QUICK CARD

IEEE 1588v2 Precision Timing Protocol (PTP) Verification Measurements in an ITU-T G.8275.1 PTP Telecom Profile Architecture

This quick card outlines how to run IEEE 1588 measurements for Time Distribution in an ITU-T G.8275.1 PTP Telecom Profile Architecture with full timing support. The quick card documents a procedure to set up a TEM V2 Timing Expansion Module and T-BERD/MTS on a 1GigE Optical Interface, but the same workflow may be applied to other Ethernet data rates, or when using the GNSS option and connector on the TB/MTS 5882 or TB/MTS 5800-100 platform.

EQUIPMENT REQUIREMENTS

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

Figure 1: Equipment Requirements

CONNECT GNSS ANTENNA AND ACTIVATE TEM V2

1. Press the Power button to turn on the test set.
2. 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 2: TEM V2

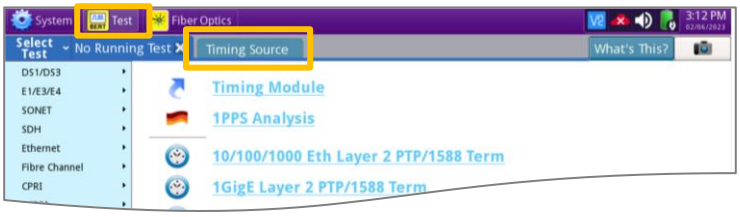

Figure 3: Home Screen

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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 in-line 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.
5. Tap the **Results** soft key on the upper right-hand corner of the screen.

