Viavi T-BERD 5800 RFC-2544 Ethernet Layer 2 Testing Guide



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Scope

This document describes how to measure Layer 2 Metro Ethernet performance with the T-BERD 5800v2 or T-BERD 5800-100G in accordance with Viavi's Enhanced RFC 2544 test methodology. RFC-2544 is a recommended test suite for verifying key performance indicators (KPIs) including Throughput, Delay and Frame Loss. Viavi's Enhanced RFC 2544 Test Suite also measures Jitter and Committed Burst Size (CBS) to verify conformance to a Service Level Agreement (SLA) or Service Level Objectives. This document is not intended to be a user guide. This Method of Procedure (MOP) should be used in conjunction with the T-BERD User's Guides for detailed explanation of all testing options.

The following procedures are documented:

- Setting up the T-BERD up as a Layer 2 Loopback device (Section 2)
- Running a Layer 2 RFC-2544 tests from the T-BERD (Section 3)

The Loopback device may be another Viavi test set (SmartClass, HST-3000 or T-BERD), a Viavi Test Head (QT-600), a Viavi-compatible NID, a Viavi JMEP loopable SFP, or an ALU 7705 Service Aggregation Router configured for IEEE 802.1ag Connectivity Fault Management (CFM) loopback. Fiber Loopback Cables (Hard Loops) may only be used if there is no Layer 2 switching equipment on the link.





The following minimum software revision is recommended:

- T-BERD 5800-100G BERT Software Release 25.0
- T-BERD 5800v2 BERT Software Release 25.1

If your T-BERD is Strata Sync enabled, use StrataSync to update your software. Otherwise, go to <u>http://updatemyunit.net/</u> for software update instructions. StrataSync can also be used to create configuration templates and download configuration files for this procedure.

1. Hardware Description

The T-BERD 5800 is a portable test tool for Ethernet testing. The product can also be optioned to support T1, DS3, SONET, OTN, Fiber Channel, CPRI, and OBSAI. Test connections are made from the top of the mainframe. Menu selections are made from the color touch screen. The T-BERD 5800v2 uses RJ-45 ports, labeled **10/100/1000** for copper testing (10/100/1000BASE-T) and SFP+ ports for optical testing:



Figure 4: T-BERD 5800v2 Top View (dual port configuration)

The T-BERD 5800-100G uses the SFP+ port for both copper and optical testing. The RJ-45 10/100/1000 port is only used for dual port testing and requires option C5DUALPORT:







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Technical Support

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2. T-BERD 5800 Remote Unit setup

Follow this procedure to set up a T-BERD as a layer 2 loopback device.

2.1 Information requirements

The following information is required to set up the T-BERD as a loopback device. This information should be included in the Work Order:

- Physical Interface (10/100/1000BASE-T, 100BASE-FX, 1000BASE-SX, 1000BASE-LX, 10GBASE-LR, 40GBASE-SR4, 100GBASE-LR4, etc.)
- Auto Negotiation settings of the port under test.

2.2 Test Setup

Step	Action	Details
1.	Power On	Press and hold the ON/OFF button to turn on the T-BERD. For copper testing with the T-BERD 5800v2, connect the Port 1 10/100/1000 RJ-45 jack to the port under test using CAT 5E or better cable, and proceed to step 5. For optical testing, or for copper testing on the T-BERD 5800-100G, proceed to step 2.
2.	Insert SFP	Insert desired Copper SFP, Optical SFP, QSFP, or CFP4 into the Port 1 slot on the top of the T-BERD.
3.	Clean & Inspect	Ensure the fiber and connectors are clean using a Fiber Inspection probe.
4.	Connect	 Connect the SFP, QSFP, or CFP4 to the port under test. Use orange or aqua Multimode jumper cables for 850 nm 1000BASE-SX or 10GBASE-SR. Use yellow or dark blue Single Mode Fiber jumper cables for 1310 nm 1000BASE-LX, 10GBASE-LR, 40GBASE-LR4, or 100GBASE-LR4. Use CAT 5E or better cable for copper 10/100/1000BASE-TX connections. Use 12-fiber MPO trunk cables for 40GBASE-SR4. Use 24-fiber MPO trunk cables for 100GBASE-SR10.



