



AEQ NETBOX 4 MH

AUDIO OVER IP MULTICHANNEL INTERFACE

USER'S MANUAL

ED. 05/21

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Firmware Versions:	CPU 1.11 or higher
	AoIP Ultimo X: CPU 4.1.6.7 or higher
	AoIP Ultimo 4x4: CPU 4.0.11.3 / Switch & Phy 1.0.2.5 or higher
Software Versions:	NetBox 4 MH Tool 1.0.0.10 or higher
	NetBox 4 MH 1.0.0.11 or higher

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1. INTRODUCTION.

1.1. Fields of application of the product.

Using off-the-shelf routing equipment to send audio over IP in small to medium-sized systems offers cost advantages over synchronous solutions using AES-10 (MADI) or TDM buses. These have higher capacity, but require powerful hardware. Besides, large TDM systems can reduce their cost and at the same time increase their flexibility when they are combined with IP audio links to connect a few circuits with a central router.

That's why, when developing the IP audio routing system at AEQ, we have created not only IP connection devices for the consoles, but also connection panels that allow for audio input and output installation wherever it's necessary, as well as access boards for the AEQ BC2000D router.

On the other hand, AEQ insists on offering interoperability with third party devices for the convenience of our customers. Because of that, the solution we now present is based on AUDINATE's technology that is operating with extraordinary performance, making our systems 100% compatible with a wide selection of equipment for Broadcast, Recording Studios and Professional Audio (see full listing at www.audinate.com).

Please consult the **AEQ AoIP user's manual** for more information.



Dante™ is a trademark of Audinate Pty Ltd.

Product includes license from Audinate Pty Ltd under US patent number(s) 7747725, 8005939, 7978696, 8171152 and others. Visit Audinate website for more details on Dante: <http://www.audinate.com/>

1.2. Description of NETBOX 4 MH audio interface.

It is an audio-over-IP multichannel interface used to insert and extract signaling and audio channels to/from a Dante system, especially suitable for booths and other areas where microphone or line inputs and headphone or line outputs are required.

This product is designed to cover the need for high-quality microphone inputs and headphone outputs availability outputs, for example in radio and TV studios, stage or multimedia installations. The multichannel IP connectivity (Audinate DANTE™ protocol) makes the Inputs of the unit available at any point of the network. As a complementary feature, the unit is delivering the same inputs and outputs as analogue balanced line Inputs and Outputs.

It features 4 input and 4 output channels. Inputs have XLR connectors and are microphone / line level selectable by means of switches at the unit's front panel. All 4 outputs are balanced, with XLR connectors and line level, and are also distributed to 4 headphone outputs. Each one can be configured as a stereo pair, which is called "primary" if it takes outputs 1 and 2, or "secondary" when it is assigned outputs 3 and 4.

It also provides 4 GPIs and 4 GPOs, including a supply pin for external interface power in the same connector, and a special set of additional, dedicated GPIOs specially designed to connect control and signaling boxes in radio booths, including 7 opto-coupled GPI and 2 relay activated GPOs for ON AIR signaling, powered by the Netbox unit.

Audio routing and levels are configured from a real-time control application running on Windows operating systems.

1.3. Electrical audio diagrams.

1.3.1. Audio inputs.

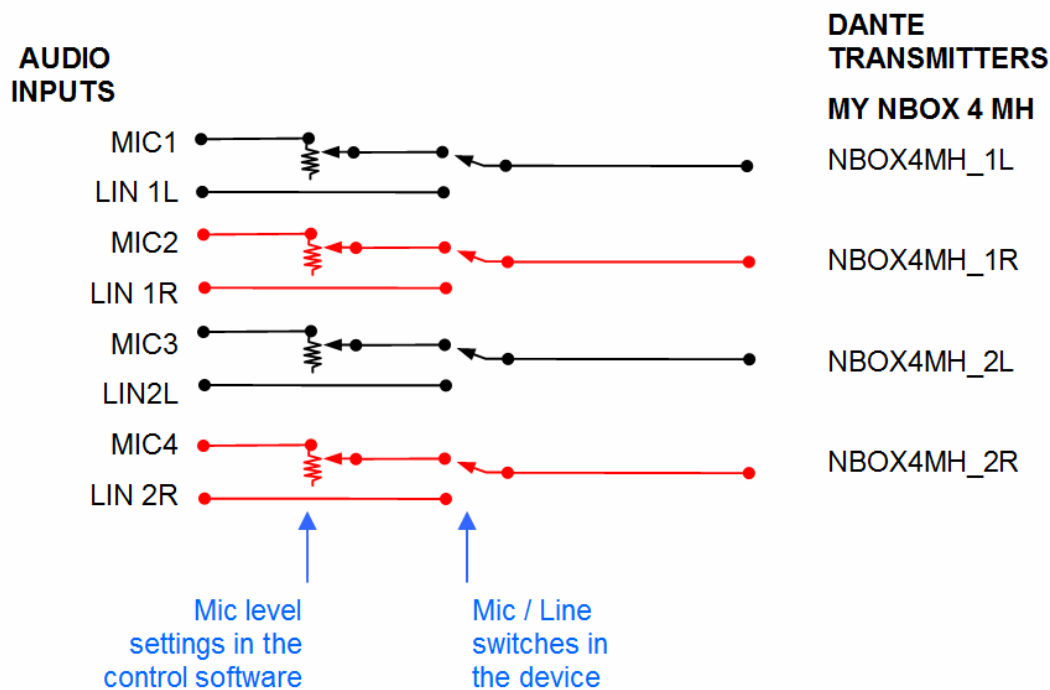
The device has 4 microphone / line switchable inputs. The real time control software provides a 55 dB level control range (+19 to -36dB) in order to adjust sensitivity from the nominal 1mV/Pa level.

Line inputs have a +4dBu nominal sensitivity with +24dBu clipping level.

There is a switch for each input at the front panel that allows for the selection of the sensitivity for microphone or line level compatibility.

Each of the 4 inputs is sent to the Dante network with the name assigned by the user to the device using the configuration software, and these default labels:

- NBOX4MH_1L
- NBOX4MH_1R
- NBOX4MH_2L
- NBOX4MH_2R



**NETBOX 4 MH ELECTRICAL DIAGRAM:
FROM MIC / LINE INPUTS TO AoIP DANTE NETWORK**

1.3.2. Audio outputs.

The unit has 4 receiver circuits from the Dante network, with the name assigned by the user to the device using the configuration software and these default labels:

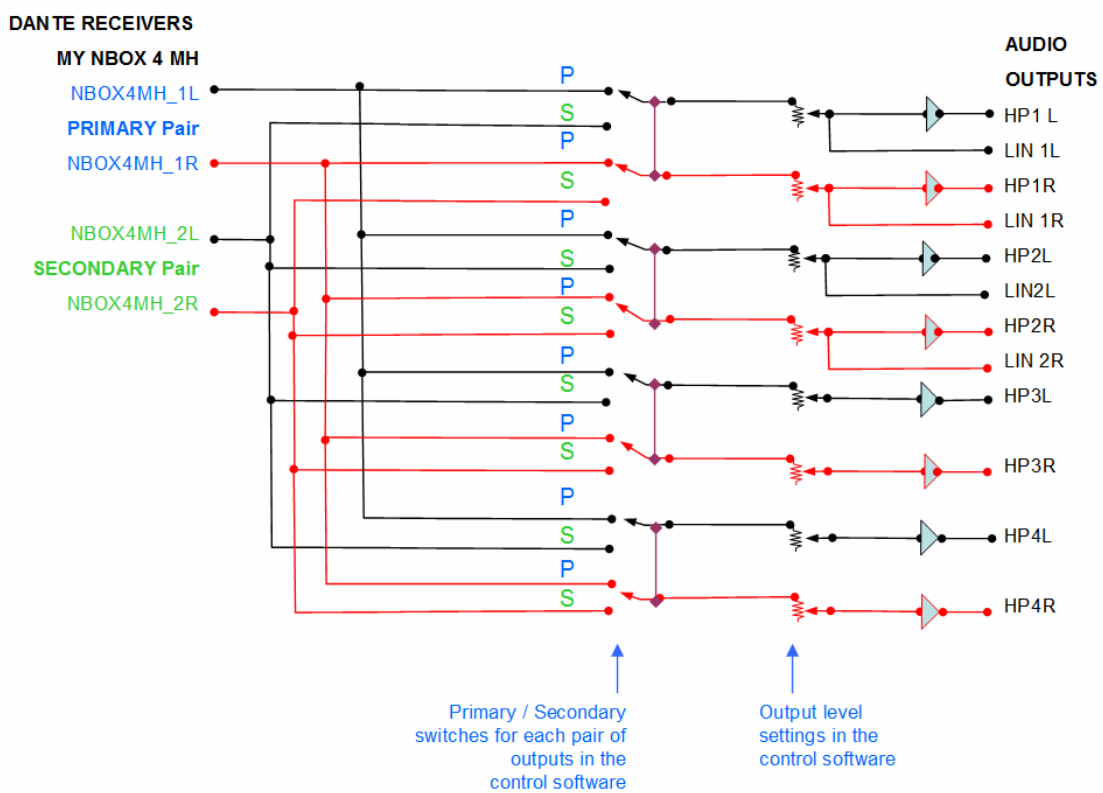
- NBOX4MH_1L
- NBOX4MH_1R
- NBOX4MH_2L
- NBOX4MH_2R

The two first ones are called “Primary pair” while the third and fourth ones form the “Secondary pair”, in what relates to the assignment of the different circuits to the headphones.

Netbox 4MH also provides 4 line outputs, that can be grouped as two stereo groups, named LIN 1L, LIN 1R, LIN 2L, and LIN 2R, and 4 stereo headphones denoted as HP1, HP2, HP3 y HP4.

"NetBox4MH" remote control application provides 4 fader pairs with an adjustment range within 0dB and -∞. HP1 headphone output shares its level regulation with LIN1, HP2 with LIN 2, while HP3 and HP3 have independent controls. Also, some selection buttons are shown in the application which define whether each fader pair takes its signal from the Primary Pair or from the Secondary Pair.

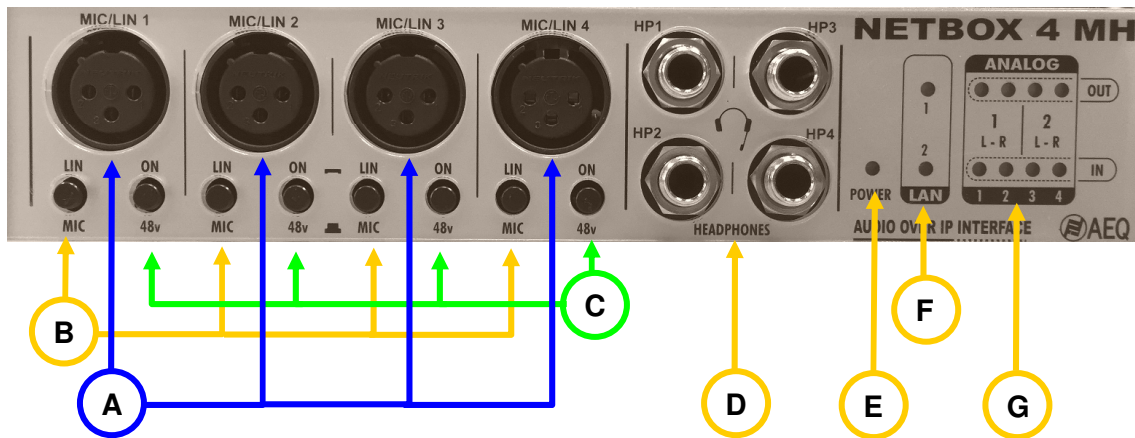
In practice, the internal circuitry allows the user to connect up to 4 pairs or volume-controlled headphones and decide whether to listen the Primary or Secondary circuits on each one, so two different headphone circuits are available. There are also two line-level outputs in parallel with the HP1 and HP2 headphone pairs.



**NETBOX 4 MH ELECTRICAL DIAGRAM:
FROM THE AoIP NETWORK TO LINE AND HEADPHONES AUDIO OUTPUTS**

2. PHYSICAL DESCRIPTION OF NETBOX 4 MH INTERFACE.

2.1. Description of the front panel and connections.



2.1.1. MIC/LIN 1 to MIC/LIN 4 analog audio inputs. **A**

XLR-3 female connectors, balanced connection, with the following pinout:

- Pin 1: Ground
- Pin 2: MIC/LIN Input +
- Pin 3: MIC/LIN Input -

2.1.2. MIC/LIN inputs level selection switches. **B**

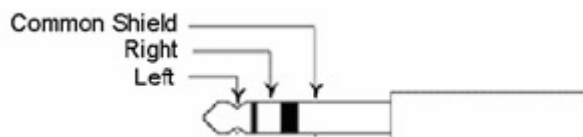
When depressed, the sensitivity of each input is reduced to adapt it to line levels. In order to prevent accidental pressing of the buttons, they are embedded in the front panel and must be accessed to with the aid of a sharp object, such as a pen's tip. The remote control software indicates the actual position of these switches.

2.1.3. 48V Phantom supply switch. **C**

When each of these switches is depressed and operating in microphone mode, the corresponding 48V phantom supply is turned on, as required by condenser microphones. In order to prevent accidental pressing of the buttons, these switches are embedded in the front panel and must be accessed to with the aid of a sharp object, such as a pen's tip. The remote control software indicates the actual position of these switches.

2.1.4. HP1 to HP4 headphone outputs. **D**

1/4" TRS Headphone Jack connectors, unbalanced connection, with the following pinout:



The operation software controls:

- Selection of the signal source for each output (primary headphones when receiving from outputs 1 and 2, and secondary when taking signal from outputs 3 and 4).

- Each output's level adjustment. This adjustment can be performed independently for each side or as a stereo pairs.

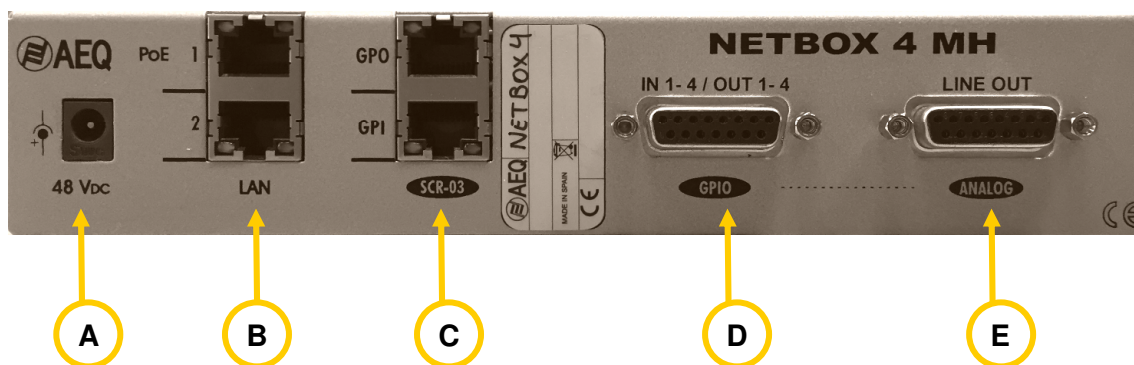
These audio outputs are provided simultaneously in the 4 audio channels with the line level output connectors at the back.

2.1.5. Status indicators.

Several indicators are provided that inform on the device status, communications and audio levels.

- E POWER ON LED:** indicates the status of the unit power supply.
 - Off: no mains input.
 - Green: power supply ON.
- F LAN LEDs:** indicate the status of the audio local area network: LAN 1 (main interface) and LAN 2 (secondary interface).
 - Off: no local network connection.
 - Blinking green: link is established at data level.
- G AUDIO LEVEL LEDs:** Each LED indicates the level of the corresponding device audio input / output:
 - LED off: the channel is muted, or transmits / receives (depending on whether it is an output or an input) at a level below -60dBFS.
 - Green LED: channel is transmitting / receiving audio (depending on whether it is an output or an input) at a level between -60dBFS and -20dBFS.
 - Amber LED: channel is transmitting / receiving audio (depending on whether it is an output or an input) at a level between -20dBFS and -10dBFS.
 - Red LED: the channel is saturated or "clipping" (above -10dBFS).

2.2. Description of the back panel and connections.



2.2.1. Power supply. **A**

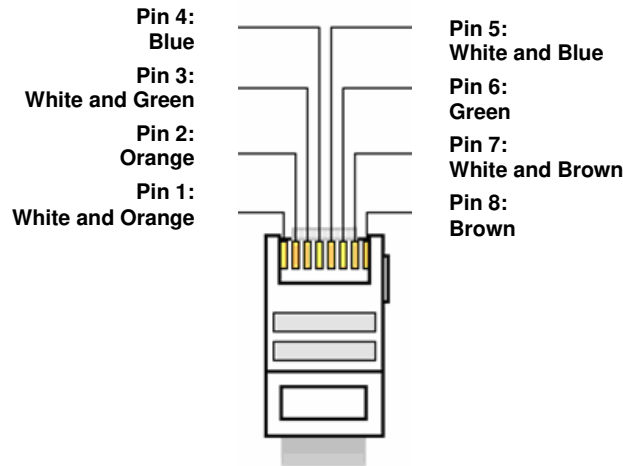
There is a connector located at the left of the device's back panel for an external 48V DC power supply. The provided universal input power supply admits 90 to 264V AC, 47-63Hz.

2.2.2. Ethernet Ports (LAN 1 and LAN 2). **B**

NETBOX 4 MH includes two Ethernet ports: LAN1 must be always connected, while LAN 2 is wired only when the system is used in "switch" mode or is configured in order to use separate networks for control and audio over IP (AoIP). The "NetBox 4 MH Tool" application allows the user to configure the device in this respect: for more details, see paragraph 3.2.2.1.

If LAN 1 port is connected to a PoE+ capable switch (enhanced device power through Ethernet interface), the LAN connector will provide power supply to the Netbox, so the external 48VDC external adaptor connection is not really required, although it can still be provided as a redundant supply.

Physically, both are RJ45 10/100/1000 connectors, with the pinout described below:



2.2.3. STUDIOBOX and SCR-03 booth control box signaling inputs / outputs. C

NETBOX 4 MH includes signaling inputs and outputs for booth control boxes such as STUDIOBOX or SCR-03. This allows for the transport, through NETBOX 4 MH, of several GPI and GPO with destination and origin in STUDIOBOX or SCR-03, that remotely end in compatible AEQ equipment such as FORUM and CAPITOL consoles, PHOENIX audiocodecs, NETBOX IP terminals and other related products.

The most common application for the two GPO is to signal the ON AIR status, while the remaining 7 GPI can be used to control cough-cut, pre-listen functions or remote control on different Forum or Capitol consoles, from a booth equipped with STUDIOBOX or SCR-03 connected to a NETBOX 4 MH.

GPO connector: RJ45 connector with two 24V supplied relay outputs. Max. current capability: 250 mA. It should be connected to connector 2 in the STUDIOBOX (marked with a double-dot) or SCR-03 control box.

