NDX Manual

User Manual

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Introduction

Thanks for choosing NDX made by Kronback Tracers.

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Acronyms

NDF Narrowband Digital Forward

NDR Narrowband Digital Return

OOB Out Of Band

RPD Remote Phy Device

CIN Corporate Infrastructure Network

GbE Giga bit Ethernet

SFP+ Small_form-factor pluggable transceiver

IPv6 Internet Protocol version 6

IPv4 Internet Protocol version 6

IEEE Institute of Electrical and Electronics Engineer

AC Alternate Current

L2TP Layer 2 tunneling protocol

LCD Licuid crystal display

LED Light emmiting diode

NDX Kronback Tracers OOB gateway

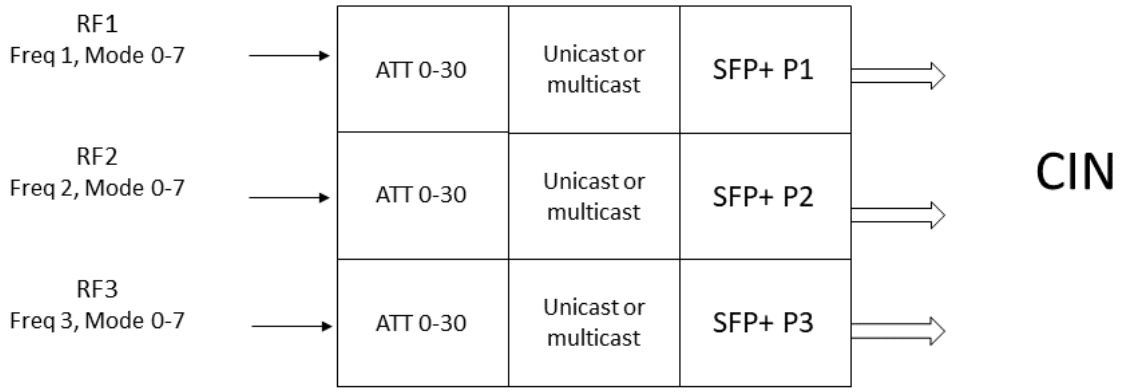
General description

FEATURES

The Kronback Tracers NDX is used by Cable TV operators to interface distributed Remote Phy Device (RPD) with equipment in HUBs. It is a 1 rack unit with 3 inputs (NDF) and 6 outputs (NDR). Each of the 6 outputs has 3 NDR carriers, providing a total of 18 NDR carriers per unit. On each of the 6 outputs 16 RPDs can be combined, providing interface for a total of 96 RPD´s. In addition to the NDF and NDR interfacing the NDX can receive the upstream spectrum capture data from each individual RPD.

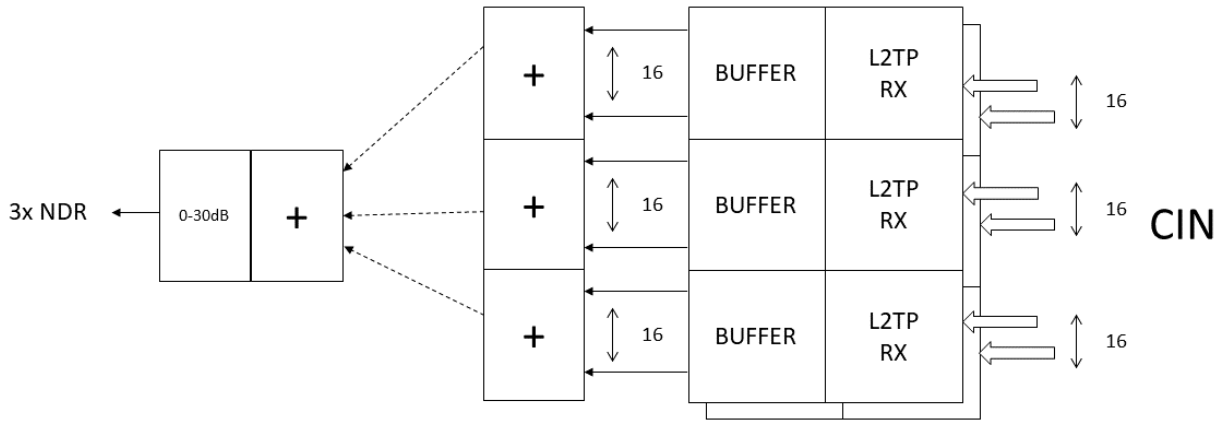
The NDX supports both IPv4 and IPv6. Interfacing to the CIN consists of 4 x 10GbE SFP+ slots. The NDX is synchronized using the IEEE1588 standard (8275.2 profile) Dual hot swap powersupplys ensures un-interrupted operation. The NDX can be ordered in 115V/230V AC as well as -48V configuration.

