

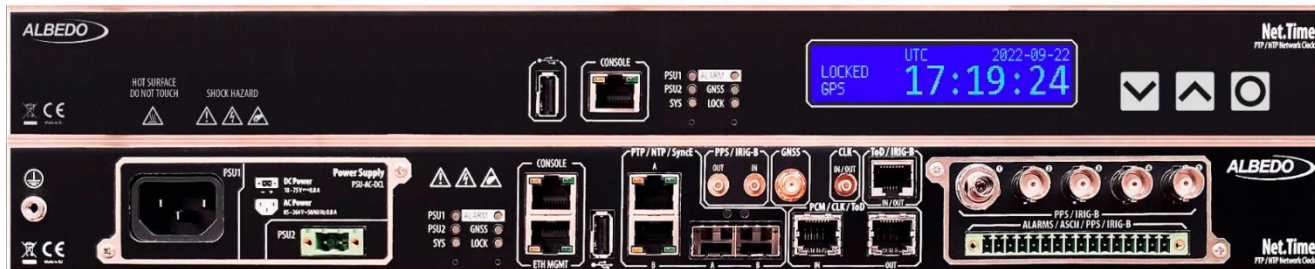
First step **Get access**



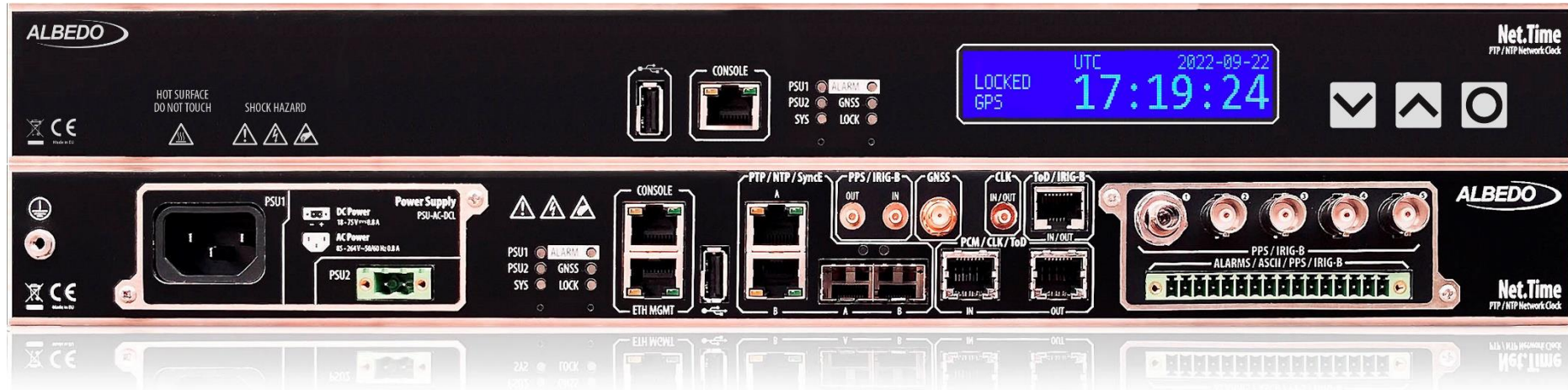
Configure and Get access from the labtop

Guide & Slides corresponding to software ver 1.5.27

Display & Modular



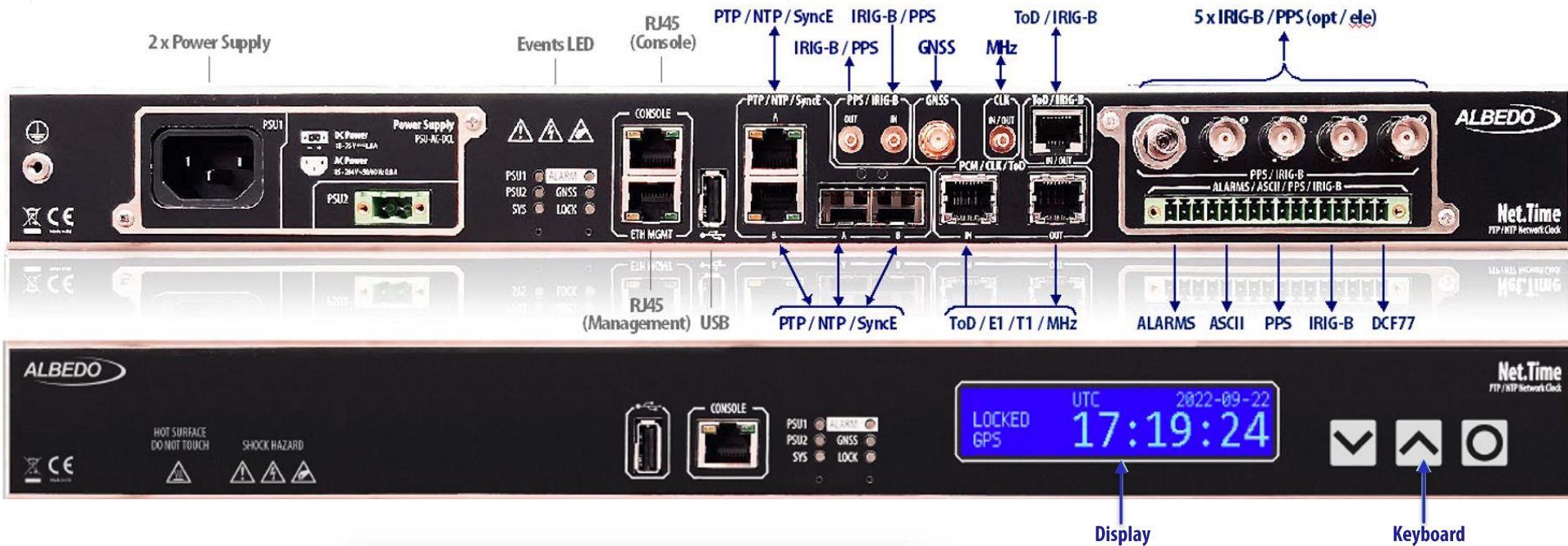
Net.Time



Net.Time is a PTP/NTP/PRP network clock that allows for multiple configurations to meet the timing demands of any industry, including data centres, stock exchange, broadcast, IoT, power utilities, or air traffic control.

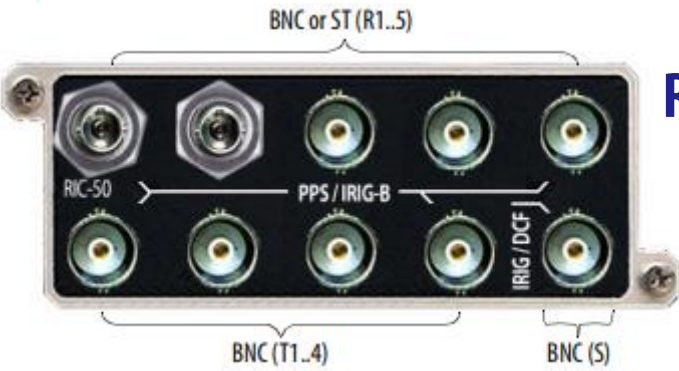
Net.Time is a reliable and fault-tolerant solution to loss of reference, network outages and power failures. Simultaneously Net.Time Ω simplifies the migration to PTP without abandoning investments in NTP, IRIG-B or BITS, facilitating on this way the integration, interaction and translation of all types of signals, profiles and protocols

Interfaces & time References

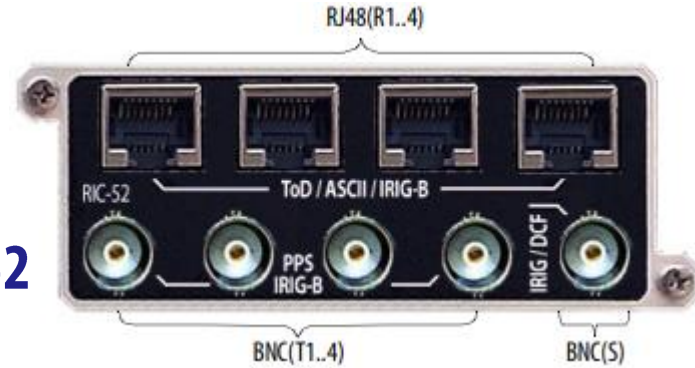


| | GNSS | PTP | NTP | SyncE | ToD | IRIGB | PPS | T1/E1 | MHz |
|----------|------|--------|-----|--------|--------|--------|-----|-------|--------|
| RJ45 (A) | | out | out | out | | | | | |
| SPF (A) | | out | out | out | | | | | |
| RJ45 (B) | | in/out | out | in/out | | | | | |
| SPF (B) | | in/out | out | in/out | | | | | |
| RJ48 (C) | | | | | in | | | in | in |
| RJ48 (D) | | | | | out | | | out | out |
| SMB (E) | | | | | | out | out | | |
| SMB (F) | | | | | | in | in | | |
| SMA (G) | in | | | | | | | | |
| SMB (H) | | | | | | | | | in/out |
| RJ48 (I) | | | | | in/out | in/out | | out | out |