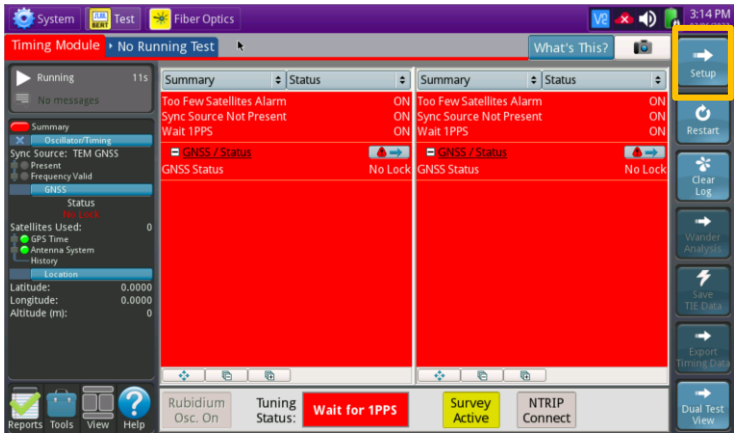

Figure 4: Timing Module Results

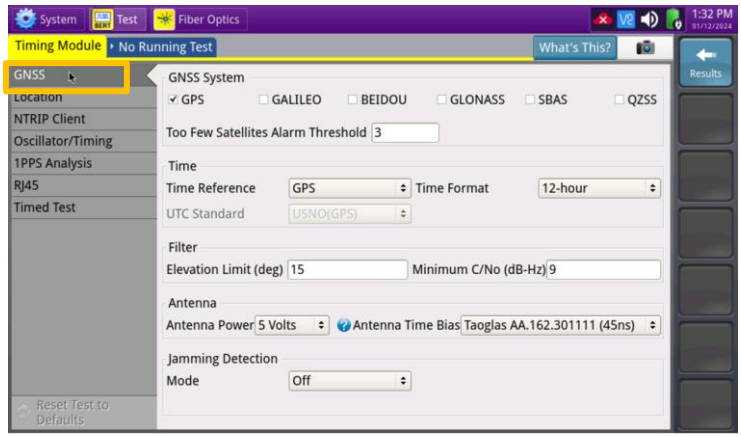

Figure 5: GNSS Settings

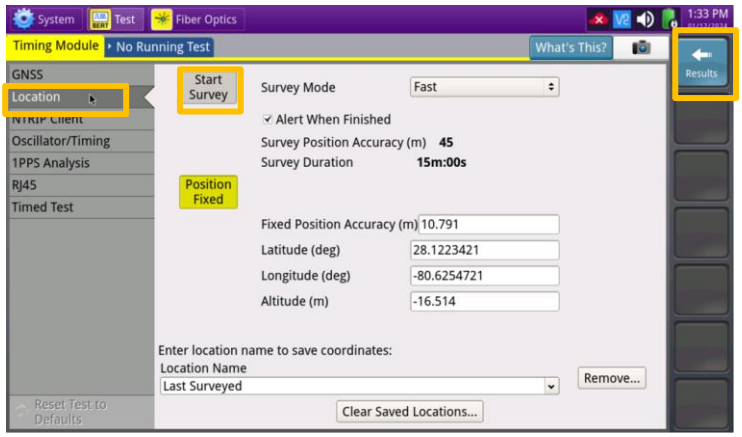

Figure 6: Location Settings

VERIFY GNSS RECEPTION

1. **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. 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.
3. 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.

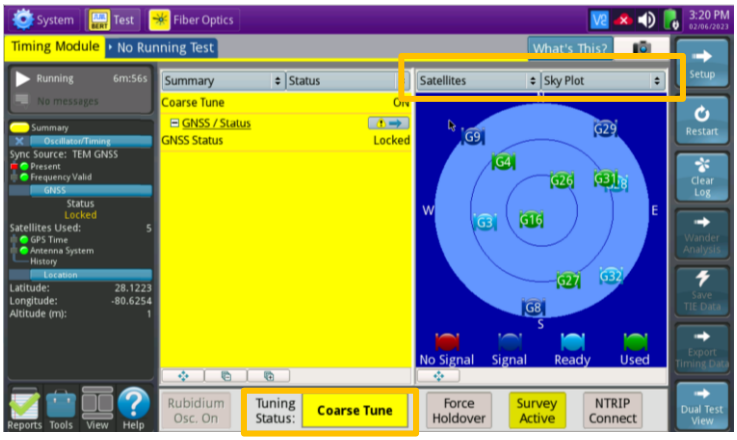

Figure 7: Satellites/Sky Plot Results

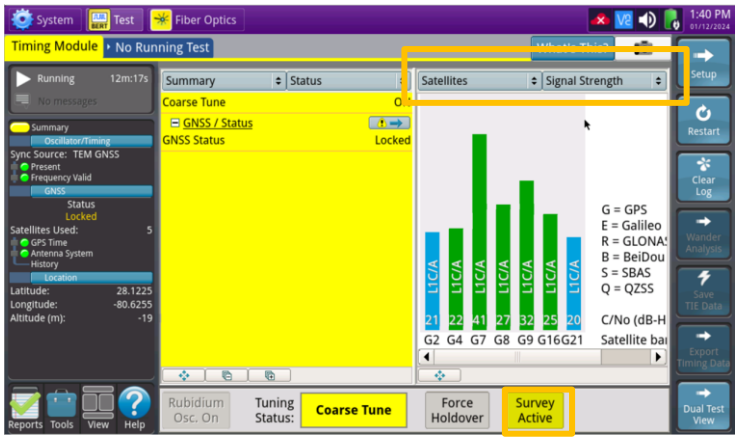

Figure 8: Satellites/Signal Strength Results

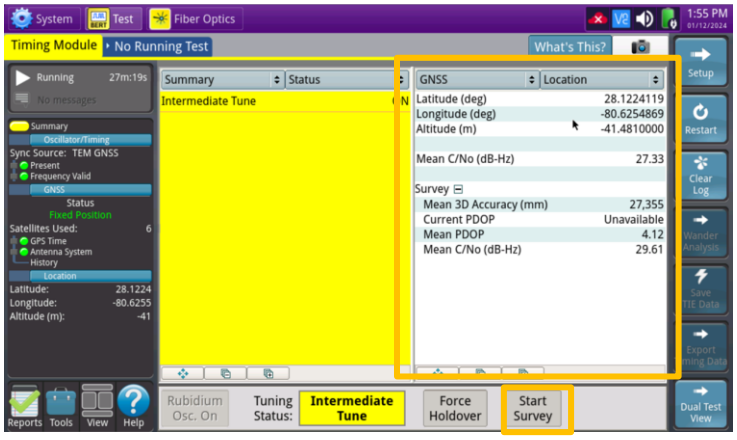

Figure 9: GNSS/Status Results

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LAUNCH PTP/1588 TEST

1. Tap the second folder under the Test Icon 

at the top of the screen, Labeled either Port 1 or Port 2.

