

NuPOE-32EL OVERVIEW

NuPOE-32EL is a designed chassis especially made for built-in Power over Ethernet load modules, and it could limit supported 16 modules (≤ 20 Watt) per chassis; structured as a chain of chassis via IDs and Ethernet ports in parallel. It offers a prompt and flexible interface to test and monitor different Ethernet power sourcing equipment. NuPOE-32EL provides the capability to bypass cabling traffic, delivering reports and analysis data simultaneously.

Key Features

- Specialized equipment for production testing of PSE switch device.
- Support cascade of multiple chassis.
- Load operation in constant power mode.
- Supports of Alternative A and /or B POE wiring mode.
- Supports for all 5 PD classes (0~4) of power level.
- Emulate PD Connect, Disconnect, Overload, Short Circuit and Dynamic Loading tests.
- Great loading capacity for each port.
- Support up to 20, 35, 45 Watt for short-term overload tests.
- LCD on front panel displays chassis ID and temperature.
- IEEE802.3af and IEEE802.3at compliant.
- PoE Verification Procedure:
 - PD Detection Test
 - Decide whether the terminal is PoE enabled
 - Test Detection Voltage
 - PD Classification Test
 - Signature ranges
 - Voltage range
 - Time
 - Gradual Start-up Test
 - Inrush current limit and time
 - Turn-off voltage and time
 - Support operation Test
 - Support short circuit test
 - Support overload test
 - Support repetitive overload test
 - Support load cross talk test
 - PD Disconnection Test

BENEFITS

- Robust design and abundant ventilation for high power PoE testing requirements, and provide the integrated testing solution for PSE correlation power and data collection.
- Direct measurements of power, current, voltage, rise time, duration, signaling behavior, and other physical and signaling protocol related parameters.
- Four types of power module option (20w, 35w, 45w for IEEE802.3af or IEEE802.3at) for customization.
- Up to 32 PSE ports in high density chassis by multiple 20 Watt modules.
- Load capacity is up to 45 Watt/port continuously.
- Attached with user friendly software to reduce the cost of testing.
- Rackmount size and able to be cascaded for test of mass production.
- Comply with ongoing IEEE 802.3at standard that transmit high power via network cable for device with higher power consumption.



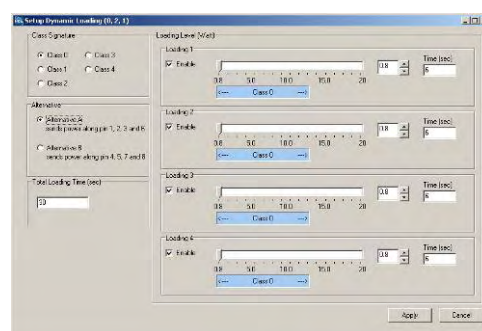
MAIN APPLICATIONS

- PSE switch manufacturing test
- Basic function tests for PSE switch

USER-FRIENDLY UTILITY

- Easy to Operate Windows UI**

NuApps-POE is a user-friendly utility with Windows based interface that can process the test quickly and easily.



(Dynamic Loading interface)

- Accurate Measurement**
Testing result data from Counter Window

Counter Window					
(Chassis, Slot, Port)	(0, 2, 1)	(0, 2, 2)	(0, 3, 1)	(0, 3, 2)	Total: 4 ports
Module Card	XM-21B2	XM-21B2	XM-21B2	XM-21B2	-----
PD Class	2	1	0	1	-----
Alternative	A	A	A	A	-----
Conductor	MD-I	MD-I	MD-I	MD-I	-----
Power Status	NP	PG	PG	PG	-----
RMS Voltage (V)	1.727	46.630	46.680	0.177	-----
RMS Current (mA)	1.744	109.966	117.825	1.543	-----
Power (Watt)	0.003	5.128	5.500	0.000	10.631
Max Power (Watt)	4.647	5.128	5.502	0.730	5.502
Min Power (Watt)	0.000	0.296	0.869	0.000	0.000
Max Peak Voltage (V)	48.173	-47.059	47.202	0.374	48.173
Max Peak Current (mA)	157.861	110.689	118.749	113.612	157.861
Min Peak Voltage (V)	-53.070	-47.568	-47.495	-47.365	-53.070
Min Peak Current (mA)	-2.325	9.726	30.622	-1.916	-2.325
Temperature (Centigrade)	41.000	51.000	65.000	68.000	-----
Power Failure Event	0	0	0	0	0