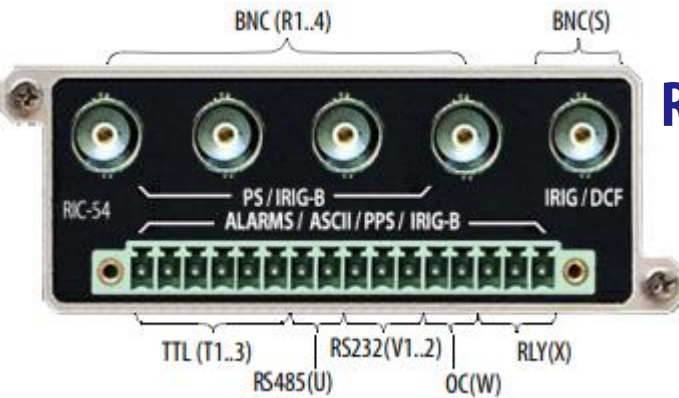
Modules



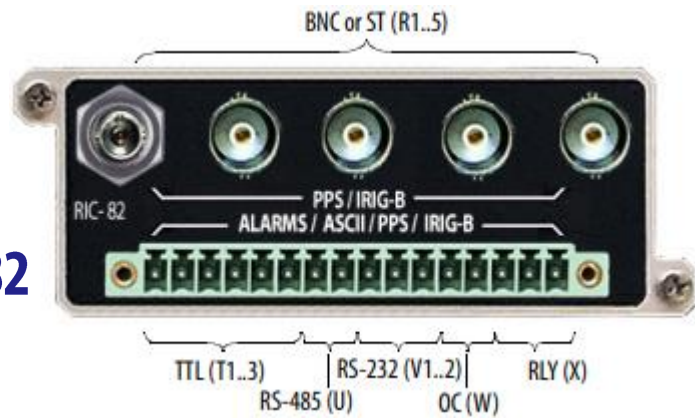
RIC-50



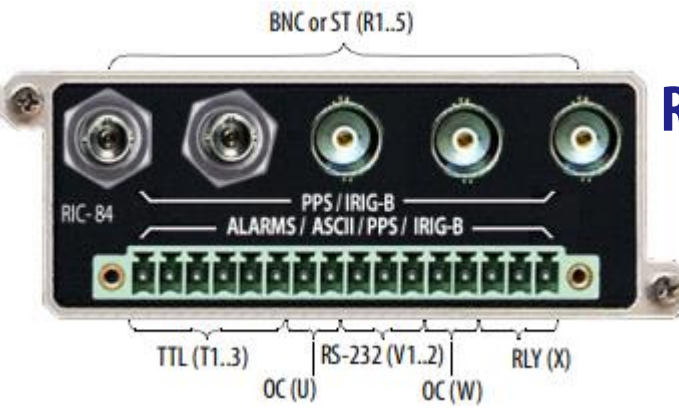
RIC-52



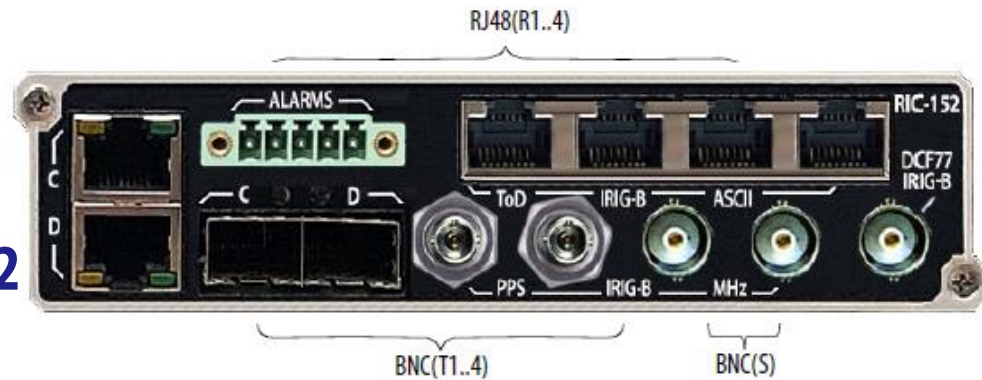
RIC-54



RIC-82

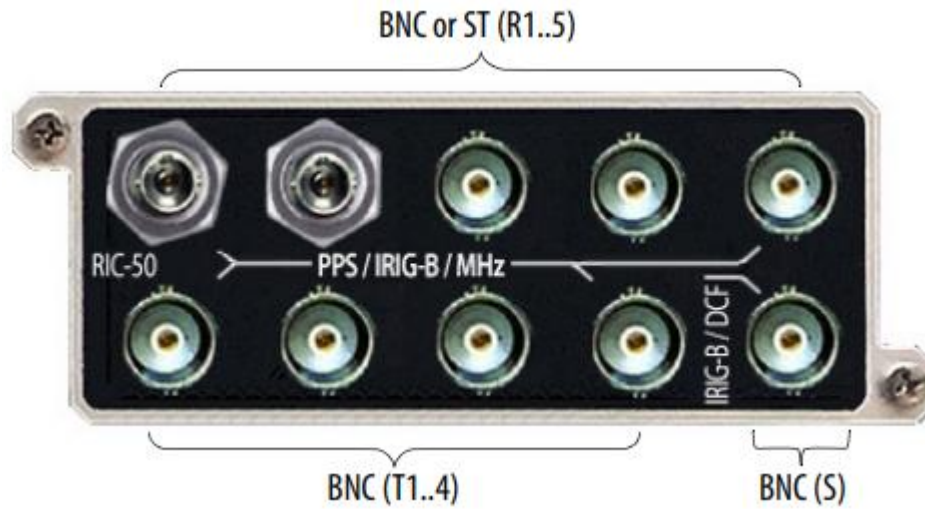


RIC-84



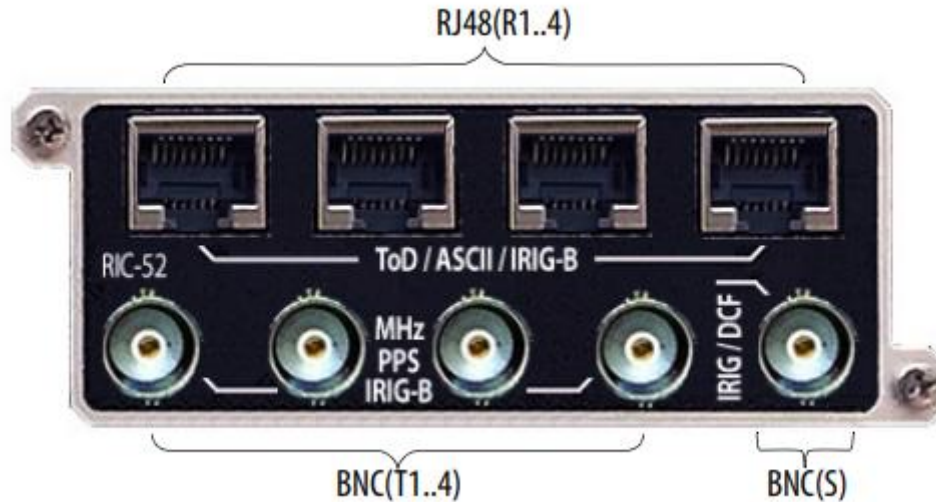
RIC-152

RIC-50 module



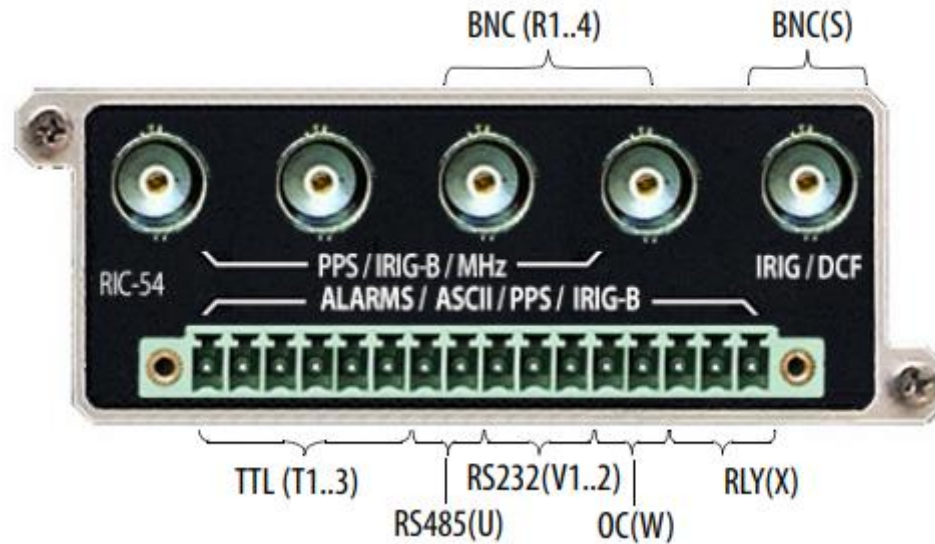
| | IRIG-B | PPS | DCF77 | MHz |
|-------------|--------|-----|-------|-----|
| ST (R1..5) | out | out | | out |
| BNC (R1..5) | out | out | | out |
| BNC (S) | out | | out | |
| BNC (T1..4) | out | out | | out |

RIC-52 module



| | ToD | IRIG-B | PPS | ASCII | DCF77 | MHz |
|--------------|-----|--------|-----|-------|-------|-----|
| RJ48 (R1..4) | out | out | | out | | |
| BNC (S) | | out | | | out | |
| BNC (T1..5) | | out | out | | | out |

RIC54- module



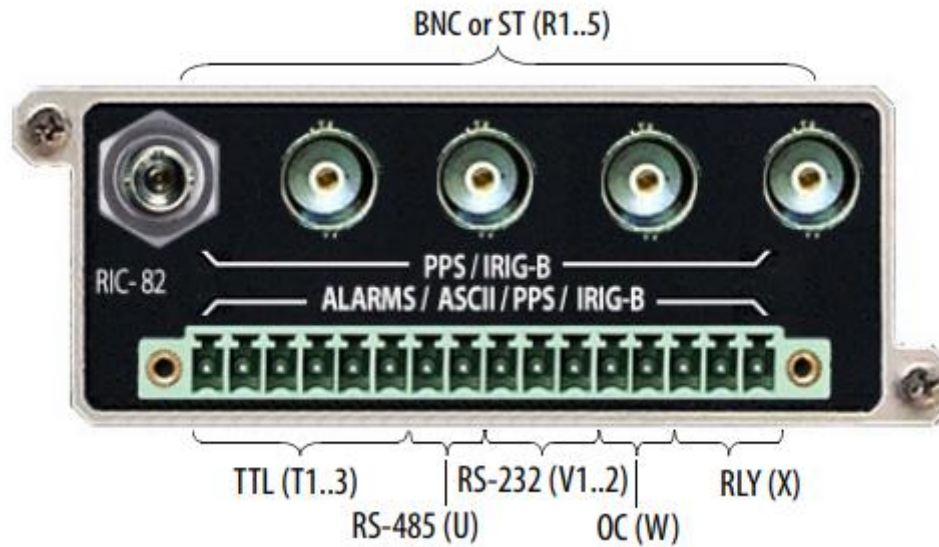
| | IRIG-B | PPS | ASCII | DCF77 | Alarm | MHz |
|---------------|--------|-----|-------|-------|-------|-----|
| BNC (R1..4) | out | out | | | | out |
| BNC (S) | out | | | out | | |
| TTL (T1..3) | out | out | | | | |
| RS485 (U) | out | out | out | | | |
| RS232 (V1..2) | | | out | | | |
| OC (W) | | out | | | out | |
| RLY (X) | | | | | out | |

