

IEEE 1588v2 Precision Timing Protocol (PTP) Verification Measurements in an ITU-T G.8275.2 PTP Telecom Profile Architecture

This guick card outlines how to run IEEE 1588 measurements for Time Distribution in an ITU-T G.8275.2 PTP Telecom Profile Architecture with partial timing support. The quick card documents how to set up a TEM V2 Timing Expansion Module and OneAdvisor on a 10GigE Optical Interface utilizing IPv4 addressing without VLAN tagging, but the same workflow may be applied to other data rates, VLANs, and IPv6.

EQUIPMENT REQUIREMENTS

- OneAdvisor 800 equipped with the following:
 - RAxxMA-O Radio Analysis Module or SPA06MA-O Spectrum Analyzer Module.
 - Transport software release V5.1.0 or greater
 - ONA-SP-10GELAN 10 Gig Ethernet option
 - PTP Option ONA-SP-10G1588
- Timing Expansion Module V2 (TEM V2) •
- GNSS Antenna (Taoglas A.171, Taoglas AA.162, Tallysman TW7882, or Maxtena M9706CWT recommended)
- SFP+ Optical Transceiver and cables to match the line under test

CONNECT GNSS ANTENNA AND ACTIVATE TEM V2

- Press the Power button is to turn on the 1. OneAdvisor.
- Connect the male SMA connector on the 2. end of the antenna cable to the female SMA connector on the TEM V2 (labeled Antenna).
- Tighten the connector until the antenna is 3. securely attached.
- Place the antenna in a location with 4. minimum interference or blocking.
- **1** Home to display the Home Screen. 5. Tap
- Tap [1] Tests to display the Tests menu. 6.
- Tap Timing Module > 7.
- Tap the **Timing** icon (N) to activate the 8. TEM V2 Timing Module. OneAdvisor 800 Platform

VIAVI//Public



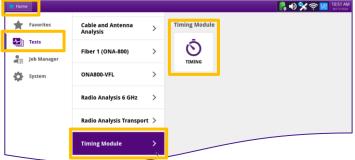


Figure 3: Home Screen

https://www.viavisolutions.com/en-us/products/oneadvisor





Figure 1: Equipment Requirements



QUICK CARD

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: Typical (3 hours) is recommended, Fast (15 minutes) may be used with reduced position accuracy, Quick should not be used.
- 4. Tap the **Start Survey** button to start a survey. If prompted, tap **OK** to continue.
- 5. Tap the **Results** soft key on the upper right corner of the screen.

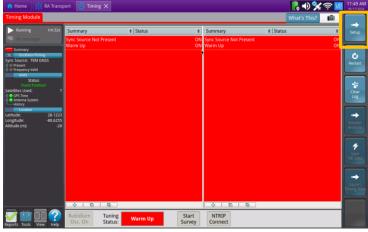


Figure 4: Timing Module Results

Timing Module					What's This?	(Ö)
	GNSS System					
Location	l GPS □	GALILEO	BEIDOU	GLONASS	S SBAS	
NTRIP Client	Too Few Satellites Alarm Threshold 3					
Oscillator/Timing	100 Pew Satellites Alarm	Inreshold 5				
1PPS Analysis	Time					
RJ45	Time Reference	Time Reference GPS • UTC Standard USNO(GPS) •		Time Format	12-hour	•
Timed Test	UTC Standard					
	Filter					
	Elevation Limit (deg)	15		Minimum C/No (dB-Hz)	30	
	Antenna					
	Antenna Power	5 Volts	0	😮 Antenna Time Bias	Taoglas AA.171.301111 (28ns)	٥
	Jamming Detection					
	Mode	Off	•			
		*				

Figure 5: GNSS Settings

🟫 Home 🔛 RA T	ransport 🧿 Timing 🗙				📙 🜒 🐝	<u>چ</u>	11:56 AM
Timing Module					What's This?	10	
GNSS Location	Start Survey	Survey Mode ≺ Alert When Finished	Typical	•			Results
Oscillator/Timing 1PPS Analysis RJ45 Timed Test	Position	Survey Position Accuracy (m) Survey Duration	1 3h:00m:00s				
nined rest	Theo	Fixed Position Accuracy (m)	44.453				
		Latitude (deg)	28.1222963				
		Longitude (deg)	-80.6255481				
		Altitude (m)	-28.396				
	Enter location name Location Name	to save coordinates:			Remove		
	Last Surveyed			*	Kemove	4	
		Clear Sa	ved Locations				
Reset Test to Defaults							

Figure 6: Location Settings



QUICK CARD

VERIFY GNSS RECEPTION

- Tuning Status will be displayed at the bottom of 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.
 - Satellites/Signal Strength: Uses a bar graph to display the signal strength for each identified satellite. Ensure at least 4 satellites are used (green) and that signal strength of used satellites exceeds Minimum C/No setting (bar will be green). Otherwise, relocate antenna to a less obstructed location or reduce the 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 15minute survey with 45-meter position accuracy.