ORDER INFORMATION

NuPOE-32EL has four types of power module options and we provide customer all-in-one customization order:

- 20 Watt Support Module:** Up to 16 modules (≤ 20 Watt) per chassis and support 2 PSE ports per module. (IEEE802.3af or IEEE802.3at)
- 35 Watt Support Module:** Up to 8 modules (≤ 35 Watt) per chassis and support 2 PSE ports per module.
- 45 Watt Support Module:** Up to 8 modules (≤ 45 Watt) per chassis and support 2 PSE ports per module.

There are built-in electric resistors that generate heat to consume the power under safety regulation for power loading test. For module above 20 Watt, reserve space for ventilation between each module is required, thus it can attach only 8 modules per chassis.

SPECIFICATIONS

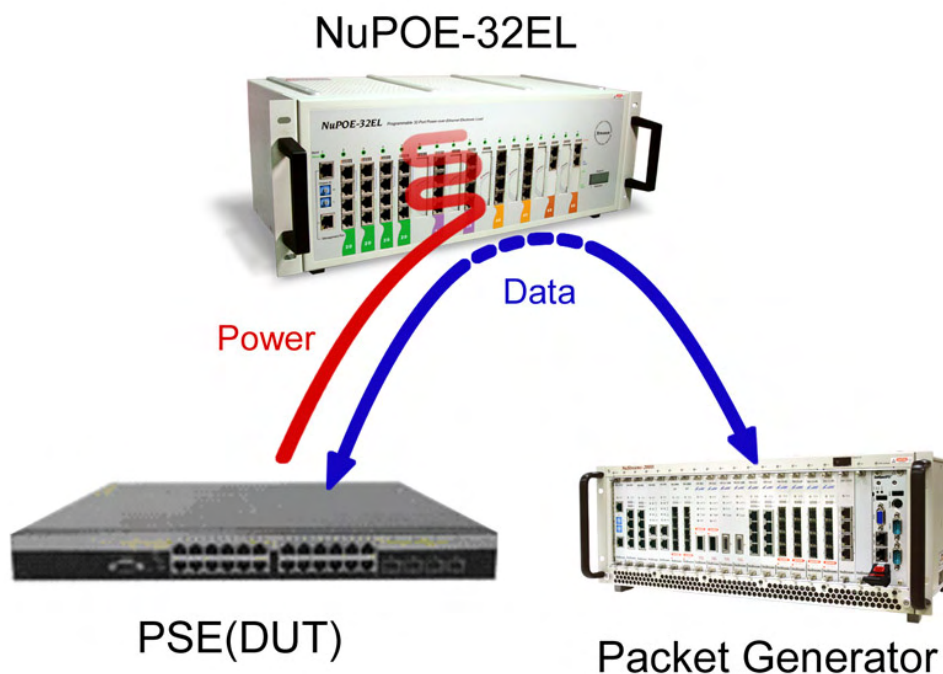
Model Name	NuPOE-32EL	
Interfaces	Ethernet: RJ45 connector	Power: Male IEC 320 receptacle
Ethernet Speed	Support 10/100/1000 Mbps	
Standard	IEEE 802.3-2005 Clause 33 (IEEE802.3af), IEEE802.3at	
Test Mode	<div>➤ Dynamic Loading test</div> <div>➤ PoE Connect test</div> <div>➤ PoE Disconnect test</div> <div>➤ PoE Overload test</div> <div>➤ PoE Short Circuit test</div>	
Customized built-in Module*	<div>➤ 20, 35, 45 Watt loading module (IEEE802.3af, IEEE802.3at)</div>	
Hardware Information		
Dimension	441 mm x 190 mm x 170 mm	
Temperature*	Operating: 0°C~ 40°C (32°F~ 104°F)	Storage: 0°C~ 50°C (32°F~ 122°F)
Humidity	Operating: 0% ~ 85% RH(non-condensing)	
Power Source	AC 100 to 240 V, 47 to 63 Hz	
Supporting Softwares		
<div>➤ Utility: APMPT-4 is a customizable solution that enables manufactures to perform highly reliable and accurate mass production and quality assurance tests at wire speed during the manufacturing process.</div> <div>➤ Application: NuApps-POE provides a platform to collect the data of power from PSE.</div>		

