Paragon-neo

Calnex
Insight and Innovation

Paragon-neo Release 10

NEW FUNCTIONALITY AND ENHANCEMENTS

(Release 10.00.XX)

Contents

1. Software Release Overview

Release 10 (10.00.XX) adds the following features to Paragon-neo.

Software Update with valid CSS (Customer Support Service) contract

New Options	Enhancements to existing Options	Base product enhancements
None	**None**	• O-RAN Conformance Test • Custom optical module latency settings • IEEE1588-2019 • Https support • Defect Fixes

To check the current software version installed, select **Help > About** on the Paragon-neo GUI.

2. Features and Benefits

Paragon-neo A	Benefit
O-RAN Conformance Test	This feature is intended to greatly simplify the process of O-RAN O-DU and O-RU synchronization conformance testing as per O-RAN.WG4.CONF.
Custom optical module settings	Provides the ability to apply custom compensations for transceiver transmit and receive path delays, and to modify electrical interface settings to enable the use of any transceiver.
IEEE 1588-2019	Updated to support testing devices compliant with IEEE 1588-2019 (PTP v2.1).
Https support	Support for https protocol

3. Base Product Enhancements

3.1 O-RAN Conformance Test

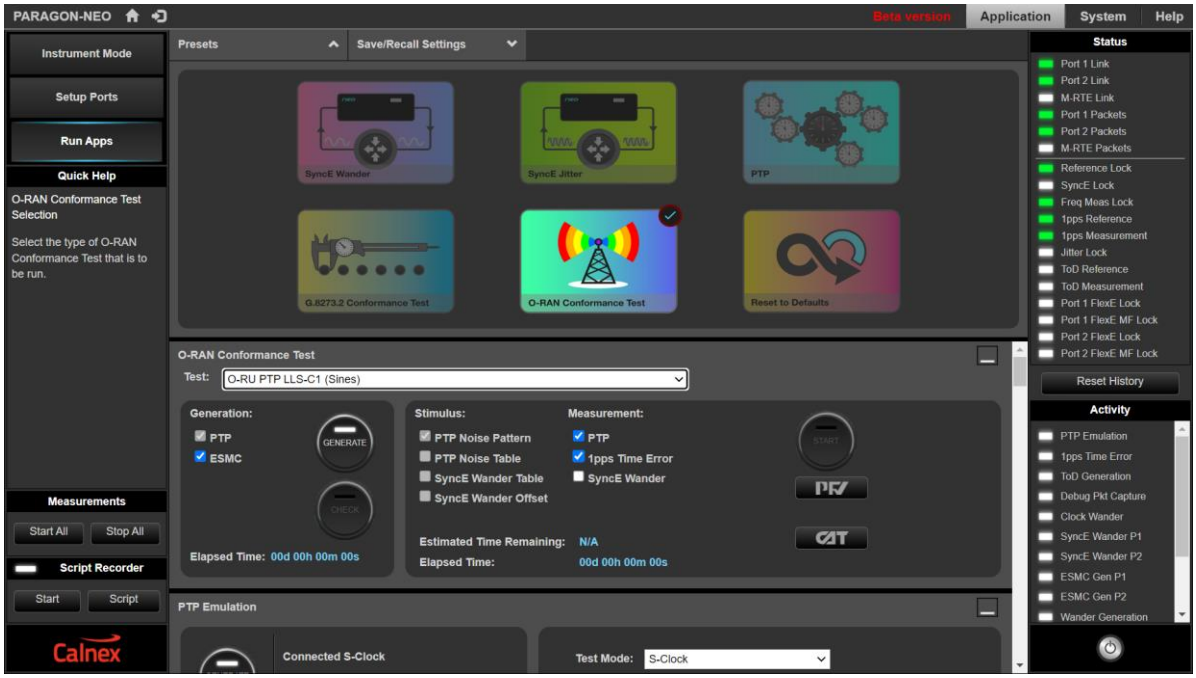
This release provides a new O-RAN Conformance Test preset and application. This feature is intended to greatly simplify the process of O-RAN O-DU and O-RU synchronization conformance testing as per O-RAN.WG4.CONF. The feature provides the following:

- Pre-configure inputs for testing both ideal and normal operating conditions for PTP and (optionally) SyncE.
- Automatically applies filters, metrics and masks for both regular and enhanced O-RU as well as both Class A and Class B O-DU.
- Comprehensive analysis and results **in real time** with automatic pass/fail indication.

