## T-BERD/MTS 5800 Portable Network Tester



### QUICK CARD

# IEEE 1588v2 Precision Timing Protocol (PTP) Verification Measurements in an ITU-T G.8265.1 PTP Telecom Profile Architecture

This quick card outlines how to run IEEE 1588 measurements for Frequency Distribution in an ITU-T G.8265.1 PTP Telecom Profile Architecture on the T-BERD/MTS 5800. The quick card documents a procedure to set up a TEM V2 Timing Expansion Module and T-BERD/MTS on a 1GigE Optical Interface utilizing IPv6 addressing without VLAN tagging, but the same workflow may be applied to other Ethernet data rates, VLANs, and IPv4, or when using the GNSS connectors on the TB/MTS 5882 or TB/MTS 5800-100 platforms.

### EQUIPMENT REQUIREMENTS

- ► T-BERD/MTS 5800 with
  - Transport Software V31.1.1 or greater
  - Ethernet Option C510M1GE
  - PTP Option C5LS1588
  - IPv6 Option C5IPV6
- Timing Expansion Module V2 (TEM V2)
- GNSS Antenna (Taoglas A.171, Taoglas AA.162, Tallysman TW7882, or Maxtena M9706CWT recommended)

### CONNECT GNSS ANTENNA AND ACTIVATE TEM V2

- 1. Press the Power button 6 to turn on the test set.
- Connect the male SMA connector on the end of the antenna cable to the female SMA connector on the TEM V2 (labeled Antenna).
- 3. Tighten the connector until the antenna is securely attached.
- 4. Place the antenna in a location with minimum interference or blocking.
- 5. Tap the **Test** icon at the top of the screen.
- 6. Tap the **Timing Source** tab to activate the TEM V2 Timing Module.



Figure 1: Equipment Requirements



Figure 2: TEM V2

💇 System 🛛 🔛 Test	Fibe	rOptics	<u>V2</u>	*	•)	R	3:12 PM
Select ~ No Running T	est 🗙	Timing Source	W	nat's		s7	
DS1/DS3 + E1/E3/E4 + SONET + SDH +	2	Timing Module 1PPS Analysis					
Ethernet Fibre Channel CPRI	(*) (*)	10/100/1000 Eth Layer 2 PTP/1588 Term 1GigE Layer 2 PTP/1588 Term					



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https://www.viavisolutions.com/en-us/product-family/t-berd-mts



### SETUP GNSS RECEIVER AND START SURVEY

- 1. Tap the **Setup** soft key on the upper right-hand corner of the screen.
- 2. Configure GNSS settings as follows:
  - GNSS System: Select GPS for use in North America. Other constellations or combination of constellations can also be used:
    - · Galileo and SBAS: European systems
    - GLONASS: Russian System
    - · BeiDou: Chinese system
    - QZSS: Japanese system
  - > Too few Satellites Alarm: 3
  - > Time Reference: GPS
  - > Time Format: 12-hour
  - Elevation Limit: 5 to 15 deg recommended, Using satellites near the horizon may degrade performance but may be needed in "urban canyons".
  - Minimum C/No: 9 dB-Hz recommended, 30 dB-Hz maximum. Using satellites with a weak carrier to noise ratio may degrade performance but may be needed in "urban canyons".
  - Antenna Power: 5 volts for VIAVI supplied magnetic mount antennas. If you are using a different antenna, enter the antenna power, or select 0V if the site powers the GPS antenna.
  - Antenna Time Bias: Select Antenna Type for VIAVI supplied antennas; otherwise, Select "User Defined" and enter the cumulative delay introduced by the antenna, cables, and any inline splitters or amplifiers. In absence of more specific information, use 1.2ns/foot or 4.5ns/meter of cable.
  - > Jamming Detection Mode: Off
- 3. Tap the **Location** settings tab and configure location settings as follows:
  - Survey mode: Fast (15 minutes) is recommended, Typical may be used for better accuracy, Quick should not be used.
- 4. Tap the **Start Survey** button to start a survey.
- 5. Tap the **Results** soft key on the upper right-hand corner of the screen.