Note 1: Each port in NuPOE-32EL's module card can provide power that matches its designed watt (20, 35, or 45 watt).

Note 2: If the NuPOE-32EL reach 65 -70°C, the test task will stop, please reactivate your test task after 10-20 seconds when the fan tray cooled your NuPOE-32EL to below 65°C. If the NuPOE-32EL reach 100°C, the system will shutdown automatically, please reactivate your NuPOE-32EL after it reaches the room temperature.

APPLICATION DIAGRAM

Below is the illustration to test network flow and PoE function of PSE DUT simultaneously. NuPOE-32EL acts as a PD that process the test of PoE and also bypasses the data flow to Packet Generator such as NuStream-2000i for network test.



TECHNICAL TERMS AND APPLICATIONS POE

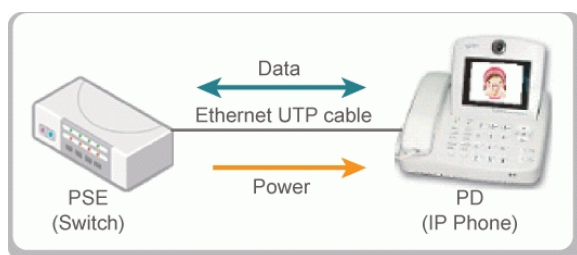
Power over Ethernet or PoE technology (commonly referred to as IEEE 802.3af) describes a system to transfer electrical power, along with data, to remote devices over standard twisted-pair cable in an Ethernet network. This technology is useful for powering IP telephones, wireless LAN access points, and other appliances where it would be inconvenient, expensive (mainly wiring problem) or infeasible to supply power separately. PoE includes two devices.

PSE (Power Sourcing Equipment)

Power Sourcing Equipment is a device (switch or hub for instance) that will provide power in a PoE structure. Maximum allowed continuous output power per such device in IEEE 802.3af is 15.40 W.

PD (Powered Device)

A powered device is a device powered by a PSE and thus it consumes energy. Examples include wireless access points, IP (video) Phones, and IP cameras. The IEEE 802.3af standard specifies a maximum power usage of 12.95W. NuPOE-32EL is a kind of PD for loading test.



Power Class (Level)

In order to know how much power consumption does the PD needs, when PSE detect the PD, this feature allows the PD to indicate its power requirements by changing the sense resistance at higher voltages. Thus, the PSE knows what power class does the PD uses. Power Class of NuPOE-32EL is tunable for the test.

Power level available

Class	Usage	Maximum Power Levels at Input of Powered Device [Watt]
0	Default	0.44 to 12.94
1	Optional	0.44 to 3.84
2	Optional	3.84 to 6.49
3	Optional	6.49 to 12.95
4	Reserved	(PSEs classify as Class 0)

Endspans and Midspans

Endspans are Ethernet Switches that include the Power over Ethernet transmission circuitry. Endspans are commonly called PoE switches. Midspans are power injectors that stand between a regular Ethernet switch and the powered device, injecting power without affecting the data. NuPOE-32EL is able to test these two kinds of devices

Alternative Mode

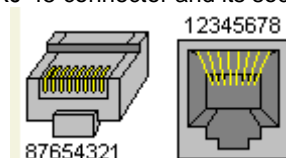
Ethernet UTP network cable has 4 twisted pairs (8 totally) copper wires inside. PSE should provide Mode A and B that define the pairs of power transmission. The mode that is used finally is up to PSE after the PSE detect the status what PD use. For NuPOE-32EL (PD), it provides two modes for the test from PSE.