NDF



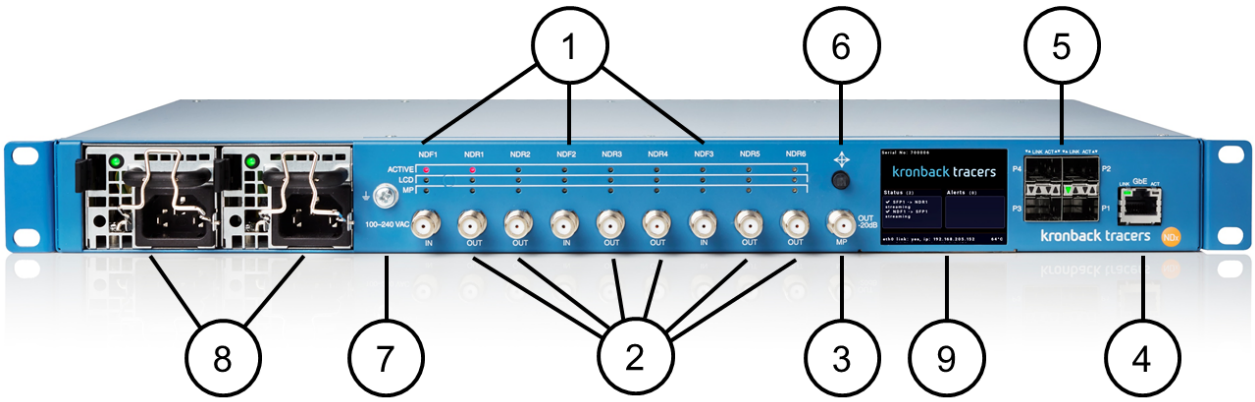
The NDX provides 3 parallel NDF channels. Each channel can be individually configured to a center frequency between xx and 862 MHz. Mode 0 to 7 are supported. The input level of each input can be adjusted in a 30dB range to meet the required 1.41 RMS output level (S6.3 format). The NDF input signal can be monitored by the -20dB test point output on the front of the NDX, on the LCD screen or from the integrated spectrum analyzer on the web interface. After the RF input signal has been sampled the data are packetized as L2TP format and forwarded to the SFP+ interface, with the binding that NDF1 is sent to SFP+ port 1, NDF2 is sent to SFP+ port 2, NDF1 is sent to SFP+ port 3. The data output of each individual NDF signal can be either formatted as IPv4 or IPv6. Both unicast and multicast signaling is supported.

NDR



Each of the 6 NDR output connectors of the NDX can carry up to 3 NDR carriers. Each of the 18 carriers can individually be configured as mode 0 to mode 6. When the NDR signal is received at the SFP+ interface as L2TP formatted data, each session is expected to have a RMS level of 1.41 (S6.3 format). One session is combined with 15 other sessions in a digitally combining. After the combining of 16 sessions the combined NDR carrier again combined with 2 other NDR carriers a total of 3 carriers are present on the NDR output connector. A common 30 dB attenuator can be used to adjust the coarse level of the 3 output carriers. The NDF input signal can be monitored by the -20dB test point output on the front of the NDX, on the LCD screen or from the integrated spectrum analyzer on the web interface.

