AEQ Audio Over IP Routing System

IP-based multi-channel audio network

- **ATRIUM Console: XC24 boards and ATX CTL / ATX MTR modules.**
- **ARENA Console: BC2214 & BC2224 boards.**
- **X_CORE/BC2000D/CONEXIA Matrix: XC24 / BC2214 & BC2224 boards.**
- **FORUM IP Console: FR14 boards.**
- **FORUM LITE Console.**
- **CAPITOL IP Console.**
- **NETBOX 32 AD Audio Interface.**
- **NETBOX 8 AD Audio Interface.**
- **NETBOX 4 MH Audio Interface.**
- **NETBOX DSP Matrix.**
- **CrossNET Matrix.**
- **TP8000 Panels.**
- **OLYMPIA 3 Commentary Unit.**
- **PHOENIX VENUS V3 Audiocodec.**
- **SYSTEL IP 16 VoIP ON AIR Telephone System.**
- **Automation Suite AudioPlus.**
- **Dante Virtual Soundcard.**

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Software Versions: **Dante Controller 4.4.2.2 or higher**
Dante Virtual Soundcard 4.1.2.5 or higher
Dante Firmware Update Manager 3.10.2.4 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 digital 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 X_CORE/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.

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1.2. Description of the devices covered by this manual.

1.2.1. ATRIUM Console / X_CORE - CONEXIA Matrix. XC24 boards and ATX CTL / ATX MTR modules.

XC24 AoIP boards are designed to be installed in X_CORE frames used in AEQ ATRIUM digital mixing consoles and AEQ X_CORE-TITAN / CONEXIA routers. This board has two Ethernet ports (LAN1 and LAN2) with activity LEDs and allows you to connect via IP up to 64 input and 64 output channels to/from the X_CORE internal TDM bus system.

In order to build a large sized router, a X_CORE frame can be equipped with as many XC24 boards as needed; they can be connected to one or several Gigabit Ethernet networks, enabling TDM-IP "hybrid" routers with great flexibility.

In the case of AEQ ATRIUM consoles there are 2 additional modules with AoIP connectivity:

- ATX CTL: control module that uses an AoIP Dante link to transport self-control microphone and control headphones between the module and the X_CORE frame. It has 8 input and 8 output channels.
- ATX MTR: optional module that allows the measurement of stereo signals phase correlation and loudness measurement and that receives the signal to be measured through an AoIP Dante link. It has 2 input and 2 output channels.

1.2.2. ARENA Console / BC2000D - CONEXIA 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 BC2000D-TITAN / CONEXIA 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.

1.2.3. FORUM IP console. FR14 boards.

FR14 AoIP boards are installed as any other input/output board at the rear panel of the FORUM IP console (and its versions GRAND FORUM, V2 and IP SPLIT). They allow you to connect up to 32 input and 32 output channels to the unit's TDM bus. The FR14 boards feature 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. This option is not compatible with the MADI functionality, so in case an AoIP board is configured in the console, the MADI option will not be available.

1.2.4. FORUM LITE Console.

IP connectivity in FORUM LITE console is implemented through a single AoIP Dante module incorporated in its core (both in its initial edition and in the MCORE edition), that is optional and excludes MADI connectivity (a FORUM LITE console can have a single multichannel access: AoIP or MADI). There are two versions of that AoIP Dante module: one with 16 input and 16 output channels, and another one with 32 input and 32 output channels.

1.2.5. CAPITOL IP Console.

IP connectivity in CAPITOL IP console is implemented through a single AoIP Dante module incorporated in its core (both in its initial edition and in the MCORE edition), that is optional and excludes MADI connectivity (a CAPITOL IP console can have a single multichannel access: AoIP or MADI). There are two versions of that AoIP Dante module: one with 16 input and 16 output channels, and another one with 32 input and 32 output channels.

1.2.6. NETBOX 32 AD Audio interface.

NETBOX 32 AD is an interface for multi-channel AoIP. It allows you to insert and extract audio channels in a system based on DANTE technology, at locations 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 GPIs and 16 GPOs (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 X_CORE/BC2000D.

This information is also valid when using the unit as a mixing and distributing matrix (**NETBOX 32 AD MX**) or as a multichannel audio level detector in Broadcast Pix Visual Radio (**NETBOX 32 AD VX**).

1.2.7. NETBOX 8 AD Audio interface.

NETBOX 8 AD is an interface for multi-channel AoIP. It allows you to insert and extract audio channels in a system based on DANTE technology, at locations 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 GPIs and 4 GPOs. 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.

