DirectOut TECHNOLOGIES

MILAN.IO

User's Manual

Version 1.0

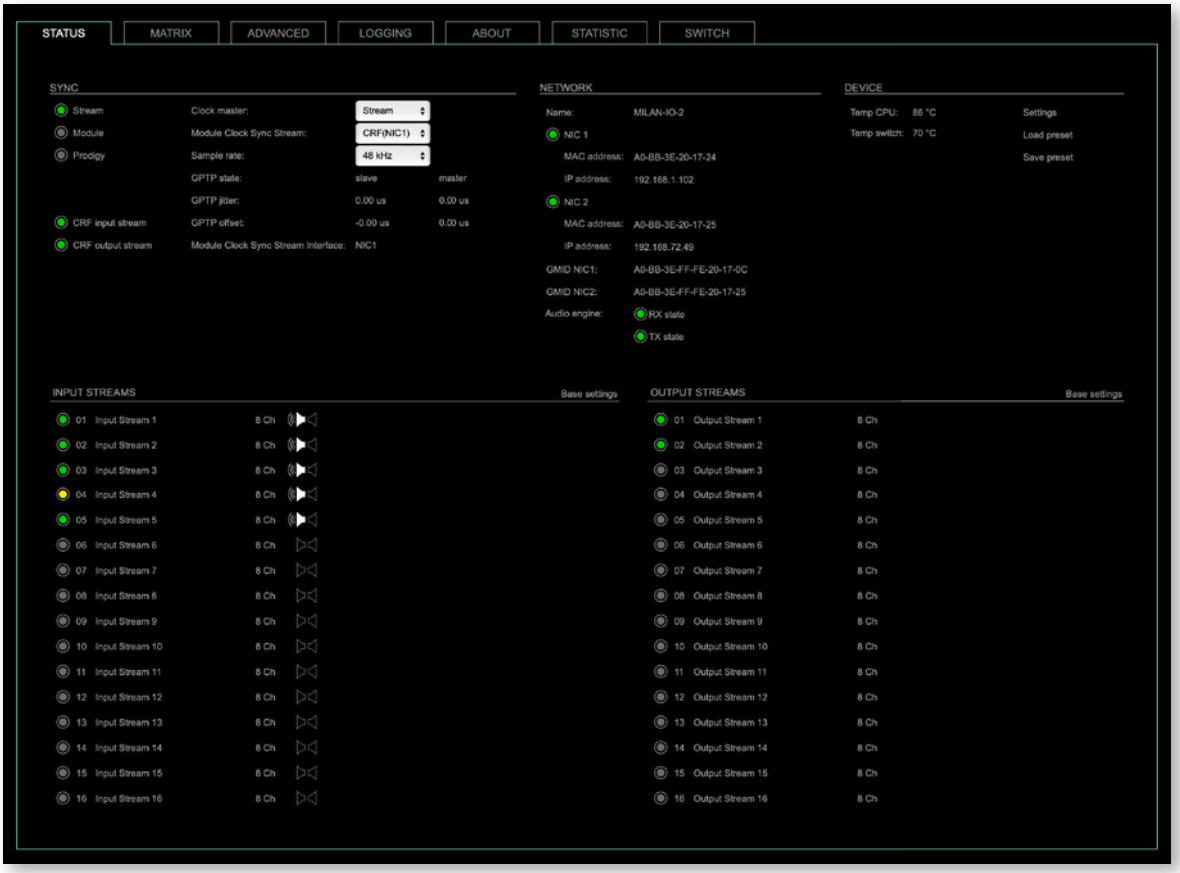
Table of contents

MILAN.IO

Introduction

MILAN.IO is an audio network module for MILAN/AVB. It is hosted in a PRODIGY mainframe.

- The general setup of the module is available via a browser based interface.
- The actual stream connection and management should all be done in the application 'Hive' or another ATDECC controller software.

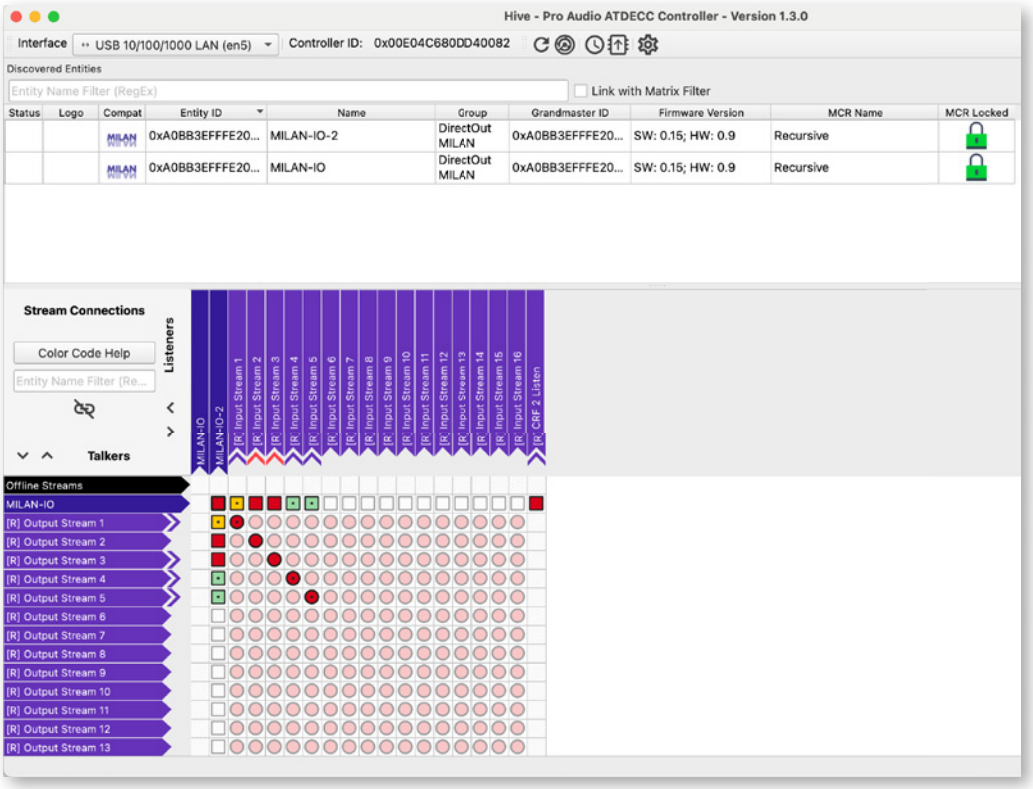


Web UI

The size of the window and the zoom level can be varied. The page is organized in tabs; pulldown menus or hyperlinks offer access to the values of a parameter. Some values use an input field (e.g. IP address).

NOTE

Refers to module software: SW 0.15 / HW 0.09



Hive

ATDECC controller software for patching of AVB streams.

Link: https://github.com/christophe-calmejane/Hive/releases

See “HIVE- Installation” on page 44.

NOTE

Refers to version 1.3.0

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Web UI - Connecting Audio Network

To access the control page:

- connect the network with one port
- enter http://<IP Address> (default IP @ PORT 1: 192.168.0.1) in the navigation bar of your browser

The three physical network ports (Port 1 to 3) are managed by two independent internal network interfaces (NIC 1 / NIC 2).

Port 1 is fixed assigned to NIC 1.
Port 2 and 3 can be assigned to either NIC 1 or NIC 2 on the SWITCH tab - see p 39.

NOTE

If NIC 1 and NIC 2 are connected to the same switch, they must be configured to different subnets - see “Network Settings” on page 15.

Web UI - Status - Overview

The tab ‘STATUS’ is divided into several sections:

- SYNC - monitoring sync state, clock selection, links to I/O settings
- NETWORK - display network info, link to network settings
- DEVICE - monitoring device info, link to device settings
- INPUT STREAMS - monitoring and control input streams, link to input stream settings
- OUTPUT STREAMS - monitoring and control output streams, link to output stream settings

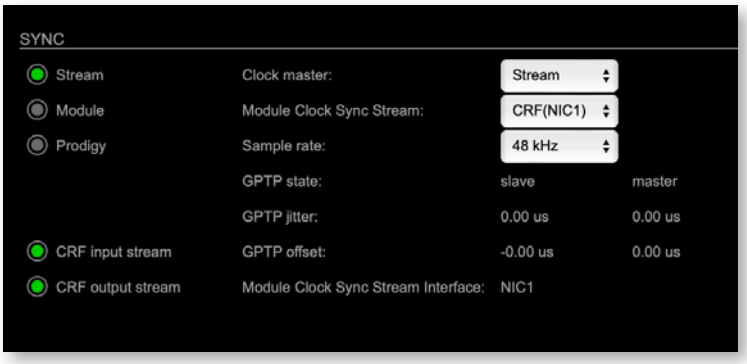
Hyperlinks open a popup window to adjust related settings. Most settings are updated immediately without further notification. To exit a popup window click the button in the top right corner.

Mouse overs are used to display further information (e.g. connection speed of network link).

NOTE

The web user interface updates itself when changes are applied by other instances (other browsers, external control commands).

