QUICK CARD

Ethernet Layer 2 Traffic Generation

This document outlines how to configure and run an Ethernet Bit Error Rate Test (BERT). Bit Error Rate Testing is only recommended when testing head-to-head with another T-BERD/MTS, or when testing to a hard loop on a Layer 1 Transport Network.

- T-BERD/MTS 5800 equipped with the following:
 - Transport software release V31.2.1 or greater
 - C510M1GE test option for 10 Megabit to 1 Gigabit Ethernet
 - C510GELAN test option for 10 Gigabit Ethernet
 - o C525GE test option for 25 Gigabit Ethernet
 - o C540GE test option for 40 Gigabit Ethernet
 - o C550GE test option for 50 Gigabit Ethernet
 - C5100GE test option for 100 Gigabit Ethernet
- Optical Transceiver supporting the line rate to be tested (SFP or QSFP)
- Cables to match the optical transceiver and the line under test
- Fiber optic inspection microscope (P5000i or FiberChek Probe)
- Fiber optic cleaning supplies

LAUNCH TEST

- Press the Power button to turn on the T-BERD.
- 2. Tap the **Test** icon **Test** at the top of the screen to display the **Launch Screen**.
- Using the Select Test menu, Quick Launch menu, or Job Manager, launch the Ethernet Layer 2 Traffic test on Port 1 for the desired data rate. For example:

Ethernet ► 1GigE Optical ► Layer 2 Traffic ► P1 Terminate.

Tap to open the **Tools** Panel and select **Reset Test to Defaults**.
 Tap **Y** or to continue.

System	Test	😴 Fiber Optics	🚾 🕩 🔒	9:05 P
lect v P1: est	OC-192 STS-	192c Bulk BERT Term 🗙 🕂 Timing Source	What's This?	10
IVESTANDEST 1/E3/E4 ONET DH thernet ibre Channel PRI DBSAI DTN 37.94 BERT iming		 10/100/1000 Eth Layer 2 Traffic Term 10/100/1000 L2 Streams SAMComplete 10/100/1000 L2 Traffic RFC 2544 10/100/1000 L4 TCP Wirespeed RFC 6349 TrueSpe 1GigE Layer 2 Traffic Term 1GigE L2 Streams SAMComplete 		
1000 T	11	1GigE L2 Traffic RFC 2544		





Figure 1: Equipment Requirements





T-BERD/MTS 5800 Portable Network Tester



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CONFIGURE TEST

- The following Information is needed to configure the test:
 - Physical Interface (10/100/1000BASE-T, 1000BASE-LX, 10GBASE-LR, 100GBASE-LR4, etc.)
 - Auto Negotiation settings of the port under test.
 - Bit Error Rate Threshold
- ► For 10/100/1000 Electrical tests:
 - Tap the Ethernet tab of the Quick Configuration menu and set Auto Neg. to the same value as the Ethernet port under test (On or Off).
 - 2. Tap the **Setup** soft key con the top right side of the screen and proceed to page 3.
- ► For Optical Interfaces:
 - 1. Tap the **Setup** soft key and the top right side of the screen.
 - 2. Select the Interface/Connector folder.
 - Insert desired optical transceiver into the Port 1 SFP or QSFP slot on the top of the T-BERD/MTS.
 - 4. Review SFP information:
 - Verify that the SFP operates on the required wavelength (850nm, 1310nm or 1550nm).
 - Verify that the SFP supports the required data rate (1G, 10G LAN, etc).
 - Note the Min and Max Tx Levels (dBm) and Max Rx Level (dBm) to assess if optical attenuators are required.