5. Load Test

If a shortcut for this test is stored on the T-BERD, use the Test List to launch the test. Proceed to step 8.

🥸 System 🔛	Tests 😽 Fiber Optics		nc 🗢 📚 📣 🔒 🏅	1:50 AM
Select Test ~ Port 1: 1	0/100/1000 Eth Layer 3 Ping Term 🗙 🚺 🕂			
SONET SDH Ethernet OTN	→ 10/100/1000 Eth Layer → 1GigE Layer 2 Traffic L	2 Loopback		
 Load Test Save Test As 	 10GigE LAN Layer 2 Traffi 100GigE Layer 2 Traffi 	affic Loopback c Loopback		
Add Test	10/100/1000 L2 Traffic 1GigE L2 Traffic SAMCo 10GigE LAN L2 Traffic :	SAMComplete omplete SAMComplete		
	 100GigE L2 Traffic SAN 10/100/1000 L2 Stream 1GigE L2 Streams SAM 	IComplete ns SAMComplete Complete		
	K Hide Menu	Customize	S Ch	ose

- 6. All Test If the Select Test menu is hidden, tap to display the menu.
- 7. Select Test In the Select Test menu, select **Test**, at the top left corner of the screen, choose one of the following:
 - For 10BASE-T, 100BASE-T, or 1000BASE-T Electrical Ethernet testing: Ethernet ▶ 10/100/1000 ▶ Layer 2 Traffic ▶ Terminate or Ethernet ▶ 10/100/1000 ▶ Layer 2 Traffic ▶ P1 Terminate.
 - For 100BASE-FX Optical Fast Ethernet testing: Ethernet ► 100M Optical ► Layer 2 Traffic ► Terminate or Ethernet ► 100M Optical ► Layer 2 Traffic ► P1 Terminate.
 - For 1000BASE-SR, 1000BASE-LR, or other GigE Optical Testing: Ethernet ▶ 1GigE Optical ▶ Layer 2 Traffic ▶ Terminate or Ethernet ▶ 1GigE Optical ▶ Layer 2 Traffic ▶ P1 Terminate.
 - For 10GBASE-SR, 10GBASE-LR, other 10GigE Optical Testing: Ethernet ▶ 10GigE LAN ▶ Layer 2 Traffic ▶ Terminate or Ethernet ▶ 10GigE LAN ▶ Layer 2 Traffic ▶ P1 Terminate.
 - For 40GBASE-SR4, 40GBASE-LR4, other 40GigE Optical Testing: Ethernet ▶ 40GigE ▶ Layer 2 Traffic ▶ Terminate or Ethernet ▶ 40GigE ▶ Layer 2 Traffic ▶ P1 Terminate.
 - For 1000GBASE-SR4, 40GBASE-LR4, other 40GigE Optical Testing: Ethernet ▶ 100GigE ▶ Layer 2 Traffic ▶ Terminate or Ethernet ▶ 100GigE ▶ Layer 2 Traffic ▶ P1 Terminate.



8. Reset Test to Defaults In the **Tools Panel**, **Tools**, select **Reset Test to Defaults**. Press **Yok** to continue.



