AEQ Audio Over IP Routing System

IP-based multi-channel audio network

- **ARENA Console / BC2000D Matriz: BC2214 & BC2224 boards.**
- **FORUM - GRAND FORUM Console: FR14 board.**
- **CAPITOL IP Console.**
- **NETBOX 32 AD Audio Interface.**
- **NETBOX 8 AD Audio Interface.**
- **Dante Virtual Soundcard.**

USER´S MANUAL
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Software Versions:
Dante Controller 3.5.6.2 or higher
Dante Virtual Soundcard 3.7.0.22 or higher
Dante Firmware Update Manager 1.4.13.2 or higher

CONTENTS

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).

At the same time, in the near future we are open to adapt this solution to other technologies that are currently under development, in order to be compatible with other manufacturers, as they start to become mature and widely available.

1.2. Description of the devices covered by this manual.

1.2.1. ARENA Console / BC2000D Matrix. BC2214 and BC2224 boards.

BC2214 and BC2224 AoIP boards are designed to be installed in BC2000D frames used in AEQ ARENA digital mixing consoles and AEQ TITAN / BC2000D routers. Both boards have two Ethernet ports (LAN1 and LAN2) with activity LEDs.

BC2214 board allows you to connect via IP up to 32 input and 32 output channels to/from the BC2000D internal TDM bus system. This is enough to provide IP connectivity to an ARENA console in a network, what is equivalent to an up to 512x512 channels IP matrix.

BC2224 board allows you to connect via IP up to 64 input and 64 output channels to/from the BC2000D internal TDM bus system.

In order to build a large sized router, a BC2000D frame can be equipped with as many BC2214 or BC2224 boards as needed; they can be connected to one or several Gigabit Ethernet networks, enabling TDM-IP "hybrid" routers with great flexibility.

Besides several AoIP BC2214/BC2224 boards, the BC2000D frame can be equipped with a number of synchronous TDM access ports such as MADI (BC2211/BC2212) or the 1024 channels BC2213 (HSAL), as required, in order to create a large routing structure.

1.2.2. FORUM - GRAND FORUM console. FR14 board.

FR14 AoIP board is installed as any other input/output board at the rear panel of the FORUM console. It allows you to connect up to 32 input and 32 output channels to the unit's TDM bus. The FR14 board features two Ethernet ports (LAN 1 and LAN 2), both including activity LEDs. The same console can be equipped with up to two FR14 AoIP boards. It is not compatible with the MADI option, so in case one AoIP board is configured in the console, the MADI option will not be available.

1.2.3. CAPITOL IP Console.

CAPITOL IP is an 8 channel digital mixing console. Its performance is based on the CAPITOL console and the experience gained with this model. The control surface has been redesigned with new silent buttons, more programmable keys and a new arrangement of the monitoring section controls.

IP connectivity in CAPITOL IP console is implemented through a single module with 16 input and 16 output channels incorporated in its core, and excludes MADI connectivity. So the rear panel is similar to the former model with two precut holes for both Ethernet connectors. Depending on the configuration, the unit may come either with the Ethernet connectors or the MADI optical connector - or without any of these options - but never with both at the same time. CAPITOL IP consoles can have a single multichannel access: IP or MADI.

1.2.4. NETBOX 32 AD Audio interface.

NETBOX 32 AD is an interface for multi-channel AoIP. It allows for the Audio Input and Output system connectivity atlocations where the installation of AEQ digital consoles is not planned. NETBOX 32 AD features 32 input and 32 output channels organized in 16 mono analog and 8 stereo digital channels. The stereo digital audio channels can be configured as AES/EBU or SPDIF standard. It also incorporates 16 GPI and 16 GPO (each GPIO connector includes a power supply pin to feed the external circuitry). Due to its high input and output capacity, it is especially suitable for central controls and link dispatches and also to increase or distribute the capacity of TDM BUS matrices such as the AEQ BC2000D. Dimensions (height x width x depth, in millimeters): 44 x 482 x 361. Weight: 4.5 Kg.

1.2.5. NETBOX 8 AD Audio interface.

NETBOX 8 AD is an interface for multi-channel AoIP. It allows for the Audio Input and Output system connectivity atlocations where the installation of AEQ digital consoles is not planned. NETBOX 8 AD features 8 inputs and 8 outputs, organized in 4 mono analog and 2 digital stereo channels. Stereo digital ones can be configured as AES/EBU or SPDIF standards. The second digital stereo channel can also be switched to a USB connector to ease the connection to an audio workstation. It also provides 4 GPI and 4 GPO. The GPO port includes a power supply pin to feed the output circuitry. Due to its small footprint, it can be useful to give IP access to analog or digital consoles that are not ready for this type of connectivity from factory, for recording rooms, talk-rooms or any other auxiliary location. Dimensions (height x width x depth, in millimeters): 44 x 211 x 300. Weight: 1.8 Kg.

1.2.6. "**Dante Virtual Soundcard**".

Being an open system, any third-party device compatible with DANTE technology can be incorporated. Among them, the "Dante Virtual Soundcard" is especially interesting, as a complement to the equipments presented by AEQ. This software can be downloaded, in trial and full versions at www.audinate.com. Chapter 5 in this manual explains how to configure and operate it.

Any computer with "Dante Virtual Soundcard" installed can receive and send channels from / to AEQ consoles and matrixes. It is very useful for monitoring and intercom purposes from the network control stations where the "**Dante Controller**" application, described below, is installed.

1.2.7. Control Software "Dante Controller".

The system is able to auto detect all DANTE-enabled equipment that can provide Audio within the network. Through the "Dante Controller" application installed on one or more computers on the network, the user can choose among the available audio channels which one should be received from the different consoles or interfaces. The application is very comprehensible and easy to operate. Chapter 4 in this manual explains how to operate it.

Compatibility with other manufacturers is absolute. "Dante Controller" software makes the different IP access cards work together, no matter which manufacturer provides the equipment they are installed in.

1.3. General Features.

- Up to 512 audio channels in each Gigabit Ethernet network. Possibility of integration of several networks in a TITAN / BC2000D 5120 x 5120 circuit concentrator.
- Double Ethernet Audio over IP connections in all AEQ consoles and digital matrices.
- Standalone, double audio over IP interfaces, making audio input and output connections to central controls, link dispatches, analog studios, reporter cabins and any other locations where an AEQ digital mixing console is not available an easy task.
- The system is usually structured as a star-topology using Gigabit Ethernet switches.
- For smaller installations, the system can be cascaded or "daisy chained", as network interfaces are duplicated.
- Where maximum availability is a design goal, the network can be wired with duplicate switches, ensuring uninterrupted operations with redundant paths.

1.4. Operation of the AEQ AoIP system based on DANTE.

1.4.1. Discovery and auto-configuration.

When a Dante-enabled device is connected to an IP/Ethernet network, it will automatically:

- Configure its IP address.
- Advertise itself to allow automatic discovery.

Within seconds of a Dante-enabled device connecting to a network, "Dante Controller" will automatically discover and display the device, allowing you to configure channels and route audio.

Network automatic configuration.

A Dante-enabled device connected to a network will automatically setup its own network configuration, including its IP address.

If the network has a DHCP server, which may be the case for installed networks, it will receive its IP configuration using the standard DHCP protocol.

On a network without a DHCP server, which may be the case for temporary or smaller networks, the Dante-enabled device will automatically assign itself an address using link local protocols, in the same way PCs and printers often do.

Automatic discovery.

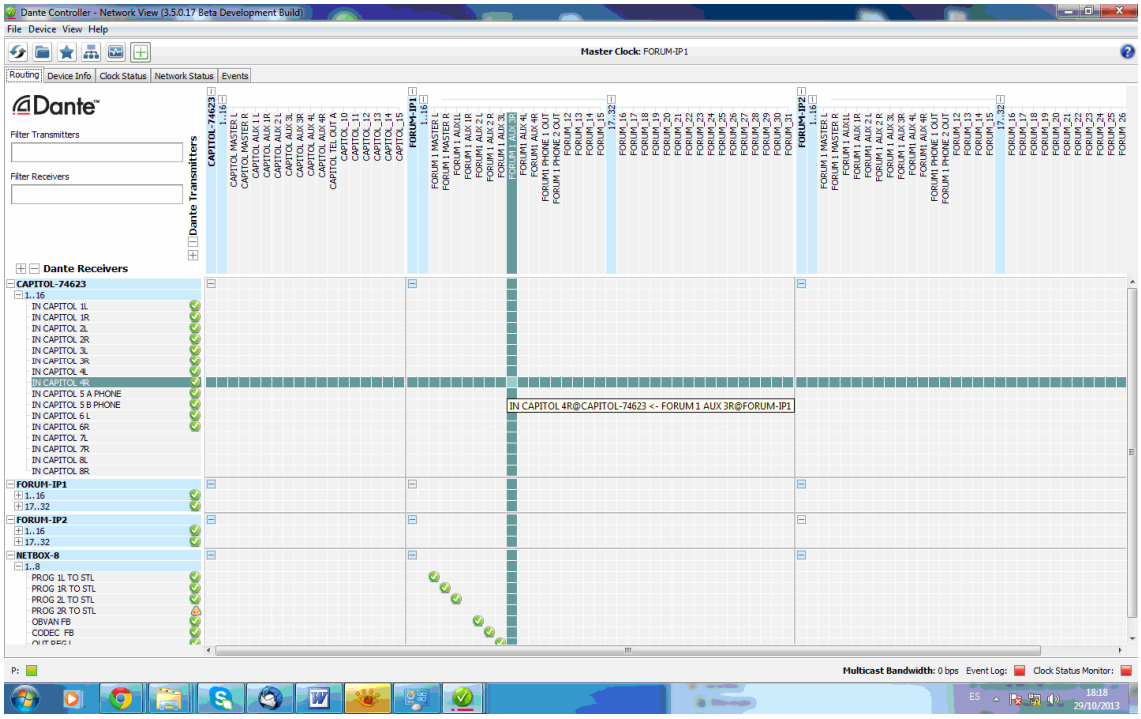
A Dante-enabled device will advertise information about itself to other Dante devices and “Dante Controller”, including:

- Device name.
- Audio channel labels.
- Number of audio channels.
- Sample rates and bit depths.

This information can be seen when viewing a device on “Dante Controller”, and allows Dante devices to determine compatibility with other devices, such as compatible sample rates to allow audio to be routed.

Device Channels.

A Dante device has a number of channels associated with it. These are either transmit (Tx) or receive (Rx) channels. Receive channels and devices are listed down the left side of the grid. Transmit channels and devices are listed along the top of the grid.



Transmit channels are advertised on the network. A receiver uses this advertisement to establish a subscription to the channel. A transmit channel can be sent to multiple receivers using unicast or multicast.

Receive channels are connected to transmit channels via a subscription. Each receive channel will receive audio over the network from at most one transmit channel. Chapter 4.7.4.1 explains this in detail.

1.4.2. Differentiating between input and output channels.

Channels are classified according to whether they put audio data onto, or take audio data off the network:

- A channel that puts audio data onto the network is known as a transmitter, Tx or output channel.
- A channel that takes data off the network is known as a receiver, Rx or input channel.

1.4.3. Device Names and Channel Labels.

In Dante, devices and audio channels are identified by names and labels. Device names and channel labels can be customized.

IMPORTANT NOTE: Device names must be unique on a Dante network. Channel labels must be unique on the device.

Dante routing is performed using the device names and channel labels. A receive channel can be subscribed to the name of a transmit channel at a device.

Example: "Analog_L@FORUM-IP 1" describes a channel labelled "Analog_L" on a device named "FORUM-IP 1".

If a device or channel is renamed, Dante routing considers it to be a different device or channel. If a new device or channel is then given the old name, Dante routing will route from the new device in place of the previous device.

Example: The power supply on “Netbox 3” fails and “Netbox 3” needs to be replaced. The old "Netbox” is removed, and a new “Netbox” is plugged in and named "Netbox 3". Dante receivers previously subscribed to the old "Netbox 3" will now automatically restore their subscriptions to the new "Netbox 3".

Device names must be unique on the network. If you attempt to rename a device using “Dante Controller” to a name that is already in use on the network, “Dante Controller” will notify you and reject the name change.

Example: There is an existing device on the network called “MY16 - Slot1”. If user attempts to rename another device to “MY16- Slot1” “Dante Controller” will notify you that the name is already in use. The device will not be renamed.

If a new device is added to the network with a name that already exists, a name conflict is detected, and one of the devices will rename itself by appending (2) to its name. This device will not be able to transmit audio until it is renamed.

NOTE: A device that has been renamed with (2) appended (e.g. “MY16- Slot1 (2)”) will NOT BE ABLE to transmit audio until it is renamed. The device name must be changed by the user to be a valid non conflicting name before the device can become fully functional.

Rules for Names and Labels.

- All Dante names and labels are up to 31 characters in length. Name and label comparisons are caseinsensitive; “Guitar” and “guitar” are treated as the same label. Unicode and non-roman characters are not supported.
- Device names should follow Domain Name System (DNS) hostname rules. Legal characters are AZ, a-z, 0-9 and '-' (dash or hyphen).
- Tx channel labels may use any character except '=' (equals), '.' (full stop or period) or '@' (at). Tx channel labels must be unique on a device. Tx channel labels do not need to be unique on the network as they are always qualified by device (channel@device).
- RX channel labels follow the same rules as Tx channel labels.

1.4.4. Routing Audio.

Routing Terminology.

Device: A device means a Dante-enabled device, and more specifically that component of the audio equipment that implements the Dante interface. A Dante device typically has Tx and Rx channels and other routing-related properties.

Transmit (Tx) channel: A transmit channel transmits audio from the audio hardware onto the network.

Receive (Rx) channel: A receive channel receives audio from the network and sends it to the audio hardware.

Flow: Dante audio routing creates flows. Each flow carries several channels of audio from a transmitter to one or more receivers. Unicast routing creates flows to single receivers. Multicast routing creates flows that can be received by multiple receivers. Multicast flows are assigned IDs enabling them to be identified in “Dante Controller”.

Unicast routing: Unicast flows are point-to-point from a single transmitter to a single receiver. Unicast flows typically have room for 4 channels of audio.

Multicast routing: Multicast flows are one-to-many from a single transmitter to any number of receivers.Use “Dante Controller” to choose which channels are to be multicast. Unlike unicast routing, multicast flows consume network bandwidth even if there are no receivers, but do not require additional bandwidth to add more receivers.

Subscription: A subscription configures a receive channel (Rx) to receive audio from a transmit channel (Tx) on another Dante device.

Subscription status: For a receive channel, subscription status indicates whether it is subscribed, whether it is receiving unicast or multicast audio, whether the subscription is OK, or whether an error has occurred.

Subscription.

Dante routing is performed by associating a receiving (Rx) channel with a transmitting (Tx) channel. This is called subscription.

Example: Route Tx channels 1 and 2 (labeled “Audio L” and “Audio R”) on the device labeled “Source” to Rx channels 3 and 4 on the device labeled “Dest”.

Rx channels 3 and 4 on “Dest” are subscribed as follows:

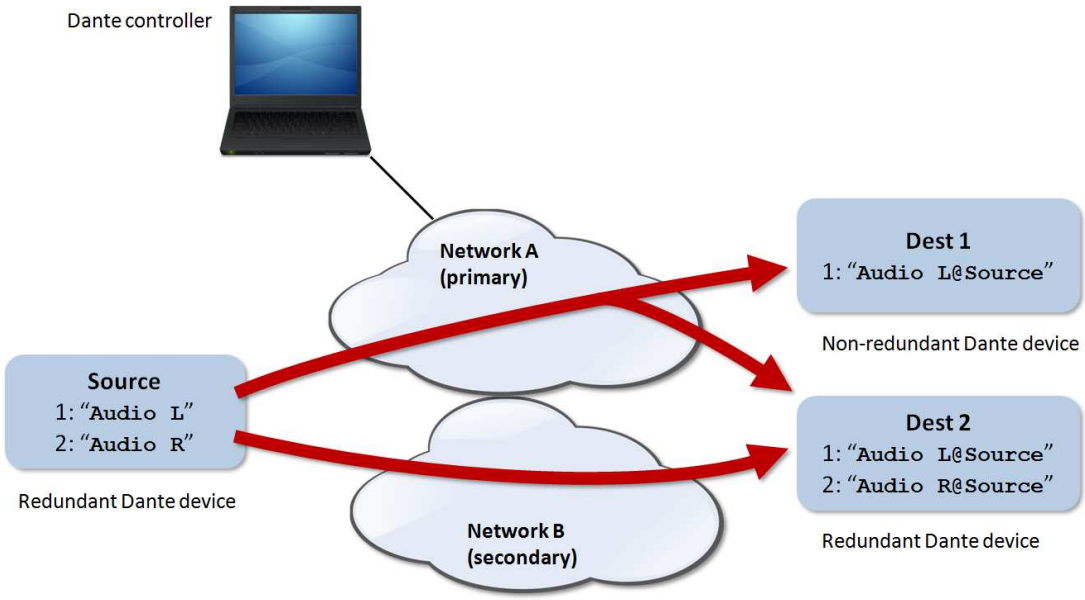
- 3. Audio L@Source
- 4. Audio R@Source

Dante will perform the necessary audio routing to deliver the audio from the Tx channels to the Rx channels.

Redundancy.

Many Dante devices support redundant audio routing. These devices have two network interfaces, labelled primary and secondary. Primary interfaces should be connected to one physical network.

IMPORTANT NOTE: If redundancy is being used, secondary interfaces should be connected to a second separated network. Secondary interfaces cannot communicate with primary interfaces.



If the secondary network is connected to a device that supports redundancy, it is enabled automatically. Audio data is transmitted on both the primary and secondary networks simultaneously. In the event of a failure on one network, audio will continue to flow via the other network.

NOTE 1: Dante redundancy requires that both the primary and secondary interfaces on any redundant device are connected using the same link speed. For example, if the primary interface is connected to a 1 Gbps switch port, the secondary interface must also be connected to a 1 Gbps switch port. Similarly, if the primary interface is connected to a 100 Mbps switch port, the secondary interface must also be connected to a 100 Mbps switch port.

NOTE 2: Dante devices that do not support redundancy must be connected to the primary network only.

Audio Formats.

Some Dante devices support a range of audio formats (sample rates). AEQ equipment operates at FS=48 kHz, 24 bits PCM.

It is only possible to set up a subscription between channels which have a common audio format. If AEQ pieces of equipment are connected to systems from other manufacturers, make sure that they are setup to operate at 48 kHz 24 bits PCM. Channels on devices with incompatible formats will be shown in grey, and will not be routable.

Flows.

Dante audio routing creates 'flows'. Each flow carries one or more channels of audio from a transmitting device to one or more receiving devices. There are two types of flow: unicast and multicast.

Unicast routing creates flows to a single receiving device; a unicast flow typically assigns space for 4 channels of audio. Unicast flows are set up when a receiver subscribes to an available audio channel, and are automatically removed when the receiver unsubscribes from all channels in that flow.

Multicast routing creates flows that can be received by multiple receivers. Multicast flows are assigned IDs, enabling them to be identified in “Dante Controller”, and to facilitate their removal. In contrast to unicast flows, multicast flows must be set up on the transmitting Dante device before receivers can subscribe to these flows.

Advanced Routing: Using Multicast.

Dante routing is unicast by default. This means that a separate flow is set up between each transmitter and receiver. If several receivers are all subscribed to the same channels of a transmitter, it may sometimes be more efficient to use multicast.

Multicast sends the same set of channels to multiple receivers. In practice, this usually means that the audio flow is flooded throughout the network. If many receivers want the same channels, using multicast can reduce overall network use, especially on the transmitter, because only one copy of each audio channel needs to be sent, rather than many.

Dante receivers will automatically prefer multicast to unicast if it is available. This means that if a new multicast flow is created containing the channels that a receiver is currently receiving as unicast, the receiver will switch over to receiving audio from the multicast flow and the unicast flow will be removed.

1.4.5. Clock Synchronization.

All Dante-enabled devices use the IEEE 1588 Precision Time Protocol (PTP) across the network to synchronize their local clocks to a master clock, providing sample-accurate time alignment throughout the network.

One Dante device will be elected as the PTP Master Clock for the network; all other Dante devices act as a PTP Slave Clocks to the elected master clock. Although many Dante devices may be capable of becoming PTP Master Clock, only one device will win the election. Devices with clock inputs (e.g. Word Clock or AES3) will be preferred in the election process. A gigabit connected device is preferred over a device connected via 100Mbps. A tie-breaker rule of the lowest MAC address is used if several equivalent candidate master clocks are available. The election process may be overridden by manually setting 'Preferred Master' on a device.

Dante Clock Types.

Each Dante hardware device can derive its clock from either its high-quality onboard clock circuit, or an externally connected word clock. In the case of “Dante Virtual Soundcard”, the computer’s clock will be used.

Clock Settings.

Slave to External Clock Word.

A Dante device set to "Slave to External Clock Word" will use the external word clock from its host equipment to tune its onboard VCXO. A Dante device with this attribute set will become the PTP Master Clock, unless there is another Dante device present with 'Preferred Master' set.

Preferred Master.

Sometimes it may be necessary to force a particular device to provide the PTP Master Clock. A Dante device with 'Preferred Master' set will always be chosen as the PTP Master Clock. If more than one device has 'Preferred Master' set, the device with the lowest MAC address will be chosen.

Clocking and Synchronization in Redundant Networks.

In a redundant network, the clock synchronization protocol operates over both primary and secondary networks. Each network will have a designated PTP master clock; usually this will be the same device on both networks. If this is not the case (e.g. if a non-redundant device is designated Preferred Master) then one device will bridge the clock synchronization information from the primary to the secondary network, ensuring that all devices derive their clock from the same source. Redundant PTP Slave clocks will synchronize their local clocks based on information from one of the networks they are connected to. In event of a failure on one network, a redundant device will continue to receive clock synchronization information over the other network.

1.4.6. Latency.

In Dante, variation in latency in the network is compensated for at the receiver. Each receiver has a device latency setting. This setting defines the latency between the timestamps on the incoming audio samples and when those samples are played out.

The typical default latency for a Dante device is 1 msec. This is sufficient for a very large network, consisting of a Gigabit network core (with up to 10 hops between edge switches) and 100 Mbps links to Dante devices. Smaller, Gigabit-only networks can use lower values of latency (down to 150 µsec for very fast devices, such as PCIe cards). Recommended latency settings are displayed in “Dante Controller”, and may also be found in the documentation accompanying the product.

Latency is set on the receiver. However, when a subscription is made, there is an automatic negotiation process between the receiver and the transmitter, to ensure that the latency for the subscription is high enough to prevent packet loss.

For example, Ultimo devices support a minimum of 2ms latency. If a faster device (such as a PCIe card) is set to 1ms latency and is then subscribed to an Ultimo transmitter, the latency used for the subscription will be 2ms, which is the minimum supported latency for the subscription. Subscriptions to other devices (such as a Brooklyn II device using AEQ devices with two AoIP ports) will be set at 1ms (or whatever latency the receiver is set to). This effectively makes the device latency setting a 'default' latency, which is used unless the transmitter doesn't support it.

NOTE: The minimum latency available for a device connected to a 100 Mbps network port is 1 msec. Using a latency lower than 1 msec over a 100 Mbps link will result in a subscription error, with the tooltip 'Tx Scheduler Failure'.

Latency and Dante Virtual Soundcard.

“Dante Virtual Soundcard” allows a standard Apple Mac or Windows PC to function as a Dante device. Because “Dante Virtual Soundcard” runs on a general purpose computer without special hardware to support Dante timing requirements, additional latency needs to be added to connections received from a “Dante Virtual Soundcard” transmitter.

“Dante Virtual Soundcard” is configured with custom latency values for reliable operation. Dante devices with Rx channels that are subscribed to Tx channels from a “Dante Virtual Soundcard” transmitter will automatically configure themselves to use these higher latency values for those channels only. The latency on all other subscriptions on the receiver is unaffected.

1.4.7. Dante Control and Monitoring.

In addition to automatic configuration and discovery, audio transport and routing, Dante-enabled devices can also be controlled and monitored in various ways. This includes being able to view and change specific parameters, such as clock configuration settings. Dante devices are also capable of sending status events that can be viewed using “Dante Controller”. Status events include changes in clock status, or network interface changes.

NOTE: The computer service that manages control and monitoring is called 'ConMon'.

2. PHYSICAL DESCRIPTION OF THE UNITS.

In order to understand the installation and cabling process associated to each unit, first you need to be familiar with the connectors and other specific elements of the AoIP solution described in this manual and the equipment front and back panels. In the case of BC2000D, ARENA, FORUM, GRAND FORUM and CAPITOL IP units, have in mind that the general information about them is included in the respective user manuals, so this one includes only specific pieces of information related to the AoIP solution.

2.1. Description of the BC2214 and BC2224 modules.

2.1.1. Front panel description.

Any number of BC2214/BC2224 modules can be installed in the back Input/Output slots of the BC2000D router or ARENA digital mixing console frames. Each module has two connectors, LAN 1 and LAN 2, each one with its respective physical link signaling LEDs.

- **LAN** LEDs**:** indicate the status of the audio local area network: LAN 1 (main interface) and LAN 2 (secondary interface).

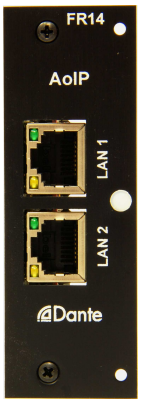
Status:

- Off: no local network connection.
- Blinking green: link is established at data level.
- Steady yellow: link is established at physical level only.

If the boards are wired to a dedicated audio network using a switch, in LAN 1 only, the green LED should be blinking and the yellow one should be steady on. If the wiring is connected in “Daisy Chain” mode, without switches, or there is a redundant network, both green LEDs should be blinking and both yellow ones should be steady on. **IMPORTANT NOTE:** When there is a redundant network, primary and secondary interfaces must be connected to separate networks.

2.2. FR14 module description.

2.2.1. Front panel description.



One or two FR14 modules can be installed in the FORUM digital mixing console back Input/Output slots 14 and 13, respectively. Each module features two connectors, LAN 1 and LAN 2, with their corresponding physical connection indicator LEDs:

- **LAN** LEDs**:** indicate the status of the audio local area network: LAN 1 (main interface) and LAN 2 (secondary interface).

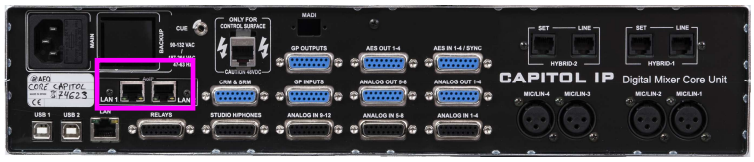
Status:

- Off: no local network connection.
- Blinking green: link is established at data level.
- Steady yellow: link is established at physical level only.

If the boards are wired to a dedicated audio network using a switch, in LAN 1 only, the green LED should be blinking and the yellow one should be steady on. If the wiring is connected in “Daisy Chain” mode, without switches, or there is a redundant network, both green LEDs should be blinking and both yellow ones should be steady on. **IMPORTANT NOTE:** When there is a redundant network, primary and secondary interfaces must be connected to separate networks.

2.3. CAPITOL IP BOARD module description.

2.3.1. Back panel description.



Only one CAPITOL IP BOARD module can be installed inside the CAPITOL IP digital mixing console core. In that case, two Ethernet LAN 1 and LAN 2 ports will be installed in the AoIP area of the core back panel, with their corresponding physical connection indicator LEDs:

- **LAN** LEDs: indicate the status of the audio local area network: LAN 1 (main interface) and LAN 2 (secondary interface).

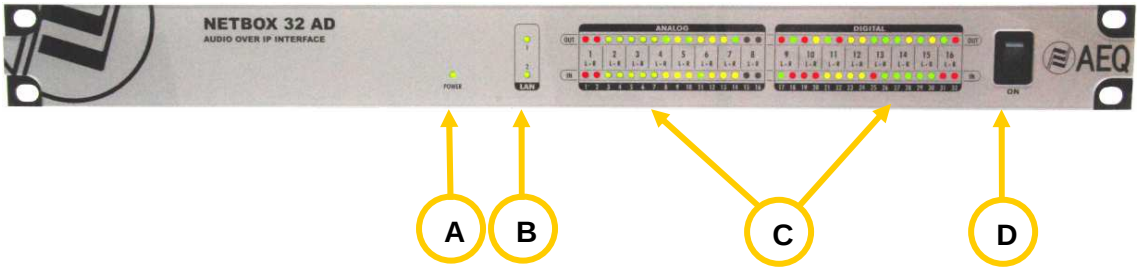
Status:

- Off: no local network connection.
- Blinking green: link is established at data level.
- Steady yellow: link is established at physical level only.

If the boards are wired to a dedicated audio network using a switch, in LAN 1 only, the green LED should be blinking and the yellow one should be steady on. If the wiring is connected in "Daisy Chain" mode, without switches, or there is a redundant network, both green LEDs should be blinking and both yellow ones should be steady on. **IMPORTANT NOTE:** When there is a redundant network, primary and secondary interfaces must be connected to separate networks.

2.4. NETBOX 32 AD equipment description.

2.4.1. Front Panel description.



There are indicators related to the unit status, communications and audio levels.

A **LED POWER ON:** indicates the status of the unit power supply.

- Off: no mains input.
- Green: power supply ON.

B **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.

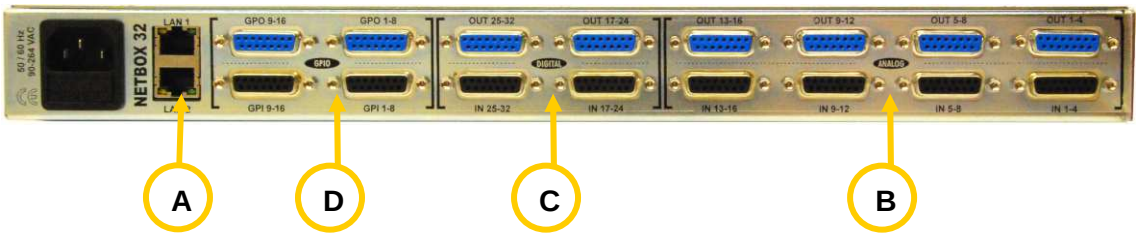
If the boards are wired to a dedicated audio network using a switch, in LAN 1 only, the green LED should be blinking. If the wiring is connected in "Daisy Chain" mode, without switches, or there is a redundant network, both green LEDs should be blinking. **IMPORTANT NOTE:** When there is a redundant network, primary and secondary interfaces must be connected to separate networks.

C **AUDIO LEVEL LEDs:** Each LED indicates the level of the corresponding device audio input / output:

- LED off: the channel is muted, or transmits or receives (depending on whether it is an output or an input) at a level below -60dBFS.
- Green LED: channel is transmitting or receiving audio (depending on whether it is an output or an input) at a level between -60dBFS and -20dBFS.
- Amber LED: channel is transmitting or receiving audio (depending on whether it is an output or an input) at a level between -20dBFS and -14dBFS.
- Red LED: the channel is saturated or "clipping" (above -14dBFS).

D **On / Off switch.**

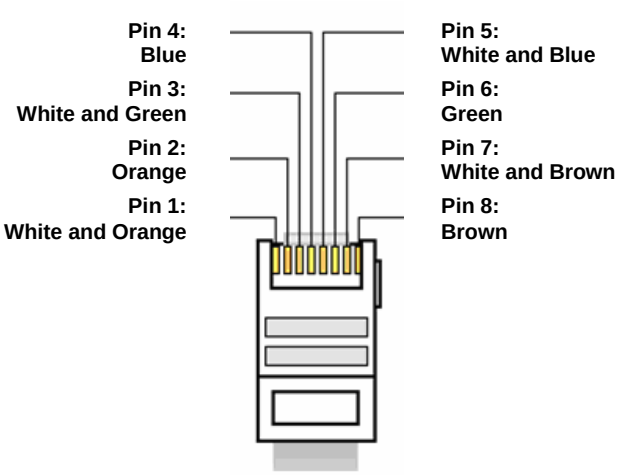
2.4.2. Description of the back panel and connections



2.4.2.1. Ethernet Ports (LAN 1 and LAN 2). A

Netbox 32 includes two Ethernet ports: LAN 1 must always be wired, while LAN 2 is only used when the system is wired in "Daisy Chain" mode or a redundant system is set up. **IMPORTANT NOTE:** When there is a redundant network, primary and secondary interfaces must be connected to separate networks.

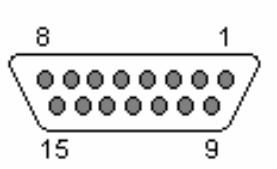
Physically, both are RJ45 10/100/1000, connectors, with the pinout described below:



RJ45 connector pinout

2.4.2.2. Analog Inputs and Outputs. B

The physical connectors used are DB15-female. INPUTS (IN) connectors are placed in the bottom row while OUTPUTS (OUT) are located in the upper row, with the following pinout:



Pinout of DB15 ANALOG IN 1 - 4 connector

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

Pinout of DB15 ANALOG IN 5 - 8 connector

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

Pinout of DB15 ANALOG IN 9 - 12 connector

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

Pinout of DB15 ANALOG IN 13 - 16 connector

- Pin 1: ANALOG 13 IN +
- Pin 2: GND
- Pin 3: ANALOG 14 IN +
- Pin 4: GND
- Pin 5: ANALOG 15 IN +
- Pin 6: GND
- Pin 7: ANALOG 16 IN +
- Pin 8: GND
- Pin 9: ANALOG 13 IN -
- Pin 10: GND
- Pin 11: ANALOG 14 IN -
- Pin 12: GND
- Pin 13: ANALOG 15 IN -
- Pin 14: GND
- Pin 15: ANALOG 16 IN -

Pinout of DB15 ANALOG OUT 1 - 4 connector

- 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 -

Pinout of DB15 ANALOG OUT 5 - 8 connector

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

Pinout of DB15 ANALOG OUT 9 - 12 connector

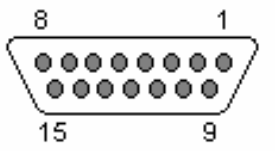
- Pin 1: ANALOG 9 OUT +
- Pin 2: GND
- Pin 3: ANALOG 10 OUT +
- Pin 4: GND
- Pin 5: ANALOG 11 OUT +
- Pin 6: GND
- Pin 7: ANALOG 12 OUT +
- Pin 8: GND
- Pin 9: ANALOG 9 OUT -
- Pin 10: GND
- Pin 11: ANALOG 10 OUT -
- Pin 12: GND
- Pin 13: ANALOG 11 OUT -
- Pin 14: GND
- Pin 15: ANALOG 12 OUT -

Pinout of DB15 ANALOG OUT 13 - 16 connector

- Pin 1: ANALOG 13 OUT +
- Pin 2: GND
- Pin 3: ANALOG 14 OUT +
- Pin 4: GND
- Pin 5: ANALOG 15 OUT +
- Pin 6: GND
- Pin 7: ANALOG 16 OUT +
- Pin 8: GND
- Pin 9: ANALOG 13 OUT -
- Pin 10: GND
- Pin 11: ANALOG 14 OUT -
- Pin 12: GND
- Pin 13: ANALOG 15 OUT -
- Pin 14: GND
- Pin 15: ANALOG 16 OUT -

2.4.2.3. Digital Inputs and Outputs. C

The physical connectors used are DB15-female. INPUTS (IN) connectors are placed in the bottom row while OUTPUTS (OUT) are located in the upper row, with the following pinout:



Pinout of DB15 DIGITAL IN 17 - 24 connector

- Pin 1: DIGITAL 17-18 IN +
- Pin 2: GND
- Pin 3: DIGITAL 19-20 IN +
- Pin 4: GND
- Pin 5: DIGITAL 21-22 IN +
- Pin 6: GND
- Pin 7: DIGITAL 23-24 IN +
- Pin 8: GND
- Pin 9: DIGITAL 17-18 IN -
- Pin 10: GND
- Pin 11: DIGITAL 19-20 IN -
- Pin 12: GND
- Pin 13: DIGITAL 21-22 IN -
- Pin 14: GND
- Pin 15: DIGITAL 23-24 IN -

Pinout of DB15 DIGITAL IN 25 - 32 connector

- Pin 1: DIGITAL 25-26 IN +
- Pin 2: GND
- Pin 3: DIGITAL 27-28 IN +
- Pin 4: GND
- Pin 5: DIGITAL 29-30 IN +
- Pin 6: GND
- Pin 7: DIGITAL 31-32 IN +
- Pin 8: GND
- Pin 9: DIGITAL 25-26 IN -
- Pin 10: GND
- Pin 11: DIGITAL 27-28 IN -
- Pin 12: GND
- Pin 13: DIGITAL 29-30 IN -
- Pin 14: GND
- Pin 15: DIGITAL 31-32 IN -

Pinout of DB15 DIGITAL OUT 17 - 24 connector

- Pin 1: DIGITAL 17-18 OUT +
- Pin 2: GND
- Pin 3: DIGITAL 19-20 OUT +
- Pin 4: GND
- Pin 5: DIGITAL 21-22 OUT +
- Pin 6: GND
- Pin 7: DIGITAL 23-24 OUT +
- Pin 8: GND
- Pin 9: DIGITAL 17-18 OUT -
- Pin 10: GND
- Pin 11: DIGITAL 19-20 OUT -
- Pin 12: GND
- Pin 13: DIGITAL 21-22 OUT -
- Pin 14: GND
- Pin 15: DIGITAL 23-24 OUT -

Pinout of DB15 DIGITAL OUT 25 - 32 connector

- Pin 1: DIGITAL 25-26 OUT +
- Pin 2: GND
- Pin 3: DIGITAL 27-28 OUT +
- Pin 4: GND
- Pin 5: DIGITAL 29-30 OUT +
- Pin 6: GND
- Pin 7: DIGITAL 31-32 OUT +
- Pin 8: GND
- Pin 9: DIGITAL 25-26 OUT -
- Pin 10: GND
- Pin 11: DIGITAL 27-28 OUT -
- Pin 12: GND
- Pin 13: DIGITAL 29-30 OUT -
- Pin 14: GND
- Pin 15: DIGITAL 31-32 OUT -

Remarks:

- Each of the eight digital audio inputs and outputs include two different audio channels, according to AES 3 or SPDIF standard.
- The first digital input (17-18) synchronizes NETBOX 32 with the source connected to it, emitting an AES 3/SPDIF or AES 11 formatted stream.
- The outputs can be used to provide synchronization to other devices that can extract it from an AES 3 formatted audio stream.

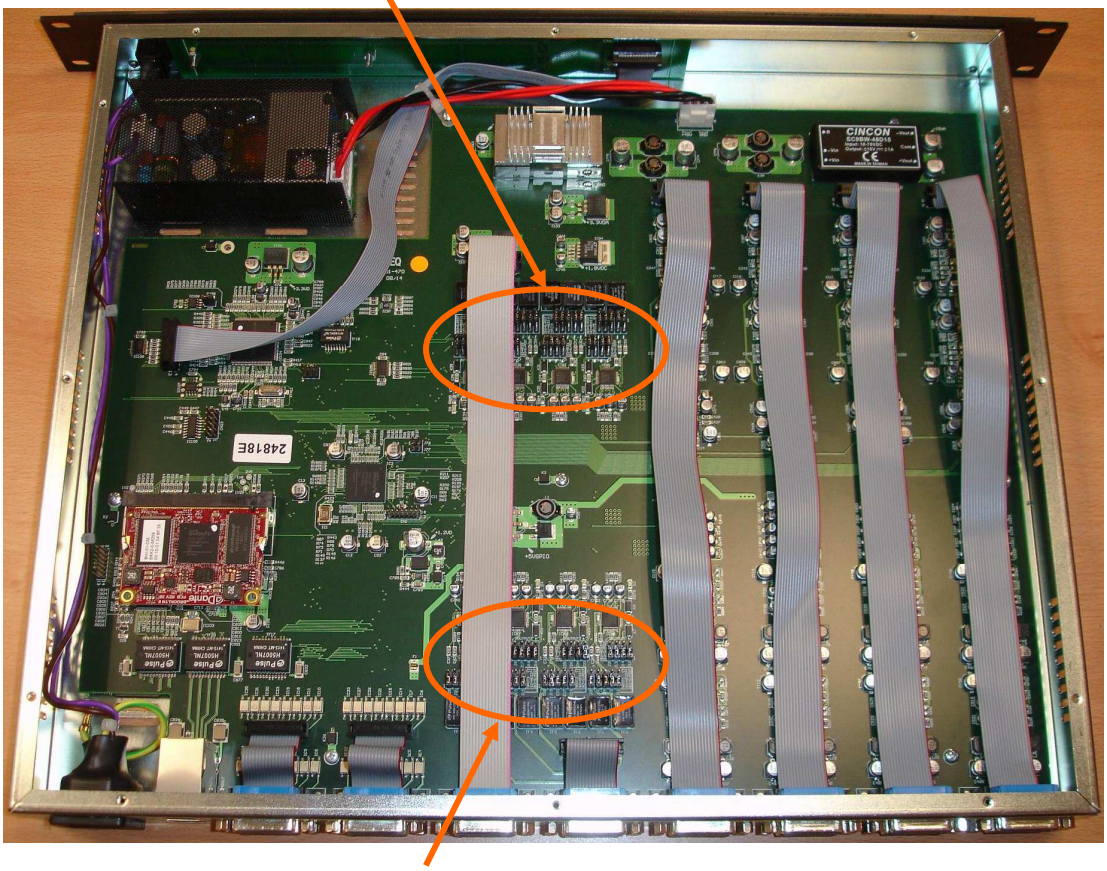
2.4.2.3.1 Digital inputs/outputs jumpers configuration.

IMPORTANT NOTE: Access and configuration of the configuration jumpers require a previous experience in installing and configuring computer or electronic cads. Don't open the unit if you lack this experience in order to avoid risk of electrical shock or damages to the system.

Digital inputs and outputs are programmed by default as **AES/EBU.** If compatibility with **SPDIF** equipment is required, you must open the unit and change the corresponding configuration jumpers.

- **Opening the unit.**
  It's **VERY IMPORTANT** to turn first the equipment off and disconnect the power supply cable. Remove the 12 screws located at the top cover. Pull up from the top cover and remove it.
- **Finding the jumpers location.**
  Place the unit with the connectors facing towards you and recognize the following zones inside it:

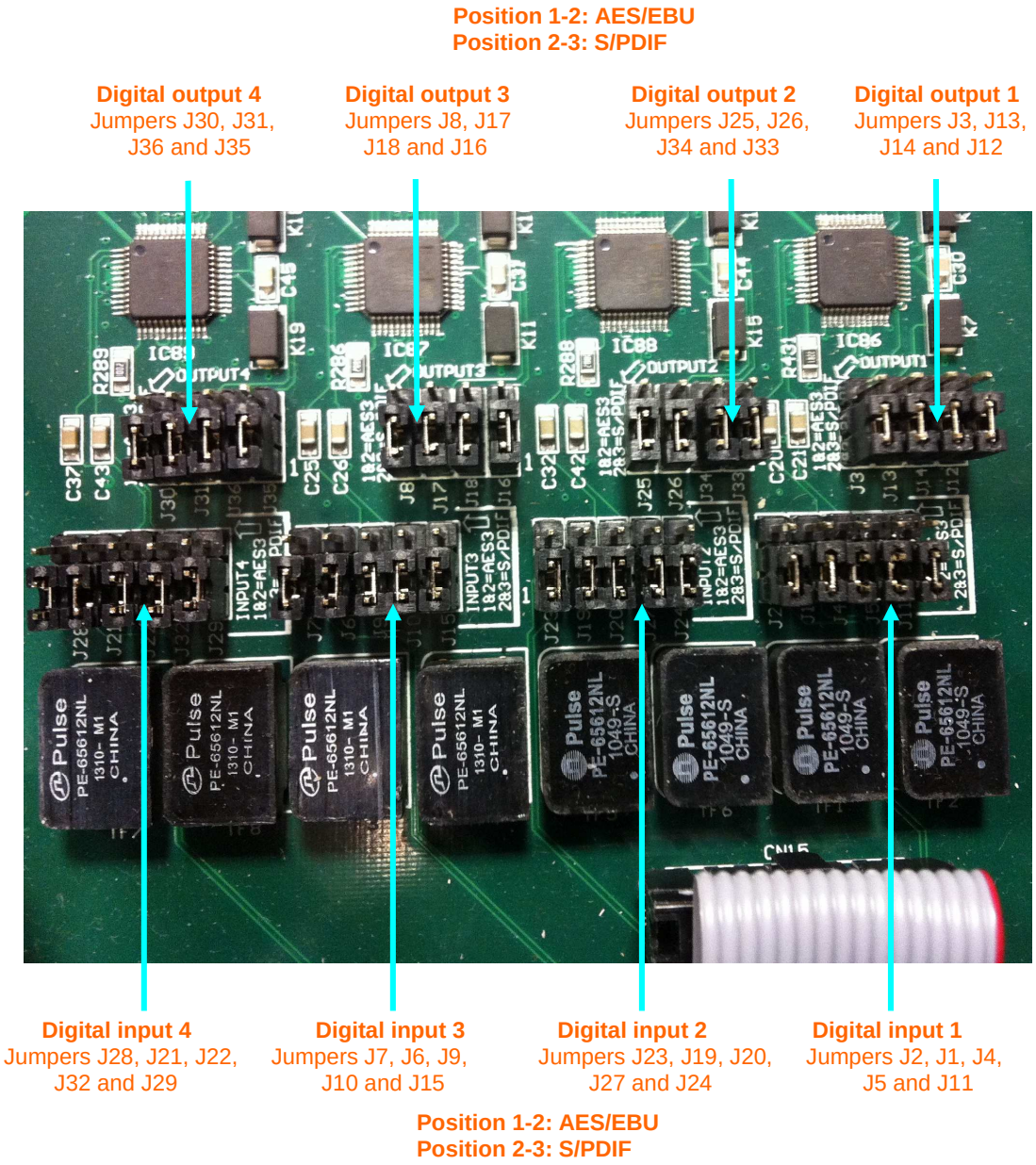
5 TO 8 (25 TO 32) DIGITAL INPUTS AND OUTPUTS PROGRAMMING ZONE



1 TO 4 (17 TO 24) DIGITAL INPUTS AND OUTPUTS PROGRAMMING ZONE

- **Programming digital outputs 1 to 4 as S/PDIF.**
  In order to provide outputs to S/PDIF equipments, the programming procedure described below adapts the levels and unbalances the signals by joining OUT1-, OUT2-, OUT3- and OUT4- to their corresponding GND, so the signal is taken from each OUT+ to OUT- (or GND).