Pinout:

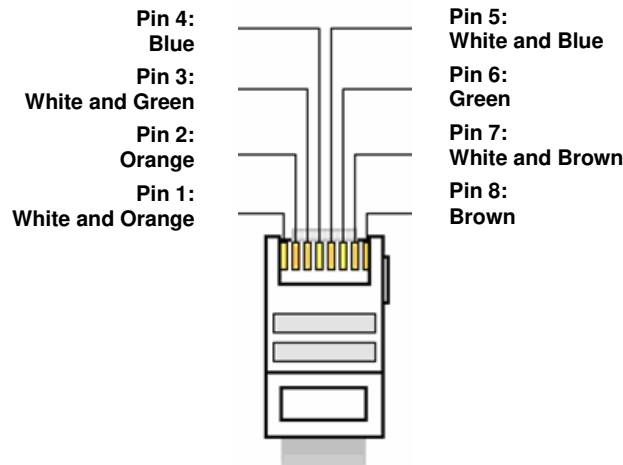
- | | |
|------------------------|--------------------------|
| - Pin 1: Not used | - Pin 5: Not used |
| - Pin 2: RED LIGHT (+) | - Pin 6: GND |
| - Pin 3: 24V DC Output | - Pin 7: GREEN LIGHT (+) |
| - Pin 4: Not used | - Pin 8: Not used |

GPI connector: RJ45 connector with 7 optically coupled inputs, identified in the software as MUTE, TECH. T BACK and USER KEYS 1 to 5. It should be connected to connector 1 in the STUDIOBOX (marked with a dot) or SCR-03 control box.

Pinout:

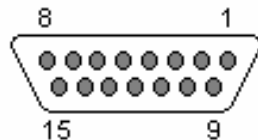
- | | |
|-----------------------------|------------------------|
| - Pin 1: TECH. T BACK (CUE) | - Pin 5: USER KEY 3 |
| - Pin 2: MUTE (CUT) | - Pin 6: USER KEY 4 |
| - Pin 3: USER KEY 1 | - Pin 7: USER KEY 5 |
| - Pin 4: USER KEY 2 | - Pin 8: 24V DC Output |

AEQ STUDIOBOX and SCR-03 are designed to be compatible with these GPIs and GPOs.



2.2.4. General Purpose Inputs and Outputs (GPIO IN 1-4 / OUT 1-4). D

The physical connector used is a DB15-female, with the following pinout:

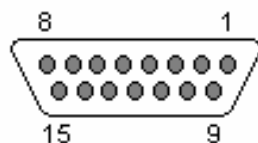


- Pin 1: GPI 1
- Pin 2: GPI 2
- Pin 3: GPI 3
- Pin 4: GPI 4
- Pin 5: GPO 1
- Pin 6: GPO 2
- Pin 7: GPO 3
- Pin 8: GPO 4
- Pin 9: GND_GPI 1-4
- Pin 10: GND_GPI 1-4
- Pin 11: GND_GPI 1-4
- Pin 12: +5V GPIO 1-4
- Pin 13: GND_GPO 1-4
- Pin 14: GND_GPO 1-4
- Pin 15: GND_GPO 1-4

Remarks: please note that a common ground (GND) is provided for inputs and another one exists for outputs. Pin 12 supplies a +5V reference voltage to ease wiring.

2.2.5. Analog Outputs. E

The physical connector used is DB15-female, with the following pinout:



- Pin 1: ANALOG 1 OUT +
- Pin 2: GND
- Pin 3: ANALOG 2 OUT +
- Pin 4: GND
- Pin 5: ANALOG 3 OUT +
- Pin 6: GND
- Pin 7: ANALOG 4 OUT +
- Pin 8: GND
- Pin 9: ANALOG 1 OUT -
- Pin 10: GND
- Pin 11: ANALOG 2 OUT -
- Pin 12: GND
- Pin 13: ANALOG 3 OUT -
- Pin 14: GND
- Pin 15: ANALOG 4 OUT -

IMPORTANT NOTE: If you want to connect any of the outputs to an unbalanced input, you must unbalance the output, using the corresponding positive and GND pins and leaving the negative pin unconnected. Also keep in mind that unbalancing the output will reduce its level by 6dB.

2.2.6. Remarks on NETBOX 4 MH audio wiring.

AEQ eases the installation task providing the connection between the system and the connected pieces of equipment by providing “**FR CAB INP**” wiring accessory on request, consisting on a DB15 male connected to four balanced and shielded pairs, 6 meters long, unterminated, in order to ease the wiring of 4 audio pairs.



The “**CP CAB GPIO**” accessory consists on a DB15 male connector connected to a 15-way wire, 6 meters long, unterminated, for GPIs and GPOs. Each cable allows you to connect the GPIs or GPOs provided by the unit (GPIO IN 1-4 / OUT 1-4).



The wiring to connect STUDIOBOX or SCR-03 control box GPI and GPO is composed by simple Ethernet data cables.

WARNING: Make sure that cables are connected to STUDIOBOX or SCR-03 properly, as GPI and GPO wires provide 24Vdc supply from NETBOX 4 MH to STUDIOBOX or SCR-03 and they could cause damage if accidentally connected to a switch or the wrong connector within STUDIOBOX or SCR-03.



2.3. STUDIOBOX and SCR-03 control box description.

Both models are functionally equivalent.

Controls and indicators:

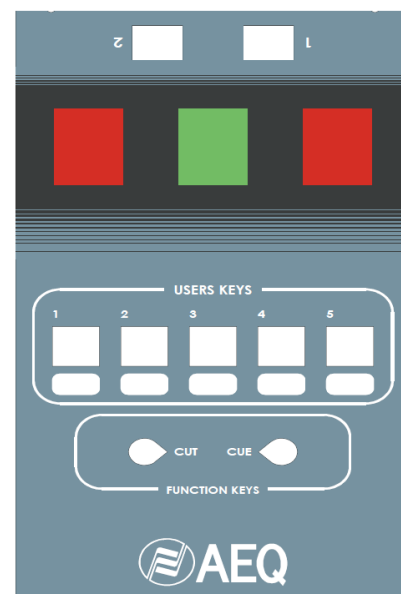
- **MUTE** or **CUT**: Microphone MUTE key.
- **TECH T. BACK** or **CUE**: PFL key.
- **USER KEYS 1- 5**: Configurable buttons with LED activation indicator.
- **GREEN LIGHT**: Green indicator, usually signals closed microphones.
- **RED LIGHT**: Red indicator, usually signals that some microphone is open in the studio.



Connectors:

RJ45 connectors have been wired for compatibility NETBOX 4 MH when used with standard, straight Ethernet cabling.

- **RJ45 1: To be connected to the SCR 03 GPI connector**
 - Pin 1: TECH. T BACK (CUE)
 - Pin 2: MUTE (CUT)
 - Pin 3: USERS KEY 1
 - Pin 4: USERS KEY 2
 - Pin 5: USERS KEY 3
 - Pin 6: USERS KEY 4
 - Pin 7: USERS KEY 5
 - Pin 8: 24V DC Input
- **RJ45 2: To be connected to the SCR 03 GPO connector**
 - Pin 1: Not used
 - Pin 2: RED LIGHT (+)
 - Pin 3: 24V DC Input
 - Pin 4: Not used
 - Pin 5: Not used
 - Pin 6: GND
 - Pin 7: GREEN LIGHT (+)
 - Pin 8: Not used



Connectors are marked with a dot and a double-dot respectively in STUDIOBOX.

NOTE 1: It's possible to manage the **STUDIOBOX** (or **SCR-03**) control box from the **general purpose GPIOs** of NETBOX 4 MH, by previously activating the "**GPIOs Transport**" option from "NetBox 4 MH Tool" application (see section 3.2.2.1 of this manual).

In that case, the **RED LIGHT** of the box would be associated to **GPI 1** activation and the **GREEN LIGHT** to **GPI 2**.

On the other hand, when you press the **TECH. T BACK** (or **CUE**) key the **GPO 1** will be activated. The same thing happens with **MUTE** (or **CUT**) key and **GPO 2**, **USER KEY 1** and **GPO 3** and **USER KEY 2** and **GPO 4**.

Other available option is to manage the **STUDIOBOX** (or **SCR-03**) control box by means of **virtual GPIOs**. See section 3.2.2.3 of this manual.

Both options are **exclusive**. When you activate the "**GPIOs Transport**" option, the configuration of virtual GPIOs associated to STUDIOBOX (or SCR-03) stops being operative.

NOTE 2: It's possible to mute the NETBOX 4 MH microphones from the keys of the **STUDIOBOX** (or **SCR-03**) signaling box, by previously activating the "**S. Box Mute**" option from "NetBox 4 MH Tool" application (see section 3.2.2.1 of this manual).

With this option is activated, the **USER KEYS 1 to 4** allow you to mute microphones 1 to 4 of the NETBOX 4 MH, respectively. On the other hand, the **MUTE** key allows you to mute the 4 microphones at the same time. The **USER KEYS** lock their position when pressed (latch mode), while the **MUTE** key operates only when it's kept pressed down (PTT mode).

The "S. Box Mute" option only acts on those inputs configured as a microphone by means of the front switch; if, for example, the input 2 is configured as line, when pressing the **USER KEY 2** it does not mute it (neither does it when pressing the **MUTE** key, which will mute inputs 1, 3 and 4).

3. SOFTWARE INSTALLATION AND OPERATION.

3.1. PC-based configuration and control applications.

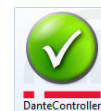
In order to configure each NETBOX 4 MH within the work environment and determine interactions between different NETBOX 4 MH devices, consoles or other AEQ equipment by means of virtual GPIOs, the "**NetBox 4 MH Tool**" application is required.



On the other hand, "**NetBox4MH**" RTC software is used to operate the device, adjust its input and output levels, and the source for each headphone output.



Last, "**Dante Controller**" application needs to be installed on every control room where a NETBOX 4 MH operates, in order to access the Dante system control and choose the different source and destination signals processed by NETBOX 4 MH.



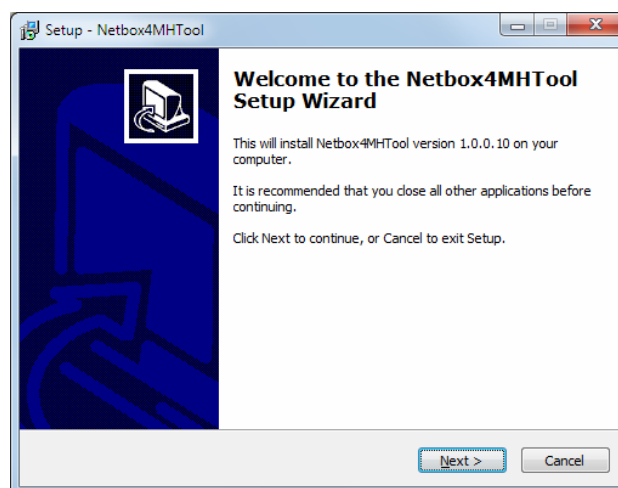
3.2. "NetBox 4 MH Tool": configuration software.

3.2.1. Introduction.

"**NetBox 4 MH Tool**" application is the control and configuration software for NETBOX 4 MH. Its installation is recommended on a single PC, which can be even a laptop that may be disconnected once the system is properly configured.

The auto run USB key furnished with this unit contains the executable file that installs the application. Installing it is simply a matter of executing this file and following the on-screen instructions as they come up.

In order to install the application as well as for using it, it must be done from a PC user with administrator rights; once it is installed, if the user has restrictions, you must give at least administrator permission to the executable file.



Once the "**NetBox 4 MH Tool**" application is installed (by default, in C:\Program files\AEQ\Netbox4MHTool), you can start it up by double-clicking the icon displayed on the desktop:



3.2.2. Initial screen.

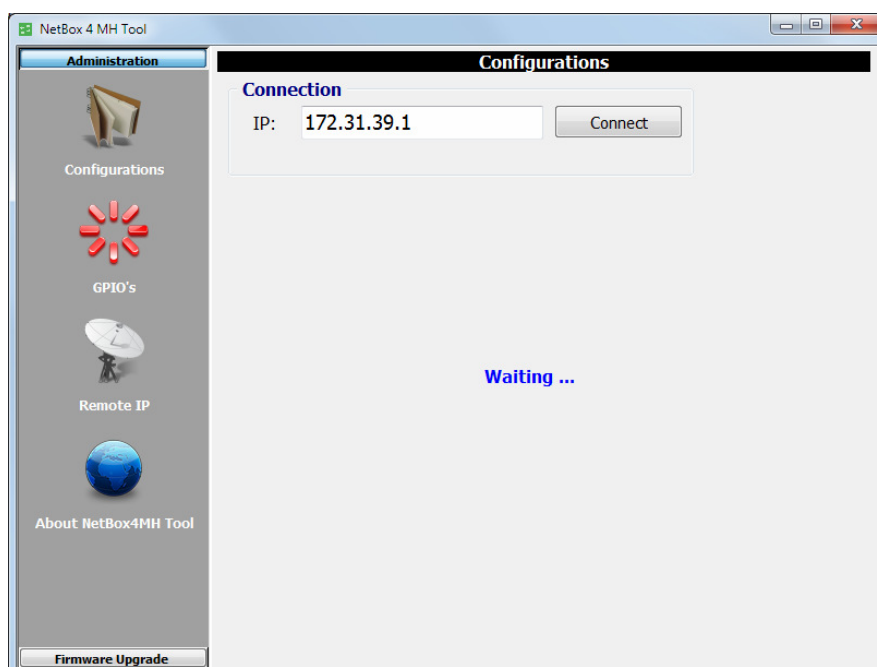
When the application starts up, the initial screen will appear allowing you to access the different options and displaying the software version, as well as an image showing the equipment.



On the left side of the screen all the relevant menus and submenus are available. These are drop-down menus and are activated by clicking on the desired option.

3.2.2.1. "Configurations" submenu.

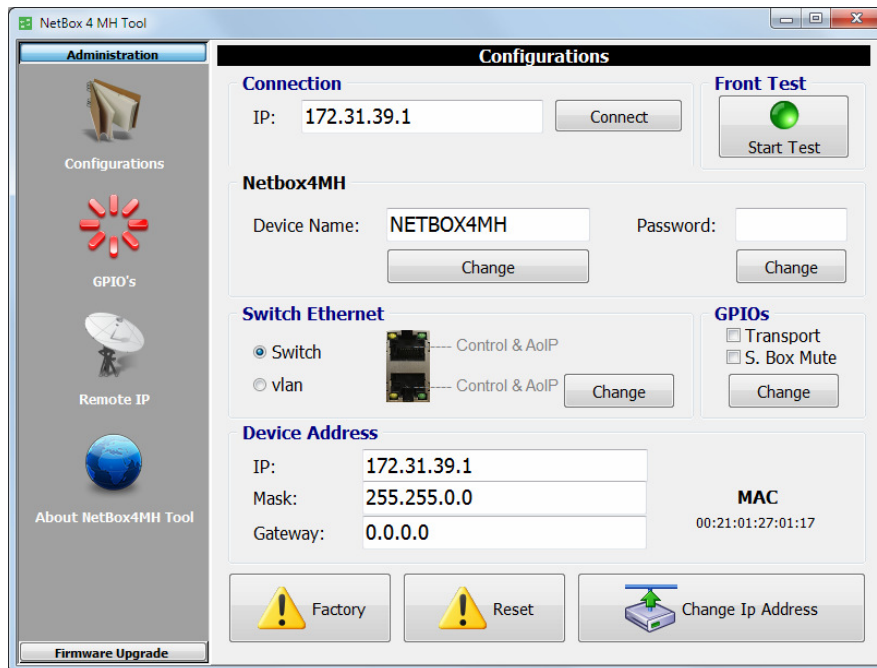
"Configurations" submenu, accessed from the drop-down menu "Administration" by clicking on the corresponding icon, allows you to configure and control the communication between application and physical equipment. When no connection is established, this submenu looks like that:



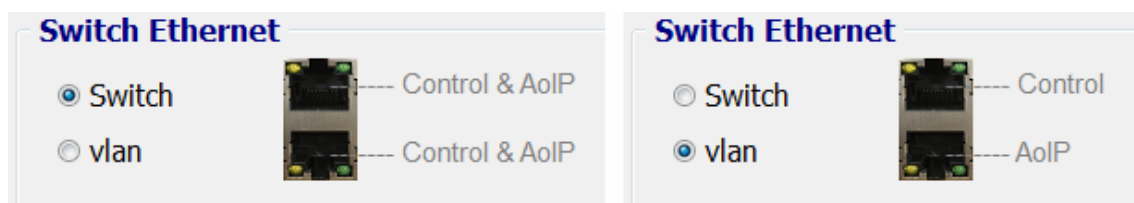
“**Connection**” section allows you to configure the parameters to connect to the unit. Firstly, the **IP** address of the equipment must be configured (by default, **NETBOX 4MH** units are supplied with **172.31.39.1** IP address).

The device is connected by clicking on “**Connect**”, provided that it is reachable in the same sub network as one of the IP addresses of the PC network card.

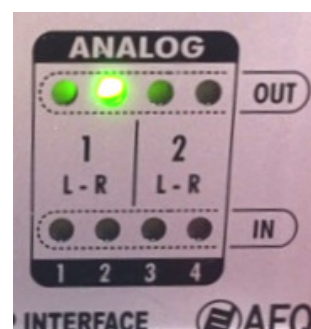
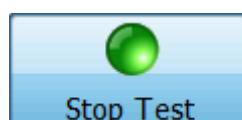
This is the appearance of the application when connecting to the NETBOX 4 MH unit:



Please not that, in order to connect, it is also necessary to observe the checkbox within the “**Switch Ethernet**” section: when it is in the “**Switch**” position -the most flexible of all- the unit can be controlled from any of its ports. When it is in the “**vln**” position -adequate for audio and control networks separation- the control network configured in the PC where the applications are installed must reach the device through the upper (**LAN 1**) Ethernet port. Once this section is configured, the changes will be applied by pressing the “**Change**” associated button (then the unit will reset).

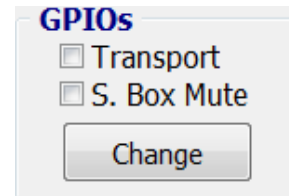


“**Front Test**” section allows you to start a test of front level indicators, by pressing the “**Start Test**” button (when test is started, the button changes to “**Stop Test**” and allows you to stop the process). The front LEDs will light one by one following the green-red-yellow-off sequence.



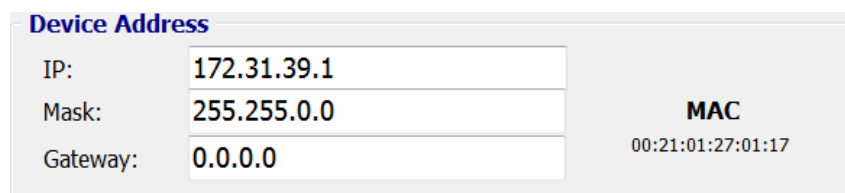
The NETBOX4MH "**Device Name**", that we can change later, is displayed in "**Netbox4MH**" section. Its associated "**Password**" can also be modified. The changes will be applied when pressing the "**Change**" associated button. When a password is established, only the users that know this password will be able to control the unit by means of "**NetBox4MH**" RTC application.

