

Paragon-**neo** Drop 2

NEW FUNCTIONALITY AND ENHANCEMENTS

(Release 02.00.XX)




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1 Software Release Overview

Drop 2 (02.02.XX) adds the following features to Paragon-neo and CAT¹:

Software Update with valid CSS
(Customer Support Service) contract



New Options	Enhancements to existing Options	Base product enhancements
Option ToD Option SyncE Jitter (25G/40G/100G variants)	PTP: Slave test mode PTP: Debug Packet Capture SyncE: Enhanced SSM code selector	10MHz/2MHz clock measurement Defect Fixes

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

¹ This release includes enhancements to the CAT. The CAT accompanies Paragon-neo and is used to display/present graphical results such as Wander and Time Error and to calculate metrics such as MTIE/TDEV for further analysis.

2 Features and Benefits

Paragon-neo	Benefit
<p>Option: ToD (Time of Day)</p>	<p>In parallel with PTP, SyncE and/or 1pps timing testing as required, provide stimulus and measurement of Time-of-Day messages as required for applications such as Assisted Partial Timing Support (ITU-T G.8273.4)</p> <p>ITU-T G.8271, CCSA and NMEA formats supported</p>
<p>Option: SyncE Jitter (25G/40G/100G variants)</p>	<p>Verify 25/40/100GbE SyncE jitter tolerance standards compliance to ITU-T G.8262. Applies Jitter with test packets for visibility of device throughput, plus ability to apply jitter beyond G.8262 jitter tolerance mask limits for device margin testing.</p> <p>Verify 25/40/100GbE SyncE jitter generation performance to ITU-T G.8262. Measures ITU-T G.8262 peak to peak jitter and RMS jitter with pass/fail to G.8262</p>
<p>Slave test mode (Requires any PTP option)</p>	<p>Allows device conformance testing of Slave devices up to ITU-T Class-C/D accuracy levels, with easy setup and multiple simultaneous measurements</p>
<p>Debug Packet Capture (Requires any PTP option)</p>	<p>Quickly troubleshoot packet exchanges to debug setup issues in PTP test systems</p>
<p>10MHz/2MHz clock measurement</p>	<p>High-accuracy frequency measurements, to validate clock performance, including scenarios for clock recovery with high accuracy PTP and SyncE test inputs</p>
<p>Enhanced SSM code selector (Requires SyncE Wander)</p>	<p>Configure SSM generation as per ITU-T G.8264 Amd1</p>
<p>ITU-T G.8262.1 Wander Transfer (Requires SyncE Wander)</p>	<p>Leverage Paragon-neo 250ps Phase Wander measurement resolution to complete G.8262.1 Transfer testing, with pre-selected test points to verify 3Hz bandwidth</p>

3 New Options

3.1 Option: ToD (Time of Day)

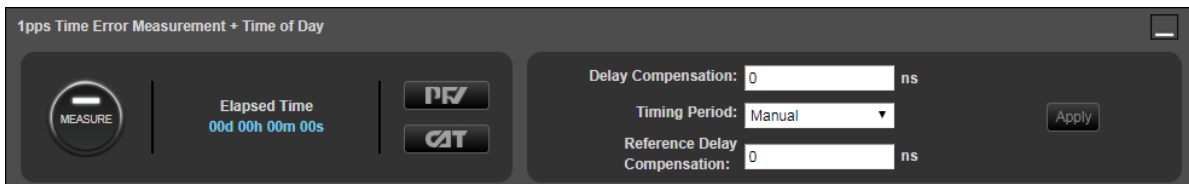
As stated in ITU-T G.8271, Time and phase synchronization interfaces are needed in networks/equipment for two purposes:

- As a measurement interface
- As a distribution interface

Particularly when used as a distribution interface, it is desirable for ToD messages to include information about synchronization status, for example to allow downstream equipment to select the best reference signal from the available options. Message formats to allow this are defined within G.8271, and equivalent information is also carried in China Communication Standards Association (CCSA) format ToD messages.