  At the “1 TO 4 DIGITAL INPUTS AND OUTPUTS PROGRAMMING ZONE”, you can change the outputs one by one from AES/EBU to S/PDIF by moving the 4 jumpers associated to each output from position 1-2 (down) to position 2-3 (up), as shown in the following image:

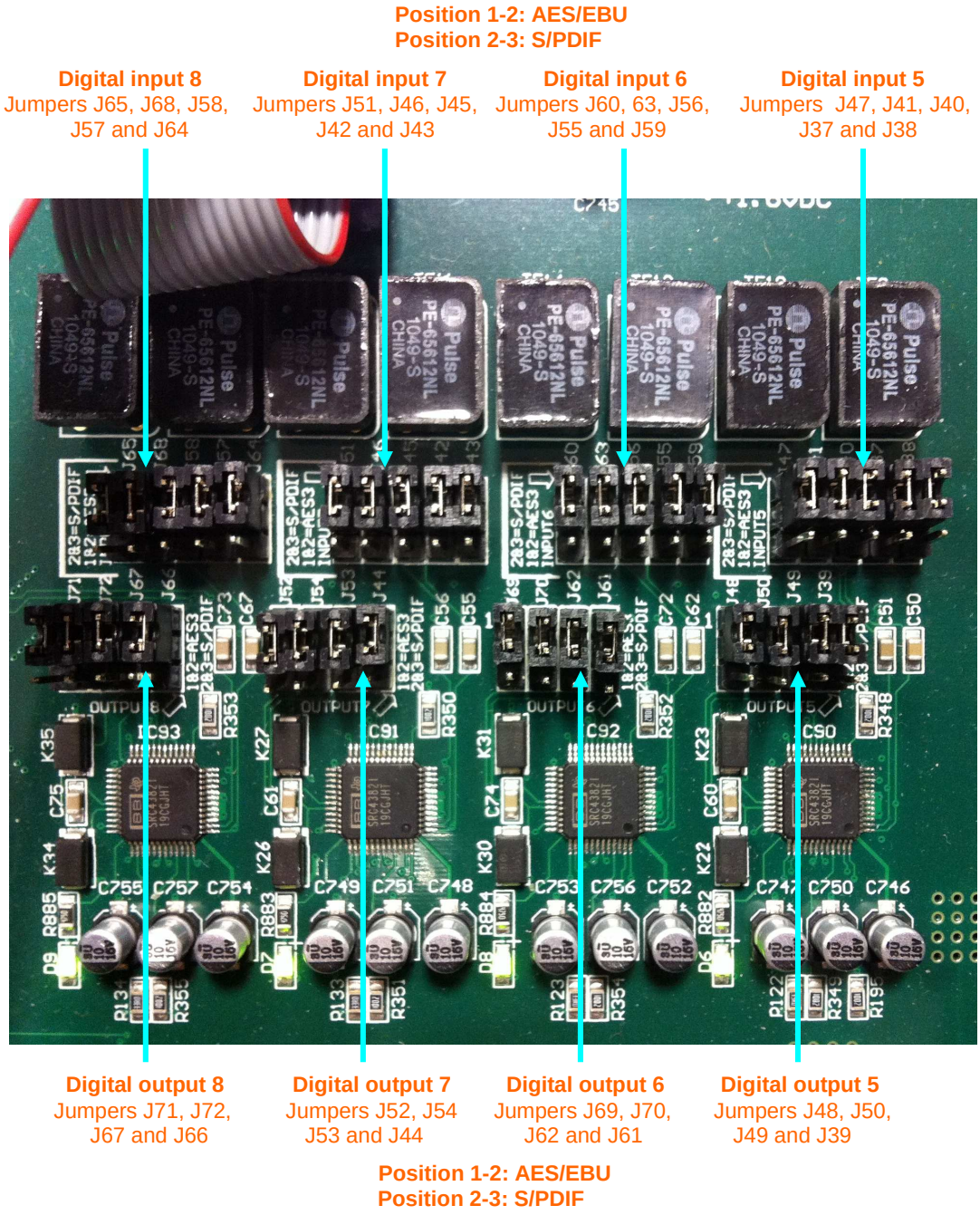


- **Programming digital inputs 1 to 4 as S/PDIF.**
  In order to use S/PDIF inputs, the programming described above adapts levels and unbalance signals by joining IN1-, IN2-, IN3- and IN4- to their associated grounds, so each signal is taken from the corresponding IN+ and its GND (or IN-).

  At the “1 TO 4 DIGITAL INPUTS AND OUTPUTS PROGRAMMING ZONE”, you can change the inputs one by one from AES/EBU to S/PDIF by moving the 5 jumpers associated to each input from position 1-2 (down) to position 2-3 (up), as shown in the previous image.

- **Programming digital inputs 5 to 8 as S/PDIF.**
  In order to use S/PDIF inputs, the programming described below adapts levels and unbalance signals by joining IN5-, IN6-, IN7- and IN8- to their associated grounds, so each signal is taken from the corresponding IN+ and its GND (or IN-).

At the “5 TO 8 DIGITAL INPUTS AND OUTPUTS PROGRAMMING ZONE”, you can change the inputs one by one from AES/EBU to S/PDIF by moving the 5 jumpers associated to each input from position 1-2 (up) to position 2-3 (down), as shown in the following image:

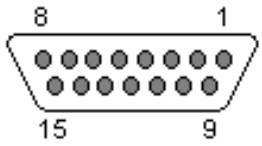


- **Programming digital outputs 5 to 8 as S/PDIF.**
  In order to provide outputs to S/PDIF equipments, the programming procedure described above adapts the levels and unbalances the signals by joining OUT5-, OUT6-, OUT7- and OUT8- to their corresponding GND, so the signal is taken from each OUT+ to OUT- (or GND).

  At the “5 TO 8 DIGITAL INPUTS AND OUTPUTS PROGRAMMING ZONE”, you can change the outputs one by one from AES/EBU to S/PDIF by moving the 4 jumpers associated to each output from position 1-2 (up) to position 2-3 (down), as shown in the previous image.

2.4.2.4. General Purpose Inputs and Outputs (GPIO). D

The physical connectors used are DB15-female. INPUTS (GPI) connectors are placed in the bottom row while OUTPUTS (GPO) are located in the upper row, with the following pinout:



Pinout of DB15 GPI 1 - 8 connector

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

Remarks: please note that a common ground (GND) is provided for inputs 1 to 4 and another one exists for inputs 5 to 8. Pin 12 supplies a +5V reference voltage to ease wiring.

Pinout of DB15 GPI 9 - 16 connector

- Pin 1: GPI 9
- Pin 2: GPI 10
- Pin 3: GPI 11
- Pin 4: GPI 12
- Pin 5: GPI 13
- Pin 6: GPI 14
- Pin 7: GPI 15
- Pin 8: GPI 16
- Pin 9: GND_GPI 9-12
- Pin 10: GND_GPI 9-12
- Pin 11: GND_GPI 9-12
- Pin 12: +5V GPIO
- Pin 13: GND_GPI 13-16
- Pin 14: GND_GPI 13-16
- Pin 15: GND_GPI 13-16

Remarks: please note that a common ground (GND) is provided for inputs 9 to 12 and another one exists for inputs 13 to 16. Pin 12 supplies a +5V reference voltage to ease wiring.

Pinout of DB15 GPO 1 - 8 connector

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

Remarks: please note that a common ground (GND) is provided for inputs 1 to 4 and another one exists for inputs 5 to 8. Pin 12 supplies a +5V reference voltage to ease wiring.

Pinout of DB15 GPO 9 - 16 connector

- Pin 1: GPO 9
- Pin 2: GPO 10
- Pin 3: GPO 11
- Pin 4: GPO 12
- Pin 5: GPO 13
- Pin 6: GPO 14
- Pin 7: GPO 15
- Pin 8: GPO 16
- Pin 9: GND_GPO 9-12
- Pin 10: GND_GPO 9-12
- Pin 11: GND_GPO 9-12
- Pin 12: +5V GPIO
- Pin 13: GND_GPO 13-16
- Pin 14: GND_GPO 13-16
- Pin 15: GND_GPO 13-16

Remarks: please note that a common ground (GND) is provided for inputs 9 to 12 and another one exists for inputs 13 to 16. Pin 12 supplies a +5V reference voltage to ease wiring.

2.4.2.5. Power supply.

The mains power supply connector is located in the back left area of the unit. The internal power supply is auto ranging, accepting: 90 - 132 V AC & 187 - 264 V AC, 47-63Hz.

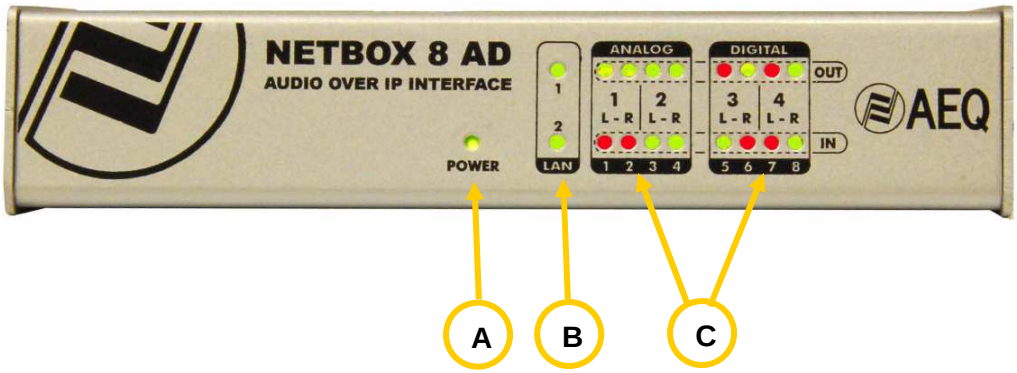
2.4.2.6. Remarks on Netbox 32 AD audio wiring.

AEQ eases the installation task providing the connection between the system and the connected pieces of equipment by providing on demand the "**FR CAB INP**" wiring accessory, 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 "**FR 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 8 GPIs or GPOs provided by each connector.

2.5. NETBOX 8 AD equipment description.

2.5.1. Front Panel description.



There are indicators related to the unit status, communications and audio levels.

A **LED POWER ON:** indicates the status of the unit power supply:

- Off: no mains input.
- Green: power supply ON.

B **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.

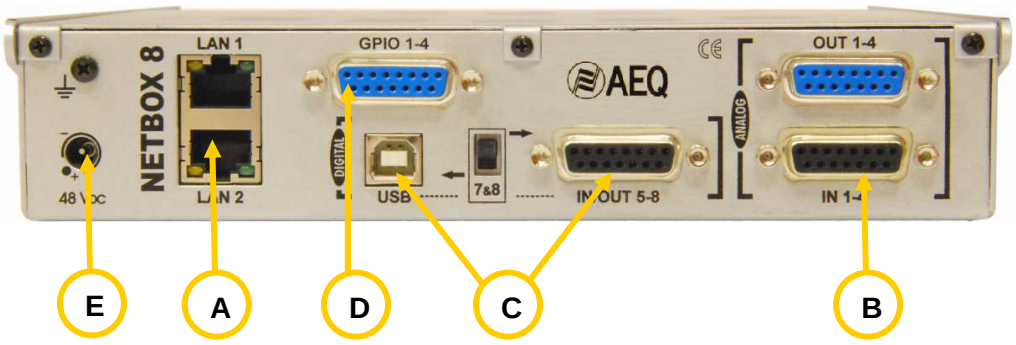
If the boards are wired to a dedicated audio network using a switch, in LAN 1 only, the green LED should be blinking. If the wiring is connected in "Daisy Chain" mode, without switches, or there is a redundant network, both green LEDs should be blinking. **IMPORTANT NOTE:** When there is a redundant network, primary and secondary interfaces must be connected to separate networks.

C **AUDIO LEVEL LEDs:** Each LED indicates the level of the corresponding device audio input / output:

- LED off: the channel is muted, or transmits or receives (depending on whether it is an output or an input) at a level below -60dBFS.

- Green LED: channel is transmitting or receiving audio (depending on whether it is an output or an input) at a level between -60dBFS and -20dBFS.
- Amber LED: channel is transmitting or receiving audio (depending on whether it is an output or an input) at a level between -20dBFS and -14dBFS.
- Red LED: the channel is saturated or "clipping" (above -14dBFS).

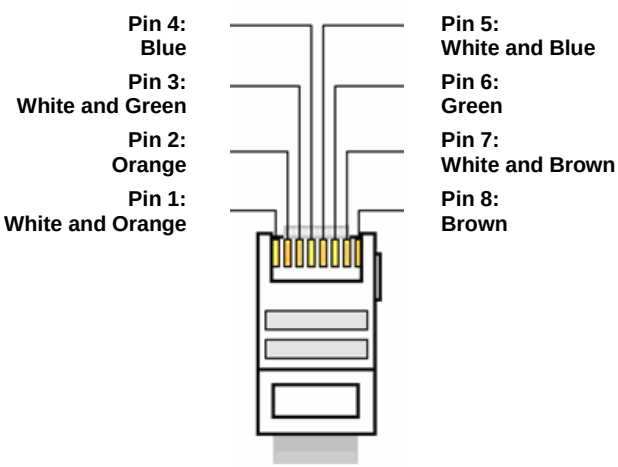
2.5.2. Description of the back panel and connections.



2.5.2.1. Ethernet Ports (LAN 1 and LAN 2). A

Netbox 8 includes two Ethernet ports: LAN 1 must always be wired, while LAN 2 is only used when the system is wired in "Daisy Chain" mode or a redundant system is set up. **IMPORTANT NOTE:** When there is a redundant network, primary and secondary interfaces must be connected to separate networks.

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

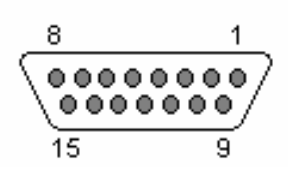


2.5.2.2. Analog Inputs and Outputs. B

The physical connectors used are DB15-female. INPUTS (IN) connector is placed in the bottom row while OUTPUTS (OUT) is located in the upper row, with the following pinout:

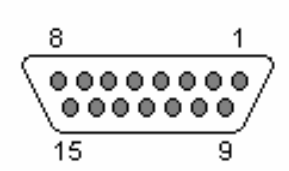
Pinout of DB15 ANALOG IN 1 - 4 connector

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



Pinout of DB15 ANALOG OUT 1 - 4 connector

- 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 -



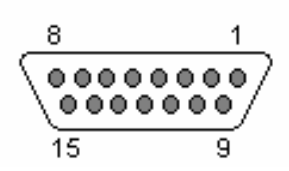
2.5.2.3. Digital Inputs and Outputs. C

The physical connector used is DB15-female. In addition, there is a switch ("**7&8**") to assign the second digital input and output to that DB15 female connector or, alternatively, to a USB connector.

This way, when the switch is in the upper position, the DB15 female connector will include the 2 INPUTS (IN) and the 2 OUTPUTS (OUT), using the following pinout:

Pinout of DB15 DIGITAL IN/OUT 5-8 connector

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



Remarks:

- Each of the two digital audio inputs and outputs include two different audio channels, according to AES 3 or SPDIF standard. The second one has also two channels in USB connector when the switch is in the lower position.
- The first digital input (5-6) synchronizes NETBOX 8 with the source connected to it, emitting an AES 3/SPDIF or AES 11 formatted stream.
- The outputs can be used to provide synchronization to other devices that can extract it from an AES 3 formatted audio stream.

USB Digital input and output 2 (7-8).

When the rear switch is in the lower position, AEQ NETBOX 8 provides the second stereo digital input through the USB type-B connector labeled "USB". **NOTE:** The second output is always available through the DB15 connector as well as through the USB connector, regardless of the switch position.

When connecting the USB module to a PC through the USB port, the PC automatically recognizes it as a new audio device (identified as "USB Audio CODEC"). Audio can be sent to it from any playback program, like with any other professional external soundcard. Also, audio can be recorded from NETBOX by using any recording application. The card is "plug&play" on Microsoft Windows™ operating systems and Apple Computer Mac OS™, not requiring any special driver.

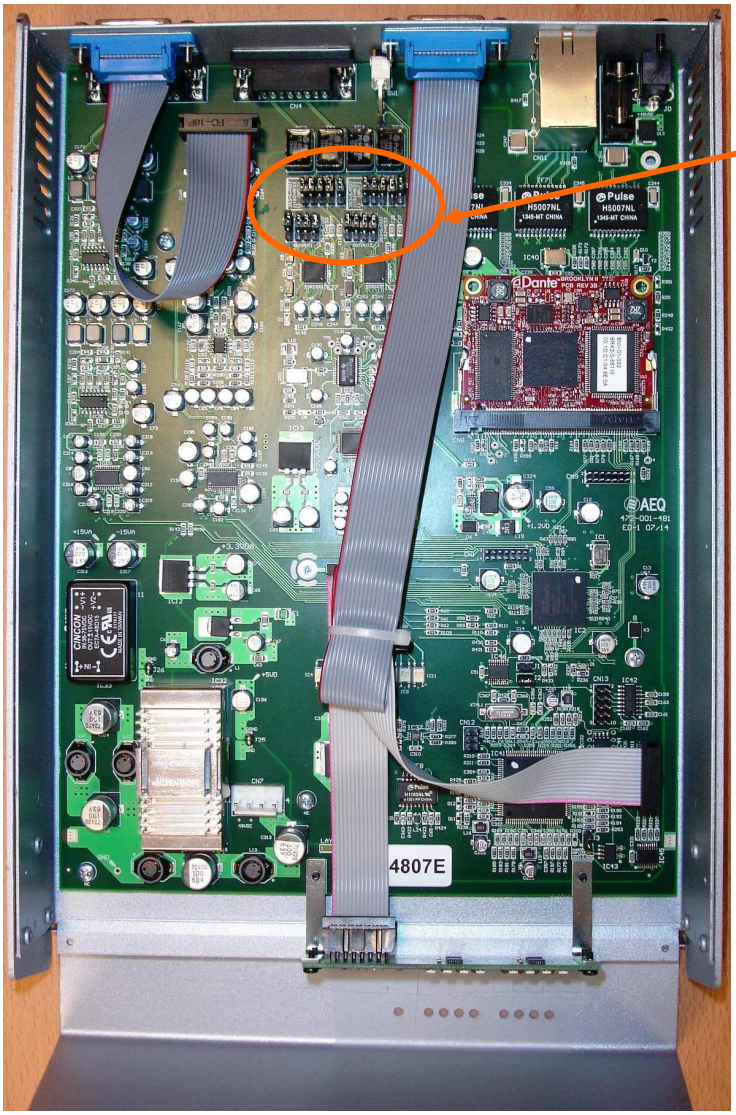
The supported sampling rates are 32 KHz, 44.1 KHz y 48 KHz, with internal Sample Rate Converter (SRC) to the 48 KHz frequency used internally by the DANTE-based AoIP AEQ system.

2.5.2.3.1 Digital inputs/outputs jumpers configuration.

IMPORTANT NOTE: Access and configuration of the configuration jumpers require a previous experience in installing and configuring computer or electronic cads. Don't open the unit if you lack this experience in order to avoid risk of electrical shock or damages to the system.

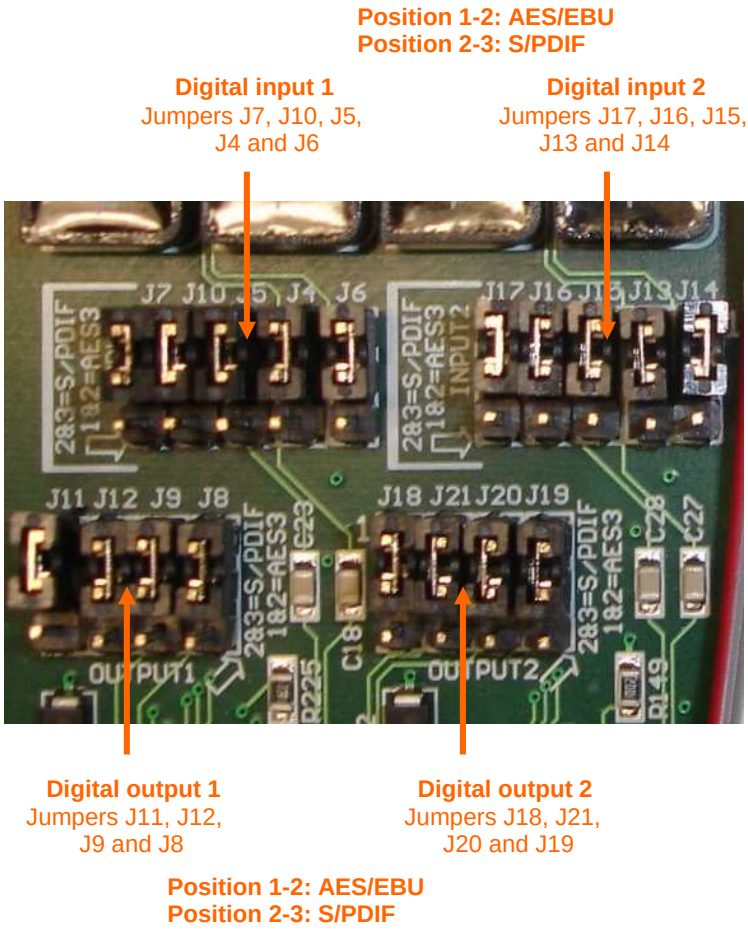
Digital inputs and outputs are programmed by default as **AES/EBU.** If compatibility with **SPDIF** equipment is required, you must open the unit and change the corresponding configuration jumpers.

- **Opening the unit.**
  It's **VERY IMPORTANT** to turn first the equipment off and disconnect the power supply cable. Remove the 3 screws located at the top of the rear panel and the 3 one located at the front of the unit's base. Pull up from the top cover and remove it.
- **Finding the jumpers location.**
  Place the unit with the front facing towards you and recognize the following zone inside it:



- **Programming digital inputs 1 and 2 as S/PDIF.**
  In order to use S/PDIF inputs, the programming described below adapts levels and unbalance signals by joining IN1- and IN2- to their associated grounds, so each signal is taken from the corresponding IN+ and its GND (or IN-). Take note that when the rear switch is in USB position, the digital input 2 will be placed at the USB connector regardless of the configuration programmed by jumpers.

  At the “DIGITAL INPUTS AND OUTPUTS PROGRAMMING ZONE”, you can change the inputs one by one from AES/EBU to S/PDIF by moving the 5 jumpers associated to each input from position 1-2 (up) to position 2-3 (down), as shown in the following image:

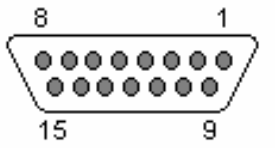


- **Programming digital outputs 1 and 2 as S/PDIF.**
  In order to provide outputs to S/PDIF equipments, the programming procedure described above adapts the levels and unbalances the signals by joining OUT1- and OUT2- to their corresponding GND, so the signal is taken from each OUT+ to OUT– (or GND). Take note that the digital output 2 will be duplicated at the USB connector regardless of the configuration programmed by jumpers.

  At the “DIGITAL INPUTS AND OUTPUTS PROGRAMMING ZONE”, you can change the outputs one by one from AES/EBU to S/PDIF by moving the 4 jumpers associated to each output from position 1-2 (up) to position 2-3 (down), as shown in the previous image.

2.5.2.4. General Purpose Inputs and Outputs (GPIO). D

The physical connector used is 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.

2.5.2.5. Power supply. E

The conector for external 48V DC adapter is located in the back left area of the unit. The provided universal mains adapter operates from 90 to 264 V AC, 47-63Hz.

2.5.2.6. Remarks on Netbox 8 AD audio wiring.

AEQ eases the installation task providing the connection between the system and the connected pieces of equipment by providing on demand the "**FR CAB INP**" wiring accessory, 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 "**FR 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.

3. BRIEF GUIDE TO SYSTEM INSTALLATION.

3.1. Control elements.

3.1.1. PC for RTC and monitoring.

In order to control the system, the “Dante Controller” must be running on a PC. If audio monitoring at the PC is required, the “Dante Virtual Soundcard” application must also be installed. If a backup network is installed, a network interface card will be required for each network.

3.1.1.1. Applications installation.

“**Dante Controller**” application is provided with each system, as an application running on Microsoft Windows 7 and Windows 8 environments.

The auto run disk provided includes an executable file that installs the software. The software modules to be installed are:

- Dante Controller Windows (version 3.5.6.2).
- Dante Firmware Update Manager (version 1.4.13.2).

The PC must be set up so it automatically obtains an IP configuration from the network (DHCP Enabled).

Once installed, the application is run from the Start menu:

In order to get more information, please check chapter 4 of this manual.

“**Dante Virtual Soundcard**” application can be downloaded from Audinate website (version 3.7.0.22).

Once installed, the application is run from the Start menu:

In order to get more information, please check chapter 5 of this manual.

3.2. Boards installation in mixing consoles and routers.

3.2.1. Installation of BC2214/BC2224 boards in an ARENA console or BC2000D router.

If the ARENA console or BC2000D router has been provided with the AoIP option installed from factory, they will have updated firmware and should be ready to be connected to the Ethernet network/s and readily operate. In the case of already installed consoles or routers, the AoIP boards, having 32 or 64 input/output channels (BC2214 and BC2224 respectively), can be installed in any free back slots of the BC2000D frame, and the routing can be configured as any other multichannel board such as MADI or HSAL (these can be also used to generate a complex routing infrastructure).

For existing consoles and routers, the firmware must be updated according to the procedure described in the user’s manual and the system configuration must be changed in order to add the new boards.

3.2.2. Installation of FR14 boards into a FORUM o GRAND FORUM console.

If the console has been provided with the AoIP option installed from factory, they will have updated firmware and should be ready to be connected to the Ethernet network/s and readily operate. The FORUM and GRAND FORUM AoIP option consists on one or two FR14 boards, with 32 input and output channels each. If only one FR14 board is installed, it should be in slot 14, and if two are installed, slots 13 and 14 are used, substituting the MADI port for routing purposes (the AoIP uses its routing resources so it can be no longer used).

The firmware must be updated according to the procedure described in the user's manual for existing consoles.

Then a FORUM or GRAND FORUM configuration must be created in the following way:

1. Physically assemble the FR14 board in slot 14, and optionally install a second one in slot 13.
2. Enable AoIP functionality by means of the "Forum Setup" application.
3. Configure up to 32 AoIP channels (or up to 64 if a second FR14 board is installed). They are automatically labeled as AOIP01 to AOIP16 (16 stereo channels) or as AOIP01 to AOIP32 (when 64 channels are configured).
4. Configure the AoIP input and output routing.
5. Assign to faders those channels that are required to be readily available. Those channels that are not initially assigned can be selected afterwards from the corresponding menu for association of input channels to fader.

3.2.3. Installation of the CAPITOL IP BOARD on a CAPITOL IP console.

The CAPITOL IP consoles have their own CAPITOL IP BOARD installed and configured from factory to provide 16 Audio over IP inputs and outputs through a DANTE network. The user manual provides all necessary information regarding this. If the console had a special configuration (such as a MADI board instead of AoIP) and it is necessary to substitute the type of multichannel board, AEQ SAT will guide you in the steps to follow.

3.3. Installation of a DANTE network with AEQ mixing consoles and NETBOX.

The installation will be described using two examples.

3.3.1. AEQ Audio over IP System for two digital studios and a Central Control.

This drawing represents a proposed installation for a small, two-studio radio station. The "Daisy Chain" IP wiring is represented in pink, running from one PC to the audio interface located in the central control, to the mixing console in studio one and from there to the console in studio two.

The program audio for both studios as well as other required signals for the central control (such as clean-feeds for telephone systems, etc) are sourced from the NETBOX 8 audio outputs. The signals necessary for the studios, such as satellite downlink, audiocodecs, tuners, etc. are routed to the NETBOX 8 inputs. Each console will also receive not only the NETBOX 8 incoming audio but also the aux and program sends from the other console.

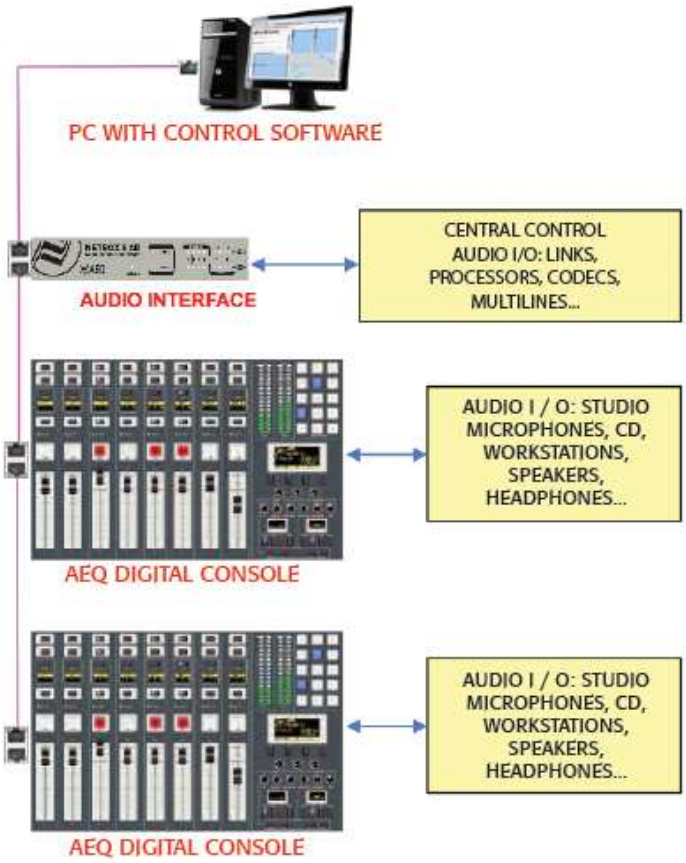
3.3.1.1. Installation.

- Setup a PC with the control applications as explained in chapter 3.1.
- Double check that the digital mixing consoles are configured as described in chapter 3.2.
- Wire the PC, consoles and NETBOX 8 in “Daisy Chain” mode according to the diagram (or, preferably, in a star topology by using a switch such as the one recommended in annex 3).

3.3.1.2. Turning ON.

- Turn the units on, configure them to send the program audio from the mixing consoles to the DANTE network, as well as to the NETBOX 8 outputs. Start the “Dante Controller” application and send a test audio.

- Check that all units are displayed in the “Routing” window of the application. Check that the indicators in the “Signal” column within the “Transmit” tab in the “Device View” window corresponding to each device are illuminated green, indicating that the equipment is sending audio to the network.



3.3.1.2. Monitoring audio and creating routes.

- Open the “Dante Virtual Soundcard” for monitoring, or alternatively prepare some receiving channels in the consoles or NETBOX 8 audio devices in order to receive and monitor audio.
- Subscribe the input channels of each device the output channels corresponding to the Master and NETBOX 8 outputs. In order to check the sound from the PC, also subscribe “Dante Virtual Soundcard” to the different master and NETBOX 8 output flows.

3.3.1.3. Optimization.

- Check the audio quality and, if possible, adjust its latency.
- You can substitute unicast flows by more than two multicast subscriptions (this is not mandatory in networks that are not too overloaded).
- Make switching groups, especially to switch audio pairs simultaneously.

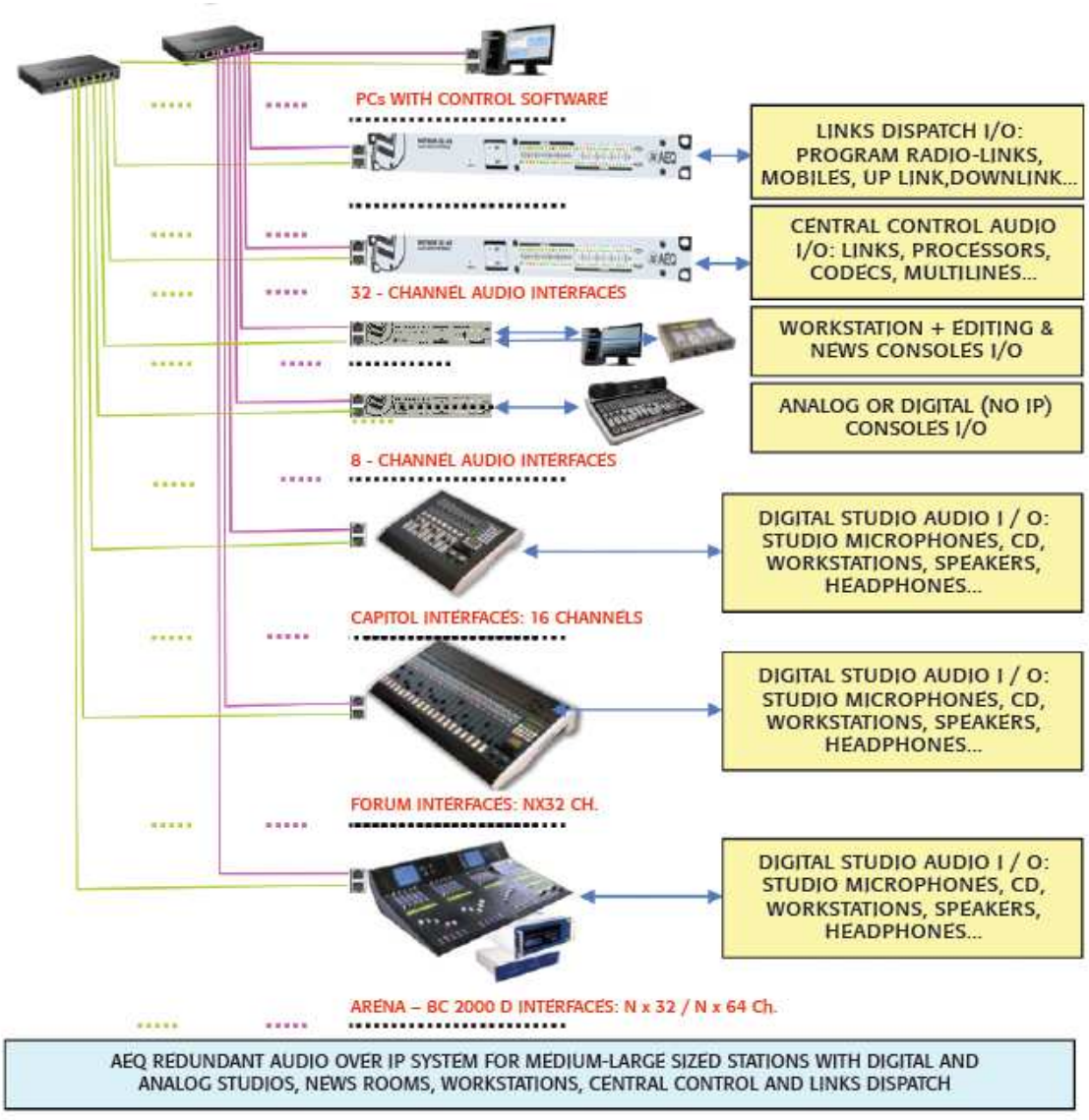
3.3.2. AEQ Audio over IP system for medium to large sized stations.

This drawing represents a proposed installation of a medium to large sized radio station. The main wiring for IP is represented in pink, using an IP switch or group of switches when the wiring is disperse or distributed in different zones or floors.

The backup IP wiring is represented in green. It can be easily installed through a second IP switch or group of switches (when the wiring is dispersed or distributed in different areas or floors of the building). All devices in the “AEQ Audio Over IP Routing System” feature two network interfaces that allow optional installation of system redundancy. To complete this redundancy, the PCs must be equipped with a second Ethernet adapter. **IMPORTANT NOTE:** When there is a redundant network, primary and secondary interfaces must be connected to separate networks.

The schematic shows the 5 different AoIP interfaces in the AEQ system:

- NETBOX 32 Channel interface.
- NETBOX 8 Channel interface.
- CAPITOL IP console.
- FR14 boards to connect FORUM and GRAND FORUM mixing consoles.
- BC2214/BC2224 boards to connect ARENA consoles and BC2000D / TITAN routers.



The program audio for all studios, as well as other required signals for the central control (such as clean-feed auxiliary sends for telephone systems, etc) are sourced from the NETBOX 32 AD audio outputs. The signals necessary for the studios, such as satellite downlink, audiocodecs, tuners or TV receivers, etc. are routed to the NETBOX 32 AD inputs.

One or several NETBOX 32 AD units can also be installed in the links dispatch. From this can be extracted, for example, signals going to radio links and satellite uplinks. Audio signals from the central control will be channeled into the system through them. Programs from all the studios (as well as any other signal required in central control such as auxiliary program sends orclean-feeds for telephone systems) are available on the NETBOX32 AD audio outputs. Signals required as studio channels such as satellite down-links, mobile units, etc. are connected tot the NETBOX 32 AD audio inputs.

A NETBOX 8 AD can be installed in News recording cabins or edit suites providing audio input and output for the audio workstations through a bi-directional USB link. Audio can also be provided to the mixing console using analog and digital I/O connections.

The same NETBOX 8 AD unit will provide IP connectivity to analog or digital studios without AEQ IP connectivity. This way, a station can be IP–connected without having to abandon existing equipment.

AEQ CAPITOL IP, FORUM and ARENA digital consoles can be provided with the corresponding multi-channel interfaces: One with 16 input + 16 outputs for CAPITOL IP and one or more with 32 input + 32 outputs for FORUM and ARENA. The most important outputs of each console can be routed to the multi-channel interfaces: master, auxiliary, clean feeds, etc. so they can be used at any other location within the station. At any moment and as required, it is possible to assign and route the signals with origin from studios, cabins, central control and links to the audio inputs of the interface.

The installation, turn-on, monitoring, routing creation and optimization tasks are equivalent to those described in the corresponding paragraphs in section 3.1, except for the differences related to the size and complexity o the system.

4. "DANTE CONTROLLER": REAL-TIME OPERATION SOFTWARE.

4.1. "Dante Controller" Description.

NOTE: The information included in this manual is valid for software **version 3.5.6.2** (or higher versions).

"Dante Controller" is a software application provided by Audinate which allows users to configure and route audio around Dante networks. It is available for PCs running Windows 7, 8 and 8.1, and Apple Macs running OS X 10.7.5, 10.8.5, 10.9.5 and 10.10.

Once you install "Dante Controller" on your PC or Mac and connect it to a Dante network, you can use "Dante Controller" to:

- View all Dante-enabled audio devices and their channels on the network.
- View Dante-enabled device clock and network settings.
- Route audio on these devices, and view the state of existing audio routes.
- Change the labels of audio channels.
- Customize the receive latency (latency before play out).
- Save audio routing presets.
- Apply previously saved presets.
- View and set per device configuration options including:
    - Changing the device name.
    - Changing sample rate and clock settings.
    - Viewing detailed network information.
    - Access the device web page to upgrade firmware and license information (where supported).
    - Identify a device for example by flashing LEDs (where supported).
- View network status information, including:
    - Multicast bandwidth across the network.
    - Transmit and receive bandwidth for each device.
- View device performance information, including latency statistics and packet errors.
- View clock status information for each device, including frequency offset history and clock event logs.

4.2. Minimum System Requirements.

Below we list the minimum system specifications for your computer to be able to use "Dante Controller".

Disclaimer: It is possible that your computer may meet the requirements below, but suffer from some other individual performance limitation related to its particular hardware. Please seek the advice of your computer support administrator.

General.

Recommended Minimum Requirement:

- Processor 1GHz or better.
- Memory 512 Mbytes of RAM.
- Network Standard wired Ethernet network interface (100Mbps or Gigabit). Wireless LAN (Wi-Fi) Ethernet interfaces are not supported.

Windows.

Recommended Minimum Requirement:

- Windows 7, 8 and 8.1 (32-bit and 64-bit)

It may work on Windows XP SP3 (32 bits), but we don't provide support for this OS.

NOTE: Both UTF-8 and Unicode are supported EXCEPT for host or device names; the DNS standard does not support Unicode for these.

Operating System Updates.

Ensure your PC has the latest Windows updates installed.

Firewall Configuration.

Firewall configuration for Windows Firewall is automatically handled during installation. “Dante Controller” communicates over UDP over the following ports:

- Dante Control and Monitoring: 8700-8705, 8800

If you are using a third-party firewall product, use the port information provided above to configure it accordingly.

Monitor Requirements.

A display resolution of at least 1024 x 768, with a screen size of at least 19” is recommended for “Dante Controller”.

4.3. Installing “Dante Controller”.

4.3.1. Downloading “Dante Controller”.

“Dante Controller” is available for download from Audinate’s website. It’s also available in the auto run disk furnished with AEQ equipment.

To download a copy of “Dante Controller”:

1. Go to the Audinate website: www.audinate.com.
2. Navigate to Products > Dante Controller.
3. Under “Download“, choose your operating system.
4. Click the red download button.

This will take you to the appropriate Dante Controller release page for your operating system. Click the link under “File downloads“ to download the Dante Controller installer.

4.3.2. Installing “Dante Controller” on Windows.

Once you have downloaded the self-installing “Dante Controller” file, navigate to the directory where you have downloaded it (e.g. Desktop).

To install “Dante Controller”:

1. Ensure you are logged on to your PC as an administrator.
2. Navigate to and double-click the “Dante Controller” installer file.
3. Read the license agreement. If you agree to the terms, select the 'I agree' checkbox and click Install. If you do not agree to the terms, click Close.
4. Confirm / acknowledge any Windows security prompts that are displayed.

“Dante Controller” will then be installed. “Dante Controller” will be added to the start menu, under “Audinate”.

4.3.3. Uninstalling “Dante Controller“ under Windows.

You should not need to uninstall “Dante Controller” before installing a new version. However, if you do wish to uninstall “Dante Controller”:

Navigate to Control Panel > Programs and Features, select “Dante Controller” and click Uninstall.

NOTE: Two other Dante features, 'Dante Control and Monitoring' and 'Dante Discovery', may still be present in the programs list after uninstalling “Dante Controller”. Do not uninstall these features if they are present - they are required by other Dante software applications (for example, “Dante Virtual Soundcard”, Firmware Update Manager, and third-party Dante control applications). They will be removed automatically if they are no longer required.

4.4. Where to find the "Dante Controller" application?

By default "Dante Controller" will be installed in
C:\Program Files\Audinate\Dante Controller\

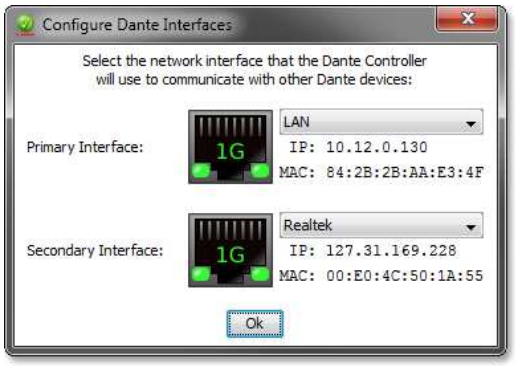
It can be started in several ways:

- From the Start menu: Start > Programs > Audinate > Dante Controller > Dante Controller
- Run by going to Start > Run and entering in the dialog box:
  C:\Program Files\Audinate\Dante Controller\DanteController.exe
- Navigate to the directory where it is installed, and double-click the "Dante Controller" icon.

4.5. Configuring "Dante Controller".

"Dante Controller" can communicate with other Dante devices on the primary network, or the secondary network, or both. "Dante Controller" needs to know which of the network interfaces of the host computer is connected to each Dante network.

The first time "Dante Controller" is run, you may be presented with the Configure Dante Interfaces dialog box (shown below), providing a list of interfaces from which to select the primary and secondary Dante interfaces. Once interfaces have been selected, they are remembered for future use, and this dialog box will not be shown when "Dante Controller" is run subsequently.



To display this dialog at any other time, click the button  in the main toolbar.

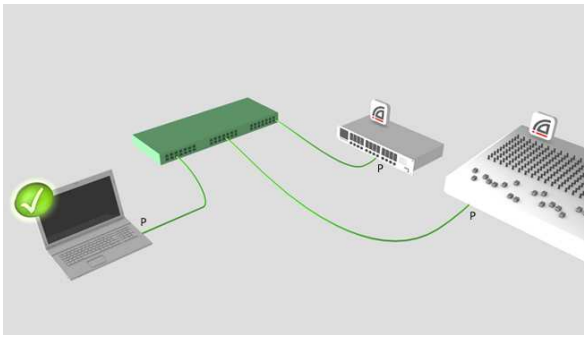
Network Interface Configuration Guidelines.

<u>Primary only (non-redundant) Dante network</u>.

If you only have a primary network, you can only connect one interface to the Dante network.

In the example below, the laptop (running "Dante Controller") and the two Dante devices (a console and a Netbox) are connected to the switch via their primary interfaces. This is a typical non-redundant Dante network.

If the laptop has two network interfaces, either can be used.

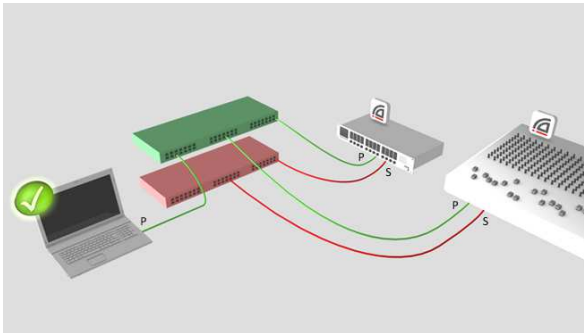


<u>Primary and secondary Dante networks (redundant configuration), only one network interface on the host computer</u>.

If you have primary and secondary (redundant) networks, but only one network interface on your computer, you should set your computer's network interface as the primary interface. This ensures that you can control any non-redundant devices, and see full connection information for any redundant devices that are connected to non-redundant devices.

If a problem does occur, and you lose connectivity on the primary network, you can connect instead to the secondary network, to maintain control over your devices. This entails changing the physical connection (i.e. physically connecting your computer to a switch on the secondary network), and changing the interface selection in the Configure Dante Interfaces dialog.

In the example below, the laptop (running "Dante Controller") is connected to the switch via one interface only, which is set as the primary Dante interface.



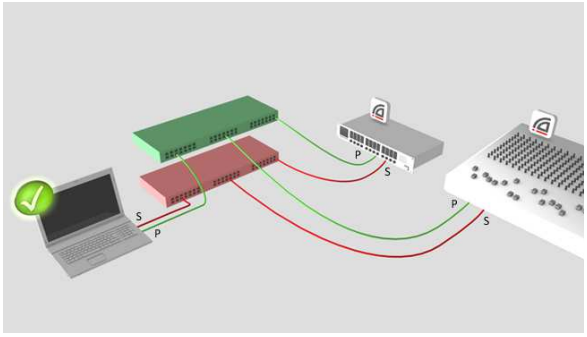
The two Dante devices (the console and the Netbox) are connected to the primary switch via their primary interfaces, and to the secondary switch via their secondary interfaces. The two switches are not connected to each other. This is a typical redundant network configuration for computers with only one network interface.

NOTE: When connected to the secondary network, you will not have control over devices that are only connected to the primary network (i.e. non-redundant devices, or "Dante Virtual Soundcard"). You will see the device names in the Network view, and in subscription dialogs (for example, the Device View > Receive and Transmit tabs) but you will not be able to view or edit device configuration for those devices. Also, if the master clock is only connected to the primary network, its name will not resolve in the 'Master Clocks' section of the main window tool bar, it will be shown as a MAC address string.

Primary and secondary networks (redundant configuration), two network interfaces on the host computer.

If you have primary and secondary networks, and two network interfaces available on the host computer, you should connect one interface to each network. This means that you will always have full control of all redundant devices, even if the primary network fails.

In the example below, the laptop (running "Dante Controller") and the two Dante devices are connected to the primary switch via their primary interfaces, and to the secondary switch via their secondary interfaces.



The two switches are not connected to each other. This is a typical redundant network configuration for computers with two (or more) network interfaces.

NOTE 1: You must be connected to a standard wired Ethernet network in order to use "Dante Controller". Wireless and other non-standard wired Ethernet interfaces will not appear in the Configure Dante Interfaces dialog.

NOTE 2: All Dante applications on the same computer have a shared understanding of which interface is the primary Dante interface. For example, if you have installed "Dante Virtual Soundcard" on the same PC as "Dante Controller", and a new primary interface is selected from within "Dante Virtual Soundcard", "Dante Controller" will automatically switch to the newly selected interface, and begin operating on that interface.

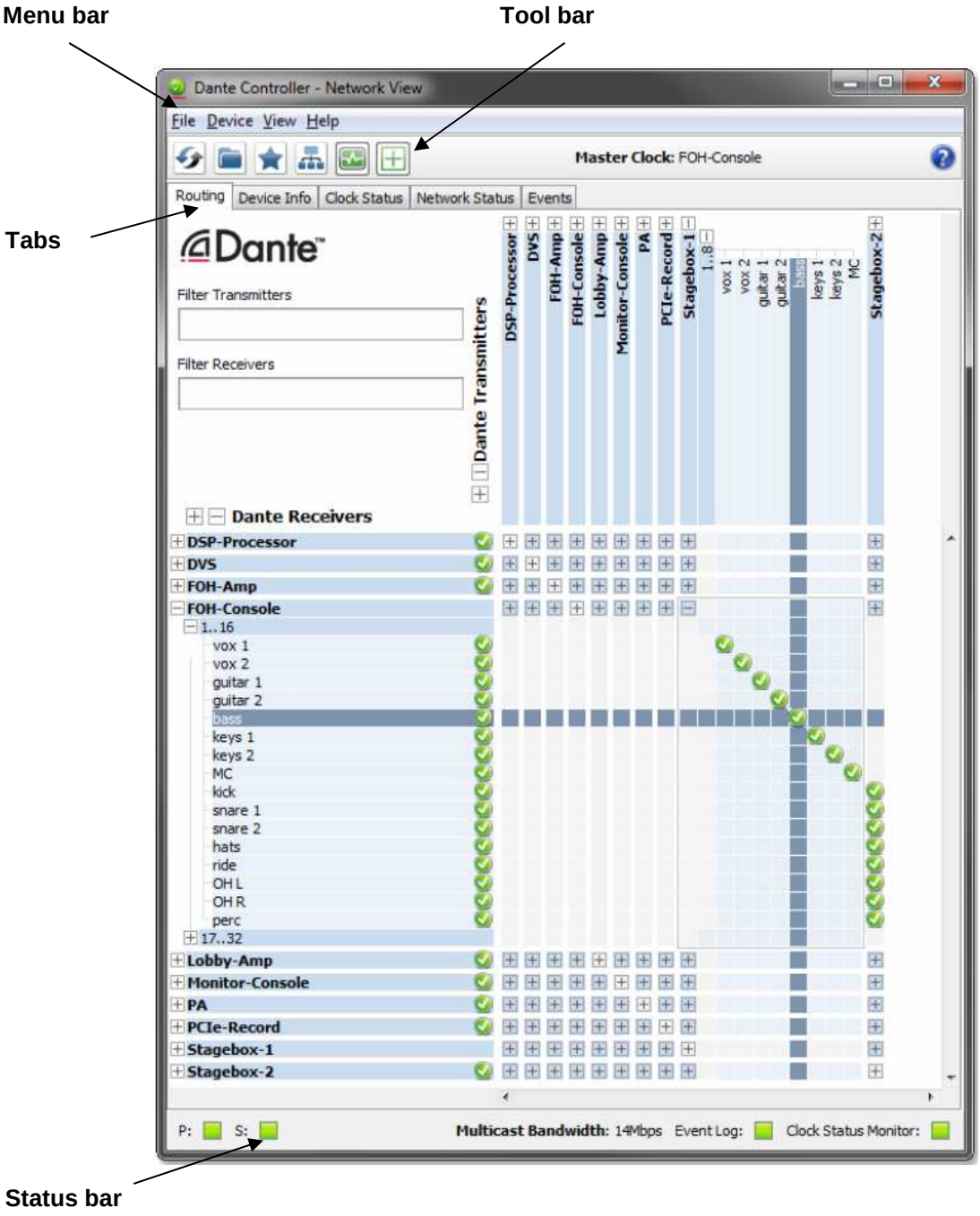
4.6. Using “Dante Controller”.