Figure 7: Satellites/Sky Plot Results

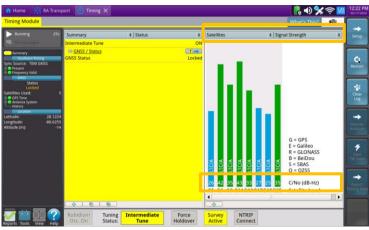


Figure 8: Satellites/Signal Strength Results

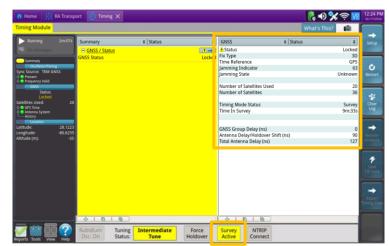


Figure 9: GNSS/Status Results

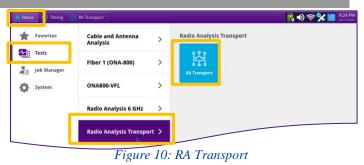
QUICK CARD

LAUNCH PTP/1588 TEST

- 1. Tap 1 Home to display the Home Screen.
- 2. Tap 🛃 Tests to display the Tests menu.
- 3. Tap Radio Analysis Transport > .
- 4. Tap the **RA Transport** icon 🔀 to activate the Radio Analysis Module.
- 5. Tap the Select Test drop-down and select the following test:
 - Ethernet> 10GigE LAN> PTP/1588> Terminate
- Connect the OneAdvisor SFP+ Port 1 to the network port to be tested using an LC patch cable. Note the cable length.
 - ► Enable the Laser: ^{Laser} Off
 - ► Press the **Restart** soft key.
 - Look for 5 or 6 green LEDs. This will indicate that the link is up, and GPS sourced timing is available.

CONFIGURE PORT ADDRESSES

- 1. Tap the **Setup** soft key.
- 2. Select the Port Addresses Folder. Configure Source IP Address Type, Source IP Address, Default Gateway, and Subnet Mask.



V I A V I

VIAVI Solutions

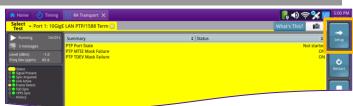




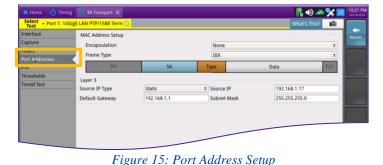




Figure 13: Check LEDs









QUICK CARD

CONFIGURE PTP SLAVE SESSION

- 1. Select the PTP Folder. Make all PTP settings as necessary for a PTP Slave on the network under test:
 - PTP Layer: L4 IPv4
 - > Mode: Slave
 - > Address Mode: Unicast
 - Domain: the default value for G.8275.2 is 44, otherwise use the value recommended by your timing administrator, in the range 44 to 63
 - > Master IP Address: example shown
 - Encapsulation: None or apply VLAN settings as needed
 - > Announce Rx Timeout: 3
 - > Query: 2 seconds
 - Announce: Range is 1 per second to 8 per second
 - Sync: Range 1 per second to 128 per second
 - Delay Request: Range 1 per sec to 128 per sec
 - > Cable Delay: 4 ns per meter of patch cable
- Select the Thresholds folder. Enable and set the desired settings thresholds.
 Packet Select 2-Way Time Error (TE) Measurement is recommended.
 - Swipe screen or use scroll bar to view and configure additional measurement settings and pass/fail limits.
- 4. Tap the **Results** soft key to return to the results view.

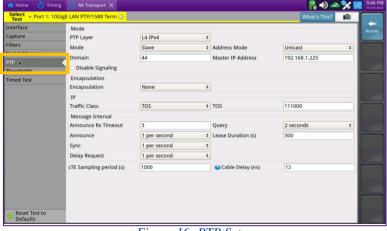


Figure 16: PTP Setup

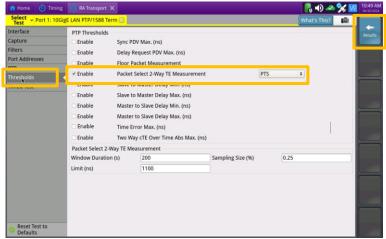


Figure 17: Thresholds Setup



QUICK CARD

START PTP SLAVE SESSION AND REVIEW RESULTS

 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.

- 3. Select the **Actions** tab at the bottom of the screen, press **Start Slave PTP Session**.
 - Port State should progress from "Not Started" to "Listening" to "Slave"
 - Detecting the Rx Domain Number (44 to 63) and seeing a Max TE value indicates that the PTP Slave Session is active. The OneAdvisor 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, Summary/Status window and the Status LED and the value for that result will turn red.

