

Quick Card

T-BERD[®]/MTS-5800 Network Tester

IEEE 1588v2 Precise Timing Protocol (PTP) Verification Measurements in a G.8275.2 Architecture

This document outlines how to set up a T-BERD/MTS-5800 test instrument for timing and sync measurements related to the IEEE 1588v2 (aka Precise Timing Protocol (PTP)) according to **G.8275.2 Telecom Profile for Time/Phase Synchronization with Partial Timing Support from the Network**.

Equipment Requirements:

- One of the following T-BERD/MTS-5800 models:
 - T-BERD 5800-100G or T-BERD 5882 equipped with GNSS Timing and Location option (Part# C5GNSS)
 - Any T-BERD/MTS-5800 equipped with Timing Expansion Module (C5TEM-R)
- Ethernet and IEEE1588v2/PTP Test options:
 - For 1G: C510M1GE and C5LS1588
 - For 10G: C510GELAN and C510G1588
 - For 25G: C525GE and C525G1588 (TBERD 5800-100G only)
- BERT software release V29.0.1 or greater
- GNSS Antenna (Taoglas AA.171, VIAVI Part# C5TEM-ANTENNA)
- The Timing Expansion Module (C5TEM-R) is recommended in any situation where access to GPS (the sky) is limited and/or measurement accuracy of +/-20ns is necessary.



Figure 1: Equipment Requirements



Figure 2: T-BERD/MTS-5882

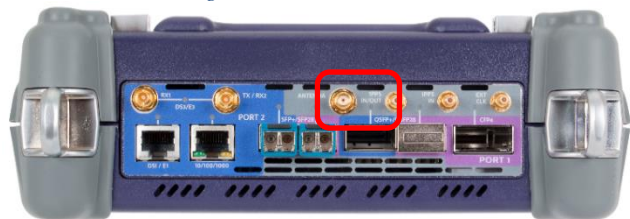


Figure 3: T-BERD 5800-100G


Connect the GNSS Antenna:


1. Connect the antenna cable to the SMA connector on the T-BERD/MTS-5800/TEM (labeled **Antenna**).
2. Tighten the connector until the antenna is securely attached.
3. Place the antenna in a location with minimum interference or blocking (buildings, terrain, etc.).



Figure 4: T-BERD 5800v2 shown with the **TEM**

Enable GNSS Receiver and Complete Survey:

1. Press the Power button  to turn on the test set.

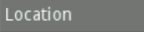
2. Tap the Test icon .

3. Tap the **Internal GNSS** tab  or the **Timing Source** tab .

4. Tap the **Setup** soft key .


5. Configure GNSS Settings as follows:


- **GNSS System(s):** Select **GPS** for use in North America. Other constellations or combination of constellations can also be used.
- **Time Type:** GPS
- **Time Format:** 12-hour
- **Elevation Limit:** 5 deg recommended and will work in “urban canyon” environments with many obstructions. Using satellites near the horizon may degrade performance so using an Elevation Limit greater than 5 but less than 15 degrees is acceptable.
- **Minimum C/No:** 9 dB-Hz recommended and will work in “urban canyon” environments with many obstructions. Using satellites with a weak carrier to noise ratio may degrade performance so values as high as 30 dB-Hz are acceptable for “clear-key” environments.
- **Antenna Power:** 3.3 volts for VIAVI supplied Taoglas AA.171 antenna. If you are using a different antenna, enter the voltage required by that antenna. Enter “0” if the antenna has a power source.
- **Antenna Time Bias:** 28 ms for VIAVI supplied Taoglas AA.171 antenna. If you are using a different antenna, enter the cumulative delay introduced by the antenna, the cables, and any in-line splitters, surge arresters or amplifiers. In absence of more specific information, use 1.2ns/foot or 4.5ns/meter of cable.

6. Tap the **Location** settings tab .


7. Configure Location Settings as follows:

- **Survey mode:** **Typical (3 hours)** the **minimum** recommended survey length for best accuracy. **Fast** or **Quick** may be used, but timing accuracy is reduced.

8. Tap the **Start Survey** button  to start a survey.

9. Tap the **Results** soft key  to view the Test Result screen.

10. If you are using a T-BERD 5800v2 and Timing Module (C5TEM-R), tap the **Rubidium Osc.**

button  to turn on and tune the oscillator.