RIC-56 module



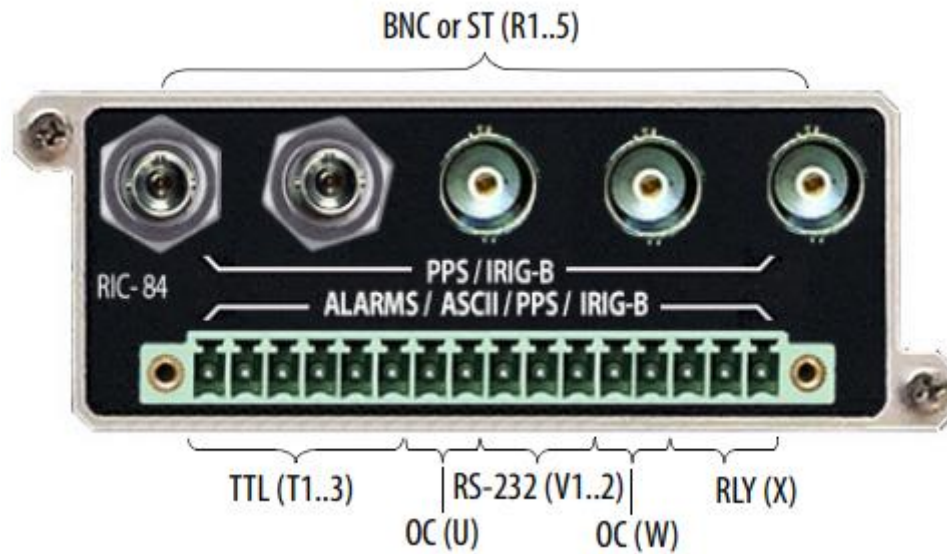
| | IRIG-B | PPS | DCF77 | MHz |
|-------------------|--------|-----|-------|-----|
| BNC / SMA (R1..5) | | | | out |
| BNC / SMA (S) | out | | out | |
| BNC / SMA (T1..4) | out | out | | out |

RIC-82 module

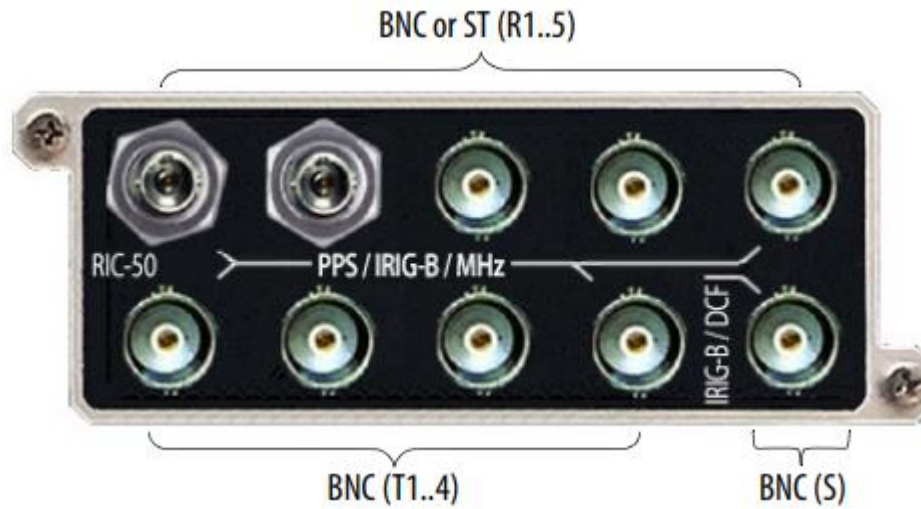


| | IRIG-B | PPS | ASCII | Alarm |
|---------------|--------|-----|-------|-------|
| ST (R1..5) | out | out | | |
| BNC (R1..5) | out | out | | |
| TTL (T1..3) | out | out | | |
| RS485 (U) | out | out | out | |
| RS232 (V1..2) | | | out | |
| OC (W) | | out | | out |
| RLY (X) | | | | out |

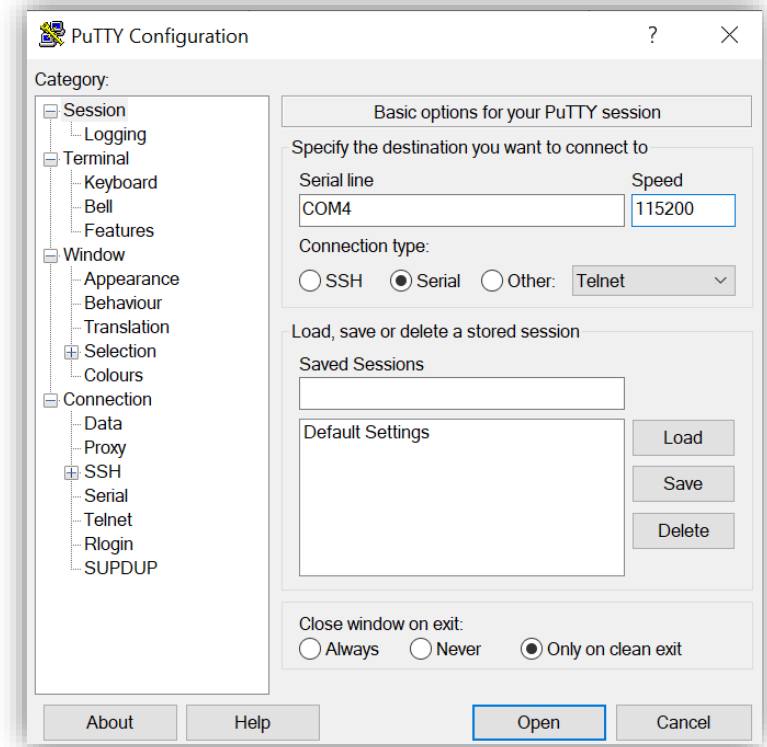
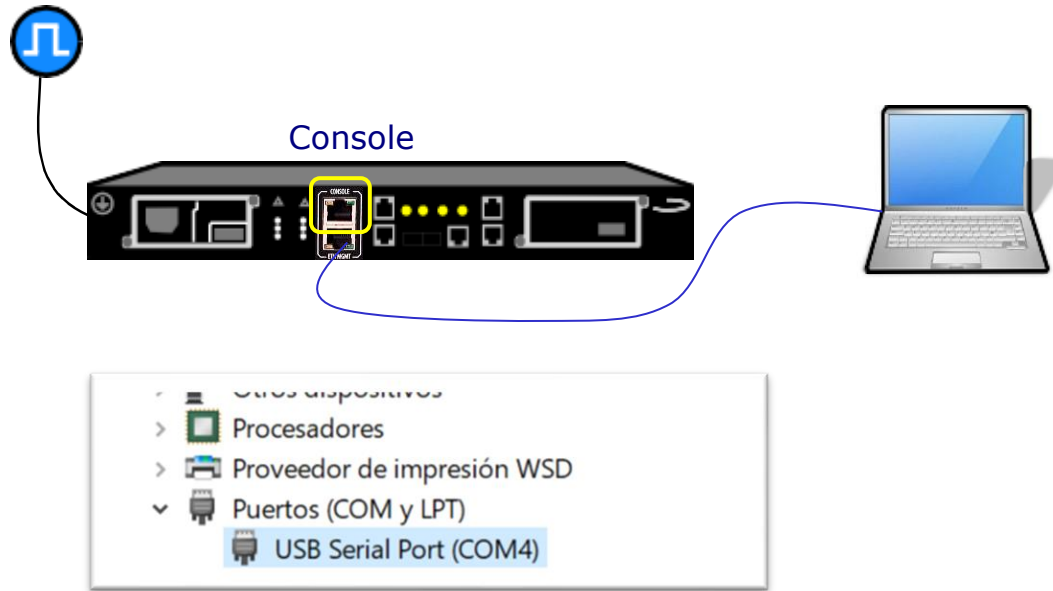
RIC-84 module



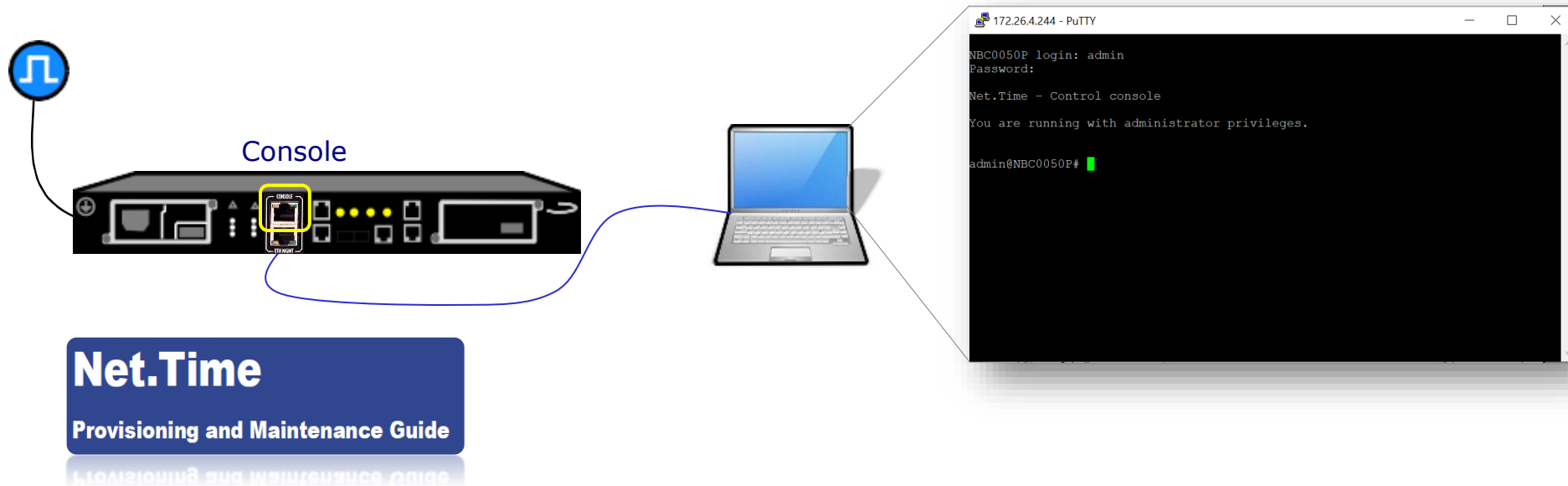
| | IRIG-B | PPS | ASCII | Alarm |
|---------------|--------|-----|-------|-------|
| ST (R1..5) | out | out | | |
| BNC (R1..5) | out | out | | |
| TTL (T1..3) | out | out | | |
| OC (U) | | out | | out |
| RS232 (V1..2) | | | out | |
| OC (W) | | out | | out |
| RLY (X) | | | | out |



| | IRIG-B | PPS | DCF77 | MHz |
|-------------|--------|-----|-------|-----|
| ST (R1..5) | out | out | | out |
| BNC (R1..5) | out | out | | out |
| BNC (S) | out | | out | |
| BNC (T1..4) | out | out | | out |