Hardware description



1. NDF1 - NDF3 connectors
2. NDR1 - NDR6 connectors
3. MEASSURE OUT CONNECTOR
4. MANAGEMENT NETWORK CONNECTOR
5. 4x SFP+ 10GbE CONNECTOR
6. JOYSTICK
7. GROUND TERMINAL
8. DUAL PSU
9. LCD

NDF1 - NDF3 connectors

RF signals can be digitized for NDF streaming using the three NDF F-connectors. Over each connector are three red LED that indicates the activity of each input. Each input can have 3 activities.

The ACTIVE LED is indicate that the input is active streaming NDF data.

The LCD LED is active if the input is being displayed on the LCD display.

The MP LED is active if the NDF input is copied to the MEASSURE POINT OUT connector

NDR1 – NDR6 connectors

The six NDR output F-connectors outputs the NDR signals

Over each connector are three red LED that indicates the activity of each input. Each input can have 3 activities.

The ACTIVE LED is indicates that an active NDR signal is present.

The LCD LED is active if the input is being displayed on the LCD display.

The MP LED is active if the NDR output is copied to the MEASSURE POINT OUT connector

MEASURE OUTPUT

Each of the NDF1 to NDF3 and NDR1 to NDR6 signal can be measured using the MP output. The output to the MP connector is selected using the joystick and will be indicated on the MP LED.

ALL RF Connectors

All F-connectors connectors are mechanically fixed in the chassis front by a double D-cut hole. The connectors can withstand torques > 4,5 Nm (40 lb*inch)

All F-connectors are DC blocked up to 100V

All F-connectors are high quality CABLECON type.

Management Network Connector

The GbE is used for remote management and WEB access.

The RJ45 Network connector is supporting 10/100/1000 Mbit/s link speed, and half or full duplex. MDIX is supported for both straight and crossed twisted-pair cables

LED indicators

The top left LED (green??) indicates that LINK is stablished The top right LED (orange??) when flashing indicates that data is transmitted or received.

SFP+ connectors

P1 – P4 SFP+ connectors are used for NDR and NDF streaming. The data rate is fixed 10GbE.

JOYSTICK

The LCD display and its associated joystick is used for configuration and monitoring.

The joystick is used to

- navigate through the menus
- set values.

With the joystick 5 selections can be made: UP, DOWN, LEFT, RIGHT and PUSH.

From the starting point in the top left part of the screen a fold out menu will appear when selecting the DOWN key.

GROUND TERMINAL

The ground termination screw is connected to the chassis ground of the X16.

NOTE:

> *Proper grounding is critical to avoid hazard and to avoid damaging equipment due to voltage differences.*

DUAL PSU

The Dual PSU´s are hot swap replaceable.