Web UI - Status - Sync



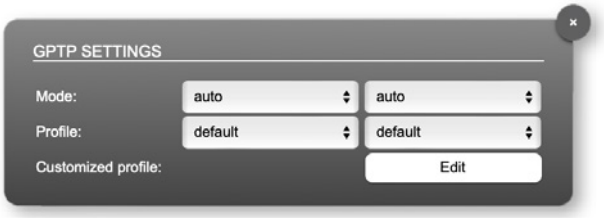
Stream, Module, Prodigy	Displays clock source and state for the main frame: (OFF) = not locked (ON, green) = locked and in sync with clock master (blinking, green) = locked but not in sync with clock master (blinking, red) = no lock at selected clock source
Clock master	Pulldown menu to select clock source of the module (Stream, Module, Prodigy)
Module Clock Sync Stream	Pulldown Menu to select a stream as source to derive the clock from. Values: <stream ##> <NIC 1 or NIC 2> (active when Clock Master = 'Stream')
Sample rate	Pulldown menu to adjust sample rate of the module (44.1 / 48 / 88.2 / 96 / 176.4 / 192 kHz).
GPTP state	State of GPTP (Master / Slave).
GPTP jitter	GPTP-clock jitter per second
GPTP offset	Offet relative to GPTP-clock master
Module Clock Sync Stream Interface	Displays the used hardware source to derive the clock from stream when Clock Master is set to 'Stream'. Values: NIC 1, NIC 2 or Intern (Clock Master = 'Module')

CRF input stream	State of module's CRF input (OFF) = no stream connected (ON, green) = ok, receiving data as connected (ON, yellow) = error connecting stream at one NIC (redundancy) (blinking, red) = error connecting stream at both NICs
CRF output stream	State of module's CRF output (OFF) = no CRF stream output (ON, green) = ok, sending CRF stream to listener

Hyperlinks:

- GPTP state (p 10)
- CRF input stream
- CRF output stream

Web UI - GPTP Settings

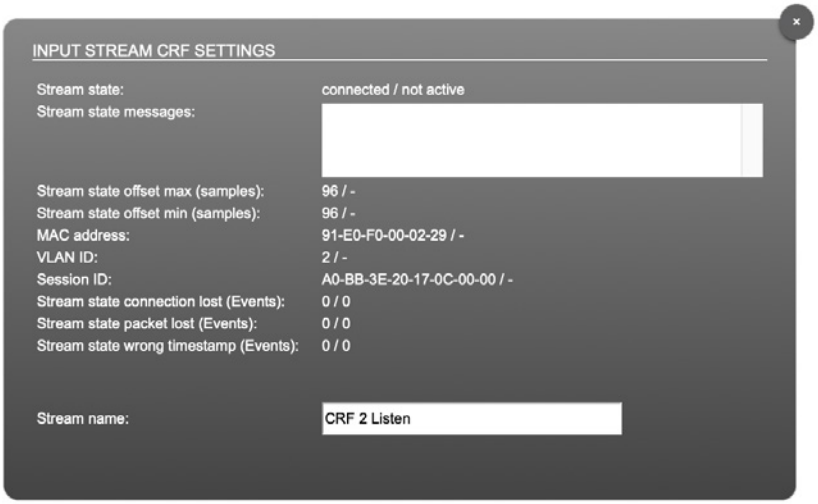


Settings can be edited separately for NIC 1 (left) & NIC 2 (right)

Mode	GPTP-clock master / slave configuration auto = is auto negotiated between devices in the network. Module's master / slave state may change automatically. preferred master = increase priority to become clock master slave only = module never will act as clock master
Profile	GPTP profile selection Values: default, customized
Edit	opens the tab 'ADVANCED' to adjust the custom profile

See „Web UI- Advanced- GPTP Current Settings“ on page 30 for more details.

Web UI - CRF input stream



Displayed information for NIC 1 / NIC 2

Stream state	Information about CRF input stream state Values: connected, connecting, not active
Stream state messages	Status info related to stream state.
Stream state offset max (samples)	Measured value (maximum). A high value indicates that the media offset of the source might not match the adjusted media offset of the device.
Stream state offset min (samples)	Measured value (minimum). The offset should not become negative.
MAC address	
VLAN ID	
Session ID	
Stream state connection lost (Events)	counter indicates the number of incidents where the network connection was lost (link down)
Stream state packet lost (Events)	counter indicates the number of lost CRF packets
Stream state wrong timestamp (Events)	counter indicates the number of packets with invalid timestamp
Stream name	Individually defined name of the CRF input stream.

Web UI - CRF output stream

Presentation time	Pulldown menu to select presentation time of the CRF output stream Values: 0.25 ms, 0.5 ms, 1 ms, 2 ms [default]
Stream name	Individually defined name of the CRF output stream.

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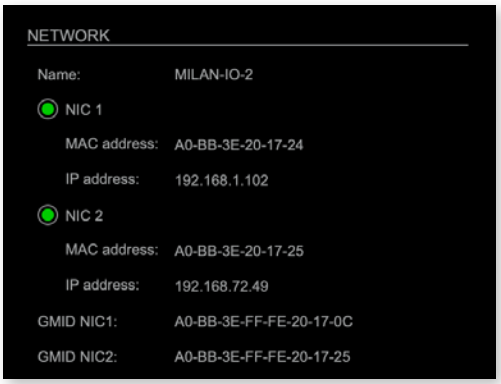
Web UI - Status - Network



Name	Module's name in the network. Used e.g. for mDNS service. The name needs to be unique throughout the network.
NIC 1 / NIC 2	Monitoring state of network interface controller (OFF) = not connected (ON) = connected with the network
MAC address	Hardware identification of network interface controller.
IP address	IP address of device
GMID (NIC 1 / NIC2)	Grand Master ID (GPTP)

Hyperlinks

- Name / IP address (p 15)

Mouse over:

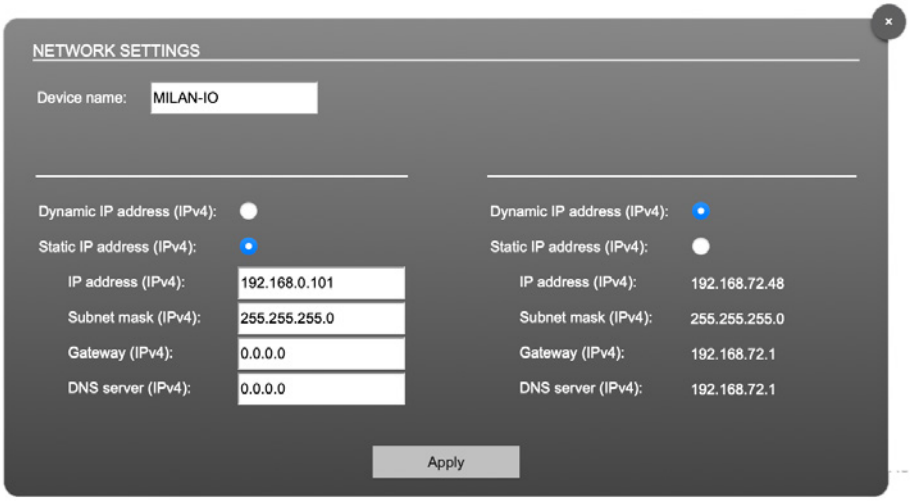
- LED NIC 1- indicating link state and connection speed
- LED NIC 2- indicating link state and connection speed

NOTE

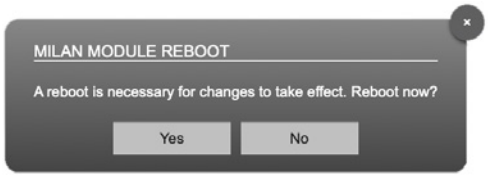
If NIC 1 and NIC 2 are connected to the same switch, they must be configured to different subnets - see "Network Settings" on page 15.

Network Settings

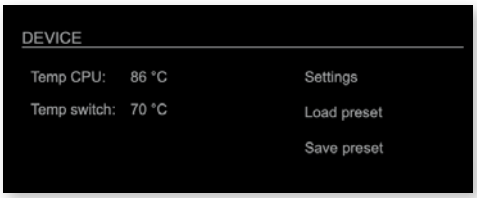
The two network interfaces (NIC 1 / NIC 2) are configured individually.



Device name	Input field - Module's name in the network. Used e.g. for mDNS service. The name needs to be unique throughout the network.
Dynamic IP address (IPv4)	Switch to enable the device's DHCP client. IP address is assigned by DHCP server. If no DHCP is available the IP address is determined via Zeroconf.
Static IP address (IPv4)	Switch to disable the device's DHCP client. Manual configuration of network parameters.
IP address (IPv4)	Module´s IP Address
Subnet mask (IPv4)	Module's subnet mask
Gateway (IPv4)	IP address of gateway
DNS server (IPv4)	IP address of DNS server
Apply	Button to confirm changes. Another popup window will appear to confirm a reboot of the module.