"**GPIOs**" section allows you to activate/deactivate the "**Transport**" mode in order to manage or not the **STUDIOBOX** control box from the general purpose GPIOs. It's also possible to activate/deactivate the "**S. Box Mute**" mode in order to be able to mute the microphones from the keys of the **STUDIOBOX** (this mode appears only for units with CPU version 1.11 or higher). Once this section is configured, the changes will be applied by pressing the "**Change**" associated button. See notes 1 and 2 of section 2.3 of this manual.

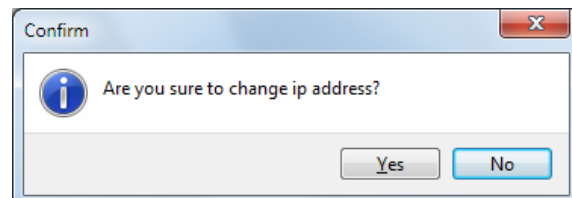
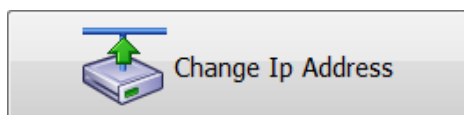


"**Device Address**" section allows you to configure the IP parameters of the Ethernet interface of the unit:

- "**IP**": valid IP address associated with that interface.
- "**Mask**": valid subnet mask associated with that interface.
- "**Gateway**": valid gateway or network gateway address associated with that interface.
- "**MAC**": valid MAC address associated with that interface (this parameter is automatically configured depending on the IP address assigned to the unit).



Once those parameters are configured, the changes will be applied by pressing the "**Change Ip Address**" button. Confirmation is requested (then the unit will reset).

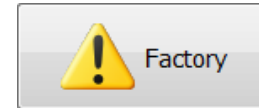


If there is more than one NETBOX 4 MH device reachable in the network, each of them must be individually connected and its IP changed to a unique value in order to avoid network conflicts. This is done in the "Device Address" section fields.

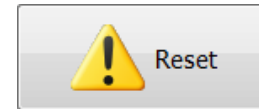
This procedure is mandatory and required when several units are to be installed, as all of them come with the default IP address 172.31.39.1 from factory. At the same time, a name that is easily recognizable by the users can be assigned, and a password defined, so that unauthorized people cannot control it from the real time control application, and this way, inadvertent accesses on the wrong devices in networks with several devices (for example, when several studios are installed) are prevented.

IMPORTANT NOTE: In cases where the control IP address of the device that we want to connect to is unknown, a **procedure** that allows for the return to the default configuration has been defined (included in the "Extras" menu of the USB key furnished with the unit). If you have any doubt, please consult AEQ Technical Service (support@aeq.es).

The “**Factory**” button allows you to return to initial Factory parameters.



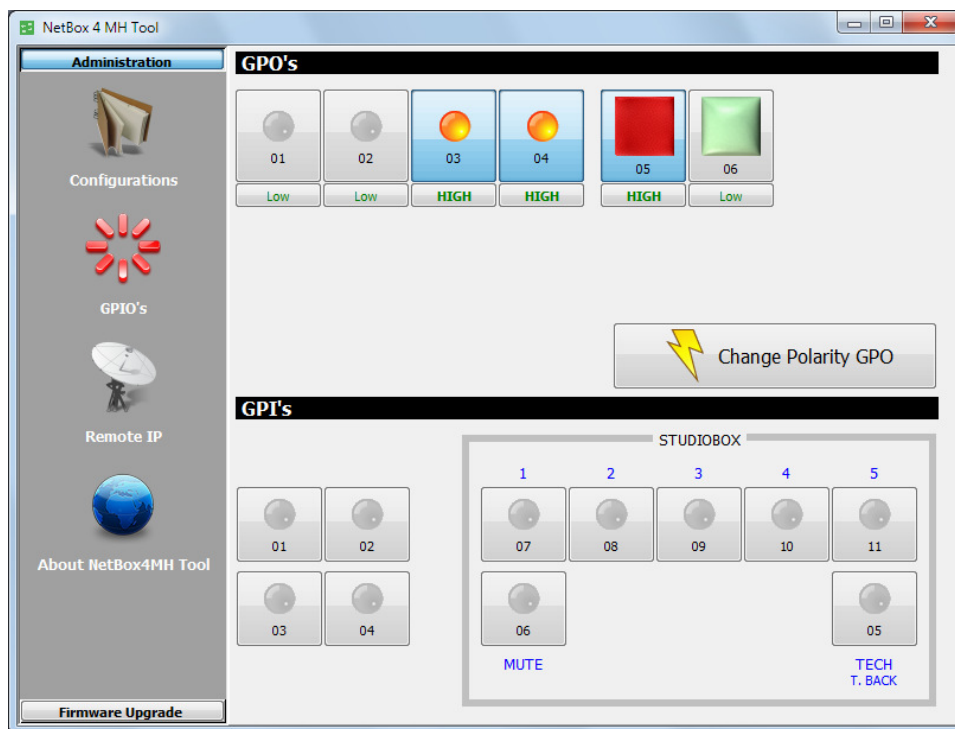
The “**Reset**” button allows you to restart the unit.



Confirmation is requested for both options.

3.2.2.2. "GPIO's" submenu.

“**GPIO’s**” submenu, accessed from the drop-down menu “Administration” by clicking on the corresponding icon, allows you to check the functioning and perform basic operations of unit’s physical GPIOs (the GPIOs are normally used in relation with other units and applications).

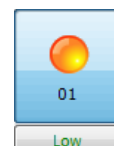
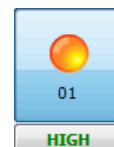


HIGH/Low configuration and GPOs testing.

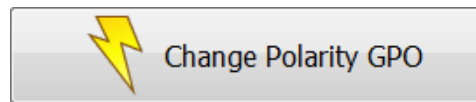
NETBOX 4 MH features 4 optically-coupled GPOs on the "GPIO - IN 1-4 / OUT 1-4" DB15 connector, and 2 relay activated ones with internal power supply at the "SCR-03 - GPO" RJ45 connector.

When you press any of the 4 numbered 1-2-3-4 buttons in “**GPIO’s**” section, it is lighted in amber and the corresponding GPO of the unit changes to active status:

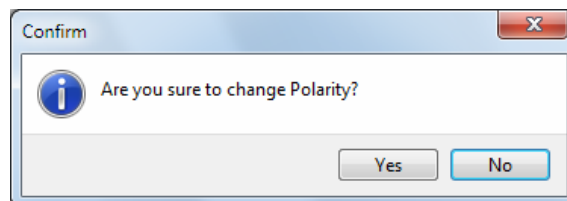
- in case that GPO is configured as “**HIGH**”, the circuit between the corresponding pin and the ground pin in DB15 connector of the unit gets open.
- in case that GPO is configured as “**Low**”, the circuit between the corresponding pin and the ground pin in DB15 connector of the unit gets closed.



In order to change the default configuration of a GPO closing and opening you must press the associated button, which will change from "HIGH" to "Low" or vice versa, although changes will not be applied until you press the button:



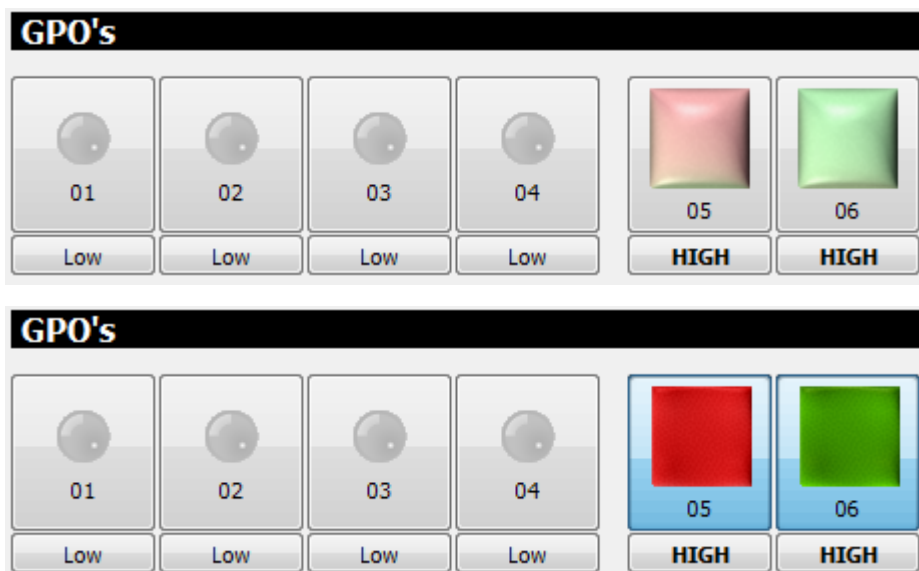
and confirmation is provided in the window that appears:



The voltage and current limits for external power supply of GPOs 1 to 4 are 200 volts and 120mA.

The unit provides a +5V voltage in order to make easier GPOs cabling when the receiver unit accepts logical levels. In order to use the voltage provided by the unit, you have to connect the floating ground of GND pin to the connector chassis. A device with a consumption lower than 3mA can be connected between GPO pin and the one with +5V voltage.

If a STUDIOBOX or SCR-03 control box is connected, operation can be tested from the application by clicking on any of the 2 buttons numbered 05 and 06 in the "GPO's" section. If a key is represented with pale color and the user clicks on it, it will change to an intense color and the corresponding GPO in the device will shift to active status. When the key has a pale colour, the GPO will turn on when clicking on it.



If the configuration is set to "Low", operation of the keys works the other way round: the pale representation of the keys correspond to ON keys, and when the user clicks on any of them, the color is intensified and the lights are off.



Voltage supplied by GPOs 5 and 6 is 24V DC. Maximum allowed current consumption is 250 mA. STUDIOBOX or SCR-03 control box signaling has internal LEDs with resistors built in to limit the current drawn to the specified value. Don't connect other signaling system without previous validation by AEQ Technical Service (support@aeq.es).

"Virtual GPI/O in AEQ systems" application note, available at www.aeq.es, explains how to configure these GPOs in order to produce ON AIR signaling from different control consoles in a shared radio booth.

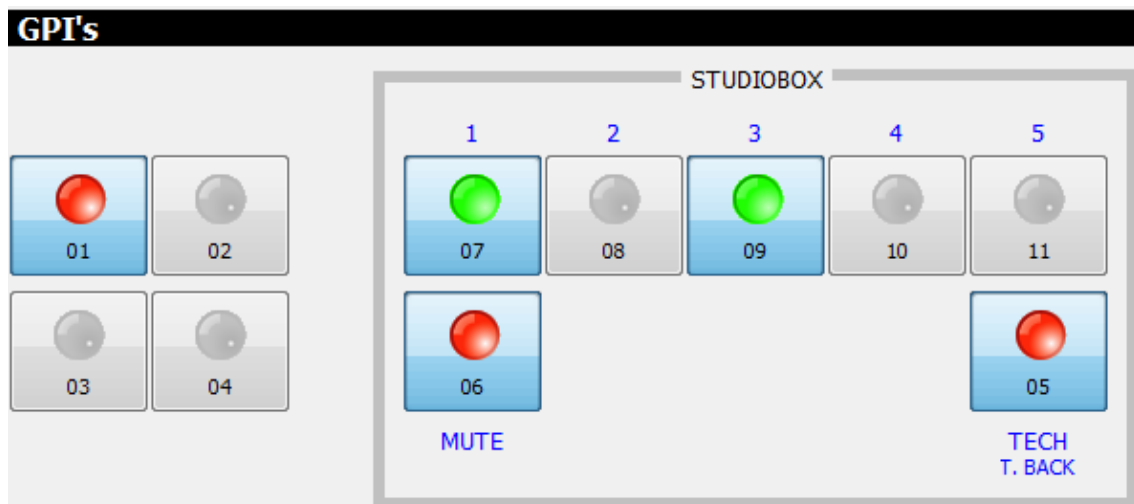
In order to use these GPOs from third-party (non AEQ) devices, please contact AEQ Technical Service (support@aeq.es).

GPIs testing.

NETBOX 4 MH features 4 optically-coupled GPIs on the "GPIO - IN 1-4 / OUT 1-4" DB15 connector and another 7 GPIs (also optically-coupled) at the "SCR-03 - GPI" RJ45 connector.

When a **GPI** is activated in the unit (the circuit between the corresponding pin and the ground pin gets closed), the corresponding button in "**GPI's**" section will light in red. This GPI will be also transmitted as a Virtual GPO through the network to all the IP addresses configured in "**Remote IP**" submenu (see section 3.2.2.3 of this manual). In order to activate a GPI with internal voltage, you have to connect the floating ground to the connector chassis.

All 7 GPI in the "SCR-03 - GPI" connector can be activated from the corresponding push-buttons in the STUDIOBOX or SCR-03 control box. Those labeled as USER KEYS 1 to 5 are latching, while the ones labeled as MUTE and TECH T. BACK (or CUT and CUE in the case of SCR-03) operate only when they are kept pressed down.



"Virtual GPI/O in AEQ systems" application note, available at www.aeq.es, explains how to configure these GPI in order to produce the remote cut and pre-listen control actions on different control consoles from a radio booth.

In order to use these GPIs from third-party (non AEQ) devices, please contact AEQ Technical Service (support@aeq.es).

3.2.2.3. "Remote IP" submenu.

"Remote IP" submenu, accessed from the drop-down menu "Administration" by clicking on the corresponding icon, allows you to manage the virtual GPIs and GPOs.

The **connection port (2001)** is a fixed parameter and it's shown for informative purposes only.

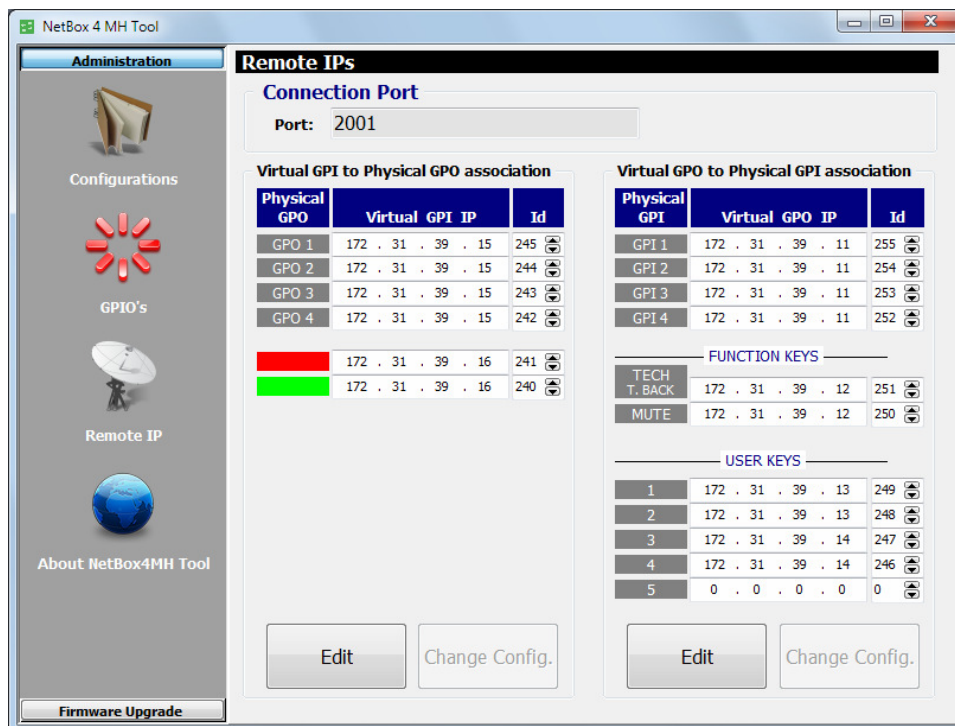
"Virtual GPI to Physical GPO association":

Allows for the control of the status of every GPO in NETBOX 4 MH as a response to remote commands sent from another Netbox or AEQ IP devices such as Forum, Capitol, Phoenix audiocodexs, Systel IP and Audio+. The parameters of a virtual GPI are the **IP address** of the unit we want to receive the Virtual GPI from, and the "**Id**", an identifier from 0 to 255 that must match with the "Id" number configured in the device that transmits the corresponding virtual GPO.

"Virtual GPO to Physical GPI association":

Allows the NETBOX 4 MH to send its physical inputs (GPI and, in case that a STUDIOBOX or SCR-03 control box is connected, also its keys) to a remote NETBOX or other AEQ IP devices such as Forum, Capitol, Phoenix audiocodexs, Systel IP and Audio+ by means of virtual GPO, activating their physical GPOs or generating other kinds of actions. The parameters to configure for a virtual GPO are the control **IP address** of the device we want to send the Virtual GPO to, and an "**Id**" (number from 0 to 255) that must match the "Id" configured in the receiver for the corresponding virtual GPI that we are setting up.

NOTE: In order to manage the control box by means of virtual GPIOs, it's necessary that the "**GPIOs Transport**" option is **NOT** activated (see section 3.2.2.1 of this manual).



In the example shown in upper picture, we are assuming that our NETBOX 4 MH has the following IP address: 172.31.39.4.

The control of virtual GPIs 1 to 4 is received from a device with IP 172.31.39.15, using the same "Id" numbering from 245 to 242 at both ends and activating the local physical GPOs 1 to 4.

The control of **RED** and **GREEN** physical GPOs is received from a console with IP 172.31.39.16, using the same "Id" numbering 241 and 240 at both ends.

On the other hand, the virtual GPOs 1 to 4 (corresponding to the status of the physical GPIs 1 to 4) are sent to the device with IP address 172.31.39.11, using identifiers from 255 to 252 at both ends.

TECH T. BACK and MUTE (or CUE and CUT) dedicated keys connect these functions from a STUDIOBOX (or SCR-03) control box in a shared booth to a control console with IP address 172.31.39.12, using identifiers 251 and 250, respectively.

User keys 1 and 2 connect the pushbuttons 1 and 2 from that same STUDIOBOX or SCR-03 control box in a shared booth to a different control console with IP address 172.31.39.13, using identifiers 249 and 248. User keys 3 and 4 connect the pushbuttons 3 and 4 from the same STUDIOBOX or SCR-03 control box in a shared booth to a different control console with IP address 172.31.39.14, using identifiers 247 and 246.

In order to configure virtual GPI's or GPO's you must press the associated **"Edit"** button (the headline of the corresponding section changes from blue to green), make the desired configuration and apply the changes by pressing the **"Change Config."** button: then the unit will reset. If you want to cancel the changes before pressing "Change Config.", you can do it by pressing the "Cancel" button.



3.2.2.4. "About NetBox4MH Tool" submenu.

"**About NetBox Tool**" submenu, accessed from the drop-down menu "Administration" by clicking on the corresponding icon, shows the version and date of "**NetBox 4 MH Tool**" application. It also shows an image of the equipment.



3.2.3. Upgrading Tools.


“Firmware Upgrade” is a maintenance menu that allows you to update the firmware versions of the unit.