A (Power via Pin 1, 2, 3, 6) - Mode A

B (Power via Pin 4, 5, 7, 8) - Mode B

RJ45 Pin #	Wire Color (T568A)	Wire Diagram (T568A)	10Base-T Signal 100Base-TX Signal	PoE
1	White/Green		Transmit+	Mode A +
2	Green		Transmit-	Mode A +
3	White/Orange		Receive+	Mode A -
4	Blue		Unused	Mode B +
5	White/Blue		Unused	Mode B +
6	Orange		Receive-	Mode A -
7	White/Brown		Unused	Mode B -
8	Brown		Unused	Mode B -

Pin location of RJ-45 connector and its socket



New technique is used so that the powered pairs can also carry data. This permits its application not only with 10BASE-T and 100BASE-TX, which use only two of the four pairs in the cable, but also with 1000BASE-T (Gigabit Ethernet) and 10GBASE-T Ethernet, which uses all four pairs for data transmission.

Stages of PoE link

To create a link that PSE provides power to PD, the stages below is required.

Stage	Action	Volts
Detection	PSE measure whether powered device has the correct signature resistance of 15–33 kΩ	2.7-10.0
Classification	PSE measure which power level class does the PD resistor indicates	14.5-20.5
Startup	Where the powered device will startup	>42
Normal operation	Supply power to device	36-57

RMS Voltage (V)

Root means square voltage. A method used for calculating average voltage in positive value.

RMS Current (mA)

Root means square electrical current. A method used for calculating average current in positive value.

Dynamic Loading

This is a unique feature of NuPOE-32EL. It emulates a PD device that consumes different Watt at different states. For example, some PD consume more power when it starts up and almost idle when start up is done. NuPOE-32EL has 4 sets of dynamic loading with different duration and Watt consumed.

PoE-Connect

As the stages of PoE link, the PSE has to detect the PD when cable is connected. A feature of NuPOE-32EL that can tune the value of Time to connect (ms) and Test period (sec) parameter. Time to connect is the waiting time before the connect test and Test period (sec) is the duration of test. From this test, operator knows if their PSE fit all Connect condition.

PoE-Disconnect

To stay powered, the PD must continuously use 5–10 mA below 60 ms interval with no less than 400 ms since last use or else it will be unpowered (disconnected) by the PSE. A feature of NuPOE-32EL that can tune the value of Time to Disconnect (0~2000 ms) and Test period (2~16 sec) parameters. Time to Disconnect is as the value (400 ms) above. Test period (sec) is the duration of test. From this test, operator knows if their PSE fit all Disconnect condition.

PoE-Overload

Different PD has different power consumption. A feature of NuPOE-32EL that can tune power consumption between idle and pulse overload. From this test, operator know if their PSE able to deal with temporary overload.

PoE-Short Circuit

In real condition, breakdown of PD is possible. Some breakdown cause short circuit that may damage the device that is harmful to both PSE and PD. A feature of NuPOE-32EL that can short-circulate the PD port in specified duration. From this test, operator know if their PSE able to cut off power to prevent damage.

IEEE 802.3at

IEEE 802.3at is commonly referred as PoE+. The standard describes extending the IEEE Power over Ethernet by using two pairs of wires in standard Ethernet Category 5 cable to provide at least 24W of power. NuPOE-32EL support ongoing IEEE 802.3at standard such as:

- Follow the power safety rules and limitations pertinent to 802.3af
- Backward compatible with 802.3af PSE.

NuPOE-32EL supports module with higher loading watt that comply with IEEE 802.3at. PSE that comply with the IEEE 802.3at standard can provide more power and its performance can be test via NuPOE-32EL.

Parameter in Test Report

The values below are utilized in NuPOE-32EL, and these value are the report after the detection of the PSE switch.

I Class

It is the value in mA current used from PD for a given power class that is detectable from NuPOE-32EL for PoE Connect.

Tpdc

It is the values in milliseconds to classify power level of the PD, which is detectable from NuPOE-32EL for PoE Connect.