9. Auto Negotiation For 10/100/1000 Electrical and 1GigE Optical tests, select the Ethernet tab of the Quick Config and set Auto Neg. to the same value as the Ethernet port

under test.			
😻 System 🔛 Tests 🕨	<mark>∗</mark> Fiber Optics	nc 🛷 🕯	🔊 📣) 😵 惧 9:24 PM
Select - Port 1: 1GigE Layer	2 Traffic Term 🗙 🛑 🕂		
Running 32s	Ethernet Payload LBM/LTM J-Conne	ct	Setup
No messages	On 🛊 Triffic 🗢 512 🗢		
Level (döm) —	Auto Neg. Test Mode Frame Size		Ú
Freq Dev (ppm) —	Summary 🗘 Status 🗘	Summary \$ SLA / KPI	estart.
Summary	Signal Present OFF	Throughput, Current 🖃	
d Cignal Present		Rx Mbps, L1	Unavailable
🖷 🖶 Sync Acquired	Signal Loss Seconds 32	Tx Mbps, L1	0.00 Stop
Eink Active		Rx Mbps, L2	Unavailable
ATP Detect		Tx Mbps, L2	0.00
🖶 🌑 Pattern Sync		Frame Loss - FLR 🖃	
SVI AN Frame Detect		Lost Frames	Unavailable Complete
Stacked VLAN Detect		Prime Loss Rabo	Unavailable
History		Auerage	Unavailable TT/t
Time Source		Current	Unavailable
IDD Sync		Maximum	Unavailable RFC2544
History		Packet litter - FDV (us)	
		Average	Unavailable
	•	* 6 6	QuickCheck
	Laser Actions Service Disruption Erro	ors OAM Capture	
	Laser Internal +1 +1	-10 +10	and the second second
Reports Tools View Help	Off Cock Source Freq Off	set (ppm)	

10. Turn Laser On

For 1GigE, 10GigE, 40GigE, or 100GigE Optical tests, select the Laser tab

in the **Actions panel**, and press diff. The button will turn yellow and be

elabeled	On					
Laser	Actions	Service Disruption	Alarms	Errors	Faults	Capture
QSFP 😫	Laser	Internal 🗘	-1	+1	-10	+10
Connector	On	On Clock Source	Freq Offset (ppm)			



11. Restart Test

Press the **Restart** Soft Key, Restart, on the right side of the screen.



12. Check LEDs	A green Signal Present LED • indicates the T-BERD is receiving an optical signal from the Ethernet port under test. Green Sync Acquired and Link Active LEDs indicate that the T-BERD has successfully connected to the port under test and the link is active.	Summary Ethernet Signal Present Sync Acquired Link Active
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The T-BERD is ready to be looped.

Press the Setup Soft Key,



and select the **Ethernet** menu.

13. Setup

Tap to display the Default Source MAC Address of your T-BERD. Provide this address to the operator of the Y.1564 Traffic Generator, upon request.



14. Results

Press the Results Soft Key,

, to view the progress of the test.



Results



3. T-BERD 5800 RFC-2544 Test Procedure

Follow this procedure to set up a T-BERD to run the Enhanced RFC 2544 Test.

3.1 Information requirements

The following information is required to set the T-BERD up to run the RFC 2544 Test. This information should be included in the Work Order:

- Physical Interface (10/100/1000BASE-T, 1000BASE-SX, 1000BASE-LX, 10GBASE-LR, 40GBASE-SR4, 100GBASE-LR4, etc.)
- Type of Loopback Device (T-BERD, HST-3000, QT-600, JMEP, NID, ALU 7705, etc.)
- Destination MAC for for ALU 7705 CFM Loopback
- Maintenance Domain Level for ALU 7705 CFM Loopback
- VLAN ID, if VLAN tagging is used.
- Maximum Transmission Unit (MTU)
- Committed Information Rate (CIR)
- Committed Burst Size (CBS)
- Pass/Fail Threshold for Throughput, Frame Loss, Latency and Jitter