Web UI - Status - Device

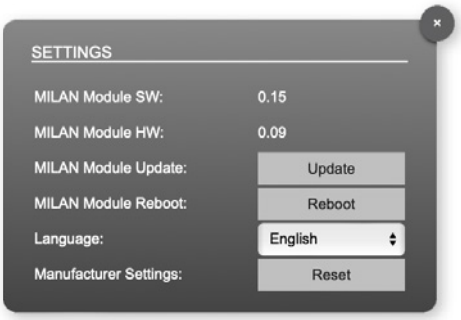


Temp CPU	Display temperature of CPU core in degree Celsius. It may reach 95 °C without affecting the performance of the device.
Temp switch	Display temperature of network switch in degree Celsius
Settings	Opens a popup window to configure the device.
Load preset	Opens a dialog to store the device settings to a file. Filetype: .rps
Save preset	Opens a dialog to restore the device settings from a file. Filetype: .rps

Hyperlinks:

- Settings (p 16)
- Load preset (p 17)
- Save preset

Settings

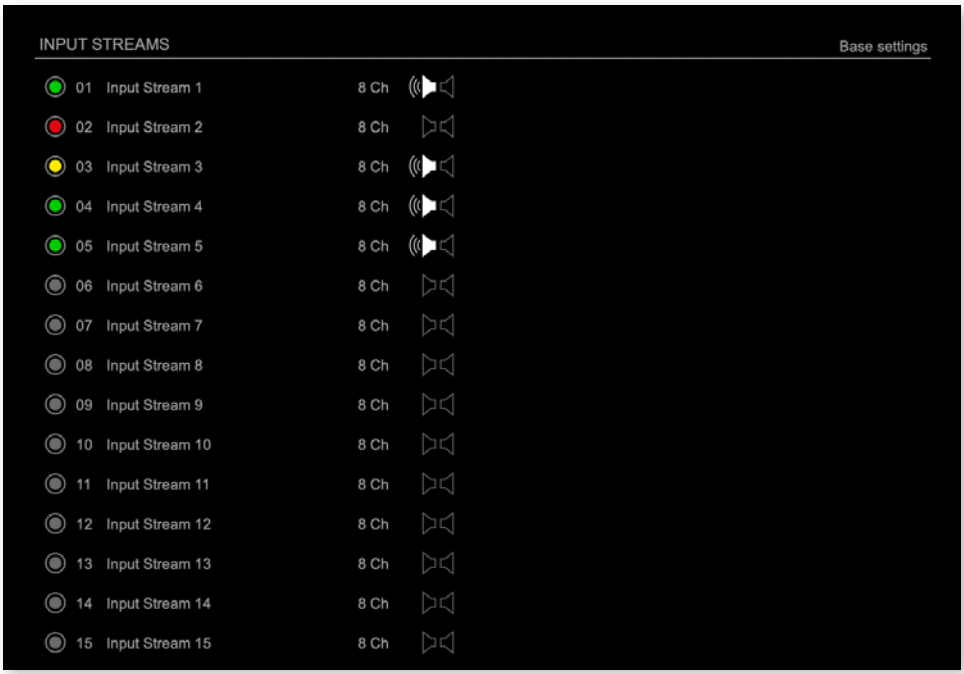


MILAN Module SW	Module´s software version. It is updated together with hardware version via network.
MILAN Module HW	Module´s bitstream version. It is updated together with software version via network.
MILAN Module Update	Opens a dialog for selection of the update file - see p 43
MILAN Module Reboot	Restart of the MILAN module. Confirmation required. Audio transmission will be interrupted.
Language	Menu language (english, german).
Manufacturer Settings Reset	Restore device settings to factory defaults. Confirmation required.

Load Preset

The device configuration can be stored to a single file (.rps).
When restoring the configuration a dialog prompts for selection of individual settings. This enhances flexibility at setup changes when a particular adjustment shall be preserved or just a single adjustment shall be restored.

Web UI - Status - Input Streams



The module can subscribe up to 32 streams. 16 streams are enabled as factory default to avoid overlapping of I/O channels with 8 channel streams (128ch max). Each stream can be configured to contain between 1 and 8 audio channels. The overview displays the basic information of each stream. The input stream name must be set manually.

The total number of available streams and the maximum channel count of a single input stream can be configured in 'Base settings'.

01 to 32	State of incoming streams (OFF) = stream not activated (ON) = stream activated, receiving data (ON) = stream activated, receiving data not expected as patched in HIVE* (blinking) = stream activated, not receiving data
01 to 32 Name	Name of stream set manually in the stream settings dialog.
01 to 32 xx ch	Number of audio channels transported by the stream
Base settings	Click to open general configuration of 'input streams'.

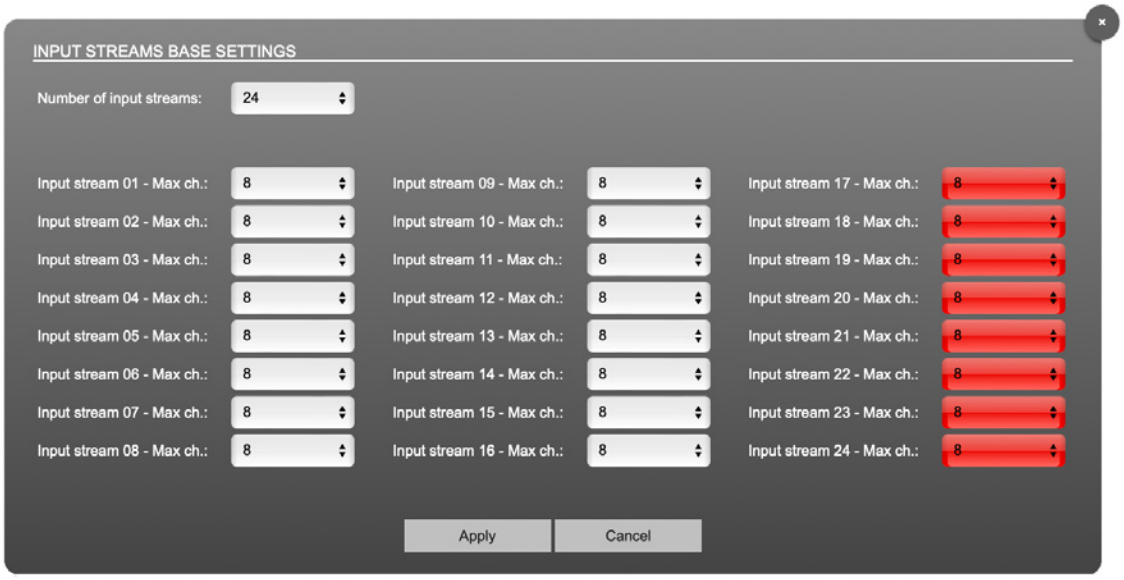
* see "HIVE- Patching single/redundant streams" on page 46

01 to 32 	Stream active, audio output active
01 to 32 	Stream inactive
01 to 32 	Stream active, audio output mute

Left speaker = NIC 1, Right speaker = NIC 2

Input Stream Base Settings

Configuration of the number of input streams and the maximum channel count per stream.



Number of input streams	Pulldown menu to set the total number of input streams. Values: 1 to 32 (factory default: 16 streams)
Input stream – Max ch 01 to 32 *	Pulldown menu to set the maximum number of channels for each stream. Changes require a reboot.
Apply	Button to confirm changes. Another popup window will appear to confirm a reboot of the module.

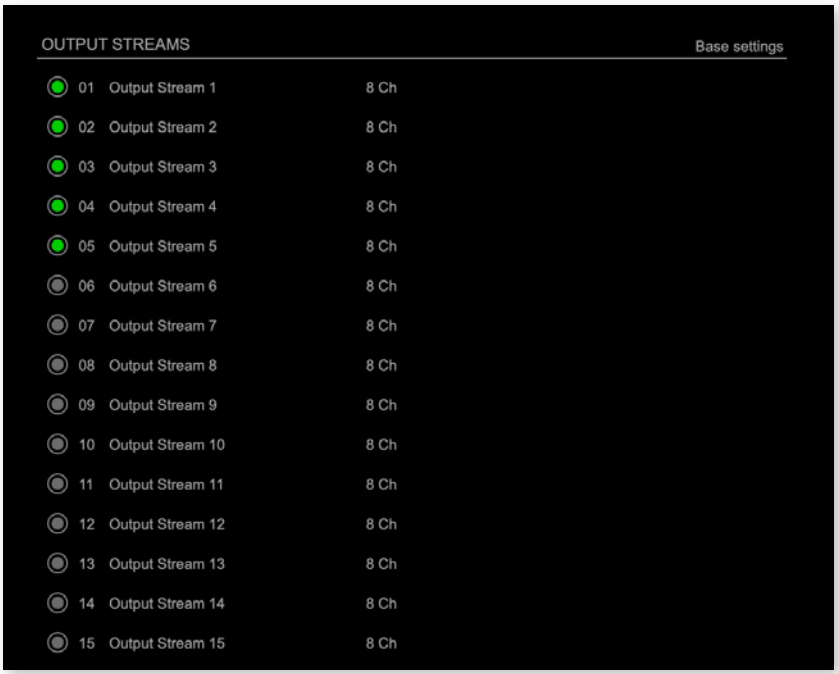
* If a parameter is marked red, this setting exceeds the limit of the modules audio channels.

Web UI - Input Stream Settings

The status of a single stream is displayed here.
The stream settings allow to adjust the processing of the received audio data (stream name, audio format and number of channels). The receiving of stream data starts once the stream has been enabled via an ATDECC controller (i.e. Hive).