1. Connect the laptop to NetTime console using a cable USB > RJ45
2. A communications soft such as PUTTY is required
3. Identify the USB Port in our case COM4
4. Speed := 115,200 bps
5. Connection := serial



Net.Time

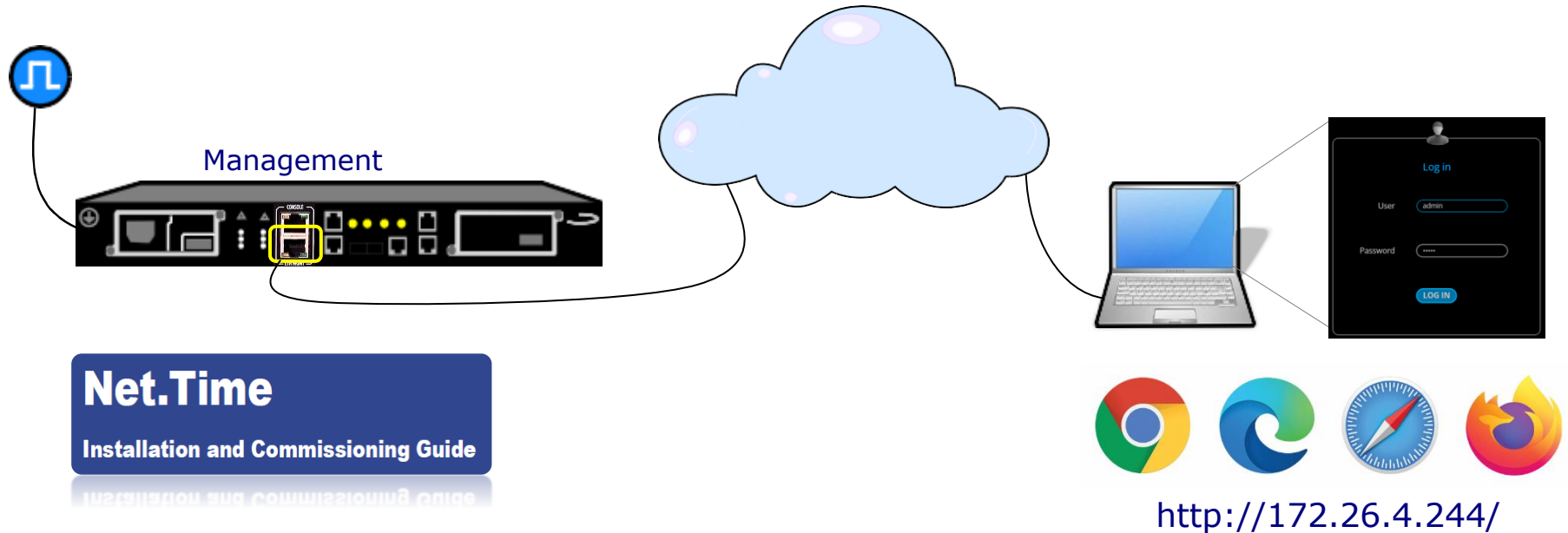
Provisioning and Maintenance Guide

Once the communication is established will appear the Console black window

1. Press intro
2. Login: admin
3. Pass: admin

Now you can use the set of CLI commands listed in the Provisioning Guide.

You can manage Net.Time with CLI but it is easier a browser and the web server. The Web GUI is available through the management port that must be connected to a network and configured before (See sections 3.2, 3.4.2 of the Manual)

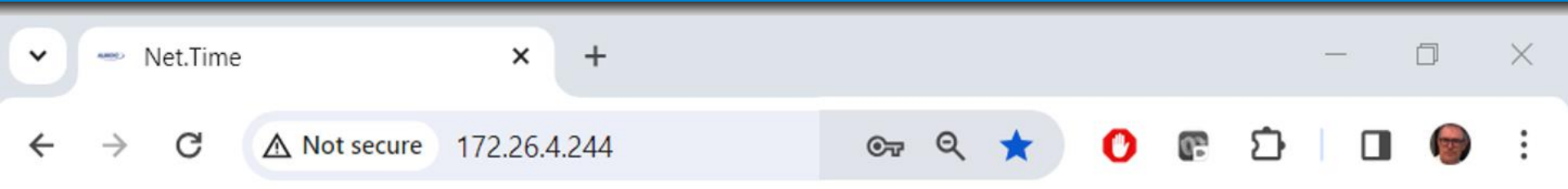


To run the application from a Labtop type the IP address in the browser. The protocol is HTTP or HTTPS, depending on the configuration.

The application requires credentials (user name + password) then same as CLI and there are three kinds of users:

1. Administrators
2. Controllers
3. Viewers

Initial Configuration: Console Connection



Unconnected

Log in

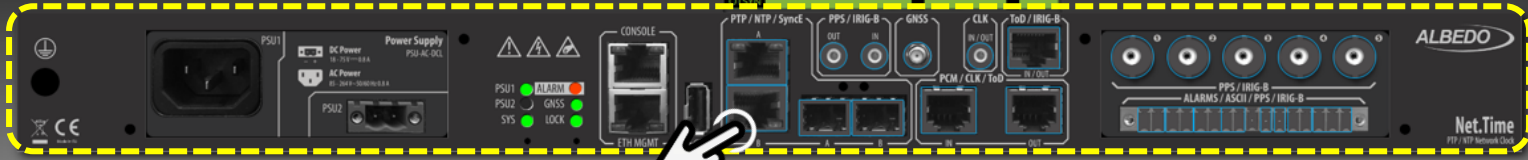
User

Password

Use the browser

1. Set the IP address
2. User Name
3. Password

The web server tells about the configuration, the status of the timing input / output ports including Ethernet. You can configure and spot the changes.

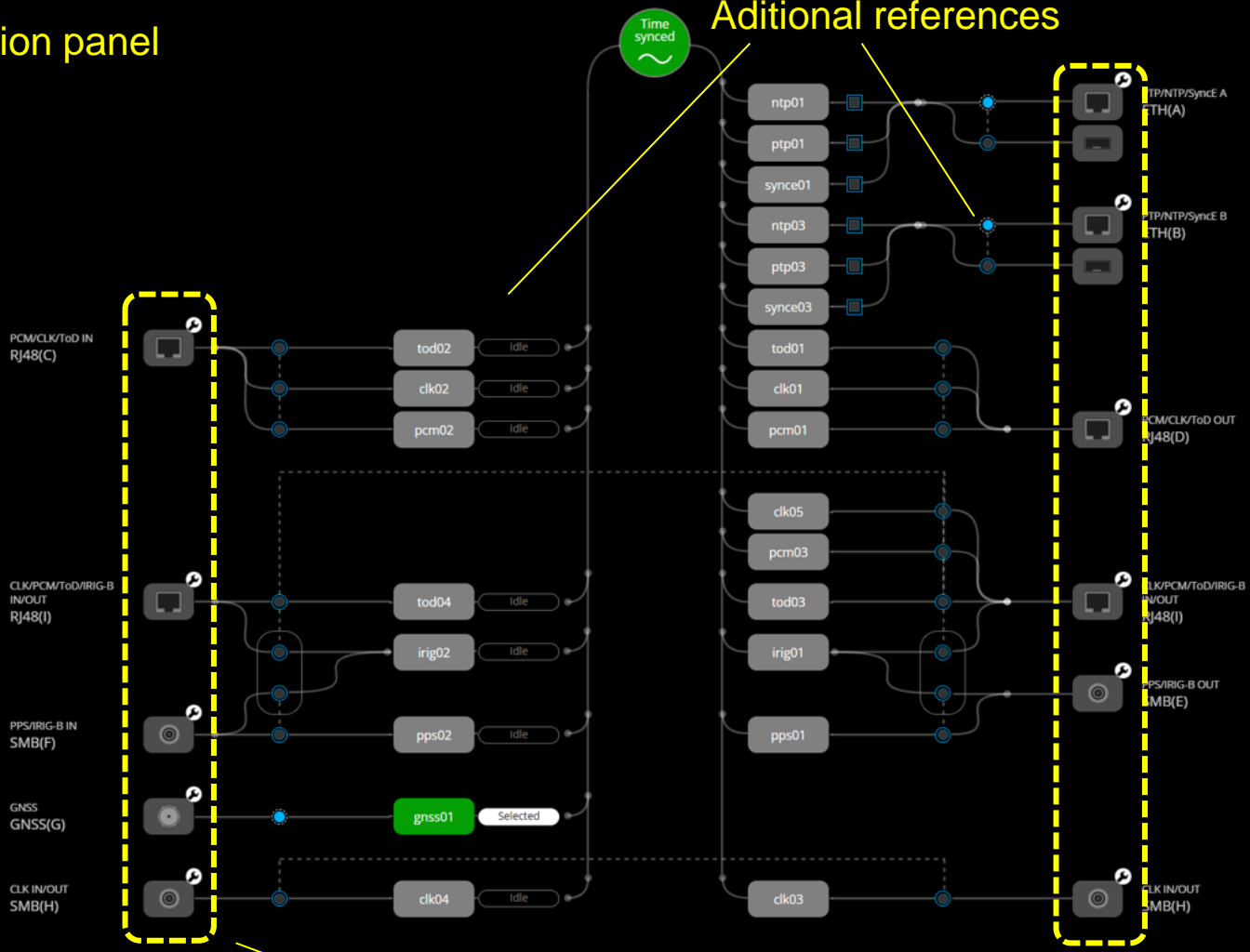


IN

OUT

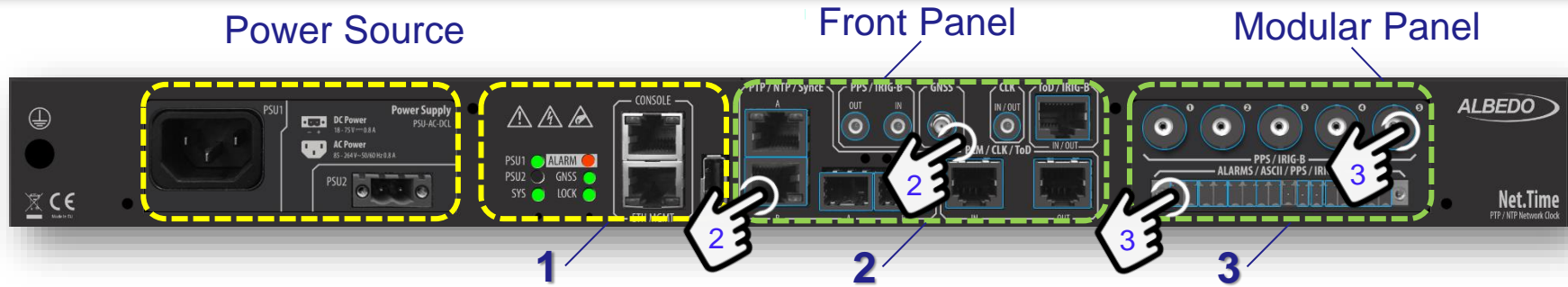
Front connection panel

Additional references



Mainframe block diagram

Mainframe Block Diagram



This is a replica of the Net.Time that reproduces connectors, LEDs and other elements. Sub-panels depend on the hardware:

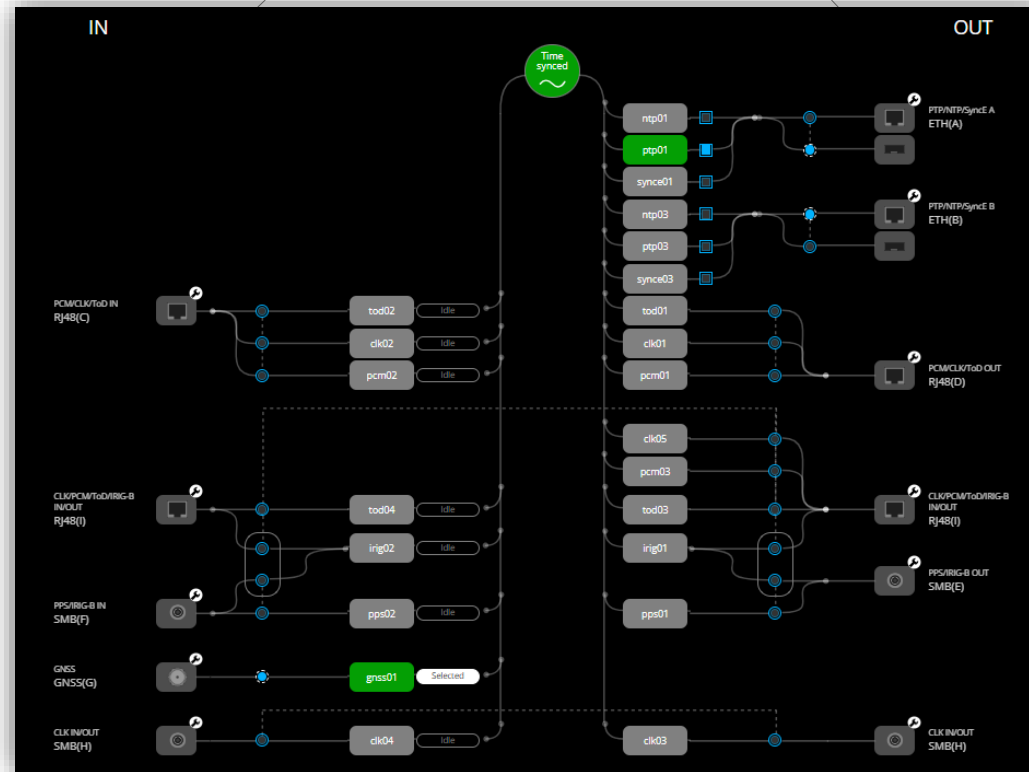
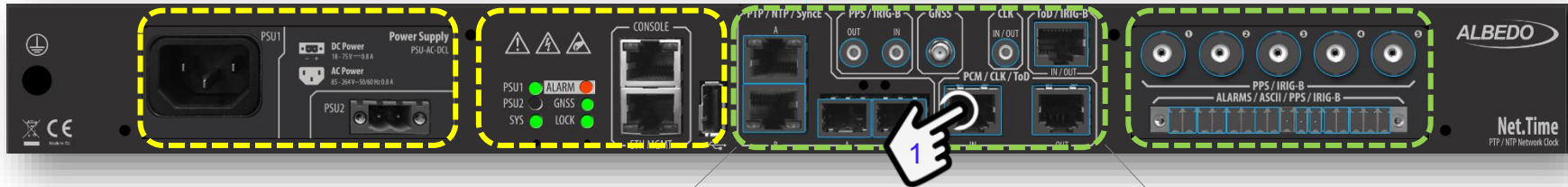
- Power sources
- Time references

There are 3 sub-panels

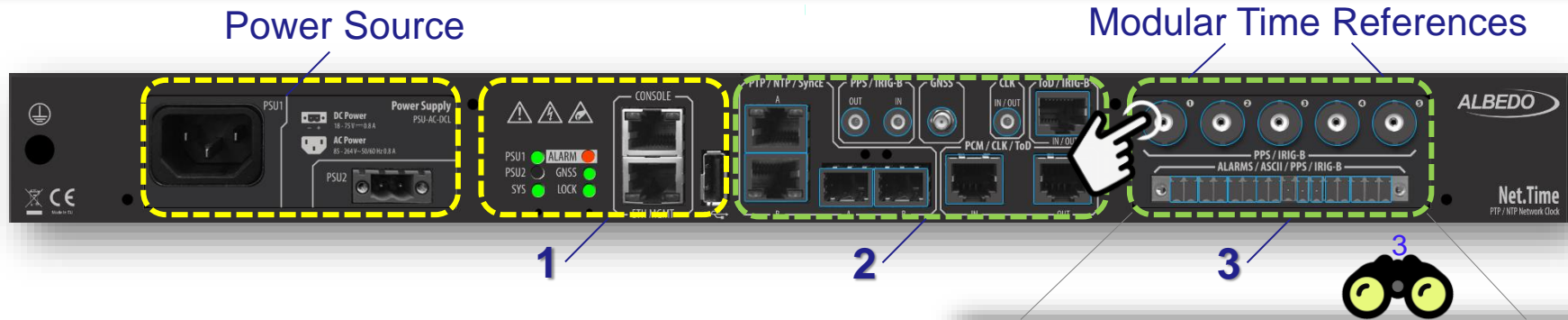
1. Management connectors and LEDs
2. Front Panel with the Mainframe clock references
3. Modular Panel with the Complementary clock references

You can Click any port of sub-panel 2 or 3 then it will be displayed a diagram that will permit you to know the configuration and change it.

Front Connection Panel



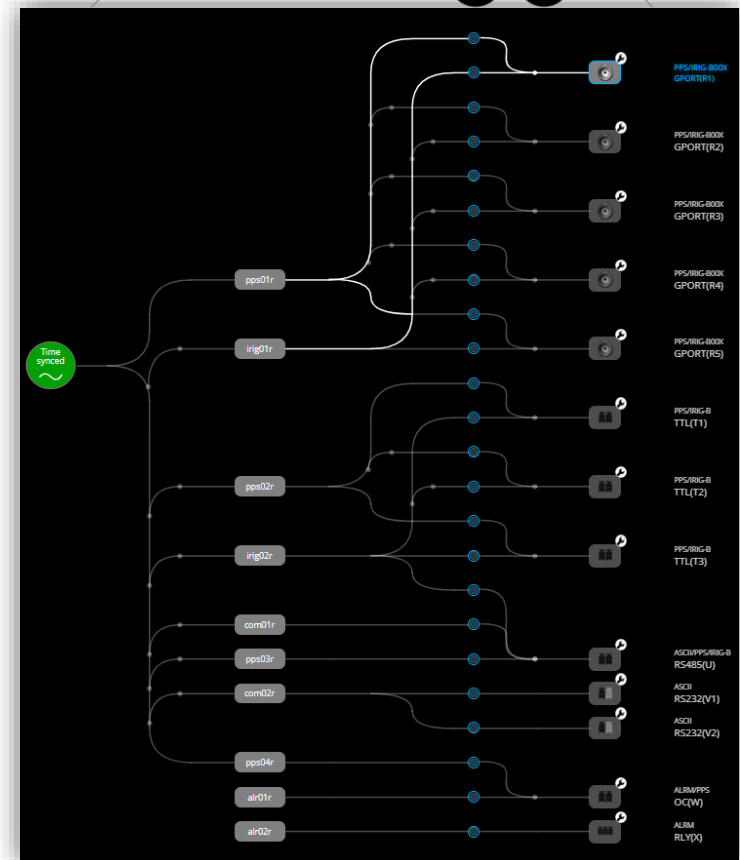
Some blocks can be inputs or outputs clock references (transmitted or received) other blocks are interfaces which are the clock references themselves.