Toff

It is the values in milliseconds to turn off power of the PD, which is detectable on NuPOE-32EL for PoE Disconnect.

Icut

It is the values in mA current to turn off power if there is power overloaded from PD, which is detectable on NuPOE-32EL for PoE Overload.

Tovld

It is the duration in milliseconds to turn off power if there is power overloaded from PD, which is detectable on NuPOE-32EL for PoE Overload.

Ilm

It is the values in mA current to turn off power if short-circuit happens on PD, which is detectable on NuPOE-32EL for PoE Short Circuit.

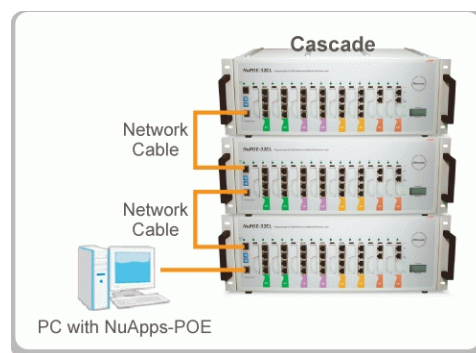
Tlim

It is the duration in milliseconds to turn off power if short-circuit happens on PD, which is detectable on NuPOE-32EL for PoE Overload.

Hardware Configuration

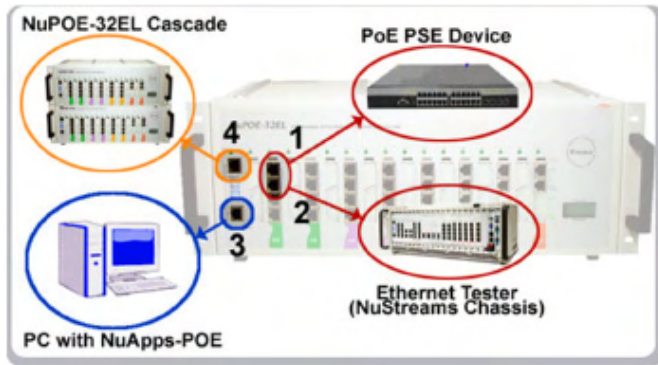
Cascade of Chassis

Several NuPOE-32EL can be cascaded and controlled by one PC for test of multiple ports PSE.



Test Data Flow and PoE Simultaneously

Xtramus has total solution to test the PoE DUT in both data flow and PoE simultaneously. Each module on NuPOE-32EL has even number of ports, 2 ports for one pair or 4 ports for 2 pairs. When PSE connect to PoE module such as port 1 in below graph, the data flow bypasses the module to port 2 for the test from other tester such as NuStreams Chassis. Xtramus' smart utility, can run both data flow and PoE tests sequentially or simultaneously.



Connection for Mass Production Test

Module with Different Power Consumption

For PD device, there are varieties of power consumption requirement. NuPOE-32EL has different modules in one chassis for test from PSE with different power consumption. It support up to 20, 35, 45 Watt for overload tests. Modules with higher Watt specification can do lower Watt test together with lower Watt module. However, do higher Watt test on lower Watt module is not available.

OPERATION OF NuPOE-32EL

There is no control button on NuPOE-32EL, and all operation can be done by utility software that is executed in Windows system. PC that runs the utility controls the NuPOE-32EL via network cable with RJ-45 connector. There are two utility from Xtramus can do PoE related test, APMPT-4 and NuApps-POE.

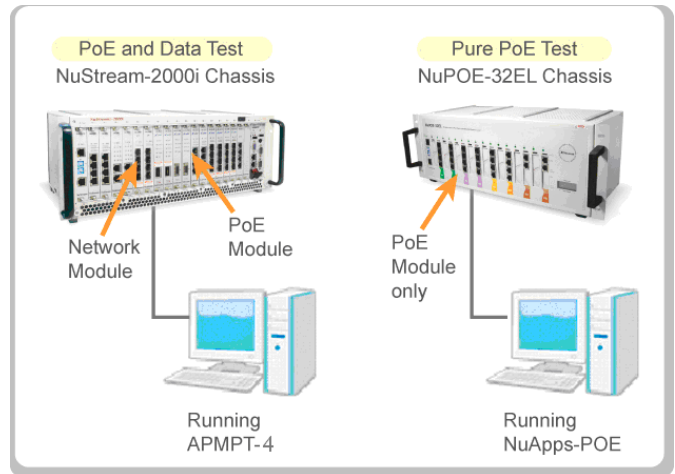
APMPT-4: A Windows UI utility of NuStreams chassis platform for all-purpose mass production test. All tests of network device can be pre-configure and arranged in sequential. Accurate and real-time report shows the status of the DUT.