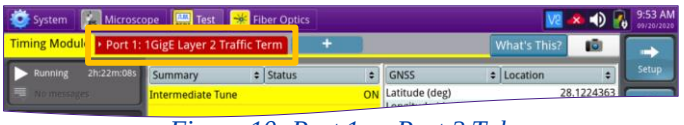

Figure 10: Port 1 or Port 2 Tab

2. Tap the **Select Test** drop-down 

and select the following Layer 2 PTP/1588 test:
   - ► **Ethernet> 1GigE Optical> Layer 2 PTP/1588> P1 Terminate**

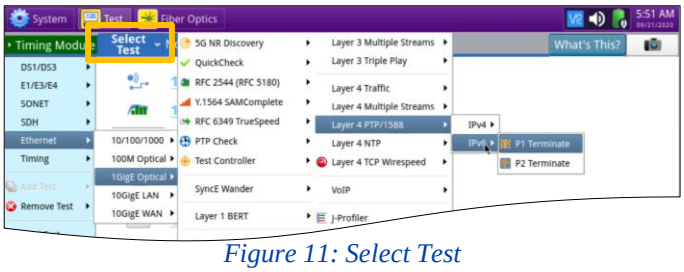

Figure 11: Select Test

3. Connect T-BERD SFP+ Port 1 to the network port to be tested using an LC patch cable.
   - ► Enable the Laser: 

   - ► Press **Restart**: 

   - ► Look for 5 or 6 green LEDs: This will indicate that the link is up, and GPS sourced timing is available.

Figure 12: Enable the Laser

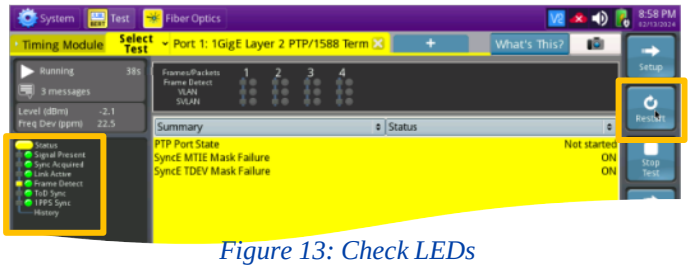

Figure 13: Check LEDs

CONFIGURE PTP SLAVE SESSION

1. Press Setup: 

2. Select the **PTP** Folder. Make all PTP settings as necessary for a PTP Slave on the network under test:
   - Mode: Slave
   - Address Mode: Multicast
   - Domain: default value should be set to 24, otherwise use the value recommended by your network timing administrators, in the range 24 to 43
   - Encapsulation: None
   - Announce Rx Timeout: 3
   - Announce: 8 per second

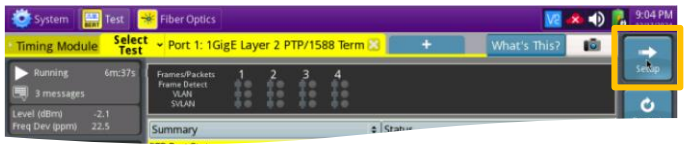

Figure 14: Setup

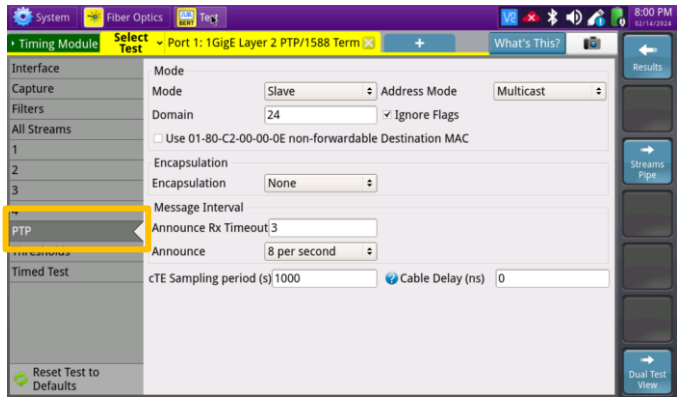

Figure 15: PTP Setup

CONFIGURE PTP SLAVE SESSION (Continued)