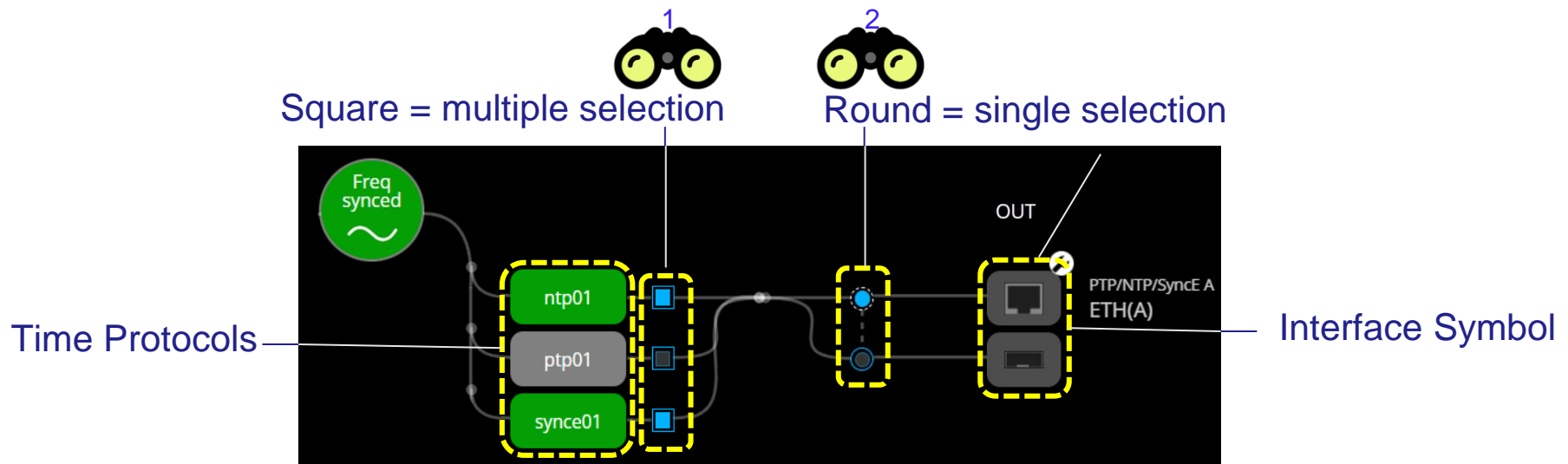


The complementary references represents the port interfaces of the installed module. All are outputs to provide specific timing signals.

The diagram is a tree which root tree is the Net.Time oscillator that provides time to the ports that are the leaves of this tree.

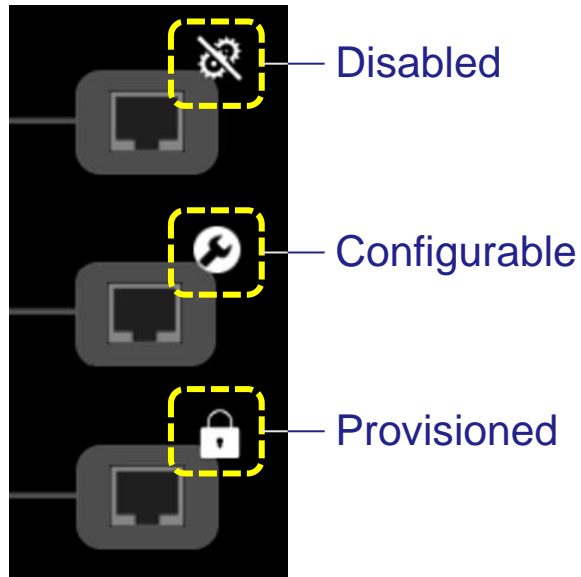
Mind that enabled interfaces are displayed in green color.





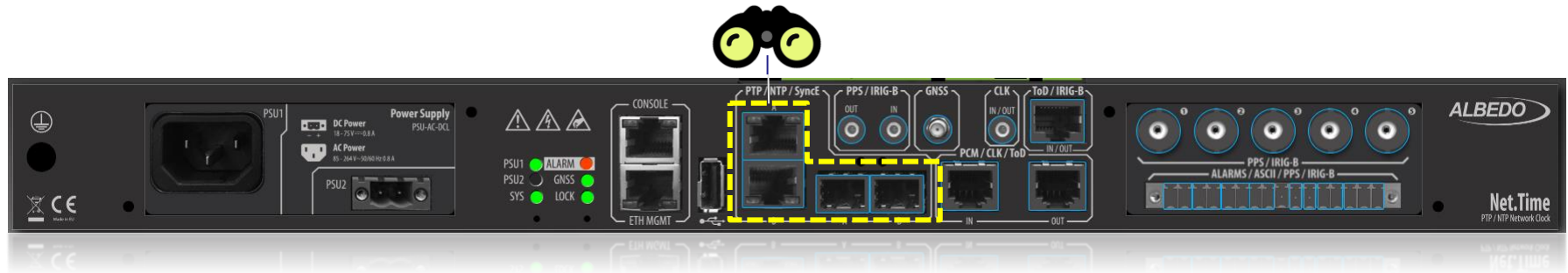
Mapping is the process to decide:

- ◆ Which signal is presented in each output port
- ◆ Which reference is accepted in an input port
 - Square check-boxes: multiple protocols can be configured i.e. permits the selection of NTP and SYNCE protocols (see 1)
 - Round radio-buttons: indicate that the path or the protocol is exclusive i.e. permits the selection of electrical interface (see 2)



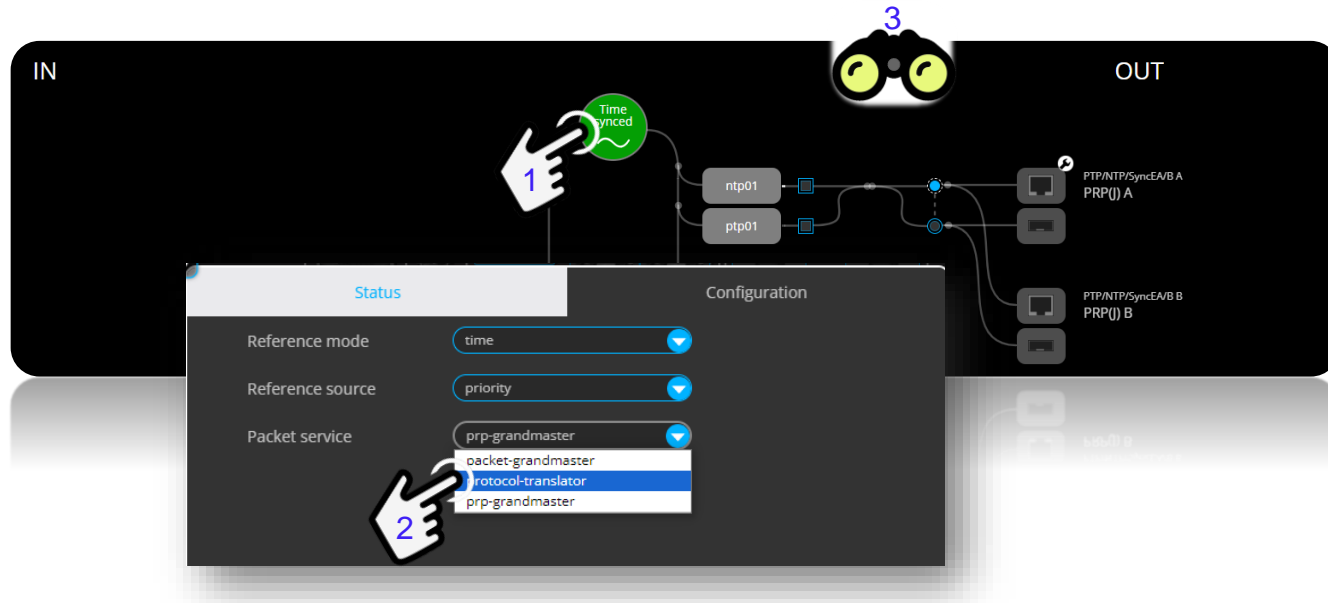
Port status depends on the configuration:

- ◆ Disabled: do not generate any output
- ◆ Configurable: open to be defined/modified
- ◆ Provisioned: protocols are and is locked

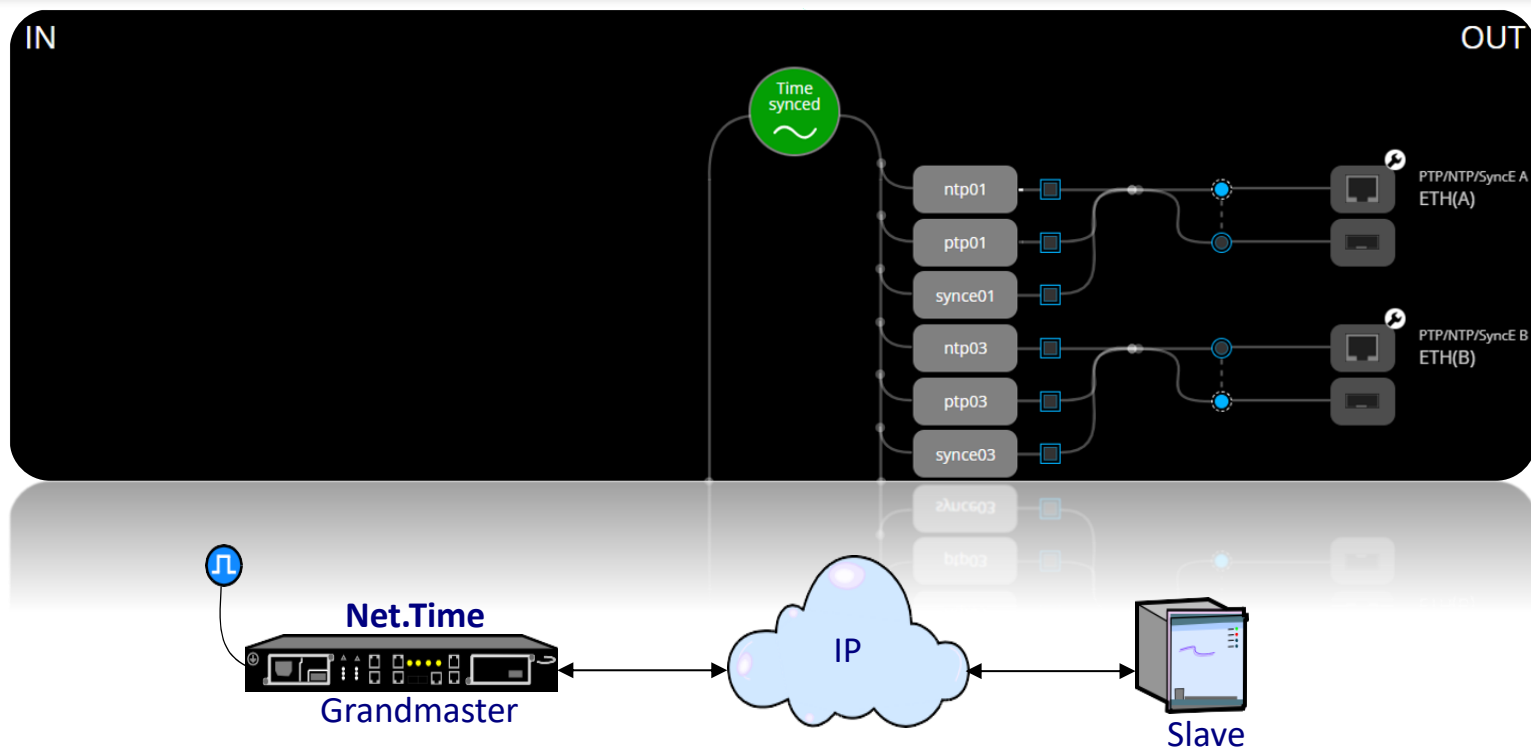


The packet service (PS) is a configuration facility that determines the roles of the Ethernet ports at the PHY layer. Are currently supported the following PS:

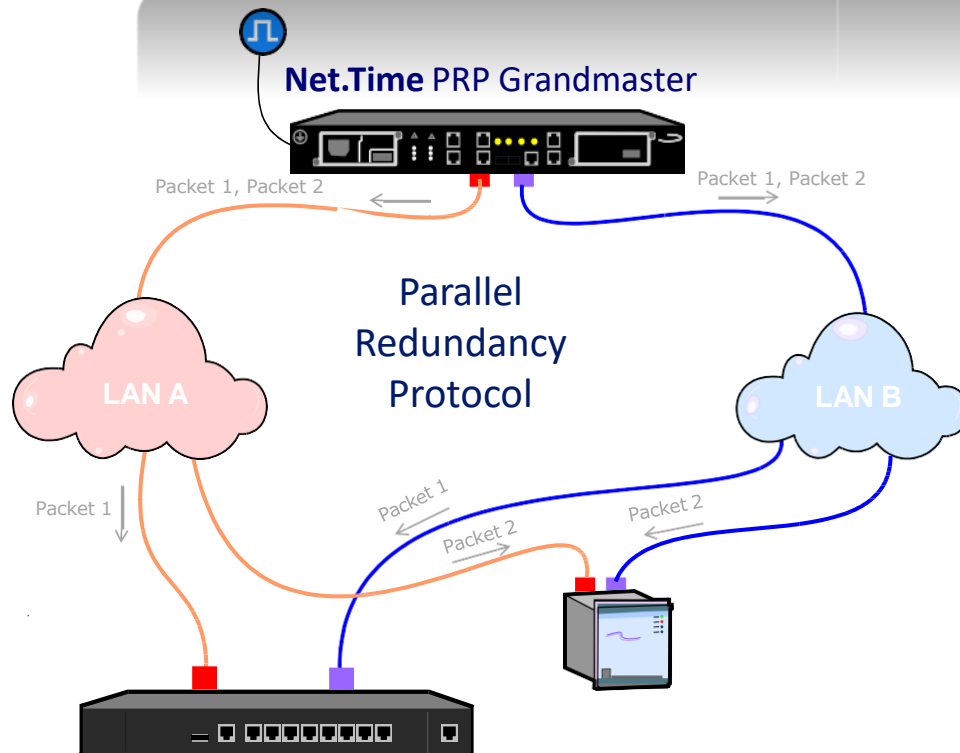
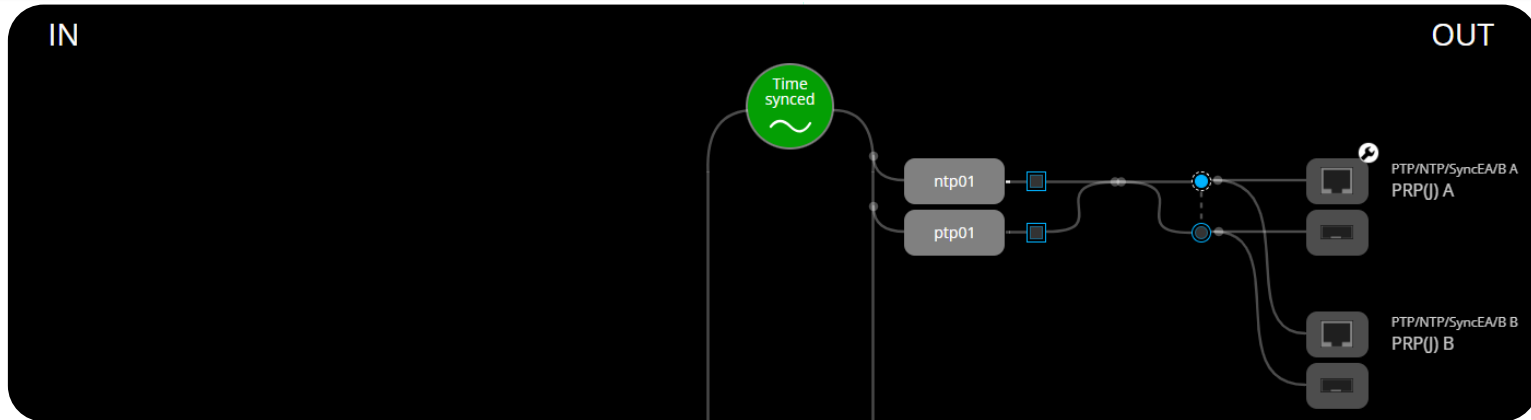
1. **Grandmaster:** to operate as a PTP server / NTP master
2. **PRP Grandmaster:** PTP / NTP service providing path redundancy by PRP protocol
3. **Protocol Translator:** permits the NTP and PTP protocols and profiles cross translation



1. To define the packet service (PS) click on the Oscillator symbol
2. Select the desired Packet Service
3. Observe how the diagram changes and the Net.Time Ethernet interfaces becomes configured at the PHY layer with the selected role.



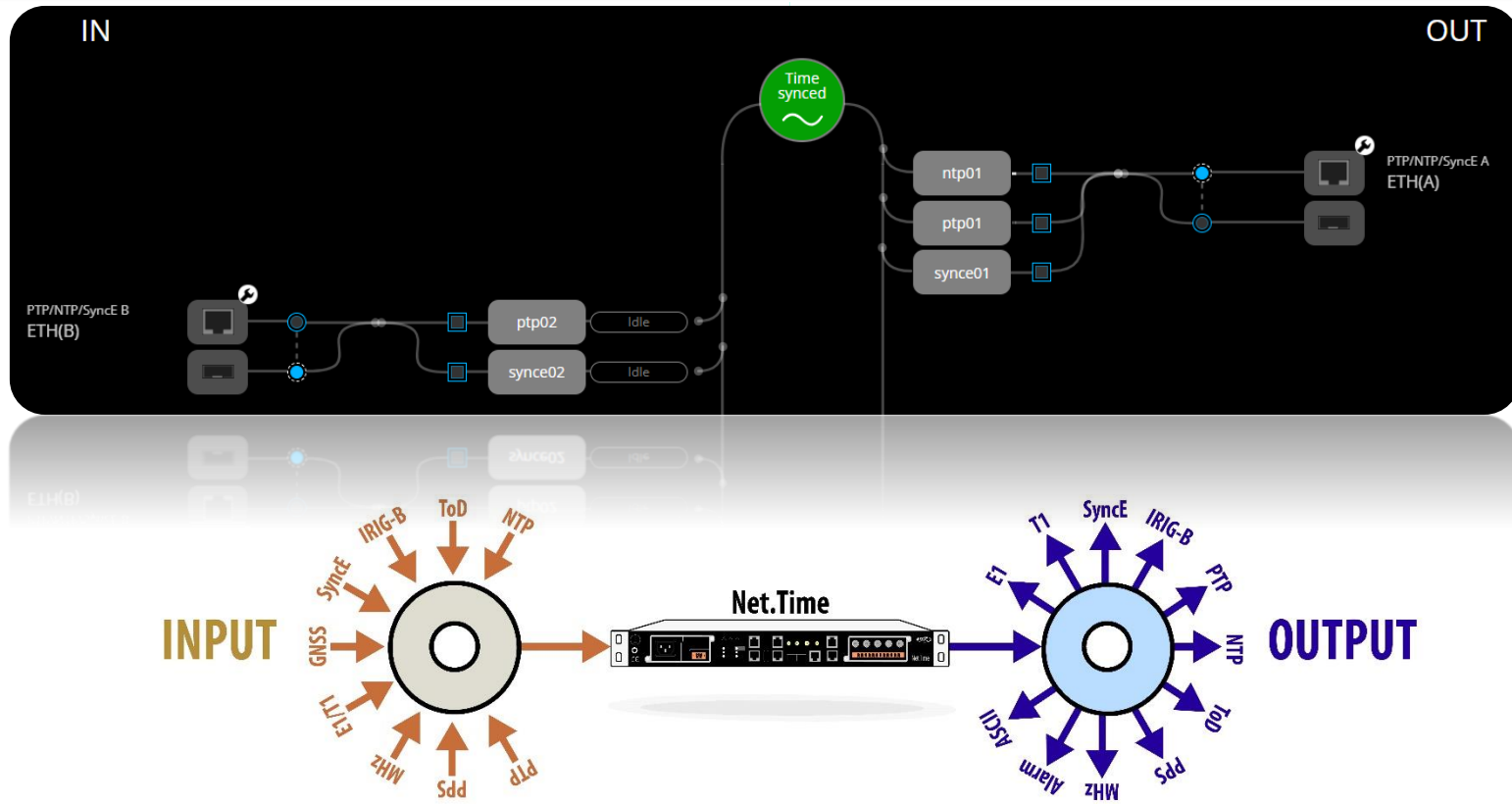
Grandmaster PS: Net.Time becomes multi-port PTP grandmaster / NTP server. The implementation follows the block diagram of a IEEE 1588 ordinary clock (PTP) or the definitions from RFC 1305 (NTPv3) or RFC 5905 (NTPv4). For PTP, it is ensured that the engine running in the clock never achieves the slave role by means a profile dependent procedure.



PRP Grandmaster: Assigns the Ethernet ports to PRP ports and maps the PTP / NTP packet services (PTP ISO/IEC 61850-9-3 grandmaster and NTP server).

Configuring the packet service to anything different to frees the ports assigned to PRP.

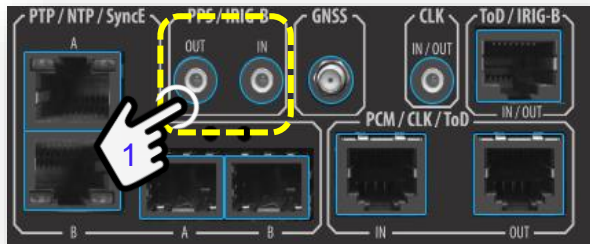
Consequently PTP grandmasters mapped over PRP will be reassigned to ETH ports and PRP virtual ports will be deleted from the port list.