“Dante Controller” presents two main types of view: Network View and Device View.

IMPORTANT NOTE: After making changes to Dante network routing (e.g. subscriptions, device names, channel labels etc.) please wait at least 5 seconds before disconnecting or powering down any affected devices. This ensures that the new information has been properly saved to the devices. Device configuration (e.g. sample rates, latency, clock settings) is saved instantly.

4.7. Using “Dante Controller”: “Network View”.

When “Dante Controller” is started, it opens at the Network View, with the Routing tab selected, offering the network connection view in XY format:

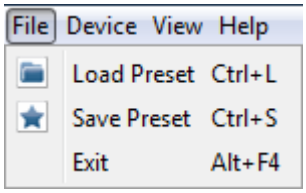


4.7.1. "Network View" Menu Bar.

The menu bar in the Network View includes four menus: File, Device, View and Help. The options available for each of the menus are the following ones:

"**File**":

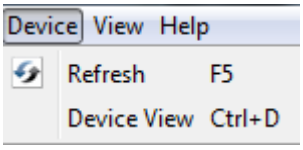
- "Load Preset" (Ctrl + L): loads a configuration from a file.
- "Save Preset" (Ctrl + S): saves configuration for currently displayed devices to a file.
- "Exit" (Alt + F4): exits "Dante Controller".



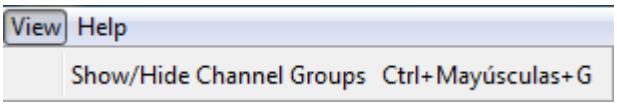
"Presets" operation is described in more detail in section 4.10 of this manual.

"**Device**":

- "Refresh" (F5): refreshes the displayed network / device data.
- "Device View" (Ctrl + D): opens a new Device View window.

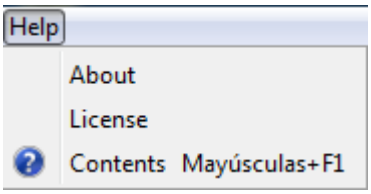


"**View**": allows the activation of channel groups (Ctrl + Caps + G).



"**Help**":

- "About": shows the "Dante Controller" version, and current event log file location.
- "License": displays the license text.
- "Contents" (Shift + F1): opens a help window and displays help contents.



4.7.2. "Network View" Tool Bar.

Below the menu bar there is a tool bar, containing six buttons:

 Reload Device Information: Updates the current view with the latest device information from the network. This is useful when a recent change to the network has not yet propagated automatically through to "Dante Controller" (for example, a new device has been added to the network).

 Load Preset: Loads a previously saved audio routing configuration. For more information, check section 4.10.

 Save Preset: Saves the current audio routing configuration. For more information, check section 4.10.

 Choose a Dante Interface: Opens the Configure Dante Interfaces dialog. For more information, check section 4.5.

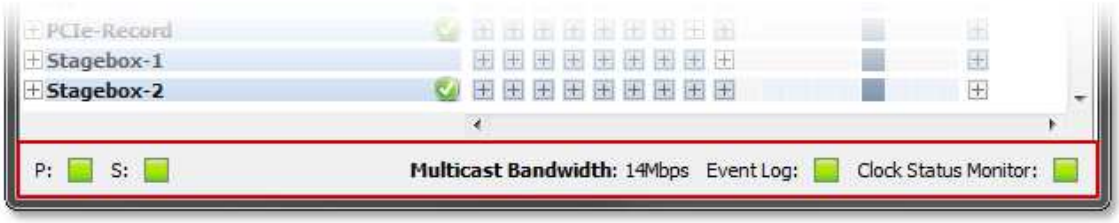
 Clock Status Monitoring: Activates the Clock Status Monitoring function. For more information, check section 4.7.4.3.

 Channel Groups: Allows the activation of the display of audio channels for each device in groups of 16. For more information, check section 4.7.4.1.

To the right of the toolbar, "Dante Controller" displays the current master clock (or clocks, in the case of redundant networks).

4.7.3. "Network View" Status Bar.

The Status Bar, in the bottom area of the screen, displays notifications for network status, general device events, and clock status events, plus the current Dante audio multicast bandwidth on the network.



The Status Bar displays the following information:

- **P:** The current status of the Primary network. Green indicates that "Dante Controller" is currently connected to the primary Dante network. Red indicates a problem with the connection.
- **S:** The current status of the Secondary Dante network. Only displayed where a secondary network is connected.
- **Multicast Bandwidth:** The current Dante audio multicast bandwidth on the connected networks.Note that there may be network traffic from other sources that is not included in the multicast bandwidth reading.
- **Event Log:** Indicates the current status of the event log. Click the icon to open the Events View.
- **Clock Status Monitor:** Indicates the current status of the Clock Status Monitor. Click the icon to open the Clock Status Monitor.

4.7.4. "Network View" Tabs.

There are five sub-views within "Network View" that can be selected by clicking on the tabs located under the tool bar:

Each of these options is described below.

4.7.4.1. "Routing".

When "Dante Controller" is started, it always displays the Routing Tab within the Network View. In this view the network is shown in the form of a grid. Devices with Tx channels are displayed along the top row of the grid, and those with Rx channels are displayed along the left-hand column of the grid. Initially a collapsed view is presented; individual channels cannot be seen.

NOTE: If a device name is shown in red, it means "Dante Controller" has automatically detected an error condition. Double-click the device name to see more information. For more information, check section 4.7.5.

Device Channels.

A Dante device has a number of channels associated with it. These are either transmit (Tx) or receive (Rx) channels. Receive channels and devices are listed down the left side of the grid. Transmit channels and devices are listed along the top of the grid.

Transmit channels are advertised on the network. A receiver uses this advertisement to establish a subscription to the channel. A transmit channel can be sent to multiple receivers using unicast or multicast.

Receive channels are connected to transmit channels via a subscription. Each receive channel will receive audio over the network from at most one transmit channel.

Subscribing to Audio Channels.

In the Routing View, a blue square at the intersection of an Rx and a Tx channel indicates that is it possible to create an audio route between those channels. A grey square indicates that it is not possible to create a route between those channels. This may be because of a mismatch in sample rate between the transmitter and receiver, or because a device cannot route to itself.

When you click a blue square at the cross-point between a transmit channel and a receive channel, a subscription will be created, and a green tick will appear in the matrix cross point. You may initially see a grey hourglass icon (usually very briefly) to indicate that the subscription is in progress.


If there is a problem with the subscription, either a warning or an error icon may appear. If many devices have been subscribed at the same time, a yellow pending icon may appear temporarily.



NOTE: Subscriptions can also be created in the Device View. This is covered in the Device View Section.

Subscribing to Multiple Audio Channels at once.

To subscribe multiple channels at the same time, hold down the **Ctrl** key and click the [-] symbol at the top left corner of the intersection between the two devices. All the possible channels will be subscribed at the same time (see image in next page) in diagonal arrangement (the first channel of the transmitting device connected to the first channel of the receiver device, second channel to second channel and so on) This multiple-subscription tool subscribes channel by channel (for example, 4 transmitters to 4 receivers), that is, a receiver can receive audio from one transmitter only.

Unsubscribing Audio Channels.

To unsubscribe an audio channel, click on the cross-point containing a subscription. The subscription icon will be removed and revert to a plain blue square.

Subscription Status.

The symbol displayed at the intersection of the Tx channel and the Rx channel in the Routing View provides information on the status of the subscription or connection, as follows:


In progress: The subscription is in progress.


Subscribed: Connection is established and fully functional.

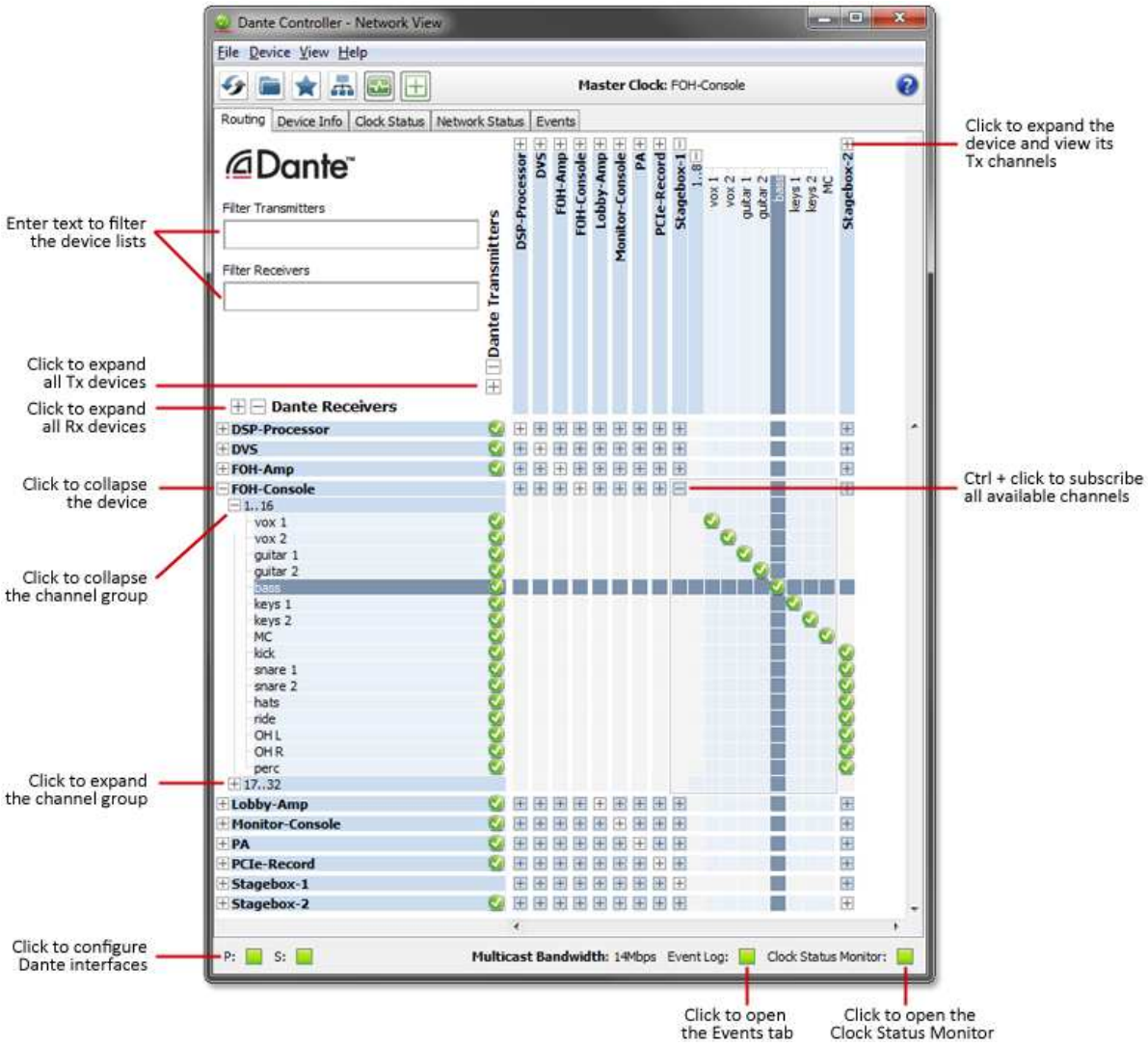

Warning: The subscription is unresolved, typically because the transmitting device is not visible on the network (for example, because it has been removed, or switched off).

Error: An error has occurred - for example, there is insufficient bandwidth to establish the subscription.


Pending: Device is part-way through setting up subscription. Most commonly seen when subscribing many channels at a time.

NOTE: The status of a subscription can change after it has been initially established, due to changes in the network or changes in other devices.

Expanding the Routing View.



The Rx channels associated with any device can be displayed by clicking on the [+] to the left of the device name in the left-hand column of the grid. The Tx channels associated with any device can be displayed by clicking on the [+] above the device name on the top row of the grid. When this action is performed the grid view expands to show each channel of the device, and the [+] becomes a [-]. Clicking on [-] collapses the view. You can also group channels into sets of 16 (see next page).

The Rx channels associated with all devices can be simultaneously expanded by clicking on the [+] of "[+] [-] Dante Receivers" at the top of the left-hand column. Similarly, the Tx channels associated with all devices can be simultaneously expanded by clicking on the [+] of "[+] [-] Dante Transmitters" at the left of the top row. Clicking on [-] will collapse the view.

Device List Filtering.

The device lists in the Routing view can be filtered using the "Filter Transmitters" and "Filter Receivers" boxes, below the Dante logo in the top left-hand corner. Any text string typed into the box will filter the view to only display devices that contain that text string, in either a device name, or channel name.

The filtering is case-insensitive. For example, in the “Dante Controller” Network view shown here, entering the string “foh” in either of the Filter fields would display only the FOH-Amp and FOH-Console devices, and their channels.

Channel Groups.

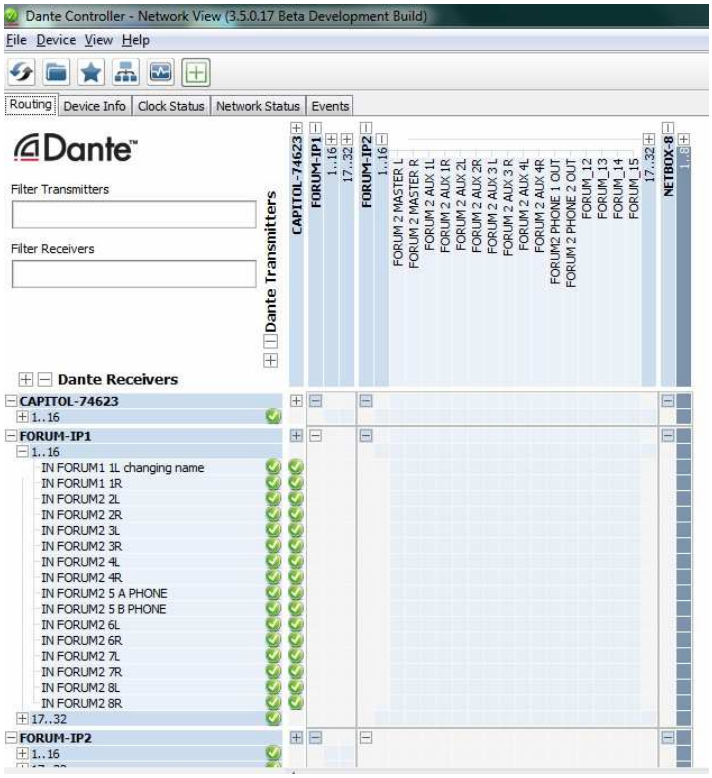
When Channel Groups is active, device channels in the Network View Routing tab are grouped into sets of 16. The button changes its color to green when this option is activated.

This makes it easier to view and make channel subscriptions for devices with large numbers of channels.

The groups are named “1..16”, “17..32” etc.

To expand a channel group, click the plus [+] icon. To collapse a channel group, click the minus [-] icon.

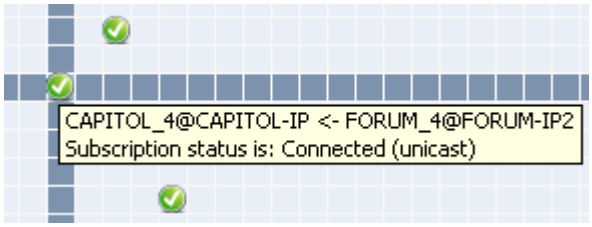
NOTE: Grouping channels does not affect routing or device behaviour.



Subscription Tooltips.

Hovering the mouse over a subscription icon in the Routing tab displays a tooltip containing information about the subscription

If there is no problem with the subscription, the tooltip will display the Rx channel and device name, plus the Tx channel and device name (for example, “CAPITOL_4” Rx channel of “CAPITOL-IP” device subscribed to “FORUM_4” Tx channel of “FORUM-IP2” device).

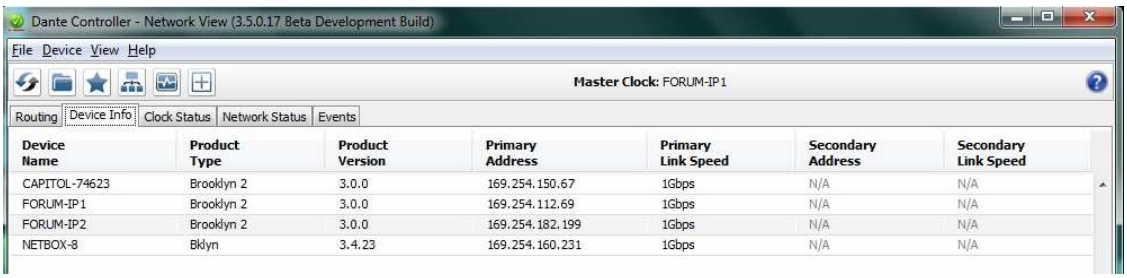


Other messages are displayed if the subscription is in any other state:

- “Incorrect channel format: source and destination channels do not match”: The receiver and transmitter are set to different sample rates.
- “Mismatched clock domains: The transmitter and receiver are not part of the same clock domain”: One of the devices is configured with sample rate pull-up/down that does not match the other device.
- ”Tx Scheduler failure”: This is typically because you are trying to use sub-millisecond latency over a 100 Mbps network link (1 msec is the minimum supported latency over 100 Mbps links).

- "No Receive flows: receiver cannot support any more flows": This will be seen if the receiver is subscribed to too many devices (devices typically do not support the same number of flows as they do channels).
- "No more flows (TX): transmitter cannot support any more flows": This will be seen if too many devices are subscribed to the transmitter.

4.7.4.2. "**Device Info**" **(status of the device).**



The Device Info tab provides a network-wide overview of device configuration and operating information. The tabular view presents the following information, in columns from the left:

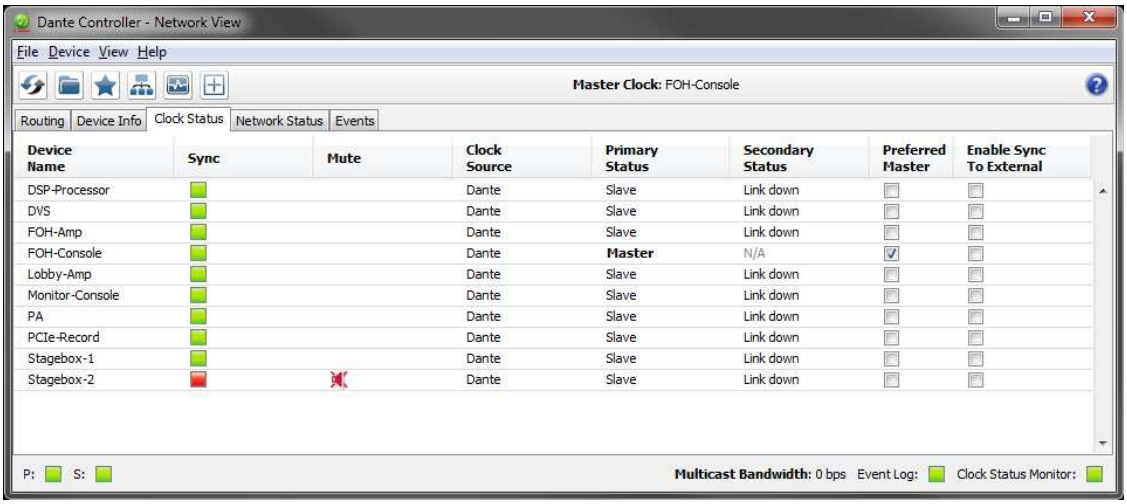
- Device Name: The device name currently associated with the device.
- Product Type: The type of Dante module in the device.
- Product Version: The product version, as defined by the manufacturer.
- Primary Address: The IP address assigned to the primary interface. IP addresses are currently assigned via DHCP, or automatically self-assigned. Self-assigned addresses on the primary interface will be in the 169.254.X.Y range.
- Primary Link Speed: The Ethernet link speed of the primary interface.
- Secondary Address: The IP address assigned to the secondary interface. Self-assigned addresses on the secondary interface will be in the 172.31.X.Y range. 'N/A' indicates that the device does not support a secondary interface. 'Link down' indicates that the device supports a secondary Dante interface, but it is not currently connected.
- Secondary Link Speed: The Ethernet link speed of the secondary interface. Other values are possible (as per Secondary Address).

NOTE 1: A Dante interface may have a preferred link speed. Where it does, and an interface is not operating at that preferred link speed, the values in the Link Speed columns will be shown in red.

NOTE 2: If no device information is displayed for a device, it can indicate a ConMon (Dante control and monitoring service) failure on the device. The device may need to be reset or restored.

4.7.4.3. "**Clock Status**".

The Clock Status tab provides a network-wide overview of the clocking state within the network.



This view provides a convenient way of quickly scanning the network for clock information. The tabular view presents the following information, in columns from the left:

- "**Device Name**"**:** The device name currently associated with the device.
- "**Sync**"**:** Indicates the clock sync status for the device.
  - A green light indicates that the device is currently synced to (or is driving) the network clock.
  - A red light indicates that the device is not currently synced.
- "**Mute**"**:** Indicates the mute status for the device.
  - A red mute icon indicates that the device is currently muted (usually due to loss of clock sync).
  - No icon in the mute column means that the device is not muted (audio should be flowing normally).
- "**Clock Source**"**:** Indicates the clock source for the device.
  - Dante: The device is deriving its clock from the Dante network, or is acting as master clock (but not deriving its clock from an external source).
  - External: The device is deriving its clock from an external word clock source.
- "**Primary Status / Secondary Status**"**:** Indicates the state of the PTP clock for the primary and secondary network interfaces.
  - Master: Device is the current PTP Master Clock on the primary Dante network.
  - Slave: Device is a PTP Slave on the primary Dante network.
  - Passive: Device is not using clock synchronization information from this interface.
  - Link Down: The interface is not connected to the network.
  - N/A: Indicates that the device does not support clock status reporting. In the Secondary Status column, can also indicate that the device is non-redundant.
  - Listening: Usually transient. When persistent, it indicates that the device can not operate as a clock master (slave only), and is waiting for a clock master to appear on the network.

  Devices that are configured with sample rate pull-up/down (this is not the case with AEQ equipment) are shown with the relevant pull-up/down value against their Clock Status. For example, a device acting as master clock with +0.1% pull-up will be shown as Master (+0.1%). See "About Clock Domains" section for more information.

  Other transient clock states exist, which are not listed above.

- "**Preferred Master**"**:** Raises the priority of the device in the master clock election. If only one device on a particular clock domain has this checkbox ticked, it ensures that the selected device becomes master clock (for that clock domain). When multiple devices have their Preferred Master checkbox ticked, the master will be elected automatically from within that group.

  If 'Slave Only' is shown instead of a checkbox, it indicates that the device is not capable of acting as a master clock.

- "**Enable Sync To External**"**:** Forces the Dante module to derive its clock from an external source - either from a host device word clock, or from an auxiliary device. This will also ensure that this Dante device becomes master clock for the relevant clock domain (unless another device has 'Preferred Master' selected). It is not normal practice to configure more than one device per clock domain with an external clock source. In this case, the user is assumed to have synchronized external word clock sources (e.g. house clock).

  Where the checkbox is present but greyed-out (and inactive), it means that the Dante device can be slaved to an external word clock, but it cannot be set directly from "Dante Controller" - it must be done via the host device user interface, or via some other method (e.g. third-party control software). If the checkbox is greyed out and populated, it means that the Dante device is currently slaved to the external clock.

  If N/A is displayed, it means that the device does not support slaving to an external word clock.

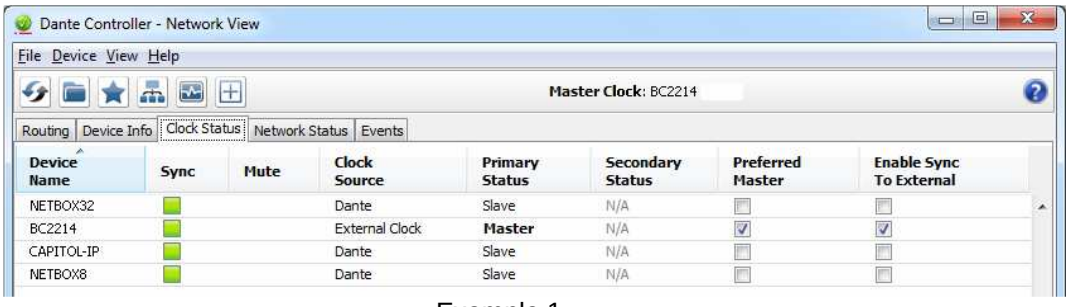
NOTE: If no clock status information is displayed for a particular device, it can indicate a ConMon (Dante control and monitoring service) failure on the device. The device may need to be reset or restored.

The way to configure DANTE synchronism of an **AEQ** device will change depending on if the unit will work in **master** or **slave** mode and, in the case of **FORUM** and **BC2000D** Matrix or ARENA), if there is one or more DANTE boards (FR14 for FORUM and BC2214/BC2224 for BC2000D).

Keep it in mind that only one system device will work as master, the rest of devices will work as slaves.

- Device **NETBOX 8**, **NETBOX 32**, **CAPITOL**, **FORUM** with 1 module FR14 or **BC2000D** with 1 module BC2214 or BC2224:

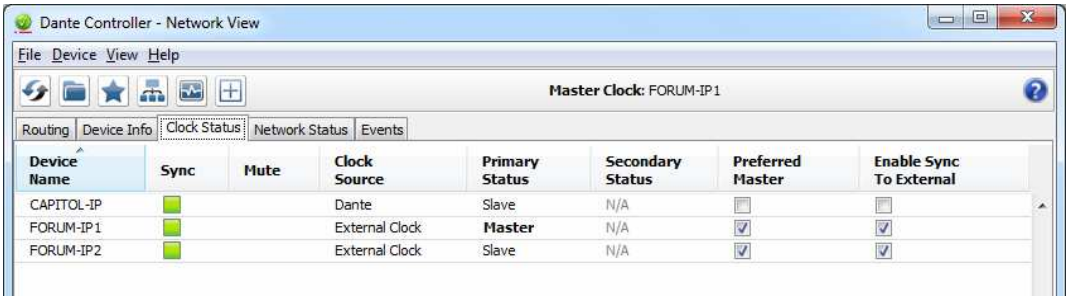
  - **Master** mode**:** in "Clock Status" tab of Dante Controller **mark** the "Preferred Master" and "Enable Sync To External" checkboxes.
  - **Slave** mode**:** in "Clock Status" tab of Dante Controller **don't mark** the "Preferred Master" and "Enable Sync To External" checkboxes.



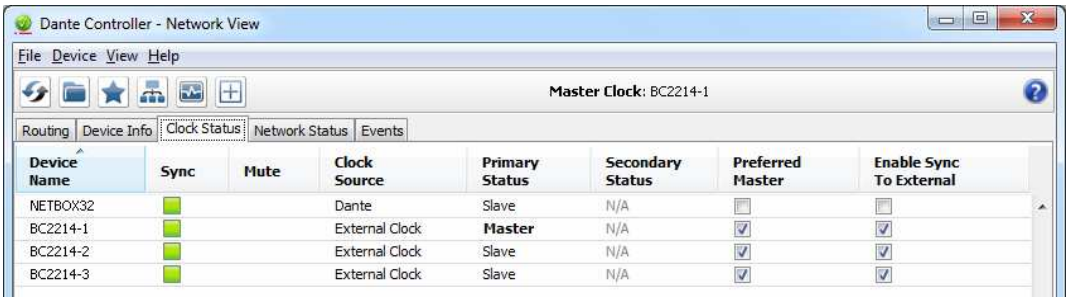
Example 1

In addition, the device must be also configured as **master** or **slave** (depending on the configuration that will be applied by Dante Controller) by means of the specific software of the device (NetBox Tool, CAPITOL Setup, FORUM Setup, Matrix Setup or Console Setup).

- Device **FORUM** with 2 modules FR14 or **BC2000D** with 2 or more modules BC2214 o BC2224:
    - **Master** mode**:** in “Clock Status” tab of Dante Controller **mark** the “Preferred Master” and “Enable Sync To External” checkboxes of all the modules FR14 or BC2214/BC2224.

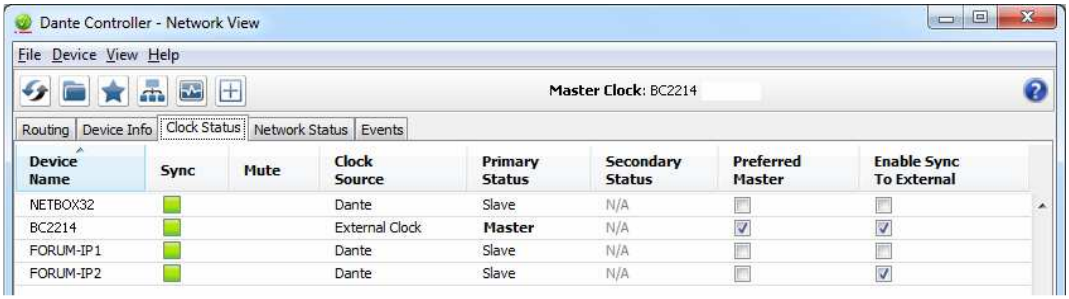


Example 2



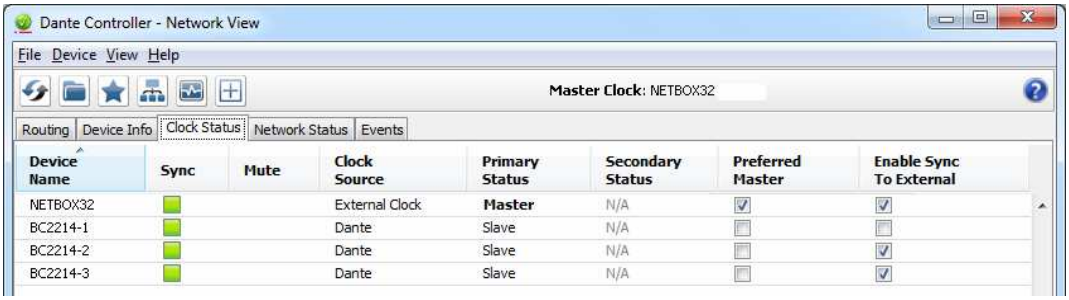
Example 3

- **Slave** mode for **FORUM:** in “Clock Status” tab of Dante Controller **mark only** the “Enable Sync To External” checkbox of the FR14 module placed in **slot 13.**



Example 4

- **Slave** mode for **BC2000D:** in “Clock Status” tab of Dante Controller **mark** the “Enable Sync To External” checkbox of all the modules BC2214/BC2224 **except** of the one that will extract synchronism from the link:
    - In the case of **Matrix** you can prioritize from Matrix Setup the synchronism extraction in the boards configured as sync slaves in order to fix beforehand wihich one will have higher priority for that extraction function.
    - In the case of **Arena**, it's not possible to configure that priority, all the boards will have the same probability of being the one that will extract synchronism: you'll have to check which board will make that function by means of Status Information application (it will indicate "REMOTE SYNC ENABLED") or by checking the LED signalling of the board (fast blinking with momentary interruptions)



Example 5

In addition, the device must be also configured as **master** or **slave** (depending on the configuration that will be applied by Dante Controller) by means of the specific software of the device (FORUM Setup, Matrix Setup or Console Setup).

About Clock Domains.

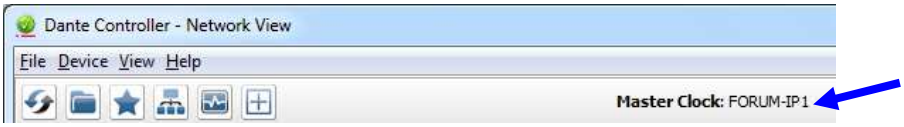
Dante Devices that are not configured with sample rate pull-up/down operate on the default clock domain, using the default clock. Devices that are configured with sample rate pull-up/down operate on separate 'clock domains', which have their own dedicated PTP clocks, adjusted to account for the pulled up/down sample rates.

Clock domains are not physically separated, they all exist on the network simultaneously. Devices with pull-up/down synchronise to the appropriate clock for their pull-up/down setting, and ignore other clocks. Those devices are shown with the relevant pull-up/down value against their Clock Status in the Clock Status tab.

Dante devices can only transmit audio to, and receive audio from other devices on the same clock domain. For example, a device with zero sample rate pull-up/down operates on the default clock domain, and cannot transmit audio to, or receive audio from any devices on the +4.1667% clock domain, or the -1% clock domain, etc.

Up to 5 separate clock domains can be supported at any one time. All clock domains have their own master clock.

About Master Clocks.



The Dante network master clock (often also referred to as the 'Grand Master'), is displayed at all times in the center of the toolbar of the Network View. This is the device that is providing the time sync source for all devices on the network.

If multiple clock domains are in use, the master clock for each domain is shown, in a comma-separated list.

The master clock is chosen automatically through an election process, though there are user configurable parameters that allow prioritization of some devices in the master clock election. Configuring a device to have an external word clock source will force that device to become master clock, unless another device has 'Preferred Master' set.

Checking the 'Preferred Master' flag will always result in that device (or the device with the lowest MAC address, if more than one device has been checked) becoming master clock for that domain.

NOTE: If the master clock device is not directly visible to “Dante Controller” (for example, if the master clock device is for some reason only connected to the secondary network, and “Dante Controller” is only connected to the primary network), the 'Master Clock' display in the toolbar may show a MAC address string, instead of the device name.

Clock Status Monitoring.

Dante devices are monitored by “Dante Controller” to establish the status of their clock synchronization with the Dante network master clock.

There are two levels of monitoring: 'passive' and 'active'.

- In passive mode, “Dante Controller” will report if a clock loses sync (or regains sync) with the master clock.
- In active mode, “Dante Controller” will also report if a clock is showing signs of instability. If a device clock is significantly unstable, it can lose sync with the master clock, which will result in the device being automatically muted.

Why would a device clock be unstable?

There are a range of network conditions that can interfere with a device’s clock stability. These include:

- A switch on the network is configured to use Energy Efficient Ethernet ('Green Ethernet') functionality.
- A 100 Mb switch or link is present where a Gigabit connection is required.
- One or more switches are incorrectly configured.
- A 'problematic' external word clock is being used as the master clock.

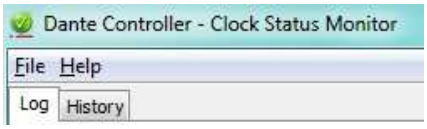
Please check Appendix 1 “Troubleshooting” for more information.

Passive monitoring.

Passive monitoring is on all the time. If a Dante device loses sync with the master clock, or regains sync with the master clock, it reports the event to “Dante Controller”. “Dante Controller” records these events in a log file, and also will display an alert: the Clock Status Monitor icon (at the bottom right corner of the main window) will light up red.

Clicking the icon opens the Clock Status Monitor, which includes 2 tabs:

- “Log”: clock status event log.
- “Hystory”: clock status histogram



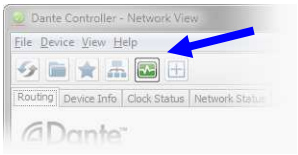
Active Monitoring.

When active monitoring is switched on, “Dante Controller” begins actively monitoring the behaviour of supported devices to identify signs of clock instability. If a clock exhibits significant instability, the Clock Status Monitor icon will light up amber, and a warning event will be recorded in the clock status event log.

Click the icon to open the “Clock Status Monitor” window.

Active monitoring is off by default. To activate it, click the Clock Status Monitoring button on the main toolbar:

When Active Clock Status Monitoring is active, the button is shown in green.



To switch it off, click the button again.

NOTE: Active monitoring does not affect passive monitoring.

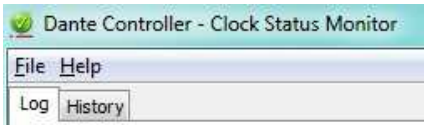
Devices including an active supervision DANTE support module are:

- "Brooklyn II” module, incorporated in all AEQ systems described in the present manual.
- Dante PCIe cards.
- Dante-MY16-AUD cards.
- Ultimo devices.

If the device includes a Brooklyn II module, this is displayed in the “Product Type” in the “Device Info” tab and also in the sections “Device Information” and “Dante Information” in the “Status” tab within the corresponding “Device View” window.

“**Clock Status Monitor**“.

The Clock Status Monitor window includes two tabs: “Log” and “History”.



“**Log**”.

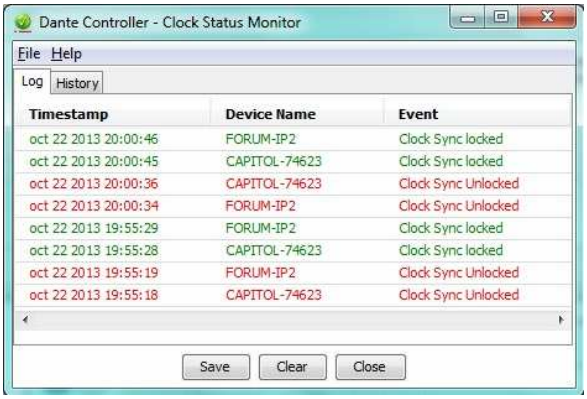
The Clock Status log shows time-stamped clock status events for each device that has been identified as unstable, or has lost or regained sync with the master clock.

The event types are:

Clock Sync Warning: Indicates that a clock has been identified as unstable, and is at risk of losing sync with the master clock.

Clock Sync Unlocked: Indicates that a device has lost sync with the master clock. This will result in the device being automatically muted until it regains sync.

Clock Sync Locked: Indicates that a device has regained sync with the master clock.



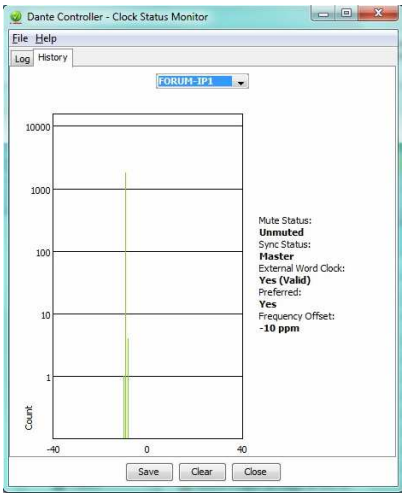
To delete all Clock Status log entries, click Clear. This will reset the Clock Status Monitor icon to green. NOTE: This will also clear all other event log entries (the Clock Status log is a filtered view of the main event log).

"Dante Controller" will then resume monitoring (unless the Clock Status Monitoring button is switched off).

To save the event log as an XML file, click Save.

"**History**".

The History tab can be used to establish the stability of device clocks. It shows a histogram of clock frequency offset for the selected device, and the current frequency offset value, updated in real time.



The following information is also displayed:

- Mute status.
- Sync status.
- External word clock.
- Preferred Master status.

About Clock Offset.

Hardware clocks are based on a vibrating (piezoelectric) quartz crystal. All crystals are slightly different, and vibrate at slightly different frequencies. When a device ('slave') clock wants to sync to a master network clock, its frequency must be 'pulled' up or down to match the frequency of the master clock. The amount that the clock's frequency is pulled is referred to as 'offset'.

Hardware clocks can only support a certain amount of offset, referred to as 'pull range'. If the pull range is exceeded, the slave clock will lose sync with the master clock, and the device will be automatically muted.

Software clocks typically use an algorithm to derive a clock from an internal counter. Software clocks can support any amount of offset.

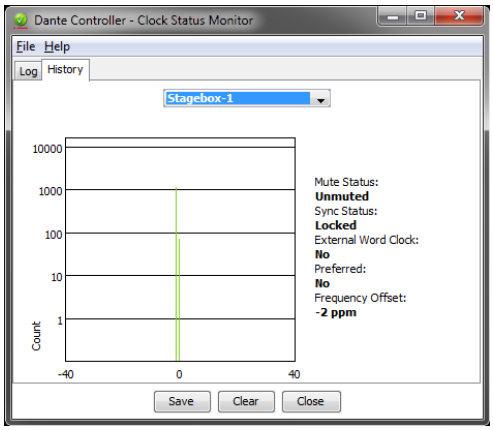
Rapidly-changing offset can also cause a slave clock to lose sync with the master clock.

Various factors can destabilise slave clocks by affecting their offset, such as:

- Overloaded network links.
- Poorly-implemented EEE (Energy Efficient Ethernet).
- A master clock that is derived from an inaccurate external word clock (one that does not run at its nominal frequency).

About the Histogram.

The horizontal axis of the histogram shows the distribution of clock frequency offset measurements against the nominal frequency of the clock, in parts per million (ppm). The zero point of the horizontal axis corresponds to the clock's nominal frequency (i.e. the frequency that the clock is intended to run at, for example, 48 kHz).



The vertical axis shows the number of measurements recorded at each data point, on a logarithmic scale.

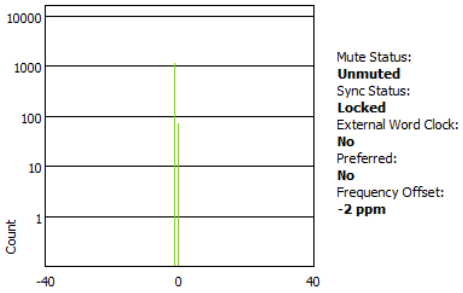
The histogram is continually updated, with measurements taken roughly once per second.

- To select devices, click the drop-down menu at the top.
- To clear the histogram, click Clear.
- To save a png format screenshot of the current data, click Save.

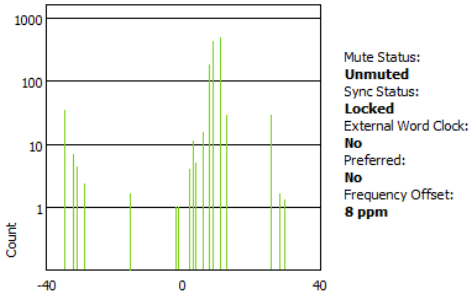
Interpreting the histogram.

The histogram can be seen as an indication of how much work a slave clock is doing to stay in sync with the master clock.

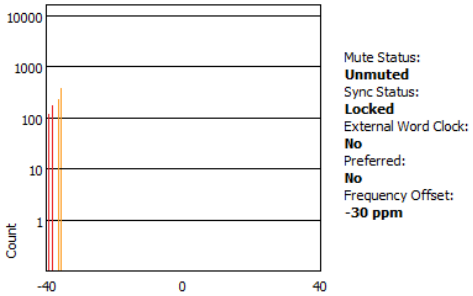
Generally, a stable and accurate clock will show consistently very low offset (in the order of a few ppm). It means that the clock's nominal frequency closely matches the master clock, and it is not having to change its offset very much to stay in sync.



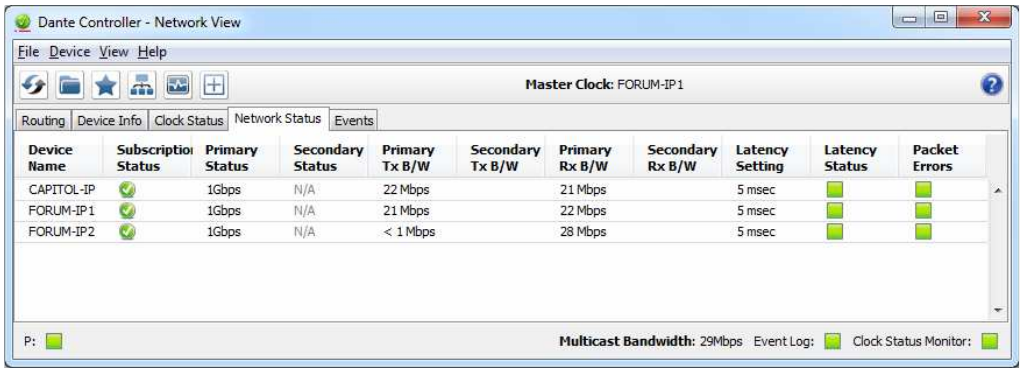
A histogram that shows a distributed range of offsets indicates an unstable clock - it is having to change its offset significantly, and often, to stay in sync with the master clock. This can be due to overloaded network links, or poorly-implemented EEE.



A histogram that shows measurements in amber and/or red indicates a clock that might be currently stable, but has little room for manoeuvre; its offset could easily move outside its pull range, at which point it will lose sync completely. This can result when the master clock is derived from an inaccurate external word clock.



4.7.4.4. "Network Status".



The Network Status tab provides a range of network-related information across all devices in the network.

This view includes subscription status, bandwidth and latency information, and can be used to quickly identify any potential network traffic issues.

The tabular view presents the following information, in columns from the left:

- "**Device Name**"**:** The device name currently associated with the device.
- "**Subscription Status**"**:** The icon in the Subscription Status column displays a summary of subscription states for the device. If any of the device's channels are not successfully subscribed, the relevant icon will be displayed here.

  Check the section "Subscription to audio channels" in section 4.7.4.1 for information about the various icons that can be displayed in the Subscription Status column.
- "**Primary Status**"**:** The Primary Status column indicates the link speed of the primary Dante network interface for the device.
- "**Secondary Status**"**:** The Secondary Status column indicates the link speed and status of the secondary Dante network interface for the device (if applicable). 'N/A' indicates that the device does not have a secondary interface 'Link Down' indicates that the device has a secondary interface, but it is not currently connected.
- **Bandwidth Columns:** Use the bandwidth columns to see an approximation of transmit and receive traffic over individual device interfaces. (Indicated in Mbps = Megabits per second):
  - "**Primary Tx B/W**"**:** It displays an approximation of the current transmit bandwidth on the primary Dante network interface for the device.
  - "**Secondary Tx B/W**"**:** It displays an approximation of the current transmit bandwidth on the secondary Dante network interface for the device.
  - "**Primary Rx B/W**"**:** It displays an approximation of the current receive bandwidth on the primary Dante network interface for the device.
  - "**Secondary Rx B/W**"**:** It displays an approximation of the current receive bandwidth on the secondary Dante network interface for the device.
- "**Latency Setting**"**:** Shows the current latency setting for the. AEQ equipment is usually configured to 1ms and "Dante Virtual Soundcard" to 4-6 ms.
- "**Latency Status**"**:** The Latency Status column displays icons representing the recent latency performance of the device.

  A green light indicates that the device is subscribed, and there are no latency problems - i.e. all audio packets are arriving well within the device's latency setting.

  An amber light indicates that audio packets for one or more channels are arriving at or near the limit of the device's latency setting. You may need to increase the device's latency, or reconfigure the network to prevent audio glitches due to packet loss from late-arriving audio packets.

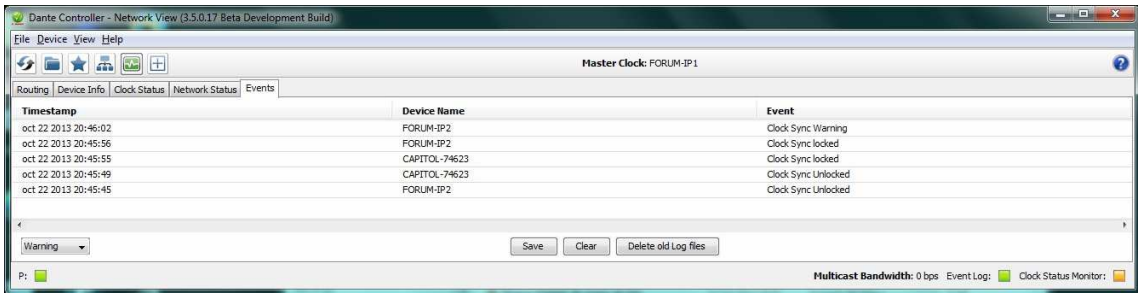
A red light indicates that one or more audio packets have arrived outside the device's latency setting. This will result in audio glitches. The device's latency setting should be increased, or the network reconfigured (for example, by reducing the number of network nodes in between the transmitter and the receiver).