Figure 4: Work Order

System 🔛 Test	🔆 Fiber Optics			<u>v</u> e 🔊 [9:44 PM
Select Test ~ Port 1: 10/100/1000	Eth Layer 2 Traffic Term 🗙	+ Timing	Source	What's This?	
Running 5s No messages	Ethernet Payload On Charles France Control Con	LBM/LTM J-Conr 512 Frame Size	ect		Setup
Ethernet	Summary 🗘 St	tatus	Summary 🗘	SLA / KPI 🗘	Restart
 Sync Acquired Link Active Frame Detect APD Detect Hold Mana Detect Hold Mana Detect Stackel data Ni Detect History Time Source History 	Acterna Test Packet Detect Sync Loss Seconds Link Loss Seconds	o	Throughput, Current Rx Mbps, L1 Tx Mbps, L1 Tx Mbps, L2 Tx Mbps, L2 Frame Loss FLR Lost Frame Lost Frame Lost Frame Round Trip Delay - FD (us) E Average Current Maximum Packet jitter - FDV (us) E Average	0.00 0.00 0.00 Unavailable Unavailable Unavailable Unavailable Unavailable	Step Test SAMI Complete Enhanced RFC 2544
	Actions Tx Signal	Peak IFG Errors	Max Avarana	Unavailable	QuickCheck Toolkit
Reports Tools View Help	Start Traffic Up	Loop Down LLB	Pause Frame Insert		

Figure 5: Quick Config, Auto Neg.

Select Y P1: OC-192 ST	S-192c Bulk BERT Term 🗙 🚺	+ Timing So	urce	What's This?	
	Connector Signal				
ONET	Ontical Connector				
attern	Optical connector				
ervice Disruption	SFP SFP Expert				
erformance	Wavelength (nm)	1310.00			
imed Test	Recommended Rates		SONET/SDH OC-192 Ethernet 10G LA Fibre Channel 8G, 100 OTN OTU2 1 OTU2 1	/STM-64 V/WAN 6 0.7G, OTU1e 11.05G 11.1G	
	Vendor Vendor PN Vendor SN Vendor Rev	FINISAR CORP. FTLX1472M3BCL AXP0EW4 A	Nominal Rate (Mbits/sec) Min Rate (Mbits/sec) Max Rate (Mbits/sec) Power Level Type	10,300 Average Power	
	Min Rx Level (dBm) Min Tx Level (dBm)	-16.9897 -7.9997	 Max Rx Level (dBm) Max Tx Level (dBm) 	0.4999 0.9999	
	Diagnostic Monitoring Module ID	1 SFP	Diagnostic Byte	104	eh le

Figure 6: Setup, Interface/Connector



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CONFIGURE TEST (CONTINUED)

- ► Select the **Ethernet** settings tab.
 - If you are testing to a hard loop, proceed to step 2. If you are testing head-to-head with another T-BERD/MTS:
 - Tap the SA field to display the Factory Default Source MAC Address of your T-BERD/MTS. Provide this address to the operator of the other T-BERD/MTS, upon request.
 - Tap the DA field and enter the Source Address (SA) of the farend T-BERD/MTS in the Destination MAC field.
 - 2. Tap the **Data** field and set **Acterna Payload** to **BERT**.
- Select the Traffic settings tab. Set Load Unit to Bit Rate and set Load to the desired traffic rate or Committed Information Rate (CIR).
- Select the Interface setting tab and Physical Layer folder.
 - 1. Tap the check box to Enable Error Rate Threshold.
 - 2. Set Payload Bit Error Rate Threshold to desired value.
- Tap the **Results** soft key

Select ~ Port 1: 100	SigE LAN Layer 2 Traffic	Term 🗙 📃 🚽		Timing Source	What's This?	10
Interface	Encapsulation	None		Test Mode	Traffic	
Ethernet	Frame Type	DIX			half-based	
name						
Capture	Frame Size (Bytes)	512	•	1		
Filters	DA	SA		Туре	Data	FCS
Service Disruption	Dection Tree	Unionst		Incom Terro	Decederat	_
Timed Test	Destination type	Unicast		соор туре	Broadcast	· ·
	Destination MAC	00-80-16-94-1	E-1A			









System 🔛 Test	😽 Fiber Optics	* •)	1:04 PM						
Select ~ Port 1: 1GigE	Layer 2 Traffic Term 🗙 🕂 What's This?	10	\leftarrow						
Interface	Connector Sign I Physical Layer Network Visibility Test Control		Results						
Traffic Capture Filters Service Disruption	Auto Negotiation Auto Negotiation FDX Capable Flow Control	÷							
Timed Test	Pause Capable Both Rx and Tx 2 Pause Length (Quanta) 1000 Pause Length (Time - ms) 0.512 Synchronous Ethernet								
	Enable Synchronous Ethernet Auto-start traffic when laser turned on BERT Payload thresholds Enable Error Count Threshold Payload Bit Error Count Threshold	+							
Reset Test to Defaults	Crable Error Rate Threshold IE-12	•							