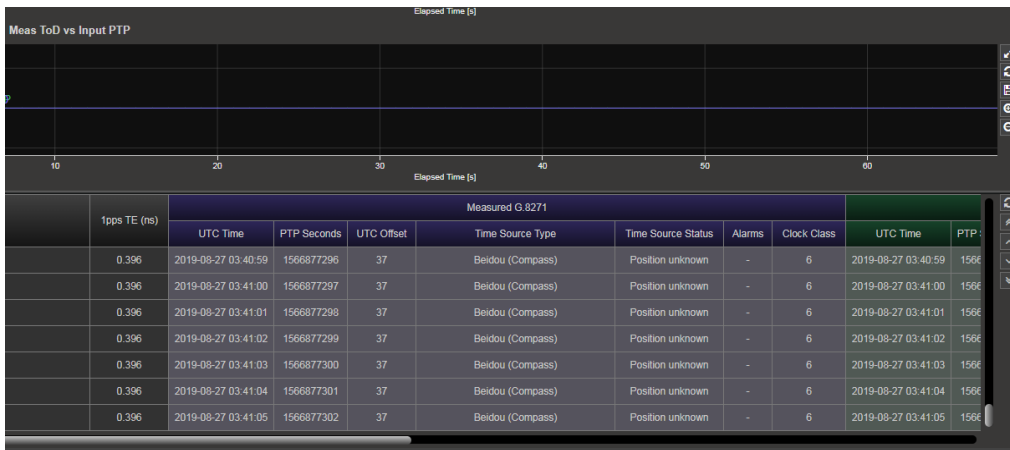
This release introduces **Option ToD** providing the ability to generate and decode/verify/measure these ToD messages, allowing users to simulate stimulus conditions involving Phase/Time as a distribution interface, as well as verify output signal performance.

With the option present, ToD measurement is enabled in the **1pps Time Error Measurement + Time of Day** app automatically. Paragon-neo will auto detect the presence and format of received ToD messages, and display results accordingly.



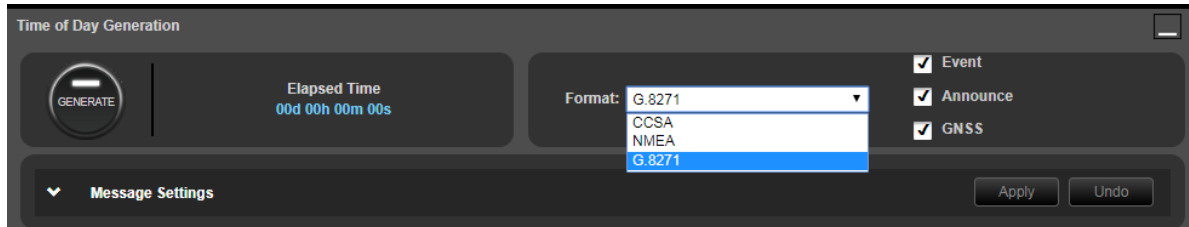
Results can be loaded into **PFV** for analysis of Time of Day messages against expected fields and values, and into **CAT** to display alongside e.g. 1pps Time Error results.

Sample #	Time Event Message				Time Announce Message							Time GNSS Status Message					
	Length	UTC Time	CurrentUTCOffset	FCS	Length	version/PTP	domainNumber	source/ClockIdentity	sourcePortNumber	clockClass	clockAccuracy	grandmaster/ClockIdentity	FCS	Length	Types of time source	Status of time source	FCS
25	14	2019-08-27 03:40:22	37	0x28	32	0x2	0x18	0x0000000000000001	0x1	6	0x21	0x0000000000000001	0x15	8	0x0	0x0	0x0
26	14	2019-08-27 03:40:23	37	0x71	32	0x2	0x18	0x0000000000000001	0x1	6	0x21	0x0000000000000001	0x15	8	0x0	0x0	0x0
27	14	2019-08-27 03:40:24	37	0x62	32	0x2	0x18	0x0000000000000001	0x1	6	0x21	0x0000000000000001	0x15	8	0x0	0x0	0x0
28	14	2019-08-27 03:40:25	37	0x20	32	0x2	0x18	0x0000000000000001	0x1	6	0x21	0x0000000000000001	0x15	8	0x0	0x0	0x0
29	14	2019-08-27 03:40:26	37	0x84	32	0x2	0x18	0x0000000000000001	0x1	6	0x21	0x0000000000000001	0x15	8	0x0	0x0	0x0