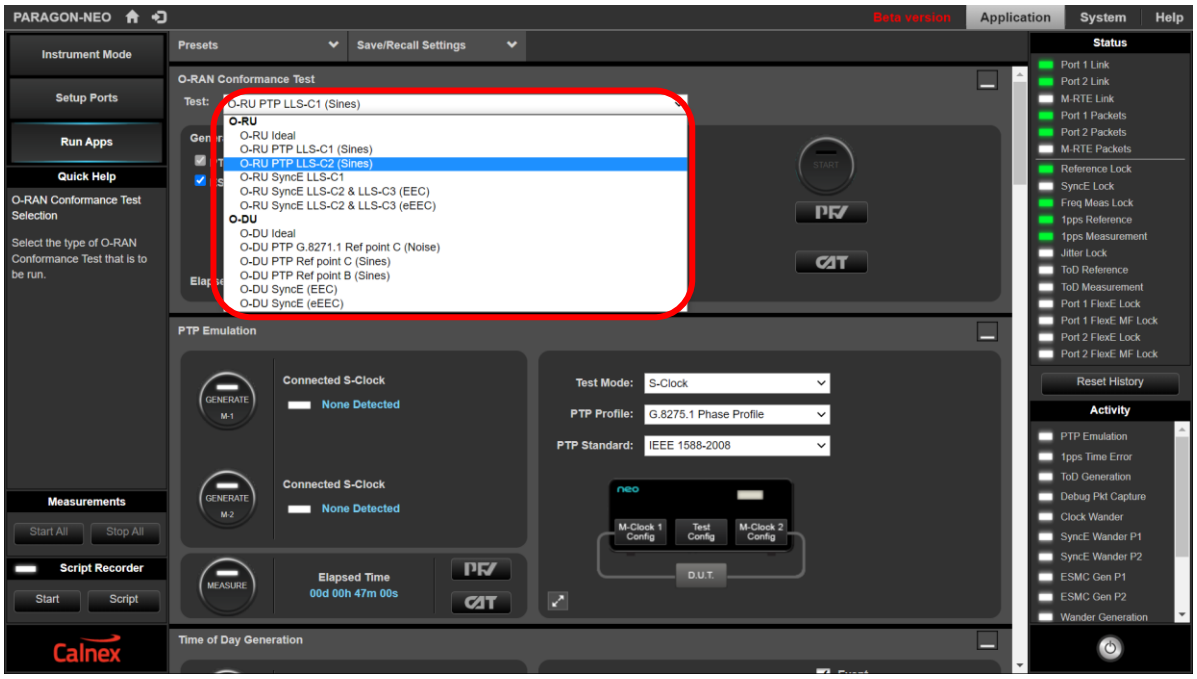
The feature requires the following options:

- Opt. NEO-PTP-G.8275.1
- Opt. NEO-SyncE-Wander (if the O-RU makes use of SyncE)
- Opt. NEO-SyncE-MTIE-TDEV (if the O-RU makes use of SyncE)

Select the required O-RAN Conformance Test preset and the application will be available at the top of the applications list.