Protocol-translator: Ethernet ports are configured with different Protocols at inputs and outputs. For example the Ethernet port A is assigned to PTP while the Ethernet port B is assigned to NTP protocol. This mode enables the transference of different timing protocols from input to output, and a potential profile / protocol can be translated and used as backup in case of failure of the primary reference.

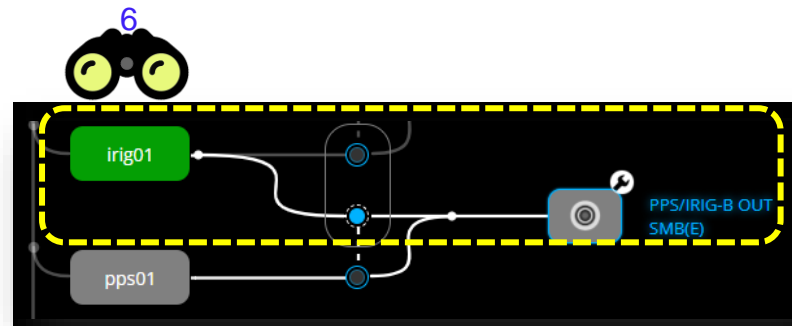
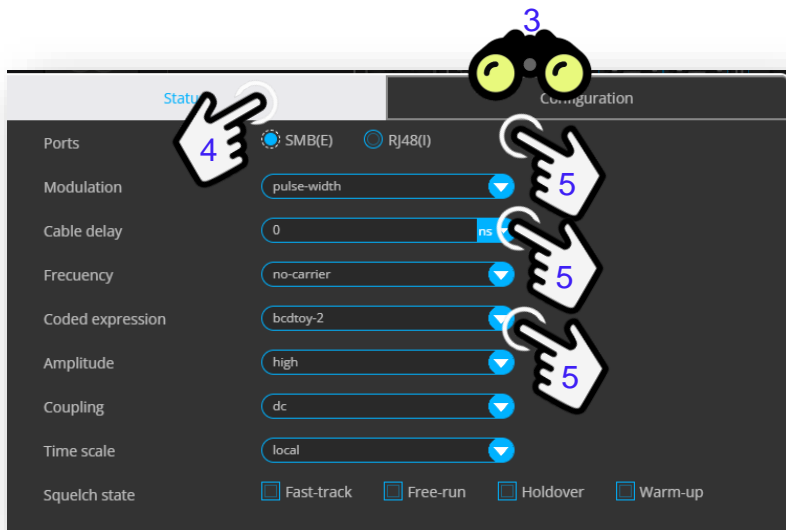
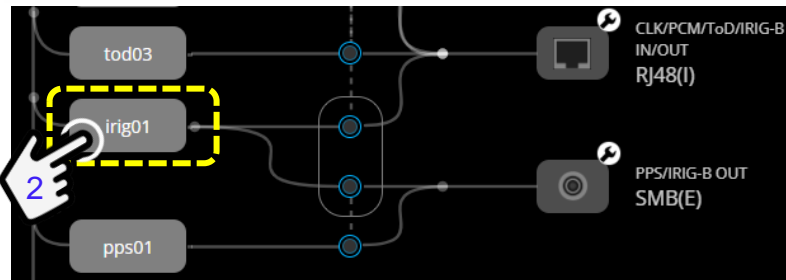
Configuration of an IRIG-B output

Front Panel



We have several alternatives: front panel, modules

1. Lets select the front panel with SMB interface
2. Select the IRIG-B output
3. A Window Pop-up will appear
4. Select the SMB interface
5. Configure the signal with the parameters
6. Observe how one provisioned changes to green color



AAA: Authentication, Authorization, and Accounting
ACL: Access Control List
ACT: Activity alarm when no data is detected in transmission
AP: Access Point
Busbar: Metallic strip or bar, typically housed inside switchgear, panel boards, and busway enclosures for local high current power distribution **C37.94:** TDM interface devoted for teleprotection
CB: Circuit Breaker designed to close or open electrical circuit under normal or abnormal conditions. It operates on relays command.
CBWFQ: Class-Based Weighted Fair Queuing
CG: Connected Grid
CID: Individual configuration of each IED **CIP:** Critical Infrastructure Protection **CLI:** Command-Line Interface
CorpSS: Corporate Substation
CT: Current Transformer, used for measurement of current, if too high to apply directly to measuring instruments, a CT produces a proportional current which can be measured and recorded, CT are used in metering and protective relays
DAN: Doubly Attached Nodes implementing HSR or PRP
DAU: Data Acquisition Unit
Disconnecter: isolates physically and visually the lines
DMZ: Demilitarized Zone
DCB: Directional Comparison Blocking
DCS: distributed control systems
DSC: Differentiated Services Code Point
ESP: Electronic Security Perimeter
Feeder: Transmits power to the distribution points
GM: Grandmaster
GNSS: Global Navigation Satellite System
GOOSE: Generic Object-Oriented Substation Events is a control model defined as per IEC 61850 which provides a fast and reliable mechanism of transferring event data over entire electrical substation networks. When implemented, this model ensures the same event message is received by multiple physical devices using multicast or broadcast services

HMI: Human Machine Interface
PTP: Precision Time Protocol
RedBox: Redundancy Box
Relay: is automatic device which senses an abnormal condition of electrical circuit and closes its contacts and complete the circuit breaker trip.
REP: Resilient Ethernet Protocol
RCT: Redundancy Control Trailer
RTU: Remote Terminal Unit
SA: Substation Automation
SAN: Singly-Attached Node
Secondary Lines: lower voltage side at the substation
SCADA: Supervisory Control And Data Acquisition, transmits and receives data from events of controls, measuring, safety and monitoring. Power system elements can be controlled remotely over. Remote switching, telemetering of grids showing voltage, current, power, direction, consumption in kWh, synchronization.
SCD: Substation Configuration Description **SCL:** Substation Configuration Language **SNTP:** Simple Network Time Protocol
Station Bus: Connects the entire substation and helps provide connectivity between central management and individual bays
STP: Spanning Tree Protocol
SV: Sampled Values, is a method to read instantaneous values such as currents, voltages, impedances, etc. from CTs, VTs or digital I/O and then transmitted to make them are available for those IED subscribed.
Switchgear: combination of switches, fuses or CB to control, protect and isolate electrical equipment
SyncE: Synchronous Ethernet
TLV: Type, Length, Value
VT: Voltage Transformer (see CT) Potential Transformer, gives the reference voltage to the Relay for Over-voltage or Under-voltage Protection
UCA IuG: Utility Communications Architecture International Users Group
VDAN: Virtual D
HQoS: Hierarchical Quality of Service
HSR: High-Availability Seamless Redundancy
IA: Industrial Automation
ICS: Industrial control systems
ICU: Intelligent Control Unit
IEC 61850: Standard defining communication protocols for intelligent electronic devices at electrical substations

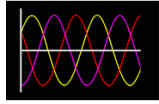
IED: Intelligent End Device, microprocessor-based controllers of power system equipment, such as circuit breakers, transformers and capacitor banks to enable advanced power automation.
IRIG: Inter-Range Instrumentation Group
ISE: Identity Services Engine
L3VPN: Layer 3 Virtual Private Network
LA: Lightning Arrester protects the power grid from electric storms
MQC: Modular QoS Command-Line Interface
MMS: Manufacturing Message Specification, messaging system for exchanging real-time data and supervisory control information. Allows client such as SCADA, an OPC server or a gateway to access all IED objects **MPLS:** Multi-protocol Label Switching
MU: Merging Unit connected to the process bus converts analog data(ie. volts, current...) into digital information
NERC: North American Electric Reliability Corporation
NIST: National Institute of Standards and Technology
NMS: Network Management System
OAM: Operations and Maintenance
PCP: Priority Code Point
PIOC: Instantaneous overcurrent Protection
PLC: Programmable Logic Controller
PMU: Phasor Measurement Unit
POTT: Permissive Overreaching Transfer Trip
PP: Primary Power
Process Bus: Connects primary units and control equipment to the IEDs
PRP: Parallel Redundancy Protocol
PRTC: Primary Reference Clock
PT: see VT
T-GM: Grand Master PTP
T-BC: Boundary Clock
T-TSC: Slave Clock



Surveillance



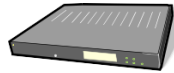
Alarm



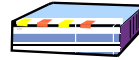
Sampled Values



IP Network



Gateway



Node



Router



Server node



Satellite



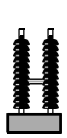
VT



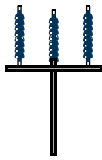
CT



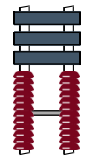
CB



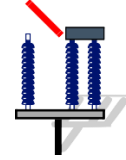
Busbar



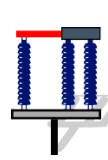
Busbar



Capacitor



Disconnector



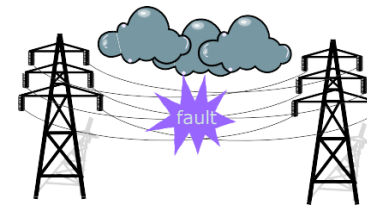
Disconnector



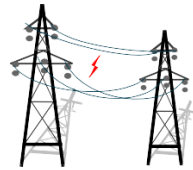
Transformer



Tower



Fault



High Voltage



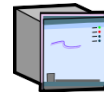
Network node



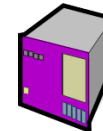
Switch



Station clock



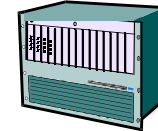
MU



IED



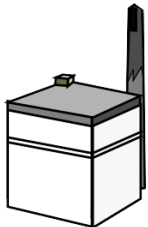
SCADA



Multiplexer



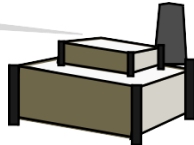
RTU



Fuel Plant



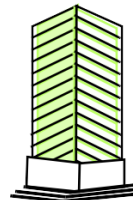
Eolic Plant



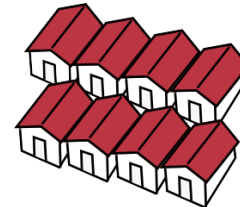
Coal Plant



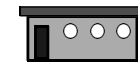
Green Plant



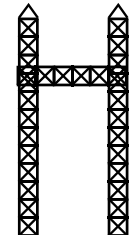
Customers



Customers



Cabinet



Substation

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