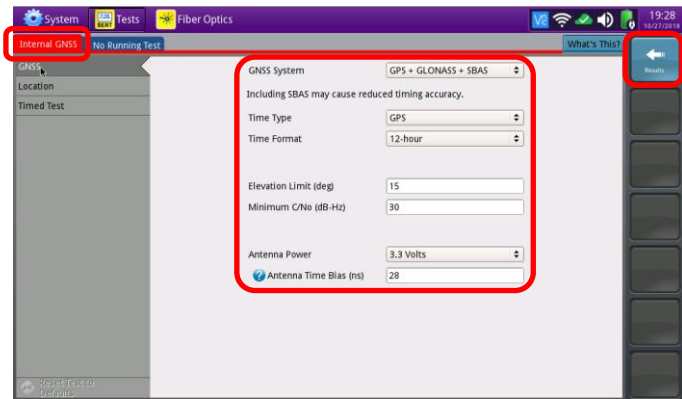


Figure 5: GNSS Setup

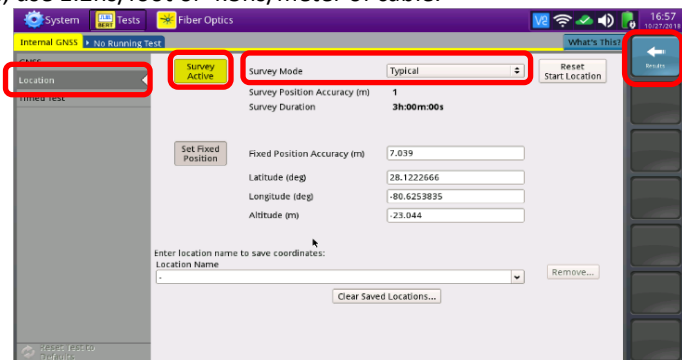


Figure 6: Location Setup

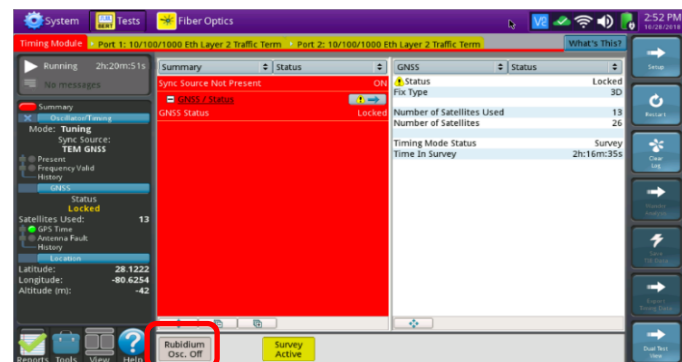


Figure 7: Test Results Screen, T-BERD 5800v2

11. Using the results group and category drop-down menus, change the left or right displays 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.
- **GNSS/Location:** Provides the mean (avg) C/No, the 3D Location Accuracy, and the Current (during survey) and Mean Position Dilution of Precision (PDOP). A PDOP of 1 is perfect. A value below 4.0 is desired.
- **Satellites/Signal Strength:** Uses a bar graph to display the signal strength for each identified satellite. Green indicates the signal is above 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”.

Note: If you are using a T-BERD 5800v2 and Timing Module (C5TEM-R), the **Summary** LED and **Summary/Status** results display will remain red until the rubidium oscillator is tuned.

12. Once the survey is done (oscillator is in **Fine Tune** state if using TEM), you are ready to perform timing tests using the attached antenna, including:

- One-way delay measurements
- IEEE 1588 Precision Time Protocol (PTP) Time Error, and Packet Delay Variation (PDV) measurements
- Wander analysis
- Timing and 1PPS Analysis

