



Audio over IP  
Routing System

IP based multichannel  
Audio Network



# NETBOX DSP

Dante™ and AES 67-compatible AoIP Routing Matrix with mixing and processing capabilities. Audio inputs and outputs are exclusively through AoIP network



### EQUIPMENT DESCRIPTION

NETBOX DSP is a non-blocking routing matrix with audio summing and processing. The NETBOX DSP is a scalable system that can be sized through internal cards from 64 x 64 up to 160 x 160 circuits. The system is a perfect solution for large and medium-sized installations.

It can route each of its inputs from the IP network, to any, or several, of its IP outputs

As a summing matrix, it can also mix combinations of its inputs, each one with independent level, to each of its outputs, according to the configuration established in Netbox RTC at any given time, being able to adjust audio levels both for inputs and outputs or for each individual cross-point.

Being a processor, it can also apply to a total of 64 mono audio channels, either input or output, individual or grouped in stereo pairs, one or more of the available audio processes: filters, equalization, DSP processing, noise gate and delay.

NETBOX DSP also incorporates 16 GPI and 16 GPO (each GPIO connector includes a power supply pin in order to feed external circuitry). GPIO can also be transported through the IP network between compatible devices. This way, a GPI can drive the GPOs in different piece of equipment.

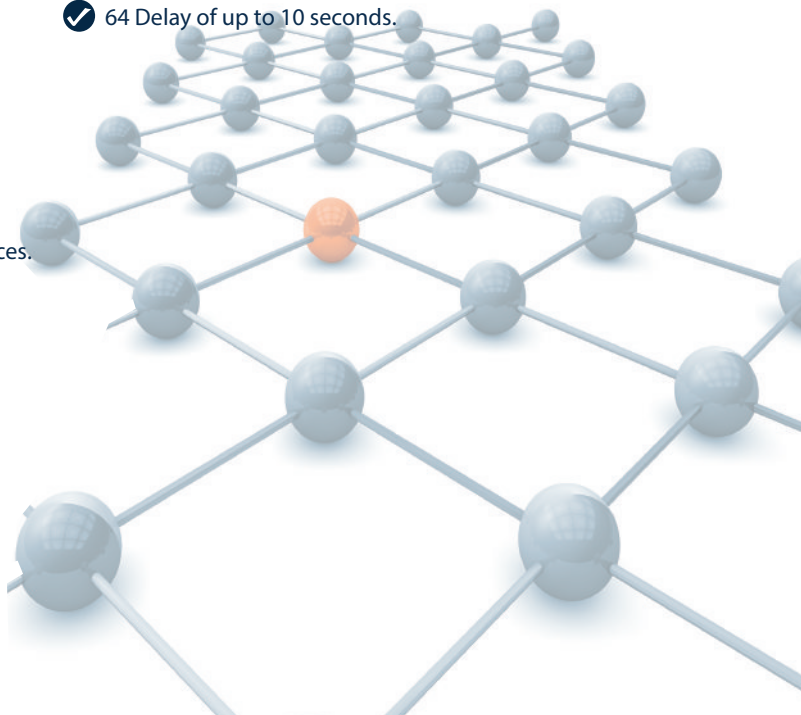
It can also generate a test tone that can be applied to any output, and sends audio presence indicators to the operation software for every input and output as well as precision vu-meters.

It can be used in combination with any AEQ or third-party device from more than 350 manufacturers which are compatible with Dante AoIP protocol, and many others compliant with AES67 standard: it can subscribe to any of the audio flows existing in the network using its inputs, while publishing its outputs so they can be received by other devices.



### MAIN FEATURES

- ✓ Logic lines grouping into stereo pairs.
- ✓ Input and output level adjustment.
- ✓ Signal mixing to any output on demand, with no limitations.
- ✓ Customized view and work scenarios configuration.
- ✓ Macro, salvo and configuration views management.
- ✓ Task scheduling, executed by clock, alarm or external triggering.
- ✓ Talkback or Multiplex, N-1 based, group creation.
- ✓ Multi-device and multi-user control.
- ✓ Access rights management for each functional user group.
- ✓ Critical lines protection.
- ✓ Physical and virtual GPIO management between different devices.
- ✓ AGC (automatic gain control) on AoIP inputs and outputs.
- ✓ Flexible vu-meters and test-tone generation.
- ✓ Dante / AES67 AoIP connectivity.
- ✓ Additional adjustment of levels at each cross-point.
- ✓ Hardware alarm: Power supply failure.
- ✓ Hardware alarm: Local network interface failure.
- ✓ Hardware alarm: System Internal configuration failure.
- ✓ From 64 to 160 AES67 / Dante AoIP inputs.
- ✓ From 64 to 160 AES67 / Dante AoIP outputs.
- ✓ 64 Frequency Processes: High-pass, low-pass and band-pass filters, 4-band Parametric Equalizer.
- ✓ 64 Dynamics Processes: DLP (Compressor, Expander, Limiter) in 4 sections, and Noise Gate
- ✓ 64 Delay of up to 10 seconds.