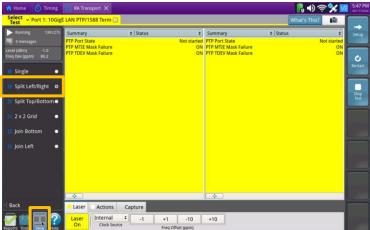


Figure 18: Split Left/Right View

Running 15m:58s	PTP .	Link Stats		Summary	Status	
3 messages	Summary			PTP Port State		Not started
	Interface		Unavailable			ON
evel (dBm) -1.0	Link		Unavailable	PTP TDEV Mask Failure		ON
	access of the second se		and states in a maine			
Status	Ethernet		Unavailable			
Signal Present	PTP		Unavailable			
Sync Acquired	Graphs					
Frame Detect	CDMA/GPS Receiver		Unavailable			
ToD Sync 9 1PPS Sync	Temperature		Unavailable			
History	Custom		Unavailable			
	Custom		Unavailable			
	I wo way cre nime kemaining	g (s)	Unavailable			
	T1 cTE (ns)		Unavailable			
	T1 cTE Time Remaining (s)		Unavailable			
	T4 cTE (ns)		Unavailable			
	T4 cTE Time Remaining (s)		Unavailable			
	Grandmaster 🖂					E C
	ID		Unavailable			
	Clock Class		Unavailable			
	Clock Class Value		Unavailable			
	Clock Accuracy		Unavailable			
	Time Source		Unavailable			
	Priority 1		Unavailable			
	Priority 2		Unavailable			
	Chance Brannand		Demolishie	*		
	Laser Actions	Capture				i i

Figure 19: PTP/Link Stats



 Nonline
 Or Tuning
 Or A Transport
 Nonline
 Of The State
 Of The Sta

Figure 21: PTP Link Stats



QUICK CARD

4. Select **Graphs / Max TE** for the right results window to view a graph of a key performance indicator.

Note: There are many more categories and sub-categories of results both tabular and graphed.

Running		PTP	Link Stats	•	Grap	hs			¢ Max	TE		•
3 messages		Port State		Slave	a	-	le t	1.4				
	_	Unicast Lease Duration (s)		300	2	٩	Scale	•	Mean	•		
evel (dBm) req Dev (ppm)		Rx Domain Number		44	40 -	1						T
Status		Max TE (ns)		37	35 -	1				1	•••••	
 Signal Present Sync Actaired Frame Detect Iob Sync IPPS Sync History 		Two Way cTE (ns)		-14						+		
		Two Way cTE Over Time (ns)	8			3						
		Average		-14	30 -	t		-		+		
		Current		-14								
		Minimum		-14	25 -	1	3			e		
		Maximum		-14			1					
		Two Way cTE Time Remainin	ng (s)	0			1					
		T1 cTE (ns)		-25	월 20 -	11						
		T1 cTE Time Remaining (s)		0			1					
		T4 cTE (ns)	•	-4	15 -	1		_				
		T4 cTE Time Remaining (s)		0								
		Grandmaster 🖃			10 -	1	- 1	-				- 6
		ID	00:80:16:FF:FE:94			1	1					
		Clock Class	Pr	imary	5.	1		-		_		
		Clock Class Value		6		1	1					
		Clock Accuracy Time Source	Within 1	GPS		1						
		Priority 1		128		1		1				
		Priority 1 Priority 2		128	2	130.5	0	21:59:10		22:0	7:90 2	2:15:50
		Cane Demand		128					Max	15		_
		0 0			0		_	_				
		Laser Actions	Capture									

Figure 22: Max TE Graph



- Tap Keports to open the **Reports** Panel and select
 Create Report...
- 2. Optionally, tap Choose Contents to select and unselect report groups.
- 3. Tap Create
- 4. A report will be saved to the OneAdvisor 800's /user/bert/reports folder.

	LAN PTP/1588 Term X	What's This?
Running 24m:56s 3 messages	reports + /user/reports	
Level (dBm) -2.4 Freq Dev (ppm) -0.4	E-1_1GigE.report_2024-04-08T14.20.24.cdm.json	
✓ Create Report	E-1_1GigE.report_2024-04-08T14.20.24.pdf SAMComplete-2024-04-08T14.33.32.cdm.json	Res
🔮 View Report	SAMComplete-2024-04-08T14.33.32.pdf SAMComplete-2024-05-22T10.58.15.cdm.json	
📥 Export Report	SAMComplete-2024-05-22T10.58.15.pdf SFP RegisterDump.txt	
S Automatic Report		
	File type: All files (*)	•
	File Name: 1_10G_LAN.report_2024-06-18T13.43.48	
	Format: • PDF CSV Text HTML XML	
	Comments/Notes	13:50:46

Figure 23: Create Report