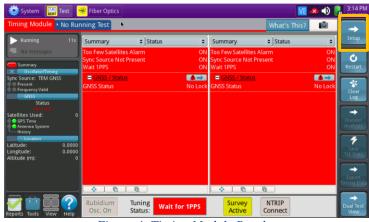


Figure 4: Timing Module Results

Timing Module • No	Running Test			What's This?	iii 🚺					
GNSS	GNSS System ✓ GPS □ GA Too Few Satellites Ala	LILEO DEIDO	U GLONASS	SBAS	QZSS					
1PPS Analysis	Time									
RJ45	Time Reference	GPS	<ul> <li>Time Format</li> </ul>	12-hour	•					
Timed Test	UTC Standard		•							
	Filter Elevation Limit (deg)	15	Minimum C/No (d	B-Hz) 9						
	Antenna Antenna Power 5 Vol	Antenna Antenna Power 5 Volts 🔹 🤣 Antenna Time Bias Taoglas AA.162.301111 (45ns) 🔹								
	Jamming Detection Mode	Off	•							

Figure 5: GNSS Settings

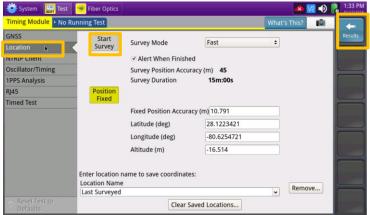


Figure 6: Location Settings



### VERIFY GNSS RECEPTION

- Tuning Status will be displayed at the bottom on the screen. The Oscillator will cycle through these stages: Warming Up, Initializing, Wait for 1PPD, Course Tune, Intermediate Tune, Fine Tune. At least Course Tune is required.
- 2. Using the results group and category drop-down menus, change the right results display to the following:
  - Satellites/Sky Plot: Displays the satellites detected by the GNSS receiver. Ensure at least 4 satellites are "Used". Otherwise, relocate antenna to a less obstructed location.
  - Satellites/Signal Strength: Uses a bar graph to display the signal strength for each identified satellite. Ensure signal strength of used satellites exceeds Minimum C/No setting (bar will be green). Otherwise, reduce Minimum C/No setting.
  - GNSS/Status: Displays general information concerning the GNSS Satellites. Ensure that Status progresses from "No Lock" to "Locked" to "Fixed Position" during the survey. Ensure that Timing Mode Status progresses from "Survey" to "Survey Done".
  - GNSS/Location: Displays general information concerning the location and position accuracy. A Mean Position Dilution of Precision (PDOP) value below 4.0 is desired.
- A "Typical" survey will run for 3 hours and stop if it has reached a 1-meter position accuracy.
   If, after 3 hours, the survey still shows Survey Active, the Timing Module was not able to attain a 1-meter or better position accuracy. Tap the Setup soft key, set Survey Mode to Fast, and tap the Results soft key. Repeat steps 1 and 2 above to conduct a 15-minute survey with 45-meter position accuracy.



Figure 7: Satellites/Sky Plot Results

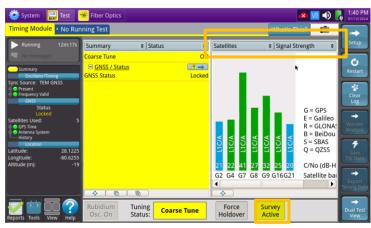


Figure 8: Satellites/Signal Strength Results

🔯 System 🔛 Test	🔆 Fiber Optics					📣 🚾 📣 [	J	1:55 PM 01/12/2024
Timing Module • No Rur	nning Test		_		What's Th	nis? 🚺	٢	-
Running 27m:19s	Summary	Status	•	GNSS	+ Location	•	Ļ	Setup
Summary Oscillator/Timing	Intermediate Tune		N	Latitude (deg) Longitude (deg) Altitude (m)	×	28.1224119 -80.6254869 -41.4810000	L	C Restart
Sync Source: TEM GNSS Present Frequency Valid GNSS				Mean C/No (dB-Hz) Survey 🖃		27.33	ľ	Clear Log
Status Fixed Position				Mean 3D Accuracy ( Current PDOP	(mm)	27,355 Unavailable	l	+
Satellites Used: 6				Mean PDOP		4.12		
Catena System History Location Latitude: 28.1224 Longitude: -80.6255 Altitude (m): -41				Mean C/No (dB-Hz)		29.61		Analysis Save TIE Data
		<b>a</b>			•		5	ming Data
Reports Tools View Help		ning Intermediate atus: Tune	•		Start urvey			➡ Dual Test View

Figure 9: GNSS/Status Results

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### QUICK CARD

### LAUNCH PTP/1588 TEST

- Tap the second folder under the Test Icon Enter at the top of the screen, Labeled either Port 1 or Port 2.
- Tap the Select Test drop-down Select and select the following Layer 4 PTP/1588 test:
  - Ethernet> 1GigE Optical> Layer 4 PTP/1588> IPv6> P1 Terminate
- 3. Connect T-BERD SFP+ Port 1 to the network port to be tested using an LC patch cable.
  - ► Enable the Laser: Off Con
  - ► Press **Restart**:
  - Look for 5 or 6 green LEDs: This will indicate that the link is up, and GPS sourced timing is available.