A grey light indicates that the device is not currently subscribed.

- "**Packet Errors**"**:** A red light in the Packet Errors column indicates that one or more audio packets have been corrupted in between the switch and the receiver. This is usually due to a faulty Ethernet cable.

4.7.4.5. "Events".

The "Events" tab in "Network View" provides information on significant changes and failures in the network.



"Dante Controller" continually monitors Dante devices and the network as a whole. It is able to watch for problematic configurations, unexpected problems and communication failures between itself and Dante network devices. Events are displayed and stored in an event log.

Events fall into one of three categories (depending on the severity, from lower to higher):

- "Information".
- "Warning".
- "Error".

Filtering the Events List.

Use the drop-down menu at the bottom left of the view to filter the events list.

- When set to Information, all events are shown.
- When set to Warning, only warning and error events are shown.
- When set to Error, only error events are shown.

Clearing the Events List.

To clear the events list, click the Clear button. When new events are detected that match the current filter setting, they are displayed in the event list.

If you have switched to another Network View tab, new events in the event list will also be indicated by a red Event Log LED icon in the Status Bar. Clicking the LED icon will take you straight to the Events tab and will clear the Event Log LED.

NOTE: The Event Log LED icon will always remain green while the Events tab is open.

Saving the Events Log.

To save the events list, click the Save button. The list is saved as a text file with file extension ".log". All events in the list are saved (the filter does not apply to saved events logs).

Automatic events logging.

Events are also continuously written to a log file. Each time "Dante Controller" is started, it creates a new log file (with a time-stamped filename, to avoid overwriting previous logs).

You can find the path to these log files under Help > About. To delete log files more than seven days old, click the Delete old Log files button.

Events Classification.

The following events are classified as **Errors:**

- Invalid link local address.
- Subnet mismatch on dante interface.
- Subnet match with non Dante interface.
- Multiple addresses with matching subnets.
- Subnet conflict of Dante interface on primary.
- Subnet conflict of Dante interface on secondary.
- Unknown address error.
- Fail Safe Mode.
- Unknown device issue.
- Elevation to Clock Master.
- Fanout Configuration detected.
- Mismatched clock pullup subdomain.
- Wrong subdomain for pull up.
- Unknown subdomain.
- Audio mute / Audio unmute.
- Clock sync lock / unlocked.

The following events are classified as **Warnings:**

- Resolution Failed.
- Elevation to Grand Master.
- Multiple external clock sources.
- Cannot Elevate to Clock Master.
- Clock Sync Warning.

The following events are classified as **Information:**

- Request Timeout Error.
- Response Timeout Error.
- Demotion from Clock Master.
- Demotion from Grand Master.
- Reboot required.

4.7.5. Automatic Notification of Device Errors.

"Dante Controller" is able to identify several types of problems that a Dante device may experience. A device that is found to have problems will have its device name displayed in **red.** Additional information about the problem can be found by double-clicking on the device.

A device displayed in red will either have entered failsafe mode or have an identified issue with its IP configuration. These states are described in more detail below.

Incorrect IP address configuration.

Dante networks use IP Addressing to communicate. Incorrect address configuration can make it hard or impossible for a Dante device to communicate. "Dante Controller" attempts to identify and report several types of incorrect IP address configuration, including:

- Having multiple DHCP servers on the same network.
- Incorrectly configured static IP addresses.
- Connecting the secondary interface of a Dante device to the primary network.
- Different interfaces on the same device using the same IP address subnet.

If you need further information, please refer to ANNEX 1 Troubleshooting.

Failsafe mode.

A device will enter failsafe mode when the firmware image stored on the board has become corrupted. Although rare, this can occur when:

- The firmware update process is interrupted by power loss or network failure.
- The firmware image itself that was used in an upgrade is corrupt.

If your device enters failsafe mode, please use the Failsafe Recovery function in the Firmware Update Manager application (if available) or contact the AEQ Technical Support.

Other Event Notifications.

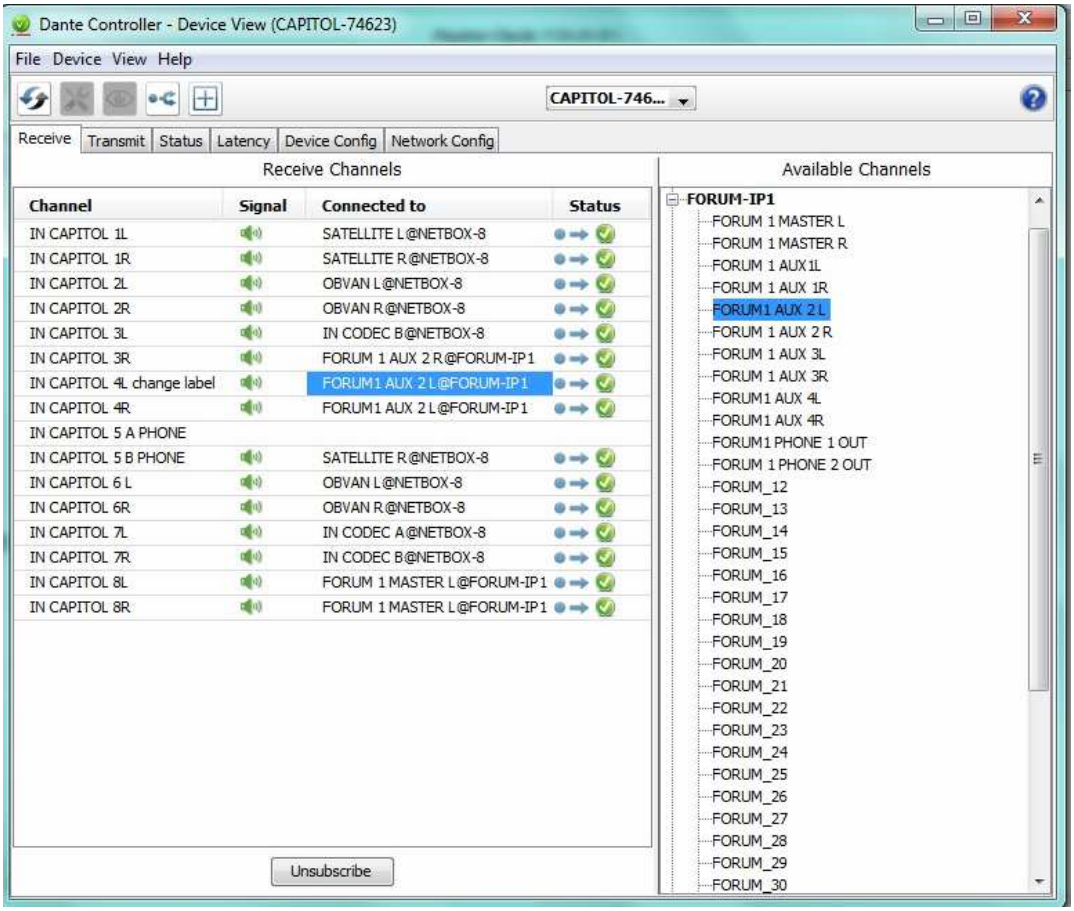
"Dante Controller" will also notify you of network status, general device events and clock status events, via the LED icons in the Status Bar.

4.8. "Dante Controller" use: "Device View".

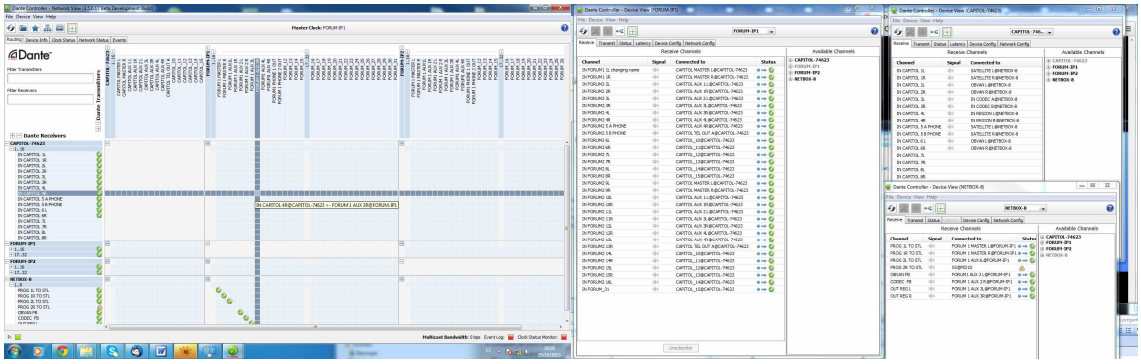
The Device View is used to view and modify detailed information and settings for a specific device. Device view can be activated by double-clicking a device name in any of the Network View tabs (except Events), or by selecting Device View from the Device menu (Ctrl + D, or Command + D) in the Network View window. The Device View opens in a new window. Multiple device views can be open simultaneously.

The label of the device being viewed is displayed in the middle of the toolbar. In the screenshot above, "CAPITOL-74623" is the device being displayed in the drop-down list box.

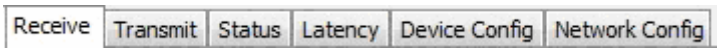
The device viewed can be changed by selecting another device from the drop-down list.



Multiple Device View windows may be opened from the Network View, so that several devices can be examined simultaneously.



The Device View has up to six tabs, allowing you to see different information relating to a specific Dante device:



- ”Receive”: display and configure device’s receive (Rx) channels.
- ”Transmit”: display and configure device’s transmit (Tx) channels including multicast
- ”Status”: device software, clock and network status information.
- ”Latency”: view latency histograms (supported devices only).
- ”Device Config”: rename device, change sample rate and set other attributes (as relevant to device type).
- ”Network Config”: view and edit network configuration.

4.8.1. "**Device View**" **Menu Bar.**

The menu bar of the "Device View" screen includes 4 sub menus. "File", "Device", "View" and "Help".The list of options included in each of them is described below:

"**File**":

- "Close Window" (Alt + F4).

"**Device**":

- "Refresh" (F5): Refreshes the displayed network / device data.
- "Create Multicast Flow" (Ctrl + M).

"**View**":

- "Show/Hide Channel Groups" (Ctrl + Shift + G).

"**Help**":

- "About": Shows "Dante Controller" version and current log file.
- "License": Displays the license text.
- "Contents" (Shift + F1): Opens a help window and displays help contents.

4.8.2. "**Device View**" **Tool Bar.**

There is a tool bar below the Menu bar including six buttons:

 Refresh: Re-load routing and configuration information for the current device.

 Web Config: Some Dante devices can be configured via a web interface. This button opens a web browser window which can be used to perform functions such as firmware upgrades. This feature is not supported on AEQ and most of Dante devices.

 Identify: Identify the current device by, for example, causing its LEDs to flash. Note that this feature is not supported on AEQ and most of Dante devices.

 Multicast: Configure multicast transmit flows on the current device.

 Channel Groups: Activates / deactivates Channel Groups.

 Help: Opens a help window.

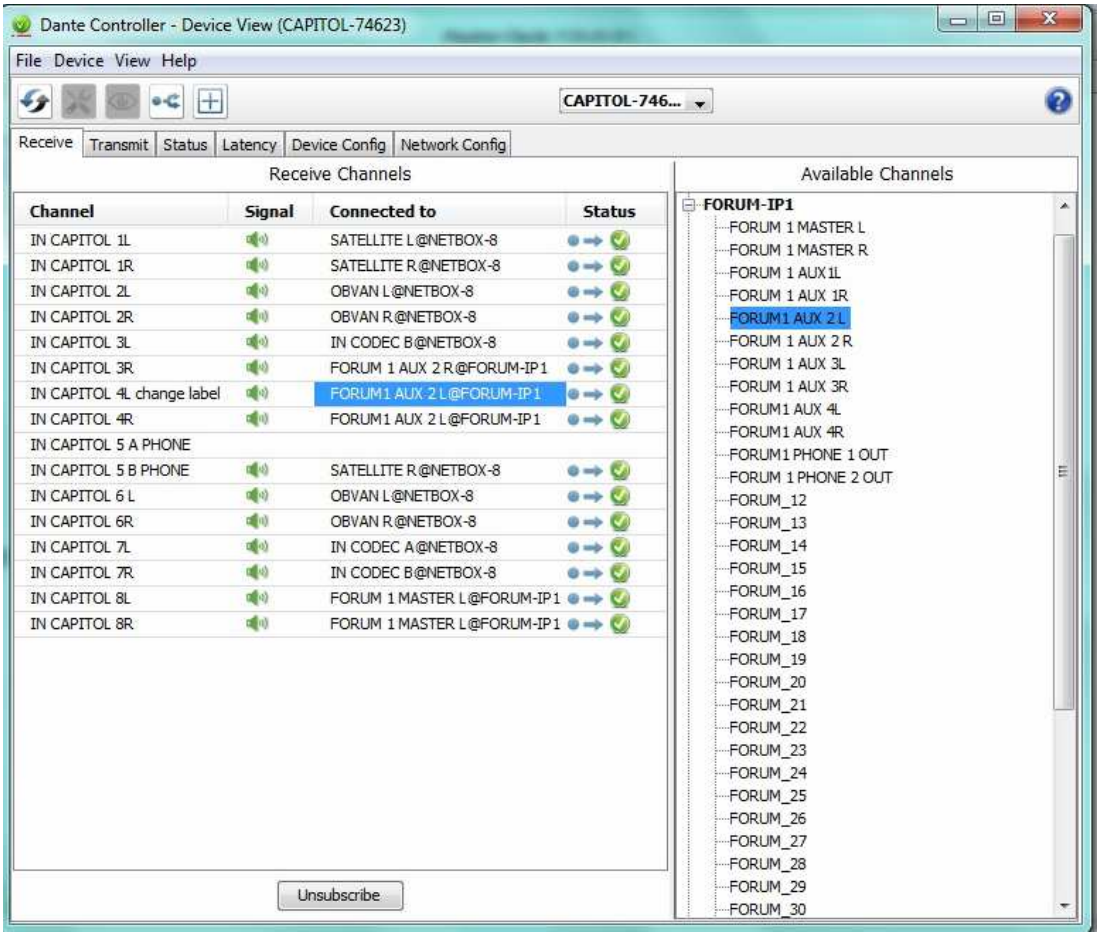
The toolbar also provides a drop down list of all available devices on the network, which allows you to switch the Device View to a different device.

4.8.3. “Device View” Tabs.

There are 6 tabs below the tool bar that we describe in detail below:

4.8.3.1. “**Receive**“.

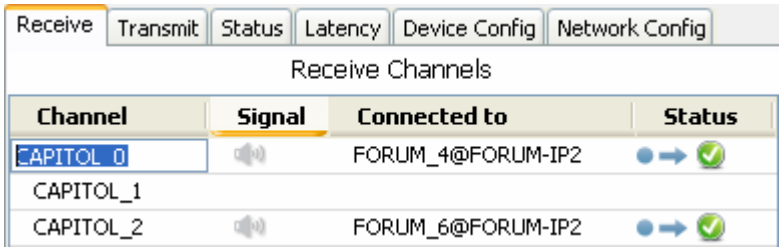
The “Receive” tab shows a list with all the subscribed and standby receive channels included in the current device, as well as information about the subscribed channels only. It also permits the creation of subscriptions from the available channels list.



The tab is split into two panes: Receive Channels, and Available Channels.

“**Receive Channels**”**:** The receive channels area, shown in the left area of the screen, contains 4 fields:

- “**Channel**“**:** It is an **editable** field showing the labels of the current device receive channels. These labels can be edited to rename the channels by double-clicking on the channel’s name and typing a new text in.



- "**Signal**"**:** Supported devices will also show the following channel metering icons, indicating the presence of audio on subscribed channels:

  Channel is either muted, or receiving audio at less than -61dBFS.

  Channel is receiving audio between -61 dBFS and 0 dBFS.

  Channel is clipping".

  Currently, Brooklyn II (featured in AEQ multichannel devices) and PCIe devices support channel metering in "Dante Controller". You can check your device type in the "Device Info" tab included in "Network View".

- "**Connected To**"**:** Shows the Tx channel that the receive channel is currently subscribed to.

- "**Status**"**:** Shows the status of both primary and secondary subscriptions, using the following icons:

  Subscription is OK and audio should be flowing.

  Subscription is unresolved - usually because the transmitting device has been removed from the network, or is switched off.

  No subscription, or a subscription error.

  Subscription is via unicast connection.

  Subscription is via multicast connection.

  Subscriptions can show several symbols in the Status column. Common status icon combinations and their meanings are as follows:

  Unicast device successfully subscribed to a transmitter.

  Redundant device successfully subscribed on both primary and secondary via unicast.

  Redundant device successfully subscribed on both primary and secondary via multicast.

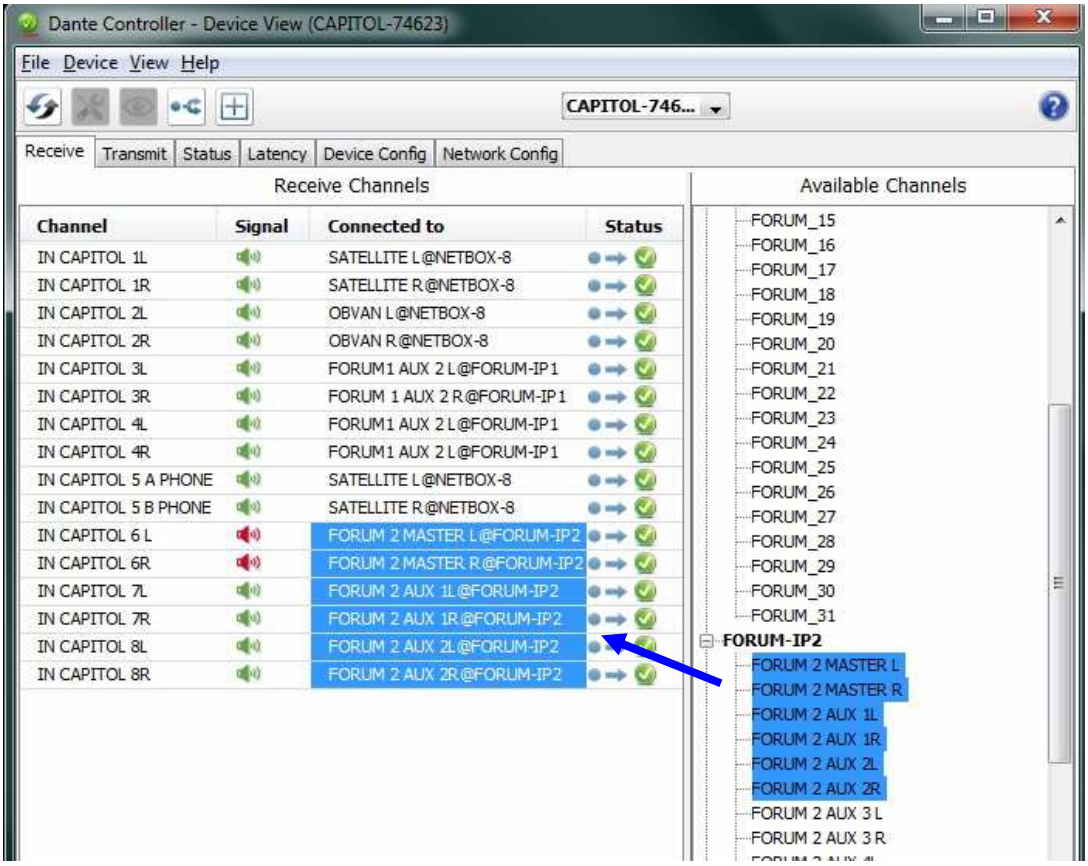
  Indica Redundant device successfully subscribed on primary only via unicast. This is typically seen when the secondary interface is not connected

"**Available Channels**"**:** The Available Channels pane, at the right side of the screen, lists the devices and advertised channels available on the network. Devices that are greyed out indicate that this receiver cannot subscribe to those channels or devices. This is typically because of a mismatch in parameters (e.g. sample rate incompatibility etc.), or because a device cannot route audio to itself.

Creating Subscriptions.

Subscriptions are created by selecting a channel from the Available Channels list in the right-hand pane of the Receive Tab, then dragging and dropping it onto the appropriate receive channel in the left-hand pane of the Receive Tab.

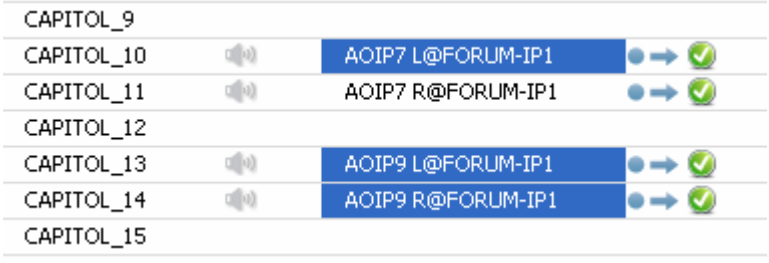
Multiple channels can be selected and then dragged and dropped onto the Receive Channels pane, to make several subscriptions simultaneously.



Canceling subscriptions.

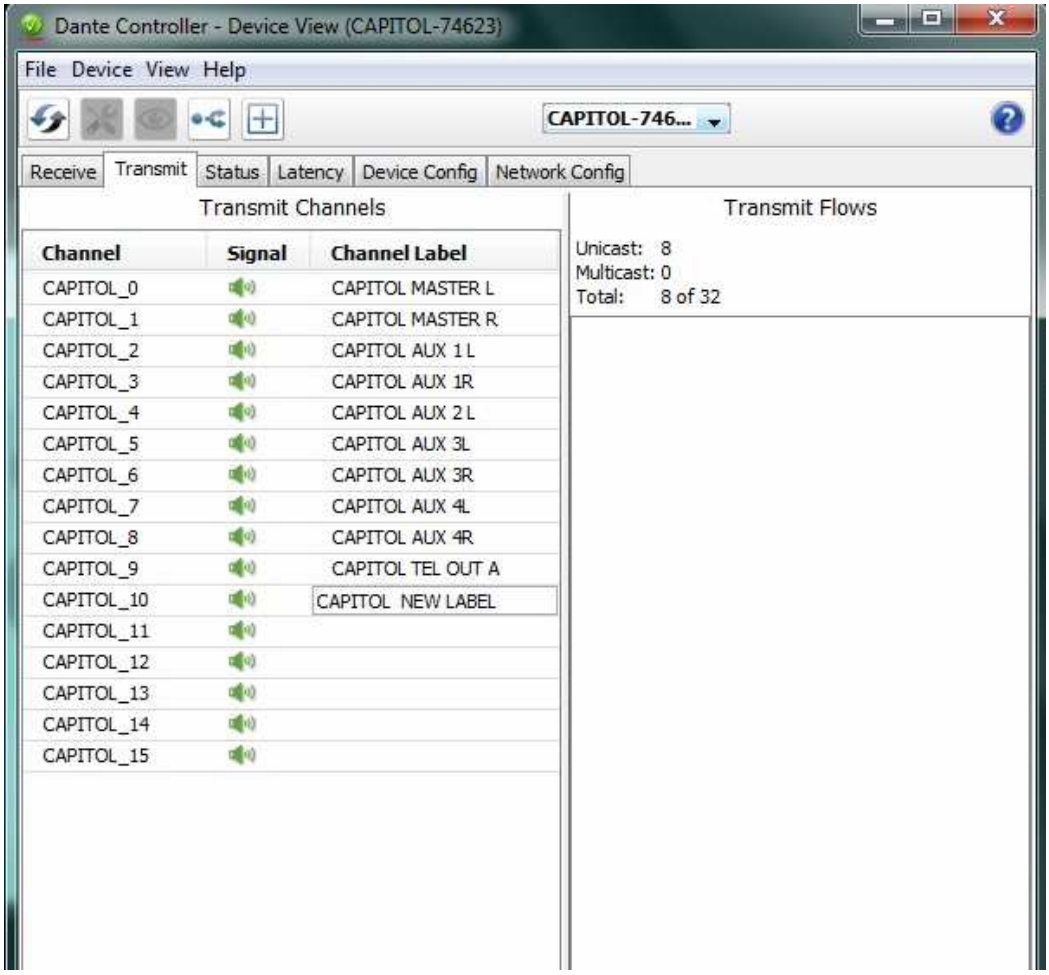
It is also possible to cancel subscriptions from the “Receive Channels” area. In order to do so, the subscription to be cancelled must be selected within the “Connected to” column, and then click on the “Unsubscribe” button located in the bottom area of the screen (this can also be done by pressing the keyboard’s “Del” key).

It is possible to cancel more than one subscription at once, by selecting several at the same time (by holding the Ctrl key down) and then clicking on the “Unsubscribe” button (or “Del” key).



4.8.3.2. "Transmit".

The "Transmit" tab is used to inspect and modify the transmit configuration of a device.



The Transmit Tab is arranged in two areas:

"**Transmit Channels**"**:** The area on the left pane of the tab shows the Tx channels for the device, and any user-defined channel label. It allows you to create labels (or editing them by double-clicking on the channel's name and typing a new text in) for transmit channels. Input to the table is filtered to prevent illegal characters from being used in channel labels. Tx channel labels must be unique within a device (the same name cannot be used for two different channels).

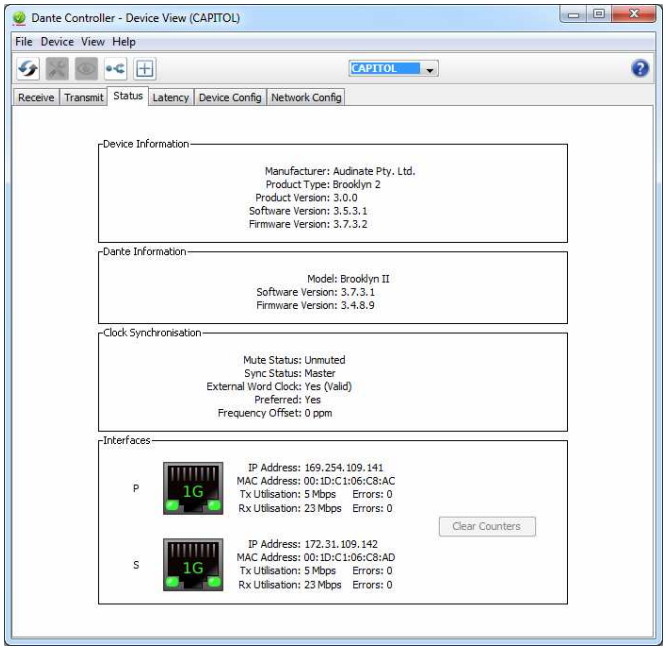
Supported devices will also show the following channel metering icons in the Signal column, indicating the presence of audio on subscribed channels:

- Channel is either muted, or receiving audio at less than -61 dBFS.
- Channel is receiving audio between -61 dBFS and 0 dBFS.
- Channel is clipping.

"**Transmit Flows**"**:** The area on the right pane of the tab indicates how many unicast flows are currently in use, as well as the multicast transmit flows that have been configured on the device. Multicast flows are listed in ID order, including the channels contained within the flow. Unicast flow details are not displayed in the transmit flow window.

4.8.3.3. "Status".

The "Status" tab is used to obtain current information about a Dante device.



The tab is divided into four sections. The information presented on this tab can be very useful when investigating networking or clocking issues in the system. The Refresh button can be used to update this information if required.

NOTE: Not all Dante devices support the display of all of this information.

The available sections are as follows:

"**Device Information**": This provides the following general information about the device:

- "Manufacturer": The name of the device manufacturer.
- "Product Type": The type of device.
- "Product Version": The product version.
- "Software Version": The version of the manufacturer software running on the device.
- "Firmware Version": The version of the manufacturer firmware running on the device.

"**Dante Information**": This provides Dante-specific information about the device:

- "Model": The Dante device type.
- "Software Version": The version of the Dante software running on the device.
- "Firmware Version": The version of the Dante firmware running on the device.

"**Clock Synchronization**": This provides the following information about device clocking:

- "Mute Status": 'Muted' indicates that the device is has been automatically muted (due to a clock synchronisation problem, or because the external word clock is invalid). 'Unmuted' indicates that the device is not muted, and audio is flowing normally.
- "Sync Status": 'Locked' indicates that the device is locked to the network PTP clock. 'Not Locked' indicates that the interface has not achieved lock with the network PTP clock.
- "External Word Clock": 'No' indicates that the device has been configured to use the internal clock source. 'Yes' indicates that the device has been configured to accept an external word clock source. NOTE: If the Dante device is configured to accept an external word clock source, it is important to make sure that the host equipment has been configured to provide its word clock to the Dante device. Check your product manual for more information.

- “Preferred“: 'No' indicates that the card has not been set to preferred master mode. 'Yes' indicates that the card is set to preferred master mode.
- “Frequency Offset”: Indicates the offset from the network clock master measured in parts-per-billion.

“**Interfaces**”**:** Provides the following information about the primary network interface **(P)** and the secondary network interface **(S):**

- “IP address”: The IP address currently assigned to the interface.
- “MAC address”: The Media Access Control address of the interface, associated with the Ethernet layer.
- “Tx Utilization”: Shows the current total transmit bandwidth in use.
- ”Errors”: (on the same line as Tx utilization) shows the number of transmit Cyclic Redundancy Check (CRC) or packet errors detected since the device was last started.
- ”Rx Utilization”: Shows the current total reception bandwidth in use.
- ”Errors”: (on the same line as Rx utilization) shows the number of receive Cyclic Redundancy Check (CRC) or packet errors detected since the device was last started.

NOTE 1: The “Rx Utilization” includes not only network traffic destined for the Dante device, but any other multicast or broadcast traffic received at this network interface.

NOTE 2: As a rule of thumb neither the “Rx Utilization” nor the “Tx Utilization” should exceed about 85% of the link speed in order to guarantee good clock synchronization performance (links are full duplex).

The graphic also indicates the speed and connected state of the interface as follows:

Indicates that the link is operating at 1Gbps.

Indicates that the link is operating at 100Mbps.

Indicates that the link is not connected, or that there is an error. The IP address will read N/A, and Tx and Rx utilization will be 0 kbps.

The information about the **secondary** network interface will only be displayed if the device supports redundancy and it’s configured as redundant.

4.8.3.4. “Latency“.

For supported devices, the “Latency” tab displays histograms of audio packet latency for each transmitter that the device is subscribed to.

Newer Brooklyn II (featured in AEQ multichannel devices) and PCIe devices support latency monitoring in “Dante Controller”. You can check your device type in the “Device Info” tab under “Network View”.

About Latency and Packet Loss.

Latency is used to account for the delay between an audio packet leaving the transmitter, traversing the network (potentially through multiple switches) and reaching the receiver.

If a receiver's latency setting is too low, audio packets will not have time to get from the transmitter to the receiver before they are supposed to be played out. When this happens, the receiver will drop packets (i.e. it will throw packets away, because they are 'late to the party').

Packet loss results in audio glitches, so it is very important to ensure that all receivers have their latency set high enough to prevent packet loss.

Setting device latency too high, however, can interfere with low-latency applications (for example, realtime monitoring when recording vocals), so it is sometimes important to find a balance between low latency and guaranteed audio integrity.

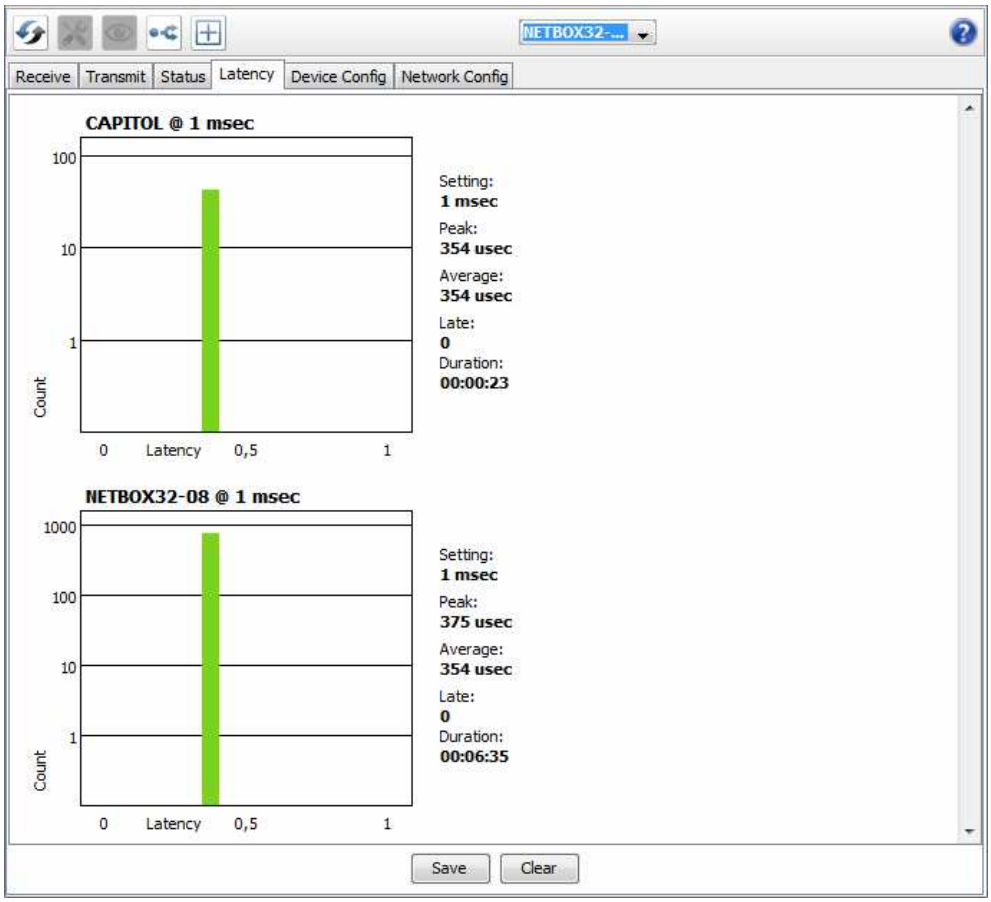
The “Latency” tab can be used to identify devices that are dropping packets because their latency is set too low, and also devices that could potentially have their latency reduced (if required; generally, the default Dante latency of 1ms is more than adequate for low-latency applications).

About the Histogram.

The transmitter's name is displayed at the top of the histogram, along with the latency value against which the histogram is reporting.

The horizontal axis shows the distribution of audio packet latency measurements from the transmitter. The vertical axis shows the number of measurements recorded at each data point, on a logarithmic scale.

Measurements are taken at roughly 1 second intervals, from when “Dante Controller” is started.



To clear the histogram, click Clear. Latency measuring will then restart.

To save the histogram as a png image, click Save.

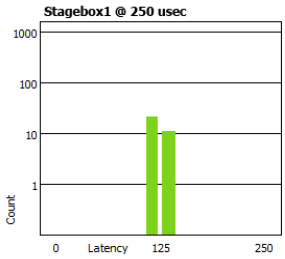
NOTE: If any subscriptions are via multicast flows, there may be two histograms displayed for one transmitter: one histogram for the unicast flows, and one for multicast. This is because multicast flows always use a latency of 1ms. If the receiver is set to a latency other than 1ms, two histograms will be displayed.

The following information is also displayed:

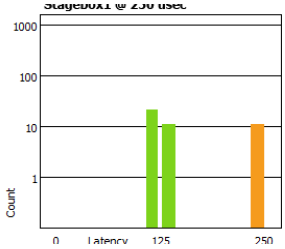
- “Setting”: indicates the latency setting for the histogram. In most cases, this will be the same as the latency setting on the receiver. However, for some subscriptions, Dante will automatically apply a different latency. For example:
    - Multicast flows are automatically set to a minimum of 1ms
    - If a transmitter does not support the latency set on the receiver (i.e. it can't guarantee delivery within the required latency), Dante will increase the latency to the lowest setting supported by the transmitter.
- “Peak”: indicates the peak latency since measuring started.
- “Average”: indicates the average latency since measuring started.
- “Late”: indicates the number of measurements taken that included one or more late packets (note that each measurement typically includes many packets).
- “Duration”: indicates the running time since measuring started.

Interpreting the Histogram.

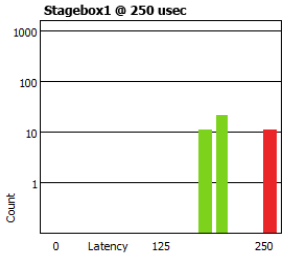
If all bars are green and falling well within the limit of the histogram (i.e. towards the left or middle of the histogram), it indicates that the latency setting for the receiver is set high enough to prevent packet loss.



If any bars are amber, it means that some packets are arriving near the limit of the latency setting. Network traffic fluctuations could potentially lead to extra delay which could cause packets to arrive late. A histogram of this type indicates that the receiver latency should be increased if possible..



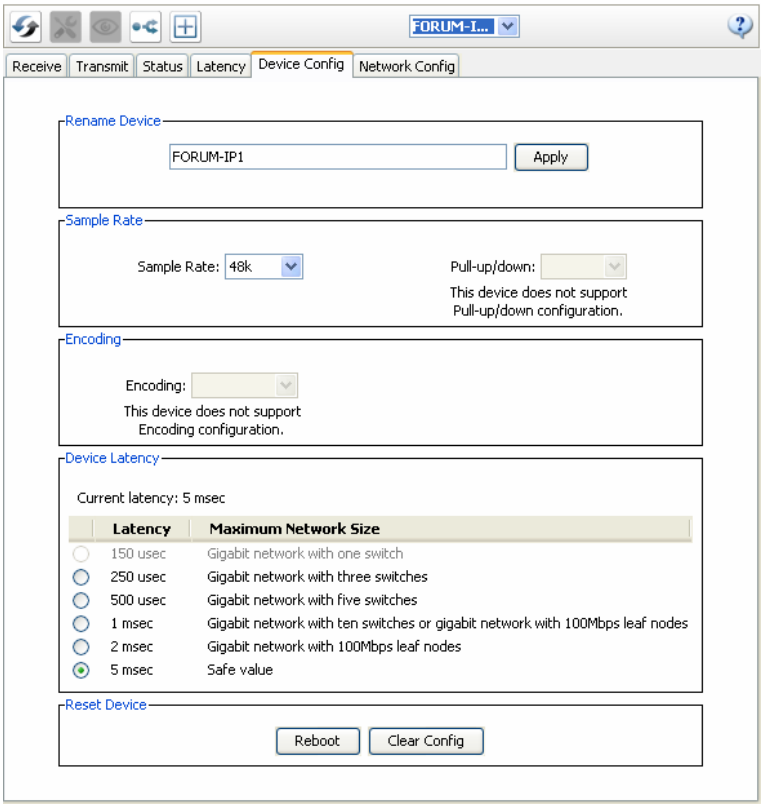
If any bars are red, it indicates lost packets, and audio loss. The receiver latency should be increased, or the network reconfigured.



4.8.3.5. “Device Config“.

This tab on the Device View window allows you to configure device specific parameters. The specific options available will depend on the capabilities of the device. In the case where a device does not support configuration via “Dante Controller”, the tab will be disabled.

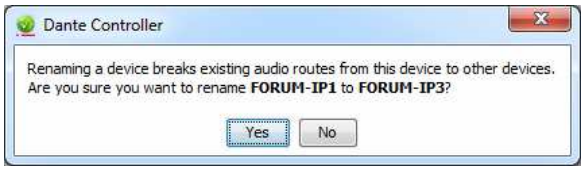
NOTE: In the case of “**Dante Virtual Soundcard**” the configurable parameters available from this tab are "Rename Device", "Sample Rate" and "Encoding". The remaining parameters are configured from its own user interface on the PC or Mac.



These are the configurable parameters:

- "**Rename Device**"**:** Allows you to enter a new Dante 'friendly name' for the device. The text field displays the current name.To change the device name, enter a new name in the text field and press "Apply".

  IMPORTANT NOTE: This action will delete the existing audio routings from this device to others. When you click on "Apply", a confirmation window will appear:



  See 1.4.3 chapter for information about name conflicts and device name rules.

- "**Sample Rate**"**:** Shows the current sample rate of the device, and allows you to change the operating sample rate of the Dante device. This may require the device to be rebooted to take effect. All sample rates supported by the device are shown in the drop down menu.

  IMPORTANT NOTE: When working with **AEQ** equipment, this sampling frequency must be set to 48 kHz.

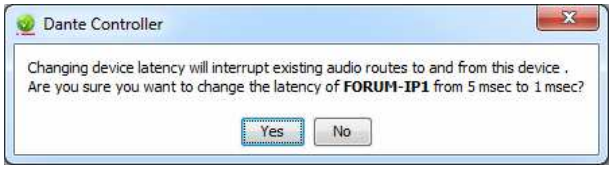
- "**Pull-up/down**"**:** Shows the current pull-up/down setting for the device, and allows you to change the pull-up/down setting. The pull-up/down setting can be used to adjust the sample rate of the device to synchronise audio with video that has undergone frame rate conversion. For example, to synchronise Dante audio with video that has been converted from 24 fps to 25 fps, set the sample rate pull-up/down for any relevant Dante audio devices to +4.1667%.

  NOTE: Changing the sample rate pull-up/down for a device places that device in a dedicated clock domain. Dante devices can only transmit audio to, or receive audio from other devices on the same clock domain. See "Clock Status View" for more information.

IMPORTANT NOTE: This configuration is not suitable for **AEQ** equipment.

- "**Encoding**"**:** Show and allows to change the current audio bit depth. This parameter is only available for "**Dante Virtual Soundcard**". Select a value and click "Yes" to modifiy it.
- "**Device Latency**"**:** Shows the current device latency setting, and allows you to change the operating receive latency for the selected device. Select a value and click "Yes" to apply the latency to all flows that the device is receiving.

  WARNING: changing the latency value will cause disruption in the audio while the flows are re-established at the new latency setting, as indicated in the confirmation window:



  NOTE: DANTE networks feature an extremely low latency. The 0.15 ms option won't be available for devices including an internal switch, as happens with all AEQ AoIP devices. Taking into account these internal switches, connecting two pieces of equipment together using a simple straight cable, we already have two switches, and if one more is connected in between, we now have three. The maximum latency value setting recommended by AEQ is 1 ms, still allowing for network topologies of certain complexity. 5 ms latency is still unnoticeable, so in case that audio cut-offs appear, it can be increased to 2 or 5ms. The "Dante Virtual Soundcard" must be configured from its own PC window to 4, 6 or up to even 10 ms.

  On the other hand, the audio network is usually critical-mission and should be isolated from any other Ethernet service to avoid unnecessary or variable latencies.

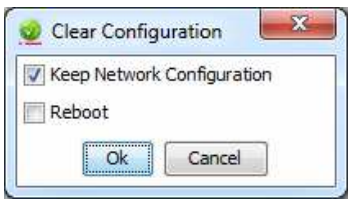
- "**Reset Device**"**:** Allows you to remotely "Reboot" the Dante interface, and also to reapply factory settings ("Factory Reset"). Rebooting the Dante device may also require a reset of the AEQ host audio equipment containing the device.

  "Factory Reset" (available in some Dante devices) wipes the following device configuration settings:

  - User-defined device name.
  - User-defined channel labels.
  - Clock configuration (clock master / external clock master setting).
  - Static IP addresses.
  - Redundancy configuration.
  - Sample rate setting (including pull-up/down).
  - Latency setting.
  - Any existing audio routes.

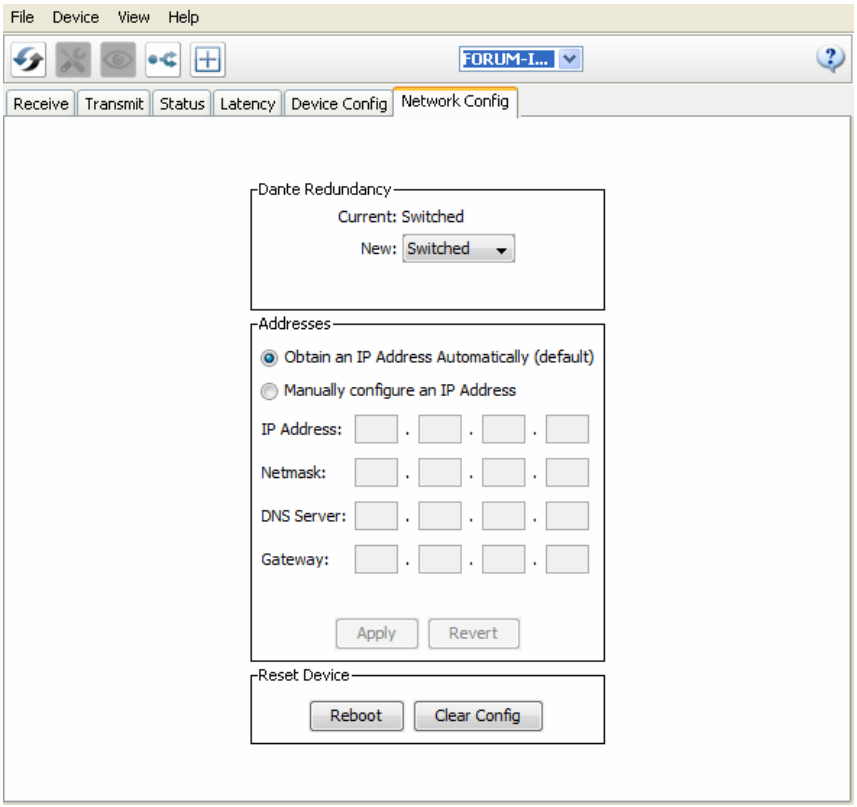
  Supported devices allow you to 'Clear Config' instead of Factory Reset. Clear Config wipes the same configuration settings listed above, but allows you to optionally keep the IP settings (i.e. retain the Dante Redundancy settings, and any static IP addresses currently configured in the Network Config tab).

  A reboot is required after clearing the configuration for the changes to take effect. Some devices will allow you to automatically reboot after clearing the configuration. If this option is not available, a manual reboot is required.



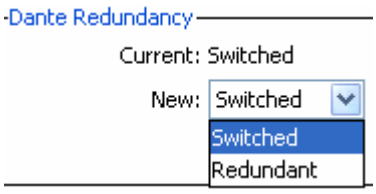
4.8.3.6. "Network Config".

Use the "Network Config" tab to toggle supported (among them, all AEQ devices feature two AoIP Ethernet ports), between Redundant and Switched modes, and to specify static IP addresses for a device's Ethernet ports.



The available sections are:

"**Dante Redundancy**"**:** Depending on the manufacturer's configuration of a device, it may be possible to toggle the device between Redundant and Switched modes, or to select a Switch Configuration.



- "Redundant": When a device is set to Redundant, the device will duplicate Dante audio traffic to both Ethernet ports, allowing the implementation of a redundant network via the secondary port. Not all devices support redundancy. All AEQ devices covered by this manual include two Ethernet AoIP ports and support this feature.
  IMPORTANT NOTE: When there is a redundant network, device primary and secondary interfaces must be connected to separate networks.
- "Switched": When a device is set to Switched, the secondary Ethernet port will behave as a standard switch port, allowing daisy-chaining through the device. All AEQ devices covered by this manual include two Ethernet AoIP ports and support this feature.

"**Addresses**"**:** Dante devices obtain IP addresses automatically by default, and in the vast majority of circumstances there is no need to change the Addresses settings. However, static IP addresses can be assigned if necessary.

To assign a static IP address:

1. Select 'manually configure an IP Address' for the appropriate Ethernet port.
2. Enter the IP Address and Netmask.
3. Click Apply.

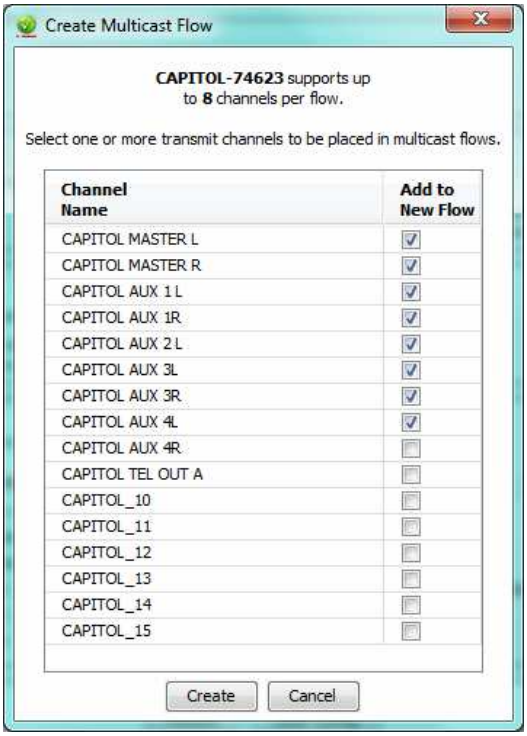
The DNS Server and Gateway settings are optional - the device will use network defaults if they are not specified.