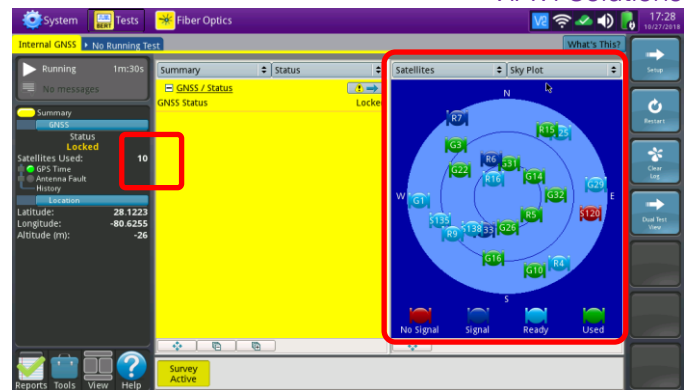


Figure 8: Satellites/Sky Plot results

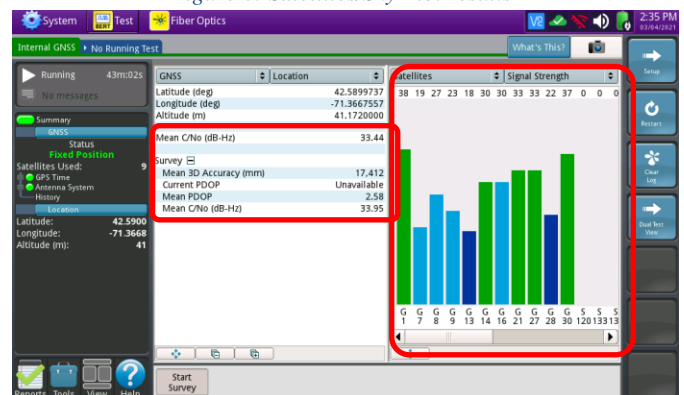


Figure 9: Satellites/Signal Strength results

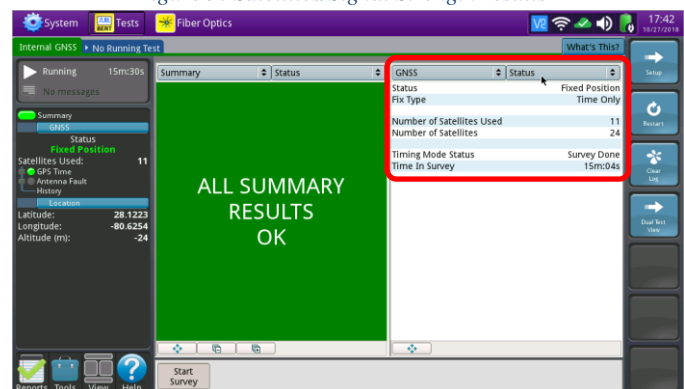


Figure 10: GNSS/Status after survey (Internal GNSS)

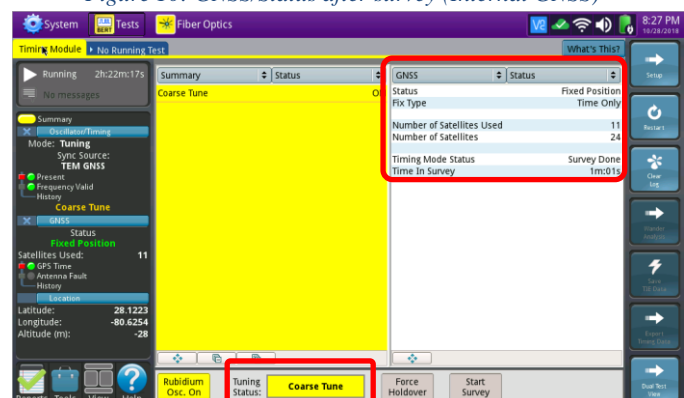


Figure 11: GNSS/Status after survey & course tune (TEM)

Enable PTP Slave Session:

- Tap the second folder under the Test Icon at the top of the screen.
- Tap the **Select Test** drop-down and select the **Layer 4 PTP/1588** at the desired rate:
 - Ethernet> 1GigE Optical> Layer 4 PTP/1588> IPv4> P1 Terminate
 - Ethernet> 10GigE LAN> Layer 4 PTP/1588> IPv4> P1 Terminate
 - Ethernet> 25GigE LAN> Layer 4 PTP/1588> P1 Terminate
- 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.
 - Press Setup:**
- Select the **All Streams** folder. Configure **Source IP Type, Source IP** and **Default Gateway**.
- 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 44, otherwise use the value recommended by your network timing administrators
 - Address Mode:** Multicast or Unicast
 - Master IP Address:** example shown
 - Encapsulation:** None or VLAN and enter VLAN ID & VLAN Priority
- Press **Results:** to return.
- In the **Actions** tab, press **Start Slave PTP Session** .