## Front panel



- 1 **Power-ON LED.** Indicates the device's power supply status.
- 2 **LAN LEDs.** Indicate the status connection of the audio over the following local area network ports: LAN 1 (main interface) and LAN 2 (secondary interface).
- 3 **Power switch.**

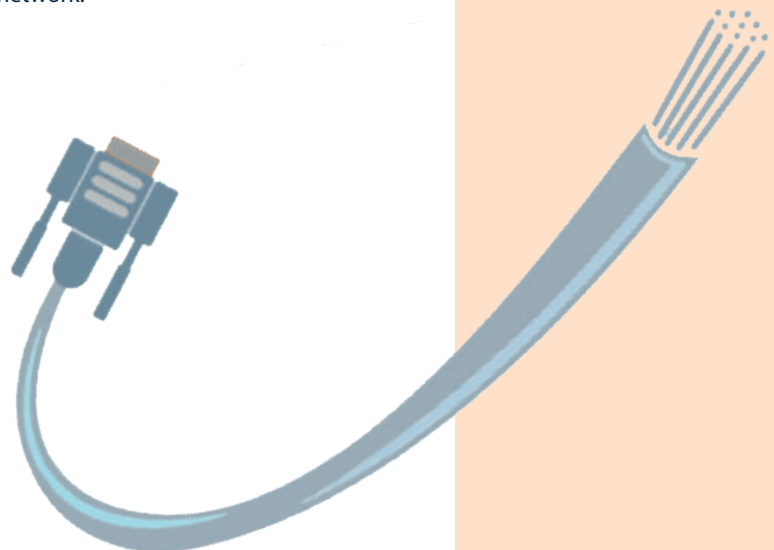
## Rear Panel Connectivity



- 1 **Power input:** The power supply connectors are located in the back left area of the unit. The power supply is redundant and autoranging.
- 2 **Ethernet ports (LAN 1 and LAN 2).** NETBOX DSP features two Ethernet ports: LAN 1 must always be wired, while LAN2 is to be connected only when the system is configured in "Daisy Chain" mode or a redundant system is set up.
- 3 **GPI/O connectors (DB15).** NETBOX DSP includes two of these connectors including 8 GPI each, and another two with 8 GPO each. All the connectors have a common ground and provide a 5V reference signal. Thanks to the open protocol implemented, operation with third-party devices is possible, allowing GPI and GPO transportation between systems using the IP network.

### Comments on Netbox DSP GPIO Wiring

AEQ simplifies installation making pre-manufactured wiring between the system and connected devices. The "CP CAB GPIO" accessory is provided on-demand. It consists on a DB15 male connector soldered to a 15-way, 6-meter long cable, which no connectors in the other end, for GPI and GPO usage. Each cable allows for the connection of the 8 GPI or 8 GPO provided in each device's connector.