Click “Revert” to revert back to the previous settings.

NOTE: Assigning static IP addresses requires a device reboot.

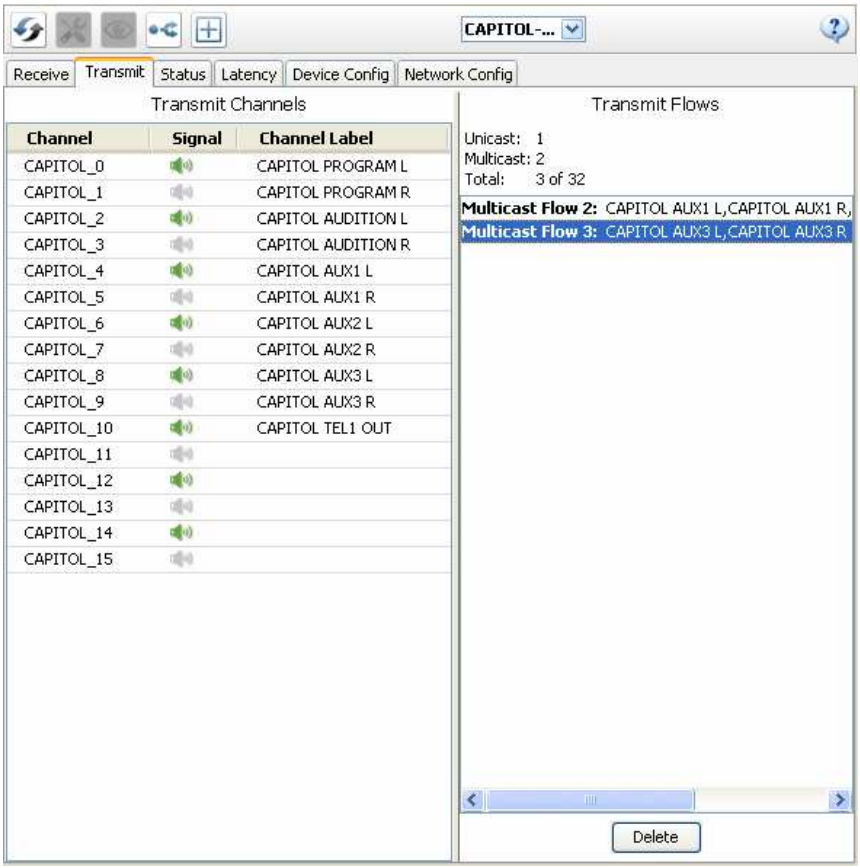
4.9. Using “Dante Controller”: Multicast Transmit Flow Configuration.

When clicking on the Multicast Setup button  within Device View (no matter what tag is selected), a Create Multicast Flow dialog box will appear that allows the user to aggregate several channels to a new multicast flow.



This window shows a list of the Tx channels for the device, and allows you to add them to the new multicast flow that is being created, by checking the tick box next to each channel name. Once you have selected all the channels required, create the multicast flow by clicking the Create button at the bottom of the dialog box. To abandon creating a new multicast flow, click Cancel.

A single multicast flow can contain up to the maximum supported channels per flow for this device. This is displayed at the top of this window, and is 8 channels for this device. If you select more than the maximum allowed channels per flow, multiple flows will be created. Once a flow has been created, it will appear in the list of flows in the transmit pane, along with the channels contained within that flow. Channels cannot be added to or removed from existing flows. Each time the dialog is used to select additional channels, a new multicast flow will be created.



By default, Dante devices 'prefer' multicast over unicast. When you click a transmit channel to make a subscription, the receiver will automatically connect to the channel via a multicast flow, if one exists. Likewise, when a channel that did not form part of an existing multicast flow is added to a new multicast flow, any existing unicast subscriptions to that channel will automatically switch over to use the new multicast flow.

Care should be taken when deleting a multicast flow, as the existing subscriptions will convert back to unicast. This has the potential to result in exceeding the link capacity or maximum number of flows at the transmit device, as multiple unicast flows will be established between the transmitter and its receivers. It may be advisable to remove some or all of the audio routes prior to deleting the multicast flow.

A good rule of thumb is to use multicast when there are more than two receivers for a specific audio channel. You should also assume that the flow will flood throughout the entire network, and therefore consume bandwidth on all network links.

NOTE: Certain Ethernet switches support IGMP (Internet Group Management Protocol), a protocol that provides the ability to 'prune' multicast traffic, so that it travels only to those end destinations that require that traffic. If this is the case, and IGMP is correctly configured on all the Ethernet switches, then multicast audio will not flood throughout the network, but will instead be sent only over the links required to deliver it to subscribed devices. Appendix 1 provides information about requirements and offers recommendations in this respect, and also regarding the use of properly configured bridges or routers that can avoid overflow produced by multicast audio streams in network areas not related to audio.

4.10. Presets.

“Dante Controller” supports the saving and loading of Dante network routing and device configurations, known as 'presets'. A preset file contains configuration and routing parameters for some or all of the devices in the network.

Preset files are saved as xml, and can be edited offline. They are also 'device-agnostic' - they can be shared between networks with different physical components.

You can use presets to:

- Backup and restore network configurations
- Quickly switch between saved network configurations
- Copy a Dante network configuration from a 'lab' or test network to a live or production network

WARNING: danger of severe system misconfiguration. The Presets tool is extremely powerful and allows the user to quickly make deep modifications in the network, as well as the fast configuration of a complex network by cutting and pasting characteristics of their individual elements. For this reason it shouldn’t be used on real operating networks until enough skills have been acquired, as any detail that is not properly configured can cause dropouts or noises in the audio.

4.10.1. About Device Roles.

Presets introduce the concept of 'device roles'. When a preset is saved, the configuration and routing for each selected device is saved into the preset as a device role, with the same name as the device from which it was created.

The role is not 'tied' to its originating device. When a preset is loaded into “Dante Controller”, each role can be applied to its originating device or to another device (even if it does not support exactly the same functionality). It is a transferable set of device configuration and routing parameters.

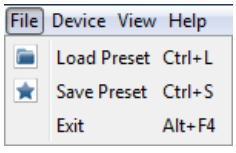
If a role is applied to a device that is different from the role's originating device - for example, a role for console model A is applied to console model B - “Dante Controller” will identify any issues that might arise (such as unsupported sample rates) and will display those issues so they can be addressed - or ignored, if they are not important.

4.10.2. Saving Presets.

To save a Preset that includes all device parameters:

1. Click the  button in the “Network View” toolbar.

“Save Preset” (Ctrl + S) can also be selected in “File” option through the “Network View” toolbar.

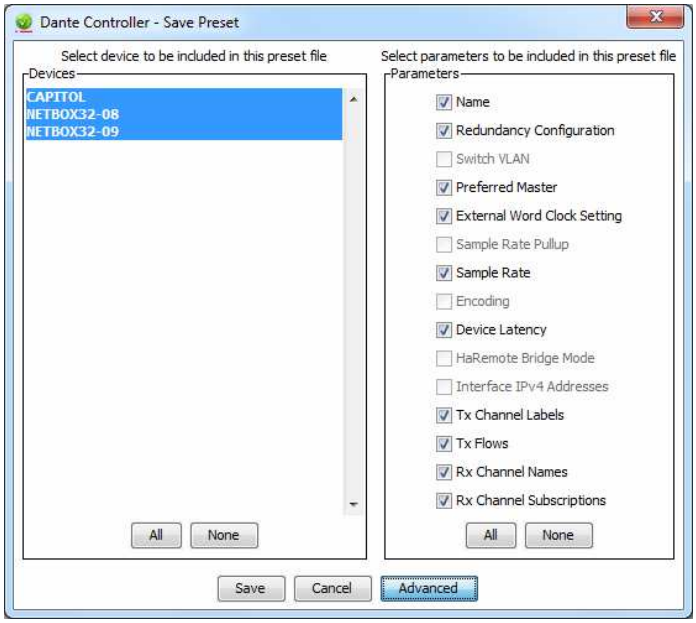


2. Select the devices that you wish to include in the preset. By default, all available devices are selected; you can clear that selection by pressing “None” button and select all devices again by pressing “All” button.

3. Click “Save”.

To save a Preset that includes a selection of device parameters:

1. Click the button in the "Network View" toolbar or select "Save Preset" (Ctrl + S) in "File" option through the "Network View" toolbar.
2. Click "Advanced" button.
3. Select the devices that you wish to include in the preset.
4. Select the parameters that you want to save for the selected devices.
5. Click "Save" button.



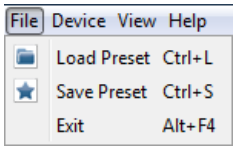
The 'Save a Preset File' dialog box will appear, allowing the user to select a folder a file name for the Preset files that will be created.

The preset is saved as an XML file, which can be manually edited if required, using a text editor.

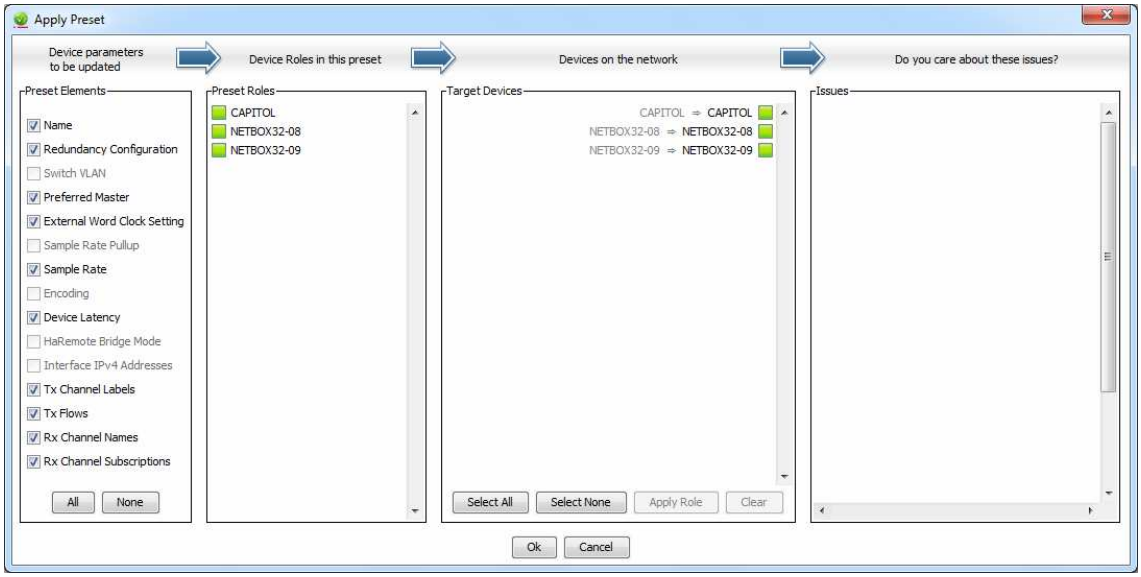
4.10.3. Applying Presets.

To load and apply a previously saved preset, click the button in the "Network View" toolbar.

"Load Preset" (Ctrl + L) can also be selected in "File" option through the "Network View" toolbar.



The "Apply Preset" dialogue is shown then, arranged in 4 columns, representing the logical steps in applying a preset (from left to right).



The 4 columns are:

- "**Preset Elements**". Use the Preset Elements column to select the parameters that you wish to apply from the preset to the target network.

  If the target network is not identical to the original network (from which the preset was saved), some parameters might not be applied successfully. For example, if some devices on the target network do not support the same range of sample rates as the devices on the original network, you could choose not to apply the 'Device Sample Rate' parameter, and change the sample rates manually instead, once the preset has been applied.

  Some preset parameters are not applicable to the current device and so they are represented in light grey.

- "**Preset Roles**". The Preset Roles column lists the roles or variants of the device with different functions that were saved in the preset.

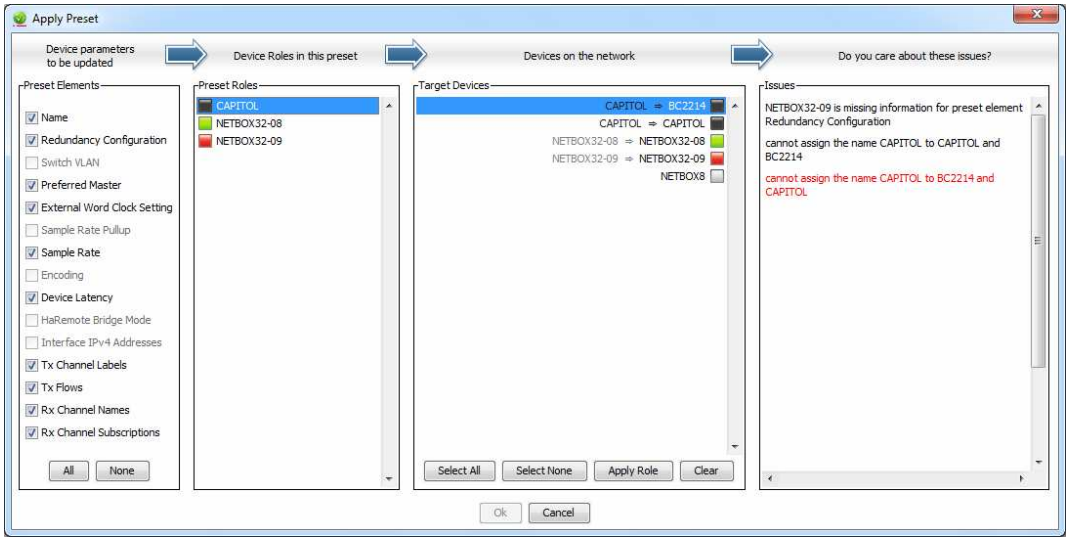
  You can apply a role to the same physical device from which it was created (if it exists in the target network), or to a different device in the same network, or to another device in a new network.

  When a role is applied to the same physical device, or a device of the exact same model, the configuration and routing should be replicated perfectly (although some subscriptions may be 'broken', if the relevant transmitters are not also present on the target network).

  NOTE: This makes presets an ideal way to backup and restore configurations for relatively static networks.

  If a role is applied to a different device model or a different type of device, the configuration and routing may not be replicated exactly - the success of the role assignment will vary depending on the functionality and channel support of the target device.

  Applying a role to a fundamentally different type of device may not be very successful. For example, applying a role for a fully-subscribed 32-channel mixing console configured at 96kHz to a 2-channel amplifier that only supports 48kHz will be problematic - only two channels can be subscribed (assuming the transmitters are also present), and the sample rate will be rejected.



You can apply a role to multiple devices. You cannot apply multiple roles to one device.

To see which devices a role has been assigned to, click the role. The assigned device/s will be highlighted in the 'Target Devices' column.

Automatic Assignments: “Dante Controller” will automatically assign roles to devices, based on the following rules:

- If there is a perfect device match (i.e. the physical device in the original network from which the role was created is also found in the target network), the role is assigned automatically.
- If there is a device name match, the role is assigned automatically.
- If a perfect match or a device name match cannot be made, the role will be assigned automatically to a device of the same manufacturer and model, assuming there is an unassigned device of that type.

Removing Assignments: In order to delete a role, just select that role in Target Devices and click on Clear (or press the keyboard’s Del key), or select another role for it from the Preset Roles column and then click on Apply Role.

Manual Assignments: To manually apply a role to a device:

- Drag the role onto the device, or
- Select the role and the target device/s in the 'Target Devices' column, and click Apply Role.

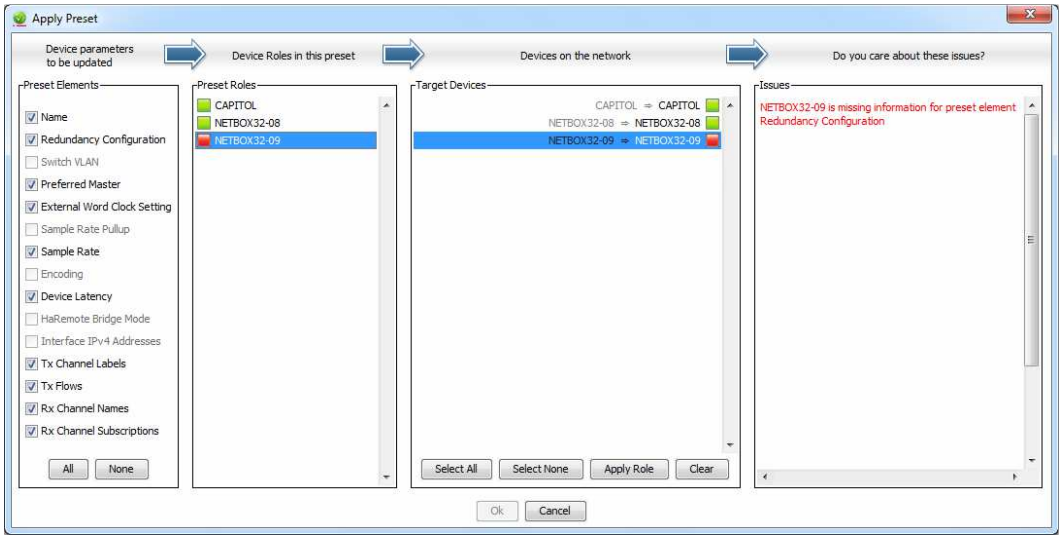
The LED icons against each role indicate the assignment status of the role:

A grey icon indicates that the role has not been assigned to any target devices.
A green icon indicates that the role has been successfully assigned to one or more target devices.
An amber icon indicates that the role has been assigned to one or more target devices, but there is a warning condition associated with one or more of the assignments.
A red icon indicates that the role has been assigned to one or more target devices, but there is an error condition associated with one or more of the assignments.
A black icon indicates that the role has been assigned to a target device, but the assignment will have a potentially terminal effect on the operation of the network.

- "**Target Devices**". This column lists the device names of devices on the currently connected Dante network and the roles that have been assigned to them (if applicable).

  The LED icons against each device indicate the assignment status of the device:

  A grey icon indicates that the device has not been assigned a role.
  A green icon indicates that the device has been successfully assigned a role.
  An amber icon indicates that the device has been assigned a role, but there is a warning condition associated with the assignment.
  A red icon indicates that the device has been assigned a role, but there is an error condition associated with of the assignment.
  A black icon indicates that the device has been assigned a role, but the assignment will have a potentially terminal effect on the operation of the network.



- "**Issues**". The Issues column lists all issues identified by "Dante Controller". Clicking a role or a target device will highlight the issues associated with that role or role assignment.

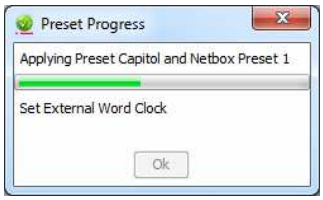
  The following are 'fatal' issues that could render the network unusable (identified by a black LED icon):

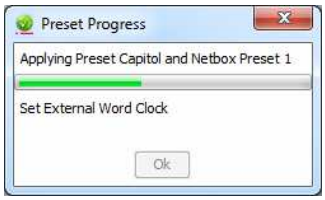
  - You cannot apply the same device name to multiple devices.
  - You cannot apply the same static IP address to multiple devices.
  - You cannot apply a redundant configuration to a device that does not support redundancy.

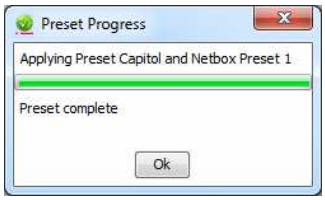
  Other issues may or may not be a problem, depending on your requirements for the network.

Applying Presets.

To apply the preset, click "**Ok**". This process will take around one minute. Click "Cancel" to abandon the operation.







5. CONTROL TERMINAL. "DANTE Virtual Soundcard".

NOTE: The information included in this manual is valid for software **version 3.7.0.22** (or higher versions).

Any computer with the "Dante Virtual Soundcard" software installed will be able to send and receive channels to and from the AEQ consoles and matrices. There are trial and fully operating versions of this software that can be downloaded free of charge from www.audinate.com.

Registered users can also download the user manual from this page. Nevertheless, for your convenience we reproduce an extract from it here.

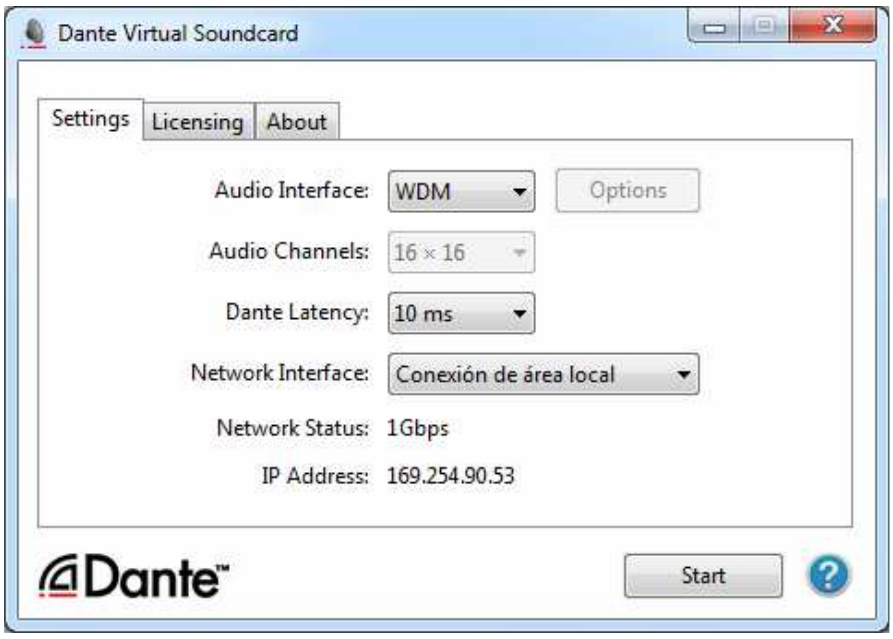
"Dante Virtual Soundcard" is a software application complementary to "Dante Controller", as it adds monitoring capabilities. The scope of this document is to describe the utility of "Dante Virtual Soundcard" as a tool allowing the insertion of a couple of channels as a test audio or to extract them as a monitor in a Dante based AEQ AoIP network, using a PC. For its use as multi-track software, please refer to the full manual.

Minimum System Requirements:

- Processor: Dual core CPU
- Memory: 1 Gigabyte of RAM
- Network: Standard wired Ethernet (WiFi not supported) network interface (100Mbps or Gigabit). A Gigabit (1000Mbps) interface is required for channel counts above 32x32 @48kHz., although the PC may have a 100 Mbps interface.
- Windows 7, 8 or 8.1 (32-bit or 64-bit) operating systems, with the latest available version and updates installed.
  Windows Drivers System drivers must be of the performance standard expected by the Windows Logo Program
  NOTE: Both UTF-8 and Unicode are supported EXCEPT for host or device names; DNS standard does not support Unicode for these.

The PC audio application must be compatible with WDM (Windows Driver Model). The application supports the ASIO multichannel standard interface, but this is not the purpose of the use that this document describes.

Its default screen must be configured this way. Note that the configured latency, even not audible, is by far higher than the one normally produced by AoIP AEQ devices, due to the lower performance of a general purpose PC hardware as compared to dedicated audio hardware:



Supporting services.

Dante Virtual Soundcard makes use of 'Dante Discovery' service for automatic device discovering, and “ConMon’ for the control and monitoring of Date devices. Both of them are installed with the application.

Firewall Configuration.

Firewall configuration for Windows Firewall is automatically handled during installation and on system boot (every time the “Dante Virtual Soundcard” services start).

The “Dante Virtual Soundcard” communicates over UDP using the following ports:

- Dante Clock Synchronization: 319, 320.
- Dante Audio Routing: 4440, 4444, 4455.
- Dante Control and Monitoring: 8700-8705, 8800.
- Dante Multicast and Unicast Audio: 4321, 14336 - 14600.

If you are using a third-party firewall product, use the port information provided above to configure it accordingly.

5.1. Installing the “Dante Virtual Soundcard”.

Downloading “Dante Virtual Soundcard”.

“Dante Virtual Soundcard” is available for download from Audinate’s website.

To download a copy of “Dante Virtual Soundcard”:

1. Go to the Audinate website: www.audinate.com.
2. Navigate to Products > Dante Virtual Soundcard.
3. Under “Download“, choose your operating system.
4. Click the red download button.

This will take you to the appropriate DVS (Dante Virtual Soundcard) release page for your operating system. Click the link under “File downloads“ to download the DVS installer.

Installing “Dante Virtual Soundcard” on Windows.

Once you have downloaded the “Dante Virtual Soundcard” installer file, navigate to the directory where you have downloaded it. To install:

1. Ensure you are logged on to your PC as an administrator.
2. Double-click the icon for the “Dante Virtual Soundcard” installer.
3. Read the license text, and if you accept the terms of the agreement, click the 'I Agree...' checkbox. If you do not agree to the terms, click Close.
4. The “Network Throttling Management” screen is displayed. Audinate recommends allowing “Dante Virtual Soundcard“ to manage this setting (the default option).
5. Click Install.
6. Acknowledge / accept any Windows security warnings that are displayed.

NOTE 1: If you are upgrading to a new version of “Dante Virtual Soundcard”, you do not need to uninstall the previous version first. If you do uninstall the previous version before upgrading, you will need to reenter your license key to activate the software.

NOTE 2: If you already have the latest version of “Dante Virtual Soundcard” installed, running the installer again will allow you to repair or uninstall the application.

NOTE 3: If you have “Dante Virtual Soundcard” selected as the default audio interface in Windows, upgrading to a new version of “Dante Virtual Soundcard” will reset the selection to an alternative interface and you will need to reselect “Dante Virtual Soundcard” following the upgrade.

5.2. Starting the "Dante Virtual Soundcard" Control Panel.

The "Dante Virtual Soundcard" Control Panel enables user interaction with "Dante Virtual Soundcard".

By default the "Dante Virtual Soundcard" will be installed in:
C:\Program Files\Audinate\Dante Virtual Soundcard\

In 64-bit Windows, it will appear under C:\Program Files (x86).

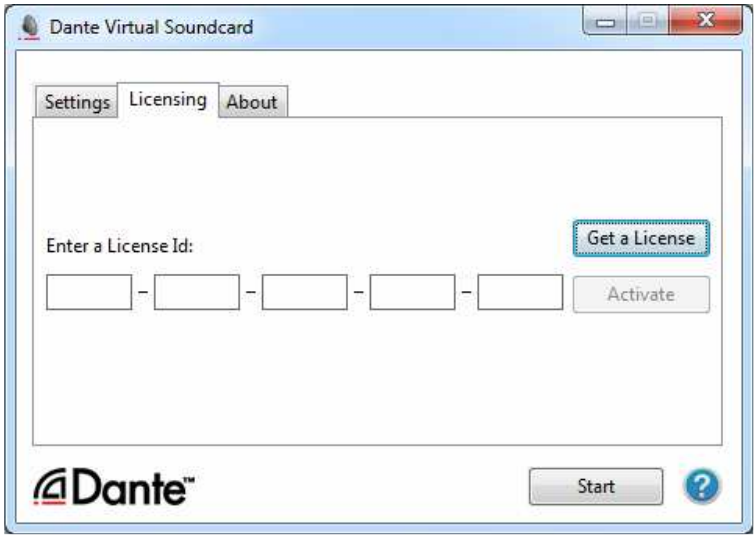
The "Dante Virtual Soundcard" Control Panel can be started in one of two ways:

- From the Start menu: Start > Programs > Audinate > Dante Virtual Soundcard > Dante Virtual Soundcard (or Windows key > Dante Virtual Soundcard in Windows 8); or
- Navigate to the directory where it is installed, and click the "Dante Virtual Soundcard" icon:

5.3. Obtaining a "Dante Virtual Soundcard" License.

"Dante Virtual Soundcard" will not operate until a valid License ID has been entered and activated.

The first time you start the "Dante Virtual Soundcard" Control Panel, you will be presented with a screen that looks similar to the following:



You are required to register with Audinate at www.audinate.com and provide an email address to obtain a valid License ID for "Dante Virtual Soundcard". If the machine on which you are installing "Dante Virtual Soundcard" is connected to the Internet, click the Get a License button to be taken directly to the Audinate website.

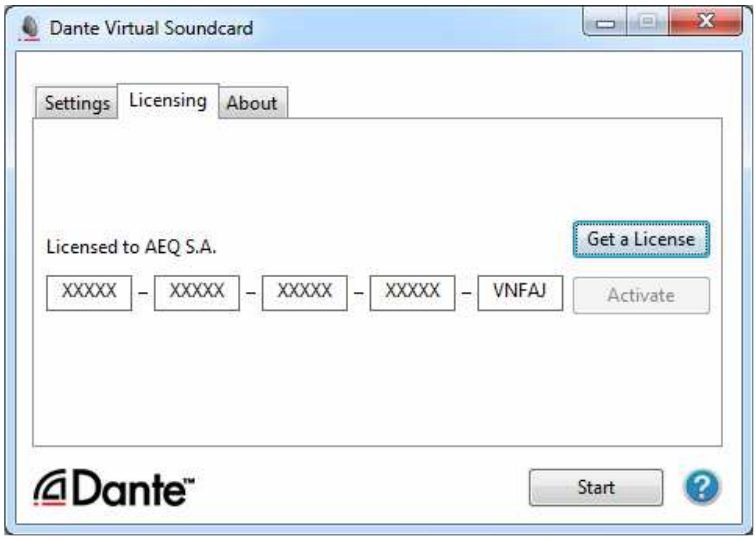
Once you have obtained a License ID, it can be entered in the Licensing tab. The "Activate" button is not enabled until a correctly formatted License ID has been entered into the dialog box.

NOTE: In some special cases, outside the scope of this manual, the documentation provided with your equipment will include a license Id or information to obtain that Id with some discount.

Click "**Activate**" to register the installation with the Audinate servers.

IMPORTANT NOTE: Ensure that the machine has access to the Internet during this step.

Once this step has been completed, a “Licensed to …” message will appear, and the software is ready for use. The Control Panel will appear as shown on the following screen.



If you are using a trial license the Control Panel a “Trial version licensed to...” message and remaining trial time info will appear. In order to continue using “Dante Virtual Soundcard” after the trial period has expired, you will need to purchase a full license.

5.4. Configuring “Dante Virtual Soundcard”.

It is important to understand that the Control Panel that is displayed when you click on the “Dante Virtual Soundcard” icon is a means of configuring and controlling “Dante Virtual Soundcard”, it is NOT the “Dante Virtual Soundcard” itself.

When you open the “Dante Virtual Soundcard” Control Panel, you are presented with a window with three tabs: “Settings“, “Licensing“ and “About“. The “Settings“ tab is shown by default when the application is opened.

5.4.1. Settings available in “Dante Controller“.

Some “Dante Virtual Soundcard” settings are only configurable via “Dante Controller”:

- Device Name.
- Sample Rate.
- Encoding (audio bit depth).

To change these settings, use the “Device Config” tab of the “Device View” in “Dante Controller” (see section 4.8.3.5 of this manual). To open this tab:

1. Completely quit out of any audio applications that are using “Dante Virtual Soundcard”. Connected applications may prevent new settings from taking effect.
2. Ensure “Dante Virtual Soundcard” is running.
3. In “Dante Controller”, open the device view for “Dante Virtual Soundcard” - either:
    - Double-click the “Dante Virtual Soundcard” device in the routing view, or:
    - Use Ctrl + D to open the device view, and select the “Dante Virtual Soundcard” device from the drop-down menu.
4. Click the “Device Config” tab.

Changing the Device Name:

By default, “Dante Virtual Soundcard“ will appear in “Dante Controller“ with the same name as the computer on which it is installed.

To change the “Dante Virtual Soundcard“ device name:

1. In “Dante Controller”, open the “Device Config” tab for “Dante Virtual Soundcard”.
2. In the “Rename Device” field, enter the new device name and click “Apply”.

Changing the Sample Rate:

To change the sample rate for “Dante Virtual Soundcard“:

1. In “Dante Controller“, open the “Device Config” tab for ”Dante Virtual Soundcard”.
2. Use the ”Sample Rate” drop-down menu to set the required sample rate.

NOTE 1: Changing the sample rate will interrupt audio.

NOTE 2: Increasing the sample rate in “Dante Controller“ may reduce the channel count (’Audio Channels’) setting on “Dante Virtual Soundcard“, if the channel count setting is not supported at the new sample rate. Subsequently decreasing the sample rate, however, will not restore the channel count setting to its previous value.

Changing the Encoding:

The encoding value is the audio bit depth. To change the encoding setting:

1. In “Dante Controller“, open the “Device Config” tab for “Dante Virtual Soundcard”.
2. Use the “Encoding” drop-down menu to set the required bit depth.

NOTE: Changing the encoding setting will interrupt audio.

Supported Audio Formats:

The supported audio formats are:

Audio Format	**Supported values WDM (Windows)**
Sample rate	44.1 KHz 48 KHz 88.2 KHz 96 KHz
Bit depth	16 bit 24 bit 32 bit

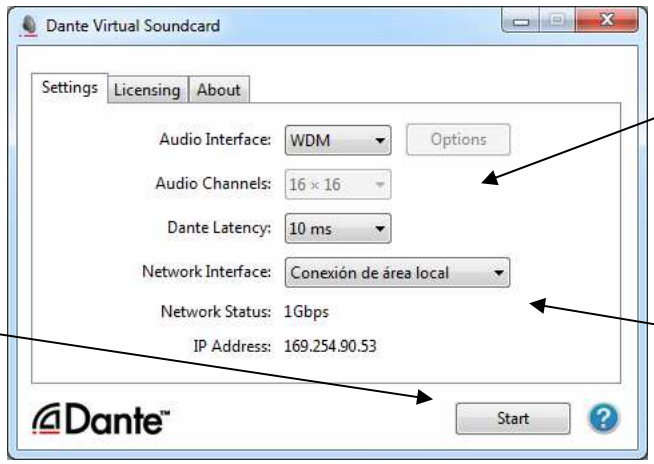
5.4.2. “Settings“ Tab in “Dante Virtual Soundcard”.

The “Settings” tab is the first screen you see when you open the “Dante Virtual Soundcard” Control Panel. **NOTE:** Settings cannot be changed while the “Dante Virtual Soundcard” is running.

To change settings:

1. Completely quit out of any audio applications that are using the “Dante Virtual Soundcard”.
2. Stop the “Dante Virtual Soundcard”.
3. Change your “Dante Virtual Soundcard” settings.
4. Start the “Dante Virtual Soundcard”.
5. Restart your audio application/s.

NOTE: The device name and audio format (sample rate and bit depth) must be set in "Dante Controller", while "Dante Virtual Soundcard" is running. You should quit out of any connected applications before changing the device name or audio format.



"**Start/Stop**" **Button.**

The "**Start/Stop**" button in the "Settings" tab indicates whether "Dante Virtual Soundcard" is currently running, and can be used to toggle the running state:

Button shows "**Start**"**:** "Dante Virtual Soundcard" is currently stopped.

Button shows "**Stop**"**:** "Dante Virtual Soundcard" is currently running.

Click the button to toggle the running state of "Dante Virtual Soundcard". When "Dante Virtual Soundcard" is running, all other buttons and drop-down lists on the "Settings" tab are greyed out.

IMPORTANT NOTE: If you are recording via "Dante Virtual Soundcard", stop the recording before you switch "Dante Virtual Soundcard" off. Switching "Dante Virtual Soundcard" off during a recording can lead to driver instability issues.

NOTE: "Dante Virtual Soundcard" can be either on or off (running or not running) when the "Dante Virtual Soundcard" Control Panel is started. It will always be in the state it was in when the Control Panel was last closed. If the computer is power cycled, "Dante Virtual Soundcard" will resume in the state it was in when the computer was powered off.

When "Dante Virtual Soundcard" is running, it will be visible on a "Dante Controller". By default, the device name shown in "Dante Controller" will be the same as the name of the computer on which it is running.

Audio Interface.

For the initial start-up, please use the "Audio Interface" button to disable ASIO audio engine and setup WDM. "Dante Virtual Soundcard" must be stopped (via the "Start/Stop" button on the control panel) before you can change the audio interface.

In WDM mode, "Dante Virtual Soundcard" supports audio applications that use WDM audio, for example iTunes for Windows, Windows Media Player and Skype.

The "Options" button is only available in ASIO mode, but this is not the purpose of the use that this document describes.

Audio Channels.

Use the “Audio Channels” drop-down menu to set the number of transmit and receive Dante audio channels available and advertised on the network when working in ASIO mode. This enables the number of channels shown in “Dante Controller” (and any connected audio application) to be limited, if required. The maximum number of channels supported depends on the interface type and the selected audio format.

In WDM mode this number is fixed: “Dante Virtual Soundcard” supports 16 channels (8 stereo pairs).

Dante Latency.

The “Dante Latency” drop-down box allows you to view and set the device receive latency (time before playout). A Dante device receiving audio from “Dante Virtual Soundcard” will use this value (unless the receiving device only supports higher latencies). The latency compensates primarily for computer scheduling jitter, as well as delay variations encountered in the network.

Supported values are:

- 4ms (low)
- 6ms (medium)
- 10ms (high)

As a rule of thumb, 4ms can be used where “Dante Virtual Soundcard” is running on a high-spec PC with low scheduling jitter. Computers with poor scheduling performance may need to use the 10ms Dante Latency setting.

NOTE: If the Dante Latency setting is set too low to compensate for network delay variation and computer scheduling jitter, there is a risk of intermittent loss of audio.

Network Interface.

The “Network Interface“ drop-down menu allows you to select the computer's network interface that “Dante Virtual Soundcard“ will use to transmit and receive Dante audio.

The available entries will be all the wired Ethernet network interfaces currently enabled on the machine. For machines with only one Ethernet network interface enabled, there will only be one option available.

The **IP address** of the currently selected interface is displayed below the “Network Status“ field.

NOTE 1: “Dante Virtual Soundcard” does NOT support wireless, USB, Bluetooth or bridged Ethernet Interfaces.

NOTE 2: All Dante applications on the same computer have a shared understanding of the primary Dante interface. For example, if you have installed “Dante Controller” on the same PC as “Dante Virtual Soundcard”, and a new primary interface is selected from within “Dante Controller”, “Dante Virtual Soundcard” will automatically switch to the newly selected interface, and begin operating on that interface.

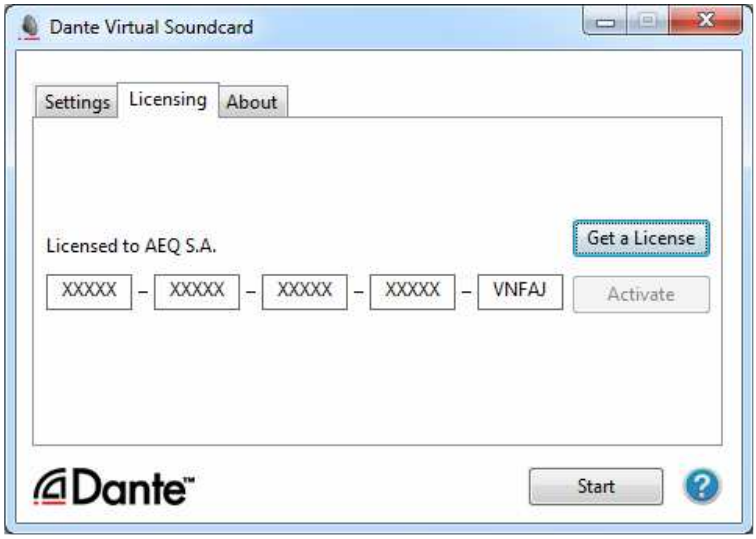
Network Status.

The “Network Status” value indicates the link speed of the computer's Ethernet network interface that is currently in use by “Dante Virtual Soundcard”. It can have the following values:

- 1Gbps (1 gigabit per second).
- 100Mbps (100 megabits per second).
- N/A (no Ethernet network detected).

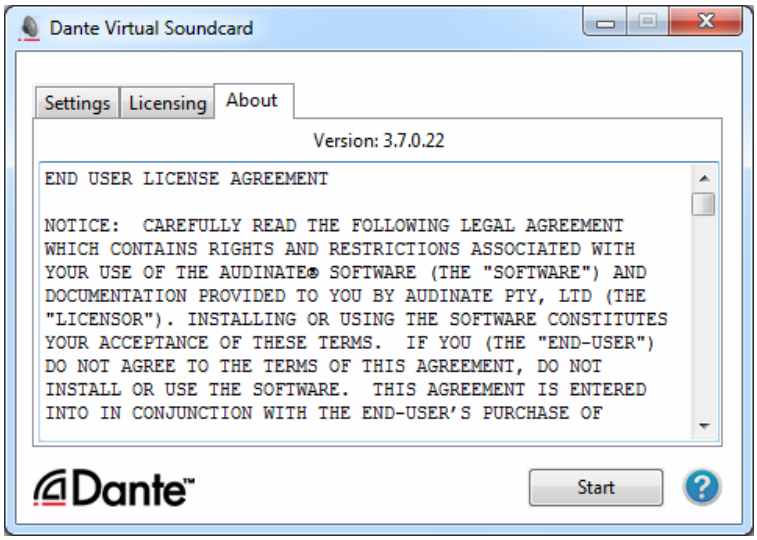
5.4.3. “Licensing“ Tab in “Dante Virtual Soundcard”.

The “Licensing” tab allows you to see the status of the license you have, and if necessary allows you to enter a new license key and re-activate the “Dante Virtual Soundcard”. If you have a trial license it will display the number of days remaining before the trial license expires.



5.4.4. “About“ Tab in “Dante Virtual Soundcard”.

The “About” tab shows you the version of “Dante Virtual Soundcard” that you have installed. It also allows you to read the End User License Agreement.



5.5. Using the "Dante Virtual Soundcard" with an Audio Application.

5.5.1. Important Notes.

"Dante Virtual Soundcard" acts in a very similar way to a hardware soundcard.

NOTE 1: Make sure that you start "Dante Virtual Soundcard" with the settings you require, BEFORE you start your audio application.

NOTE 2: Digital Audio Workstations (DAWs) treat "Dante Virtual Soundcard" like any other WDM (Windows) device. For support information about using audio devices (including "Dante Virtual Soundcard") with your DAW, please use the support services provided by the manufacturer of your DAW.

5.5.2. Choosing an Audio Application.

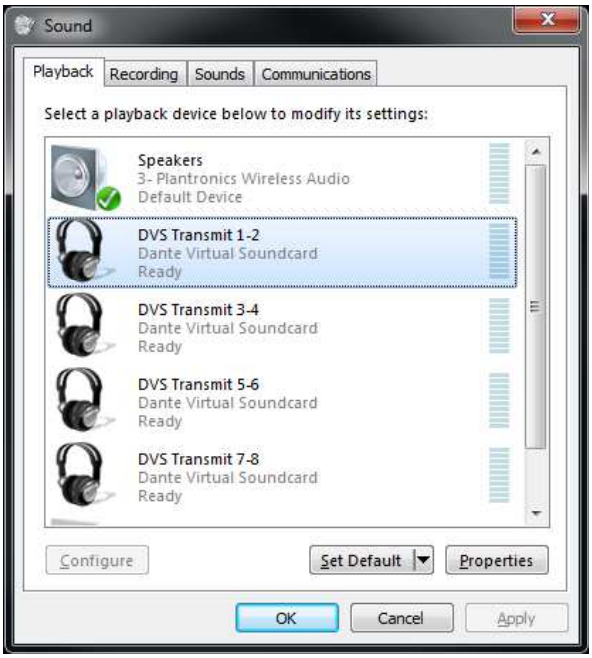
"Dante Virtual Soundcard" acts like a standard WDM sound device in a PC running Windows.

In WDM mode, "Dante Virtual Soundcard" supports common audio applications available for Windows, such as Windows Media Player, iTunes and Skype.

5.5.3. Configuring "Dante Virtual Soundcard" as your Audio Interface.

Audio applications generally provide a mechanism for selecting the sound card that they will use. Before configuring the application to use "Dante Virtual Soundcard" as its audio interface, make sure you have started "Dante Virtual Soundcard" with the required settings (and with the correct interface mode selected: WDM).

"Dante Virtual Soundcard" supports 16 channels (8 stereo pairs) in WDM mode. Each stereo pair appears as an independent selectable audio device in any relevant Windows and supporting application dialogs. In the Windows 7 Sound Playback options, "Dante Virtual Soundcard" appears as follows:



NOTE: Dante Virtual Soundcard stereo pairs will appear as selectable audio interfaces in Windows regardless of the current mode - i.e. with Dante Virtual Soundcard in ASIO mode, it will still appear as a set of selectable audio interfaces in the Windows sound playback options dialog. Similarly, in WDM mode, it will appear as a selectable audio interface in an ASIO-supporting DAW. However, it will not function correctly unless the currently selected mode matches the requirements of the application.

5.5.4. Windows Audio Shared Mode.

Windows allows applications to share audio interfaces.

If applications with differing sample rates share an audio interface, their sample rates are automatically brought into line by Windows, so it can mix the audio streams. This will result in sample rate conversion on one of the audio streams, which can adversely affect audio quality.

To prevent Windows performing sample rate conversion on “Dante Virtual Soundcard” audio, the “Shared Mode“ default format for all ”Dante Virtual Soundcard” channels should be set to match the sample rate currently selected on the ”Dante Virtual Soundcard” control panel.

In **Windows 7**, the default shared mode format for the device is automatically updated when the audio format of “Dante Virtual Soundcard” is adjusted in “Dante Controller”, so you should not have to adjust it manually.

In **Windows 8.x**, you will need to manually specify the default shared mode format for the device:

1. Open the Windows Sound options dialog (Start > Control Panel > Sound).
2. With the “Playback” tab selected, double-click the “DVS Transmit 1-2“ entry in the interface list.
   The “DVS Transmit 1-2 Properties” dialog is displayed.
3. Select the “Advanced” tab.
4. Set the Default Format to the required setting.
5. Click OK.
6. Repeat for all “Dante Virtual Soundcard” stereo pairs.
7. Repeat again for the “Recording” tab.
8. Click OK.

6. "DANTE FIRMWARE UPDATE MANAGER": FIRMWARE UPGRADING SOFTWARE.

6.1. "Dante Firmware Update Manager" description.

NOTE: The information included in this manual is valid for software **version 1.4.13.2** (or higher versions).

"Dante Firmware Update Manager" is a maintenance application provided by Audinate which allows users to upgrade the firmware of the "Brooklyn II" module included in the AEQ equipments described in this manual. It is available for PCs running Windows 7, 8 and 8.1, and Apple Macs running OS X 10.7.5, 10.8.5, 10.9.5 and 10.10.

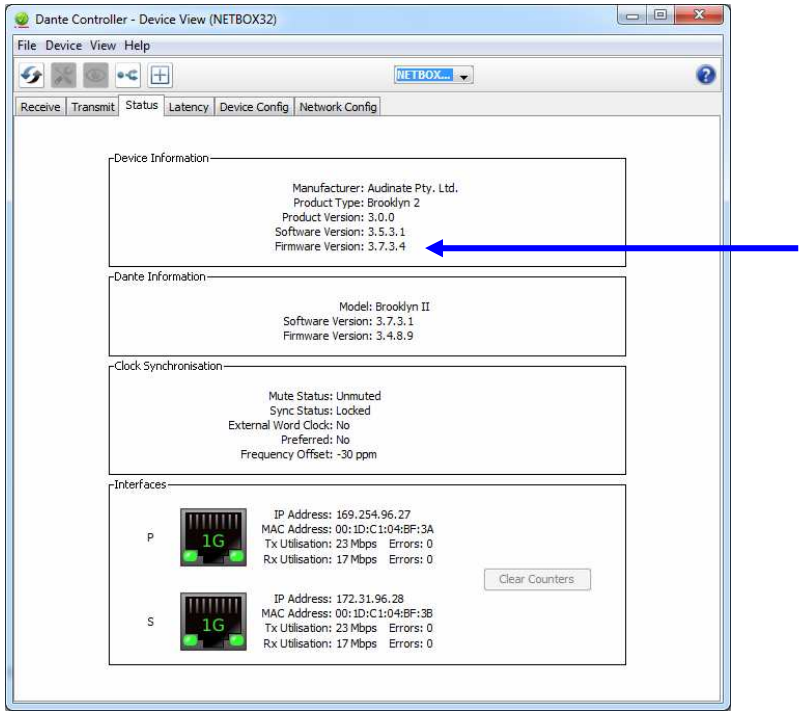
IMPORTANT NOTE: The firmware upgrading process should only be accomplished by qualified personnel in possession of all necessary technical information relative to this system and with the possibility to establish a direct communication with AEQ's technical support (sat@aeq.es).