NuStreams chassis platform with POE module can acts as a PD for the test that consume power from PSE. By the control of APMPT-4, NuStreams chassis can do the PoE test and data flow test along with other data flow module card in the chassis.

However, for the best application, do PoE test at NuPOE-32EL and use NuStreams chassis to test data flow as the illustration at previous page is the best.

NuApps-POE

A Windows UI utility for NuPOE-32EL, which acts as a PD in the test. NuApps-POE control NuPOE-32EL with all possible PD condition that can test the performance of PSE.

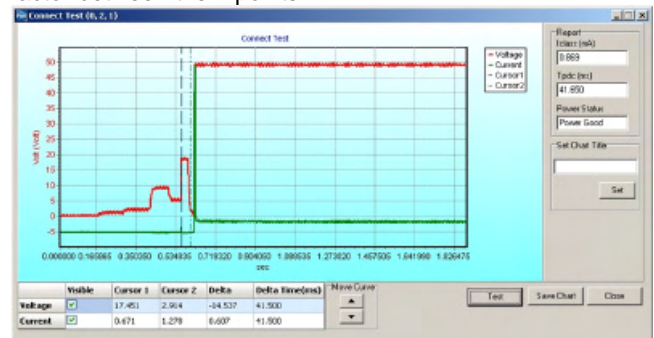


Features and Operation of NuApps-POE

Comprehensible graphic report

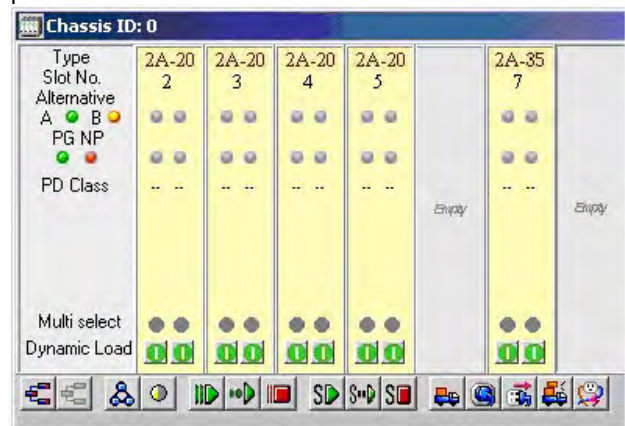
The voltage and current is presented by graphic curve that operator knows its value in any specific time of the test.

A smart feature that operator can click to specify 2 points of the curve, and then the system can calculate the moving factor between the 2 points.



Virtual Chassis Panel

Real-time status of each PoE module is shown on the screen that operator knows the status clearly and immediately. Hotkeys for operation is located below for quick operation



Reliable Statistic Counter

All test statistics are shown as table form that user can compare the result once a time.

(Chassis, Slot, Port)	(0, 2, 1)	(0, 2, 2)	(0, 3, 1)	(0, 3, 2)	Total: 4 ports
Watt	2A-20	2A-20	2A-20	2A-20	
PD Class	2	1	0	1	
Alternative	A	A	A	A	
Conductor	MDI	MDI	MDI	MDI	
Power Status	NP	PG	PG	PG	
RMS Voltage (V)	1.727	46.620	46.690	0.177	
RMS Current (mA)	1.744	109.566	117.825	1.543	
Power (Watt)	0.003	5.129	5.508	0.000	10.631
Max Power (Watt)	4.647	5.129	5.502	0.730	5.502
Min Power (Watt)	0.000	0.296	0.869	0.000	0.000
Max Peak Voltage (V)	49.173	-47.059	47.202	0.374	49.173
Max Peak Current (mA)	157.861	119.689	119.749	119.612	157.861
Min Peak Voltage (V)	-53.070	-47.569	-47.495	-52.365	-53.070
Min Peak Current (mA)	-2.325	9.726	30.622	-1.316	-2.325
Temperature (Celsius)	41.000	51.000	55.000	68.000	
Power Failure Event	0	0	0	0	0