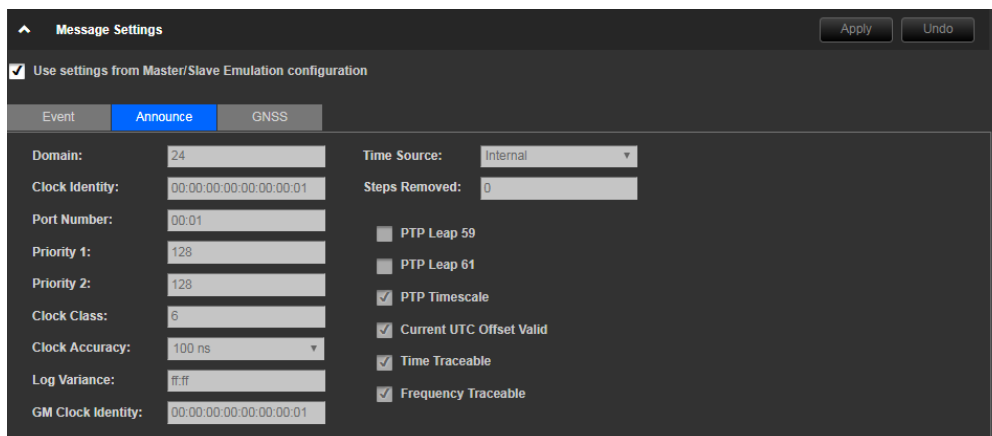
Paragon-neo also allows you to setup **Time of Day Generation** in an independent app.

Format: Can be selected, and for each format a subset of the available messages can be chosen if required via **tick-box**. It is expected that the default setting of all appropriate message types being generated will be correct for all testing other than negative test scenarios.



The **Message Settings** page can be expanded to configure each field of each generated message, for example in G.8271 **Announce** messages, the fields essentially work like a virtual PTP announce message.

These, and other fields representing timing information carried in PTP messages, can be populated directly from the Paragon-neo PTP Master/Slave Emulation configuration by selecting the appropriate tickbox:



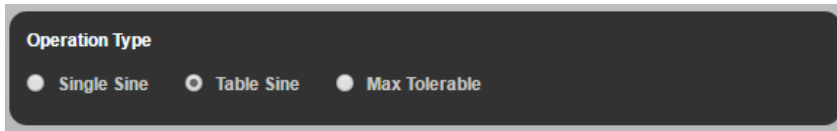
In this case, changes are driven through the **Master/Slave Emulation** app.

When decoupled from Master/Slave emulation, a number of these settings (such as values in the **Announce** message) can be modified while the ToD generation functionality is running. This can be accomplished by making the required changes and then clicking **Apply Changes** in the top right of the app. This allows you to test the dynamic behavior of your device and verify that it responds correctly to changes in its time reference.

3.2 Option: SyncE Jitter (25GbE, 40GbE, 100GbE variants)

Jitter Tolerance

This release enables full Jitter Tolerance measurements to ITU-T G.8262 Section 9.2. with configuration options for Single Sine, Table Sine and Max Tolerable Jitter.



To perform a Jitter Tolerance measurement, the user can use the default settings listed below or enter the Frequency, Amplitude and Dwell Time for each row.

Row	Enabled	Frequency (Hz)	Amplitude (uJ)	Dwell Time (s)	Status	Errors
1	<input checked="" type="checkbox"/>	10	6445	60	---	---
2	<input checked="" type="checkbox"/>	11.17	6445	60	---	---
3	<input checked="" type="checkbox"/>	1000	72	60	---	---
4	<input checked="" type="checkbox"/>	20000	3.6	60	---	---
5	<input checked="" type="checkbox"/>	100000	3.6	60	---	---
6	<input type="checkbox"/>	10	6445	60	---	---
7	<input type="checkbox"/>	10	6445	60	---	---
8	<input type="checkbox"/>	10	6445	60	---	---
9	<input type="checkbox"/>	10	6445	60	---	---
10	<input type="checkbox"/>	10	6445	60	---	---

The user is also able to set the payload using Test Packets and to configure the test packets to meet specific requirements. There are selections for Packet Size, Utilization and Payload plus Source & Destination MAC & IP addresses.