😇 System	Microsco	ope 📖 Test	😽 Fil	per Optics	:		V2	📣 🌒 🥻	9:53
Timing Modu	• Port 1:	1GigE Layer 2 T	raffic Te	erm	+		What's This?	i.	-
Running	2h:22m:08s	Summary	\$	Status	0	GNSS	+ Location	•	Setu
		Intermediate Tu	ne		ON	Latitude (deg)	2	8,1224363	-

#### Figure 10: Port 1 or Port 2 Tab



Figure 11: Select Test

Laser	Actions	Capture			
Laser Off			+1	-10	+10
Off	Clock Source		Freq Off	set (ppm)	

#### Figure 12: Enable the Laser

System Test		gE Layer	4 PTP	/1588	Term	IPv6 🗙	+	What's This?		10:26 A
Running 9s Duplicate Address Dete	Frames/Packets Frame Detect	1	2	3	4					Setup
Level (dBm) -3.0 Freq Dev (ppm)	SVLAN TCP UDP	İ								Research
Status Signal Present Sync Acquired Inik Active Frame Detect ToD Sync	Summary PTP Port State							'	¢ Not started	Stop Test
• ToD Sync • 1PPS Sync History						ack I				

#### Figure 13: Check LEDs

### CONFIGURE PTP SLAVE SESSION

- 1. Press Setup:
- Select the All Streams folder. Configure Source Address Type, Addresses, Default Gateway, and Subnet Prefix length.



Figure 14: Setup

	est 🗸 Port 1: 1GigE Layer 4 PTP/1588 Term IPv6 🔀 🔶 🔶 What's This?	+
Interface	MAC Address Setup	
Wander	Source MAC Factory Default  Default Source MAC 00-80-16-94-1E-19	
Capture	Laver 3	
Filtere All Streams	Source Address Type Manual :	+ treat
2		Pipe
3	Default Gateway 2603:9001:6c00:ccd9::	
4	Subnet Prefix Length 64	

Figure 15: All Streams Setup



### CONFIGURE PTP SLAVE SESSION (Continued)

- 1. Select the PTP Folder. Make all PTP settings as necessary as a PTP Slave on the network under test.
  - Mode: Slave
  - Domain: default value should be set to 4, otherwise use the value recommended by your network timing administrators, in the range 4 to 23
  - Address Mode: Unicast
  - Master IP Address: example shown
  - Encapsulation: None
  - Announce Rx Timeout: 3
  - Query: 2 Seconds
  - Announce: Range is 1 every 16 seconds to 8 per second, default is 1 every 2 seconds
  - Sync: Range is 1 every 16 seconds to 128 per second, default not defined
  - Delay Request: Range is 1 every 16 seconds to 128 per second, default not defined
- Select the Thresholds folder. Enable and set 2. the desired settings thresholds including **Floor** Packet Measurement.
  - Swipe screen or use scroll bar to view and configure additional Measurement settings and pass/fail limits.

3. Press Results: \_\_\_\_\_ to return to the results view.

Ti Select Por	t 1: 1GigE Layer 4 PTP.	- 😂 - Port 2: 10/	100/10	000 Eth Layer 4 PTP	What's This?	10
Interface	Mode					
Wander	Mode	Slave	•	Address Mode	Unicast	•
Capture	Domain	4				
Filters	Master Address 2	2603:9001:6c00:ccc	19-280	:16ff-fe94:1e1a		
All Streams	Disable Signalir					
1		·6				_
2	Encapsulation					
3	Encapsulation	None				
4	IP					-
	Traffic Class	TOS	٠	TOS	111000	
THE SHOWS	Message Interval					
Timed Test	Announce Rx Time	eout[3		Query	2 seconds	•
	Announce	2 seconds		Lease Duration (s)	300	
	Sync	2 seconds	•			
Reset Test to	Delay Request	2 seconds	٠			
Defaults	cTE Sampling perio	od (c) 1000		Cable Delay (pr)	0	