Stream state	Information about stream state: connected not connected receiving data read successfull error
Stream state message	Status info related to stream state.
Stream state offset max	Measured value (maximum). A high value indicates that the media offset of the source might not match the adjusted media offset of the device.
Stream state offset min	Measured value (minimum). The offset should not become negative.
MAC address	
VLAN ID	
Session ID	
Stream state connection lost NIC 1 / NIC 2	counter indicates the number of incidents where the network connection was lost (link down)
Stream state packet lost (Events) NIC 1 / NIC 2	counter indicates the number of lost audio stream packets
Stream state wrong timestamp (Events) NIC 1 / NIC 2	counter indicates the number of packets with invalid timestamp
Stream name	Individually defined name of the input stream (ASCII).
Audio format	Define word length of AES frame Values: L16, L24, L32
Number of channels	Set number of audio channels received Values: 1 to 8 (depending on ‘Base Settings’)

Web UI - Status - Output Streams

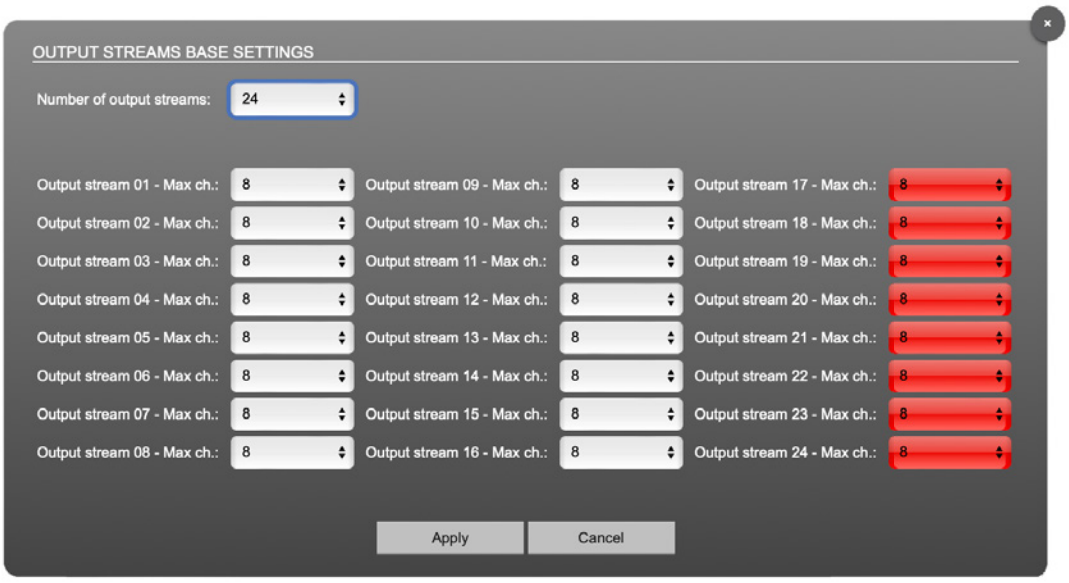


The device can send up to 32 streams. 16 streams are enabled by factory default. Each stream can contain between 1 and 8 audio channels.The overview displays the basic information of each stream.

01 to 32	State of outgoing streams (OFF) = stream not activated (ON) = stream activated, sending data (ON) = stream activated, stream output via both NICs selected, but one NIC is not linked to the network.
01 to 32 Name	Name of stream defined in the settings
01 to 32 xx ch	Number of audio channels transported by the stream

Output Stream Base Settings

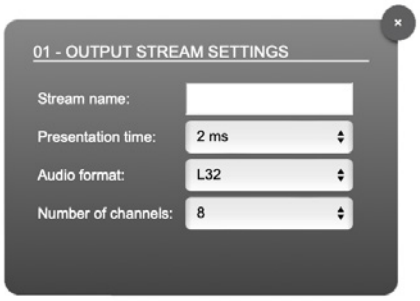
Configuration of the number of output streams and the maximum channel count per stream.



Number of output streams	Pulldown menu to set the total number of output streams. Values: 1 to 32 (factory default: 16 streams)
Output stream – Max ch 01 to 32 *	Pulldown menu to set the maximum number of channels for each stream. Changes require a reboot.
Apply	Button to confirm changes. Another popup window will appear to confirm a reboot of the module.

* If a parameter is marked red, this setting exceeds the limit of the module's audio channels.

Output Stream Settings



Presentation time	Pulldown menu to select presentation time of the output stream Values: 0.25 ms, 0.5 ms, 1 ms, 2 ms [default]
Stream name	Individually defined name of the output stream (ASCII).
Audio format	Define word length of AES frame Values: L16, L24, L32
Number of channels	Set number of audio channels received Values: 1 to 8 (depending on 'Base Settings')

Up to 32 output streams can be sent to the network.

Each stream may be labelled with an individual stream name (ASCII) which is useful for enhanced comfort at organizing the setup.

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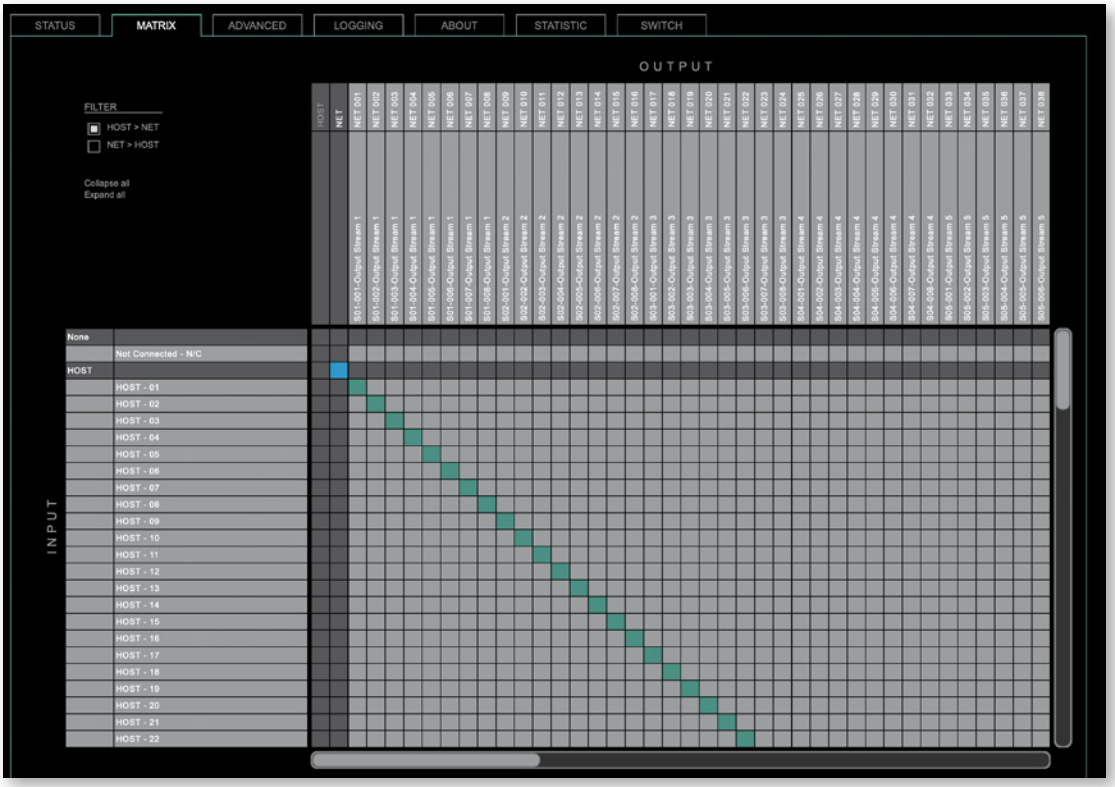
Web UI - Matrix



The tab 'MATRIX' allows channel mapping (= patching) between HOST and MILAN network channels.

Organisation

- Inputs - vertical column
- Outputs - horizontal row
- Click on HOST or NET to expand or collapse the corresponding i/o.
- NET i/os display the stream label in the second column or row of assigned streams.
- Stream label: <SXX>-<XXX>-<Stream Name>
  S<XX> = numbering of the stream in the tab 'STATUS'
  <XXX> = numbering of audio channels contained in stream
  <Stream Name> = name assigned in the stream settings

NOTE

Host outputs cannot be directly patched to host inputs; the same applies to MILAN outputs and MILAN inputs (no loop-back).

Filter

Viewing filters can be applied to focus on used areas for patching.

HOST > NET	HOST inputs and NET outputs
NET > HOST	NET inputs and HOST outputs
Collapse all	all i/os collapsed
Expand all	all i/os expanded

Patching

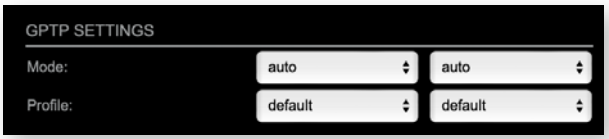
- A yellow crossline marks the hotspot for setting a patch.
- Patches are marked by a green square.
- To set a patch
  Move the hotspot to the desired position + Click
- To delete a patch
  Move the hotspot up to ‚Not Connected- NC' + Click
  or
  ALT + Click the current patch
- Multi-channel patches (diagonal and horizontal):
  SHIFT + Click start + Click end
- Multi-channel patches to N/C
  ALT + SHIFT + Click start + Click end

Web UI - Advanced - Overview

The tab 'ADVANCED' is divided into several sections:

- GPTP SETTINGS - definition of GPTP source, mode and profile
- GPTP CURRENT SETTINGS - definition of a customized GPTP profile
- CURRENT GPTP MASTER - monitoring GPTP characteristics
- GPTP STATISTIC - monitoring device's GPTP state, jitter and delay
- NETWORK ADVANCED SETTINGS - definition of network and QoS characteristics
- GPTP JITTER - graphical display of measured GPTP jitter

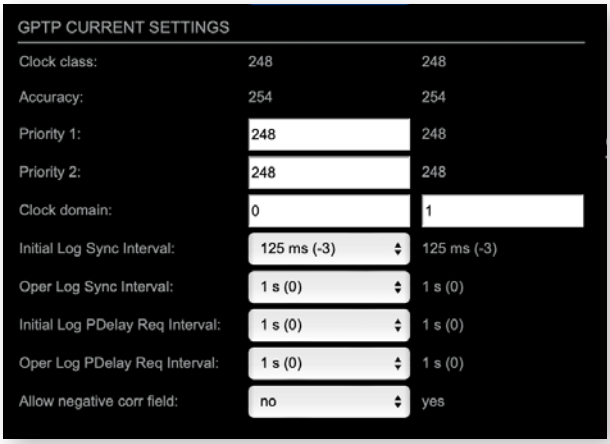
Web UI - Advanced - GPTP Settings



Mode	auto = GPTP-clock master / slave configuration is auto negotiated between devices in the network. Module's master / slave state may change automatically. slave only = GPTP-clock slave configuration is preferred. Module clocks to another device in the network preferred master = GPTP-clock master configuration is preferred. Module acts as network grandmaster. Priority values are adjusted automatically to ensure Grandmaster status. *
Profile	Selects default GPTP profile or activates customized GPTP profile.