By default "Dante Firmware Update Manager"will be installed in:
C:\Program Files\Audinate\Dante Firmware Update Manager\

It can be started in several ways:

- From the Start menu: Start > Programs > Audinate > Dante Firmware Update Manager > Dante Firmware Update Manager.
- Run by going to Start > Run and entering in the dialog box:
  C:\Program Files\Audinate\ Dante Firmware Update Manager \ fum.exe
- Navigate to the directory where it is installed, and double-click the "Dante Firmware Update Manager" icon.

You can use the "Dante Controller" application to find out the firmware version of a certain device. In order to do that, just open the associated "Device View", select the "Status" tab and check the current firmware version in the "Device Information" section (see section 4.8.3.3 of this manual):



6.2. Firmware upgrading procedure.

The procedure to upgrade the firmware of a DANTE device is the following one:

1. Open the "**Dante Firmware Update Manager**" appication.

If you have multiple network interfaces enabled on your computer, you must select the one used for connecting to the primary DANTE network. If there is only one defined network interface, it will be selected by default.

If you "have "Dante Controller" and/or "Dante Virtual Soundcard" applications installed, "Dante Firmware Update Manager" will automatically preselect the primary interface that was last used by either of those applications.

Click "**Next**" button to continue (or "Quit" to leave the application).

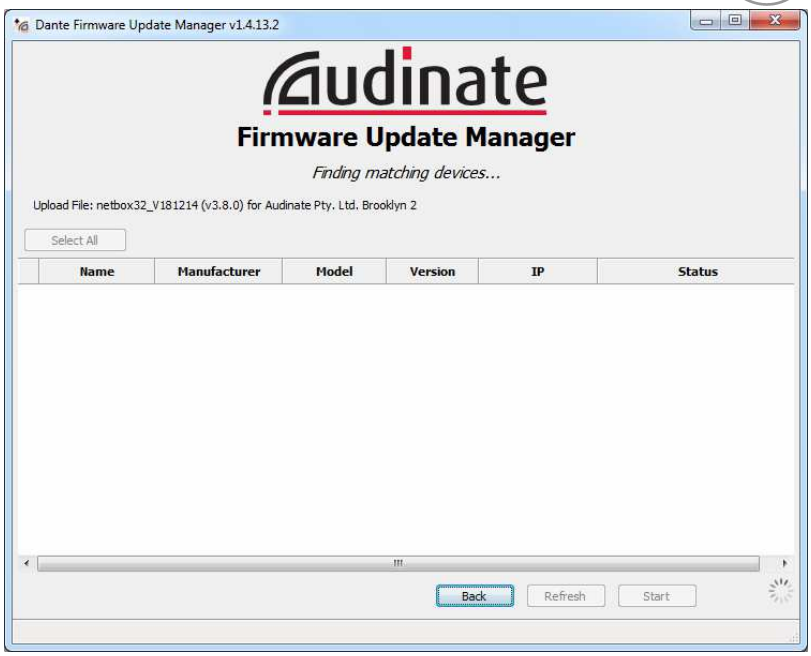
2. In the window that appears, click "**Update Dante Firmware**" button.

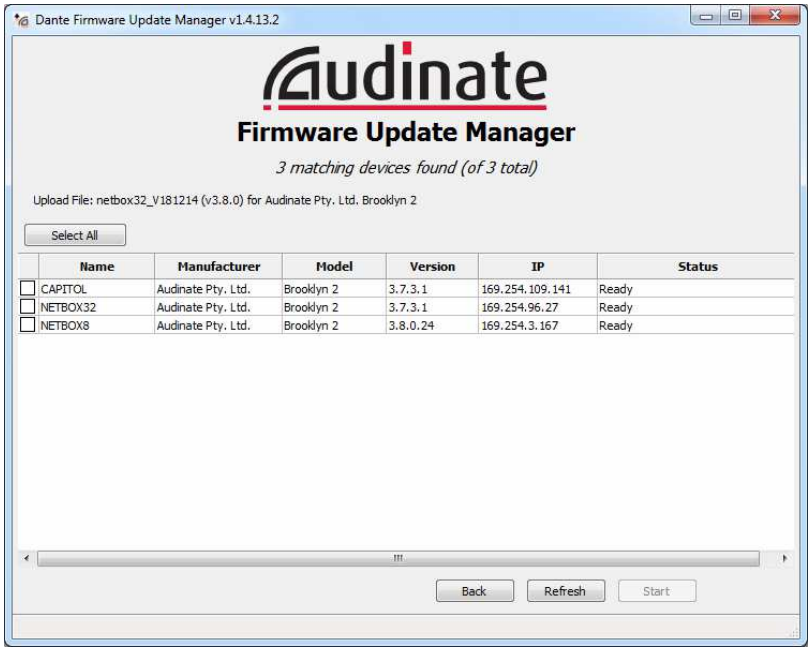
3. In the window that appears, click “**Browse**” button and select the firmware update file (“**DNT**” extension) that contains the new version to be loaded.

Once the file is loaded, check that the “Override Device Matching” box is not selected and click “**Next**” button.

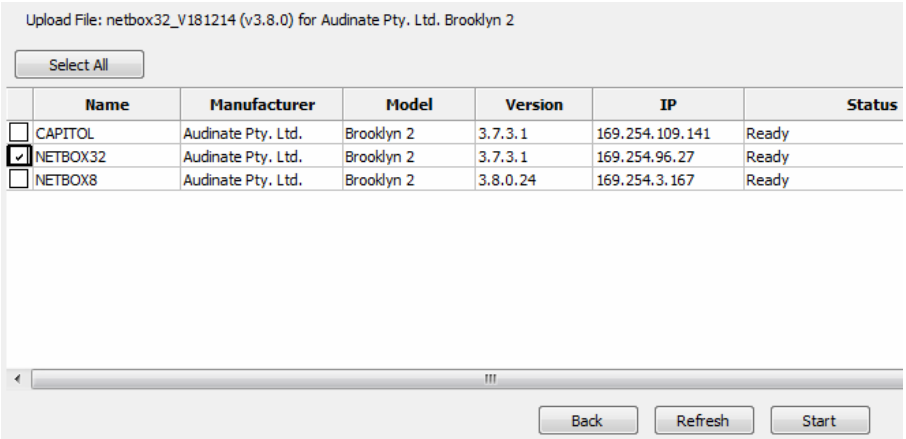
IMPORTANT NOTE: Depending on the firmware version changes it may be necessary to select that checkbox in order to be able to upgrade the device (for instance, when upgrading from version 3.8.0.24 to 3.9.6.1). In case of doubt, please consult the Technical Assistance Service (**sat@aeq.es**).

4. In the window that appears, after a few seconds, a list of the discovered DANTE devices is shown.



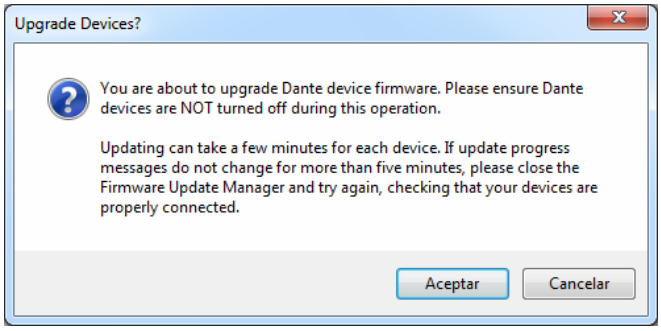


Click the checkbox/es of the device/s you wish to update:



Click “**Start**” button to start upgrading process.

In the window that appears, accept to continue:



5. Then the upgrading process starts and the “Status” column shows its progress:

IP	Status
169.254.96.27	Updating (1/1): Get file

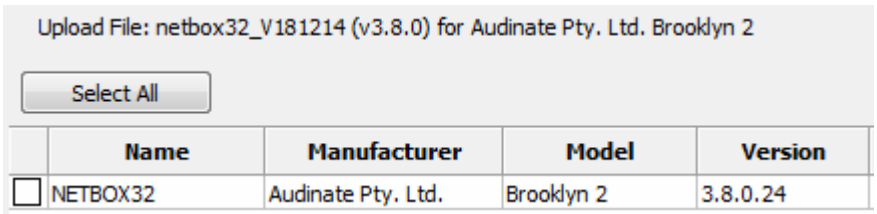
IP	Status
169.254.96.27	Updating (1/1): Flashing

When the process is correctly ended, a confirmation window will appear

and the “Status” column will indicate:

IP	Status
169.254.96.27	Update Done

After turning off and on the device and pressing “Refresh” button, the new firmware version will be shown in the “Version” column:

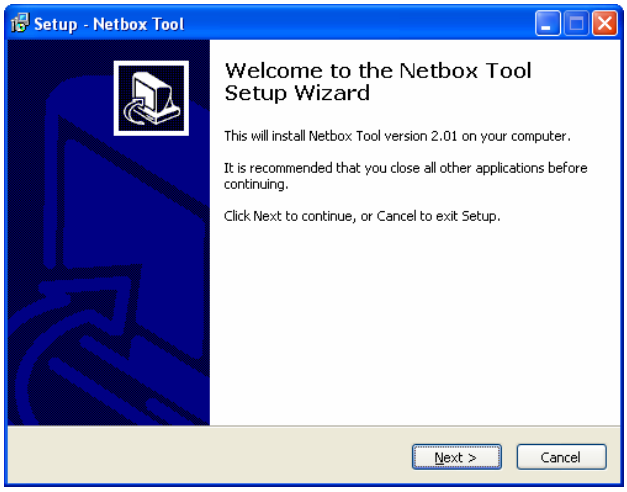


7. "AEQ NETBOX TOOL": CONTROL AND CONFIGURATION SOFTWARE FOR NETBOX 8 AND NETBOX 32.

7.1. Introduction.

"**AEQ NetBox Tool**" application is the control and configuration software for NETBOX 8 and NETBOX 32.

The auto run disk furnished with those units 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.



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

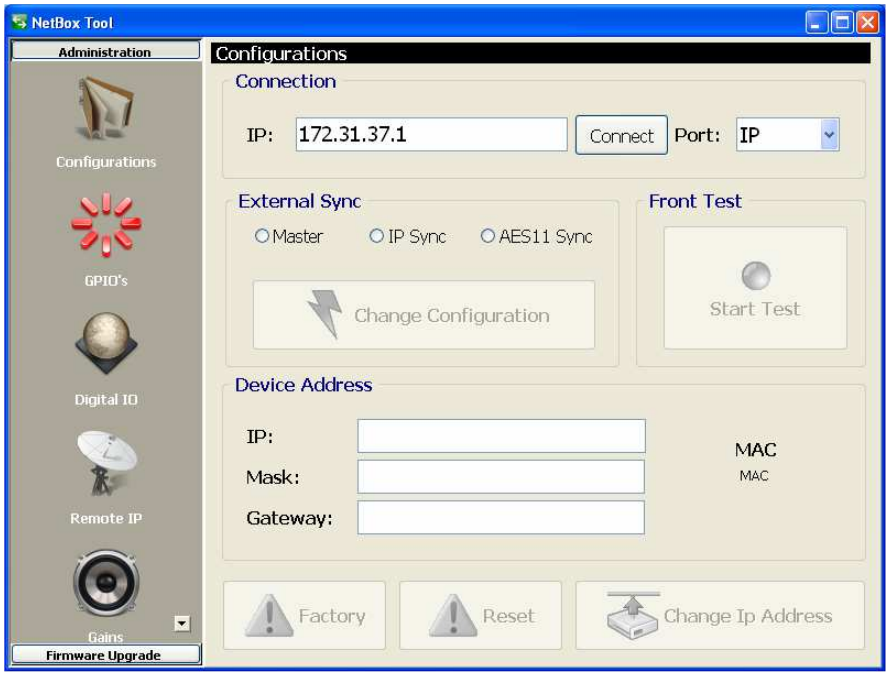
7.2. Administration Tools.

When the application starts up, the initial screen will appear allowing you to access the different options and showing the software version, as well as an image showing the equipment type (NETBOX 8 or NETBOX 32) when connection is established.

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.

7.2.1. "**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:



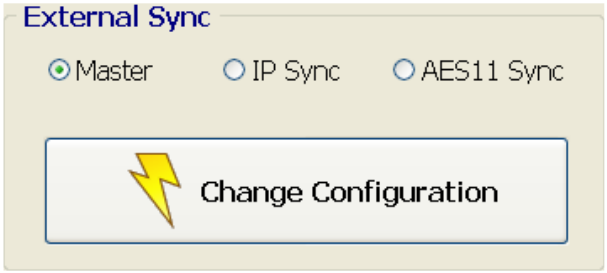
"**Connection**" section allows you to configure the parameters to connect to the unit. Firstly, the **IP** address of the equipment must be configured (by default, **NETBOX 32** units are supplied with **172.31.37.1** IP address and **NETBOX 8** with **172.31.38.1** IP address) and the **Port** the connection will be established through (**IP**). Where there is more than one unit with the same IP in the same network, you should connect to each one of them individually and change their address in order to avoid network conflicts.

IMPORTANT NOTE: In case you don't know the IP address of the unit, there is a **procedure** (included in the "Extras" menu of the CD furnished with the unit) that allows you to return to default configuration in order to control the unit again.

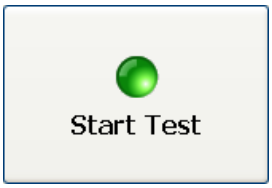
NOTE: The "Port" drop-down menu allows you to select that connection would be established through a serial port, but only for maintenance purposes and under AEQ's Technical Support supervision (sat@aeq.es).

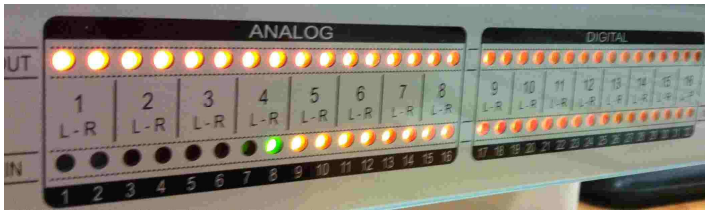
When the unit is correctly detected, the configuration buttons will appear activated (the "Connect" button allows you to force the connection, although where there is communication with the unit that connection is established automatically).

"**External Sync**" section allows you to configure the synchronization mode: whether the unit works as "**Master**" (only one unit per network must be configured that way) or it's synchronized through IP connection ("**IP Sync**") or through the source connected to **digital input 1** ("**AES11 Sync**"). The selected option will be applied when pressing "**Change Configuration**" button.



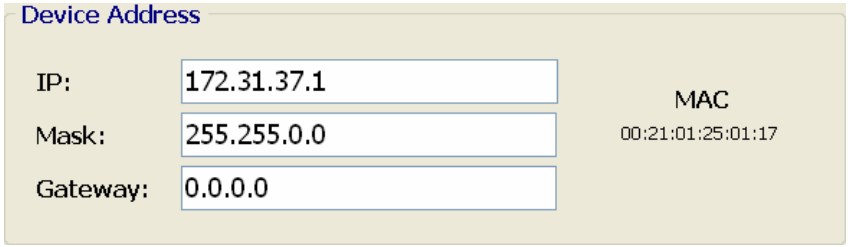
"**Front Test**" section allows you to start a test of front level indicators, by pressing the "**Start Test**" button (when test is started, the button changes to "**Stop Test**" and allows you to stop the process). The front LEDs will light one by one following the green-yellow-red sequence.



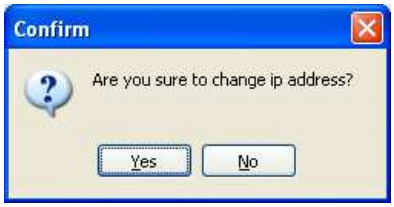


"**Device Address**" section allows you to configure the IP parameters of the Ethernet interface of the unit:

- "**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 "**Change Ip Address**" button. Confirmation is requested.



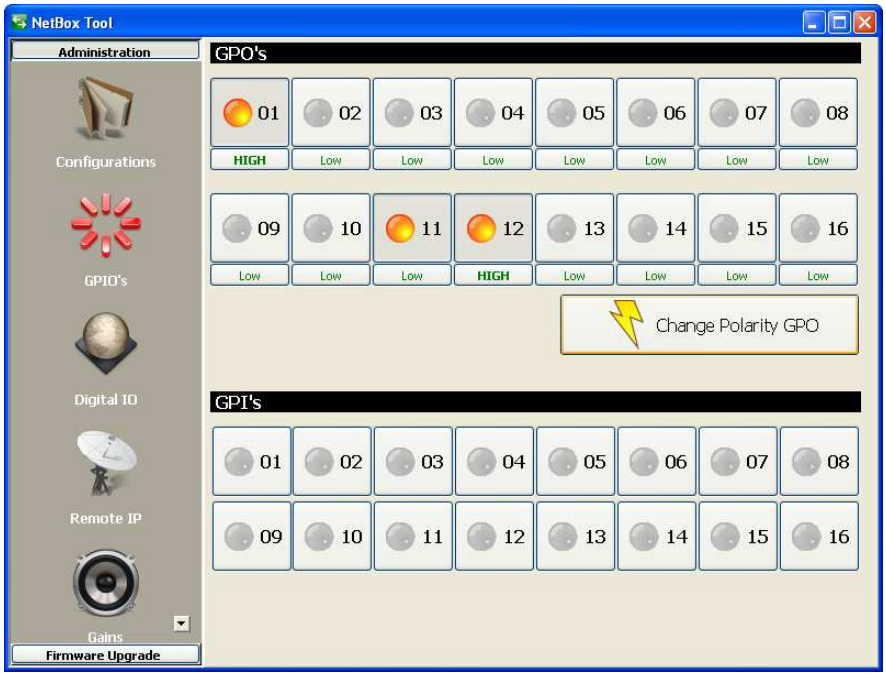
The "**Factory**" button allows you to return to iniitial Factory parameters.

The "**Reset**" button allows you to restart the unit.

Confirmation is requested for both options.

7.2.2. "GPIO's" submenu.

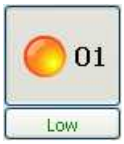
"**GPIO's**" submenu, accessed from the drop-down menu "Administration" by clicking on the corresponding icon, allows you to check the functioning and perform basic operations of unit's physical GPIO's (the GPIO's are normally used in relation with other units and applications).



When you press any of the 16 numbered buttons in "**GPO's**" section (in the case of **NETBOX 32**) it is lighted in amber and the corresponding GPO of the unit changes to active status:

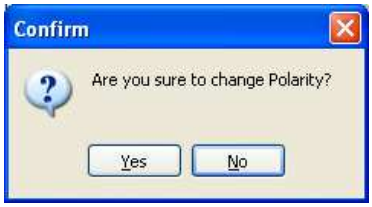
- in case that GPO is configured as "**HIGH**", the circuit between the corresponding pin and the ground pin in DB15 connector of the unit gets open.

- 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.

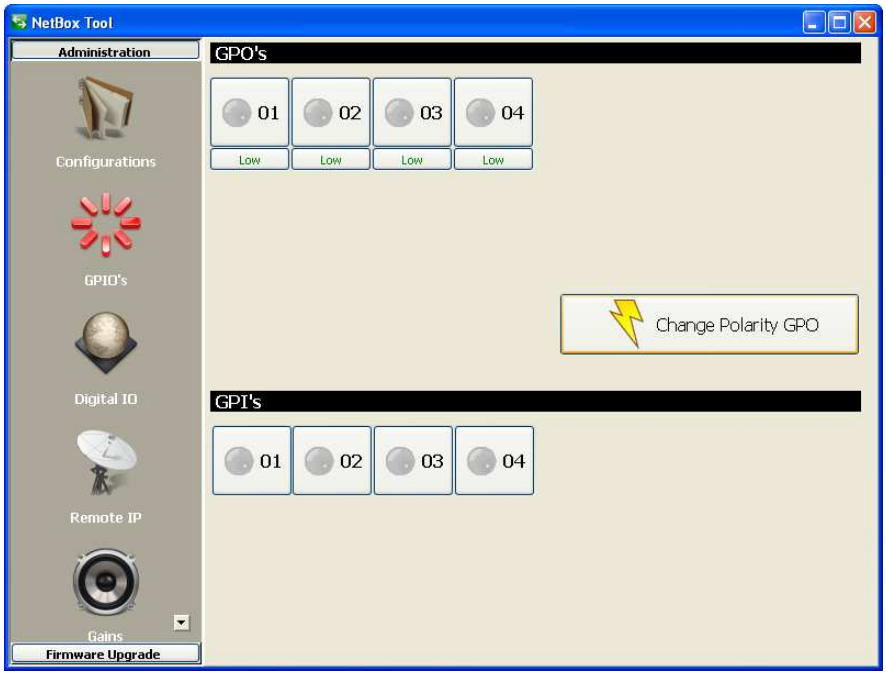


In order to change the default configuration of a GPO closing and opening you must press the associated button, that will change from "HIGH" to "Low" or vice versa, although changes will not be applied until you press the button:

and confirmation is provided in the window that appears:



In the case of **NETBOX 8** there are only **4 GPI's** and **4 GPO's** available, so that only 4 numbered buttons are shown in each section:



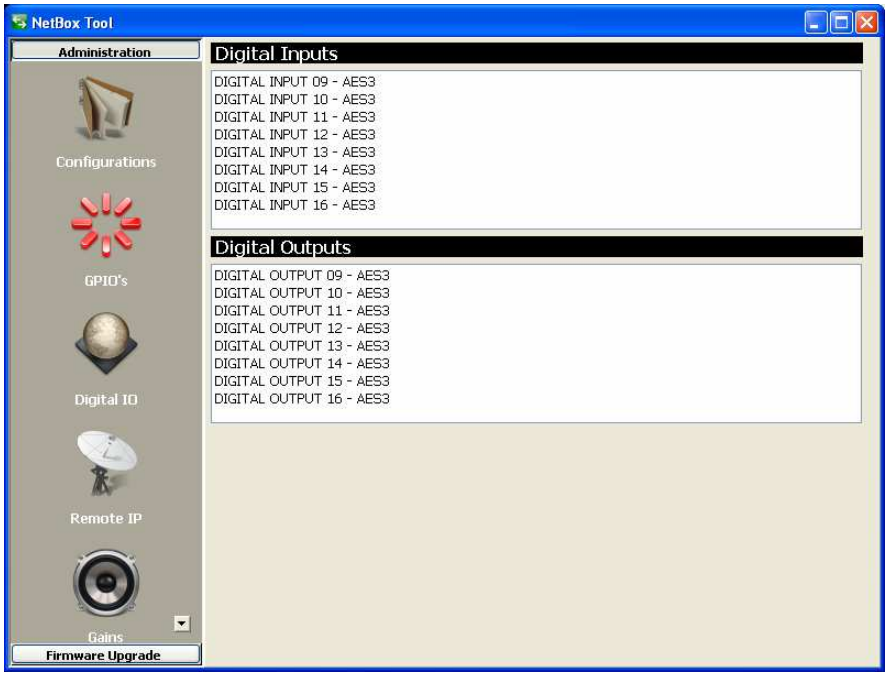
The voltage and current limits for external power supply of GPO are 200 volts and 120mA.

The unit provides a +5V voltage in order to make easier GPO's cabling when the receiver unit accepts logical levels and needs low charge 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 that 3mA can be connected between GPO pin and the one with +5V voltage.

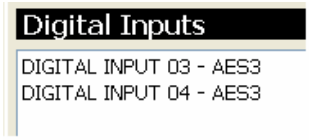
When a **GPI** is activated in the unit (the circuit between the corresponding pin and the ground pin gets closed), the corresponding button in "**GPI's**" section will light in amber. This GPI will be also transmitted through the network to all the IP addresses configured in "**Remote IP**" submenu (see section 7.2.4 of this manual). In order to activate a GPI with internal voltage, you have to connect the floating ground to the connector chassis.

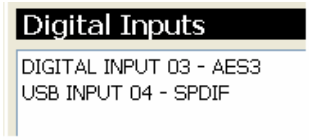
7.2.3. "DIGITAL IO" submenu.

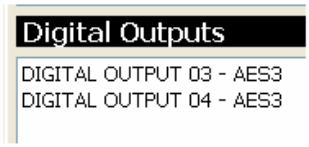
"**DIGITAL**" submenu, accessed from the drop-down menu "Administration" by clicking on the corresponding icon, gives access to an information window where you can check the digital inputs and outputs format. These inputs and outputs are configured as AES/EBU by default and can be configured as SPDIF by changing some internal jumpers. In the case of **NETBOX 32** there are **8 digital inputs** and **8 digital outputs.**

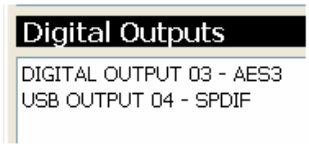


In the case of **NETBOX 8** there are **2 digital inputs** and **2 digital outputs**, and besides the second input/output can be configured by means of a switch in order to be available in DB15 connector or in USB connector and that configuration is also shown in this submenu:









7.2.4. "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 GPI's and GPO's.

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

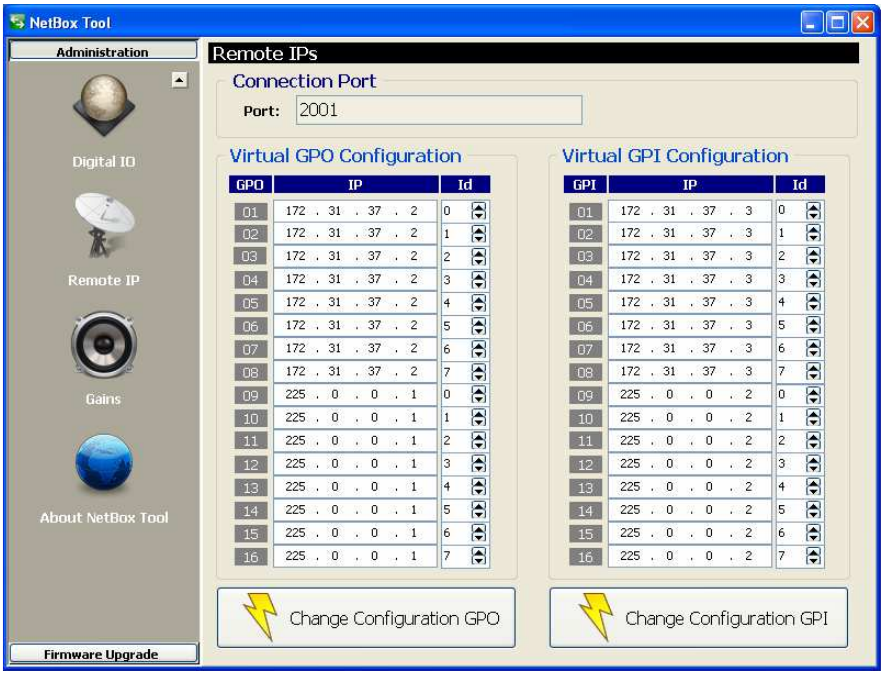
"**Virtual GPI Configuration**":

This section allows you to distribute remotely the GPI's status of a NETBOX unit in order to activate the GPO's of other NETBOX unit or other AEQ IP units as Forum, Capitol, Phoenix audiocodecs, Systel IP and Audio+. The parameters of a virtual GPI are the control **IP address** of the unit that will receive the GPI and an "**Id**" number (identifying number from 0 to 255) that must be the same in transmission and reception units.

When you need to send the same virtual GPI to more than one unit, it should be sent to an IP address of the authorized range for Multicast (224.0.0.0 a 239.255.255.255), so all the units that must receive the unit's GPI's should be subscribed to this IP address.

"**Virtual GPO Configuration**":

This section allows you to control from the corresponding GPI of a NETBOX or other AEQ IP unit as Forum, Capitol, Phoenix audiocodecs, Systel IP and Audio+, the status of each one of the NETBOX unit GPO's. The parameters of a virtual GPO are the control **IP address** of the unit that will sent the GPI and an "**Id**" number (identifying number from 0 to 255) that must be the same in transmission and reception units.



The upper image shows an example where our NETBOX 32 unit's IP address is supposed to be 172.31.37.1.

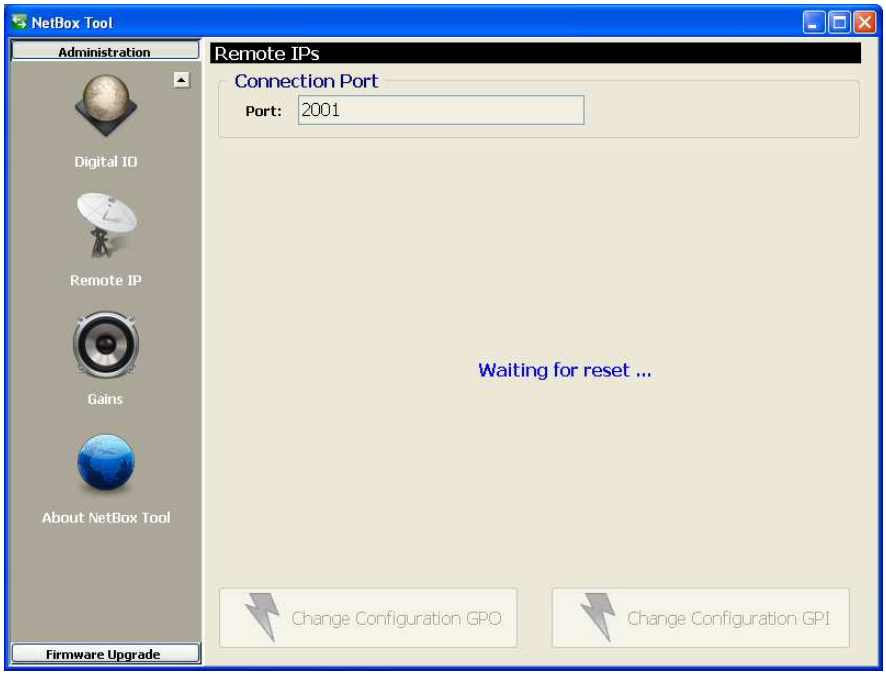
The control of virtual GPO's from 1 to 8 is received from a unit with IP address 172.31.37.2, and the "Id" numbers used in this match-up are the ones from 0 to 7.

The control of virtual GPO's from 9 to 16 is received from a unit that sends its virtual GPI's through the Multicast address 225.0.0.1, and the "Id" numbers used in this match-up are the ones from 0 to 7.

On the other hand, the virtual GPI's from 1 to 8 are sent to a unit with IP address 172.31.37.3, and the "Id" numbers used in this match-up are the ones from 0 to 7.

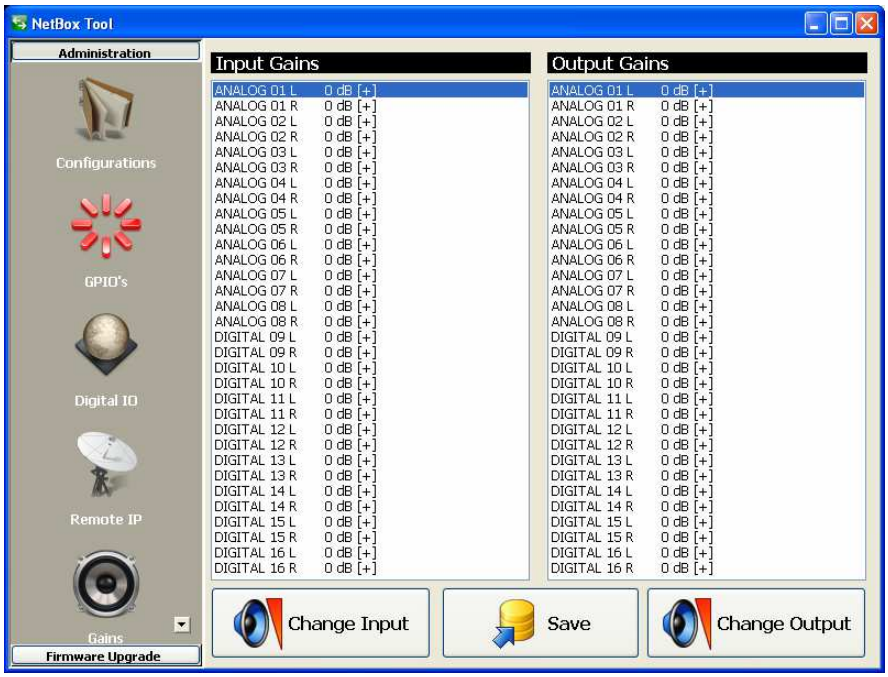
The virtual GPI's from 9 to 16 are sent to the Multicast address 225.0.0.2 in order to sent it to other units that are subscribed to this IP address, and the "Id" numbers used in this match-up are the ones from 0 to 7.

Once virtual GPO's and GPI's are configured, the changes will be applied by pressing "**Change Configuration GPO**" and "**Change Configuration GPI**" buttons respectively. Then the unit will reset.

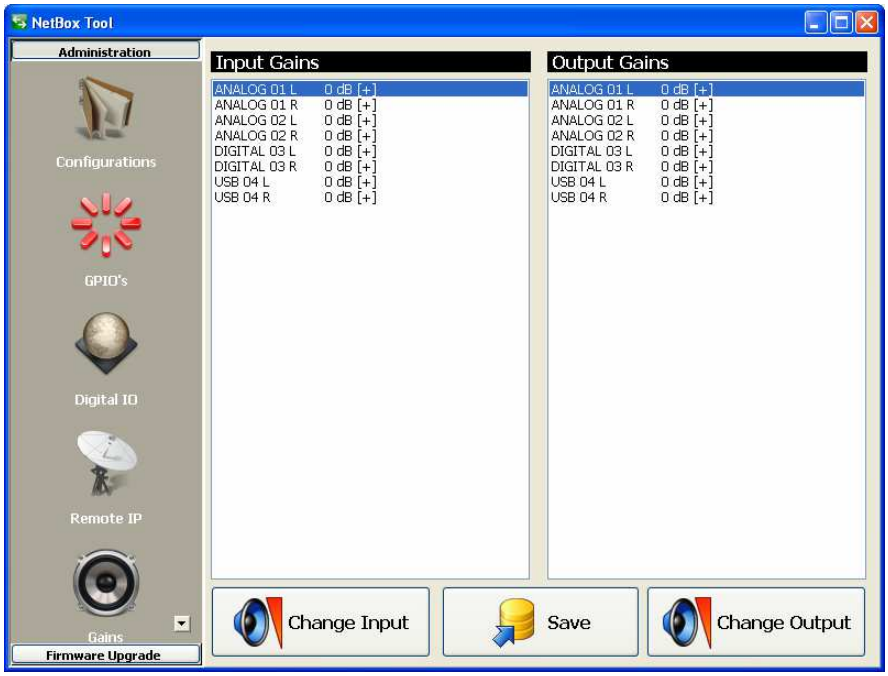


7.2.5. "Gains" submenu.

"**Gains**" submenu, accessed from the drop-down menu "Administration" by clicking on the corresponding icon, allows you to configure the input and output gains of each one of the analog and digital audio connections, adjusting inputs to the most proper level for transmission through DANTE network and outputs to the necessary level for destination unit reception. In the case of **NETBOX 32** there are **8 analogue inputs/outputs** and **8 digital inputs/outputs.**



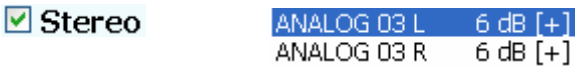
In the case of **NETBOX 8** there are **2 analogue inputs/outputs** and **2 digital inputs/outputs** (the second one can be switched between DB15 connector and USB connector):



When you select one of the inputs or outputs of the list and double-click on it (or press the "**Change Input**" or "**Change Output**" button), a window will appear allowing you to configure that input or output gain.

The "**In Phase**" checkbox allows you to modify the input or output signal phase (the sign on the right part of the line corresponding to the selected input or output changes from + to – or vice versa):

The “**Stereo**” checkbox allows you apply the gain changes, as well as the phase changes, to stereo pair. It must be activated before modify those parameters, in order to apply them simultaneously to L and R channels of selected input or output.



The “**Save**” button allows you to save the changes in the non volatile memory of the unit (that way those changes will remain saved although the unit is turned off).

7.2.6. “About NetBox 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 Tool application. It also shows an image of the equipment type (NETBOX 8 or NETBOX 32) when connection is established.

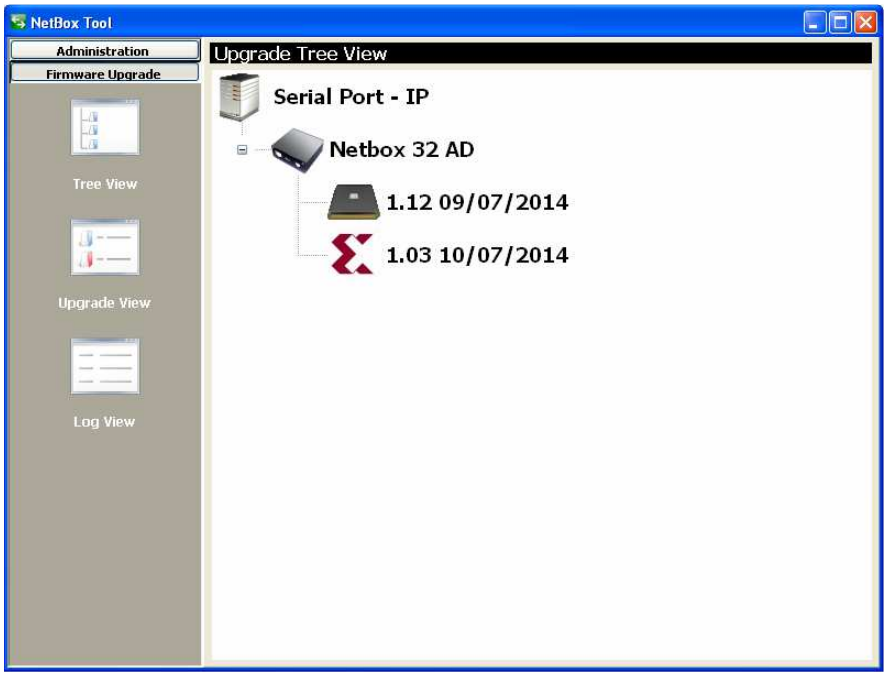
7.3. Upgrading Tools.

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

IMPORTANT NOTE: Any operation in this "Firmware Upgrade" section of the Forum Setup application 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's technical support (sat@aeq.es).

In order to execute this menu available options, it is necessary to be in direct communication with the AEQ NETBOX 8 or AEQ NETBOX 32 unit, through its Ethernet port. In case there is no connection to unit, the associated submenus will be shown blank.

"**Tree View**" submenu, accessed from the drop-down menu "Administration" 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 versions for each of the modules of the unit. The equipment type (NETBOX 8 or NETBOX 32) is also shown.

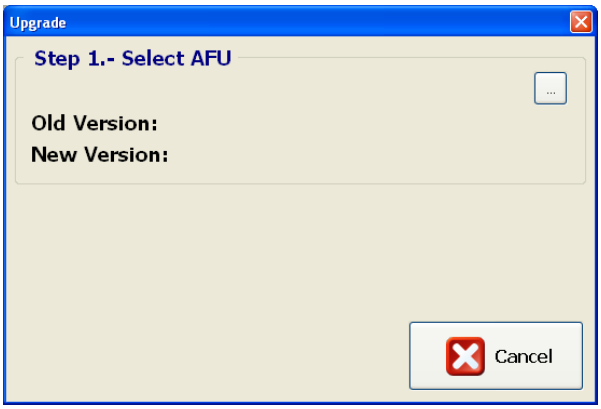


The following icon represents unit's **micro** or **CPU** 

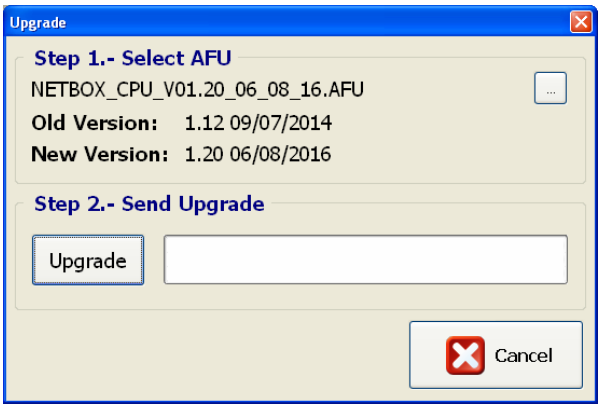
The following icon represents unit's **FPGA** 

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

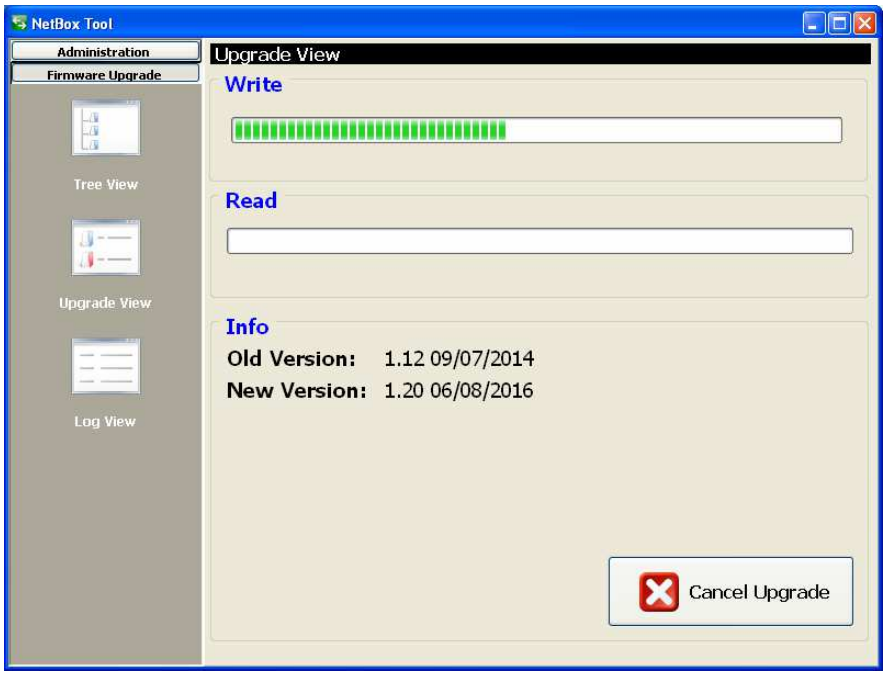
In the new window that appears, press the [...] button and select the "**AFU**" upgrading file (AEQ Firmware Upgrade) that contains the new version you want to load.



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:

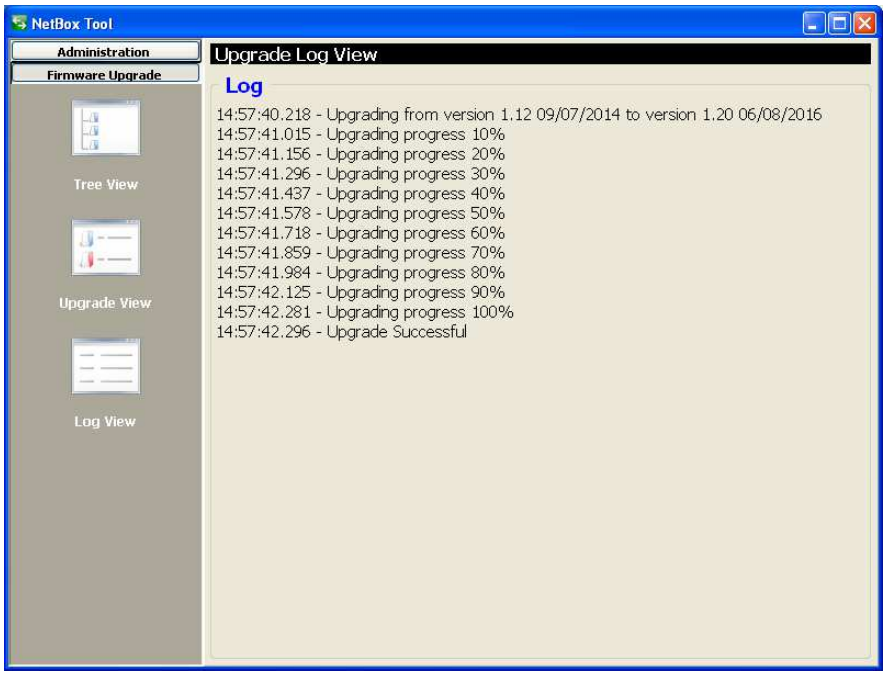


The following fields are visible on screen:

- "**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 regading 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. There is no pre-established upgrading order.

"**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.



8. TECHNICAL CHARACTERISTICS.

- Data format: DANTE Audio-over-IP technology.
- AVB - ready.
- 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.
- Works in 100 Mbps, 1 Gbps and 10 Gbps networks.
- Supports a single integrated network used for audio, video, control and monitoring. Compatible with other kinds of traffic using QoS management.
- Uses low-cost, off the shelf network infrastructure.
- 24-bit, 48 KHz. audio resolution.
- Delay: 1-1.5 ms (@ 48 KHz typical, depending on network performance and complexity).
- 2 RJ45 Ethernet ports per interface, 1000 BASE-T, galvanically isolated, that can be used for redundancy or daisy-chain connections.
- Binary rate: 10/100/1000 Mbps.
- Maximum segment length: 100m max. over CAT5e or better cabling.

Number of channels in each device.

- NETBOX 8: 8 bidirectional.
- CAPITOL IP: 16 bidirectional.
- FR14 (FORUM): 32 bidirectional.
- BC2214 (ARENA - BC 2000 D): 32 bidirectional.
- NETBOX 32: 32 bidirectional.
- BC2224 (ARENA - BC 2000 D): 64 bidirectional.

February 2014. Specifications subjected to evolutionary changes. Download the latest version of the manual at www.aeq.es, www.aeq.eu or www.aeqbroadcast.com.

9. 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.

ANNEX 1: Troubleshooting.

This appendix reproduces the Dante original troubleshoot guide and questions asked frequently by users and system integrators.

A1.1. Messages on Startup.

Error Message	Meaning & Actions
Dante Controller was unable to connect to the Conmon manager. Dante Controller cannot function without this connection. This problem is most likely caused by the Conmon manager service or daemon stopping unexpectedly. You may need to restart your computer or reinstall Dante Controller to repair this problem.	**Affects**: Windows only. **Meaning**: Dante Control and Monitoring service is not responding. **Action**: Reboot your PC, or restart this service via Control Panel > Administrative Tools > Services.

A1.2. Computer Configuration Checklist.

Before installing Dante Controller, you must be logged in to your computer as a user with administrator privileges.

To be correctly configured for use with a Dante network, the computer should have:

- Dante Controller installed.
- The correct network interface selected.
- The correct IP addresses in use.

A1.3. Thrid-party firewall configuration.

- Standard Windows and Mac firewalls are typically configured on installation.
- Third party firewalls will need to be manually configured.

If your computer has a third-party firewall installed, please read the Dante Controller and Dante Virtual Soundcard User Guides for detailed information about firewall requirements and configuration.

A1.4. Troubleshooting Dante IP Address Configuration.

All devices in a Dante network, including Dante Virtual Soundcard, must be using IP addresses from the same network. When using Dante Virtual Soundcard or Dante Controller, your PC or Mac must be connected to the Primary Dante network, and must have a correct IP address.

Note: If a device name is shown in red, it means Dante Controller has automatically detected an error condition. This will be either an IP address configuration issue, or the device has entered failsafe. Double-click the red device name to see more information.

A1.4.1. Correct IP configuration.

Dante hardware devices are set to obtain their IP address automatically from the network. They will either:

- Automatically assign themselves an address in the range 169.254.*.* (172.31.*.* for the secondary network if present), or
- Obtain an IP address from a DHCP server if it is present on the network

Dante Virtual Soundcard uses the IP address of the PC or Mac it is installed on. If the computer has more than one wired Ethernet network interface, it will use the IP address of the selected network interface.

Your PC or Mac TCP/IP network configuration set should be set to "Obtain an IP address automatically". This way it will automatically acquire a Link Local automatic IP address in the same network as other Dante devices. If a DHCP server is present, the computer and Dante devices will all acquire their IP addresses via DHCP.

A1.4.2. Possible IP network configuration mistakes.

Possible network configuration errors are listed below. Dante Controller will try to automatically detect these. If detected the offending device will be displayed in red.