LCD

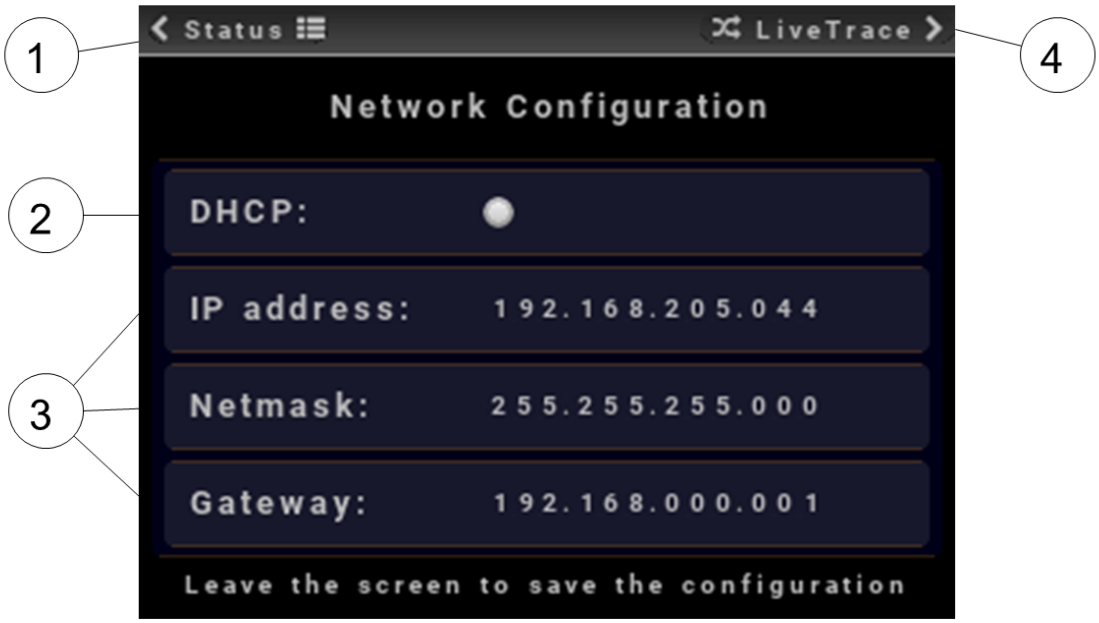
Selecting a sub menu is done by pushing the joystick or selecting the RIGHT key.

LCD main screen

1. SERIAL NUMBER
2. STREAMING STATUS
3. ALERTS
4. IP ADDRESS DISPLAY
5. FPGA INTERNAL TEMPERATURE

The LCD main screen summarizes the status and alerts of the NDX. The serial number is displayed and the internal FPGA temperature is shown. The 5 IP addresses are shown in the bottom in sequence.

LCD Network Configuration setup

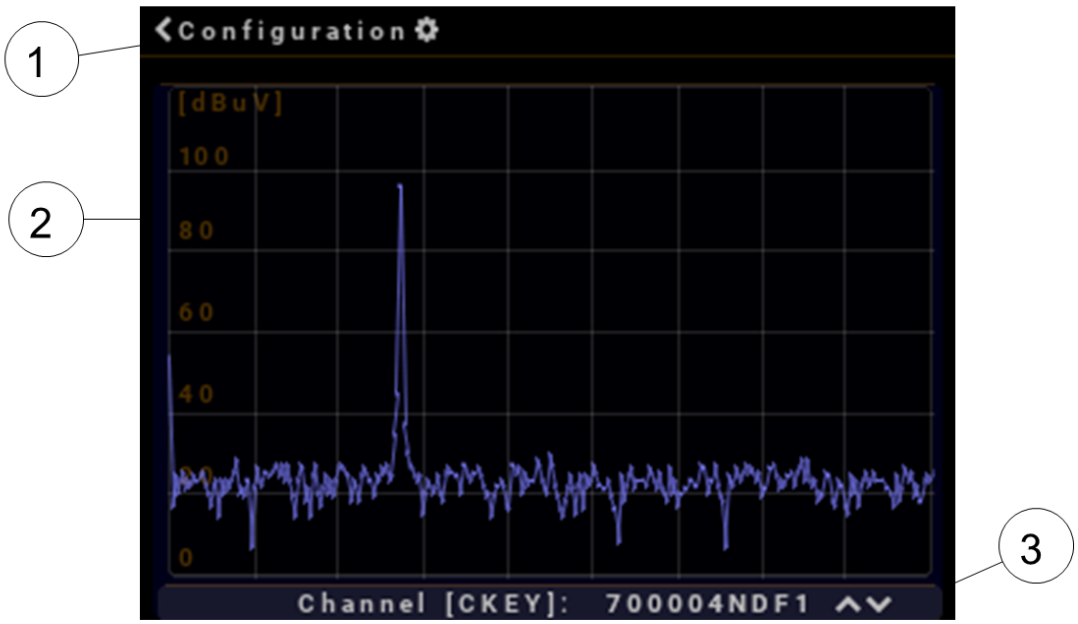


1. NAVIGATE BACK TO MAIN SCREEN
2. MANAGEMENT INTERFACE (eth0) DHCP STATUS
3. MANAGEMENT INTERFACE (eth0) IPv4 CONFIGURATION
4. NAVIGATE TO THE SPECTRUM SCREEN