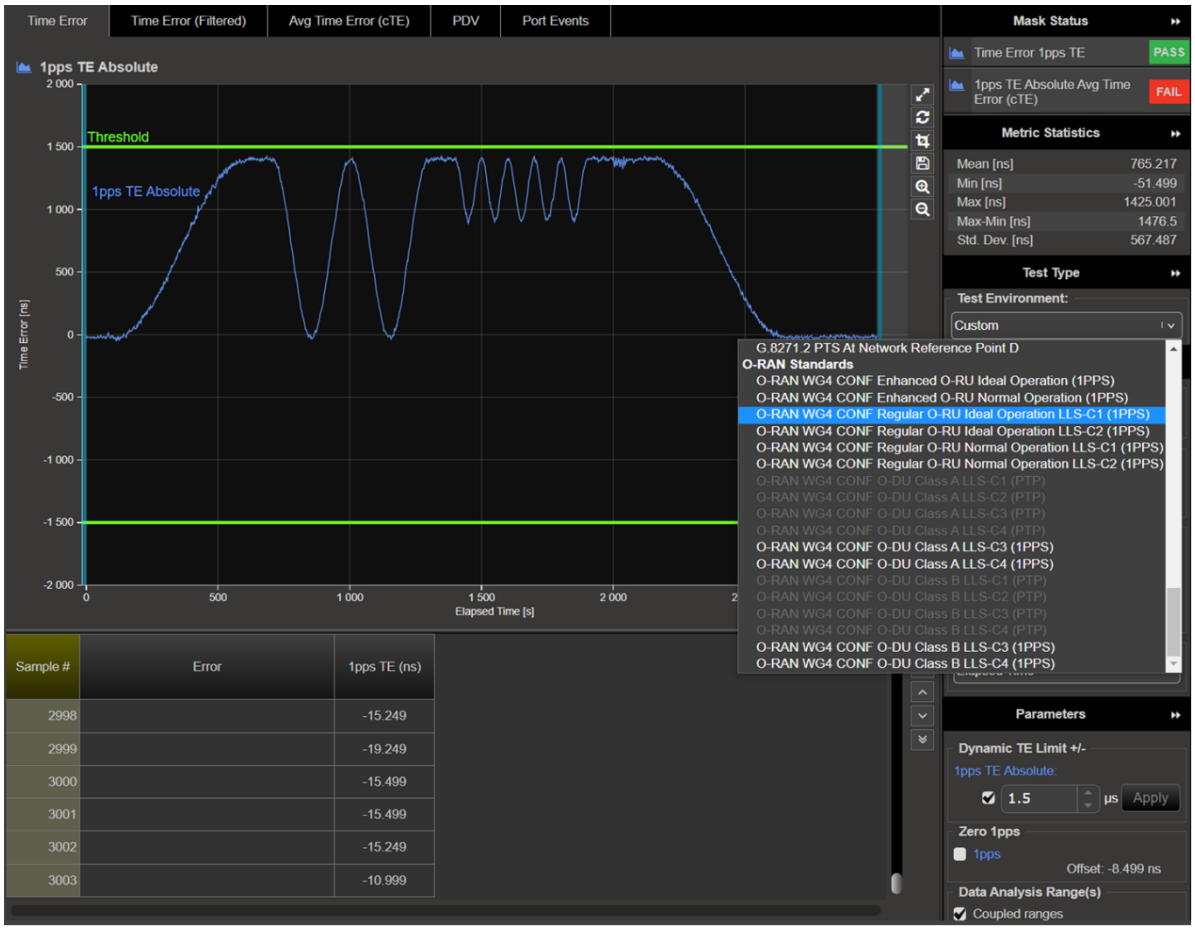


Then select the appropriate test from the drop down menu.



The relevant applications will be pre-selected and the default settings for that test will be pre-configured in the applications. Make any optional adjustments in the individual applications and start the test.

View the results in CAT and select the relevant standard for automatic generation and display of masks and pass/fail status.



Detailed test guides for testing O-DU and O-RU are available on the instrument after installing Release 10.

3.2 Custom Optical Module Settings

This feature provides the ability for you to adjust latency values to compensate for path delays and to modify electrical interface settings to enable the use of unqualified transceivers.

IMPORTANT: Incorrect electrical signal conditioning settings and timing compensation will adversely affect your timing measurements.

Calnex tests, characterizes and qualifies SFP type plug-in transceivers for use in Paragon-neo to ensure that repeatable and accurate timing measurements are made. Paragon-neo applies timing compensation and electrical interface settings when a qualified transceiver is detected. Transceivers that Calnex has characterized and qualified for making timing measurements with Paragon-neo are detailed on the Calnex product FAQ website.

When Paragon-neo detects an unqualified transceiver, it applies a set of default electrical interface settings and timing compensation. The default settings work very well for NRZ transceivers thus avoiding the need to make changes except in extreme circumstances. PAM4 transceivers that operate at higher data rates may have variable latency and may also require adjustment to the PAM4 electrical settings before taking timing measurements.

Calnex recommends using only qualified transceivers and leaving the Paragon-neo internal settings unchanged.

PAM4 Transceivers

Calnex recommends using qualified PAM4 transceivers whenever possible. Follow these steps when new or unqualified transceivers must be used:

1. Test the new transceiver to determine whether Paragon-neo default settings provide error-free communication and accurate timing measurements.
2. If needed, adjust timing latencies.
3. If needed, adjust signal conditioning.

NRZ Transceivers

Calnex strongly recommends that default timing and signal conditioning parameters are used. The default parameters work for all NRZ transceivers tested by Calnex to date. If you change the default parameters, follow the same steps as for PAM4 Transceivers.

Jitter Testing

Calnex qualified transceivers must always be used for jitter testing.