Settings

- Packet Size: 1472 byte packets
- Utilization: 100 %
- Signature: CALNEX01_00000
- Payload: PRBS

Packet Data - Ethernet

- Source MAC: 02:02:02:02:02:02
- Destination MAC: 01:01:01:01:01:01
- Packet Type: 08-00

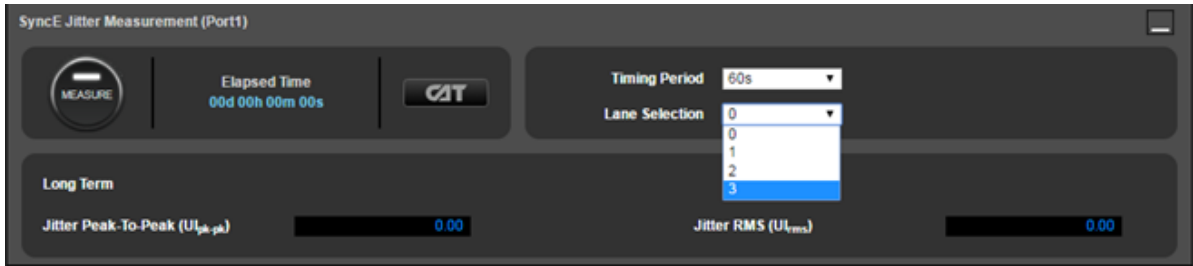
Packet Data - IP (v4)

- Source IP: 192.168.3.100
- Destination IP: 192.168.3.2

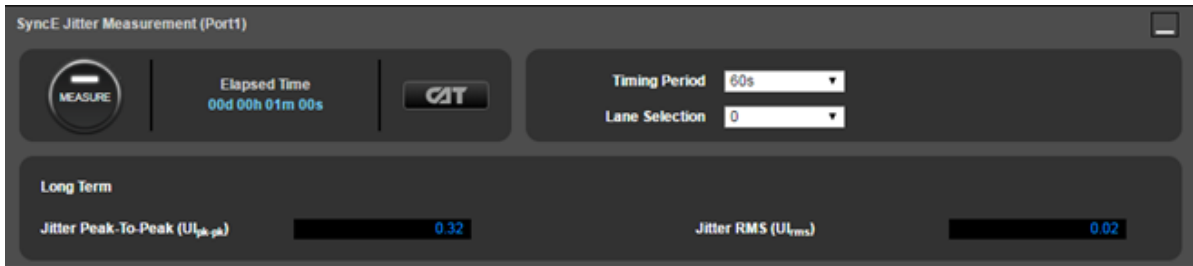
Results are determined by a **Pass** or **Fail** result for each enabled/disabled Frequency/Amplitude pairing. The result indicates if any dropped or out of sequence packets were detected during the Jitter Tolerance test. More details can be found in the **G.8262.1/G.8262 Conformance Test Guide**, available in the Paragon-neo GUI.

Jitter Generation

This release enables Jitter Generation verification to ITU-T G.8262 Section 8.3. Jitter Generation refers to the amount of jitter the device under test generates which requires accurate jitter measurement. The user is able to select each of the 4 lanes on a 100GbE LR4/SR4 interface and likewise on a 40GbE interface.