To activate DHCP pres the joystick right button. The dot becomes black. To deactivate DCHP pres right again. the dot becomes white.

The management interface (eth0) IP address is configured from the Network Configuration menu. Scroll down to each line and then step right through each number to modify the IP address, Netmask and Gateway settings. The last step will commit the changes, and to cancel changes step out to the left intead.

LCD spectrum



1. NAVIGATE BACK TO NETWORK CONFIG SCREEN
2. LIVE SPECTRUM GRAPH
3. SELECT SIGNAL TO DISPLAY

The NDF1 to NDF3 and NDR1 to NDR6 signal can be displayed in the spectrum graph of the LCD display. The signal to be monitored is selected using the joystick and will be indicated on LCD screen and also the associated MP LED (Measure point LED) wil light. In the above example the NDF1 spectrum is displayed.

HARDWARE SPECIFICATIONS

Physical Specifications

The NDX form factor meets the following size and weight requirements for installation in a 19” rack.

- Height 43.8 mm (1 rack unit)
- Width 482 mm (standard 19” dimensions)
- Depth 310 mm
- Weight 5.1 Kg.

NDF Inputs

(R4.2.2-100) The NDX supports 3 NDF ports, each of which supports the following physical and transmission characteristics.

- Connector: F-type 75 ohm, AC coupled, 100V DC isolation
- Frequency range: 70 to 866 MHz
- ADC Full-scale Dynamic range (1 CW) 80-110 dBuV
- 1 NDF channel per F connector
- Mode 0 to 7
- Input power attenuation: 30dB
- Impedance 75 Ohm
- Return loss > 16dB
- RF level accuracy +/- 0.5dB
- Isolation to all input/outputs >60 dB

NDR Output

(R4.2.3-100) The NDX supports 6 NDR ports, each of which supports the following physical and transmission characteristics.

- Connector: BNC-type, AC coupled. 100V DC isolation
- Frequency range 4-85 MHz
- 1 to 3 NDR channels multiplexed per F connector
- Mode 0 to 6
- Output power attenuation: 30dB
- RF level accuracy +/- 0.5dB
- Isolation to all input/outputs >60 dB

Network Interface

The NDX supports 1 Management 1GbE port and4 10GbE SFP+ ports, that meet the following physical and transmission characteristics.

- 1 Gigabit Ethernet for control and management
- 4x10G Ethernet (pluggable SFP+s) for NDR/NDF packets
- Fixed IP address and DHCP support
- 1588

The 4 10G ethernet ports support the following:

NDR:

- 96 RPDs
- NDR Mode 0-6
- 1-3 NDR channels per RPD
- Digital combining of up to 16 NDR streams (of same mode)
- IPv6

NDF:

- 3 NDF streams
- NDF Mode 0-7
- IPv6

LEDs

The NDX supports the following LEDs:

- 3 LEDs indicating NDF activity
- 6 LEDs indicating NDR activity
- 9 LEDs indicating activity on LCD screen
- 9 LEDs indicating output to -20dB Measure Point
- 2 LEDs indicating PSU status
- 8 LEDs indicating Link and activity on SFP+ modules
- 2 LEDs indicating Link and activity on GbE management interface

Electrical

The NDX supports the following electrical characteristics:

AC powersupply:

- 115/230V IEC Connector
- Power consumption <50 Watts
- 2 independant dual hot swappable PSU plug-in units

-48V DC powersupply:

- 48V DC terminal
- Reverse polarity protection
- Power consumption <50 Watts
- 2 independant dual hot swappable PSU plug-in units

Setup pages

NDX can be configured from the SETUP page on the management website. The SETUP page has the following sub-pages:

NETWORK SETUP

The device has five physical ethernet interfaces: a management 1 Gb interface (eth0) and four SFP+ interfaces (eth1 to eth4). Only the SFP+ interfaces support L2TP streaming and IEEE-1588 synchronization. The SFP+ interfaces does not support DHCP and must be configured with a static IPv4 or IPv6 address. The management interface supports both static and DHCP. Each interface can only operate in either IPv4 or IPv6 mode, but not both.

Changes on this page is applied immediately without needing reboot.

Management interface (eth0)

- **DHCP**
  - Activate DHCP. If checked the interface will use DHCP to obtain its IP configuration. Only IPv4 is supported with DHCP.
  - Type: On / Off
- **IPv4 Addr./Netmask**
  - Enter IPv4 address/mask for the interface. Ignored if DHCP is enabled.
  - Type: String
- **IPv4 Gateway**
  - Gateway for the interface. Enter an IPv4 address to use as gateway, or leave blank for no gateway. Ignored if DHCP is enabled.
  - Type: String
- **IPv6 Addr./Netmask**
  - Enter IPv6 address/mask for the interface. Ignored if DHCP is enabled.
  - Type: String
- **IPv6 Gateway**
  - Gateway for the interface. Enter an IPv6 address to use as gateway, or leave blank for no gateway. Ignored if DHCP is enabled.
  - Type: String

SFP1 interface (eth1)

- **Enable**
  - Check to enable the SFP1 module
  - Type: On / Off
- **IPv4 Addr./Netmask**
  - Enter IPv4 address/mask for the interface. Ignored if DHCP is enabled.
  - Type: String
- **IPv4 Gateway**
  - Gateway for the interface. Enter an IPv4 address to use as gateway, or leave blank for no gateway. Ignored if DHCP is enabled.
  - Type: String
- **IPv6 Addr./Netmask**
  - Enter IPv6 address/mask for the interface. Ignored if DHCP is enabled.
  - Type: String
- **IPv6 Gateway**
  - Gateway for the interface. Enter an IPv6 address to use as gateway, or leave blank for no gateway. Ignored if DHCP is enabled.
  - Type: String
- **Loopback**
  - Only for testing! Check to enable internal and external loopback
  - Type: On / Off

SFP2 interface (eth2)

- **Enable**
  - Check to enable the SFP2 module
  - Type: On / Off
- **IPv4 Addr./Netmask**
  - Enter IPv4 address/mask for the interface. Ignored if DHCP is enabled.
  - Type: String
- **IPv4 Gateway**
  - Gateway for the interface. Enter an IPv4 address to use as gateway, or leave blank for no gateway. Ignored if DHCP is enabled.
  - Type: String

- **IPv6 Addr./Netmask**
  - Enter IPv6 address/mask for the interface. Ignored if DHCP is enabled.
  - Type: String
- **IPv6 Gateway**
  - Gateway for the interface. Enter an IPv6 address to use as gateway, or leave blank for no gateway. Ignored if DHCP is enabled.
  - Type: String
- **Loopback**
  - Only for testing! Check to enable internal and external loopback
  - Type: On / Off

SFP3 interface (eth3)