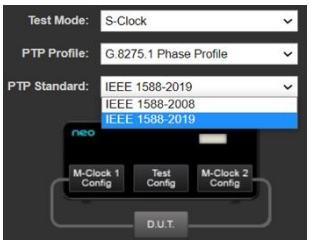
A detailed guide for using non Calnex-qualified transceivers with Paragon-neo is available on the instrument after installing Release 10.

NOTE: If the test guide is to be used to test latency of transceivers then Opt. NEO-PTP-G.8275.1 is required (test procedure utilizes the TC test mode).

3.3 IEEE1588-2019

This release includes some updates to accommodate testing of systems that are compliant with IEEE 1588-2019 (PTP v2.1). These include:

- New configurable values
- New analysis of captured values
- New metrics/rules



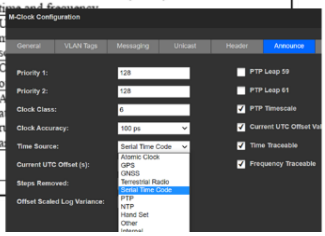
New configurable values

M-clock configuration > Announce tab

IEEE-1588 2019: 7.6.2.8

Table 6—timeSource enumeration

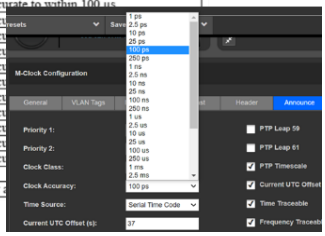
Value (hex) [a]	timeSource	Description
10	ATOMIC_CLOCK	Any PTP Instance that is based on an atomic resonance for frequency, or a PTP Instance directly connected to a device that is based on an atomic resonance for frequency.
20	GNSS	Any PTP Instance synchronized to a satellite system that distributes time and frequency.
30	TERRESTRIAL_RADIO	Any PTP Instance synchronized via any of the radio distribution systems that distribute time and frequency.
39	SERIAL_TIME_CODE	Any PTP Instance synchronized via any of the serial time code distribution systems that distribute time and frequency, for example, IRIG-B.
40	PTP	Any PTP Instance synchronized to a PTP-based source of time external to the domain.
50	NTP	Any PTP Instance synchronized via NTP or Simple Network Time Protocol (SNTP) servers that distribute
60	HAND_SET	
90	OTHER	
A0	INTERNAL_OSCILLATOR	
F0 to FE	Designated for assignment by alternate PTP Profiles	
FF	Reserved	



IEEE-1588 2019: 7.6.2.6

Table 5—clockAccuracy enumeration

Value (hex)	Specification
00 to 16	Reserved
17	The time is accurate to within 1 ps
18	The time is accurate to within 2.5 ps
19	The time is accurate to within 10 ps
1A	The time is accurate to within 25 ps
1B	The time is accurate to within 100 ps
1C	The time is accurate to within 250 ps
1D	The time is accurate to within 1 ns
1E	The time is accurate to within 2.5 ns
1F	The time is accurate to within 10 ns
20	The time is accurate to within 25 ns
21	The time is accurate to within 100 ns
22	The time is accurate to within 250 ns
23	The time is accurate to within 1 µs
24	The time is accurate to within 2.5 µs
25	The time is accurate to within 10 µs
26	The time is accurate to within 25 µs
27	The time is accurate to within 100 µs
28	The time is accu
29	The time is accu
2A	The time is accu
2B	The time is accu
2C	The time is accu
2D	The time is accu
2E	The time is accu
2F	The time is accu
30	The time is accu
31	The time is accu
32 to 7F	Reserved
80 to FD	Designated for



New analysis of captured values

- Version number field presented in PFV. Automatically adjust PFV presentation format based on captured values.
- Major/minor SdoId fields (were reserved fields in 2.0), presented in PFV for v2.1

Direction	Packet #	Arrival Time	Decoded PTP Version	Inter Message Time	Message Type	majorSdoId	versionPTP	minorVersionPTP	messageLength	domainNumber (100000)	minorSdoId
▶ 2	196956	3517.126350582250	2.1	0.125000045750	ANNOUNCE	0x0	0x2	0x1	0x40	0x2c	0x0
◀ 2	196957	3517.126350584000	2.1	0.062500024750	DEL-REQ	0x0	0x2	0x1	0x2c	0x2c	0x0
▶ 2	196958	3517.126350589750	2.1	0.062500027250	DEL-RESP	0x0	0x2	0x1	0x36	0x2c	0x0
▶ 2	196959	3517.188850606750	2.1	0.062500025000	SYNC	0x0	0x2	0x1	0x2c	0x2c	0x0
◀ 2	196960	3517.188850610250	2.1	0.062500026250	DEL-REQ	0x0	0x2	0x1	0x2c	0x2c	0x0
▶ 2	196961	3517.188850614750	2.1	0.062500025000	DEL-RESP	0x0	0x2	0x1	0x36	0x2c	0x0
▶ 2	196962	3517.251350628750	2.1	0.062500022000	SYNC	0x0	0x2	0x1	0x2c	0x2c	0x0
▶ 2	196963	3517.251350630000	2.1	0.125000047750	ANNOUNCE	0x0	0x2	0x1	0x40	0x2c	0x0