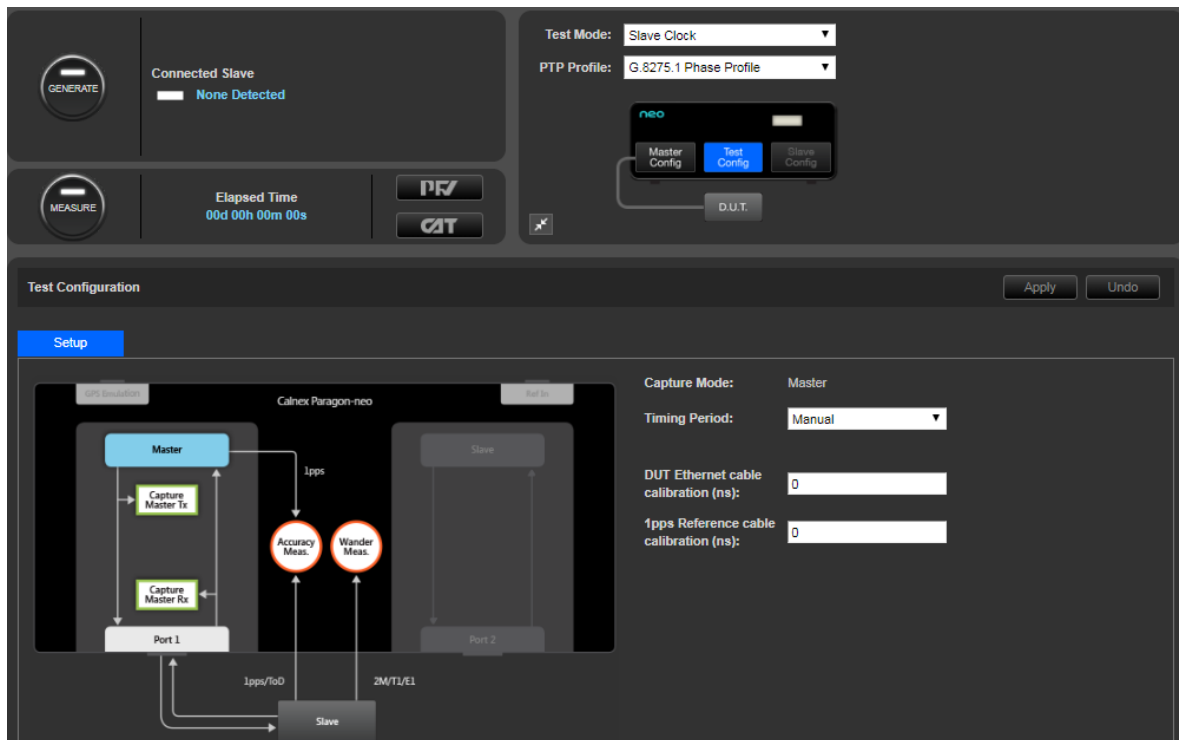
Both peak to peak and RMS jitter results are displayed. The measurement filters are fixed as per the ITU-T G.8262 recommendation of 20kHz - 200MHz for interfaces using 25GbE lanes and 20kHz - 80MHz for interfaces using 10GbE lanes.



4 Enhancements to Existing Options

4.1 Slave Test Mode (Requires any PTP option)

With the addition of the Slave Test Mode drop-down selection, users can perform specific testing of Slave devices. The ability to emulate and impair a Master Clock input, and simultaneously measure clock outputs such as 1pps, was already present in Boundary Clock test mode, however the Slave Clock test configuration allows capture of PTP packets on the connection from Paragon-*neo* Master to DUT Slave for deeper analysis, particularly PTP packet analysis in PFV.

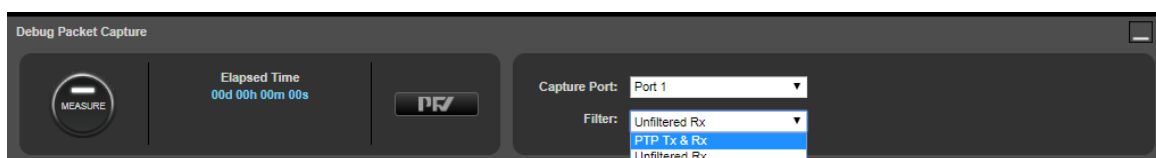


4.2 Debug Packet Capture (Requires any PTP option)

To increase the capability to debug interoperability and configuration issues with PTP that may prevent progressing to synchronization performance and conformance testing, an additional **Debug Packet Capture** app is available in this release.