Figure 10: Setup, Interface/Physical Layer

T-BERD/MTS 5800 Portable Network Tester



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CONNECT TO LINE UNDER TEST

For Optical Interfaces:

- 1. Use the VIAVI P5000i or FiberChek Probe microscope to inspect both sides of every connection being used (SFP, attenuators, patch cables, bulkheads)
 - Focus the fiber on the screen. 0
 - If it appears dirty, clean the fiber end-face 0 and re-inspect.
 - If it appears clean, run the inspection test.
 - If it fails, clean the fiber and re-run 0 inspection test. Repeat until it passes.
- 2. If necessary, insert optical attenuators into the SFP TX and/or RX ports.
- Connect the SFP to the port under test 3. using a jumper cable compatible with the line under test.
- Select the Laser tab in the Actions panel. 4.
- Laser The button will turn yellow 5. Tap Off Laser On and be relabeled
- Tap the **Restart** soft key 6.
- 7. Verify the following:
 - Summary LED is yellow.
 - Signal Present LED is green.
 - Sync Acquired LED is green.
 - Link Active LED is green. 0

► For Copper 10/100/1000BASE-T interfaces:

- 1. Connect the 10/100/1000 RJ-45 jack to the port under test using CAT 5E or better cable.
- 2. Tap the **Restart** soft key
- 3. Verify the following:
 - Summary LED is yellow.
 - Sync Acquired LED is green. 0
 - Link Active LED is green. 0



Figure 11: Inspect Before You Connect

System Err Test	<mark>米</mark> Fiber Opt	ics				[ve 🔹 🔒	11:36 PM 08/22/2022
Select v Port 1: 10GigE LAN	Layer 2 Traffic 1	ferm 🔀 📒	+ T	iming Source		What's This?	10	
Running 33m:33s	Ethernet	Payload	LBM/LTM	J-Connec	t			Setup
No messages	Traffic Test Mode	\$ 512 Frame	\$ Size				(C Restart R
	Summary	\$	Status	\$	Summary 🗘	SLA / KPI	÷	
Summary	Acterna Test P	acket Detect		OFF	Throughput, Current 🖃	·		
Signal Present					Rx Mbps, L1		Unavailable	
👖 🧿 Sync Acquired					Tx Mbps, L1		0.0	Test
Cink Active					Rx Mbps, L2		Jnavailable	
Frame Detect					Tx Mbps, L2		0.0	
🗰 🖱 Pattern Sync					Frame Loss - FLR 🖃			
VLAN Frame Detect					Lost Frames		Jnavailable	SAM- Complete
Stacked VI AN Detect					Frame Loss Ratio		Unavailable	
Local Fault Detect					Average	-	Inavailable	F /+
Remote Fault Detect					Current		Inavailable	
History					Maximum		Jnavailable	Enhanced RFC 2544
ToD Sync					Packet litter - FDV (us)		dore	
1PPS Sync					Average		Jnavailable	-4
History					May Averane		Inavailahla	
								QuickCheck Toolkit
	Laser	Actions	Peak IEG	Errors	Faults 0.4M Cant	1170		
	Cusci	Activits	i cuix il G	LITOIS	ruuro capt	are -		
	Laser	Internal	-1	+1	-10 +10			
Reports Tools View Help	On	Clock Source		Freq Off	set (ppm)			