- New *clockAccuracy* and *timeSource* values evaluated by PFV rules

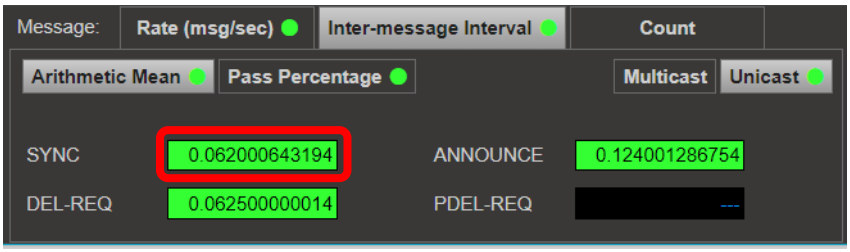
Direction	Packet #	Arrival Time	Decoded PTP Version	Inter Message Time	Message Type		Announce Body Fields					
							curUtcOffset	gmPrior1	gmClkClass	gmClkAcc (14286)	gmClkOsIv	gmTimeSource
▶ 2	196956	3517.126350582250	2.1	0.125000045750	ANNOUNCE	Oslv=0x4e5d | gm…	37	128	6	0x1b	0x4e5d	0x39
◀ 2	196957	3517.126350584000	2.1	0.062500024750	DEL-REQ							
▶ 2	196958	3517.126350589750	2.1	0.062500027250	DEL-RESP							
▶ 2	196959	3517.188850606750	2.1	0.062500025000	SYNC							
◀ 2	196960	3517.188850610250	2.1	0.062500026250	DEL-REQ							
▶ 2	196961	3517.188850614750	2.1	0.062500025000	DEL-RESP							
▶ 2	196962	3517.251350628750	2.1	0.062500022000	SYNC							
▶ 2	196963	3517.251350630000	2.1	0.125000047750	ANNOUNCE	Oslv=0x4e5d | gm…	37	128	6	0x1b	0x4e5d	0x39
◀ 2	196964	3517.251350632750	2.1	0.062500022500	DEL-REQ							

New metrics/rules

PFV will check the minorVersion PTP field and apply v2.0 (2008) or v2.1 (2019) rules accordingly.

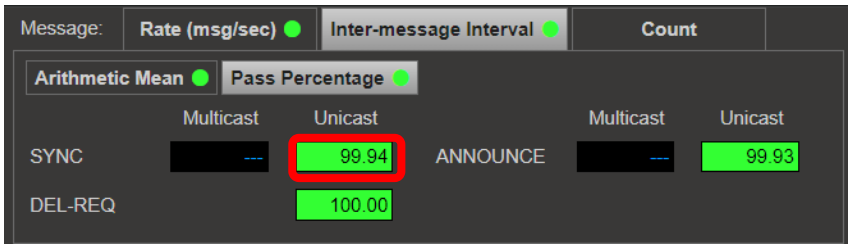
Mean Inter-message Interval

- The arithmetic mean of all inter-message intervals must be:
  - **Multicast, Sync and Announce:** Within ±30% of the equivalent log message interval
  - **Multicast, Del_Req:** ≥90% of the equivalent log message interval
  - **Unicast:** Within ±30% of the granted inter-message period
- PFV displays the arithmetic mean value and will show a fail if that value is outside the tolerance.
- **IEEE 1588-2019:** 9.5.9.2, 9.5.11.2, 9.5.13.2, 13.3.2.14, 16.1.1



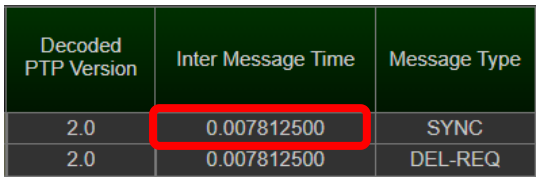
Inter-message Interval Pass Percentage

- At least 90% of the inter-message intervals must be:
  - **Multicast:** Within ±30% of the equivalent log message interval
  - **Unicast:** Within ±30% of the granted inter-message period
- PFV displays the percentage of messages that are within the ±30% tolerance and will show a fail if that percentage is less than 90%
- **IEEE 1588-2019:** 9.5.8, 9.5.9.2, 16.1.1