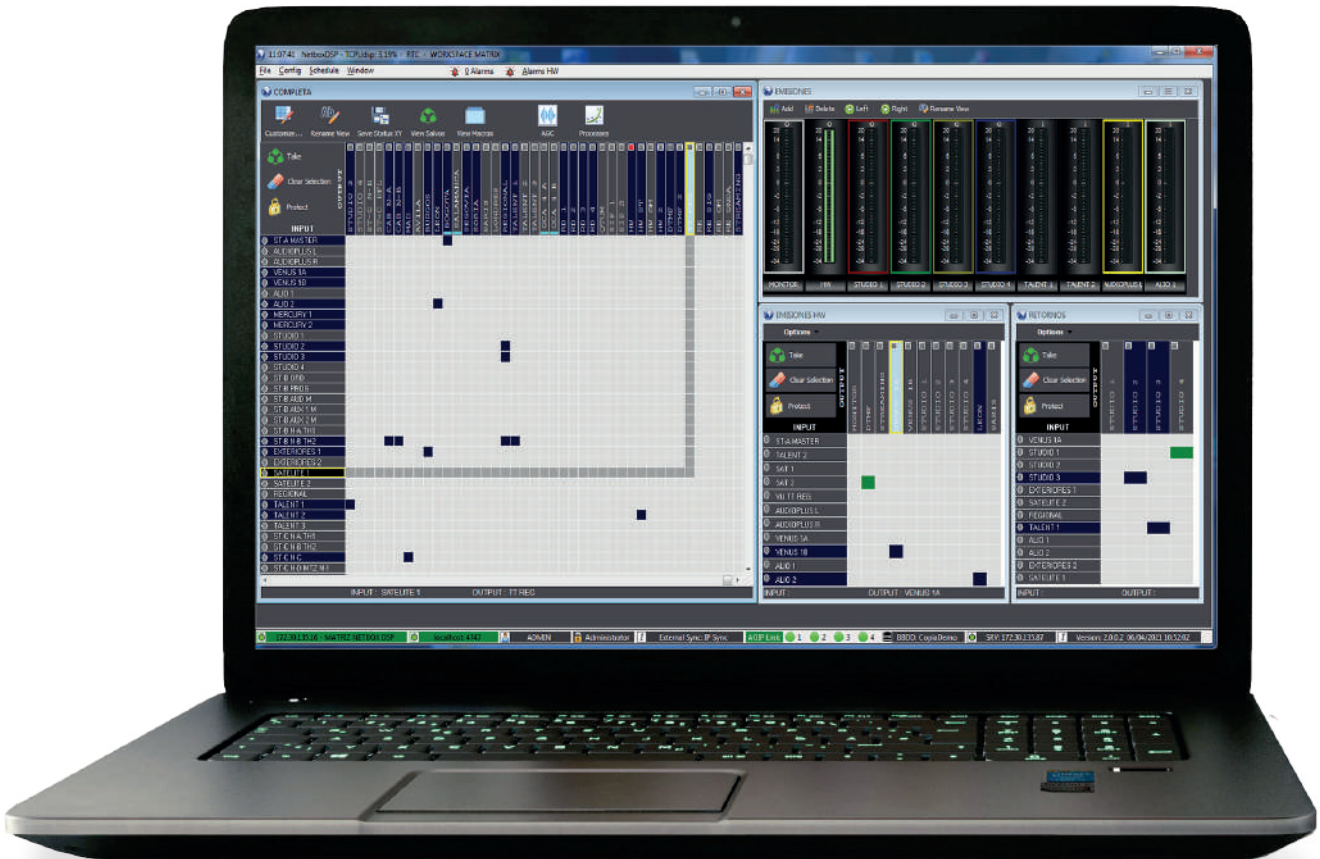




## NETBOX DSP CONTROL SOFTWARE

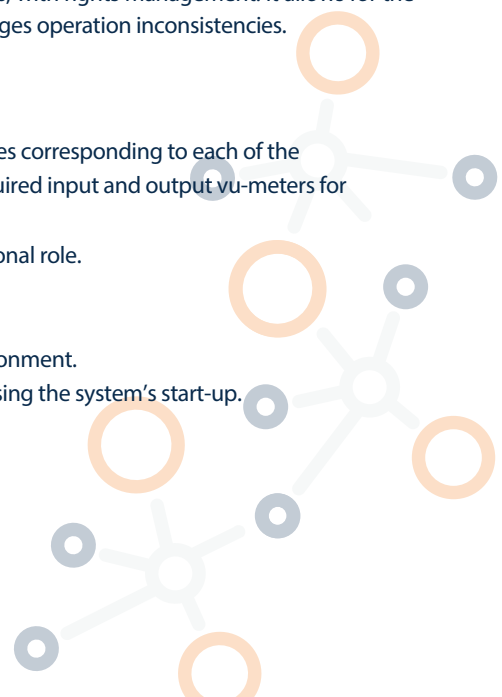
### General features

NETBOX DSP operates as an audio matrix thanks to “Netbox RTC” real-time control application, a powerful piece of software that configures, modifies and controls NETBOX 32 AD MX and NETBOX DSP audio matrices in real time.



It is a multi-device and multi-user piece of software, running over Windows operating systems, with rights management. It allows for the configuration of views and particular scenarios and protection of critical lines and it also manages operation inconsistencies.

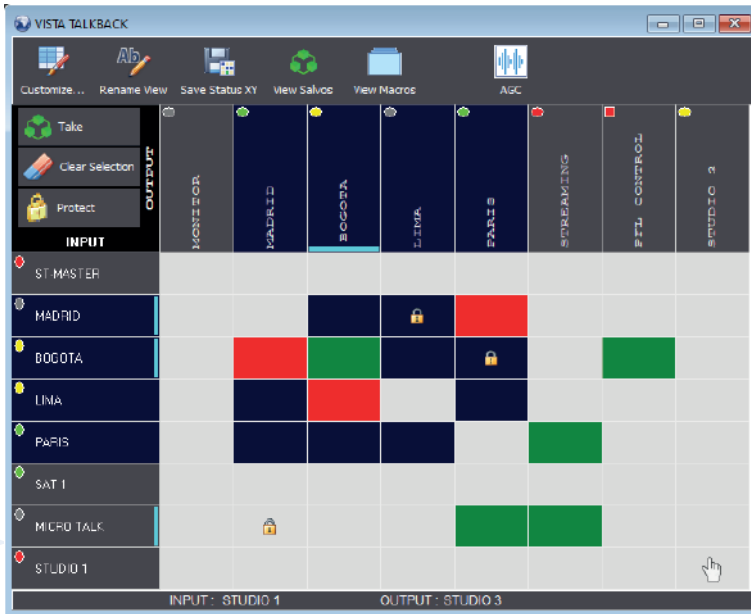
- Several matrices can be controlled from a single workstation.
- A single matrix can be controlled from several instances of the software.
- Windows can be custom defined, so each user sees only the required input and output lines corresponding to each of the matrices he/she's interested on. A workspace can have several windows as well as the required input and output vu-meters for this workstation.
- Users can be organized into groups, with different access rights according to their operational role.
- Lines can be configured and handled as mono or stereo and assigned logic names.
- For outputs, it is possible to decide which ones won't support signal summing or mixing.
- A color can be chosen to highlight different vu-meter functional types within a work environment.
- The application can import a text file with names and descriptions for each of the lines, easing the system's start-up.





## NETBOX DSP CONTROL SOFTWARE

### Operating with Cross points



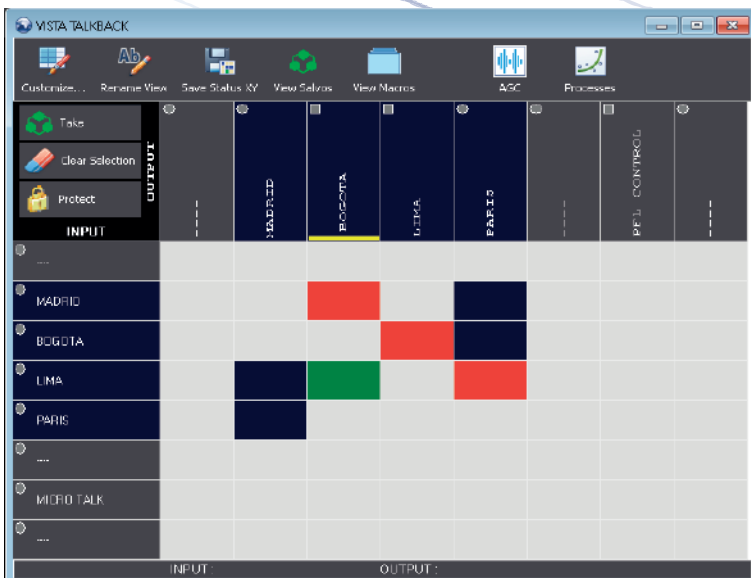
- Protect: locks the status of a cross-point in order to protect it, displaying a lock on it.
- Using the context menu, the input and output phase, as well as the gain for each cross-point, can also be adjusted. A pop-up list with the connections associated to each one can be obtained.