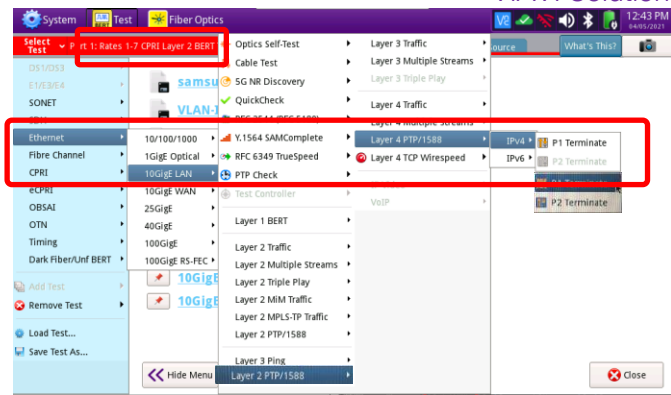


Figure 12: Test Selection

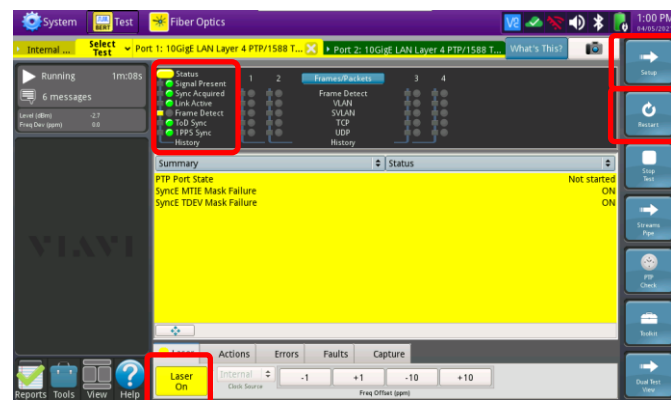


Figure 13: Physical Layer Establishment

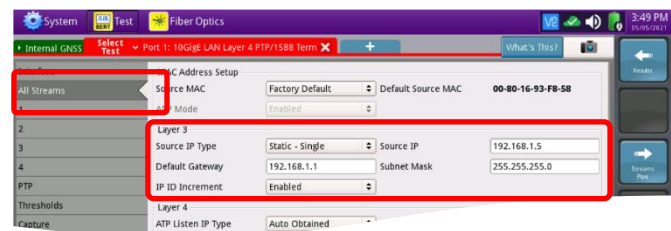


Figure 14: All Streams setup

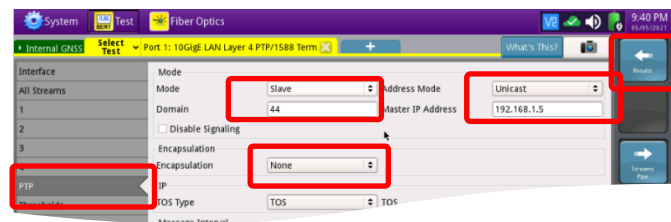


Figure 15: PTP Slave Parameters

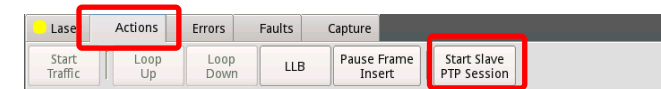


Figure 16: Actions Tab to Start PTP Session

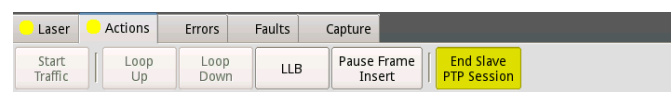


Figure 17: Session Started

Review PTP Slave Session Results:

- The default view is single screen with Summary & Status. The view can be changed to dual results (Split Left/Right) through the View button on the lower left.
- Select **PTP / Link Stats** and **Graphs / Max TE** for the two results windows.
 - Detecting the Rx Domain Number (44), Message interval (Supported) and seeing a Max TE value indicates that the PTP Slave Session is active. The T-BERD is receiving timing from the PTP master.
 - Note: There are many more categories and sub-categories of results both tabular and graphed.
- It is also possible to set thresholds for certain measurements
 - Press **Setup**:
 - Select the **Thresholds** tab.
 - Enable** and set desired thresholds.
 - For 8275.2 implementations, the **Packet Select 2 Way Time Error (TE) Measurement** is a recommended area of focus. *When this threshold is selected you must also select if the measurement type is for **Assisted Partial Timing Support (APTS)** or **Partial Timing Support (PTS)**. This will determine whether the pass/fail measurement is done peak-to-peak or if the max values are being used.*
- Press **Results**:
- In the **Actions** tab, press **Start Slave PTP Session**
- If any of the thresholds are triggered the Test Folder, the Status LED and the value for that result will all turn **red**.