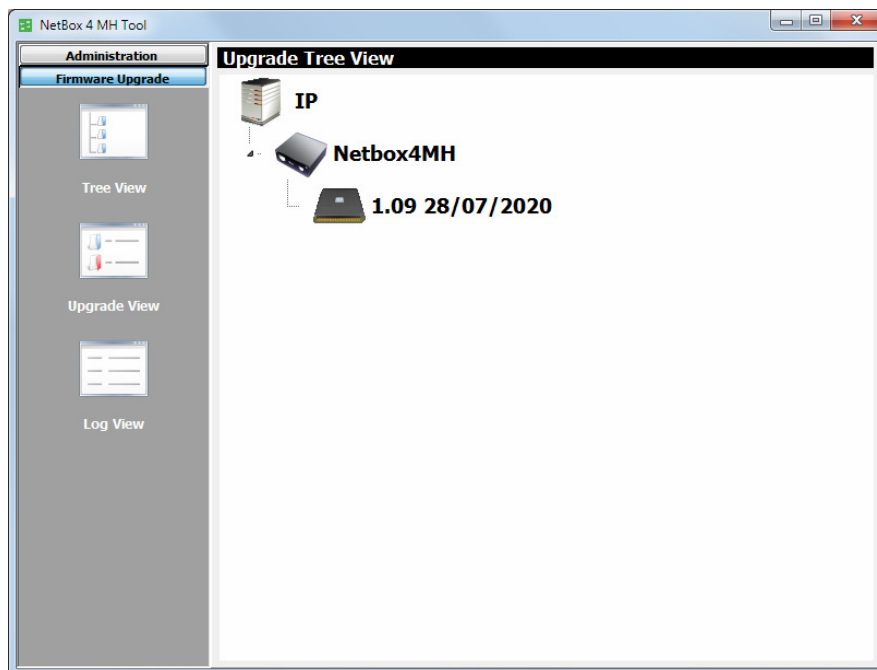
IMPORTANT NOTE 1: Any operation in this “Firmware Upgrade” section should only be accomplished by qualified personnel in possession of all necessary technical information relative to this system and with the possibility to establish a direct communication with AEQ Technical Service (support@aeq.es).

IMPORTANT NOTE 2: In case you upgrade the firmware of a unit from micro version **1.06** (or lower) to version **1.07** (or higher), you must use the version **1.0.0.7** (or lower) of “NetBox 4 MH Tool” application. Once the unit is upgraded, you must upgrade the application to version **1.0.0.8** (or higher).

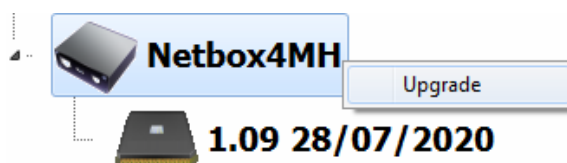
In order to execute any option available in this menu, it is necessary to be in direct communication with the AEQ NETBOX 4 MH unit, through its Ethernet port. In case that there is no connection to unit, the associated submenus will be shown blank.

“Tree View” submenu, accessed from the drop-down menu “Firmware Update” by clicking on the corresponding icon, provides a global view of the system, with a tree structured diagram, providing information regarding the currently installed firmware version for the module of the unit with associated firmware.

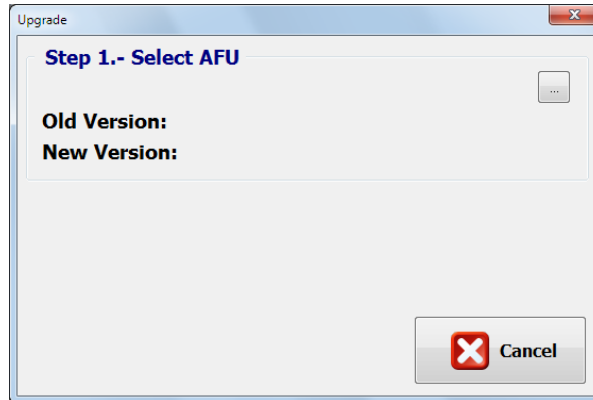
The following icon represents unit’s **micro** or **CPU** 



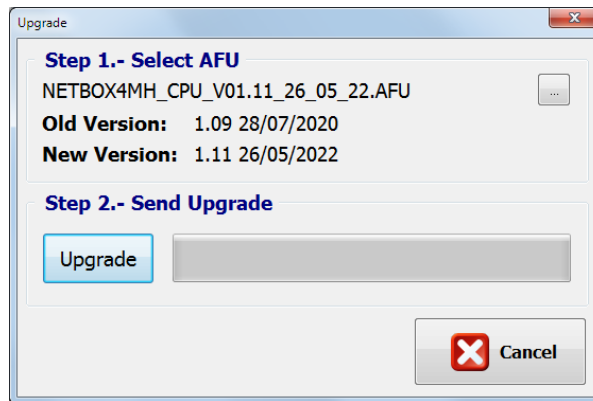
In order to upgrade the unit’s firmware, place the pointer on its name, press the right mouse button and then the “Upgrade” option that appears



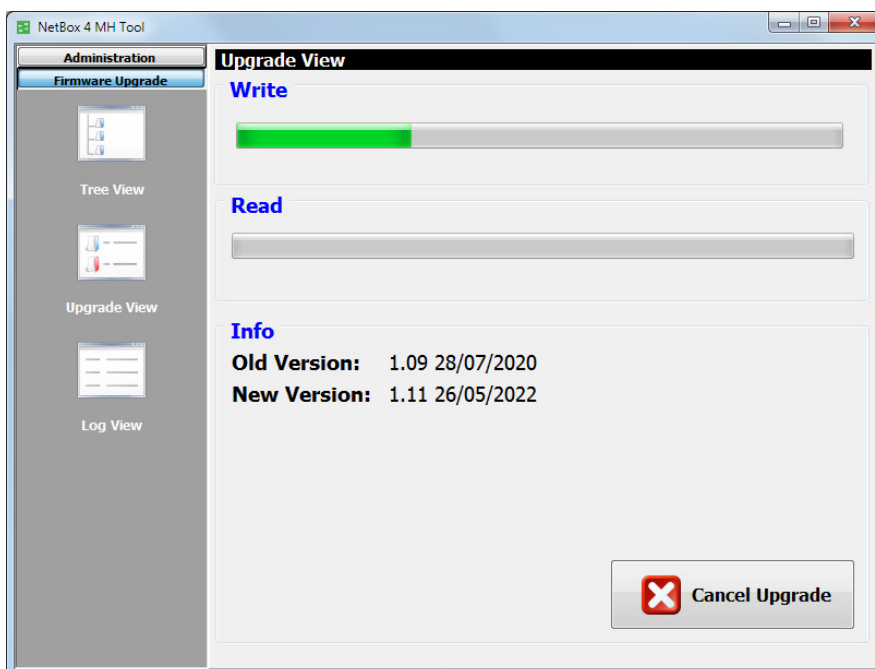
In the new window that shows up, press the  button and select the “**AFU**” upgrading file (AEQ Firmware Upgrade) that contains the new version you want to load.



Once it's selected, the following window shows the old and new versions of the module to be upgraded and allows you to start the upgrading process by pressing the “Upgrade” button.



From this point on, the application changes automatically to “**Upgrade View**” screen in order to show you the upgrading progress:

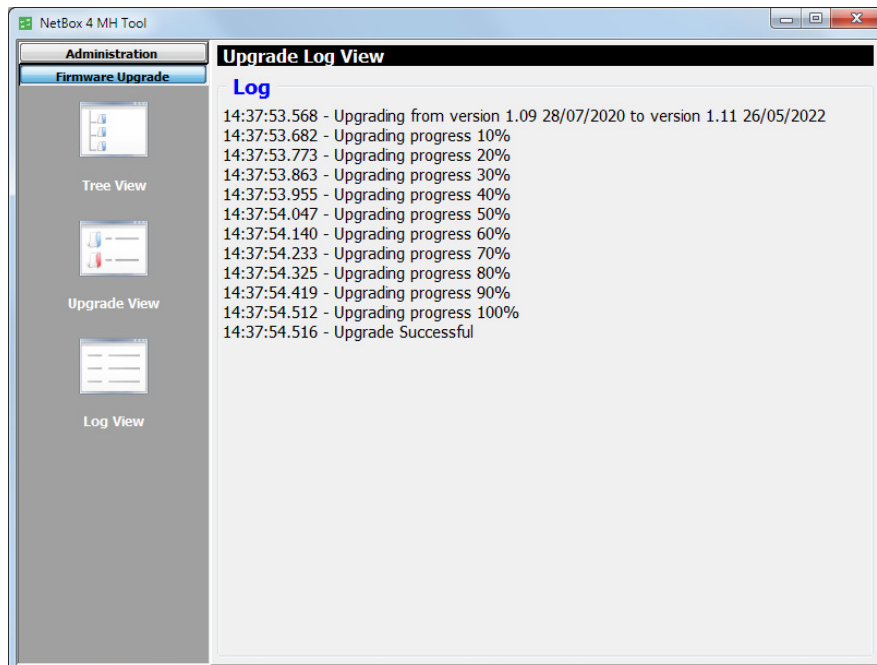


The following fields are visible on screen:

- **"Write"**: progress bar concerning the AFU file copy process from the computer that is running application to the unit internal memory.
- **"Read"**: progress bar concerning the AFU file reading process. Usually unseen due to its rapidity.
- **"Info"**: **while upgrading is in progress** it shows information regarding old and new versions of the module to be upgraded.

IMPORTANT NOTE: You should not act on the system and you must never turn off the equipment during the upgrading process, since this action may deprogram the module that you are trying to upgrade.

"Log View" submenu, accessed from the drop-down menu "Administration" by clicking on the corresponding icon, represents the record containing all the actions associated with a particular upgrade process as a sequence of independent events chronologically ordered and allows you to check whether the process ended correctly or not. This submenu provides complementary information to "Tree View" and "Upgrade View" submenus.

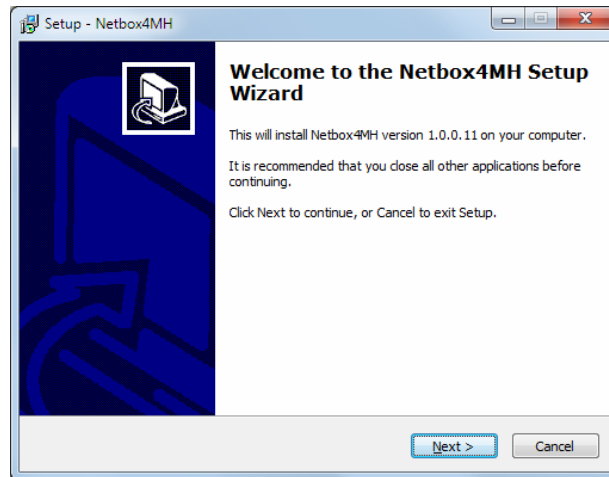


3.3. "NetBox4MH": real time control (RTC) application.

3.3.1. Introduction.

"NetBox4MH" is the real time control (RTC) software application for NETBOX 4 MH devices.

The auto run USB key furnished with these devices contains an executable file that installs the application. In order to do that, just follow the instructions provided in the screen. In order to install the application as well as for using it, it must be done from a PC user with administrator rights; once it is installed, if the user has restrictions, you must give at least administrator permission to the executable file.



The application should be installed on a PC for every location where control of any of the NETBOX 4 MH devices in the AoIP network is required, as the application allows for control of one or several devices, and control can also be shared among various instances of the application running from different PCs.

Once "Netbox4MH" is installed (in the C:\Program Files\AEQ\Netbox4MH folder, by default), it is started by double-clicking on the icon now appearing in the desktop:



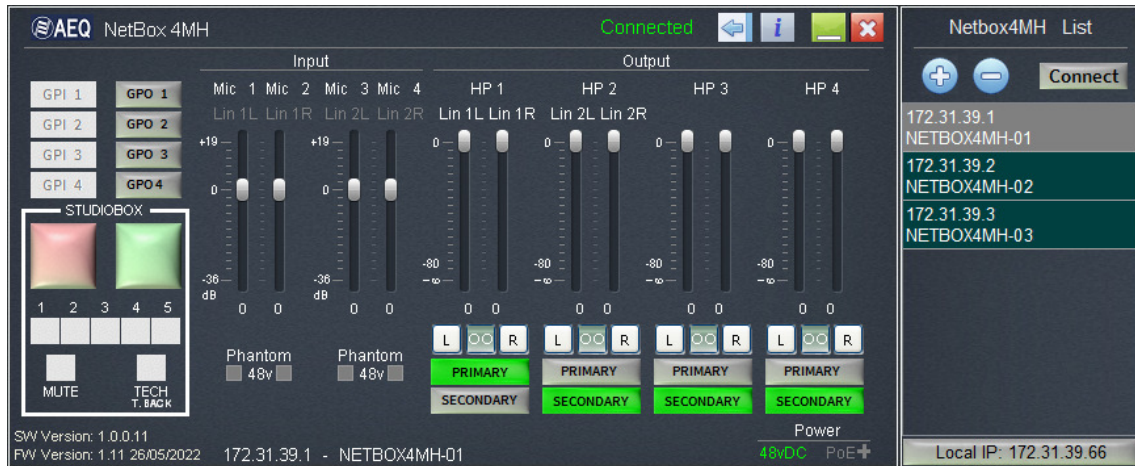
3.3.2. Starting up and selecting the device to control.

This is the main application screen when it still doesn't find the device to control, for example due to a change in its IP address from the "NetBox 4 MH Tool" software.

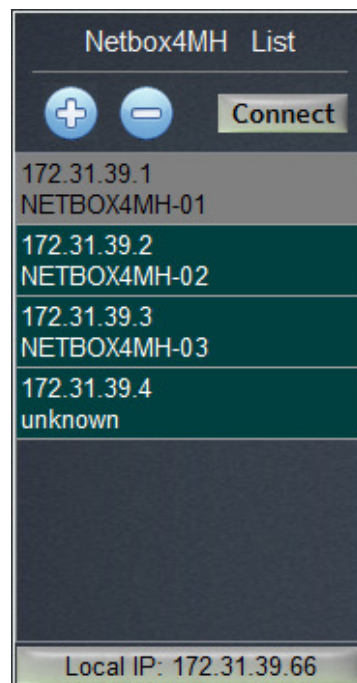
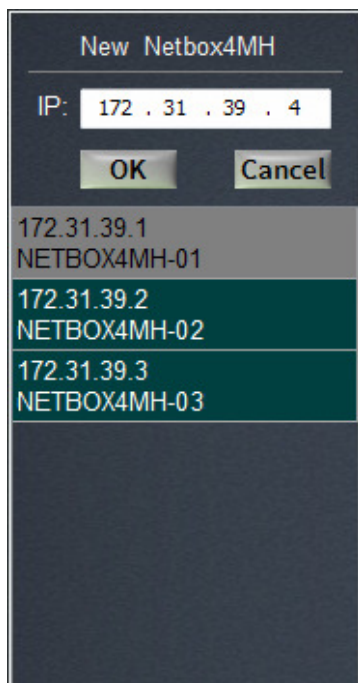


In order to connect to a device which IP address is known (by default, **NETBOX 4MH** units are supplied with **172.31.39.1** IP address), just click on the arrow located in the top right area

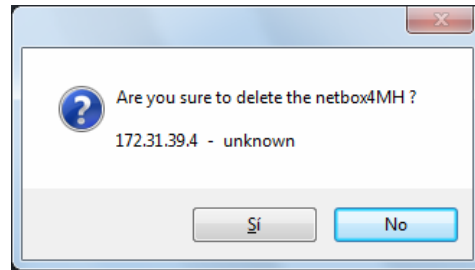
The "Netbox4MH List" window to choose devices' IP addresses will pop up at the right. After clicking OK, a list with the IP address and names of the units installed and configured in the application will appear below. When one of them is selected by clicking on its name, it will be highlighted in grey and connection with it will be attempted by pressing the **"Connect"** button.



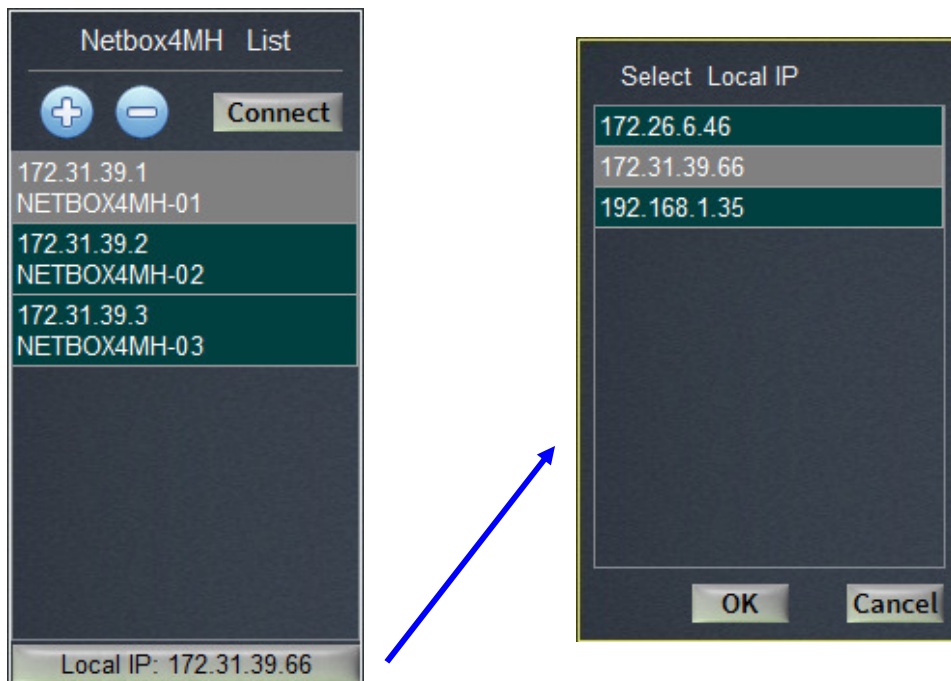
More units can be added by clicking on the button. A window will show up that allows the user to type their IP addresses in, and then their names will appear. Initially, the name will be presented as "unknown", after actual connection is established with each device, this name will be updated. Names can only be assigned and changed from the "NetBox 4 MH Tool" configuration application.



In order to delete a device from the list, just select it and click on the button. A dialog box asking for confirmation will pop up:



Sometimes, when the control PC has several IP addresses configured, it is not possible to find the NETBOX devices in the network as the application may try to connect them using an incorrect IP range. In this case, click on the "Local IP: x.x.x.x" button and a window will appear showing the different networks defined in the PC. Select the one where the NETBOX 4 MH devices were addressed by "Netbox 4 MH Tool".

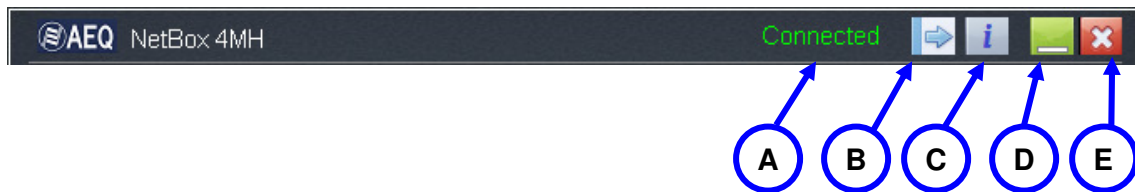




Once the device to control has been selected, close the device selection window and the real time control screen for the chosen one will appear:



3.3.3. Device control screen.

Upper screen bar.