When expanded, users can select different 'snapshot' capture configurations. These allow brief captures of additional packets, rather than the filtered information used for standard timing testing.

Users can select the desired capture port, and whether to capture **PTP Tx & Rx** (all transmitted and received PTP packets) - for example to allow analysis of any misconfigurations causing issues in the event that a planned test has not initiated correctly, or **Unfiltered Rx** (all received packets) – for example to create a view of all traffic being generated by a device under test and compare to expectations.



PTP Tx & Rx captures can be opened and viewed by launching the **PFV** tool from the app.

Unfiltered Rx captures in the app are made in pcap format, so should be browsed to on the unit and opened in applications such as Wireshark for generic packet analysis.

4.3 Enhanced SSM Code selector (Requires SyncE Wander option)

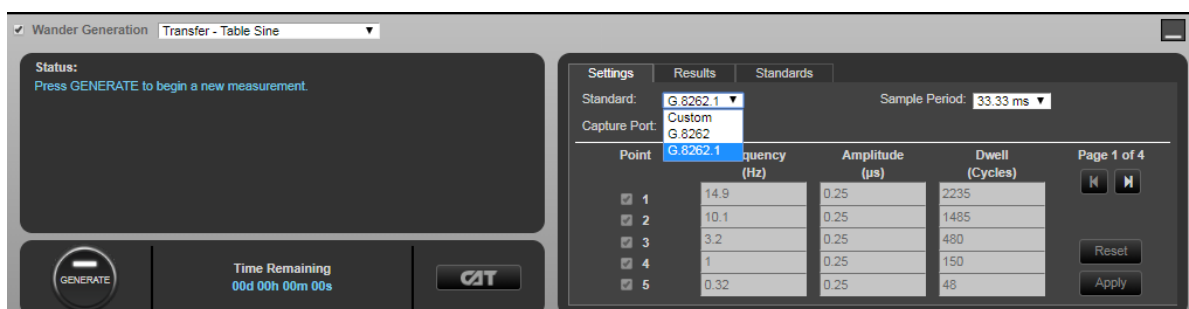
To allow users to easily select either ESMC format as per G.8264 Amd1, the **ESMC Generation** apps have a tick-box selector for **Enhanced SSM**. This selection is the default, and causes Paragon-neo to use the enhanced SSM message format, and as such also allows selection of enhanced clock class codes such as eEEC.



This release also includes a selector to determine if Option 1 or Option 2 devices are being used, and allows population of the SSM code list accordingly.

4.4 G.8262.1 Wander Transfer selector (Requires SyncE Wander option)

To allow users to easily configure wander transfer testing for ITU-T G.8262.1 and G.8262, in addition to with user-defined input frequencies and amplitudes, all 3 options are now selectable in the **Wander Generation** app, by choosing **Transfer -> Table Sine** and then the desired option from the **Standard** drop down in the **Settings** tab.



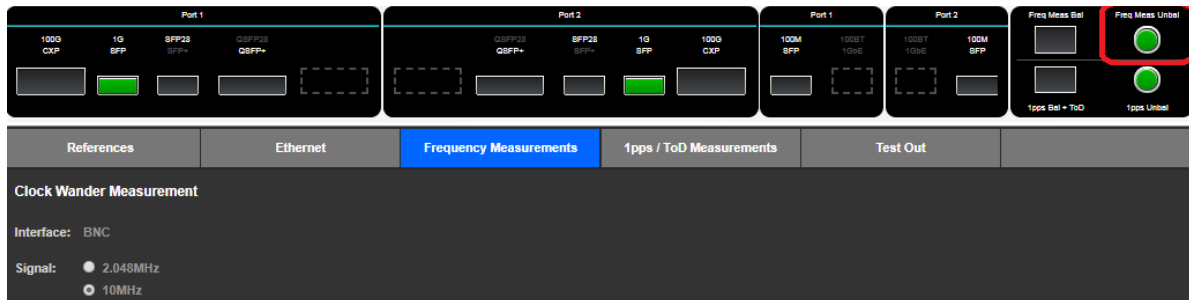
Choosing **G.8262.1** or **G.8262** will auto-populate a series of frequency and amplitude points, and apply the appropriate limits to the captured data. **Please note these values have been carefully selected to allow testing of device performance within the defined bandwidth as per the relevant standard, and to avoid aliasing and other effects. Input conditions are the same for G.8262.1 and G.8262 EEC Opt 1 testing, but the results interpretation is different based on performance and bandwidth requirements.**