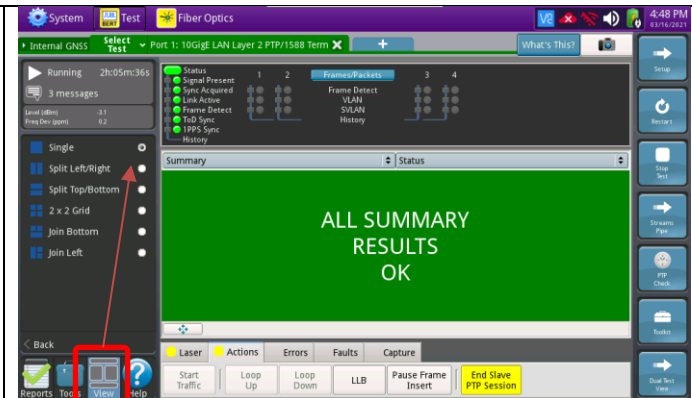


Figure 18: PTP Test Results

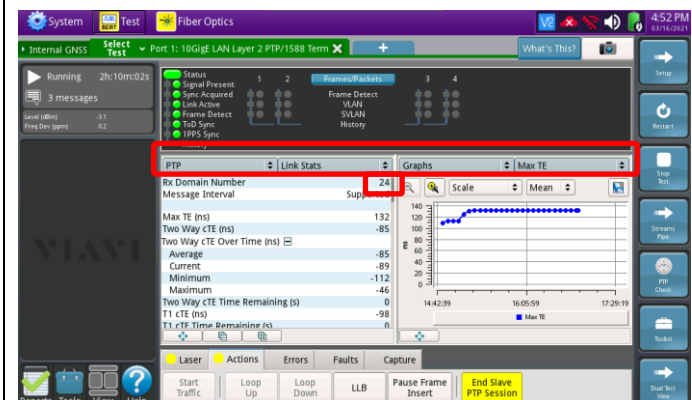


Figure 19: PTP Test Results

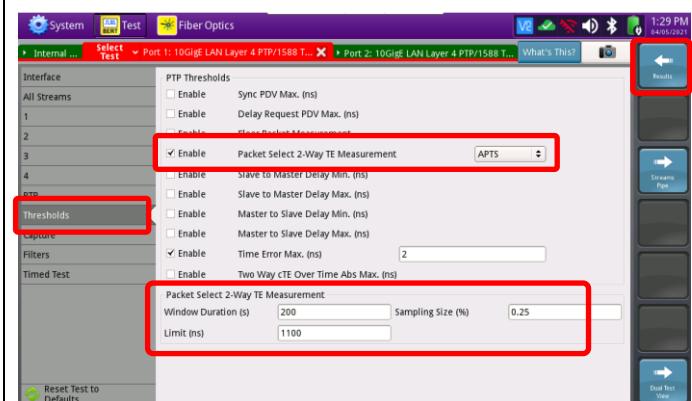


Figure 20: PTP Thresholds

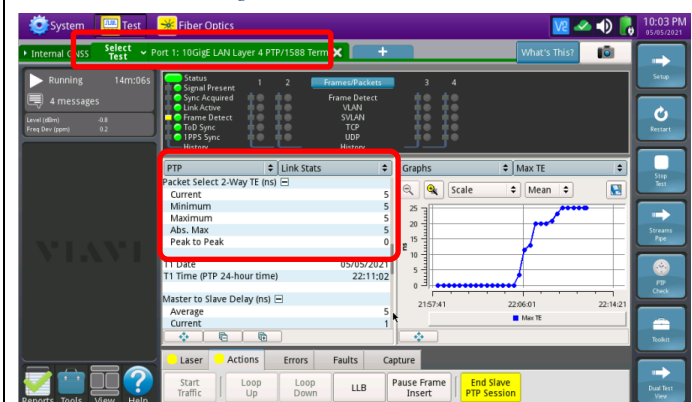


Figure 21: PTP Test Results