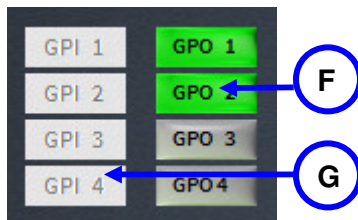


- A** Indicator of "Connected" (displayed in green) or "Disconnected" (displayed in red) unit.
- B** Activation and closure of the "Netbox4MH List" window.  
- C** Access to info screen. See section 3.3.5 of this manual.
- D** Minimize application.
- E** Close application.

While changes are made in control software a spot appears at the top left part of the bar. Once you stop to make changes, this indicator disappear after 4 seconds and the configuration is stored in non volatile internal memory of the unit, so it will always start according to last configuration.



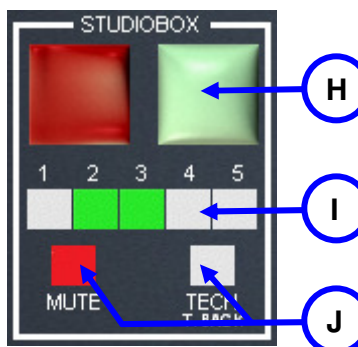
Top left area: general purpose GPI and GPOs



F Indicators and switches for GPOs 1 to 4 testing from the application: active ones are displayed in intense green. They can also be activated from other devices.

G Active GPI indicators: active ones are displayed in intense green.

Lower left area: STUDIOBOX o SCR-03 signaling box-related GPIs and GPOs.



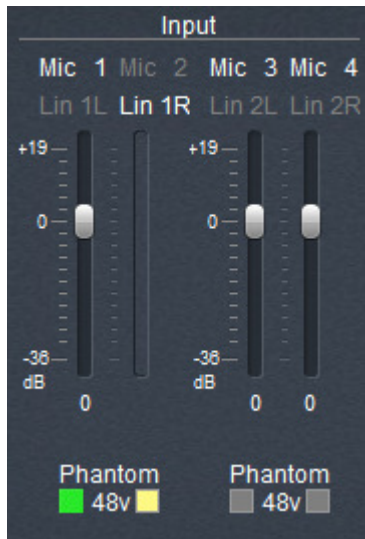
H Indicators and switches for Green and Red Light GPO testing from the application: they are displayed in intense color when active. They can also be activated from other devices

I Indicators for 5 user GPIs: displayed in intense green when active.

J Indicators for MUTE and TECH T. BACK user GPIs (or CUT and CUE). Displayed in intense red when active.

Central area: Input control,

This section allows for adjustment of the input level for each of the four inputs. The settings will be stored in the device. Also, the status of the micro / line and phantom power supply switches is indicated for each channel.



K

Highlighted in white, informs about the status of the 4 MIC / LIN switches at the front of the unit.

L



Level adjust for all inputs whose MIC/LIN switch is in the MIC position. Line level inputs have no level adjustment.

M

Highlighted in green, shows the status of the Phantom 8V switches at the front of the unit. When a line input has its associated Phantom switch depressed, this condition will be signaled in yellow, warning that the phantom voltage will be applied if the input is changed to MIC level.

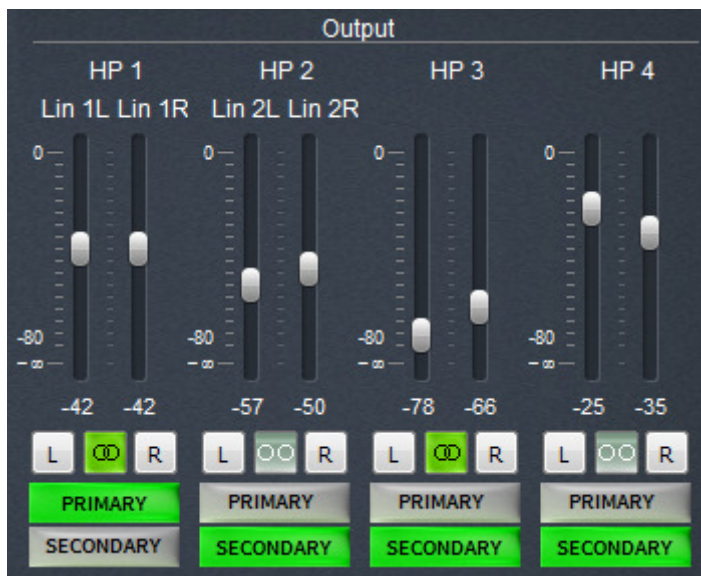
Right area: Output control,

Level for each of the 4 line and 4 headphone pair outputs is adjusted in this area. Level adjustment for Lin 1L and Lin 1R line outputs is common with HP 1 headphone output, while adjustment for Lin 2L and Lin 2R is shared with HP 2 headphones. The adjustment ranges from 0 to $-\infty$.

Also in this section, channels can be linked  (or not ) as stereo (what translates in a synchronous movement of the faders for each L and R pair) or not. You can also align the R channel level with the L channel level or vice versa, by pressing the button **L** or **R** respectively.

Last, for each of the audio output pairs it can be selected whether they get signal from the first or second Dante audio receiver channel pairs (PRIMARY or SECONDARY). See electrical diagram in section 1.3.2.

The adjustments made and the status of the switches are stored within the unit.



N

Labels of output channels.

O

4 faders pairs corresponding to Line and HP outputs. Adjustment range is between 0 y $-\infty$

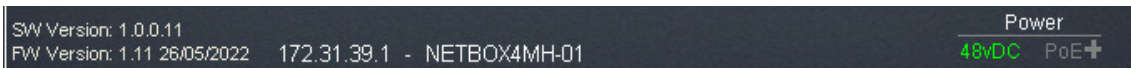
P

Stereo locking switches for each faders pair and pushbuttons for alignment to current L or R channel level.

Q

Selector switches to choose routing from Primary or Secondary channels to each headphone and line output channel pairs.

Lower status info bar.



It informs, from left to right, about:

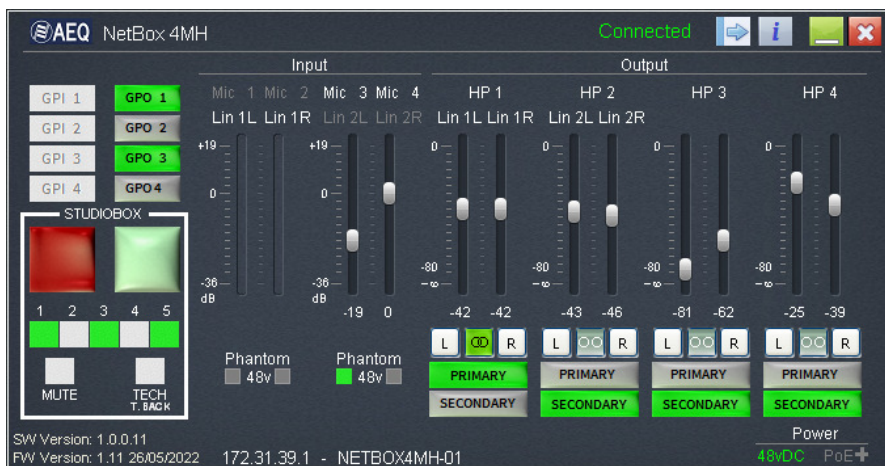
- Application version and device firmware version (and date).
- Control IP address and name of the device. They can be changed by means of "NetBox 4 MH Tool" configuration application, and are updated when reconnecting to it.
- Present power supply: external 48V DC, PoE+ or PoE. When both are present (48V DC and PoE+ or 48 V DC and PoE) only the first one appears remarked.



3.3.4. Concurrently controlling of devices.

In order to concurrently control more than one device from the same PC, several instances of the RTC application can be open according to the following procedure.

One of them is open by double-clicking on the icon of the desktop:



When double-clicking on the same icon again, the control window for the same device (NETBOX4MH-01) appears. Afterwards, the user must click on the arrow at the top right corner to choose another device, in this example, the NETBOX4MH-02 which IP is 172.31.39.2. Then, double click on its label in the window appearing at the right, and this way the second device can be controlled.

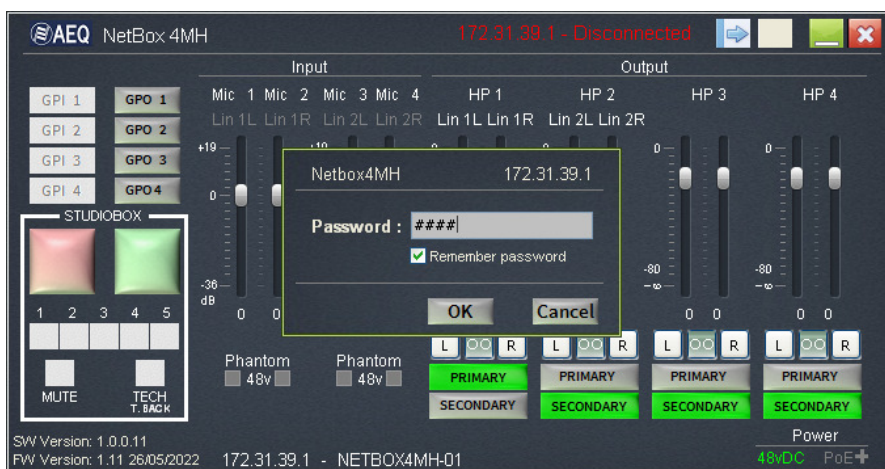




At this point, two windows will now be available in the desktop to control both devices; each window controls one of them. Following the same procedure, more windows can be open in order to control more units




The same NETBOX 4 MH can also be concurrently controlled from two PCs. In order to avoid operating errors, a **password** can be defined for every NETBOX 4 MH in order to limit the number of PCs it can be controlled from. If a password has been defined for NETBOX 4 MH using the "NetBox 4 MH Tool" configuration application, then whenever a PC requests control on it, the following dialogue will appear:

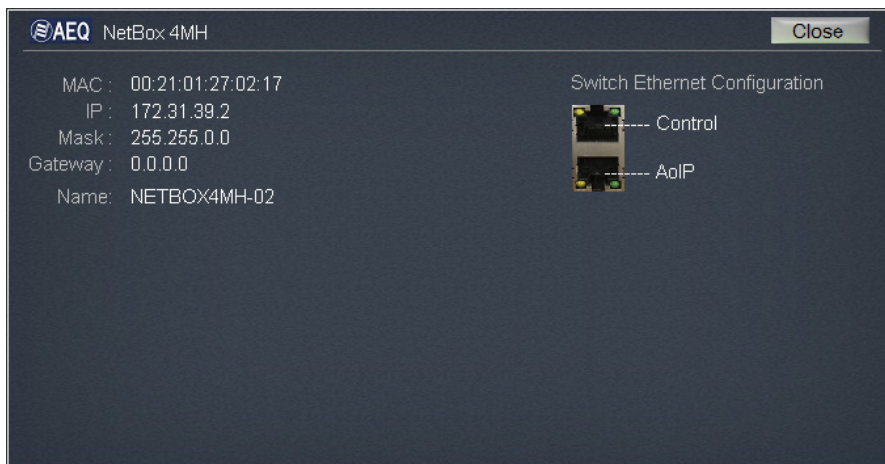
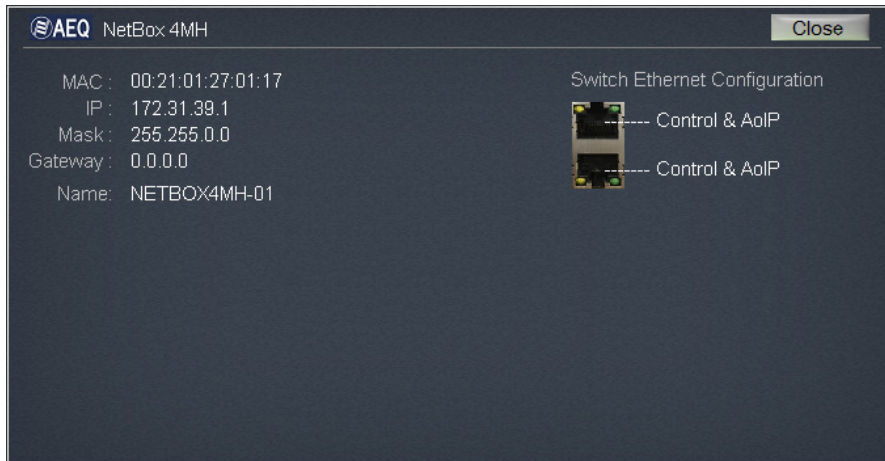


If the "Remember password" checkbox is checked, there will be no need to type again the password for this device in this PC.

3.3.5. Information window.

The device information window is accessed by clicking on the key .

It shows information of the connected NETBOX 4 MH unit regarding its Ethernet interface (MAC, control IP address, mask and gateway), its name and its "Switch Ethernet" configuration (whether audio and control networks are independent or not).



In case that any of the parameters needs to be changed, it must be done by means of "NetBox 4 MH Tool" configuration application (see section 3.2.2.1 of this manual).

4. TECHNICAL SPECIFICATIONS.

- Channels: 4 microphone-line inputs, 4 line outputs, in parallel with 4 stereo headphone outputs. Each headphone L&R pair can be assigned to a pair of line outputs
- Electronically-balanced microphone / line inputs and outputs.
- Low impedance headphone outputs, 50 ohms max.
- Internal sampling frequency: 48kHz @ 24 bits. Variable using an external clock reference.
- 48V Phantom Power supply and electronic balancing for all microphone inputs.
- Electronically-balanced analog line inputs and outputs. Mute and gain control for outputs, individually or in stereo pairs.
- Data format: DANTE Audio-over-IP technology.
- Plug-and-play technology: automatic detection and simple channels routing.
- Precise, sample-level playback synchronization, even through several switch hops.
- Extremely low, deterministic delay through the whole network.
- Scalable and flexible network topology supporting a wide range of audio transmitters and receivers.
- Supports 100Mbps, 1 Gbps and 10 Gbps network segments.
- Supports a unique and integrated network for audio, video, control and monitoring. Compatible with other kinds of traffic using QoS policies.
- Uses low-cost, off-the-shelf network devices.
- Resolution: 24-bit at 48KHz.
- Latency: 1.5 – 3ms (@ 48KHz, typical, depending on network quality and complexity).
- 2 x RJ45, 100 BASE-T Ethernet ports with galvanic isolation, usable for separate audio and data connections, or common connections when in switch mode.
- Binary data rates: 10/100/Mbps.
- Maximum segment cable length: 100 meters using CAT5e or better cabling.

Software specifications.

"NetBox 4 MH Tool" application running on Windows operating systems, that provides the following functionality:

- Device IP address, name and password configuration.
- Device's GPIO configuration and selection of which devices in the network can receive its GPIOs.

"Netbox 4MH" application running on Windows operating systems, that provides the following functionality:

- Concurrent operation from several instances of the same application in order to be able to control the device from different places or to control several devices from the same PC.
- Password controlled access for each device.
- Device's headphone outputs source configuration.
- Stereo pairing configuration for the device's outputs.
- Virtual fader bank to configure the device's microphone inputs and outputs gains.
- GPIOs control and remote activation of remote devices' GPIOs.

"Dante Controller" application running on Windows operating systems, performing the following functions:

- Display all the Dante-enabled devices within the network and their audio channels.
- Identify the Dante-enabled device that acts as clock master and check network configuration.
- Route audio between different devices and check the status of the different existing audio routings.
- Lock and unlock Dante devices.
- Change audio channels' labels.
- Customize receiver latency (delay before playing).

- Save audio routing presets.
- Apply previously saved presets.
- Check and establish configuration options for each device, including:
 - Change device's name.
 - Modify sampling frequency and clock.
 - Display detailed network information.
 - Access the device's web page in order to upgrade firmware and license information (for compatible devices).
 - Identify a device by means of, for example, LEDs blinking (only for compatible devices).
- Check network status information, including:
 - Multicast bandwidth in the network.
 - Transmitted and received bandwidth for each device.
- Device performance information, including latency and packet error statistics.
- Clock status for each device, including the frequency offset and clock events history for each one.

General specifications.

- Dimensions and weight: 44 x 211 x 170 mm; 1.73" x 8.30" x 6.69" (two units in a single rack width). 1 kg (2,2 lbs).
- Power supply: External DC 48V power supply(90 - 264V AC, 47-63Hz) or Power over Ethernet that can be enhanced (PoE+, up to 25.5 watts) or standard (PoE, up to 15.4 watts). When both are present the external DC 48V power supply is used. When the unit is connected to a signaling box or relay GPOs are used, PoE power supply is not enough and PoE+ must be used.
- Power consumption: 21W max. (power consumption of NETBOX 4 MH with an established AoIP connection is 11W; with 4 stereo headphones working at maximum consumption would increase 2W and with a STUDIOBOX fully on it would increase 8W more).
- Cooling: quiet natural convection cooling, compatible with operation inside the studio.
- Temperature operating range: -10 to + 45 ° C (14 to 114 ° F).
- "FR CAB INP" cabling accessories-compatible audio outputs.
- "CP CAB GPIO" cabling accessories-compatible general GPs and GPOs.

Easy to install.

The unit has the width of half a 19" rack, and is provided with two fixing brackets, two lateral plates that can be fixed to the base or top of the unit, and 4 desktop legs.



These options allow the user to install the device in a wide variety of positions:

- As a desktop unit, on its feet.
- As a desktop unit, fixed to the surface with brackets.
- Rack-mounted horizontally or vertically.
- Fixed to a piece of furniture or wall vertically, using the mounting brackets.
- Two devices can be mounted in parallel and installed in a 19" with the mounting brackets.
- One device can be mounted in a 19" with the optional rack kit.

STUDIOBOX control box.

Complementary device designed to interact with a digital console and provide ON AIR signaling through a NETBOX 4 MH.

Power supply: 24V DC through RJ45 connector.

Keys:

- MUTE: Switch Off studio microphones.
- TECH T. BACK: Sends the sound of the microphone to the technician.
- USER KEYS 1-5: Configurable buttons.

Lights:

- GREEN LIGHT: Usually operating as closed microphones indicator.
- RED LIGHT: Usually operating as open microphone(s) indicator.

Dimensions and weight: Diameter: 200 mm. Height: 40 mm. 750 grams.



SCR- 03 control box.

Complementary device designed to interact with a digital console and provide ON AIR signaling through a NETBOX 4 MH.

Power supply: 24V DC through RJ45 connector.

Keys:

- CUT: Switch Off studio microphones.
- CUE: Sends the sound of the microphone to the technician.
- USERS KEYS 1-5: Configurable buttons.

Lights:

- GREEN LIGHT: Usually operating as closed microphones indicator.
- RED LIGHT: Usually operating as open microphone(s) indicator.

Dimensions and weight: Width: 130 mm. Height: 55.3 mm. Depth: 174 mm. 660 grams.