Maximum Inter-message Time Check

- The interval between successive PTP messages should not exceed:
  - **Multicast:** Twice (2x) the value of the of the equivalent log message interval (multicast) or
  - **Unicast:** Twice (2x) the value of the granted inter-message period (unicast)
- PFV displays the inter-message time between messages of a common type and will show a fail if that value exceeds the maximum allowed value.
- **IEEE 1588-2019:** 9.5.9.2, 9.5.8, 9.5.11.2, 16.1.1



Decoded PTP Version	Inter Message Time	Message Type
2.0	0.007812500	SYNC
2.0	0.007812500	DEL-REQ

4. Installation

The Paragon-neo software is delivered as a tar file (*.tar).

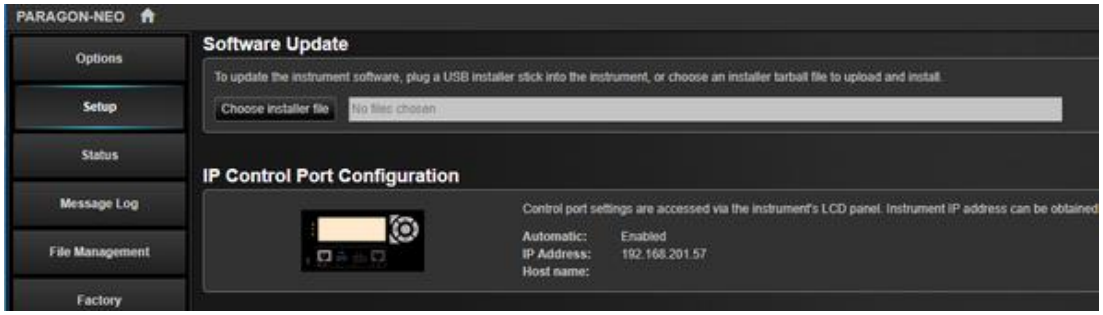
NOTE: The .tar upgrade should only be applied to an instrument running Release 9. If you are running an older software version, please first upgrade to Release 9.

From Release	Upgrade Steps to R10
R9 →	**Direct**
R8.1 →	**→ R9 → R10**
R8 →	**→ R9 → R10**
R7 →	**→ R9 → R10**
R6 →	**→ R7 → R9 → R10**
R5 →	**→ R7 → R9 → R10**
R4 →	**→ R5 → R7 → R9 → R10**
R2.1 →	**→ R4 → R5 → R7 → R9 → R10**

To install using tar file:

- Download the tar file and save it to a location on your PC.
- Before upgrading the instrument, you must first stop all generation and capture.
- Follow the steps below to upgrade:

1. Click **System** in the menus on the top right of the User Interface.
2. Click **Setup** in the left-hand menu bar. The User Interface should look something like below:



3. Click **Choose installer file** to select the tar file that you saved earlier.

   The instrument will now begin the upgrade process. Note that this will take a while (maybe as much as an hour). **Do not power off while the upgrade is in progress**.

Appendix A: Software Advisory Notes

- For more information on features and fixes in this Release, along with other user information on Calnex products, please visit the Knowledge Base at: https://calnexsolutions.atlassian.net/wiki/spaces/KB/overview
- There is a known issue in this release that the removal and re-connection of the 1PPS/ToD measurement cable during a test will result in ToD offset. To ensure expected performance, toggle the 1PPS between internal and external after pulling the cable to re-synchronize the sequence numbers.
- When using the additional M-Clock function while configured for relative time error measurements, it is not recommended to transfer jumbo packets to the M-Clock. In this particular scenario, the RTE master TE measurement performance is not guaranteed.
- Note that generating SyncE wander on the 100M electrical/optical and the 1G electrical interfaces may add packet-to-packet noise in the T1 and 2Way measurements. This noise does not affect the mean TE, and may likely be filtered out. This is for information only.
- There is a known issue in this release that a step change in phase of the external 10MHz reference after an interface has been selected can result in a link-down or bad measurement results. The measurement results will in most cases be noticeably wrong by an order of magnitude from expected. The workarounds for this are one of: toggle the Frequency Reference to internal and back again, or select another physical interface in the GUI then switch back to the original interface.

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