3.2 Test Setup

Step	Action	Details	
1.	Power On	Press and hold the ON/OFF button to turn on the T-BERD. For copper testing with the T-BERD 5800v2, connect the Port 1 10/100/1000 RJ-45 jac to the port under test using CAT 5E or better cable, and proceed to step 5. For optical testing, or for copper testing on the T-BERD 5800-100G, proceed to step 2.	
2.	Insert Transceiver	Insert desired copper SFP, optical SFP, QSFP, or CFP4 into the Port 1 slot on the top of the T- BERD.	
3.	Clean & Inspect	Ensure the fiber and connectors are clean using a Fiber Inspection probe.	
4.	Connect	 Connect the SFP, QSFP, or CFP4 to the port under test. Use orange or aqua Multimode jumper cables for 850 nm 1000BASE-SX or 10GBASE-SR. Use yellow or dark blue Single Mode Fiber jumper cables for 1310 nm 1000BASE-LX, 10GBASE-LR, 40GBASE-LR4, or 100GBASE-LR4. Use CAT 5E or better cable for copper 10/100/1000BASE-TX connections. Use 12-fiber MPO trunk cables for 40GBASE-SR4. Use 24 fiber MPO trunk cables for 100GBASE SP10 	



5. Load Test

If a shortcut for this test is stored on the T-BERD, use the Test List to launch the test. Proceed to Section 3.3.

🧿 System 🔛	fests 😽 Fiber Optics		🚾 춡 🖘 🚯 😵 🖺 6:27 PM
Select - Port 1: 10	GigE LAN Layer 2 Traffic Term 🗙 👘 🕂		
DS1/DS3 > E1/E3/E4 >	10/100/1000 Layer 2 Loop	back	1
SONET > SDH >	1GigE Optical Layer 2 Loop	oback	
Ethernet + Fibre Channel +	10GigE Optical Layer 2 Loc	opback	
	/111 10/100/1000 L2 Traffic RF0	2544	
OTN .	Am 1GigE L2 Traffic RFC 2544		
Optical BERT	And 10Gige LAN L2 Traffic RFC	2544	
Load Test	10/100/1000 Eth Layer 3 Pi	ing	
Save Test As	Gige Optical Layer 3 Ping		
Add Test		g	
		haan2ainT haan	
	K Hide Menu	Customize	S Close

- 6. All Test If the Select Test menu is hidden, tap to display the menu.
- 7. Select Test In the Select Test menu, select \vec{T} , at the top left corner of the screen, choose one of the following:
 - For 10BASE-T, 100BASE-T, or 1000BASE-T Electrical Ethernet testing: Ethernet > 10/100/1000 > RFC 2544 > L2 Traffic > Terminate or Ethernet > 10/100/1000 > RFC 2544 > L2 Traffic > P1 Terminate.
 - For 100BASE-FX Optical Fast Ethernet testing: Ethernet ▶ 100M Optical ▶ RFC 2544 ▶ L2 Traffic ▶ Terminate or Ethernet ▶ 100M Optical ▶ RFC 2544 ▶ L2 Traffic ▶ P1 Terminate.
 - For 1000BASE-SR, 1000BASE-LR, or other GigE Optical Testing: Ethernet ▶ 1GigE Optical ▶ RFC 2544 ▶ L2 Traffic ▶ Terminate or Ethernet ▶ 1GigE Optical ▶ RFC 2544 ▶ L2 Traffic ▶ P1 Terminate.
 - For 10GBASE-SR, 10GBASE-LR, or other 10GigE Optical Testing: Ethernet ▶ 10GigE LAN ▶ RFC 2544 ▶ L2 Traffic ▶ Terminate or Ethernet ▶ 10GigE LAN ▶ RFC 2544 ▶ L2 Traffic ▶ P1 Terminate.
 - For 40GBASE-SR4, 40GBASE-LR4, or other 40GigE Optical Testing: Ethernet ▶ 40GigE ▶ RFC 2544 ▶ L2 Traffic ▶ Terminate or Ethernet ▶ 40GigE ▶ RFC 2544 ▶ L2 Traffic ▶ P1 Terminate.
 - For 100GBASE-SR10, 100GBASE-LR4, or other 100GigE Testing: Ethernet ▶ 10GigE ▶ RFC 2544 ▶ L2 Traffic ▶ Terminate or Ethernet ▶ 10GigE ▶ RFC 2544 ▶ L2 Traffic ▶ P1 Terminate.