* If more than one device announces as GPTP-clock master, the network Grandmaster is determined following the Best timeTransmitter Clock Algorithm (BTCA).

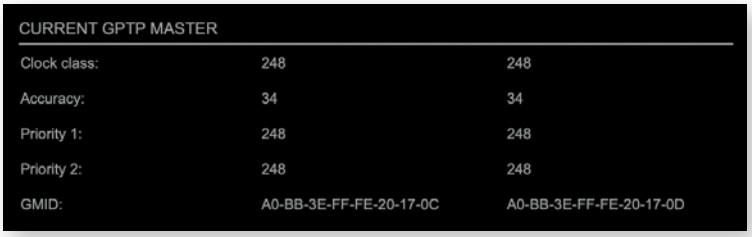
Web UI - Advanced - GPTP Current Settings



The settings become available with GPTP profile set to 'customized'.

Clock class	GPTP-clock's class according to IEEE 1588 [read only]
Accuracy	GPTP-clock's accuracy according to IEEE 1588 [read only]
Priority 1	Priority setting for master announcement (the smaller the value the higher the priority)
Priority 2	If value 'Priority1' (and other GPTP-clock parameters) of more than one device in the network match: Priority setting for master announcement (the smaller the value the higher the priority)
Clock domain	GPTP-clock's domain at NIC 1 (left) or NIC 2 (right)
Initial Log Sync Interval	Sync Interval when the PTP port is initialized
Oper Log Sync Intervall	Currently used Sync Interval
Initial Log PDelay Req Intervall	PDelay Interval when the PTP port is initialized
Oper Log PDelay Req Intervall	Currently used PDelay Interval

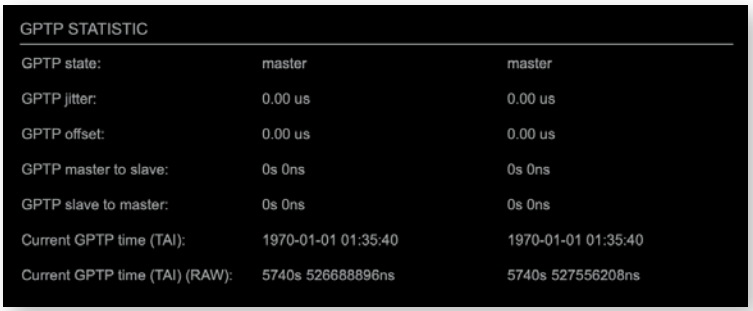
Web UI - Advanced - Current GPTP Master



Monitoring display only. NIC 1 = left, NIC 2 = right

Clock class	GPTP-clock's class according to IEEE 1588
Accuracy	GPTP-clock's accuracy according to IEEE 1588
Priority 1	Priority setting for master announcement (the smaller the value the higher the priority)
Priority 2	If value 'Priority1' (and other PTP-clock parameters) of more than one device in the network match: Priority setting for master announcement (the smaller the value the higher the priority)
GMID	ID of current Grandmaster

Web UI - Advanced - GPTP Statistic

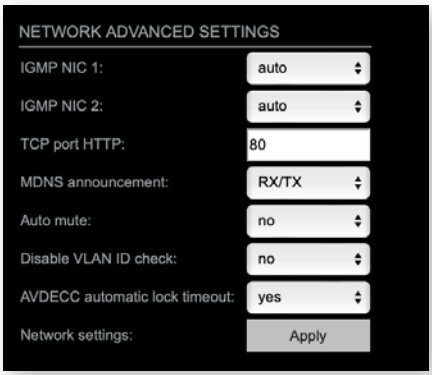


Monitoring display only. NIC 1 = left, NIC 2 = right

GPTP state	Information about current GPTP-clock state: intialize error deactivated receiving data pre master master passive not calibrated slave
GPTP jitter	GPTP-clock jitter in microseconds (µs)
GPTP offset	Offset relative to GPTP-clock master
GPTP master to slave	Absolute offset master-to-slave in nanoseconds
GPTP slave to master	Absolute offset slave-to-master in nanoseconds
Current GPTP time (TAI):	Date and time information from GPS source*
Current GPTP time (TAI) (RAW):	RAW TAI from GPS source*

* Temps Atomique International- if no GPS source is available for PTP time-stamping,the date / time display starts at 1970-01-01 / 00:00:00 after every reboot of the device.

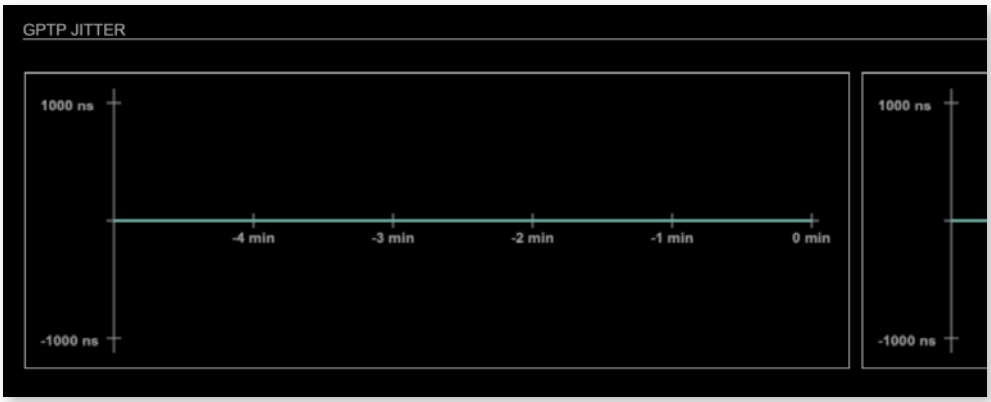
Web UI - Advanced - Network Advanced Settings



IGMP NIC 1	Definition or auto-select of IGMP version used to connect to a multicast router at NIC 1.
IGMP NIC 2	Definition or auto-select of IGMP version used to connect to a multicast router at NIC 2
TCP port HTTP	TCP port for HTTP
MDNS announcement	Announcement of streams via MDNS can be controlled to optimize network traffic or CPU load. Values: Off, RX, TX or RX/TX *
Auto Mute	automatically mute if module looses sync
Disable VLAN ID check	do not check for matching VLAN ID (default)
AVDECC automatic lock timeout	automatic timeout for lock command issued via ATDECC
Network settings Apply	Confirms and saves changes being made. Reboot required.

* RX = receive, TX = transmit, RX/TX = receive and transmit

Web UI - Advanced - PTP Jitter



Graphical display of measured GPTP jitter. NIC 1 = left, NIC 2 = right

NOTE

An error message next to Jitter measurement is displayed if delay requests are not being answered by Grandmaster.

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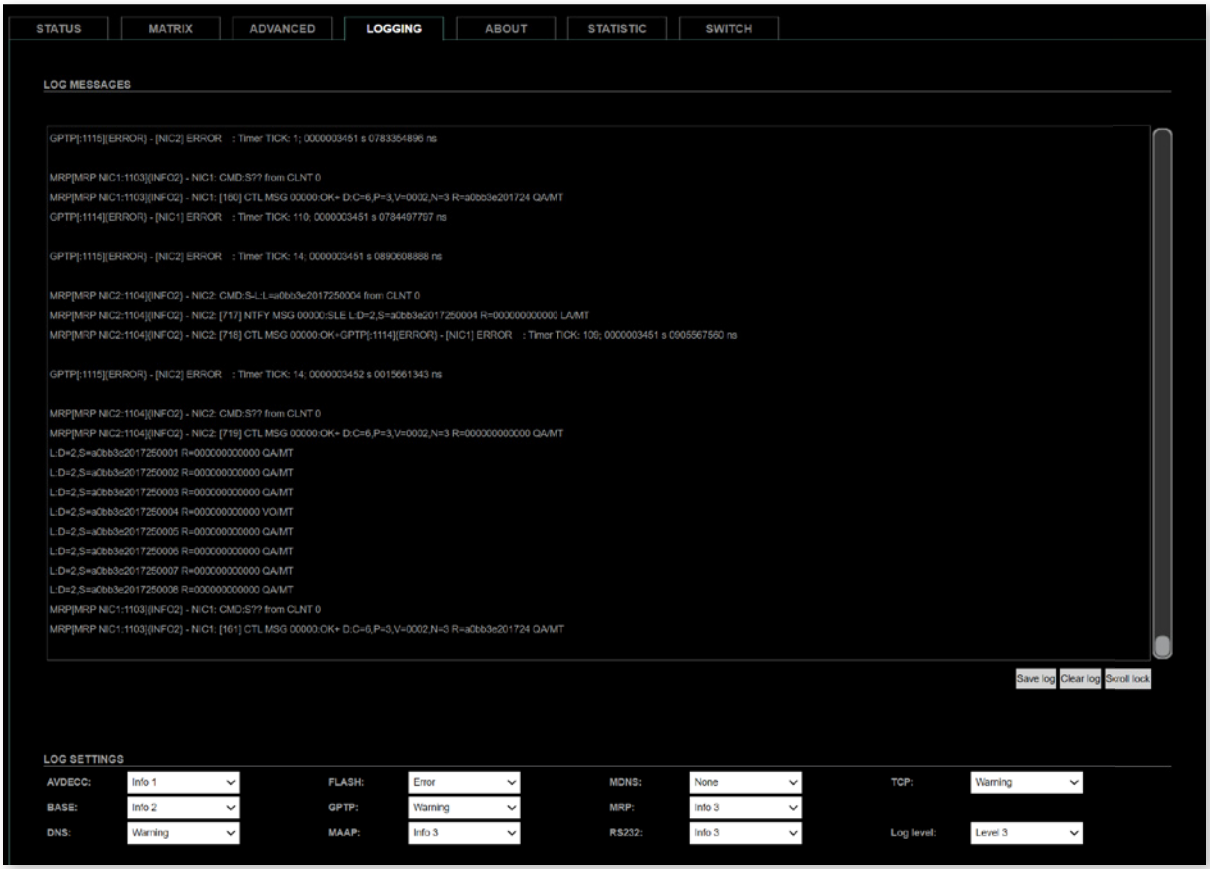
Web UI - Logging