The XY window shows the inputs as rows at the left, and the outputs at the top, as columns. Next to each input or output name, there is a 4-color level indicator, different for the non-summing input, and an indicator of AGC activation.

These are the actions that can be performed on cross-points:

- Selection, by clicking on each cross-point. If it was connected, it will be highlighted in red; otherwise it is highlighted in green.
- Take: Activates or de-activates the selected cross-points. The green points are connected while the red ones are disconnected.
- Clear Selection: clears the current cross-point selection.

### Save Status XY option



Saves current view with all the cross-points and protections, that is, it takes a snapshot of the current connections.

This snapshot can be recovered at any moment, returning the connections in the view to their original states.

A preview of the actions to be taken is presented before actually recalling a Snapshot, indicating in green and red the connections to be made or removed, respectively.



# NETBOX DSP CONTROL SOFTWARE

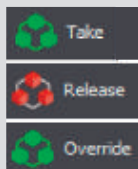


## Salvos, macros, task scheduling, alarms and logging management

Netbox RTC handles Salvos: sets of simultaneous connections to perform either manually or automatically (from the scheduling, from macros, or triggered by a physical or virtual GPI).

A salvo includes cross points to make between inputs and outputs, points to eliminate and locks of the output lines to be incorporated or released.

Critical Salvos can be defined that prompts the user for confirmation before actually been executed.

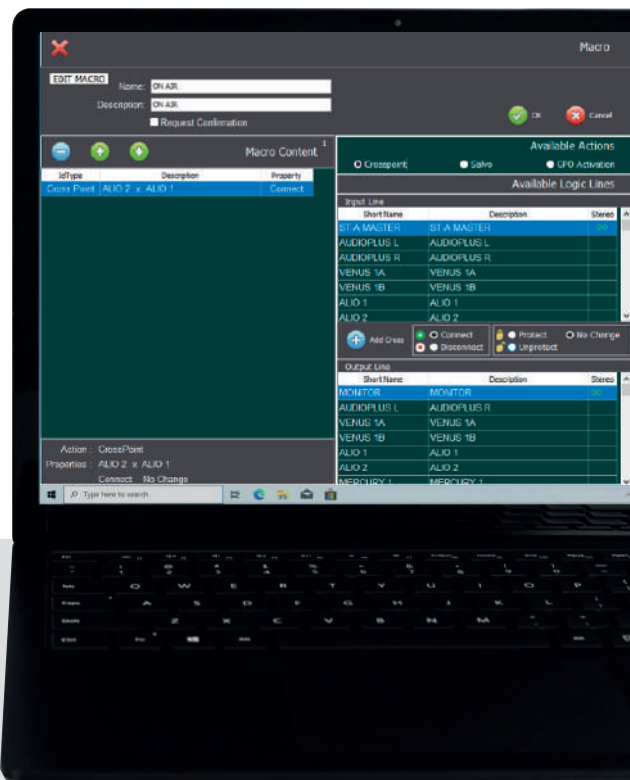


The "Take" button activates the salvo, making the connections / disconnections and cross-point locks / releases. When clicking on the "Release", button, the inverse actions are executed on the cross points. "Override" ignores cross point locks.

Macro is a set of cross point activations / deactivations, salvo executions or physical / virtual GPO triggers that are realized simultaneously.

These can be used manually from the XY Views, or, on the other hand, automatically whenever they have been programmed from the Scheduler or the Alarms module.

Macros, as Salvos, can be defined as critical and there is also an "Override" option available.