3.3 Configuring RFC-2544 Test Settings

The RFC-2544 workflow consists of a series of screen that allow the user to configure the test, run the test, and generate a report.



Figure 6: RFC-2544 GUI

Step	Action	Details	
1.	Configure	If this is the first time using the RFC 2544 test and your unit does r	not have
		pre-loaded configuration files, tap the 💁 button next to "Sta	art a Ne
		Configuration (reset to defaults) " and proceed to step 2.	
		Start a New Configuration (reset to defaults)	➡
		Otherwise, tap the 60 button next to " Load Configuration f Profile "	from a
		Load Configuration from a Profile Go	-
		Select the desired configuration, and tap Tap the next to acknowledge successful load.	
		Tap the button.	
		Tap the button next to Edit Configuration.	
		Edit Configuration Go	



2. Setup Use the Next A and Back buttons at the bottom of the screen to advance through the wizard and configure the settings as follows:

Screen	Option	Value(s)	Comment
Connect:	Throughput	Symmetric	
Symmetry	Measurements	Loopback	
	Frame Type	DIX	
	Encapsulation	See Work Order	None or VLAN
	Test Mode	Traffic or LBM Traffic	Select "LBM Traffic" if the loopback device is an ALU 7705. Select "Traffic" for all other loopback devices.
Network: L2 Network	VLAN ID	See Work Order	Option only displayed if Encapsulation = VLAN
Settings -	User Priority	0 (lowest)	
Local	Source Type	Factory Default	
	Destination MAC	See Work Order. Enter MAC address of the ALU 7705	IT Test Mode = LBM Traffic, Tap the Set MAC Addresses, EtherType, and LBM link
	Maint. Domain Level (MDL)	See Work Order. Enter MDL of the ALU 7705	Back button to return (see below).
	Enable Sender TLV	No (unchecked)	Otherwise leave at defaults.
RFC 2544 Tests: Configuration Templates	Do you want to use a configuration template?	No	
REC 2544		✓ Throughput,	
Tests: Select	RCF 2544 Tests	✓ Latency,	
Tests		Frame Loss	
DEC 2544	Randwidth Unit	Packet Jiller	
Tests:	Dandwidth Onit	LI WOPS	
Utilization	Maximum Bandwidth	See Work Order	Enter Committed Information Rate (CIR)
RFC 2544 Tests: Frame Lengths	Frame Lengths	 Select 1st, 4th, and 8th Frame Lengths. If the MTU is greater than 1518 (1522 with VLAN), also enter and select the frame length of the MTU. Deselect (uncheck) all other frame sizes. 	2 68 132 280 2 316 772 1028 1284 11284 1522 1600 2 2000
RFC 2544	Zero-in Process	Viavi Enhanced	
Tests: Throughput	Measurement Accuracy	To within 1 Mbps	
Throughput	Test Procedure	RFC 2544 Standard	
RFC 2544 Tests: Frame Loss Test	Bandwidth Granularity (L1Mbps)	Enter minimum value: • 1 for 100Mbps Ethernet • 10 for Gigabit Ethernet • 100 for 10GigE • 400 for 40GiE • 1000 for 100GigE	
Test Ctls: Test Durations	Configure test durations separately?	No	
	Duration	120 seconds	This will result in approximately 6
	Number of Trials	1	minutes of test time per frame length.
	Show Pass/Fail	Select all (✓)	
	Throughput Threshold	See Work Order	Enter CIR
Test Ctls:	Throughput Frame Loss Tolerance (%)	See Work Order	Enter 0.0000 if not specified
Test	Latency RTD (µs)	See Work Order	Enter threshold in µsecs
Thresholds	Packet Jitter (µs)	See Work Order	(1 msec = 1000 μsec). Uncheck the Show Pass/Fail box if a threshold is not specified.
	Acterna Payload Version	Version 3	



3. Save Profile If you wish to save this configuration as a new profile, enter a File Name and tap with in the Save Profiles screen.



