000200 00000000 00000000 00000000  
0070x: 00000000 00000000 00000000 00000000

I2C Address A2h, bytes 0-127, in hex  
0000x: 5500f100 5000f600 88b87918 878c7aa8



0010x: 1d4c01f4 1b5803e8 621f09d0 4df10c5a  
0020x: 621f031a 4df103e8 00000000 00000000  
0030x: 00000000 00000000 00000000 00000000  
0040x: 00000000 3f800000 00000000 01000000  
0050x: 01000000 01000000 01000000 000000d6  
0060x: 19138242 0dac29f9 1f8d0000 00000000  
0070x: 00003000 00000000 00000000 00000000  
All Keys:

BIAS\_HIGH\_ALARM: 15.0  
BIAS\_HIGH\_WARN: 14.0  
BIAS\_LOW\_ALARM: 1.0  
BIAS\_LOW\_WARN: 2.0  
BR\_MAX: 26000.0  
BR\_MIN: 26000.0  
BR\_NOMINAL: 26000  
CABLE\_SPEC: 0x0 0x0  
CONNECTOR: 7  
DATA\_READY\_BAR\_STATE: 0  
DATE\_CODE: 180801  
DIAGNOSTIC\_MONITORING\_TYPE: 104  
ENCODING: 6  
ENHANCED\_OPTIONS: 240  
EXT\_IDENTIFIER: 4  
IDENTIFIER: 3  
LENGTH\_50UM: 0  
LENGTH\_62\_5UM: 0  
LENGTH\_OM3: 70  
LENGTH\_OM4\_OR\_CU: 100  
LENGTH\_SMF: 0  
LENGTH\_SMF\_KM: 0  
L\_ALARM\_WARN: 0x0 0x0 0x30 0x0 0x0 0x0  
L\_BIAS\_ALARM: 0  
L\_BIAS\_WARN: 0  
L\_RX\_POWER\_ALARM: 0  
L\_RX\_POWER\_WARN: 0  
L\_TEMP\_ALARM: 0  
L\_TEMP\_WARN: 0  
L\_TX\_POWER\_ALARM: 0  
L\_TX\_POWER\_WARN: 0  
L\_VCC\_ALARM: 0  
L\_VCC\_WARN: 0  
OPTIONS: 0x8 0x1a  
OPT\_LASER\_TEMP: 0.0  
OPT\_TEC: 0.0  
RATE\_IDENTIFIER: 0  
RATE\_SELECT\_STATE: 0  
RS\_1\_STATE: 0  
RX\_LOS\_STATE: 0  
RX\_POWER: 0.8079  
RX\_POWER\_DBM: -0.926423918688  
RX\_POWER\_HIGH\_ALARM: 4.00002345928





RX\_POWER\_HIGH\_WARN: 3.00008202554  
RX\_POWER\_LOW\_ALARM: -11.0017949757  
RX\_POWER\_LOW\_WARN: -10.0  
SFF\_8472\_COMPLIANCE: 8  
SOFT\_RATE\_SELECT: 0  
SOFT\_TX\_DISABLE\_SELECT: 0  
STATUS\_CONTROL: 0  
TEMPERATURE: 24.8671875  
TEMP\_HIGH\_ALARM: 85.0  
TEMP\_HIGH\_WARN: 80.0  
TEMP\_LOW\_ALARM: -15.0  
TEMP\_LOW\_WARN: -10.0  
TRANSCEIVER: 0x0 0x0 0x0 0x0 0x0 0x0 0x0 0x0  
TRANSCEIVER\_EXT: 2  
TX\_BIAS: 7.0  
TX\_DISABLE\_STATE: 0  
TX\_FAULT\_STATE: 0  
TX\_POWER: 1.0745  
TX\_POWER\_DBM: 0.312064198275  
TX\_POWER\_HIGH\_ALARM: 4.00002345928  
TX\_POWER\_HIGH\_WARN: 3.00008202554  
TX\_POWER\_LOW\_ALARM: -5.99980364935  
TX\_POWER\_LOW\_WARN: -5.00038134404  
VCC: 3.3334  
VENDOR\_NAME: 10Gtek  
VENDOR\_OUI: 0x0 0x0 0x0  
VENDOR\_PN: AZS85-S28-M1  
VENDOR\_REV: 01  
VENDOR\_SN: WTZSRI80652  
VENDOR\_SPECIFIC\_96: 0x0 0x0 0x2 0x0 0x0 0x0 0x0 0x0 0x0 0x0 0x0 0x0 0x0 0x0 0x0  
VOLTAGE\_HIGH\_ALARM: 3.5  
VOLTAGE\_HIGH\_WARN: 3.47  
VOLTAGE\_LOW\_ALARM: 3.1  
VOLTAGE\_LOW\_WARN: 3.14  
WAVELENGTH: 850

The logo for 10Gtek is prominently displayed in the center of the page. It features the text '10Gtek' in a large, blue, serif font. The '10' is significantly larger than the 'Gtek'. To the left of the '10' is a stylized sun icon with rays. A large, light blue, curved swoosh or underline is positioned below the '10Gtek' text, extending from the left side of the page towards the right. A registered trademark symbol (®) is located to the right of the swoosh.

## 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