- **Enable**
  - Check to enable the SFP3 module
  - Type: On / Off
- **IPv4 Addr./Netmask**
  - Enter IPv4 address/mask for the interface. Ignored if DHCP is enabled.
  - Type: String
- **IPv4 Gateway**
  - Gateway for the interface. Enter an IPv4 address to use as gateway, or leave blank for no gateway. Ignored if DHCP is enabled.
  - Type: String
- **IPv6 Addr./Netmask**
  - Enter IPv6 address/mask for the interface. Ignored if DHCP is enabled.
  - Type: String
- **IPv6 Gateway**
  - Gateway for the interface. Enter an IPv6 address to use as gateway, or leave blank for no gateway. Ignored if DHCP is enabled.
  - Type: String
- **Loopback**
  - Only for testing! Check to enable internal and external loopback
  - Type: On / Off

SFP4 interface (eth4)

- **Enable**
  - Check to enable the SFP4 module
  - Type: On / Off
- **IPv4 Addr./Netmask**
  - Enter IPv4 address/mask for the interface. Ignored if DHCP is enabled.
  - Type: String
- **IPv4 Gateway**
  - Gateway for the interface. Enter an IPv4 address to use as gateway, or leave blank for no gateway. Ignored if DHCP is enabled.
  - Type: String
- **IPv6 Addr./Netmask**
  - Enter IPv6 address/mask for the interface. Ignored if DHCP is enabled.
  - Type: String
- **IPv6 Gateway**
  - Gateway for the interface. Enter an IPv6 address to use as gateway, or leave blank for no gateway. Ignored if DHCP is enabled.
  - Type: String
- **Loopback**
  - Only for testing! Check to enable internal and external loopback
  - Type: On / Off

DNS

- **DNS server 1**
  - DNS server 1
  - Type: String
- **DNS server 2**
  - DNS server 2
  - Type: String

IEEE 1588

The device supports accurate synchronization of the reference clock using the PTPv2 protocol and the IEEE-1588 standard. Note that the timing master must be reached through one of the SFP+ interfaces as the management interface does not support

IEEE-1588. Changes on this page is live updated. Some configuration changes (but not all) will result in a synchronization re-lock.

The state of clock regulation can be monitored on the IEEE-1588 page.

- **Enable**
  - Check to enable IEEE-1588 synchronisation
  - Type: On / Off
- **Sync Master Hostname**
  - Enter IP of the PTPv2 timing master. The timing master must be reached through one of the SFP+ interfaces.
  - Type: String
- **PTP domain**
  - Enter PTP domain number, also known as subdomain. Default: 0.
  - Type: Integer range [0-255]
- **Unicast negotiation**
  - Check to enable unicast negotiation. Must be enabled for PTP over unicast
  - Type: On / Off
- **Request SYNC per sec.**
  - Number of SYNC messages per second to request in unicast negotiation. Supported values: 1, 2, 4, 8, 16, 32. Default 8.
  - Type: Integer
  - Unit: per sec
- **Multiple messages filter**
  - Method for processing multiple SYNC messages received since last servo update. Default: minimum. For example, with minimum, the servo update calculation will use the SYNC message with the minimum time difference of the available SYNC messages
  - Options: minimum, average, maximum, latest
- **Servo P gain**
  - The servo proportional gain. Default: 40. A value of 1.0 will translate 1 usec time difference to 1 count VCXO adjust
  - Type: Decimal
- **Servo I gain**
  - The servo integrator gain. Default: 1.0. Use 0.0 to disable. A value of 1.0 will accumulate 1 VCXO adjust for 1 usec time difference at each servo update.

    - Type: Decimal
- **Servo adjust low-pass**
    - Set VCXO adjustment low-pass coefficient. Default: 0.2. For example: 0.1 will adjust VCXO by only 1/10 of the difference towards the new VCXO value at each servo update. 1.0 turns off low-pass filter
    - Type: Decimal
- **Servo update interval**
    - The interval of the servo update loop in ms. Default: 500 ms
    - Type: Integer
    - Unit: ms
- **Reject diff**
    - Reject SYNC messages with an absolute time difference more than this value. Default: 1000000 ns
    - Type: Integer
    - Unit: ns
- **Reject max. count**
    - The maximum number of consecutive SYNC messages allowed to be rejected before a new time offset is adopted. Enter 0 here to disable reject system. Default: 8
    - Type: Integer

MONITOR

On this page the MP output monitor function can be configured.