The tab 'LOGGING' displays logging depending on the 'Log Settings'. The logging can be enabled individually for different protocols, each of with an adjustable filter. An adjustable log level specifies the information detail of each entry.

To save a log the content of the view can be copied and pasted to a text document.

Log Level

0	log data
1	level and log data
2	protocol, level and log data
3	protocol, process-id of requesting process, process-id of running process, level and log data
4	protocol, process-id of requesting process, process-id of running process, level, processor time in ticks and log data
5	protocol, process-id of requesting process, process-id of running process, level, processor time in ticks, file name and line and log data

Protocol Types

AVDECC	Address Resolution Protocol
BASE	Basic operation of module
DNS	Domain Name System
FLASH	Process for updating the module
GPTP	Generalized Precision Time Protocol
MAAP	Mac Address Acquisition Protocol
MDNS	Multicast Domain Name System
MRP	Multiple Registration Protocol
RS232	Serial Protocol
TCP	Transmission Control Protocol

Log Filter

NONE	logging disabled
ERROR	error occurred
WARNING	warnings- condition that may lead to unwanted behavior or an error
INFO 1	log info* + warning + error
INFO 2	log info* + warning + error
INFO 3	log info* + warning + error
INFO 4	log info* + warning + error

* increasing amount of log info starting from ‚INFO 1‘

Log Operation

Save log	Downloads the current log entries to a text-file (log.txt).
Clear log	Deletes all log entries without further prompt.
Scroll lock	Interrupts automatic scrolling of the list view to allow copying the content to a text file via copy & paste. If scrolling is stopped for a longer period of time the display may not list all entries.

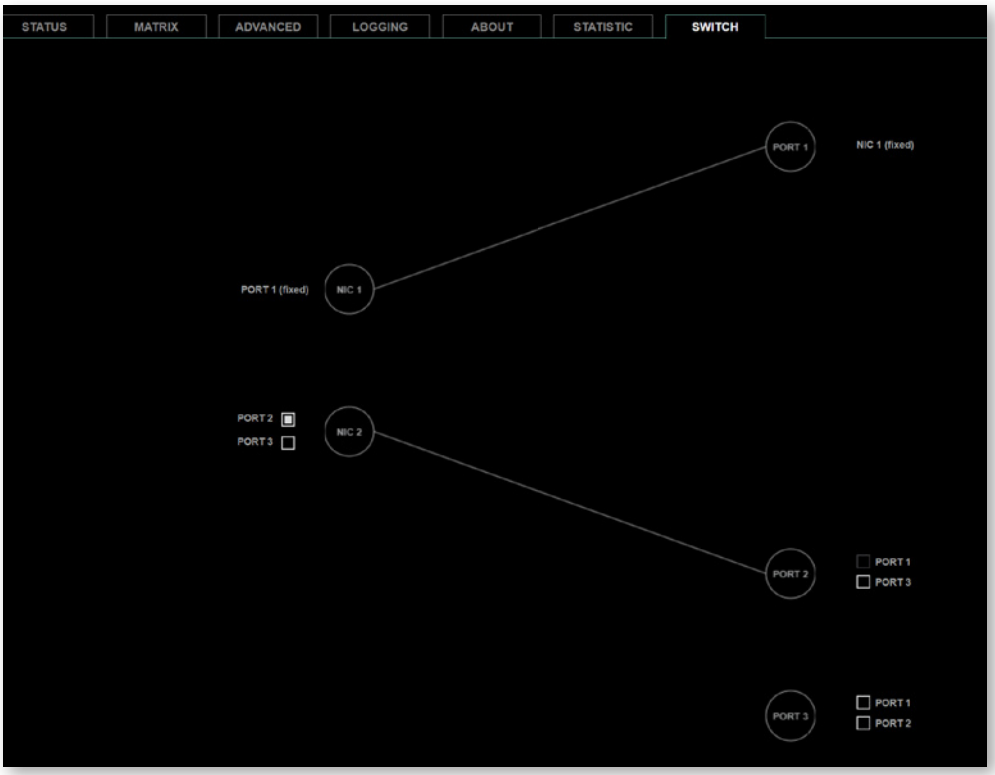
Web UI - Statistic

The tab ‘STATISTIC’ displays an overview of the CPU load of the particular processes, an error counter and a monitor display to indicate the incoming (RX) and outgoing (TX) network traffic on both network ports individually.

Details	Displays a list of input streams and related events (connection lost, packet lost, wrong timestamp) of received audio packets.
Reset	Resets the packet statistic

See “Protocol Types” on page 37.

Web UI - Switch



The module features two RJ45 sockets and an SFP cage managed by two independent network interfaces (NIC 1 / NIC 2).

- Port 1 is fixed assigned to NIC 1.
- Port 2 and 3 can be assigned to either NIC 1 or NIC 2 on the SWITCH tab

NOTE

If you want to use a port that is not assigned to a NIC e.g. to patch the device's management port (MGMT) into the audio network, you can link it to one of the audio ports.

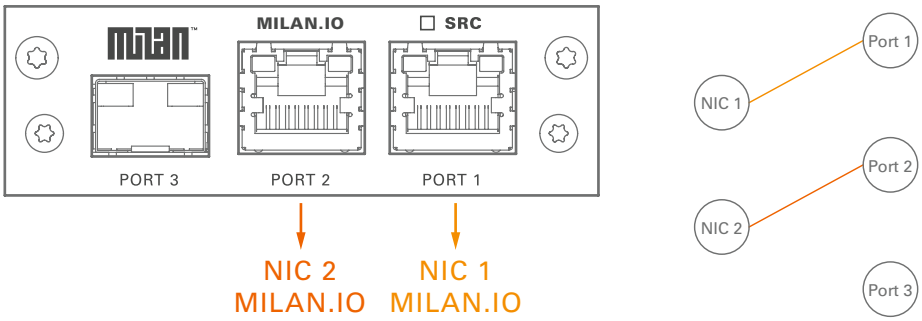
NOTE

To access the module's control page it is required to connect the management network to one of the ports that is directly attached to a NIC - see next page.

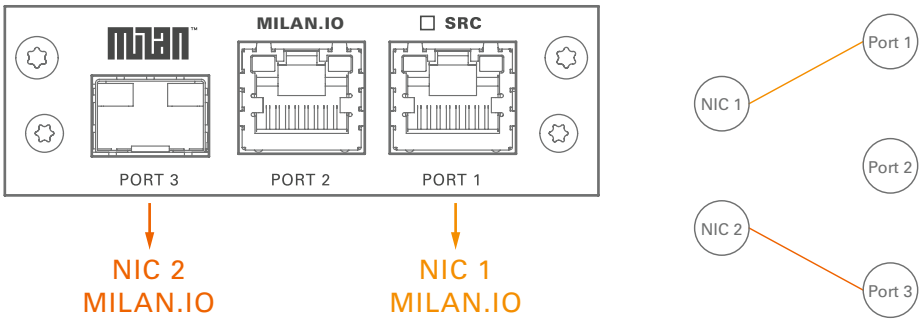
To give the very best GPTP synchronisation performance, the switch incorporates advanced timestamping between the external PORTS and the internal NICs.
As a consequence, the on-board switch cannot be used to connect other PTP devices via a single shared connection to the wider network.

Please connect all other GPTP devices directly to your system's network switch.