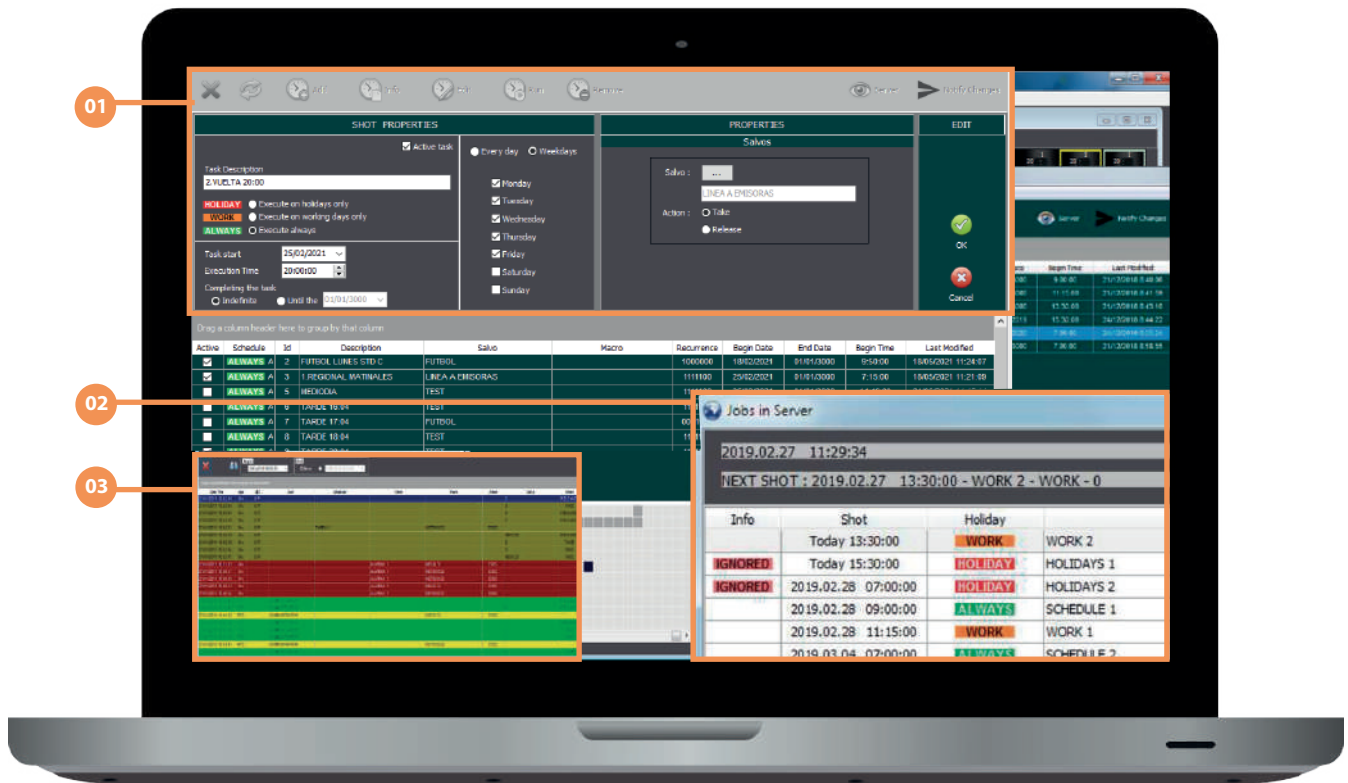


# NETBOX DSP CONTROL SOFTWARE

## Salvos, macros and alarms programming

- 01 There is a salvo and macro programming window where the date, time and repetitions for each event are defined basing on a calendar. Also there, a name is given to the event, the included salvo or macro is selected, and it is defined whether it is activated or deactivated when the event is realized.
- 02 Scheduled actions remain programmed in a server software that runs them at due time, taking into account the defined repetitions and foreseen exceptions.
- 03 Audio absence alarms can also be programmed on certain critical lines, and the execution of a macro can be associated to the alarm, triggering a switching whenever it is detected. The conditions required to revert to the normal state can also be defined.

There is a log of the scheduling and executed alarms in order to be able to investigate them and debug operation errors.



## Physical and virtual GPIO management. Hardware-controlled switching

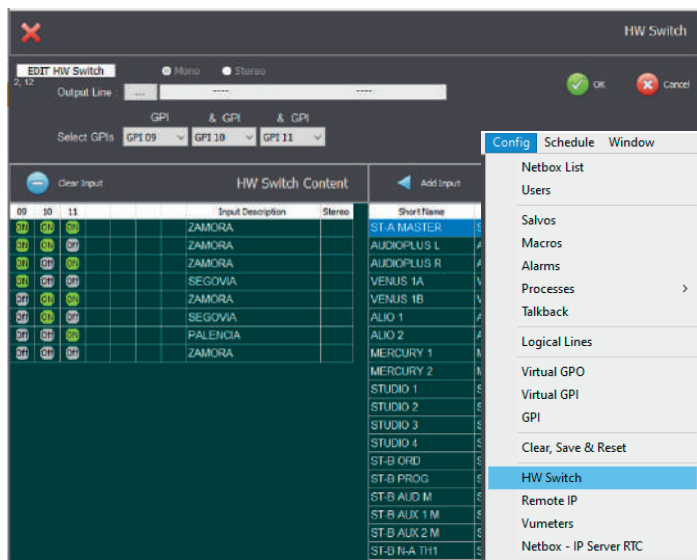
GPI: General Purpose Input is a control signal input to a device. GPO: General Purpose Output is a control signal output generated by a device.

Besides these so-called "physical" GPI and GPO, AEQ devices can also transport what's known as "virtual" GPI and GPO, transported across the IP network between pieces of equipment. A physical GPI can be linked to a virtual GPO and, conversely, a virtual GPI can trigger a physical GPO.

NETBOX DSP generates IP-transportable virtual GPO.

Besides, it can receive virtual GPI from the IP network. This can be used to activate macros or salvos or to automate "NetboxRTC" software operation from an external location. Parameters such as the GPI number, its on/o status and the salvo or macro to execute must be defined. NETBOX DSP also counts with 16 optically-coupled physical GPI/Os.

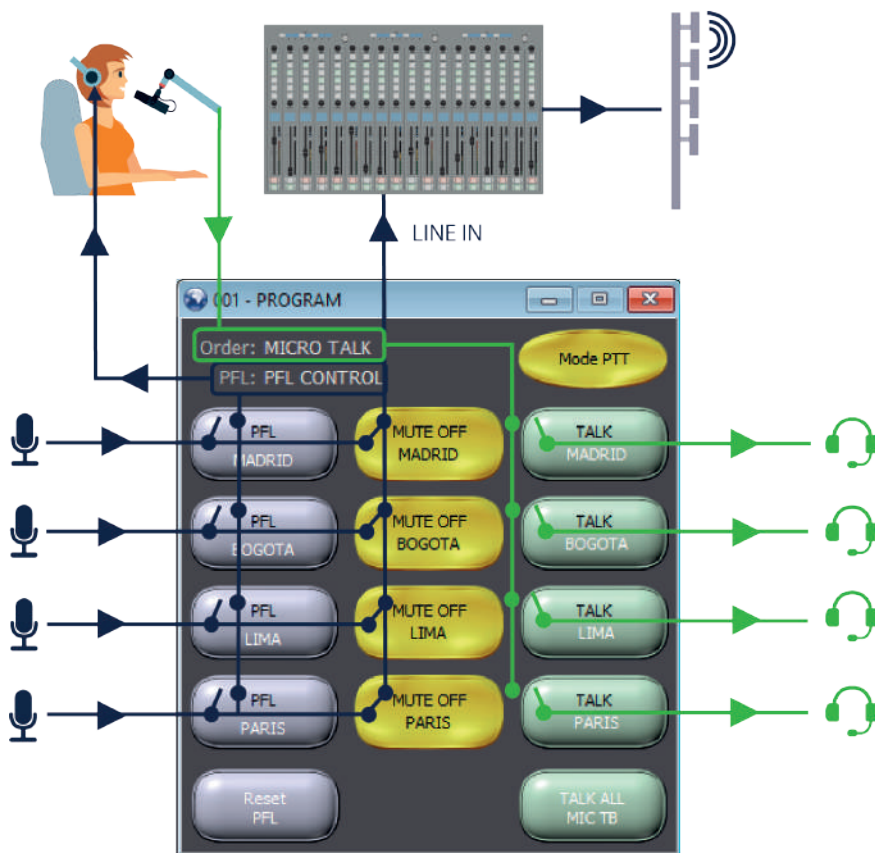
The "Hardware Switch" function allows the user to select which input is sent to a certain output depending on a physical or virtual GPI sequence. This is a full-hardware controlled operation and it doesn't require the presence of any PC to be executed.