3.4 Running the Test

Step	Action	Details	
1.	QuickCheck	Ensure that the loopback device has been setup, and tap J- QuickCheck to verify local connectivity, loop up the remote lo device, and check available bandwidth.	to run oopback
		System Fiber Optics Image: Content of the content of	12:03 PM e1/08/2017 r 2. Traffic Term o To
		Press "Start" to run at line rate. Measured Throughput will NOT be used for RFC 2544 tests. Load Test frame size: 256 bytes. Not what you wanted?	\supset
		Local Port: Remote Loop: Measured Thro	ughput:

Auto Negotiation

Exit

+

Next

-

2. Run Tests Tap Next, and tap Test. The T-BERD will loop up the loopback device and run all configured tests.

😇 System 🔛 T	ests 🏾 😽 Fiber Optics		nc 🗢 🛜 📣 😵 🦺 1205
RFC 2544			Port 1: 1GigE Layer 2 Traffic Ter
Run RFC	2544 Tests		Go To
	Not Running		
	RFC 2544 Test	ts	
	Throughput		Run Test
	Latency		
	Packet Jitter		
	Frame Loss		Pass
			Fal
			Complete
			Running
			Scheduled
Exit		•	Skip RFC 2544 Tests 🛌
		I-DuickCheck: Run I-DuickCheck	End: Test

System 🔛 Test	ts 🏾 😽 Fiber Optic	5	05	🗢 🛜 🐠 😵 鵳 1:13 PM		
RFC 2544 Bun RFC 2544 Tests			20	Port 1: 1GigE Layer 2 Traffic Term		
	Pass	Test Complete		Go To		
	RFC 2	544 Tests				
	Throughput		P	Run Test		
	Latency Packet litte		공 관 관 :	2 -]		
	Frame Loss			Pass		
*				Fail Complete		
				Running		
			5	Scheduled		
Exit			A Next	•		
		-QuickCheck:	Run J-Quick Check End: Test			

3.5 Saving Test Results

Ste	ep Action	Details
1.	Create Report	Tap Next twice and enter Customer name, Technician ID, Test
		Location, Work Order Number and Comments/Notes.
		Tap Next again and tap
2.	View Report	View the Report and tap Exit .
	-	<u>₩</u> mts5800:0
		System 🔛 Tests 🗾
		RFC_2544-2014-06-17T17.30.48.pdf
		Generated by JDSU 5800 MSAM
		Ennanced RFC 2544 Test
		O verall T est R esult: Pass
		Throughput P
		Latency P
		Darbet littar O Original e
3.	Exit	Tap to shut down the RFC 2544 test.
4	Connect USB	Connect the USB Flash Drive to the USB port on the side of the T-BERD
5.	Export Report	In the Reports Panel , knows , select select report, select the desired file, and
		tap Export . Tap Close when export is complete.
		System Tests Fiber Optics DE TO
		Running 43s Ethernet Payload LBM/LTM J-Connect
		I message On Traffic 256 Auto Nep lest Mode FrameSize
		Img Ber (ppm) 0.0 Summary Status Summary SLA / KPI
		Create Report Acterna Test Packet Detect OFF Throughput, Current Rx Mbps, L1 Unavailable XXXX Mbps, L1 Unavailable XXXXX
		Rx Mbps, L2 Unavailable Tx Mbps, L2 0.00
		Frame Loss - FLR - Loss - FLR - Loss Frames Unavailable 944
		C Automatic Report
		Average Unavailable Tenamed
		Packet jitter - FDV (us) E
		Average Unavailable Control of the C
		Laser Actions Service Disruption Errors OAM Capture
		Reports View Hep
6.	Shutdown	Press and hold the ON/OFF button to turn off the T-BERD. Remove the
		USB Flash Drive from the USB port.