February 2017. Specifications are subject to evolutionary changes. Download the latest version of this manual from www.aeq.es, www.aeq.eu or www.aeqbroadcast.com.

5. A.E.Q. GUARANTEE.

AEQ warrants that this product has been designed and manufactured under a certified Quality Assurance System. AEQ therefore warrants that the necessary test protocols to assure the proper operation and the specified technical characteristics of the product have been followed and accomplished.

This includes that the general protocols for design and production and the particular ones for this product are conveniently documented.

1.- The present guarantee does not exclude or limit in any way any legally recognized right of the client.

2.- The period of guarantee is defined to be twelve natural months starting from the date of purchase of the product by the first client.

To be able to apply to the established in this guarantee, it is compulsory condition to inform the authorized distributor or –to its effect- an AEQ Sales office or the Technical Service of AEQ within thirty days of the appearance of the defect and within the period of guarantee, as well as to facilitate a copy of the purchase invoice and serial number of the product.

It will be equally necessary the previous and expressed conformity from the AEQ Technical Service for the shipment to AEQ of products for their repair or substitution in application of the present guarantee.

In consequence, return of equipment that does not comply with these conditions will not be accepted.

3.- AEQ will at its own cost repair the faulty product once returned, including the necessary labour to carry out such repair, whenever the failure is caused by defects of the materials, design or workmanship. The repair will be carried out in any of the AEQ authorized Technical Service Centre. This guarantee does not include the freight charges of the product to or from such Authorized Technical Service Centre.

4.- No Extension of the Guarantee Period for repaired product shall be applied. Nor shall a Substituted Products in application of this Guarantee be subject to Guarantee Period Extension.

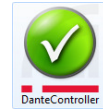
5.- The present guarantee will not be applicable in the following situations:
improper use or Contrary use of the product as per the User or Instruction Manual; violent manipulation; exhibition to humidity or extreme thermal or environmental conditions or sudden changes of such conditions; electrical discharges or lightning; oxidation; modifications or not authorized connections; repairs or non-authorized disassembly of the product; spill of liquids or chemical products.

6.- Under no circumstances, whether based upon this Limited Guarantee or otherwise, shall AEQ, S.A. be liable for incidental, special, or consequential damages derived from the use or from the impossibility of using the product.

AEQ shall not be liable for loss of information in the disks or data support that have been altered or found to be inexact, neither for any accidental damage caused by the user or other persons manipulating the product.

APPENDIX 1. USING "DANTE CONTROLLER" TO CONTROL AUDIO ROUTING.

"Dante Controller" application (developed by Audinate) manages audio over IP routing between devices, so it is complementary to "NetBox4MH" real time control application.

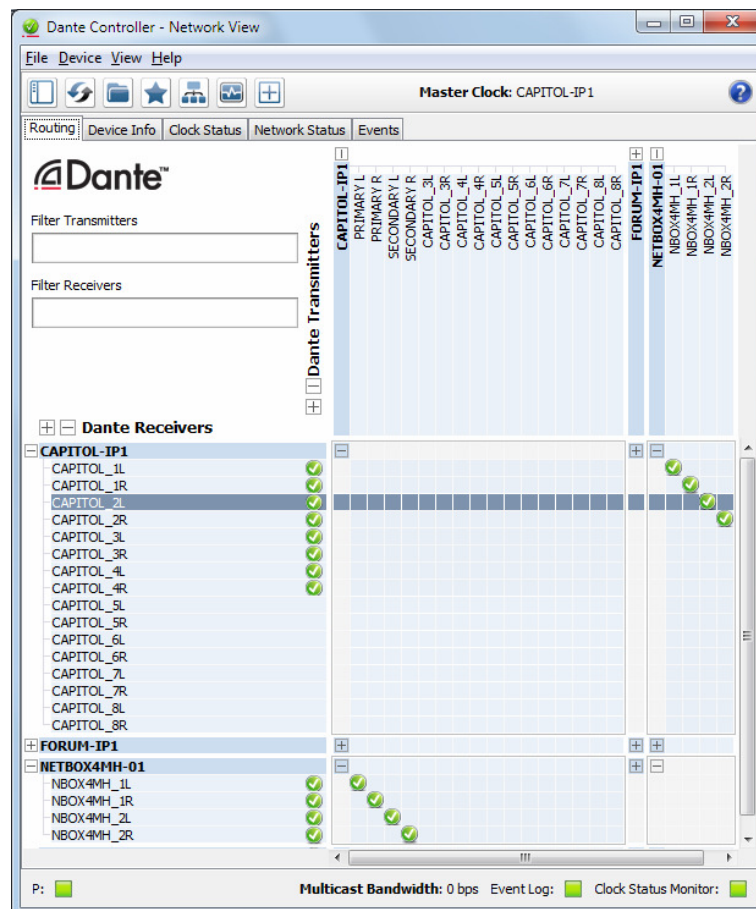


The supplied auto run USB key contains the executable file to install the software.

Please consult the **AEQ AoIP user's manual** for more information (it's also included in the auto run USB key).

IMPORTANT NOTE: NETBOX 4 MH does **NOT** allow **redundant** operation.

A1.1. Using "Dante Controller" to route audio in NETBOX 4 MH devices.



This is a typical Routing window in "Dante Controller". In this example, a bidirectional communication has been established between a NETBOX 4 MH device named "NETBOX4MH-01" and a CAPITOL IP audio console named "CAPITOL-IP1".

"NETBOX4MH-01" sends its 4 channels:
NBOX4MH_1L, NBOX4MH_1R, NBOX4MH_2L and NBOX4MH_2R

which, when properly configured, correspond to:
MIC1, MIC2, MIC3 and MIC4

to the "CAPITOL-IP1" console, which respectively receives them in channels
CAPITOL_1L, CAPITOL_1R, CAPITOL_2L and CAPITOL_2R

This allows sending these channels, already at line level, to be mixed by the console.

In the opposite direction, "CAPITOL-IP1" console sends the channels:

- PRIMARY L
- PRIMARY R
- SECONDARY L
- SECONDARY R

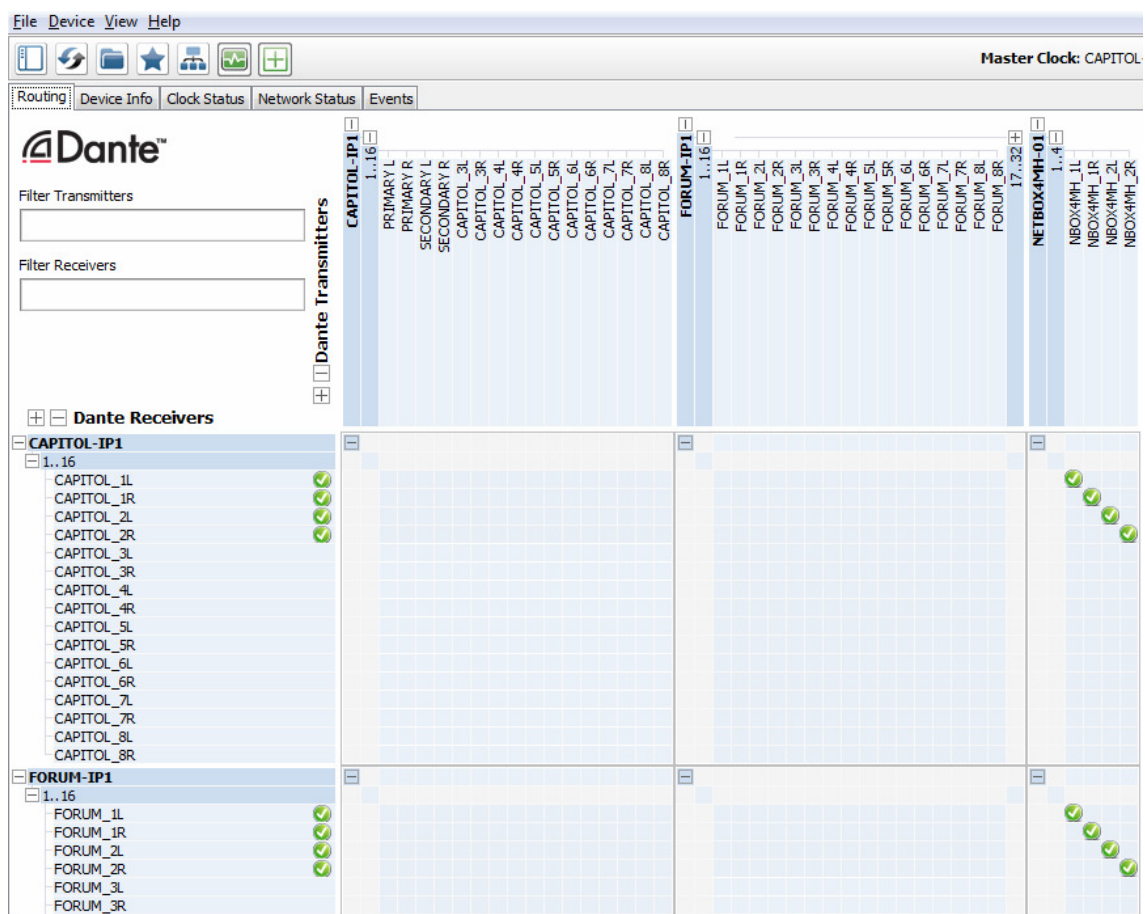
to "NETBOX4MH-01" unit, that receives them in:

Primary Pair: NBOX4MH_1L and NBOX4MH_1R
and

Secondary pair: NBOX4MH_2L and NBOX4MH_2R

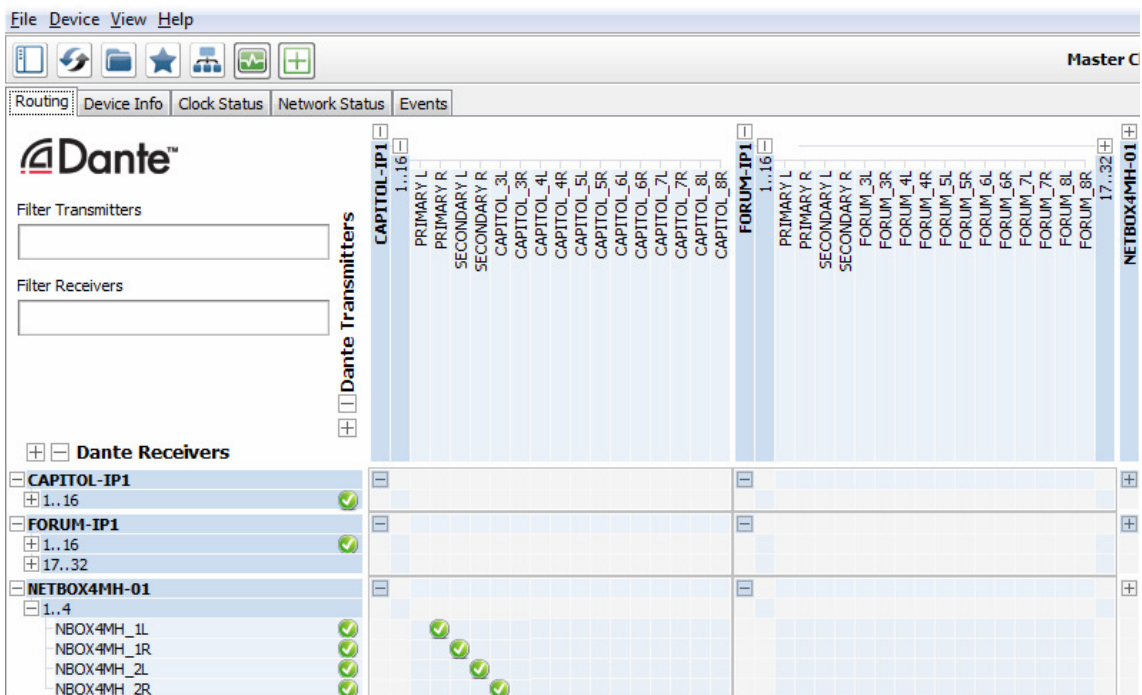
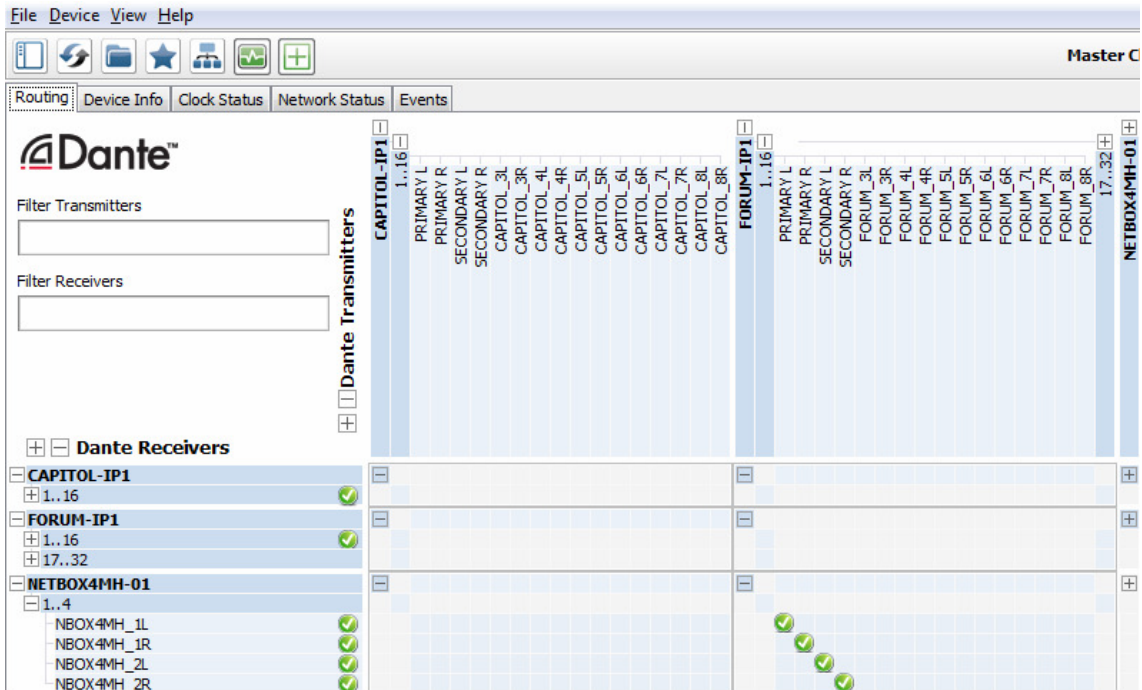
So that they can be internally routed by NETBOX 4 MH to all 4 headphone outputs.

In case that dynamic operation is required using another console, for example the mentioned "CAPITOL IP-1" and another one named "FORUM IP-1", signal from the microphones can be distributed to both consoles in parallel:

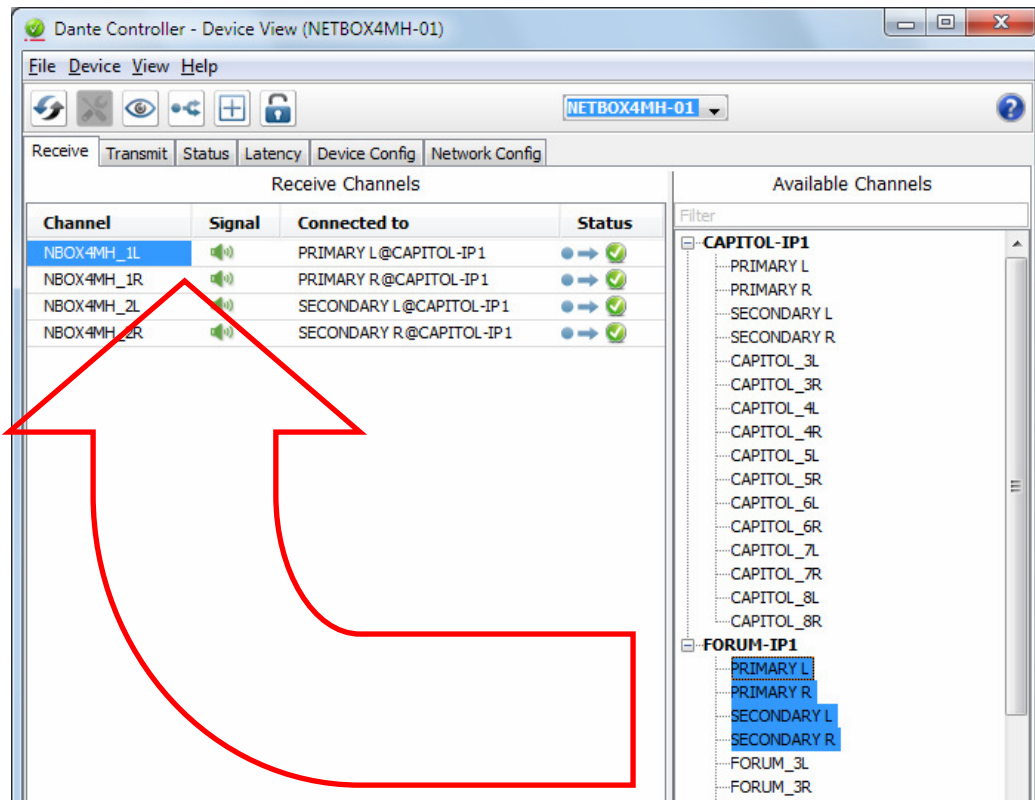


The screenshot shows the Dante network management software interface. At the top, there are menu options: File, Device, View, Help. Below the menu is a toolbar with icons for home, refresh, save, star, network status, and events. The main window is titled "Master Clock: CAPITOL" and has tabs for Routing, Device Info, Clock Status, Network Status, and Events. The "Routing" tab is active, showing a routing matrix. On the left, there are filter boxes for "Filter Transmitters" and "Filter Receivers". Below these are sections for "Dante Transmitters" and "Dante Receivers". The "Dante Receivers" section is expanded to show three devices: CAPITOL-IP1, FORUM-IP1, and NETBOX4MH-01. Each device has a list of channels. The routing matrix shows green checkmarks in the cells where a signal path is active. For example, the PRIMARY L channel of CAPITOL-IP1 is routed to NBOX4MH_1L and NBOX4MH_1R of NETBOX4MH-01. Similarly, the PRIMARY R channel of CAPITOL-IP1 is routed to NBOX4MH_1R and NBOX4MH_2R of NETBOX4MH-01.