If desired, users can select **Custom** and populate their own table of input values. This is only recommended for investigation of specific issues, due to the complication of avoiding aliasing, as mentioned above.

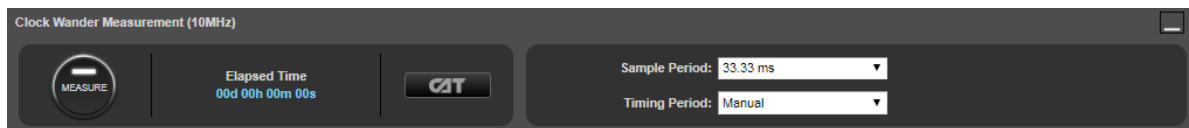
5 Base Product Enhancements

5.1 10MHz/2MHz Clock Measurement

To allow high-accuracy frequency measurements, either in isolation or together with control of PTP/SyncE input signals this release includes 10MHz and 2MHz clock wander measurements with 250ps phase wander resolution. After selecting the **Freq Meas Unbal** port in the **Setup Ports** page, 2.048MHz or 10MHz Signal can be selected.



The **Clock Wander Measurement** can be run from an independent app with user-selected sample periods (the default of 33.33ms is recommended) and as a manually controlled or time-bound measurement – this can be done in isolation or in parallel with any other features available on the Paragon-neo unit.



Launching **CAT** from the app will allow metrics analysis of the captured data, either real-time or post-processing.

6 Appendix A: Software Advisory Notes

- PTP packet generation and capture has been enhanced in this release, allowing these functions to be run when background traffic is present in the test network.
- If displaying packet data in the packet debug mode when multiple VLANs are present, only the first VLAN will be displayed in PFV, along with the PTP packet data. In future releases this will be enhanced to display all present VLANs.
- Due to the improvements to the wander transfer workflow in this release (see section 4.4), it should be noted that **existing test scrips calling on this test are unlikely to perform as expected if they are intended to write specific table values.**
- There is a known issue in this release, affecting Transparent Clock Mode T4 measurements when transmitting at relatively high packet rates. It is recommended to use the ITU-T G.8275.1 specified packet rate of 16pkt/s.
- It is not recommended to have multiple web browser tabs open on the PFV in live mode as this can have a significant effect on performance.
- When using automation, it is recommended to have live captures stopped before trying to access/read data via script, as there can be intermittent errors.

To Install:

Paragon-neo SW is delivered as an ISO (disk image). To upgrade the instrument, this ISO file must be written to a USB stick as an image. To do this, you will need to install an application capable of writing ISO images to USB. One such application is Win32DiskImager. This can be downloaded from <http://sourceforge.net/projects/win32diskimager/>

Once you have your application installed, run it. You should then load the Neo ISO. Using Win32DiskImager:

- Select the folder icon next to the “Image File” field
- In the “Select a disk image” dialog, select the *.* file filter
- Locate and open the Neo SW package installer ISO

The ISO should then be written to your USB stick:

- Select “Write”

Once written to USB, you are ready to load on to the Paragon-neo unit.

The instrument should be powered on BEFORE you insert the USB stick. In addition, it is not possible to upgrade unless the box is idle - make sure to stop all generation and capture.

Click **System** in the menu selection on the top right of the UI

- Click **Setup** in the left hand menu bar
- Insert the USB stick
- Click **Update**

The instrument will now begin the upgrade process. Note that updating the Paragon-neo can take up to 30 minutes. **Please do not power off while the upgrade is in process.**

You can now connect and the new software is ready to use.

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