3. Select the **Thresholds** folder. Enable and set the desired settings thresholds including **Time Error Max**.
   - ► Swipe screen or use scroll bar to view and configure additional Measurement settings and pass/fail limits.

4. Press Results:  to return to the results view.

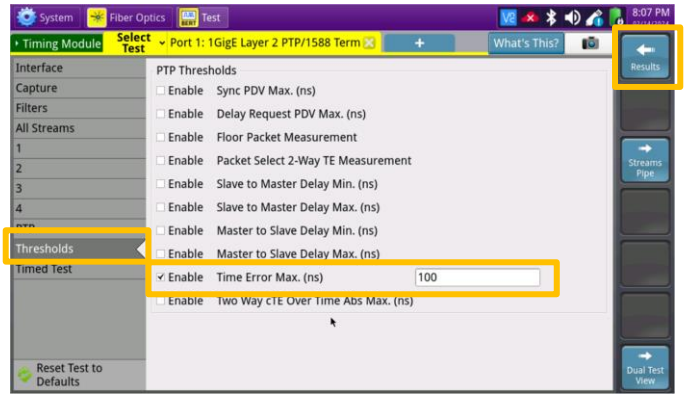

Figure 16: Thresholds Setup

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.

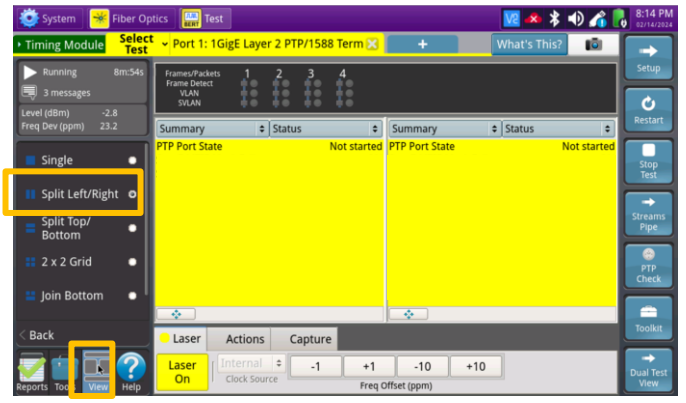

Figure 17: Split Left/Right View

2. Select **PTP / Link Stats** for the left result windows.

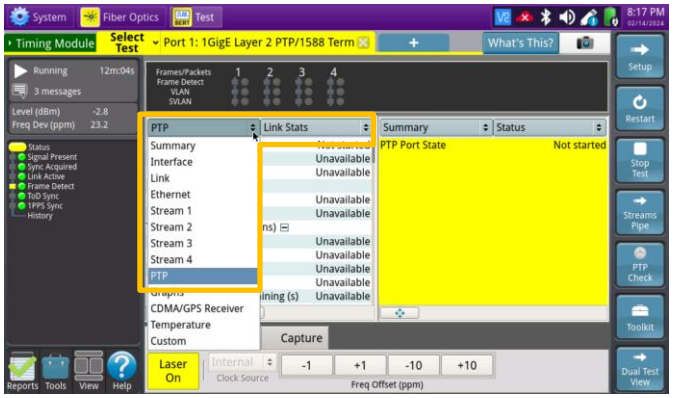

Figure 18: PTP/Link Stats

3. Select the **Actions** tab at the bottom of the screen, press **Start Slave PTP Session**.

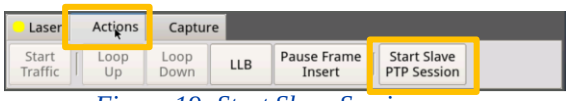

Figure 19: Start Slave Session

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- Port State should progress from "**Not Started**" to "**Listening**" to "**Slave**"
- Detecting the Rx Domain Number (24 to 43) 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, Summary/Status window and the Status LED and the value for that result will turn red.