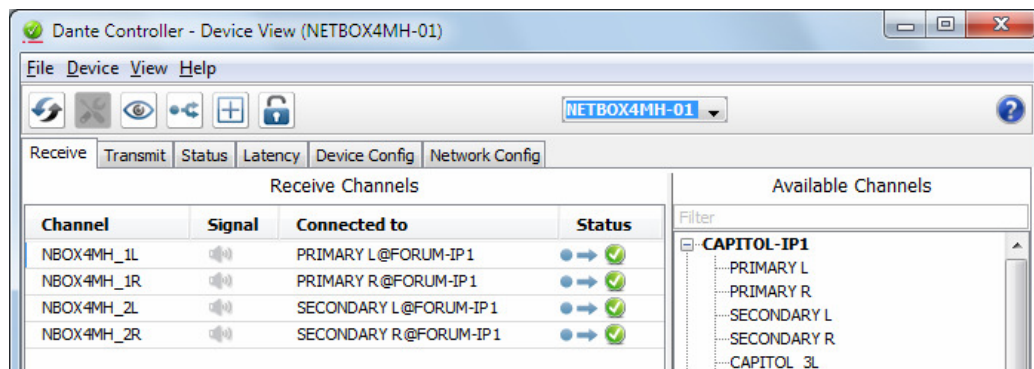
However, it is not possible to receive the signal to be routed to the headphones from two places at the same time, so two crosspoint configurations must be alternatively used:



The simplest way to change studio is by using the "Receive" tab of the "Device View" window corresponding to "NETBOX4MH-01". For example, with the "CAPITOL-IP1" console being connected, we can highlight the "FORUM-IP1" channels that we want to connect and drag them to the first channel to be substituted:



Audio switching will be immediate, even if the crosspoint display may take a few seconds to be updated:



APPENDIX 2. MANAGING AUDIO IN COMBINATION WITH FORUM AND CAPITOL MIXING CONSOLES.

A2.1. Example: STUDIOBOX (or SCR-03) control box - NETBOX 4 MH - CAPITOL IP.

A2.1.1. Setting up devices and wiring.

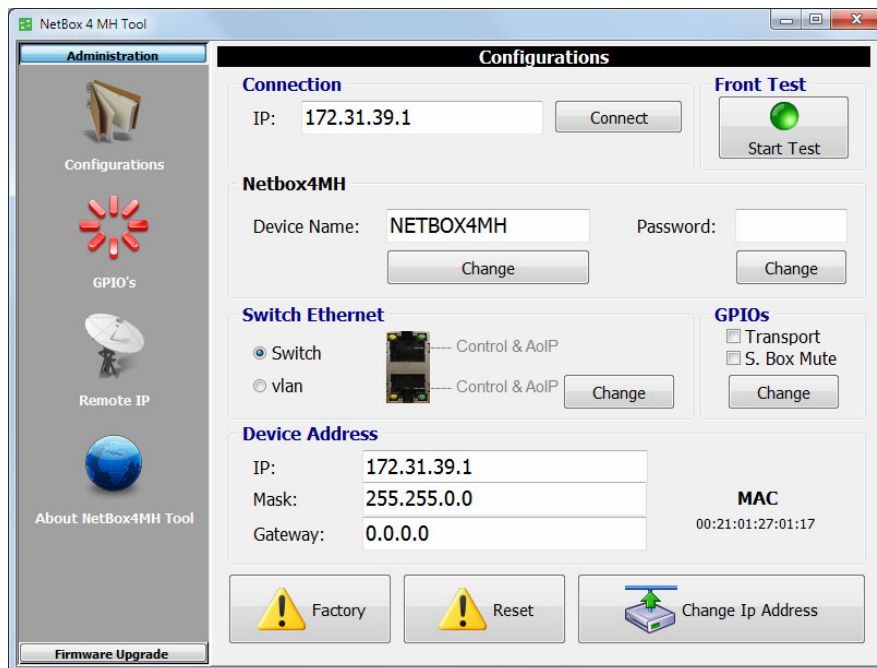
- Set up IP connections between PC, console and NETBOX 4 MH in “switch” mode, or, preferably, in star topology using an external switch, that must have PoE+ (or PoE) power supply output in case that NETBOX 4 MH gets its power from the switch.
- Connect all local area network devices and turn both NETBOX 4 MH and the mixing console on .
- If microphones are to be connected, please check that LIN/MIC switch associated to the 4 inputs are in the outside position, and that the only pressed 48V switches are those corresponding to inputs where condenser microphones are connected.
- Check that the digital mixing console has the corresponding AoIP option properly installed and configured, according to its manual.

A2.1.2. Preparing the PC and software applications.

- Prepare one or several PCs with the configuration and control applications installed as explained in section 3.
- Two different IP ranges must be assigned, one for audio and another one for control.
- If two network cards are installed in the PC as in the example (control 172.31.39.x, audio 192.168.0.x) there is complete freedom to assign the IP address ranges.
- If the PC doesn't have two network cards installed, the control IP address range must be higher than the audio network.

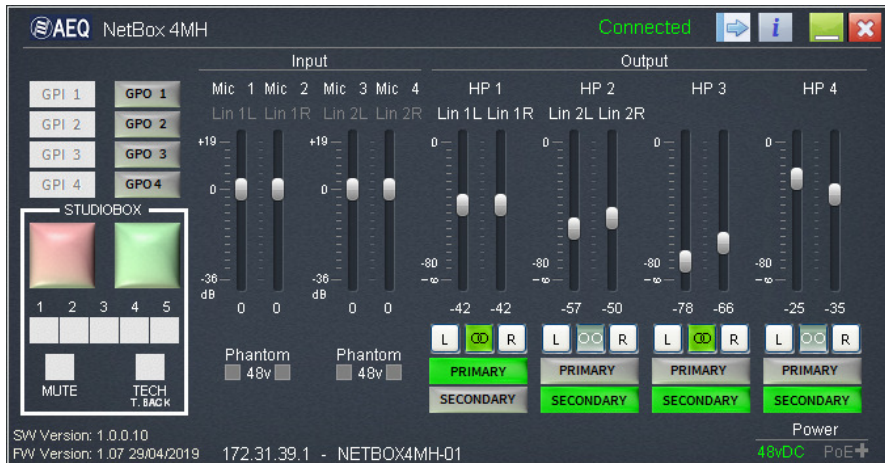
A2.1.2.1. "NetBox 4 MH Tool".

The only things that need to be configured at this point in "NetBox 4 MH Tool" application are the device's name, control IP address, and, if required, a password for the NETBOX 4 MH. As a rule of thumb, it is recommended that the "Switch Ethernet" is set to “Switch” mode in order to save wiring. For more information, consult section 3.2 of this manual.



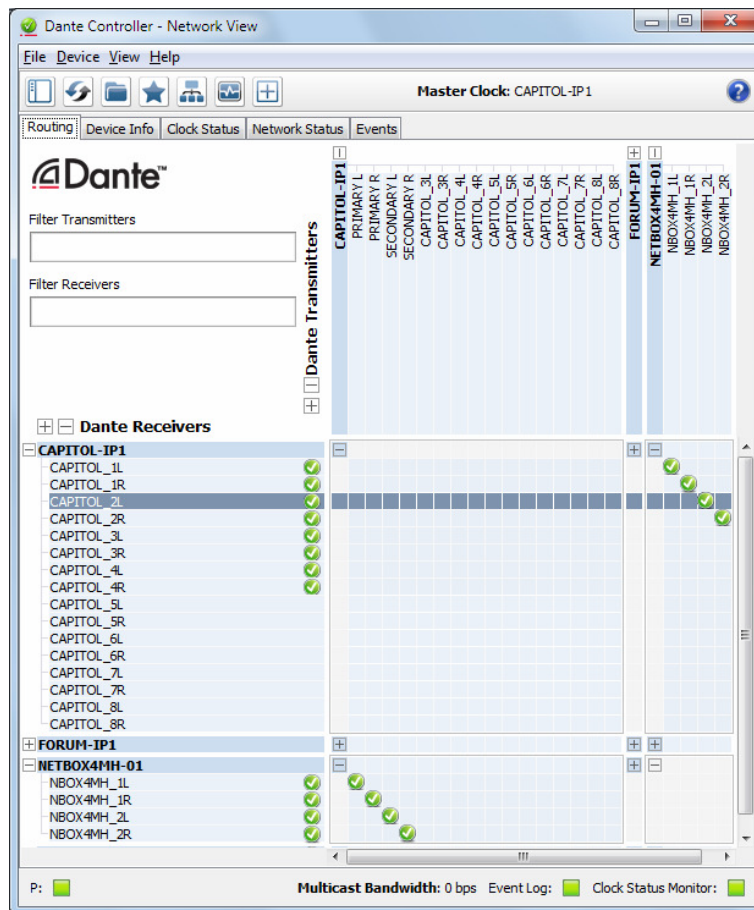
A2.1.2.2. "Netbox4MH" real time control.

Once the unit is configured, the "NetBox4MH" real time control application can be opened.



If microphones are used, check that the corresponding inputs have the Mic option highlighted, and that only the inputs where condenser microphones are connected also have the Phantom 48V option highlighted. Otherwise, act on the device's switches.

A2.1.2.3. "Dante Controller".

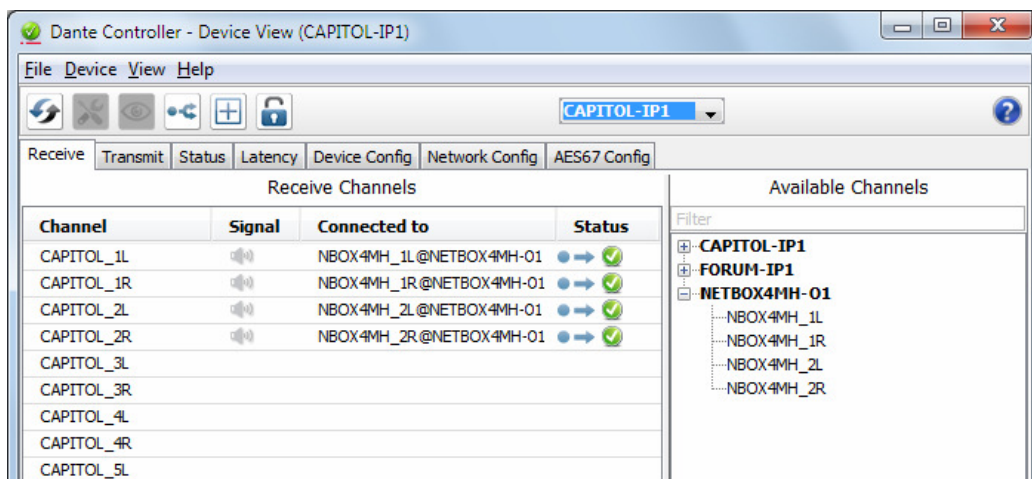
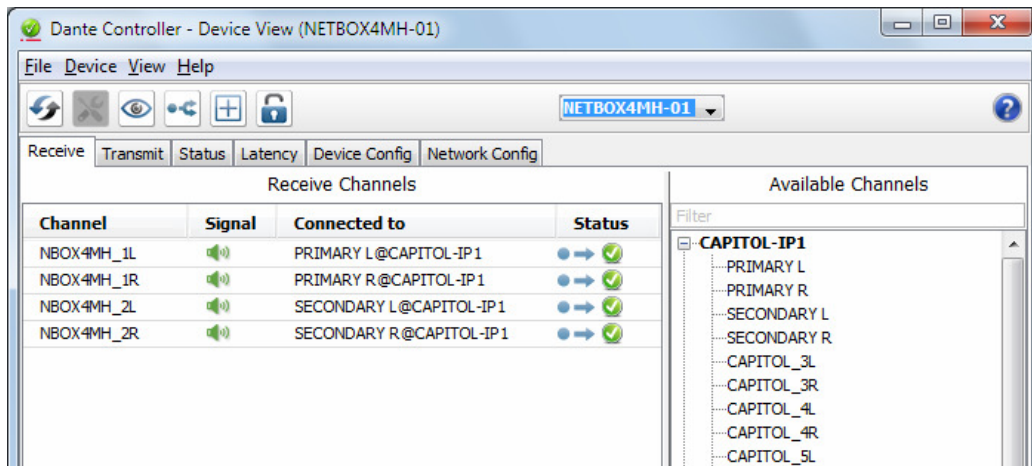


In this "Dante Controller" routing window, we can get information about the crosspoints to be made.

Crosspoints need to be established to send the audio from the "CAPITOL IP-1" console studio monitoring channels, named PRIMARY and SECONDARY, to the input circuits of "NETBOX4MH-01": NBOX4MH_1L, NBOX4MH_1R, NBOX4MH_2L and NBOX4MH_2R.

In the opposite direction, all 4 "NETBOX4MH-01" transmission channels are crossed to "CAPITOL IP-1" receivers: CAPITOL_1L, CAPITOL_1R, CAPITOL_2L and CAPITOL_2R.

These crosspoints can also be displayed and activated in the "Receive" tab of the "Device View" windows of "NETBOX4MH-01" and "CAPITOL IP1" devices.



Checks:

- Send a test audio signal in both directions.
- Check that all devices are visible in the application's "Routing" screen. Check that the indicators in the "Signal" column in the "Transmit" tab of the "Device View" corresponding to each device are displayed in green, indicating that the transmitting devices are putting audio into the network.

Monitoring and creating routings:

- Prepare the receiving channels in the devices (mixing consoles and NETBOX 4 MH) to receive and monitor audio.
- Subscribe, as seen in the pictures, the audio input channels within each device, to the output channels in the others.

Optimization:

- Check the audio quality and, if possible, adjust latency.
- If possible, substitute unicast flows with more than two subscriptions by multicast flows (not mandatory in networks that are not overloaded).
- Define switching groups, especially in order to simultaneously switch stereo pairs and to change studios.

APPENDIX 3. SIGNALING AND CUT FUNCTIONS INSTALLATION WITH FORUM AND CAPITOL CONSOLES.

A3.1. Example: STUDIOBOX (or SCR-03) control box - NETBOX 4 MH - CAPITOL IP.

In this example, a typical scenario in radio studios will be explained, where the several participants in a program have microphones and headphones located in a booth, connected via a Dante network to the mixing console (CAPITOL or FORUM IP) in the annexed control room. By means of a NETBOX 4 MH in the booth, those audio signals are sent and received to / from the studio mixing console (CAPITOL or FORUM IP) through a Dante network. Additionally, the commentators have a STUDIOBOX (or SCR-03) control box in front of them, which is connected to the NETBOX 4 MH itself, allowing it to send commands and control its signaling lights using the mentioned mixing console.

In this example, these will be the actions to perform in the mixing console:

- The control box signaling lights will be used as follows: RED light will be ON when any of the booth's microphone inputs is ON. The GREEN light will turn ON in the opposite case (both lights are mutually excluding).
- MUTE (or CUT) key will cut the first input sent to the console ("MIC1"), and TECH T. BACK (or CUE) key will activate its PFL (prefader listening).
- The 4 first user keys (USER KEYS 1 to 4) will activate / deactivate each of the 4 microphone lines ("MIC1" to "MIC4") sent by NETBOX 4 MH.
- Fifth key (USER KEY 5) will control a light in the console that will blink indicating the studio technician that the commentators need some help.

Device data:

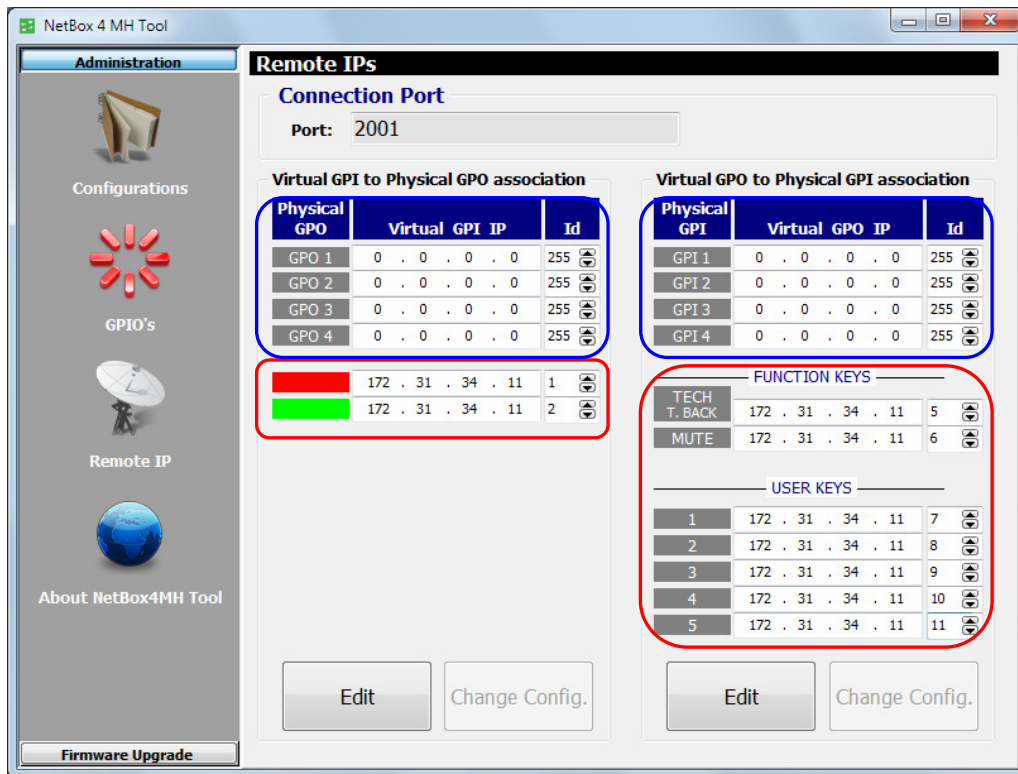
- NETBOX 4 MH IP address: 172.31.39.4
- CAPITOL IP IP address: 172.31.34.11

Physical connection of the STUDIOBOX (or SCR-03) to NETBOX 4 MH, that will be located in the booth, is direct as, besides generic GPI/O interfaces, the later features two I/O interfaces that are completely compatible with this booth control box: one is for signaling outputs for 2 lights, and another carries 2 dedicated key (MUTE + TECH T. BACK; or CUE + CUT) inputs plus 5 more general-purpose keys. Two RJ-45 connectors are used, and their pinout is detailed in section **2.3** of this manual.

In order to obtain more details about the physical connection, please check section **2.2.3**.

Once the box is connected, NETBOX 4 MH device must be configured by means of its configuration application, "**NetBox 4 MH Tool**", in order to define the virtual GPOs to be sent in response to each box's key, the Virtual GPIs that will activate its RED and GREEN lights, as well as the remote device IP address (a mixing console, in this case), plus a unique identifier for each one.

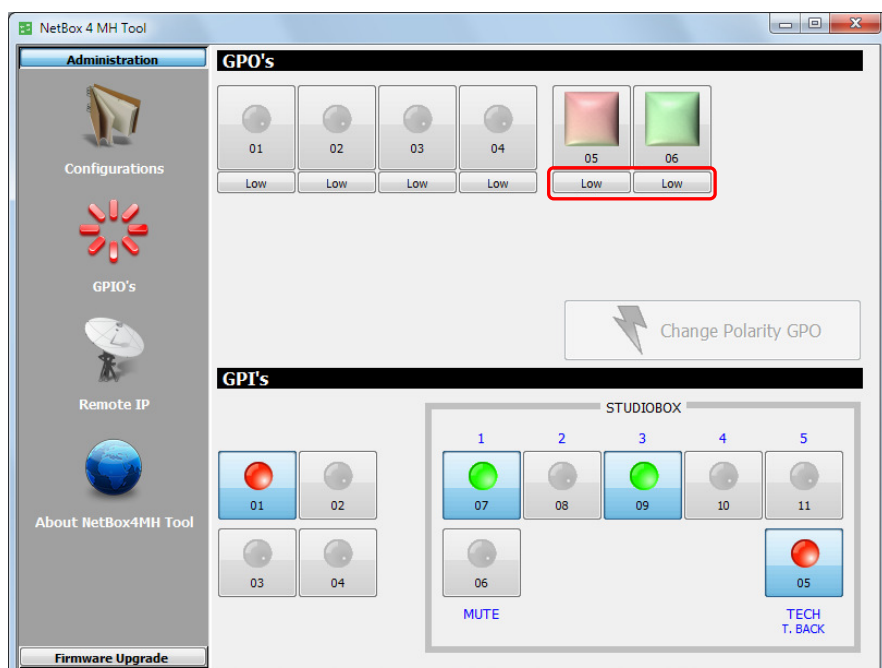
NOTE: In order to manage the control box by means of virtual GPIOs, it's necessary that the "**GPIOs Transport**" option is **NOT** activated (see section 3.2.2.1 of this manual).