Figure 16: PTP Setup

🧕 System 🔛 Test	😽 Fiber Optics			M	🙁 🜒 [	4:36 Pl
• Internal GNSS Sel	ect - Port 1: 1GigE Laye	r 4 PTP/1588 Term IPv	/6 🔀 🕂 🕂	What's This?	10	+
Interface	PTP Thresholds				-	Results
Capture	Enable Sync PDV	Max. (ns)				
Filters	□ Enable Delay Re	quest PDV Max. (ns)				
Timed Test	✓ Enable Floor Pace	ket Measurement				
All Streams	-	necciz-way it measu	rement			-
1	and the second se	Master Delay Min. (ns				Streams Pipe
2						
3		Master Delay Max. (ns	<u>Ř</u>			
4	Enable Master to	o Slave Delay Min. (ns	)			
РТР	Enable Master to	Slave Delay Max. (n	5)			
Thresholds	Enable Time Erro	or Max. (ns)				
mneu iest	Enable Two Way	cTE Over Time Abs M	ax. (ns)			
	Floor Packet Measur	ement				-
	Window Duration (s)	200	Window Spacing	Jumping	•	
Reset Test to	Cluster Range (us)	150	Settling Time (s)	600		-
Reset lest to Defaults	FPP Limit (%)	1	Message Type	Sync	•	Dual Test View

System     Test     Internal GNSS     Sel	Fiber Optics	4 PTP/1588	Term IPv6 +	What's This?	
Interface Capture Filters Timed Test All Streams 1 2 3 4 4 PTP Thresholds Timed Test	<ul> <li>Fir mesinous</li> <li>Enable Sync PDV</li> <li>Enable Delay Re</li> <li>Enable Delay Re</li> <li>Enable Floor Pacc</li> <li>Enable Packet Se</li> <li>Enable Slave to I</li> <li>Enable Master to</li> </ul>	Max. (ns) quest PDV M ket Measure elect 2-Way T Master Delay Master Delay o Slave Delay o Slave Delay or Max. (ns)	ax. (ns) ment E Measurement Min. (ns) Max. (ns) Max. (ns)		
Reset Test to	Floor Packet Measur Window Duration (s) Cluster Range (us) FPP Limit (%)		Window Spacing Settling Time (s) Message Type	Jumping 600 Sync	•

Figure 17: Thresholds Setup



### **REVIEW PTP SLAVE SESSION RESULTS**

- 1. The default Results view is single screen with Summary and Status. The view can be changed to dual results (Split Left/Right) through the View button on the lower left.
- 2. Select PTP / Link Stats for the left result windows.
- Select the Actions tab at the bottom of the 3. screen, press Start Slave PTP Session.
  - ► Port State should progress from "**Not** Started" to "Listening" to "Slave"
  - Detecting the Rx Domain Number (4 to 23) and seeing a Max TE value indicates that the PTP Slave Session is active. The T-BERD is receiving timing from the PTP master.
  - ► Additional PTP/Link Stats results can be viewed by scrolling through the window.
  - If Pass/fail thresholds are met, the Summary/Status window and Status LED will remain green.
  - ► If any thresholds are triggered, the Summary/Status window, the Status LED and the value for that result will turn red.
- 4. Select Graphs / FPP for the left results window to view a graph of key performance indicators.
  - ► Note: By default, FPP results will be displayed after a 10-minute settling time. The Settling time can be set in the PTP Threshold settings. The FPP metric provides an indication that there are packets experiencing minimal delay across the network.
  - Note: There are many more categories and sub-categories of results both tabular and graphed.



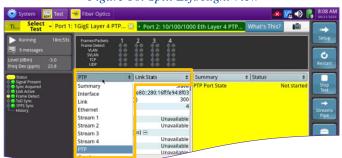


Figure 19: PTP/Link Stats

Actions

Laser

Capture





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### QUICK CARD

### CREATE REPORT



3. Tap Create .

unselect report groups.

4. A report will be saved to the T-BERD 5800's /bert/reports folder.

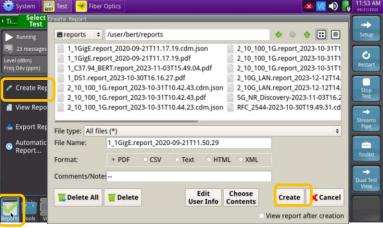


Figure 22: Create Report