## NETBOX DSP CONTROL SOFTWARE

### Talkback Mode



A "Talkback" group is a combination of input and output lines allowing for the automatic execution of an N-1 routing between these lines. In the default example, Madrid listens to Bogotá, Lima and Paris. Bogotá hears Madrid, Lima and Paris, and so on with the remaining two locations.

But, in order to make the job easier, an additional keyboard has been added to the matrix XY screen.

The coordinator can select which correspondents to listen to by means of the PFL buttons.

By means of the Mute OFF (active yellow) buttons, he incorporates each correspondent into the program, while at the same time joining it to the talkback group.

The coordinator can talk to one or all of the journalist by means of the TALK buttons. While he/she talks, the N-1 reception from the rest of inputs is muted, or attenuated by 20 dB, to each one.

### Actions on a Talkback

When a Talkback is created, the implied inputs, outputs and cross-points are cleared first. The gain for all cross-points related to Talkback is set to 0 dB. The actions executed by the Talkback on the involved cross points can be checked using a XY view. In the first image, we can see an "N-1 plus CUE", while in the second one the N-1 is substituted by a "Talk to All".



### Other Tools

Nextbox RTC software offers other tools to make audio routing operation simpler, safer and more efficient. Among others:

#### All Connections View

Builds a XY View with all the active connections, that is, it makes all the inputs and outputs having at least one connection visible.

#### "Workspace" configuration

Builds the workspaces according to each user's needs, using the open, edit and rename commands to define input & output lines and vu-meters for each one.

#### Data Base Backup

Allows the user to create backups of all the defined configurations.

#### Backup Matrix

Performs a backup copy of the audio matrix status: cross points, gains, etc.

This feature is extremely useful if a matrix needs to be substituted for maintenance reasons.

#### Clear, Save & Reset

Resets cross-points, gains, etc...

#### Netbox Tool App

It is used as a configuration assistant for the device in what relates to the IP network and synchronization, among other things.





## AoIP routing: bring audio to the Netbox DSP matrix

Netbox DSP has been specifically designed to operate in a Dante / AES67 AoIP network:

- All I/O Channels are exclusively available through the AoIP network.
- AoIP routing brings great performance to installations equipped with Netbox DSP:
  - Wiring is made with a single IP connection between all devices.
  - Multiple audio channels are available at any point of the network using a simple Ethernet connection.
  - Delivers any signal present in the network to any of the AoIP installed devices' inputs.

## Dante Controller Application

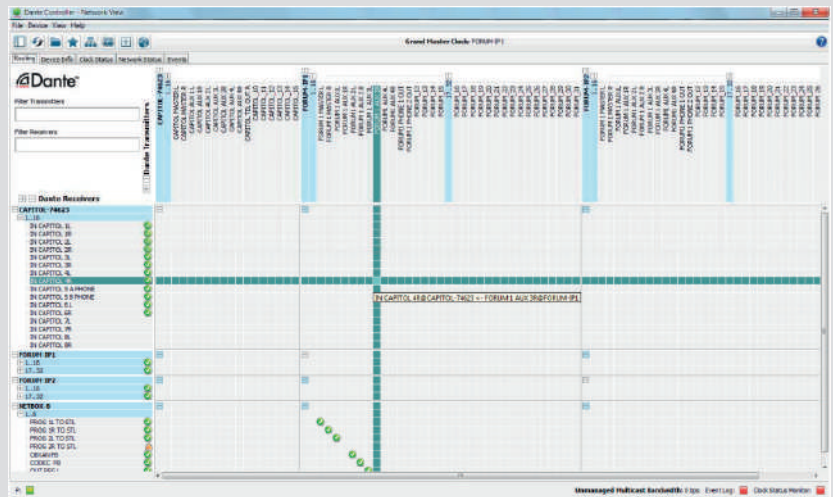
As a complement to Netbox RTC, Dante Controller software routes the AoIP signals in Dante or AES67 formats outside the matrix throughout the IP network.

Dante Controller AoIP routing allows for the configuration of Netbox router inputs and outputs' remote availability without moving from your chair.

This tool greatly simplifies wiring planning of Netbox matrices.