The virtual GPIs and GPOs associated to the control box have been marked in red in this picture. Note that the unit also features 4 physical GPIs and 4 GPOs for general purpose applications (circled in blue), available through a DB15H connector in the unit back panel.

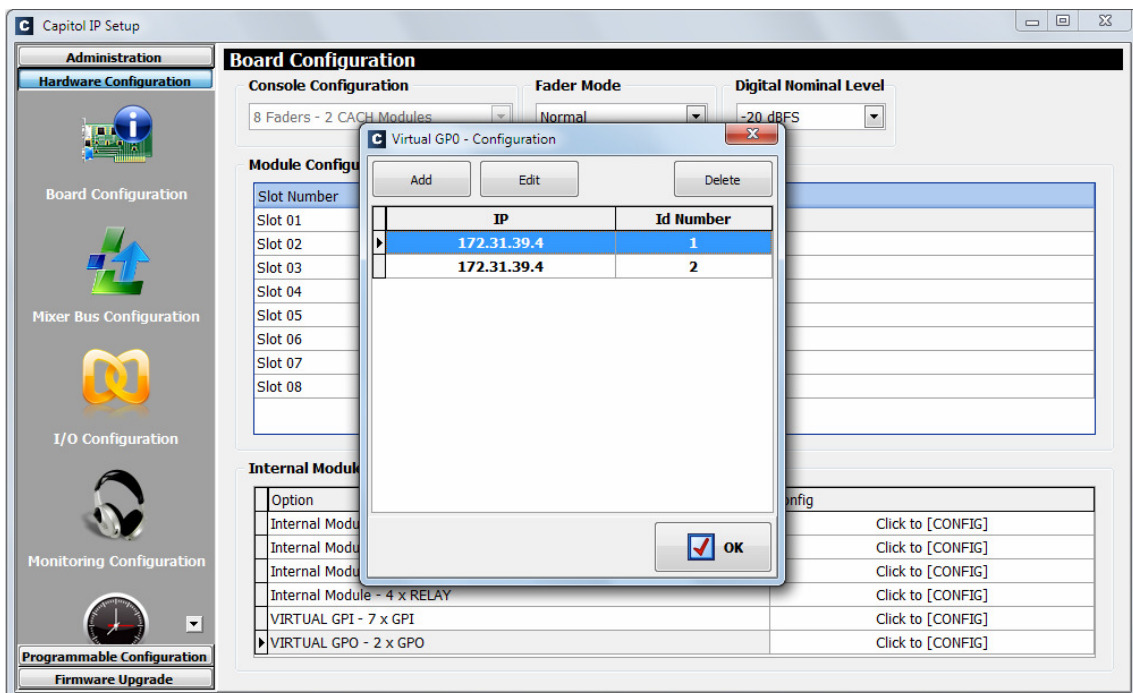
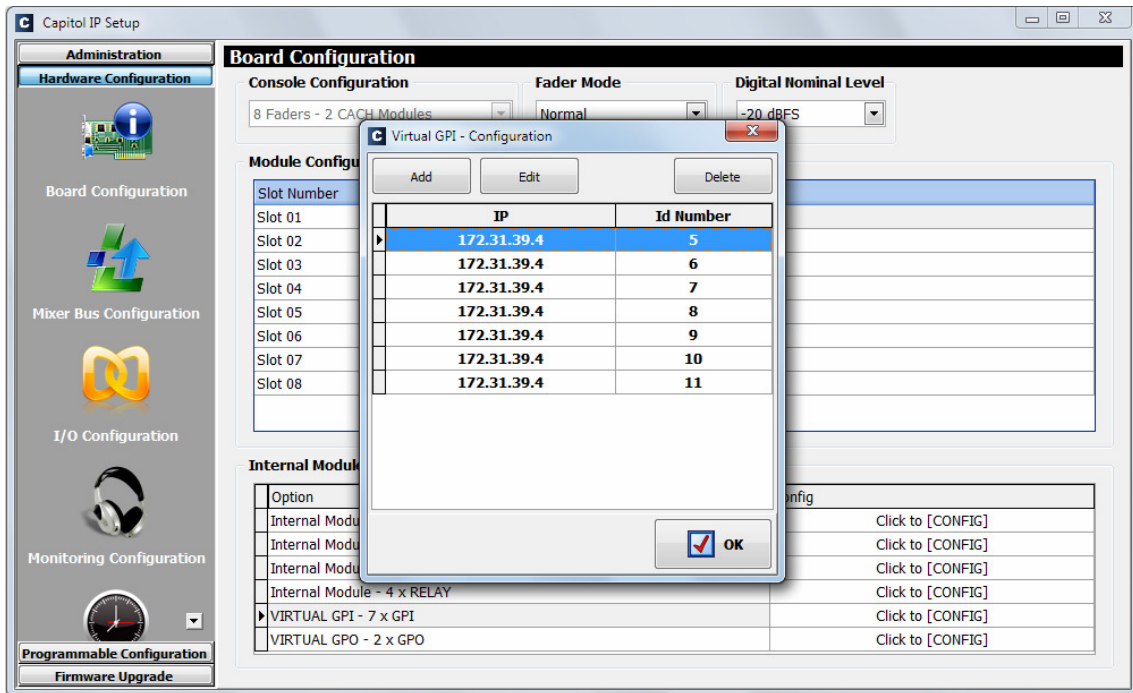
As seen in this example, the mixing console IP address is 172.31.34.11, and virtual GPIs with "Id" 1 and 2 are used for the lights, while virtual GPOs with "Id" 5 to 11 are used for the dedicated and user keys. Once one of the sections is configured (by previously pressing the "Edit" button), press the associated **"Change Config."** button in order to apply the changes and, once the reset of the unit is produced, configure the other section, by pressing "Edit" and then "Change Config." (then the unit will reset again).

It is also important to define the proper activation polarity for the lights (they must be active-low). This is configured in the **"GPIO's"** submenu of "Administration" menu:

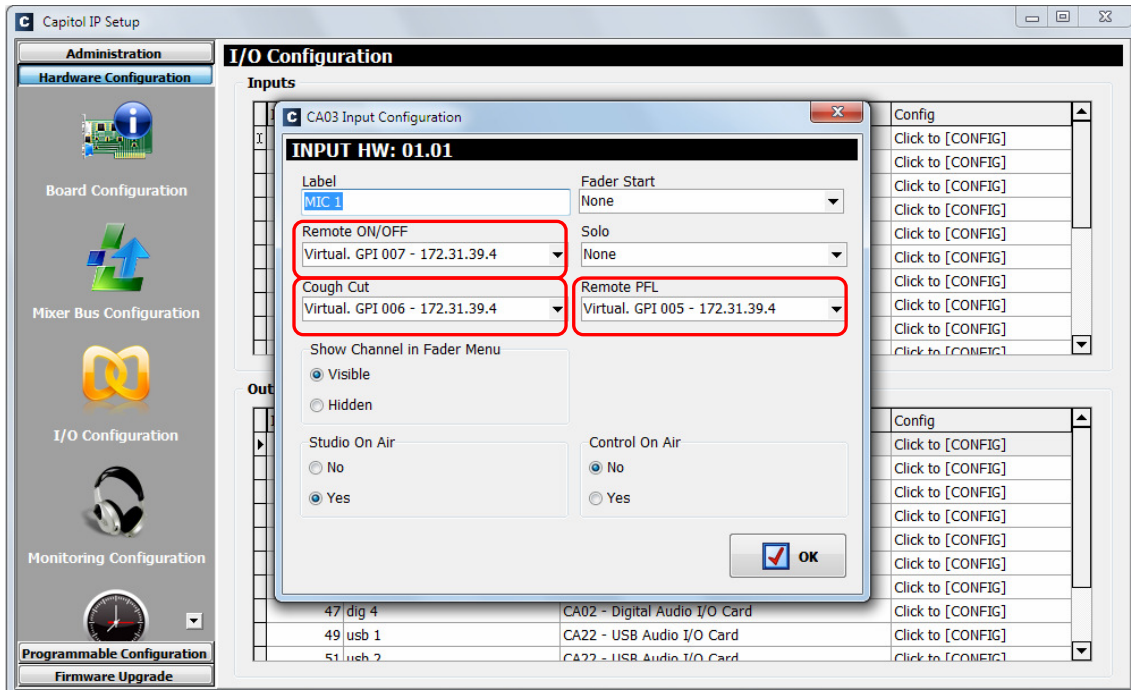


Once the functionality to perform in the console has been defined, its own configuration software "Capitol IP Setup" will be used to realize it.

First, we will define which Virtual GPI and GPOs to use, filling in NETBOX 4 MH IP address (172.31.39.4), preserving the same identifiers configured in NETBOX 4 MH. In total, there are 7 virtual GPIs and 2 virtual GPOs to be configured in the "Board Configuration" submenu of "Hardware Configuration" menu. Please check section 4.2 of CAPITOL IP user's manual.

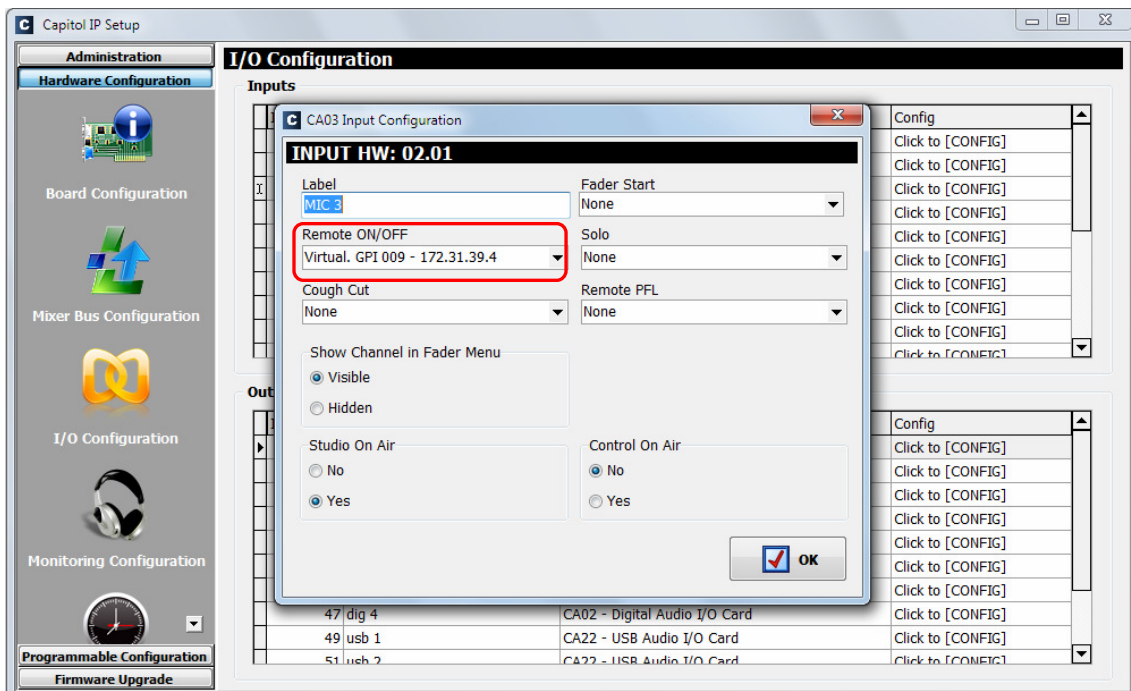


In order to define the function associated to each Virtual GPI, we need to go to each input configuration. Within MIC1, we will associate the "Cough Cut" function to virtual GPI 6 and "Remote PFL" function to virtual GPI 5. The "Remote ON/OFF" function will be associated to virtual GPI 7. This function will be configured in the "I/O Configuration" submenu of "Hardware Configuration" menu, selecting input "MIC 1".

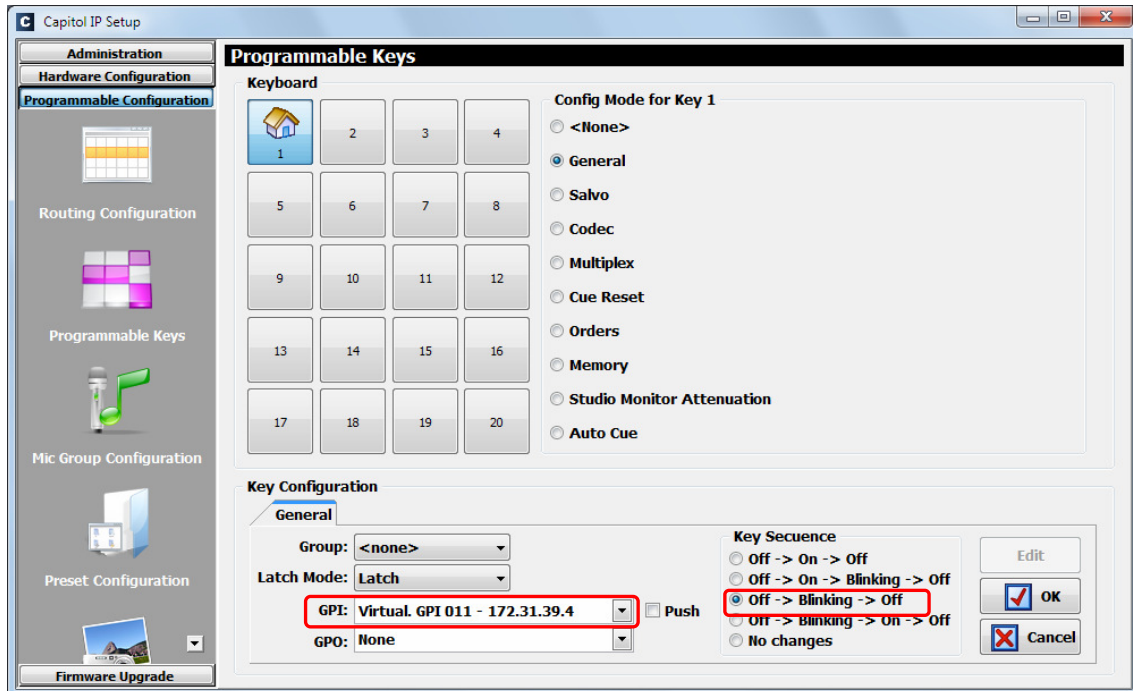


Only the "Remote ON/OFF" function will be configured for the rest of microphones (MIC2 to MIC4), and it will be assigned to STUDIOBOX (or SCR-03) USER KEYS 2, 3 and 4, respectively.

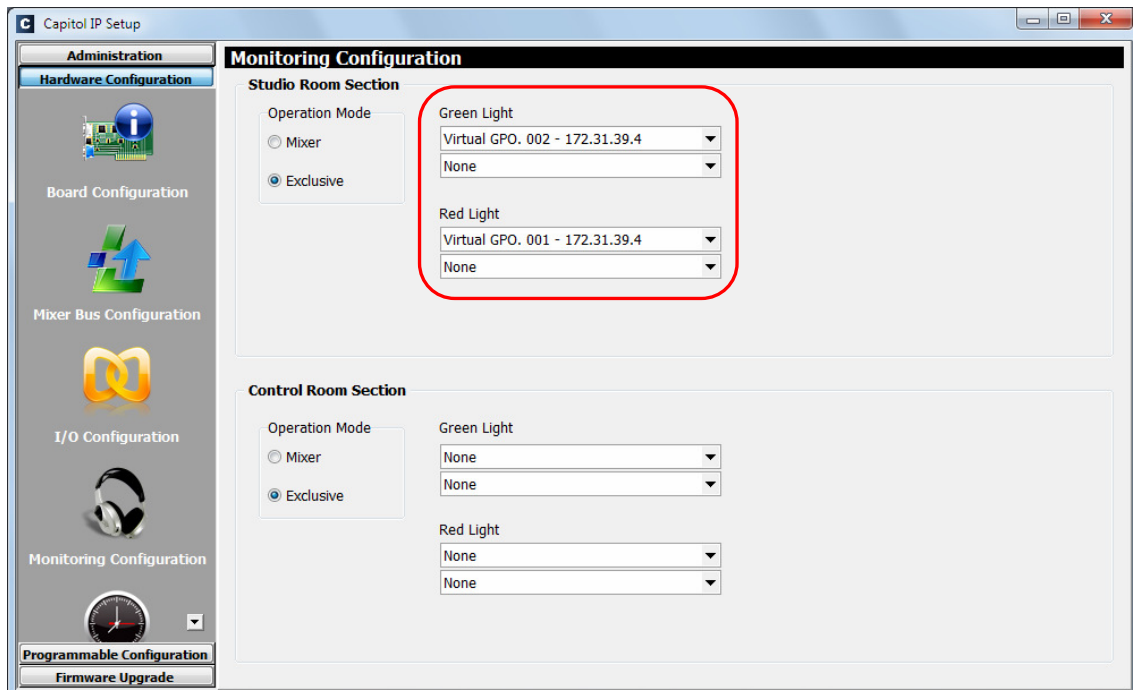
For example, this corresponds to Virtual GPI 9 for MIC 3. This is defined in the "I/O Configuration" submenu of "Hardware Configuration" menu, selecting input "MIC 3":



The last input to configure in the console will be association of the USER KEY 5 of STUDIOBOX (or SCR-03) to the activation of a programmable key in the console (in blinking mode), that will warn the technician at the studio that the commentators need some assistance. This is done under in the **"Programmable Keys"** submenu of "Programmable Configuration" menu (see section 4.3.2 of CAPITOL IP user's manual).



Last, we need to configure console signaling using virtual GPOs, under "Studio Room Section" of **"Monitoring Configuration"** submenu of "Hardware Configuration" menu (see section 4.2.4 of CAPITOL IP user's manual), and we will assign virtual GPO 1 and 2 to red and green light, respectively.



NOTE: There is another way to mute the NETBOX 4 MH microphones from the keys of the STUDIOBOX by means of "S. Box Mute" option (see sections 2.3 and 3.2.2.1 of this manual).

APPENDIX 4. ADDITIONAL INFORMATION.

NOTE: This equipment complies with the limits for a Class A digital device, pursuant to part 15 of the **FCC** Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.



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Product includes license from Audinate Pty Ltd under US patent number(s) 7747725, 8005939, 7978696, 8171152 and others. Visit Audinate website for more details on Dante:
<http://www.audinate.com/>