Incorrect PC/Mac IP configuration

- Accidentally having multiple network interfaces with addresses in the same subnet

Incorrect general IP configuration

- Accidentally having multiple DHCP servers on the same network.
  Unusual – for example, someone may have a PC connected to the network with a DHCP server running that they're not aware of.
- Incorrectly configured static IP addresses.
  You shouldn't need to configure static IP addresses at all. If for some unusual reason you do, it must be in the same subnet as the rest of the network.

Incorrect redundant network configuration

Setting up a redundant network is described in "Redundancy". There are a few ways to incorrectly configure a redundant network. More than one of these can be present at the same time.

- Connecting the secondary interface of a Dante device to the primary network.
  Most commonly by either misunderstanding how redundancy works, and using only one switch with all cables connected to it; or correctly using two switches or networks, but accidentally connecting one secondary cable to a primary network switch.
- Joining the primary and secondary Dante networks.
  By connecting primary and secondary switches, or perhaps just using one switch.
- Multiple interfaces on the same device using the same IP address subnet.
  Possibly by having the same DHCP server on both primary and secondary networks, or both DHCP servers configured to serve the same IP addresses.

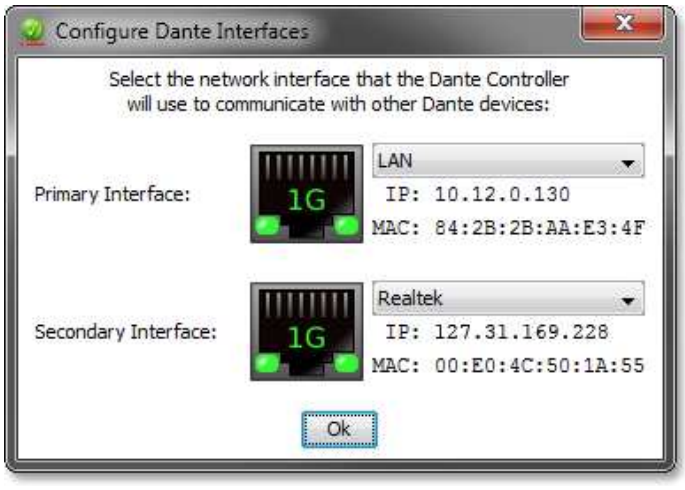
A1.4.3. What are the symptoms of using the wrong network interface on my computer?

If you have more than one wired network interface, and Dante Controller is not using the interface the rest of the Dante device are connected to:

- Dante Controller cannot see any Dante devices
- Dante Virtual Soundcard is not sending or receiving any audio when it is expected to

A1.4.4. How do I check which network interface my Dante Controller/Dante Virtual Soundcard is using?

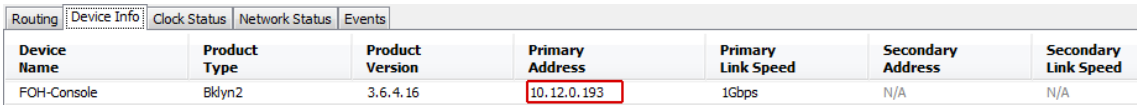
- The selected network interface can be viewed or changed via the 'interface selection' button  in the Network View toolbar of Dante Controller.



- It can also be viewed on the Dante Virtual Soundcard Settings tab
- If the Dante network is standalone and does not have a DHCP server installed, this address should be 169.254.*.*
- If the Dante network is using a DHCP server, the IP address should conform to the addressing scheme it is using (as shown in the image above)

A1.4.5. How do I check IP addresses for all devices on my network?

- Use the Dante Controller Device Status tab to view the IP addresses of all the devices on your network.



- The Primary Address of all devices should follow the same IP address scheme (e.g. 169.254.*.* or 10.12.0.*). Same for secondary addresses…
- Note that some older Dante devices or devices running older firmware may not show this information.

A1.5. Troubleshooting Switch Configuration and Cabling.

Cables are the most vulnerable part of a network system. If you suspect cabling issues, check for:

- Faulty or manually terminated cables
- Unplugged /badly connected Ethernet cables
- Incorrectly configured switches
- Dante devices removed or turned off

A1.5.1. Symptoms of switch or cabling issues.

- You cannot see (some) devices in the Dante Controller network view
- Dante Controller shows orange “unsuccessful subscription” icons, which usually means a device that was present earlier is now missing
- Faulty cables can lead to intermittent faults, which may be heard as dropped samples or “cracks” in the audio
- Dante devices may appear and disappear in Dante Controller

A1.5.2. Switch and Cabling Checklist.

- Are all the connected link/status lights on the switch lit, or flashing as expected?
    - Is the switch powered on?
    - Is the cable correctly plugged in at the switch and the PC or equipment?
- Is the switch correctly configured?
    - Perhaps QoS or VLANs have been incorrectly set up
- Are you using a switch from another application with an unchecked or tested configuration?
    - Consult the switch manual and check the switch configuration

ANNEX 2: Installation details: configuration of ARENA consoles and BC2000D matrices for use with AoIP multichannel boards.

A2.1. Scope.

The purpose of this annex is to detail the default nomenclature of audio channels in ARENA consoles and BC2000D matrices in order to ease installation and configuration of a multichannel AoIP audio system.

A2.1.1. ARENA, BC2000D and DANTE internal systems correspondence.

Have in mind that the configuration of the input and output channels in the internal configuration menus and configuration software for ARENA consoles and BC2000D matrices is not transferred to the channels that appears in DANTE Controller application, so both systems must be configured separately. Also note that:

- DANTE doesn't support stereo lines, so different names are assigned to left and right channels forming stereo line.
- ARENA displays support only up to 7 characters per normal label and up to 4 per short label.
- BC2000D matrices configuration software has a "wizard" in order to create the lines names automatically.
- The name of the internal bus or input routed to an output is sometimes more meaningful than the output line name itself.

The names that are associated by default to input/output lines of **BC2214** boards in ARENA consoles and BC2000D matrices and to associated channels that appears in DANTE CONTROLLER are detailed next, in order to ease a coherent configuration for both systems and the routing between them.

ARENA console.

Inputs Labels in ARENA	Inputs Short labels in ARENA	Reception channels Labels in DANTE Controller
AOIP01	IP01	BC2214_1L
		BC2214_1R
AOIP02	IP02	BC2214_2L
		BC2214_2R
AOIP03	IP03	BC2214_3L
		BC2214_3R
AOIP04	IP04	BC2214_4L
		BC2214_4R
AOIP05	IP05	BC2214_5L
		BC2214_6R
AOIP06	IP06	BC2214_6L
		BC2214_7R
AOIP07	IP07	BC2214_7L
		BC2214_8R
AOIP08	IP08	BC2214_8L
		BC2214_8R
AOIP09	IP09	BC2214_9L
		BC2214_9R
AOIP10	IP10	BC2214_10L
		BC2214_10R
AOIP11	IP11	BC2214_11L
		BC2214_11R
AOIP12	IP12	BC2214_12L
		BC2214_12R
AOIP13	IP13	BC2214_13L
		BC2214_13R
AOIP14	IP14	BC2214_14L
		BC2214_14R

AOIP15	IP15	BC2214_15L
		BC2214_15R
AOIP16	IP16	BC2214_16L
		BC2214_16R

Outputs Labels in ARENA	Outputs Short labels in ARENA	Transmission channels Labels in DANTE Controller
aoip01	ip01	BC2214_1L
		BC2214_1R
aoip02	ip02	BC2214_2L
		BC2214_2R
aoip03	ip03	BC2214_3L
		BC2214_3R
aoip04	ip04	BC2214_4L
		BC2214_4R
aoip05	ip05	BC2214_5L
		BC2214_5R
aoip06	ip06	BC2214_6L
		BC2214_6R
aoip07	ip07	BC2214_7L
		BC2214_7R
aoip08	ip08	BC2214_8L
		BC2214_8R
aoip09	ip09	BC2214_9L
		BC2214_9R
aoip10	ip10	BC2214_10L
		BC2214_10R
aoip11	ip11	BC2214_11L
		BC2214_11R
aoip12	ip12	BC2214_12L
		BC2214_12R
aoip13	ip13	BC2214_13L
		BC2214_13R
aoip14	ip14	BC2214_14L
		BC2214_14R
aoip15	ip15	BC2214_15L
		BC2214_15R
aoip16	ip16	BC2214_16L
		BC2214_16R

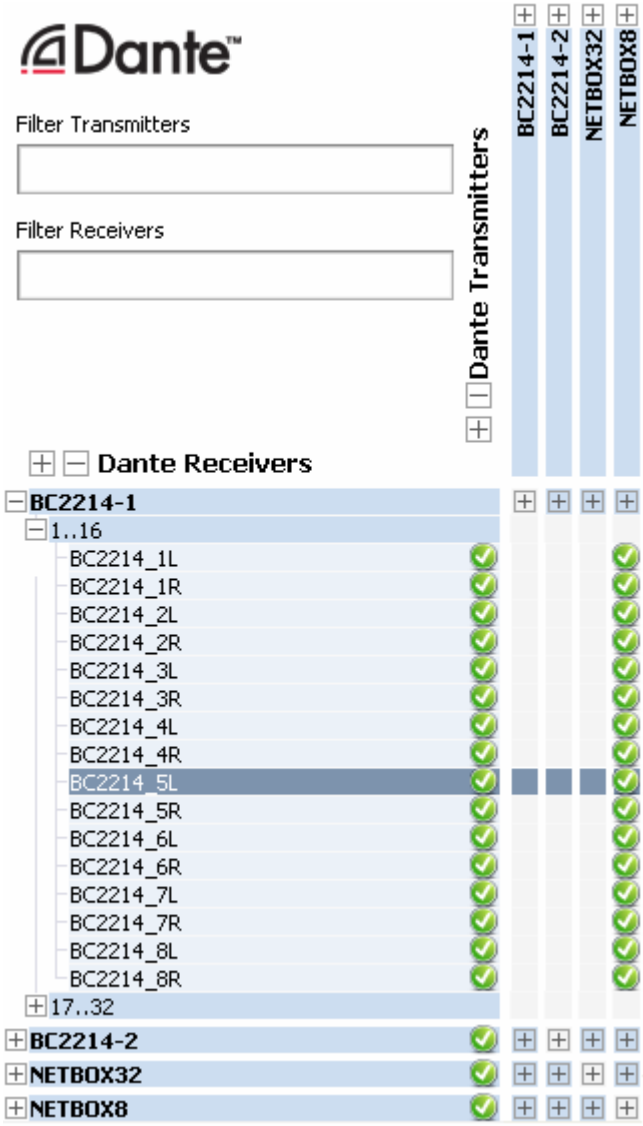
BC2000D matrix.

Inputs Logical lines in Matrix Setup	Reception channels Labels in DANTE Controller
AOIP IN 0001	BC2214_1L
	BC2214_1R
AOIP IN 0002	BC2214_2L
	BC2214_2R
AOIP IN 0003	BC2214_3L
	BC2214_3R
AOIP IN 0004	BC2214_4L
	BC2214_4R
AOIP IN 0005	BC2214_5L
	BC2214_5R
AOIP IN 0006	BC2214_6L
	BC2214_6R
AOIP IN 0007	BC2214_7L
	BC2214_7R
AOIP IN 0008	BC2214_8L
	BC2214_8R
AOIP IN 0009	BC2214_9L
	BC2214_9R

AOIP IN 0010	BC2214_10L
	BC2214_10R
AOIP IN 0011	BC2214_11L
	BC2214_11R
AOIP IN 0012	BC2214_12L
	BC2214_12R
AOIP IN 0013	BC2214_13L
	BC2214_13R
AOIP IN 0014	BC2214_14L
	BC2214_14R
AOIP IN 0015	BC2214_15L
	BC2214_15R
AOIP IN 0016	BC2214_16L
	BC2214_16R

Outputs Logical lines in Matrix Setup	**Transmission channels Labels in DANTE Controller**
AOIP OUT 0001	BC2214_1L
	BC2214_1R
AOIP OUT 0002	BC2214_2L
	BC2214_2R
AOIP OUT 0003	BC2214_3L
	BC2214_3R
AOIP OUT 0004	BC2214_4L
	BC2214_4R
AOIP OUT 0005	BC2214_5L
	BC2214_5R
AOIP OUT 0006	BC2214_6L
	BC2214_6R
AOIP OUT 0007	BC2214_7L
	BC2214_7R
AOIP OUT 0008	BC2214_8L
	BC2214_8R
AOIP OUT 0009	BC2214_9L
	BC2214_9R
AOIP OUT 0010	BC2214_10L
	BC2214_10R
AOIP OUT 0011	BC2214_11L
	BC2214_11R
AOIP OUT 0012	BC2214_12L
	BC2214_12R
AOIP OUT 0013	BC2214_13L
	BC2214_13R
AOIP OUT 0014	BC2214_14L
	BC2214_14R
AOIP OUT 0015	BC2214_15L
	BC2214_15R
AOIP OUT 0016	BC2214_16L
	BC2214_16R

NOTE 1: When there is more that one BC2214 module in ARENA console or BC2000D matrix, the devices will be labelled in DANTE Controller as BC2214-1, BC2214-2… BC2214-n in order to identify them.



NOTE 2: The previous tables show the names of the input/out lines and reception/transmission channels that are configured by default and that can be edited by means of Console Setup, Matrix Setup and DANTE Controller applications, just like the device names, depending on each installation characteristics.

NOTE 3: When **BC2224** modules are installed instead of BC2214 in ARENA console or BC2000D matrix, the process is exactly the same but, instead of 16 stereo inputs and outputs, there are **32 stereo inputs and outputs** available per device. The names of the lines in console or matrix are the same but reaching 32 and the reception and transmission channels in DANTE Controller will be changed to BC2224_1L, BC2224_1R… BC2224_32L, BC2224_32R.

ANNEX 3: Installation details: configuration of FORUM and CAPITOL IP consoles for use with AoIP multichannel boards.

A3.1. Scope.

The purpose of this annex notes is to review and set the information of the FORUM and CAPITOL digital mixing consoles User Manuals in order to ease installation and configuration of a multichannel AoIP audio system.

All the important adjustments required to configure inputs, outputs, assign faders and other important issues (regarding internal routing in the equipment to integrate it into a multichannel system) are reviewed below on the configuration software and the physical unit display screens.

A3.1.1. FORUM, CAPITOL and DANTE internal systems correspondence.

Have in mind that the configuration of the input and output channels in the internal configuration menus and configuration software for FORUM and CAPITOL IP consoles is not transferred to the channels that appears in DANTE Controller application, so both systems must be configured separately. Also note that:

- DANTE doesn't support stereo lines, so different names are assigned to left and right channels forming stereo line.
- FORUM and CAPITOL IP displays support only up to 6 characters per label.
- The name of the internal bus or input routed to an output is sometimes more meaningful than the output line name itself.

The names that are associated by default to input/output lines of AoIP boards in FORUM and CAPITOL IP consoles and to associated channels that appears in DANTE CONTROLLER are detailed next, in order to ease a coherent configuration for both systems and the routing between them.

FORUM console.

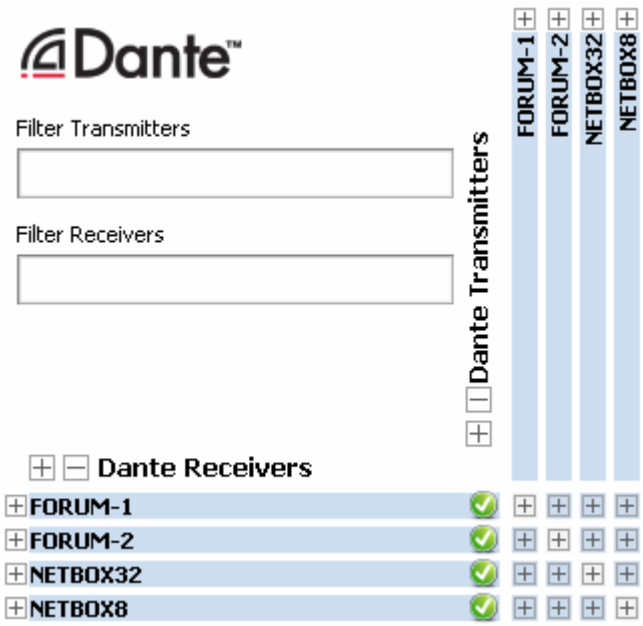
Inputs Labels in FORUM	Reception channels Labels in DANTE Controller
AOIP01	FORUM_1L
	FORUM_1R
AOIP02	FORUM_2L
	FORUM_2R
AOIP03	FORUM_3L
	FORUM_3R
AOIP04	FORUM_4L
	FORUM_4R
AOIP05	FORUM_5L
	FORUM_5R
AOIP06	FORUM_6L
	FORUM_6R
AOIP07	FORUM_7L
	FORUM_7R
AOIP08	FORUM_8L
	FORUM_8R
AOIP09	FORUM_9L
	FORUM_9R
AOIP10	FORUM_10L
	FORUM_10R
AOIP11	FORUM_11L
	FORUM_11R
AOIP12	FORUM_12L
	FORUM_12R
AOIP13	FORUM_13L
	FORUM_13R

AOIP14	FORUM _14L
	FORUM _14R
AOIP15	FORUM _15L
	FORUM _15R
AOIP16	FORUM _16L
	FORUM _16R

Outputs Labels in FORUM	Transmission channels Labels in DANTE Controller
aoip01	FORUM_1L
	FORUM _1R
aoip02	FORUM _2L
	FORUM _2R
aoip03	FORUM _3L
	FORUM _3R
aoip04	FORUM _4L
	FORUM _4R
aoip05	FORUM _5L
	FORUM _5R
aoip06	FORUM _6L
	FORUM _6R
aoip07	FORUM _7L
	FORUM _7R
aoip08	FORUM _8L
	FORUM _8R
aoip09	FORUM _9L
	FORUM _9R
aoip10	FORUM _10L
	FORUM _10R
aoip11	FORUM _11L
	FORUM _11R
aoip12	FORUM _12L
	FORUM _12R
aoip13	FORUM _13L
	FORUM _13R
aoip14	FORUM _14L
	FORUM _14R
aoip15	FORUM _15L
	FORUM _15R
aoip16	FORUM _16L
	FORUM _16R

NOTE 1: When there are 2 FR14 modules in FORUM console, the devices will be labelled in DANTE Controller as FORUM-1 and FORUM-2 in order to identify them.

When there is more than one FORUM console in the system, the devices will be labelled in DANTE Controller as FORUM1-1, FORUM1-2, FORUM2-1, FORUM2-2… FORUMn-1, FORUMn-2 in order to identify them.



NOTE 2: The previous tables show the names of the input/out lines and reception/transmission channels that are configured by default and that can be edited by means of FORUM Setup and DANTE Controller applications, just like the device names, depending on each installation characteristics.

For example, in a configuration where PROGRAM, AUDITION and AUX1 internal buses are routed to the first 3 outputs of AoIP board, these transmission channels could be renamed in DANTE Controller as follows in order to easily identify them:

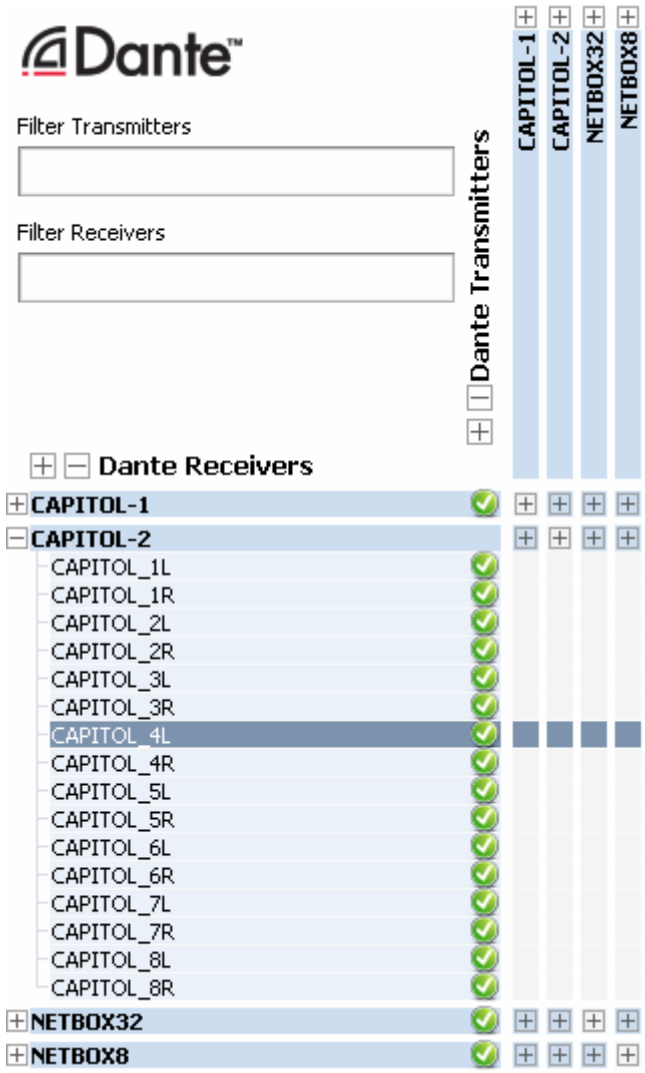
FORUM buses	Outputs Labels in FORUM	Transmission channels Labels in DANTE Controller
PROGRAM	aoip01	FORUM_PROGRAM _L
		FORUM_PROGRAM _R
AUDITION	aoip02	FORUM_AUDITION _L
		FORUM_AUDITION _R
AUX1	aoip03	FORUM_AUX1 _L
		FORUM_AUX1 _R

CAPITOL IP console.

Inputs Labels in CAPITOL IP	Reception channels Labels in DANTE Controller
AOIP01	CAPITOL_1L
	CAPITOL_1R
AOIP02	CAPITOL_2L
	CAPITOL_2R
AOIP03	CAPITOL_3L
	CAPITOL_3R
AOIP04	CAPITOL_4L
	CAPITOL_4R
AOIP05	CAPITOL_5L
	CAPITOL_5R
AOIP06	CAPITOL_6L
	CAPITOL_6R
AOIP07	CAPITOL_7L
	CAPITOL_7R
AOIP08	CAPITOL_8L
	CAPITOL_8R

Outputs Labels in CAPITOL IP	Transmission channels Labels in DANTE Controller
aoip01	CAPITOL_1L
	CAPITOL_1R
aoip02	CAPITOL_2L
	CAPITOL_2R
aoip03	CAPITOL_3L
	CAPITOL_3R
aoip04	CAPITOL_4L
	CAPITOL_4R
aoip05	CAPITOL_5L
	CAPITOL_5R
aoip06	CAPITOL_6L
	CAPITOL_6R
aoip07	CAPITOL_7L
	CAPITOL_7R
aoip08	CAPITOL_8L
	CAPITOL_8R

NOTE 1: When there is more than one CAPITOL IP console in the system, the devices will be labelled in DANTE Controller as CAPITOL-1, CAPITOL-2… CAPITOL-n in order to identify them.



NOTE 2: The previous tables show the names of the input/out lines and reception/transmission channels that are configured by default and that can be edited by means of CAPITOL IP Setup and DANTE Controller applications, just like the device names, depending on each installation characteristics.

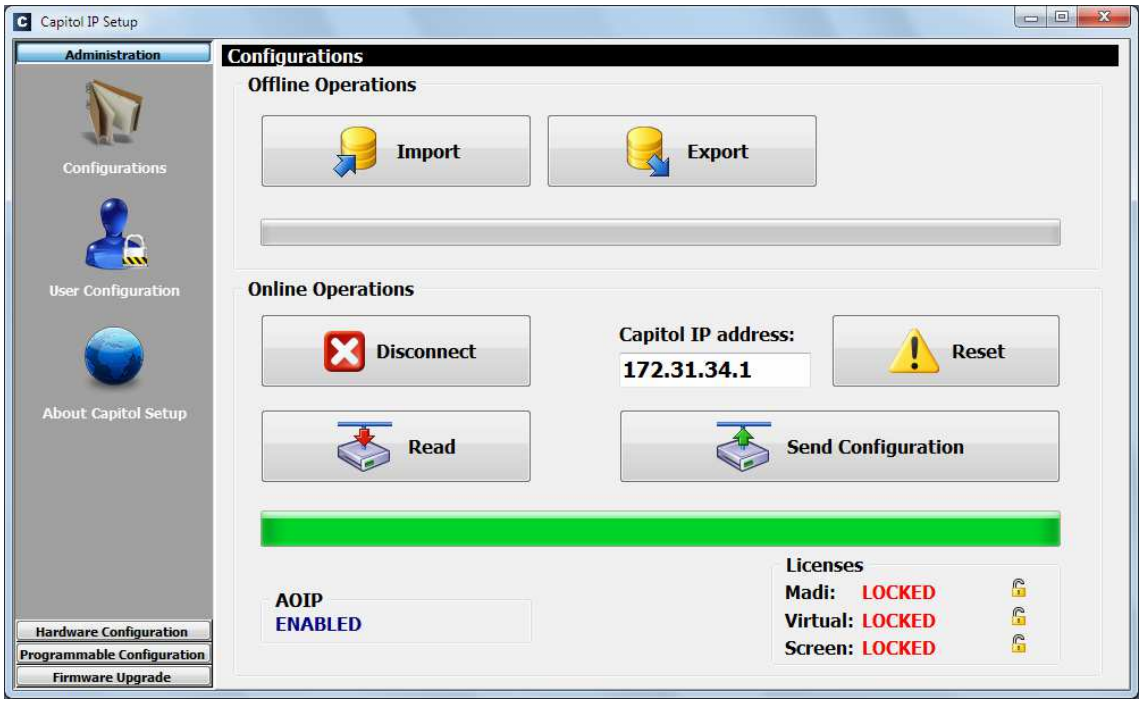
For example, in a configuration where PROGRAM and AUDITION internal buses are routed to the first 2 outputs of AoIP board, these transmission channels could be renamed in DANTE Controller as follows in order to easily identify them:

CAPITOL IP buses	Outputs Labels in CAPITOL IP	Transmission channels Labels in DANTE Controller
PROGRAM	aoip01	CAPITOL_PROGRAM _L
		CAPITOL_PROGRAM _R
AUDITION	aoip02	CAPITOL_AUDITION _L
		CAPITOL_AUDITION _R

A3.2. Configuration software.

A3.2.1. "Administration" menu.

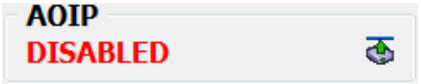
A3.2.1.1. "Configurations" submenu.

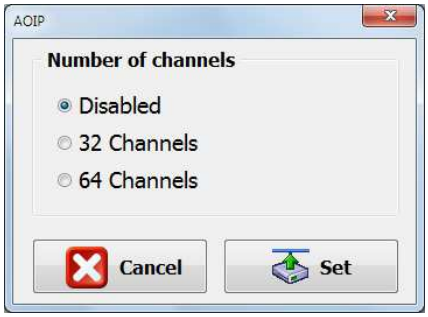


The following options appear once the connection between the computer where application is installed and the console is established.

- "**AOIP**"**:** In the case of CAPITOL IP console, this section indicates whether the AoIP (audio over IP) functionality is "ENABLED" at physical level or not ("DISABLED"), that is, i whether the IP module is installed in the audio core or not.

  In the case of FORUM console, allows you to active at physical level the AoIP (audio over IP) function. When you press the associated button, a window will appear allowing you to configure the maximum number of channels that could be activated: 32 (1 FR14 module) or 64 (2 FR14 modules):

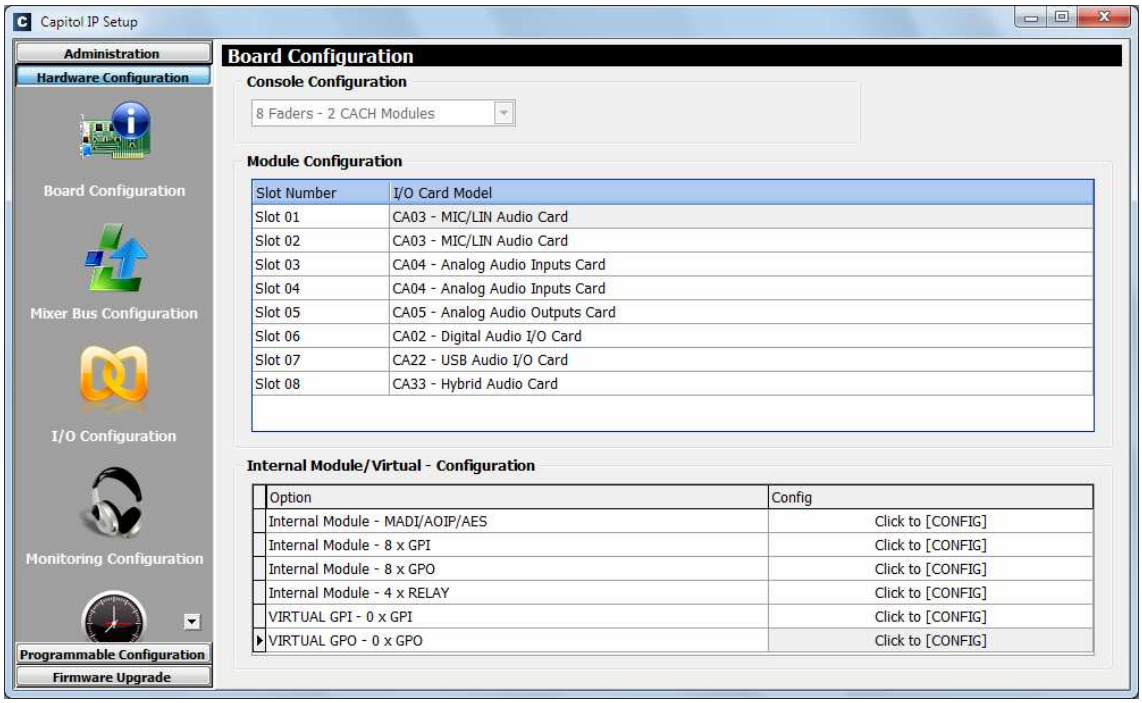
  

- "**Licenses**"**:** allows you to activate the MADI link functionality. You must purchase a mandatory usage license first. For more information, please consult the console user manual.

  IMPORTANT NOTE: MADI functionality is not compatible with **AoIP** (audio over IP) functionality, both options can't be active at the same time.

A3.2.2. “Hardware Configuration” menu.

A3.2.2.1. “Board Configuration” submenu.



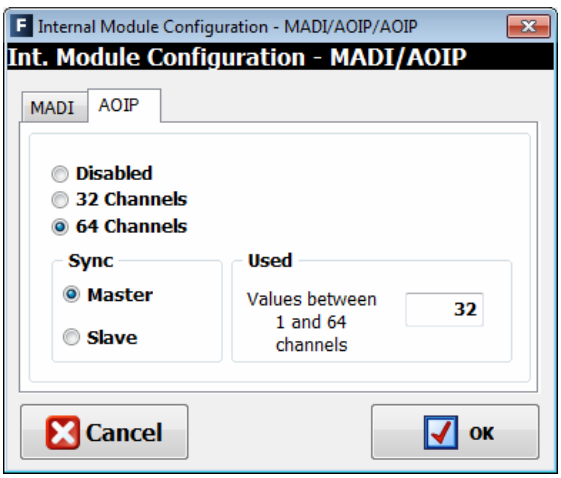
In order to configure the multichannel modules, first you need to access the “Internal Module - MADI/AOIP/AES” option for CAPITOL IP, or ”Internal Module - MADI/AOIP” in the FORUM case, by clicking first “Click to [CONFIG]” and then clicking again on the “CONFIG” button that will appear.

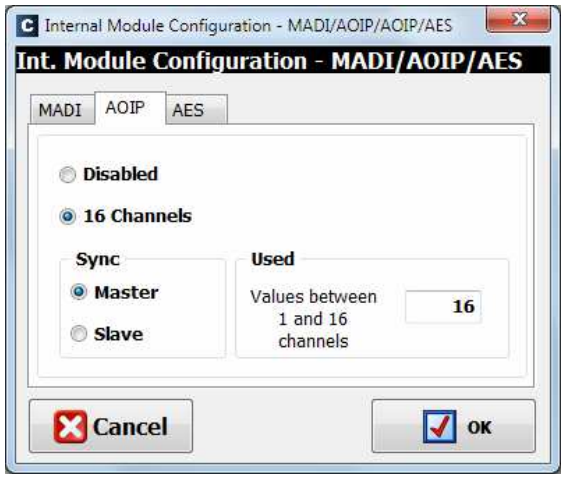
A window will appear then, comprising 2 tabs in FORUM and 3 in CAPITOL IP.

IMPORTANT NOTE: MADI and AoIP functions are mutually **EXCLUDING**, so they can not be enabled at the same time. In order to change from MADI tab to AoIP tab, the first one must be “Disabled”, and the same the other way round.

MADI: the first tab allows the user to configure the synchronous AES 10 MADI link. For more information, please consult the console user manual.

AOIP: the second tab allows the user to configure the asynchronous AoIP link based on DANTE technology.

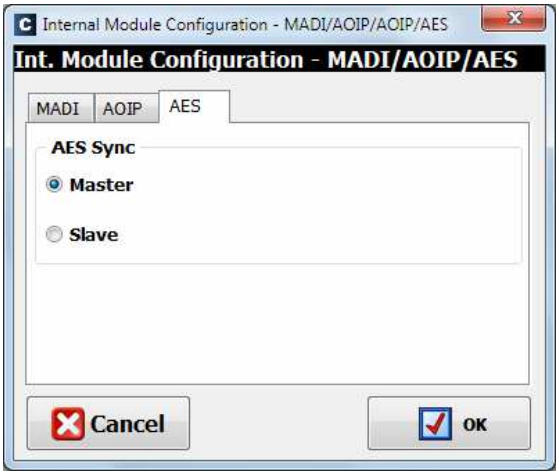




The configuration options are as follows (the last 2 are displayed only when the option is enabled):

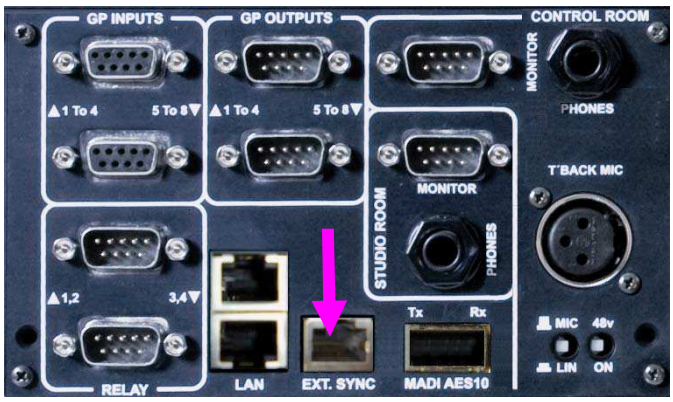
- "**Disable**"**:** to deactivate it.
- "**16 Channels**" (for CAPITOL IP): activates it with a maximum of 16 channels.
- "**32 Channels**" (for FORUM): for the activation of a single FR14 module in slot 14, with a maximum of 32 channels.
- "**64 Channels**" (for FORUM): for the activation of two FR14 modules, one in slot 14 and the other in 13, with a maximum of 64 channels.
- "**Sync**"**:** allows you to configure whether the console will use the synchronism extracted from AoIP link ("Slave"; slot 14 prevails over slot 13 in FORUM console) or not ("Master").
- "**Used**"**:** allows you to configure how many of the available mono channels are actually in use.

AES: this tab appears only in CAPITOL and allows you to configure if you want to synchronize the console using the external synchronism received in AES11 format through AES3/SPDIF digital audio input 1: in that case, you must configure this option as "**Slave**". It's not possible to use WORD CLOCK external synchronism.



"**VIRTUAL GPI**" and "**VIRTUAL GPO**" options, at the bottom of "Internal Module/Virtual - Configuration" submenu, allow you to configure the virtual GPIOs of the console. For more information, please consult the user's manual of the unit.

FORUM EXTERNAL SYNC.



There is an independent RJ45 connector for external sync input (AES11 or Word Clock) in the common inputs and outputs module at the back panel, including a follower synchronization output (AES11 or Word Clock) independent of the rest of digital outputs (see user manual for the product).

If a valid external AES11 or Word Clock synchronization signal is present, this one **prevails** over the external sync configuration on multichannel link (MADI or AoIP). If this signal is not present, then the external synchronization can be obtained from the multichannel link (MADI or AoIP) by configuring the "Slave" mode in the corresponding tab.

If the "Master" mode is selected in the multichannel link tab and there is no external sync input, then local synchronization is selected using the console internal oscillator.

CAPITOL IP EXTERNAL SYNC.

The external AES11 synchronization input is shared with AES3/SPDIF digital audio input 1 located in the back panel of the audio “Core”, so it can be enabled or disabled by using the “AES” tab; it’s not possible to use Word Clock external synchronism. Any digital audio output can be used as a follower AES11 sync output.

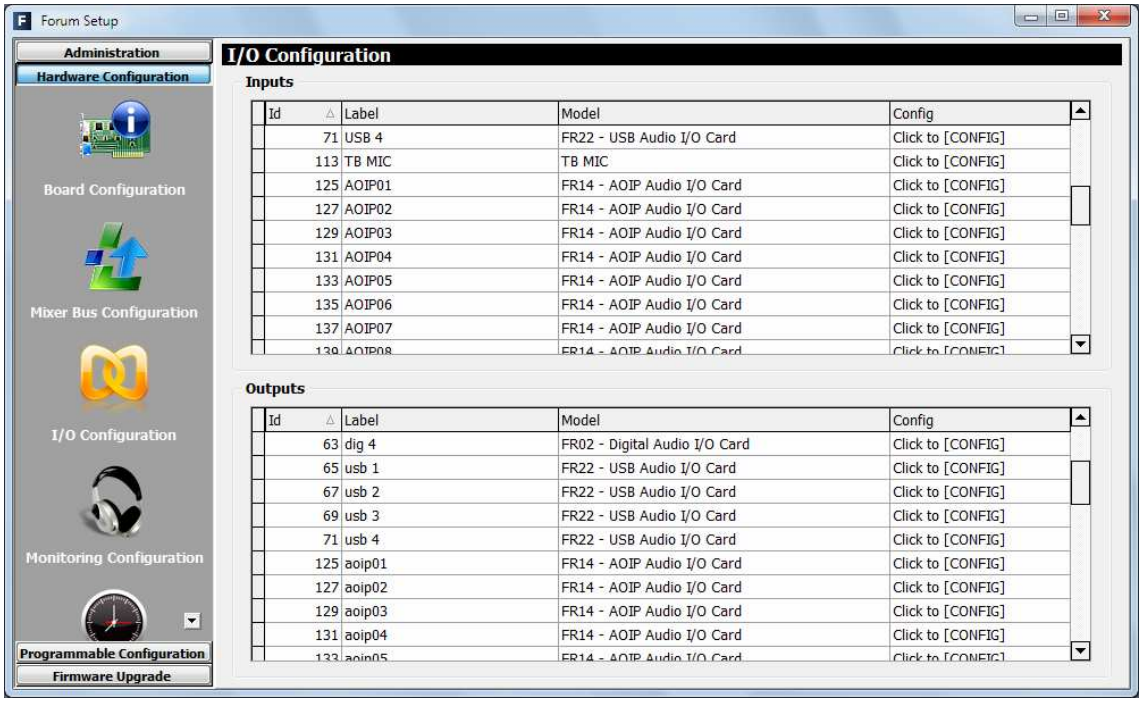
If the “Slave” mode is selected in the “AES” tab, then external AES11 sync is enabled. If a valid AES11 signal is provided in the AES3 digital audio input 1, this synchronization **prevails** over the external sync configuration on multichannel link (MADI or AoIP). If this signal is not present, then the external synchronization can be obtained from the multichannel link (MADI or AoIP) by configuring the “Slave” mode in the corresponding tab.

If the “Master” mode is selected in the multichannel link and “AES” section and/or there is no external sync input, then local synchronization is selected using the console internal oscillator.

A3.2.2.2. “I/O Configuration” submenu.

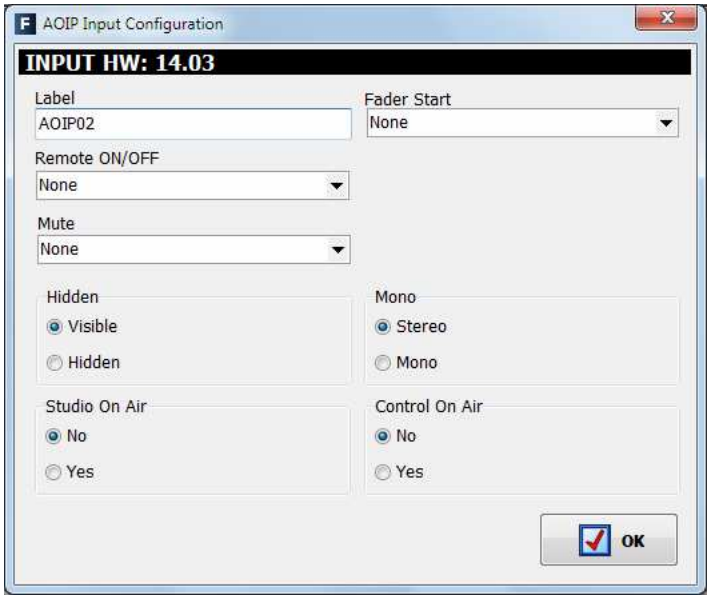
From Factory, all inputs are labeled in capitals by default and all outputs are labeled in lowercase letters.

By default, AoIP inputs are sequentially labeled as AOIP 01, AOIP 02,… (in capitals), and outputs are labeled as aoip 01, aoip 02,… (in lowercase letters). They are also all stereo by default.



Inputs configuration.

By clicking on “Click to [CONFIG]” of a multichannel input and then clicking again on the “CONFIG” button that appears, the advanced configuration menu is accessed. When configuring a multichannel input, the fields displayed in the following image can be edited. Please note “Mono” and “Hidden” options (if the input is configured as “Visible” it will be possible to associate it to a fader).

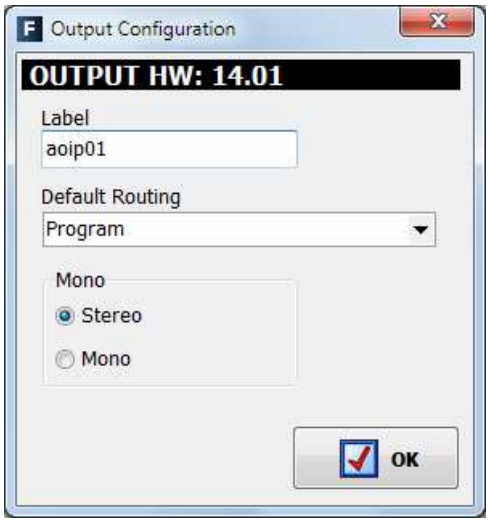


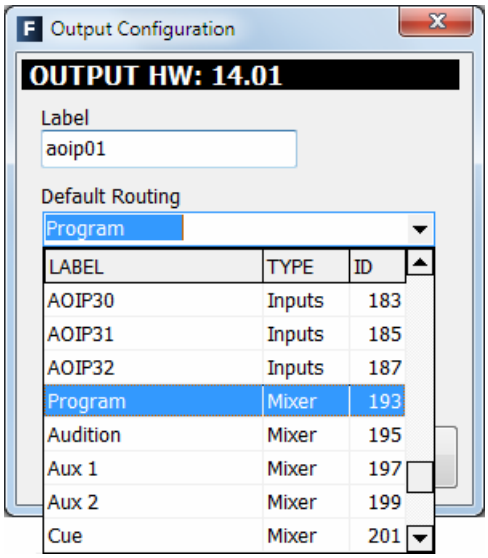
- **Headers:** indicates the type and position of the module that is configured at that moment.
  - "**AoIP Input Configuration**"**:** means that an "AoIP" type input is being configured.
  - "**INPUT HW:xx.0y**"**:** means that we are setting the input "y" of the card located in the slot xx. For instance:
    - "**INPUT HW:14.01**"**:** means that input "1" of a card located in the virtual slot 14, assigned to the AoIP board in CAPITOL IP, is being configured.
    - "**INPUT HW:14.03**"**:** means that input "3" of a card located in the slot 14, assigned to the first AoIP board in FORUM, is being configured.
    - "**INPUT HW:13.01**"**:** means that input "1" of a card located in the slot 13, assigned to the second AoIP board in FORUM, is being configured.
- "**Label**"**:** alphanumeric name of the channel. Maximum number of characters recommended is 6. This is the name that appears on all displays and menus of the AEQ FORUM or CAPITOL IP control surface.
- "**Fader Start**"**:** allows you to select a GPO to perform the Fader-start function for this channel. "None" indicates there is no Fader-start function associated to that channel.
- "**Remote ON/OFF**"**:** allows you to select a GPI to perform the remote start function for this channel (Channel ON/OFF key on control surface). "None" indicates there is no Remote ON/OFF function associated to that channel.
- "**Mute**"**:** allows you to select a GPI associated with the function to mute the channel selected upon receiving a remote command. "None" indicates there is no Mute function associated to that channel.
- "**Hidden**"**:** allows you to select whether the selected input channel can be associated ("Visible") or not ("Hidden") to a channel from AEQ FORUM or CAPITOL IP control surface through "FADER" menu. An example of a typically "Hidden" signal would be the time TOPS.
- "**Mono**"**:** allows you to define whether the selected input channel is Mono or Stereo. By default, all the input channels (except the mic/line inputs) of AEQ FORUM and CAPITOL IP are defined as Stereo. If any channel is re-configured to Mono it will result in an incremented number of the listed available input channels: one Stereo channel is converted into two Mono channels.
- "**Studio On Air**"**:** associates the activation of Channel ON/OFF key of this channel in FORUM (Channel ON key in CAPITOL IP) with the triggering of a GPO for the "ON-AIR" lights of the Studio room. It also associates the studio monitors muting. Typically you would associate this function to microphone channels.

- "**Control On Air**"**:** associates the activation of Channel ON/OFF keys of this channel in FORUM (Channel ON key in CAPITOL IP) with the triggering of a GPO for the "ON-AIR" lights of the Control room. It also associates the muting of the control monitors and the CUE bus. Typically you would associate this function to auto-control microphone channel.

Outputs configuration.

When configuring a multichannel output, "aoip1" in this case (outputs are labeled in lowercase letters by default) the fields depicted in the following image can be edited. Please note "Mono" and "Default routing" options (that last is where a signal will be received from: either directly from an input without passing through a fader, or from an internal sum bus).





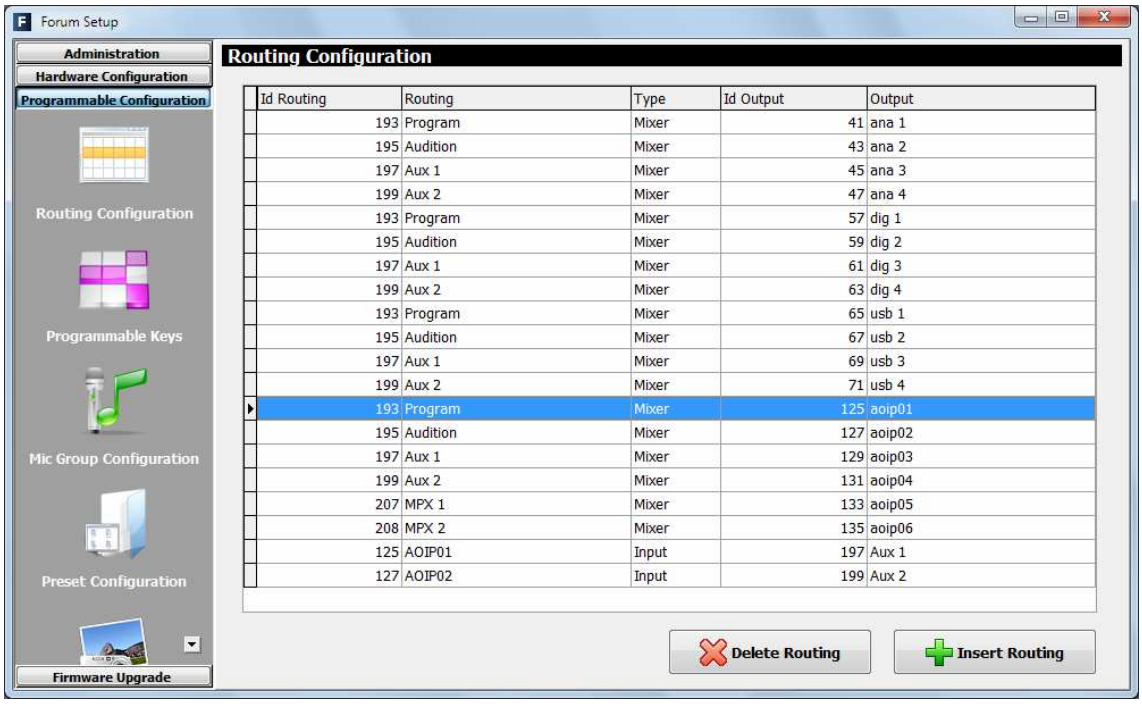
- **Headers:**
  - "**OUTPUT HW:xx.0y**"**:** means that we are setting the output "y" of the card located in the slot xx. For instance:
    - "**OUTPUT HW:14.01**"**:** means that output "1" of a card located in the virtual slot 14, assigned to the AoIP board in CAPITOL IP, is being configured.
    - "**OUTPUT HW:14.01**"**:** means that output "1" of a card located in the slot 14, assigned to the first AoIP board in FORUM, is being configured.
    - "**OUTPUT HW:13.01**"**:** means that output "1" of a card located in the slot 13, assigned to the second AoIP board in FORUM, is being configured.
- "**Label**"**:** alphanumeric name of the channel. Maximum number of characters recommended is 6. This is the name that appears on all displays and menus of the AEQ FORUM or CAPITOL IP control surface (by default outputs are labeled in lowercase letters).
- "**Default Routing**"**:** allows you to configure the signal routed by default to that output channel. You can select any input channel ("Inputs" in "Type" column) or any of the internal summing buses ("Mixer" in "Type" column). By default, inputs are labeled in capitals.
- "**Mono**"**:** allows you to configure the logical output channel as Mono or Stereo. By default, all the outputs channels of AEQ FORUM or CAPITOL IP are defined as Stereo. If any channel is re-configured to Mono it will result in an incremented number of the listed available output channels: one Stereo Channel is converted into two Mono channels.