REMOTE PHY1

On this page NDF and NDR can be configured for the following streaming channels:

- NDF1 to SFP1
- SFP1 to NDR1
- SFP1 to NDR2

NDF1 to SFP1

- **Operation**
    - Disable, enable or start test tone(s) for NDF1. If Test tone or Test sweep is selected internally generated tones will be streamed.
    - Options: Disabled, Enabled, Test tone (200 KHz), Test sweep

- **Frequency**
  - Specify center frequency for NDF1
  - Type: Integer range [1000-1250000]
  - Unit: kHz
- **Mode**
  - Select bandwith mode. Mode 7 is 25.6 MHz, 6 is 5.12 MHz, 5 is 2.56 MHz, 4 is 1.28 MHz.
  - Options: 7, 6, 5, 4, 3, 2, 1, 0
- **Session**
  - Specify session ID to encode in the LT2P stream
  - Type: Integer range [0-65535]
- **Dest. IP Address**
  - Stream destination IPv4 or IPv6 address. The address may be a multicast IPv4 or IPv6 address.
  - Type: String
- **Test Mode**
  - Enabling test mode will make NDX always start streaming regardless of the network situation, likely to an undefined MAC address. Only for testing!
  - Type: On / Off
- **Gain**
  - Digital scaling of signal. Enter a smaller number here to attenuate the signal digitally.
  - Type: Integer range [0-65535]
- **Att**
  - Analog attenuation of signal. Entering larger numbers here will enable larger analog attenuation of the signal.
  - Type: Decimal range [0-31]
  - Unit: dB
- **DC offset**
  - DC offset. This number will offset the signal digitally. Choose a value that eliminates DC issues.
  - Type: Integer range [0-4000]

SFP1 to NDR1

- **Enable**
  - Check to enable NDR1 from SFP1
  - Type: On / Off
- **Mode**
  - Select bandwith mode. Mode 7 is 25.6 MHz, 6 is 5.12 MHz, 5 is 2.56 MHz, 4 is 1.28 MHz.
  - Options: 7, 6, 5, 4, 3, 2, 1, 0
- **Frequency**
  - Specify center frequency
  - Type: Integer range [1000-1250000]
  - Unit: kHz
- **Gain**
  - Digital scaling of signal. Enter a smaller number here to attenuate the signal digitally.
  - Type: Integer range [0-65535]
- **Att**
  - Analog attenuation of signal. Entering larger numbers here will enable larger analog attenuation of the signal.
  - Type: Decimal range [0-31]

SFP1 to NDR2

- **Enable**
  - Type: On / Off
- **Mode**
  - Select bandwith mode. Mode 7 is 25.6 MHz, 6 is 5.12 MHz, 5 is 2.56 MHz, 4 is 1.28 MHz.
  - Options: 7, 6, 5, 4, 3, 2, 1, 0
- **Frequency**
  - Specify center frequency
  - Type: Integer range [1000-1250000]
  - Unit: kHz

- **Gain**
  - Digital scaling of signal. Enter a smaller number here to attenuate the signal digitally.
  - Type: Integer range [0-65535]
- **Att**
  - Analog attenuation of signal. Entering larger numbers here will enable larger analog attenuation of the signal.
  - Type: Decimal range [0-31]

REMOTE PHY2

This pages is similar to REMOTE PHY1 but configures the streaming channels:

- NDF2 to SFP2
- SFP2 to NDR3
- SFP2 to NDR4

REMOTE PHY3

This pages is similar to REMOTE PHY1 but configures the streaming channels:

- NDF3 to SFP3
- SFP3 to NDR5
- SFP3 to NDR6

SOFTWARE UPDATE

This page shows information about the NDX software version and provides features for updating the software