Counter Items

Statistic of each port

Statistic for total ports

There are Counter Items as below:

Watt, PD Class, Alternative, Conductor, Power Status, RMS Voltage (V), RMS Current (mA), Power (Watt), Max Power (Watt), Min Power (Watt), Max Peak Voltage (V), Max Peak Current (mA), Min Peak Voltage (V), Min Peak Current (mA), Temperature (°C), Power Failure Event

Brief description of certain items

- Watt: Module used, such as 2A-20
- Conductor: MDI or MDI-X
- Power Status: NP, no power (not PoE). PG, power good
- Power (Watt): Power consumption

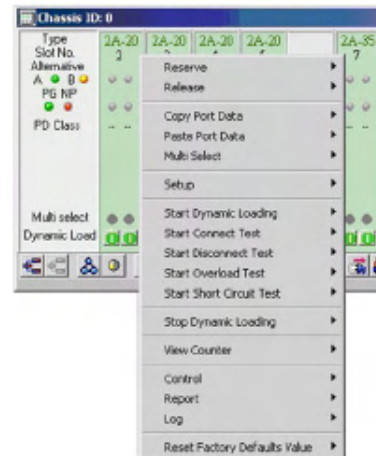
Browse Setup

It is a convenient way to configure all ports once a time in one table.

No.	Part	PD Class	Alternative	Standard (Watt)	Loading (Watt)	Request	Apply
1	(0, 2, 1)	<input checked="" type="radio"/> 0 <input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4	<input checked="" type="radio"/> A <input type="radio"/> B	0.44 ~ 12.95	5	On	Apply
2	(0, 2, 2)	<input checked="" type="radio"/> 0 <input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4	<input checked="" type="radio"/> A <input type="radio"/> B	0.44 ~ 3.04	0.5	On	Apply
3	(0, 3, 1)	<input checked="" type="radio"/> 0 <input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4	<input checked="" type="radio"/> A <input type="radio"/> B	3.04 ~ 6.40	5	On	Apply
4	(0, 3, 2)	<input checked="" type="radio"/> 0 <input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4	<input checked="" type="radio"/> A <input type="radio"/> B	6.40 ~ 12.95	5	On	Apply

Pop-up menu

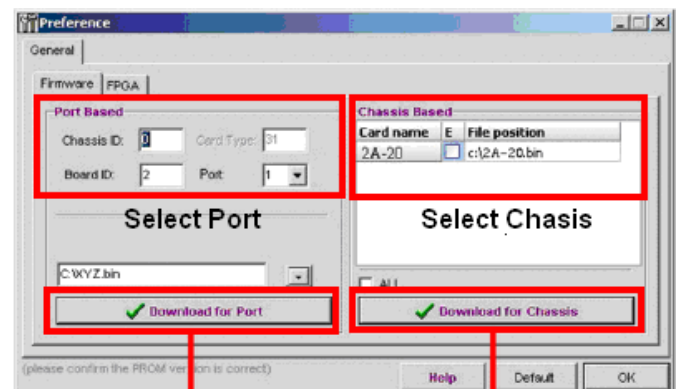
Move the cursor to any of the module cards on the Chassis Panel and right-click the mouse to bring out the pop-up menu of the current port. All operation on this module can be done by this popup menu.



Easy Firmware and FPGA upgrade

User-friendly interface that make upgrade easily. For NuPOE-32EL, there are multiple ports for different modules on different chassis if they are cascaded.

Operator can upgrade specified port, or tick to select the chassis what operator wants and upgrade them once a time. It is quite convenient to keep the version of firmware and FPGA consistent for mass production.



Port based upgrade

Chassis based upgrade

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