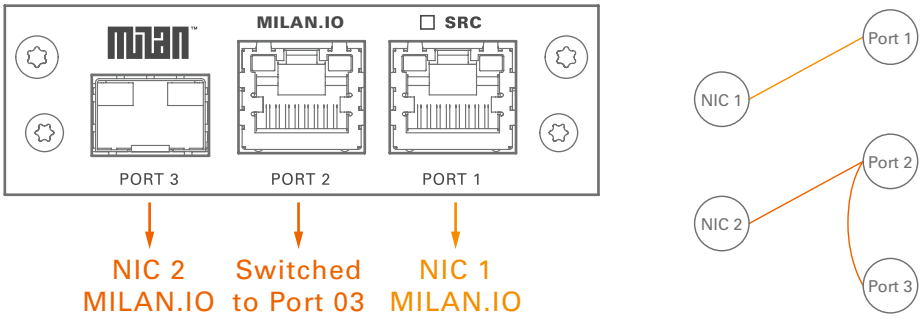
SWITCH - Configurations



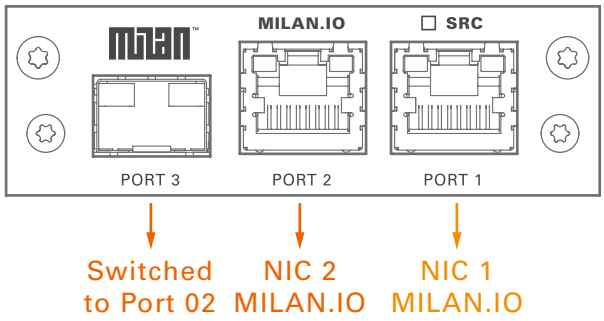
MILAN.IO Audio & Control via Port 1 and Port 2

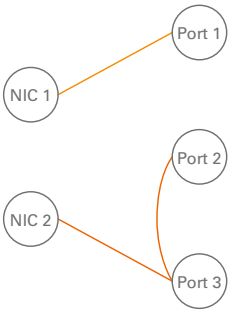


MILAN.IO Audio & Control via Port 1 and Port 3

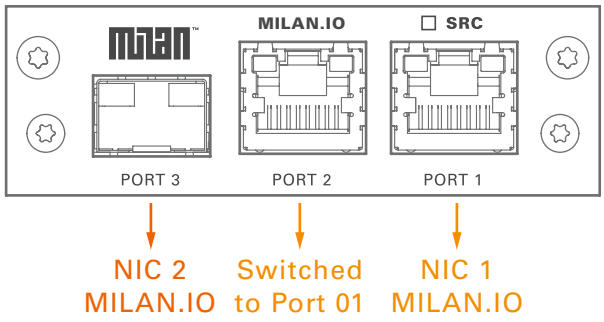


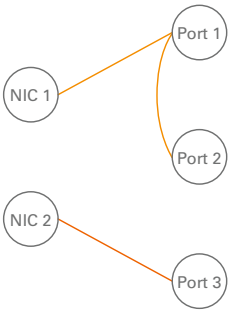
MILAN.IO Audio & Control via Port 1 and Port 2
Extra ethernet traffic via Port 3 (NIC 2)



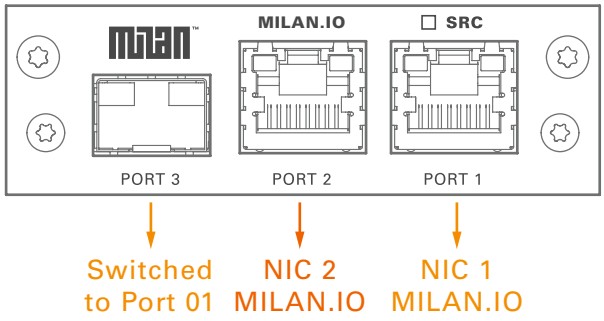


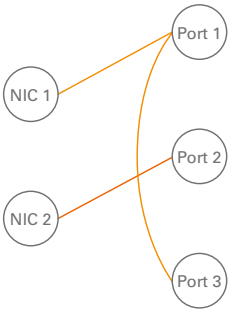
MILAN.IO Audio & Control via Port 1 and Port 3
Extra ethernet traffic via Port 2 (NIC 2)





MILAN.IO Audio & Control via Port 1 and Port 3
Extra ethernet traffic via Port 2 (NIC 1)*



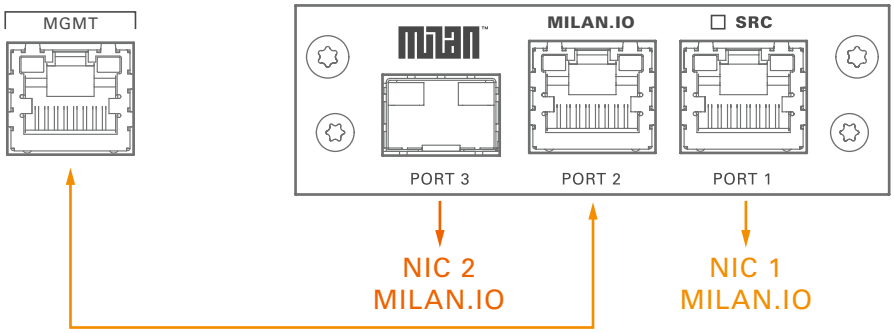


MILAN.IO Audio & Control via Port 1 and Port 2
Extra ethernet traffic via Port 3 (NIC 1)

* see example on the following page.

Device Management over the audio network

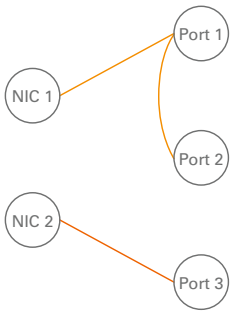
This configuration is exemplary to illustrate the possibility to integrate the management data that is used to control the device into the audio network.



- connect the MGMT port of the device with Port 2 of the MILAN.IO
- connect the MILAN network to Port 1 of the MILAN.IO
- connect the MILAN network to Port 3 of the MILAN.IO (if needed)

Switch configuration

MILAN.IO Audio & Control via Port 1 and Port 3
Extra ethernet traffic via Port 2 (NIC 1)



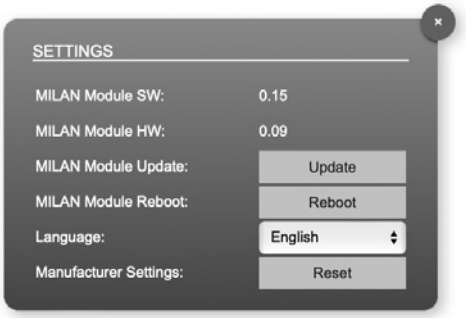
Web UI - MILAN.IO - Firmware Update

The MILAN.IO module is updated via network.

Visit www.directout.eu and navigate to a PRODIGY product page.
Download:

- PRODIGY MILAN.IO Firmware

Open the control page of the module and navigate to the tab STATUS and click SETTINGS in the top right corner (p 16).



Click 'Update' and browse to the update file after unzipping first.
Example: milan_io_hw_0_09_sw_0_15.update

Folllow the instructions displayed.

WARNING!

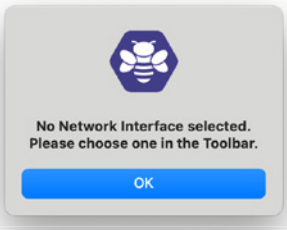
It is strongly recommended to backup the device configuration (Save Preset) before running any update.