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

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

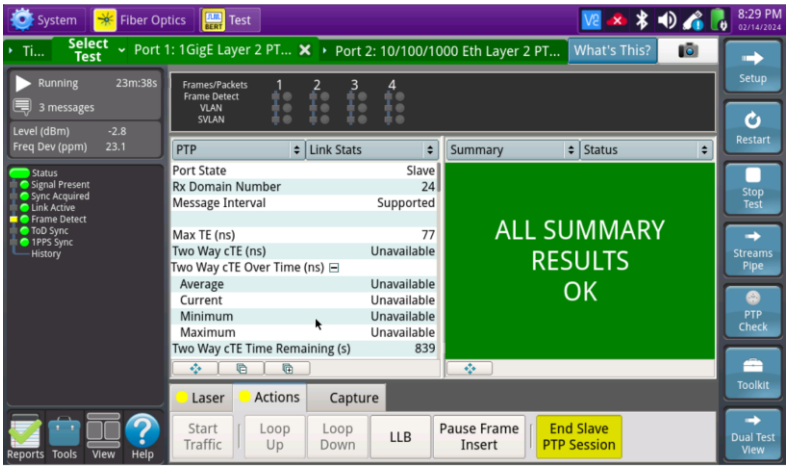

Figure 20: PTP Link Stats

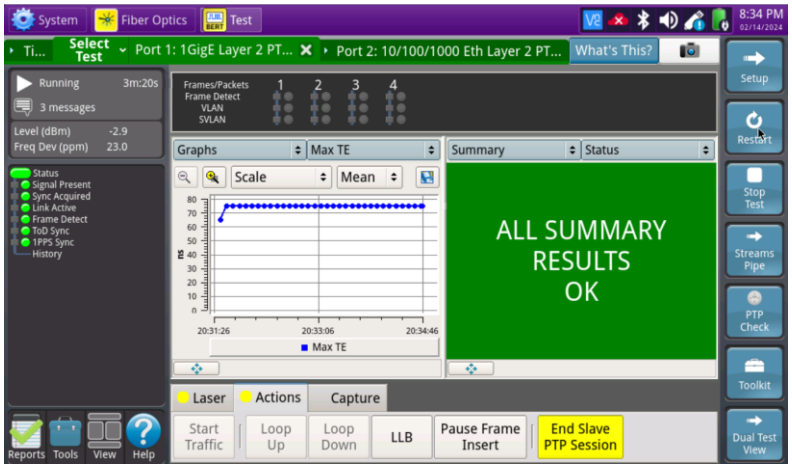

Figure 21: Max TE Graph

CREATE REPORT

1. Tap Reports 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 T-BERD 5800's **/user/bert/reports** folder.

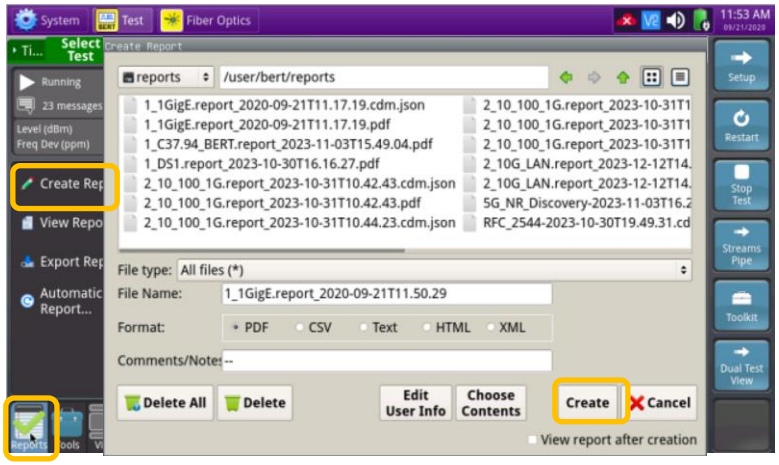

Figure 22: Create Report

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