Figure 12: Optical Interface Results

					_		
Running 3m:11s	Ethernet	Payload	LBM/LTM	J-Connec	t		
No messages	On ¢	Traffic Test Mode	\$ 512 Frame Size	\$			
Ethernet	Summary	\$	Status	\$	Summary 🗘	SLA / KPI	•
Sync Acquired Link Active Frame Detect	Acterna Test F	acket Detect		OFF	Throughput, Current		0.00
Air Detett	1				Tx Mbps, L1	*	0.00
VLAN Frame Detect					Rx Mbps, L2		0.00
SVLAN Frame Detect					Tx Mbps, L2		0.00
Stacked VLAN Detect					Frame Loss - FLR 🖃	1 la su a	(lable)
Time Source					Erame Loss Patio	Unava	
ToD Sync					Round Trin Delay - FD (us)		
1PPS Sync					Average	Unava	ilable
History					Current	Unava	ilable
					Maximum	Unava	ilable 🛛 🕫
					Packet Jitter - FDV (us) 🖃		
					Average	Unava	ilable
					May Averane	Linava	ulahla.

Figure 13: Copper Interface Results



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RUN TEST

- 1. Select the **Actions** tab in the **Actions** Panel.
- 2. Tap Start Traffic . The button will turn yellow and be relabeled Traffic .
- 3. Press the **Restart** soft key on the

right side of the screen.

- 4. Verify that:
 - The Right Results window shows
 "Rx Mbps, L1" is approximately equal to the Committed Information Rate.
 - ✓ The Right Results window shows
 Lost Frames = 0.
- 5. Using the drop-down menus, change the right results window to **Ethernet/BERT Stats.**
- Allow the Test to run for the desired duration. Verify that the right result window displays "Payload Error Rate threshold = OFF" throughout the test.

Port 1: 10GigE LAN Laver 2 Traffic Ethernet Payload J-Connect Traffic \$ 512 Ċ Test Mode Frame Size Status \$ SLA / KPI Summary hroughput, Current 🖃 Rx Mbps, L1 9,999.6 Tx Mbps, L1 9,999.6 Rx Mbps, L2 Tx Mbps, L2 Tx Mbps, L2 Frame Loss - FLR 🖃 9,623.7 9,623.7 ALL SUMMARY RESULTS Lost Frames OK Frame Loss Ratio 0.0 Average 3.421 Current 3.421 <u>е</u> Т Laser Actions Peak IFG Faults Errors Captur Pause Frame Traffic Loop Up Loop Down LLB Insert

Figure 14: Summary Results

👔 Microscope 🛛 🙋 Syst	em 🛄 Test 🏼 😽	Fiber Optics			📣 🜒 🔒	10:19 PM 05/13/2023
Select ~ Port 1: 10GigE	LAN Layer 2 Traffi	cTerm 🗙 🛛 🕂		Timing Source What's This	?	-
Running 5m:22s	Ethernet Pa	ayload J-Connect				Setup
🗐 1 message	Traffic 🗧 5	12 🗧				Ċ
Level (dBm) -1.9 Freq Dev (ppm) 0.0	Test Mode	Frame Size	_			Restart
Summary	Summary	Status	¢	Ethernet BERT Stats	•	
Ethemet Signal Present Sync Acquired Link Active Frame Detect	ALL SUMMARY RESULTS			Pattern Losses Pattern Losses Bit Error Rate 0.00E- Bit Errors Payload Error Count uneshold Quad Error Rate threshold Bit Errorad Seconds		Stop Test
ATP Detect Pattern Sync VLAN Frame Detect SVLAN Frame Detect SVLAN Prame Detect						SAM- Complete
Classified VCM Detect Classified Each Classified Class		OK		Bit Error-Free Seconds Bit Error-Free Seconds, %	322 100	Enhanced RFC 2544
1PPS Sync History	•			•		OuickCheck
	😑 Laser 😑 Actio	ns Peak IFG	Erro	rs Faults Capture		Toolkit
Reports Tools View Help	Traffic Started Up	Down LLB		Pause Frame Insert		

Figure 15: BERT Stats

Notes:

- The Summary/Status screen with turn red if there is a single bit error, regardless of the Payload Error Rate threshold.
- If the test traffic is transported though any Layer 2 or Layer 3 network equipment, including Ethernet Switches, Routers, NIDs, and Layer 2 Loopback devices, they will drop all errored frames. This will result in multiple **Bit Errors**, **Lost Frames**, and **Pattern Losses**.