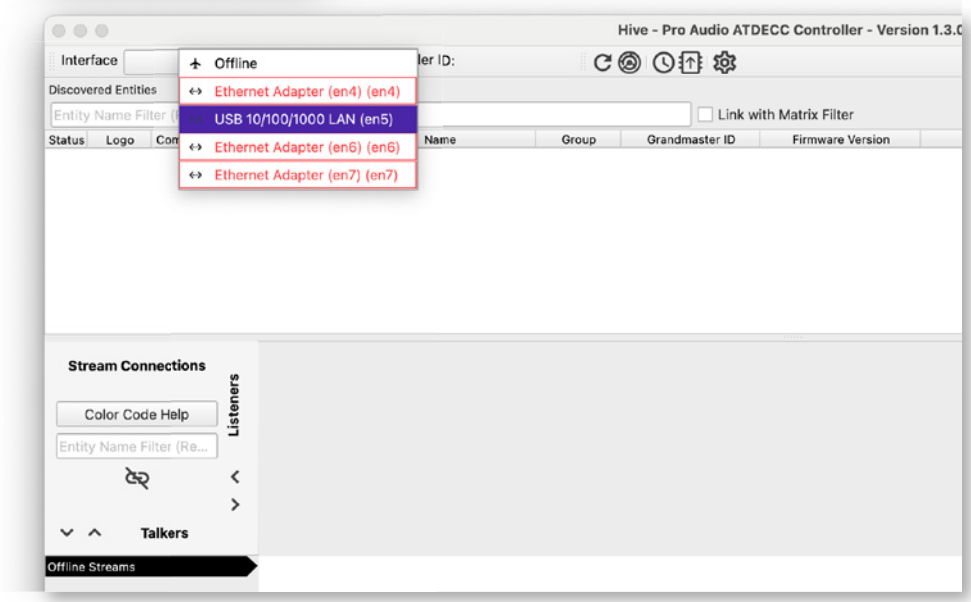
HIVE - Installation

1. Download latest version.
   Link: https://github.com/christophe-calmejane/Hive/releases

2. Select 'Standard' Profile

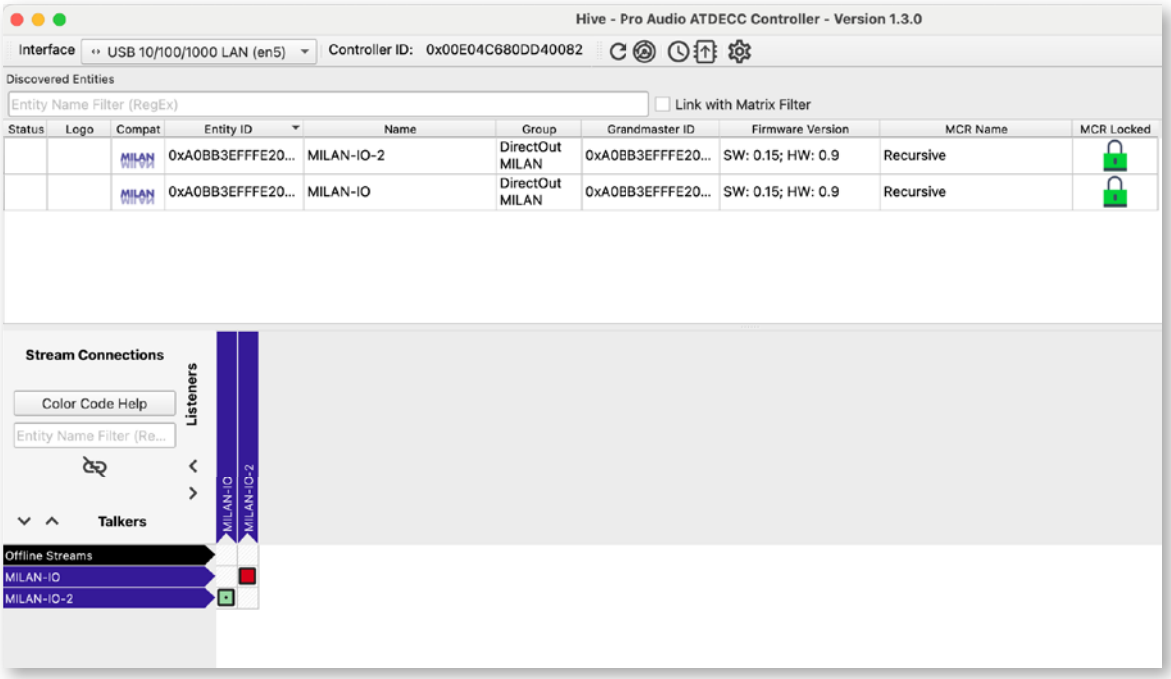
3. Select Network Interface



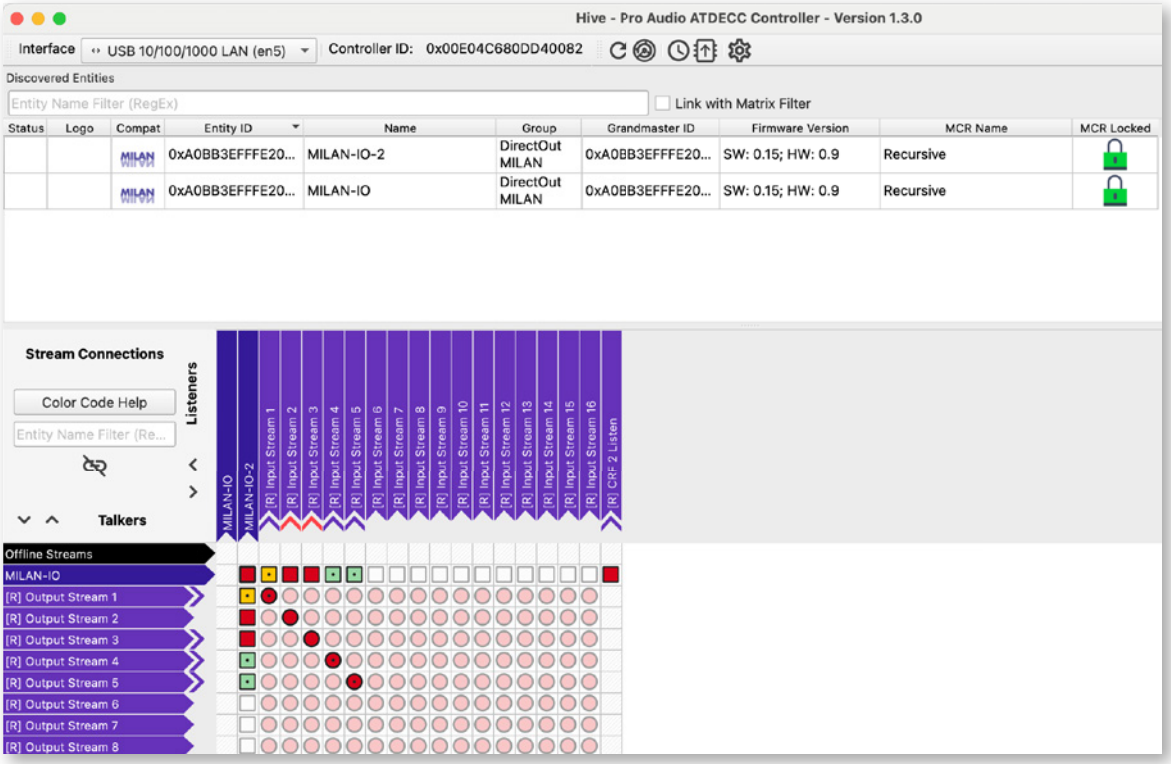


HIVE - Patching

Hive displays the detected AVB devices that are connected to the network.



Click the lines or collumns to expand the routing matrix.
'Talkers' are sender, 'Listeners' are receiver



HIVE - Patching single/redundant streams

Patches are set to both network interfaces (NIC 1 & 2) in collapsed stream view. To modify the single patches to each NIC expand the view by clicking on the stream line or collumn.

Output Stream 1 is expanded to modify single patches, patched to NIC 1 only. Output Stream 2 is patched to NIC 1 & 2.

NOTE

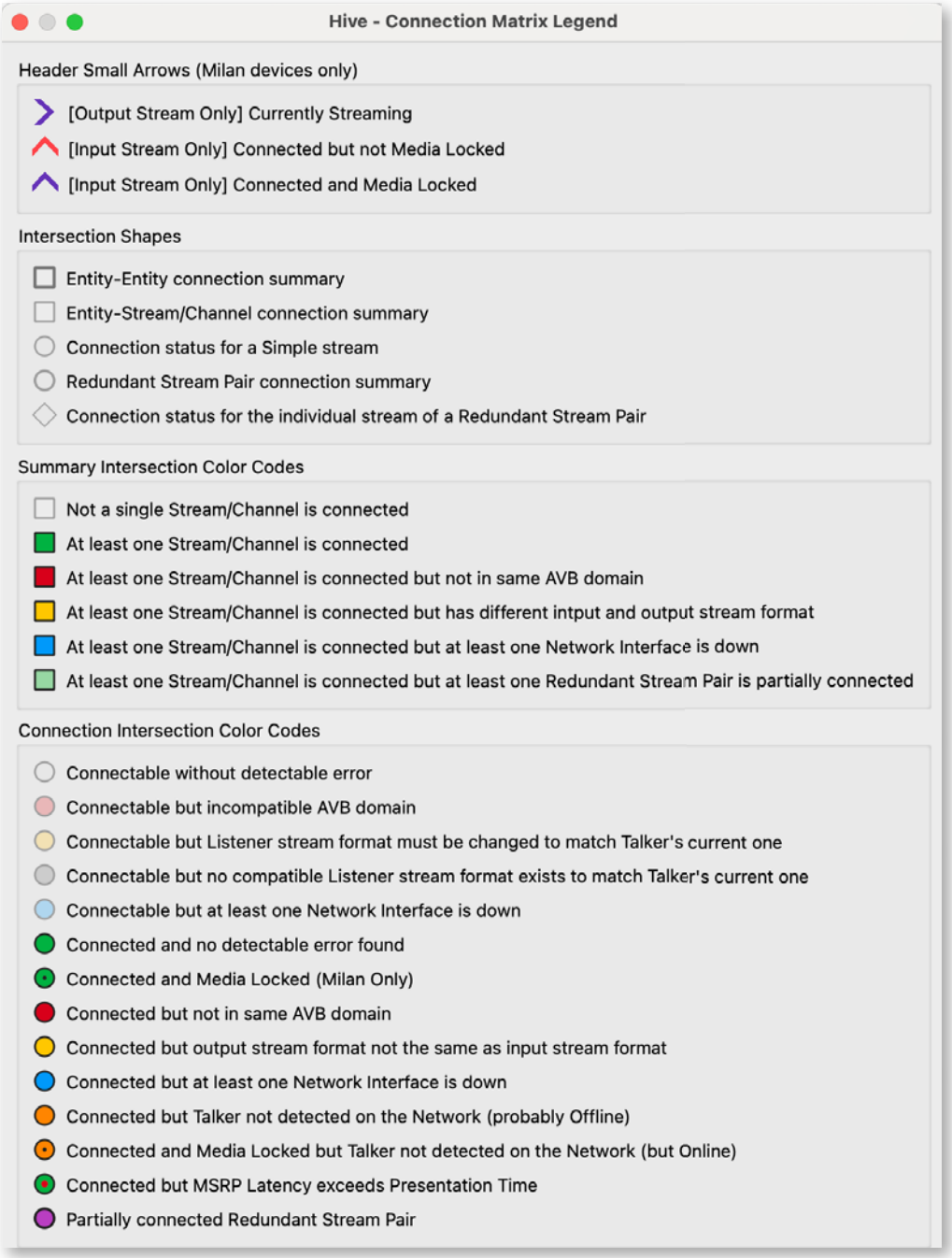
The status led and speaker symbols of the input stream in the Web UI display whether:

- the intended patch is received as expected (led: green = ok, yellow = error)
- the connection is redundant or single stream (speaker symbol)

Input Stream 4:
redundant patch,
only NIC 1 receiving data

Input Stream 1:
redundant patch,
NIC 1 & 2 receiving data

HIVE - Color Codes



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