A3.2.3. "Programmable Configuration" menu.

A3.2.3.1. "Routing Configuration" submenu.

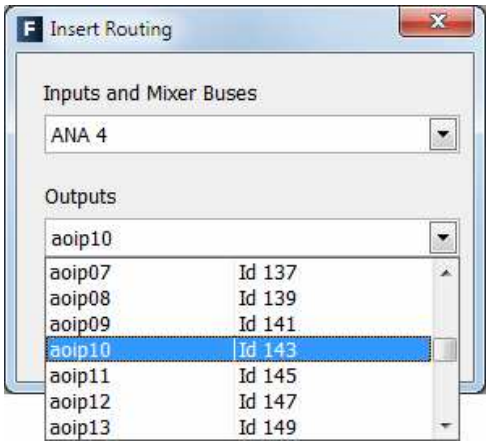
"Routing Configuration" submenu of "Programmable Configuration" menu allows you to define the cross-points between input channels or internal summing buses and output channels or internal summing buses. The entire set of cross-points available on the mixing console is arranged in a table with the following fields:

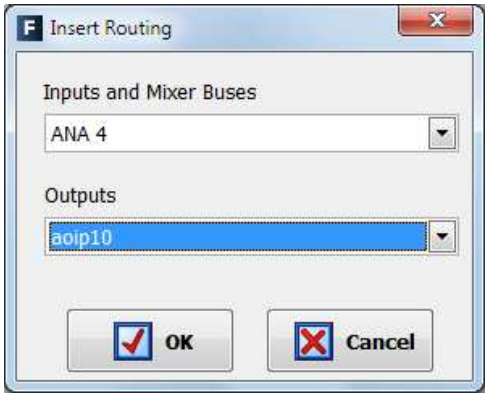
- "**Id Routing**"**:** internal numeric identifier for the input channel or the summing bus.
- "**Routing**"**:** "LABEL" of the input channel or summing bus.
- "**Type**"**:** type of channel used in the cross-point: "Input" for input channels and "Mixer" for internal summing buses.
- "**Id Output**"**:** internal numeric identifier for the output channel.
- "**Output**"**:** "LABEL" of the output channel.



Id Routing	Routing	Type	Id Output	Output
193	Program	Mixer	41	ana 1
195	Audition	Mixer	43	ana 2
197	Aux 1	Mixer	45	ana 3
199	Aux 2	Mixer	47	ana 4
193	Program	Mixer	57	dig 1
195	Audition	Mixer	59	dig 2
197	Aux 1	Mixer	61	dig 3
199	Aux 2	Mixer	63	dig 4
193	Program	Mixer	65	usb 1
195	Audition	Mixer	67	usb 2
197	Aux 1	Mixer	69	usb 3
199	Aux 2	Mixer	71	usb 4
193	Program	Mixer	125	aoip01
195	Audition	Mixer	127	aoip02
197	Aux 1	Mixer	129	aoip03
199	Aux 2	Mixer	131	aoip04
207	MPX 1	Mixer	133	aoip05
208	MPX 2	Mixer	135	aoip06
125	AOIP01	Input	197	Aux 1
127	AOIP02	Input	199	Aux 2

"**Insert Routing**" button allows you to create a cross-point through a simple process that allows you to select an input channel or an internal summing bus as the source, and an output channel or an internal summing bus as the destination. "**Delete Routing**" button allows you to eliminate the selected cross-point (confirmation is requested).

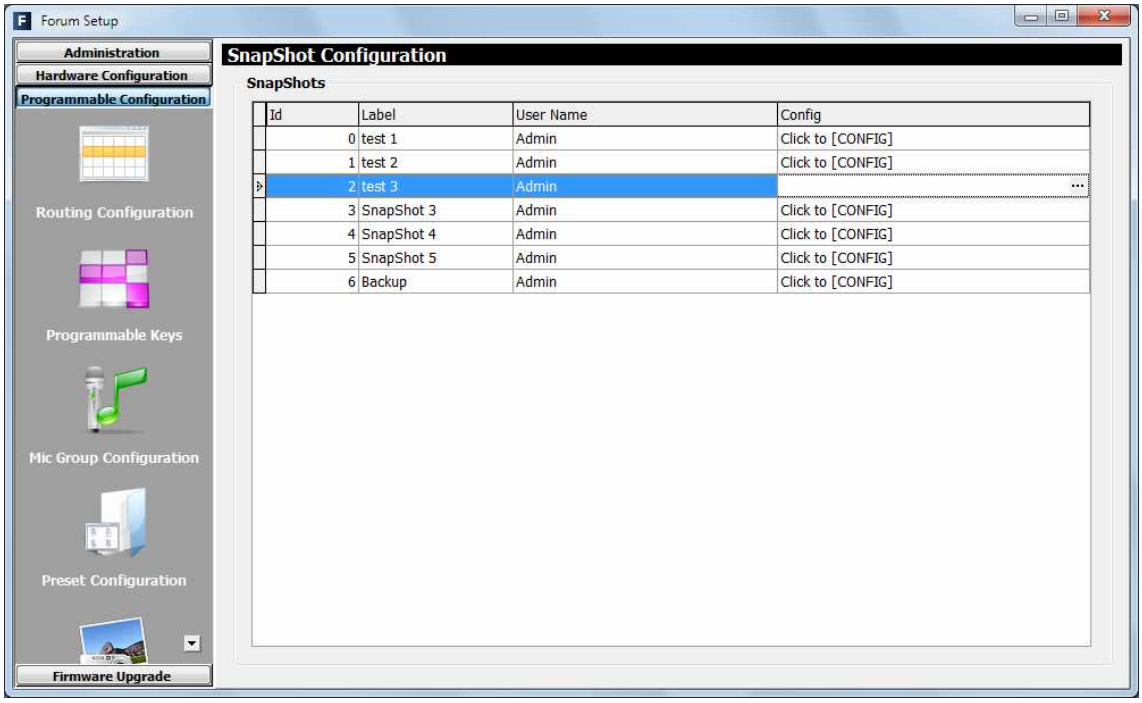




A3.2.3.2. "SnapShot Configuration" submenu.

"SnapShot Configuration" submenu of "Programmable Configuration" menu allows you to manage the different configurations memories stored in console and available to operators through the internal menu of the main screen of the Control and Monitoring section of AEQ FORUM or CAPITOL IP control surface.

This configuration allows us to specify how the input signals from a multichannel AoIP card are asigned to a fader's configuration.



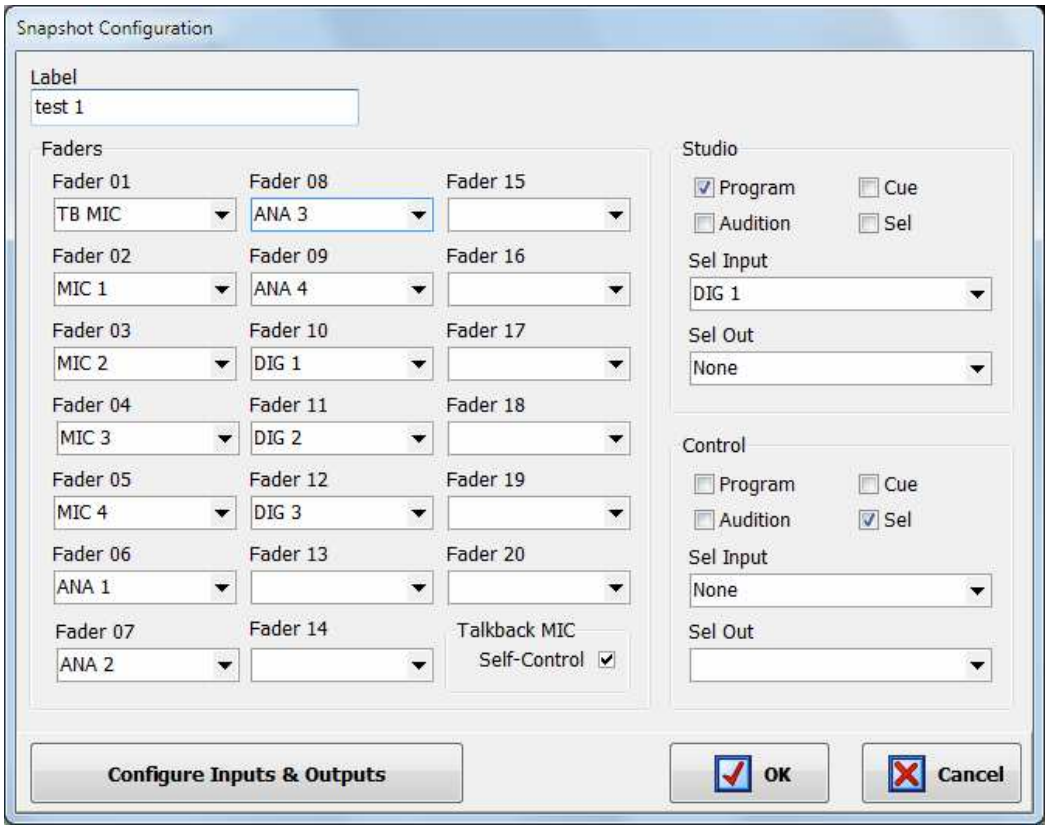
The main screen of this submenu is presented as a list of all the snapshots stored (there are up to 7 available snapshots), ordered by their "**Id**" and with a "**Label**" or name as identifier.

The advanced configuration menu of each one of the snapshots is accessed by clicking "**Click to [CONFIG]**" and then clicking again on the ... button that will appear.

The available options in the snapshots advanced configuration menu, affecting the multichannel signals in particular, are the following ones:

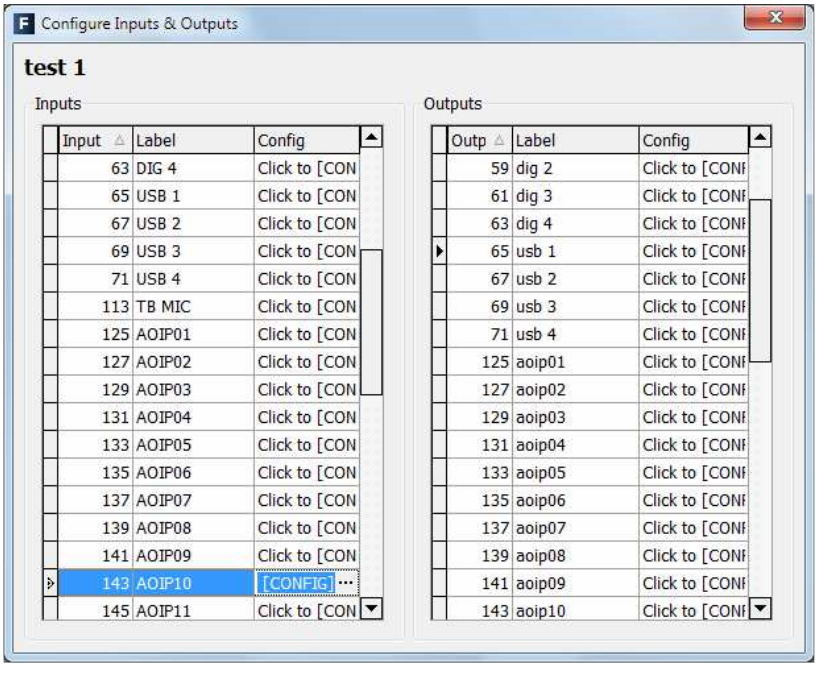
- "**Label**"**:** name or alphanumeric label for the snapshot memory.
- "**Faders**"**:** section where several drop down menus allows the user to assign a previously created audio input channel to each one of the physically present faders on the control surface (up to 8 for CAPITOL IP, up to 12 in FORUM and up to 20 for GRAND FORUM). These faders are numbered from left to right, starting in 1 up to 8 in CAPITOL IP and to 20 in FORUM. In the case of AEQ FORUM console, the number of faders to configure will depend on the quantity of 4-fader independent modules (FRCH) installed on the control surface (1, 2 or 3 modules in FORUM, meaning up to 4, 8 or 12 channels, respectively; or 1 to 5 modules in GRAND FORUM, meaning a maximum of 4, 8, 12, 16 or 20 channels, respectively).
- "**Configure Inputs & Outputs**"**:** this button gives you a quick access to the advanced configuration section for audio inputs and outputs channels, presented in two consecutive columns.
- "**OK**"**:** allows you to accept the created or edited configuration.

- "**Cancel**"**:** allows you to reject the created or edited configuration. No change you may have made is saved.



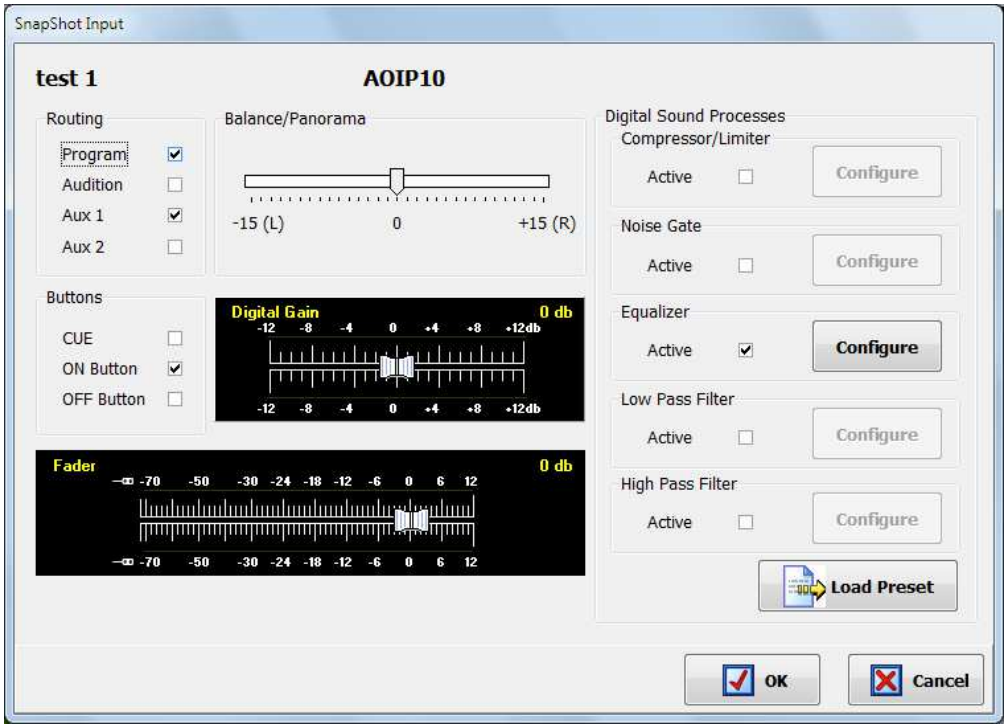
<u>Advanced configuration of inputs</u>.

Within the "Configure Inputs & Outputs" advanced configuration screen, accessed by pressing the corresponding button, the left part of the screen shows the complete list of all the available audio input channels.



Three columns are shown:

- "**Input**"**:** shows the internal numeric identifier for the input.
- "**Label**"**:** shows the name or label associated to the channel.
- "**Config**"**:** allows you to configure the associated options for that input channel from a specific screen. You can access by clicking "**Click to [CONFIG]**" and then clicking again on the ··· button that will appear.



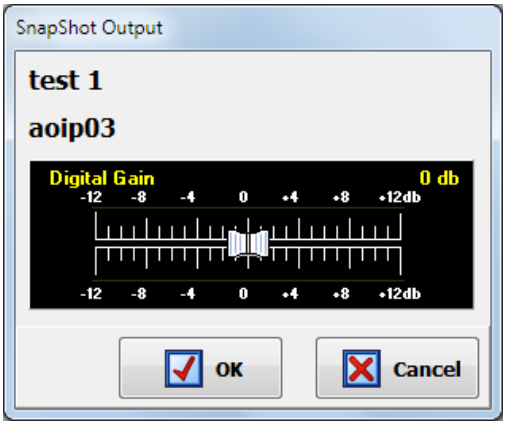
From left to right and from top to bottom the available options are:

- Name of the snapshot (SnapShot 2 in the example).
- Name of the channel (AOIP10 in the example).
- "**Routing**"**:** allows you to configure the initial activation (or not) of the quick routing keys that are available above each fader channel of console control surface (please note that in CAPITOL IP "Aux 1" and "Aux 2" don't have a dedicated key).
- "**Balance/Panorama**"**:** allows you to manage the initial balance or panoramic control for this input channel.
- "**Buttons**"**:** allows you to configure the initial status of the PFL sending button ("**CUE**") and for the CHANNEL ON/OFF keys (mutually excluding) present in AEQ FORUM control surface (only CHANNEL ON in CAPITOL IP).
- "**Digital Gain**"**:** allows you to control the initial input gain of the selected channel from -12dB to +12 dB, by means of a graphical representation of a sliding fader.
- "**Fader**"**:** allows you to configure the initial virtual position of that channel fader.
  IMPORTANT NOTE: This configuration will take effect when that channel is not associated to a physical fader in the control surface; when it's associated to a fader, the value corresponding to that physical fader position will be taken.
- "**Digital Sound Processes**"**:** allows you to configure and activate/deactivate initially the available processes for that channel or, by means of "**Load Preset**" button, to select and load a previously created preset.
- "**OK**"**:** allows you to accept the created or edited configuration.
- "**Cancel**"**:** allows you to reject the created or edited configuration. No change you may have made is saved.

Advanced configuration of outputs.

Within the "Configure Inputs & Outputs" advanced configuration screen, accessed by pressing the corresponding button, the right part of the screen shows the complete list of all the available audio output channels. Three columns are shown:

- "**Output**"**:** shows the internal numeric identifier for the output.
- "**Label**"**:** shows the name or label associated to the channel.
- "**Config**"**:** allows you to configure the associated options for that output channel from a specific screen. You can access by clicking "**Click to [CONFIG]**" and then clicking again on the ··· button that will appear.

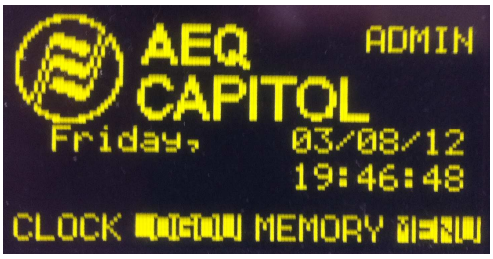


From left to right and from top to bottom the available options are:

- Name of the snapshot (SnapShot 2 in the example).
- Name of the channel (aoip03 in the example).
- "**Digital Gain**"**:** allows you to control the output gain of the selected channel from -12dB to +12 dB, by means of a graphical representation of a sliding fader.
- "**OK**"**:** allows you to accept the created or edited configuration.
- "**Cancel**"**:** allows you to reject the created or edited configuration. No change you may have made is saved.

A3.3. Multichannel audio configuration internal menu options.

Among other options, the internal menu allows for the online modification of the routing configured from the setup software, and also the activation of the different memories or snapshots.

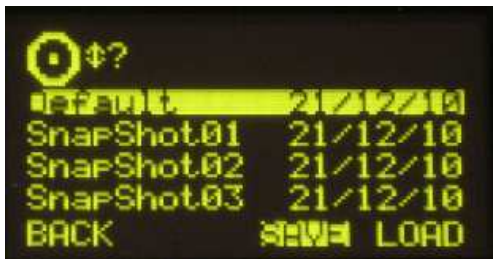


A3.3.1. "MEMORY" menu.

This menu enables you to manage the configuration memories as snapshots. In two consecutive screens, the 7 memory positions available for user-defined configurations are shown.

Each one of these memory positions stores all of the parameters in use at that time in each one of the console channel: gain, phase and balance configuration, "PROGRAM", "AUDITION", "AUX1", "AUX2" and/or "CUE" routing activation, configuration/activation of equalizers, filters and/or dynamics processes and channels activation/deactivation (ON/OFF). No fader position is stored, because these are set manually. The memory position also stores the activation of signals sending to control and studio monitoring (by means of the keys placed under the corresponding displays), but not the position of the 3 associated encoders.

The first of these screens displays the first 4 memory positions for user-defined configurations, and the second shows the following 3 memory positions. You can shift between these two screens by turning any of the associated encoders as you move through the complete list of snapshots stored at that time. The memory that is selected at any time is highlighted.



Each stored memory is identified by its name and the date on which it was created. The names of the memories are editable from the configuration software. The options available through the contextual keys below the screen, from left to right, are:

- "**BACK**"**:** pressing this key allows you to return to the previous menu screen. No change you may have made is saved.
- "**SAVE**"**:** stores in the selected memory position the configuration of the console at that moment. The system will ask for your confirmation (in the screen that appears, you can confirm by pressing "SAVE" again or return to the memories list by pressing "BACK").
- "**LOAD**"**:** allows you to load the configuration you stored previously in the selected memory position. The system will ask for your confirmation (in the screen that appears, you can confirm by pressing "LOAD" or return to the memories list by pressing "BACK").

You can also create snapshots with different configurations from the configuration software.

A3.3.2. Multichannel routing configuration.

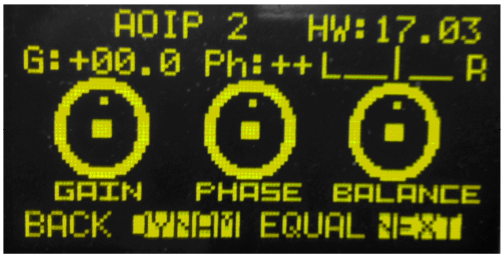
Pressing the “MENU” key in the initial screen will take you to the “MAIN MENU” screen and, from this one, by pressing “**SELECT**” you can access to the menu that allows you to perform advanced configuration of audio inputs/ouptus, internal routing and processes. There are two options, “INPUT” and “OUTPUT”, within “SELECT” menu.

A3.3.2.1. “**INPUT**” **menu.**

This menu shows a list of all the audio input logical signals defined in the system from the configuration software. For more information, see section “**A3.2. Configuration software**” in this appendix or section 4 in the users manual of the console.

You can access a more complete description of each one of the input audio channels by turning any of the 3 associated encoders and pressing then the “OK” contextual key or any of these encoders. The information showed on this screen, from top to bottom and left to right, is:

- **Name of the channel**, in alphanumeric format containing up to 6 characters. This is the same identifier as the one shown in the channel display.



- **Hardware** corresponding to the audio input of this channel, in format HW: xx.yy, where xx is the number of the virtual slot where this inputs/outputs module is installed, and yy is the audio channel of this inputs/outputs module. In stereo channels, yy represents the audio channel corresponding to the left channel of the stereo pair. The right channel corresponds to the number just above.
- Graphic representation of three **encoders** associated with the **GAIN**, **PHASE** and **BALANCE** fields. By operating on the rotary encoders associated with the main screen in the Control and Monitoring section, you can change the values:

- **GAIN:** configurable between -12dB and +12dB for line level inputs and between -36dB and +19dB for mic level inputs. The field is configured with the default value of 0dB.
- **PHASE:** allows you to modify the input signal phase among +/+, +/-, -/+ and -/- for stereo signals, and among + and – for mono signals.
- **BALANCE:** enables you to modify the balance between the L and R channels in stereo signals.

  By pressing this encoder, you can configure the sending mode of the stereo input signal toward the stereo outputs that it is routed to. The options that appear successively when you press the encoder are: **L-L** (only the L input channel is sent to L and R output channels), **R-R** (only the R input channel is sent to L and R output channels) and **R-L** (the R input channel is sent to the L output channel and the L input channel is sent to the R output channel). If you press the enconder once more, it returns to the normal working mode (**L-R**).

NOTE: When the input audio channel selected in the "INPUTS" list is assigned to a fader channel, you can also access to this advanced information screen by pressing the "**SELECT**" key of the corresponding channel, working this key as a quick access to this submenu.

The four contextual keys under the display are associated with the four options shown in the bottom line of the screen:

- "**BACK**"**:** pressing this key allows you to return to the previous menu screen.
- "**DYNAM**"**:** allows you to access to the menus for configuration and activation of dynamics effects included in AEQ FORUM and CAPITOL IP: Compressor/Limiter and Noise Gate. For more information, please consult the unit manual.
- "**EQUAL**"**:** allows you to access to the menu for configuration and activation of Equalizers and Filters included in AEQ FORUM and CAPITOL IP. For more information, please consult the unit manual.
- "**NEXT**"**:** allows you to access the additional information menú about the audio signal present in this input channel, where you can also change the signal assigned to that channel and modify its internal routing.

Expanded information menu: accessing "FADER" and "ROUTE" menus.

Pressing the "**NEXT**" contextual key from the advanced information menu of an audio input channel will give you access to the advanced information section of that channel. It maintains a structure similar to the base menu. Analyzing from left to right, top to bottom, we can recognize:

- **Name of the channel**, in alphanumeric format containing up to 6 characters. This is the same identifier as the one shown in the channel display. By default, it will be MADI 01, MADI 02,… MADI 32 if the interconnection is made by means of stereo MADI links, or on the other hand AOIP 01, AOIP 02,… AOIP16 if the interconnection is made by means of one AOIP card stereo link, or alternatively AOIP 01, AOIP 02,… AOIP 32 if the interconnection is made by means of two AOIP cards stereo link.
- **Hardware** corresponding to the audio input of this channel, in format HW: xx.yy, where xx is the number of the slot where this inputs/outputs module is installed, and yy is the audio channel of this inputs/outputs module. In stereo channels, yy represents the audio channel corresponding to the left channel of the stereo pair. The right channel corresponds to the number just above.
- **Channel type:** mic/líne, analogue, digital, USB, MADI or AoIP.

- **Indicators related to the specific hardware configuration:** “MADI ON” or “AoIP ON” to indicate that it is active, “RSYNC ON” to indicate that external synchronization is active and “LINK OK” to indicate that the physical link is up.
- Indication of **MONO** or **STEREO** signal.

The contextual keys under the display are associated with the three options shown in the bottom line of the screen:

- “**BACK**”**:** pressing this key allows you to return to the previous menu screen.
- “**FADER**”**:** allows you to assign another input channel to the physical fader where this signal is currently found.
- “**ROUTE**”**:** gives you access to the menu for control and configuration of the internal routing of the equipment.

“**FADER**” **menu.**

This submenu is displayed as a list of all the inputs available in the system (except the ones that are yet assigned to a fader). You can make your selection by turning any of the associated encoders and then pressing any of them or the “OK” contextual key to confirm the selection that is highlighted at that moment.

The “BACK” contextual key allows you to return to the previous menu screen without changed the assigned signal.

“**ROUTE**“ **menu.**

From this internal submenu you can manage the internal routing of signals in the console. You can access from the advanced information menu of an audio input channel and that submenu shows an alphabetical list of all of the outputs present in the console, followed by the internal summing buses (“Program”, “Audition”, “Aux1” and “Aux2”), the monitoring buses (“Cue”, “Studio” and “Control”) and finally the MPX buses.

The operation of the three associated encoders is as follows:

- Left: turning this encoder allows you to scroll through the several audio outputs and buses on the list. Pressing this encoder allows you to return to the previous menu screen (the changes you may have made are saved).
- Centre: turning this encoder has no associated function. Pressing this encoder allows you to return to the previous menu screen (the changes you may have made are saved).
- Right: turning this encoder enables you to modify the gain in the cross-point of the highlighted output or bus between -99.8dB and +12dB. By default, all of the cross-points will be configured with a 0dB gain. Pressing this encoder allows you to return to the previous menu screen (the changes you may have made are saved).

In the first image, by clicking “ADD” and the “OK” the “AOIP7” input of the AoIP multichannel link is sent directly to “aoip 1” output. In the second one, to “Program” bus, and in the third image, to “ana 1 output”. By default, all are stereo signals, unless the user configures the opposite.

The operation of the contextual keys, from left to right, is as follows:

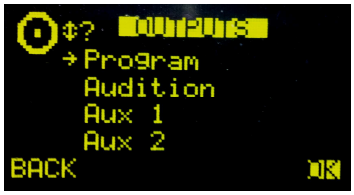
- “**BACK**”**:** pressing this key allows you to return to the previous menu screen (the changes you may have made are saved).
- “**ADD**”**:** enables you to create the cross-point toward the output signal or bus that is highlighted at that moment.
- “**DEL**”**:** enables you to delete the cross-point toward the output signal or bus that is highlighted at that moment.
- “**OK**”**:** pressing this key allows you to return to the previous menu screen (the changes you may have made are saved).

The routing toward the “Program”, “Audition”, “Aux1” and “Aux2” internal buses works in a different way depending on the assignment of the selected input to a fader or not:

- when the input is assigned to a fader and, in the previous list, you select “Program” bus (for instance), when you press the “ADD” key the routing key (“PROGRAM” in this case) of the channel is activated (the associated LED is lighted). In the display, the cross-point toward that bus appears for a moment and then dissappear. The “DEL” key has no associated function in that case (you must press the “PROGRAM” channel key to deactive that routing). If now you press the “ON” key of the channel, the cross-point appears now in the display (if you rise the fader, the “ON AIR” indicator will light); in that case, the “DEL” key allows you to deactive the routing toward that bus (the cross-point disappear and the “PROGRAM” channel key turns off).
- when the input is not assigned to a fader and, in the previous list, you select “Program” bus (for instance), pressing the “ADD” key is equivalent to set that input “ON AIR” (the cross-point appears and, if gain is not configured at its minimum value, signal is sent to that bus). The “DEL” key allows you to deactive that routing (the cross-point disappears).

A3.3.2.2. “OUTPUT” menu.

This menu shows a list of all the audio output logical signals defined in the system from the configuration software, followed by the internal summing buses (“Program”, “Audition”, “Aux1” and “Aux2”), the monitoring buses (“Cue”, “Studio” and “Control”) and finally the MPX buses. For more information, see section “**4. CONFIGURATION SOFTWARE**” in the unit manual.



You can access a more detailed description of each one of the output audio channels by turning any of the 3 associated encoders and pressing then the “OK” contextual key or any of these encoders. The information showed on this screen, from top to bottom and left to right, is:

- **Name of the channel**, in alphanumeric format containing up to 6 characters.
- **Hardware** corresponding to the audio output of this channel, in format HW: xx.yy, where xx is the number of the virtual slot where this inputs/outputs module is installed, and yy is the audio channel of this inputs/outputs module. In stereo channels, yy represents the audio channel corresponding to the left channel of the stereo pair. The right channel corresponds to the number just above.
- Graphic representation of an **encoder** associated with the **GAIN** field. By turning the first associated encoder you can configure gain between -12dB and +12dB. The field is configured with the default value of 0dB.
- Indication of audio signal type: analogue, digital, USB, MADI or AoIP.
- Indication of **MONO** or **STEREO** signal.

The contextual keys under the display are associated with the three options shown in the bottom line of the screen:

- "**BACK**"**:** pressing this key allows you to return to the previous menu screen. The gain configuration you may have made is saved. You can also return to the previous screen by pressing any of the three associated encoders.
- "**TONE**"**:** controls the tone generator associated with that physical output. The tone generated is 1 KHz. Its activation is identified through the **LED** of the contextual key. To modify its level, you need only to change the output gain associated with that channel from the rotary encoder associated with "GAIN" control.
- "**ROUTE**"**:** this submenu allows you to manage the internal routing of the signals of the console toward that output signal or bus. It is displayed as a list of all the inputs channels connected to that output at that moment. By turning the first encoder you can go round the cross-points list. You can activate or deactivate the selected routing by means of "ADD" and "DEL" contextual keys and you can modify the cross-point gain (between -99.8dB and +12dB) by turning the third encoder.

ANNEX 4: Installation details: configuration of NETBOX 8 and NETBOX 32.

A4.1. Scope.

The purpose of this annex is to detail the default nomenclature of audio channels in NETBOX 8 and NETBOX 32 in order to ease installation and configuration of a multichannel AoIP audio system.

A4.1.1. NETBOX 8, NETBOX 32 and DANTE internal systems correspondence.

Have in mind that:

- DANTE doesn't support stereo lines, so different names are assigned to left and right channels forming stereo line.
- The names of the input and output lines for NETBOX 8 and NETBOX 32 that appear in NetBox Tool application are not editable.

The names that are associated by default to input/output lines of NETBOX 8 and NETBOX 32 (as they appear in NetBox Tool application) and to associated channels that appears in DANTE CONTROLLER are detailed next, in order to ease a coherent configuration for both systems and the routing between them.

NETBOX 8.

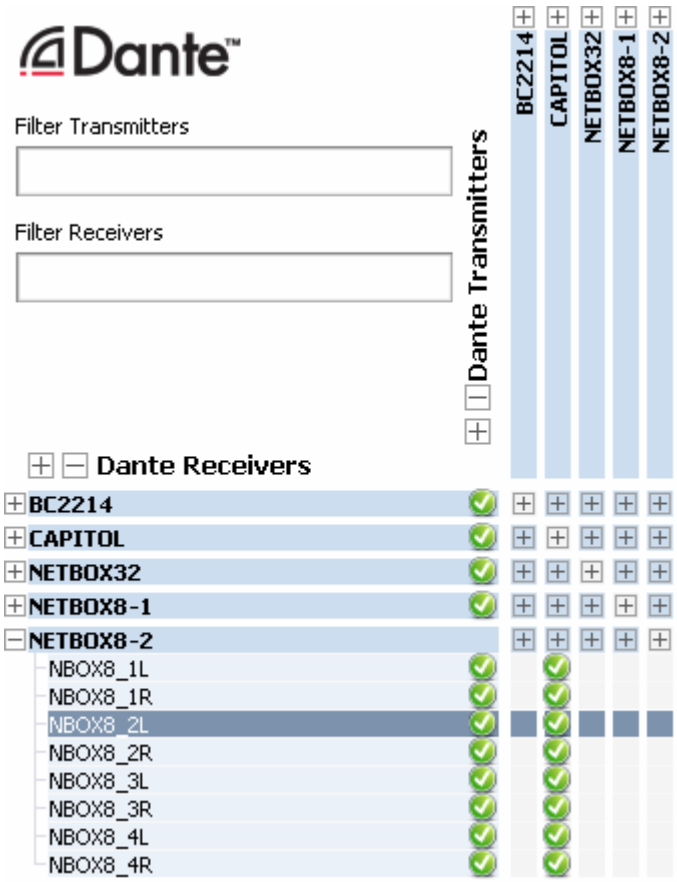
Inputs / Outputs Labels in NetBox Tool	Reception / transmission channels Labels in DANTE Controller
ANALOG 01 L	NBOX8_1L
ANALOG 01 R	NBOX8_1R
ANALOG 02 L	NBOX8_2L
ANALOG 02 R	NBOX8_2R
DIGITAL 03 L	NBOX8_3L
DIGITAL 03 R	NBOX8_3R
DIGITAL 04 L	NBOX8_4L
DIGITAL 04 R	NBOX8_4R

NETBOX 32.

Inputs / Outputs Labels in NetBox Tool	Reception / transmission channels Labels in DANTE Controller
ANALOG 01 L	NBOX32_1L
ANALOG 01 R	NBOX32_1R
ANALOG 02 L	NBOX32_2L
ANALOG 02 R	NBOX32_2R
ANALOG 03 L	NBOX32_3L
ANALOG 03 R	NBOX32_3R
ANALOG 04 L	NBOX32_4L
ANALOG 04 R	NBOX32_4R
ANALOG 05 L	NBOX32_5L
ANALOG 05 R	NBOX32_5R
ANALOG 06 L	NBOX32_6L
ANALOG 06 R	NBOX32_6R
ANALOG 07 L	NBOX32_7L
ANALOG 07 R	NBOX32_7R
ANALOG 08 L	NBOX32_8L
ANALOG 08 R	NBOX32_8R
DIGITAL 09 L	NBOX32_9L
DIGITAL 09 R	NBOX32_9R
DIGITAL 10 L	NBOX32_10L
DIGITAL 10 R	NBOX32_10R
DIGITAL 11 L	NBOX32_11L
DIGITAL 11 R	NBOX32_11R

DIGITAL 12 L	NBOX32_12L
DIGITAL 12 R	NBOX32_12R
DIGITAL 13 L	NBOX32_13L
DIGITAL 13 R	NBOX32_13R
DIGITAL 14 L	NBOX32_14L
DIGITAL 14 R	NBOX32_14R
DIGITAL 15 L	NBOX32_15L
DIGITAL 15 R	NBOX32_15R
DIGITAL 16 L	NBOX32_16L
DIGITAL 16 R	NBOX32_16R

NOTE 1: When there is more than one NETBOX in the system, the devices will be labelled in DANTE Controller as NETBOX8-1, NETBOX8-2… NETBOX8-n or as NETBOX32-1, NETBOX32-2… NETBOX32-n in order to identify them.



NOTE 2: The previous tables show the names of the input/out lines and reception/transmission channels that are configured by default. These last ones can be edited by means of DANTE Controller application, just like the device names, depending on each installation characteristics.

ANNEX 5: DANTE based AEQ AoIP Ethernet Switches.

A5.1. General configuration of DANTE based AEQ AoIP Ethernet Switches.

The vast majority of AEQ AoIP systems will require a network switch.

This document will provide information which will help the decision of which switch to purchase and provides data for its correct configuration.

Requirements:

- Switch must be Gigabit rated (1000 Mbps)
- Quality of Service (QoS) with four queues
- Diffserv (DSCP) QoS with strict priority
- A managed switch is required to allow custom configuration as well as detailed operation information
- Switches prioritise packets using DSCP/Diffserv Values. The packet priority values used for Dante have been chosen to make it simple to configure QoS with a wide range of switches. Some switches require additional configuration to recognise and prioritise specific DSCP values. The table below shows the various Diffserv Code Points (DSCP) packet priority values: l

Priority	Usage	DSCP Label	Hex	Decimal	Binary
High	Time critical PTP events	CS7	0x38	56	111000
Medium	Audio PTP	EF	0x2E	46	101110
Low	(reserved)	CS1	0x08	8	001 000
None	Other traffic	BestEffort	0x00	0	000000

Whilst most switches support DSCP they may default to either not using it, or having the priorities incorrectly mapped for AEQ AoIP / Dante. For this reason, managed switches must be used in an AEQ AoIP system. Managed switches allow the user to interrogate and, if necessary, change the settings of the switch, usually via a web interface. Some switches came with EF (Audio) prioritised over CS7 (Clocking). If Audio packets are prioritised above PTP (sample clock timing) packets, it can lead to higher clock jitter and longer lock times. In extreme situations (high audio traffic), it could lead to a network node loosing sync and dropping audio packets because the sample timing has become skewed.

Please refer to the user documentation of your specific switch for more information regarding configuring QoS.

Whilst not an exhaustive list, the following switches were found to be suitable for RedNet after the aforementioned setup was carried out:

- Cisco SG300
- Cisco SG200
- Netgear GS724T

A5.2. Configuration of CISCO SG 200 family of switches for Dante-based AEQ AoIP.

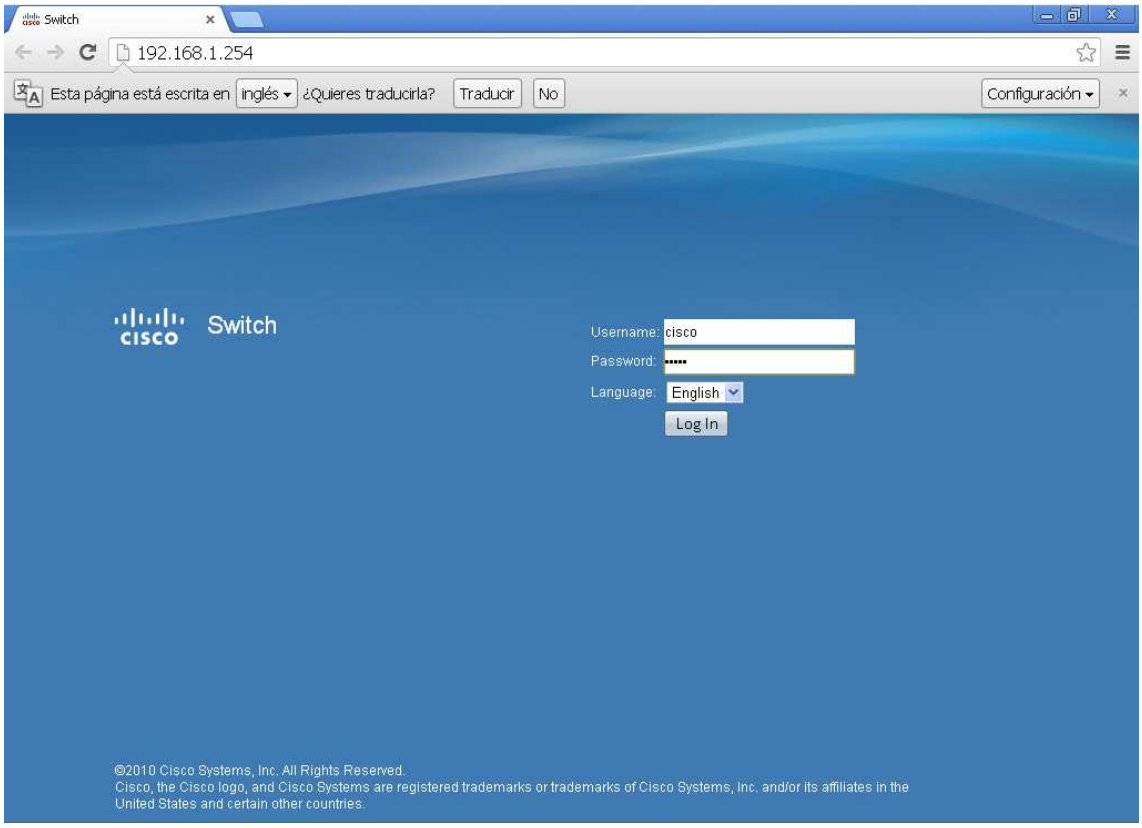
AEQ can provide properly configured CISCO SG200 switches on demand. If the switch from a third party, you must set it up according to the following procedure:

<u>Configuration procedure for the Cisco SG200 family of switches for use with DANTE technology</u>

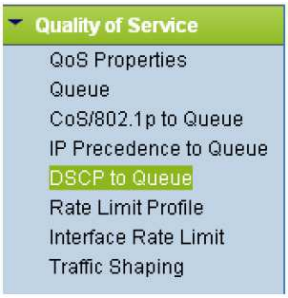
1. Change the IP address of the computer used to configure the switch, so it falls in the 192.168.1.xxx range.

2. Using an Internet browser, type the address 192.168.1.254 in the URL bar and then type:
   User: cisco
   Password: cisco

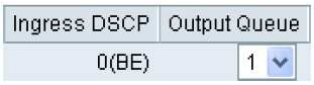
You will be asked to change the password the first time you access the switch configuration.



3. Go to section Quality of Service →DSCP to Queue:



We will see some decimal values and a priority:
Ingress DSCP= <decimal value>
Output Queue=Priority (1 corresponds to the lowest priority, 4 is the highest)



4. Change the following priorities in the corresponding decimal numbers:

56(CS7=4)
46(EF=3)
8(CS1=2)

DSCP to Queue Table

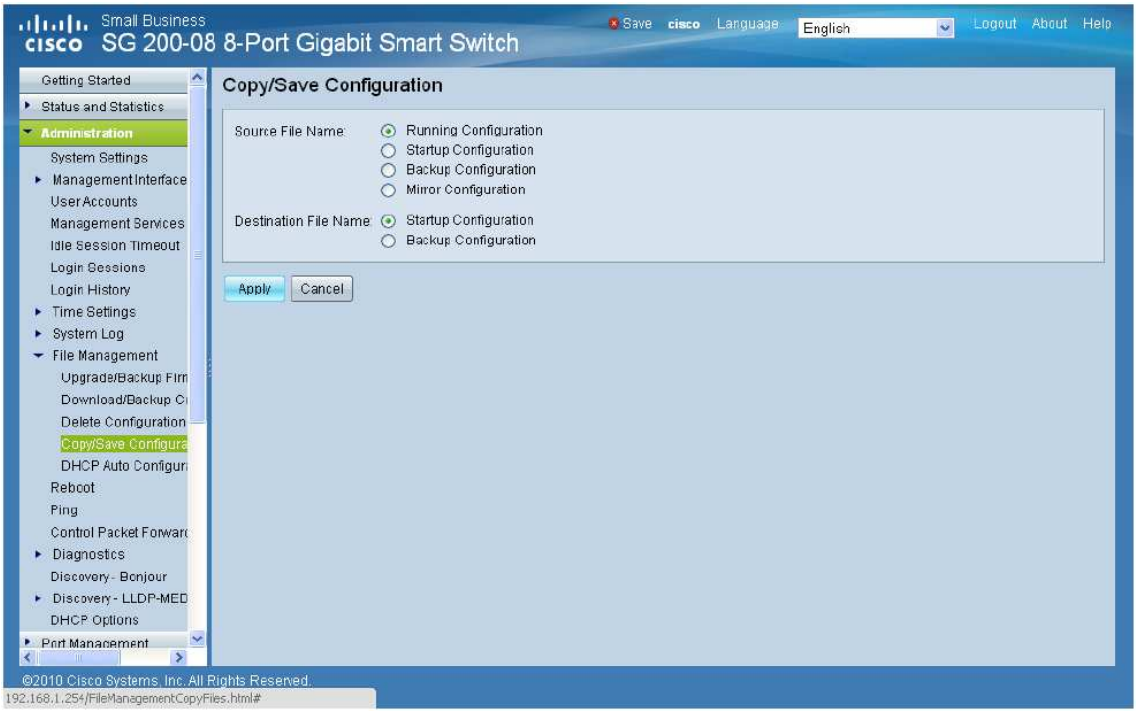
Ingress DSCP	Output Queue	Ingress DSCP	Output Queue	Ingress DSCP	Output Queue	Ingress DSCP	Output Queue
0(BE)	1	16(CS2)	2	32(CS4)	3	48(CS6)	3
1	1	17	2	33	3	49	3
2	1	18(AF21)	2	34(AF41)	3	50	3
3	1	19	2	35	3	51	3
4	1	20(AF22)	2	36(AF42)	3	52	3
5	1	21	2	37	3	53	3
6	1	22(AF23)	2	38(AF43)	3	54	3
7	1	23	2	39	3	55	3
8(CS1)	2	24(CS3)	3	40(CS5)	4	56(CS7)	4
9	1	25	3	41	4	57	3
10(AF11)	1	26(AF31)	3	42	4	58	3
11	1	27	3	43	4	59	3
12(AF12)	1	28(AF32)	3	44	4	60	3
13	1	29	3	45	4	61	3
14(AF13)	1	30(AF33)	3	46(EF)	3	62	3
15	1	31	3	47	4	63	3

Queue 1 has the lowest priority, queue 4 has the highest priority.

Apply Cancel Restore Defaults

5. Apply the changes, and a Save button will appear in the top area of the screen:

6. By clicking on the Save button, you will be redirected to another page to save the values in the switch.
   Click on Apply.



ANNEX 6: 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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