Running on Windows Operating Systems, it provides the following functions:

- Visual reference of all Dante audio devices with the channels they publish to the network.
- Choose the clock audio source and checking network configuration.
- Routing audio between IP devices and checking the status of the existing audio paths.
- Lock and unlocking of Dante devices.
- Change audio channels' labels.
- Customize reception latency (delay before playback).
- Store and apply network audio routing presets.
- Checking and establishing configuration options for each device.
- Checking network's multicast bandwidth information and transmission / reception stats at each device.
- Checking performance of each device, including latency and packet error statistics.
- Checking clock status for each device, including logs with frequency offsets and clock events.



## NETBOX AUDIO INTERFACES

Most current consoles and other devices are equipped with AoIP interfaces which can connect with NETBOX DSP matrix via IP. If we need to add analogue or digital microphone, line or headphone inputs and outputs to the matrix, all we need to do is installing Dante AoIP terminal devices near the sources and destinations, such as:



This unit provides 32 local input and output channels that can be connected to the NETBOX DSP through the AoIP network. These I/O's are available as 16 mono analogue and 8 digital stereo channels. It also features 16 GPI/O's that can be transported between different AEQ devices using Virtual GPIO over IP.



Netbox 8 AD provides 8 local input and output channels that can be connected to the NETBOX DSP through the AoIP network I/O's are available in 4 mono analogue and 2 digital stereo channels. The second digital stereo interface can be switched for a USB connection. It also offers 4 GPI /O's that can be transported between different AEQ devices using Virtual GPIO over IP.



Netbox 4MH features 4 local microphone/line input and 4 output (stereo headphone + line) channels that can be connected to the NETBOX DSP through the AoIP network. It has 4 GPI and 4 GPO that can be transported between different AEQ devices using Virtual GPIO over IP. It also offers additional GPIOs for signaling terminals. PoE powered.



## AoIP system for radio station between 5 and 10 studios, central control and dispatch room

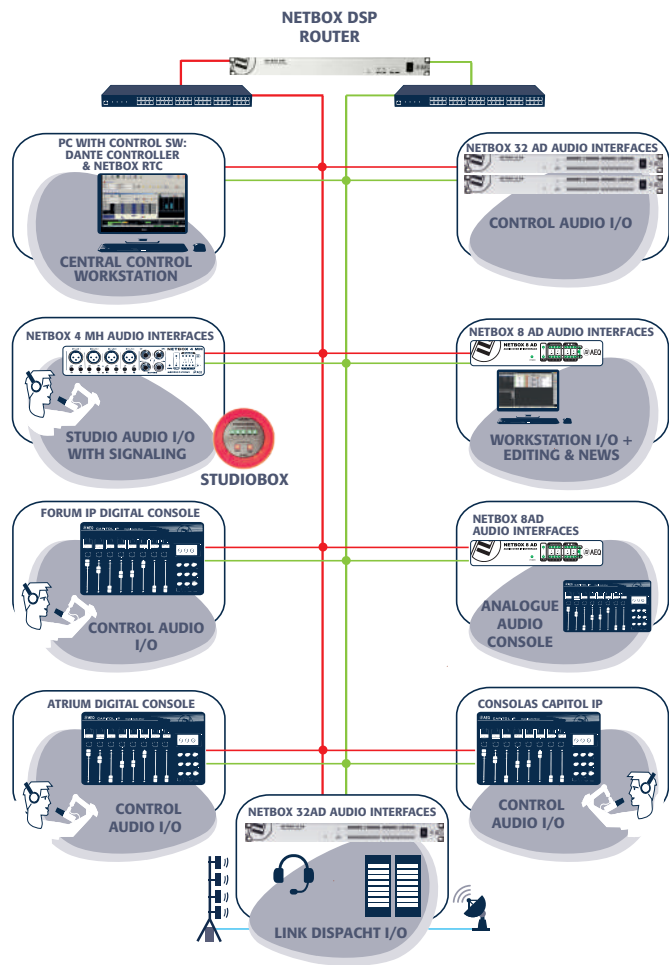
At the top a Netbox DSP TDM matrix is included. It receives audio from the IP network, processes it and returns it mixed and processed to the same network. Its maximum capability is 160 inputs and 160 outputs.

The wired IP network wired around a switch is represented in red: the NETBOX DSP audio matrix does not have analogue or digital audio inputs and outputs, therefore it needs interfaces, for example Netbox 32 AD to connect the equipment located in analog or digital in central control and dispatch room: connections to the broadcasting center, satellite download, codecs for reporting, continuity recording systems, radio tuners and receivers, etc.

Studio consoles are also shown, and the NETBOX 4 MH audio interface for a shared booth.

In the upper left part the PC (or PCs) for the operation of the transport and audio routing is represented.

In green the secondary IP link, if you want to give more security, wiring around another switch. If you want to connect the secondary link to the PC, you must have 2 network cards.



## Audio Processing



NETBOX DSP includes the Audio Processing function that can be applied to any input or output up to a maximum of 64 mono or 32 stereo channels.

Several processes can be chained on the same input or output, as well as handled as mono or stereo. Each process can be used live or, enable, disable and use previously configured presets.

The Netbox DSP processes are:

- 4-band equalizer. On each one you can adjust the frequency, the Q and the gain.
- Filters: High pass, low pass and band pass.
- DLP: It is a Compressor, Expander and Limiter by sections.
- Noise Gate: To eliminate noise below one level.
- Delay: Delays the signal to synchronize it with other audios, videos, etc ...

If a line has an active process it is shown in the XY view with a yellow bar. There is a button at the top of the view that shows the active processes.

The operation is very simple and intuitive: Upon selecting Processing, a window appears with the different available options, and from here you go to the individual windows for each type of Processing where presets are adjusted, activated and created.



## Inputs and outputs

- Dante / AES67 channels, According to internal configuration:
  - 64 bidirectionals.
  - 96 bidirectionals.
  - 128 bidirectionals.
  - 160 bidirectionals.
- Additional tone generator input: 1 KHz. +4 dBu (-20 dBFS).
- Bandwidth: 20 to 20.000 Hz @ +/- 0.5 dB.

## Level indicators and meters

- Bank of mono or stereo AoIP input and output level meters in etbox RTC software.
- Precision level metering of a mono or stereo AoIP input or output in Netbox RTC software.
- 4-color level indicator for all audio inputs and outputs in Netbox RTC software.
- Configurable low signal level alarm for any input and output in Netbox RTC software.

## GPIOs

- 16 physical GPIOs at 2 DB15 connectors, including +5V power supply pin.
- 16 physical GPOs at 2 DB15 connectors, including +5V power supply pin.
- 256 virtual GPIOs that may be used to perform any of the following functions:
  - Transportation of signalling between devices.
  - Reporting audio presence at any input.
  - Indicate audio absence in any output.
  - Remote muting of any output.
  - Activation and triggering of macros and salvos.
- Physical GPI and GPO are standard GPIO, while virtual GPIO use AEQ's proprietary protocol, although it is starting to be implemented by several integrators. GPIO can also be transported through the IP network between compatible devices. This way, a GPI can drive GPOs in other equipment. This is what we call "Virtual GPIO".

## Redundancy

- NETBOX DSP device features a redundant power supply. In case that one of them stops receiving mains or fails, the system is fed by the other one without any operation disruption.
- NETBOX DSP includes two Ethernet ports. These may be configured in "Daisy Chain" mode, Primary / Secondary or Master / Slave modes.
- When Primary/Secondary redundancy mode is configured, the device uses Dante native redundancy system, which allows for Primary/Secondary failover without losing audio samples as seamless changeover.

## Mixing

- NETBOX DSP can also mix any of its inputs to any output that was enabled for it in the configuration process. This means that any set of inputs can be mixed to any of the outputs. At each input, output, and cross-point for an input and output, the gain can be modified. Any output can also be muted.

## Network Technology DANTE™

- Data format: Dante Audio over IP technology. AES67 compatible.
- Plug-and-play technology - automatic detection of the hardware and simple audio routing.
- Precise sample-level synchronization, even through several switches.
- Very low and deterministic delay in the entire network.
- Flexible and scalable network topology, supporting a great number of audio transmitters and receivers.
- Supports a single integrated network used for audio, video, control and monitoring. Compatible with other kinds of traffic using QoS management.
- Uses low-cost, on-the-self network infrastructure.
- 24-bit, 48 KHz. audio resolution.
- Delay: 1-2 ms (@ 48 KHz typical, depending on network performance and complexity).
- 2 RJ45 Ethernet ports per interface, 1000 BASE-T, transformer isolated, that can be used for redundancy or daisy-chain connections.
- Binary rate: 100/1000 Mbps.
- Maximum segment length: 100m max. over CAT5e or better cabling.

## Audio Processing


- NETBOX DSP provides an "AGC" (Automatic Gain Control) function which can be applied to any of the AoIP inputs and outputs without limits. Simple adjustment, only a target level in dBFS needs to be specified.
- In addition, the device can perform one or more of the following processes up to 64 channels, either input or output, Mono individual or grouped in stereo pairs:
  - High pass filter.
  - Low pass filter.
  - Band filter.
  - 4-band parametric equalizer.
  - Combined DLP (Dynamic Level Processor) up to 5 points, with 4 process sections depending on the level, with the functions:
    - Compressor.
    - Expander.
    - Limiter.
  - Noise gate.
  - Delay.

## General Specifications


- Cooling: Absolutely quiet natural convection cooling system, compatible with studio operation.
- Dimensions and weight: 44 x 482 x 356 mm (1.73" x 19" x 14."), 3,5 Kg. (7,7 lbs).
- Power supply: Redundant internal power supply (90 - 264V AC, 47-63Hz).
- Temperature range: -10 to + 45 ° C (32 to 114 ° F).
- Easy to install: NETBOX DSP is a 19" rack unit with 1U height.
- Versions:
  - DSP 64: Processes 64 signals, routes and mixes 64 signals.
  - DSP 96: Processes 64 signals, routes and mixes 96 signals.
  - DSP 128: Processes 64 signals, routes and mixes 128 signals.
  - DSP 160: Processes 64 signals, routes and mixes 160 signals.




**REAL  
TIME  
CONTROL**

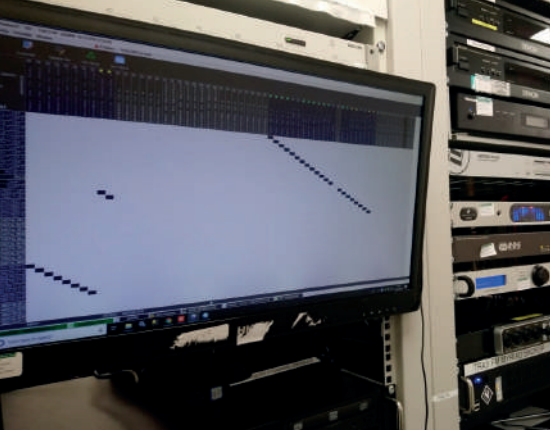
**REMOTE SUPPORT**



**EASY TO USE**




**ROUTING AND MIXING**




**MULTI-DEVICE  
AND  
MULTI-USER  
CONTROL**




**INTUITIVE SOFTWARE**



**DIGITAL, ANALOGUE  
AND IP AUDIO**



CAT.NETBOXDSP\_21\_09

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