This information is also valid when using the unit as a multichannel audio level detector in Broadcast Pix Visual Radio (**NETBOX 8 AD VX**).

1.2.8. NETBOX 4 MH Audio interface.

NETBOX 4 MH is an interface for multi-channel AoIP. It allows you to insert and extract audio channels in a system based on DANTE technology, at Studio rooms and other locations where mic/line inputs and line/headphone outputs are needed. NETBOX 4 MH features 4 inputs and 4 outputs. The input channels are mic/line type with XLR connector and frontal switch. The output channels are balanced at line level and are sent to 4 headphone outputs, that can be configured as stereo pairs. It also provides 4 GPIs and 4 GPOs. The GPO port includes a power supply pin to feed the output circuitry. It also provides additional special GPIOs for connection of signalling and control boxes, including 7 optocoupled GPIs and 2 relay GPOs for ON AIR signalling, that can be feed from the unit.

IMPORTANT NOTE: NETBOX 4 MH does **not** support **redundant** operation.

1.2.9. NETBOX DSP Matrix.

NETBOX DSP device is able to receive audio from the DANTE network and then return it, mixed and processed, to be used in another device or subsystem. It can also generate a test tone (1KHz) and vumeters of all the inputs and outputs. There are 4 different versions of NETBOX DSP: NETBOX DSP 64, NETBOX DSP 96, NETBOX DSP 128 y NETBOX DSP 160, with routing and mixing capabilities on 64, 96, 128 or 160 inputs to any of the 64, 96, 128 or 160 outputs in the AoIP network, respectively. It's possible to add any quantity of inputs (up to 160 depending on the version) in any of the outputs. In addition, there is gain control for all the inputs, outputs and cross points. Any output can also be muted. All 4 versions have the same processing capability on a maximum of 64 selectable inputs, that can be sent processed to any of the outputs.

It also incorporates 16 GPIs and 16 GPOs (each GPIO connector includes a power supply pin to feed the external circuitry), as well as 256 virtual GPIs and 256 virtual GPOs that can be transported through the IP network between compatible devices (this way, a GPI can drive the GPOs of other devices).

1.2.10. CrossNET Matrix.

CrossNET is a compact intercom matrix provided in versions from 40 up to 168 ports (CrossNET 40, 72, 104, 136 and 168). The last 4 versions feature AoIP multi-channel connectivity, with 32, 64, 96 and 128 AoIP Dante technology channels respectively, compatible with AES67 standard, which can easily be connected using existing Ethernet networks through conventional routers and switches. The system also has 12 analogue ports, 8 digital ports, and 20 AoIP ports with KROMA Standard, enabling the connection of wireless intercoms, ancillary equipment and KROMA panels.

1.2.11. TP8000 Panels.

Broadcast-quality intercom user panels. Audio is digitized and processed using 24 bits at a sampling frequency of 48 kHz. The panels feature ports for Analogue, Kroma-Digital, IP Kroma and high-quality -IP Dante connectivity (2 channels). They also have digital audio processing. There are 16 keys, rack or desktop format, and expansion panels that can be cascaded to build panels with up to 80 keys with 4 pages. Compatible with any AEQ and KROMA intercom matrix.

1.2.12. OLYMPIA 3 Commentary unit.

OLYMPIA 3 is a digital commentary unit (CU) that allows you to insert and extract audio channels in a system based on DANTE technology through one of its 3 Ethernet ports. OLYMPIA 3 features 8 inputs and 8 outputs.

1.2.13. PHOENIX VENUS V3 Audiocodec.

PHOENIX VENUS V3 is a double multiformat and multi-algorithm audiocodec. It offers optionally (it can be activated by means of a license) the possibility of inserting and extracting audio channels in a system based on DANTE technology through one of its 2 Ethernet ports. PHOENIX VENUS V3 features 4 inputs and 4 outputs.

IMPORTANT NOTE: PHOENIX VENUS V3 does **not** support **redundant** operation.

1.2.14. SYSTEL IP 16 VoIP ON AIR Telephone System.

SYSTEL IP 16 is a VoIP ON AIR telephone system that allows you to insert and extract audio channels in a system based on DANTE technology through 2 of its 3 Ethernet ports. SYSTEL IP 16 features 32 inputs and 32 outputs.

1.2.15. Automation suite AudioPlus.

AudioPlus is an automation system for broadcast production and audio content play-out for PC networks. AudioPlus has a "no-soundcard" option that links your audio inputs and outputs with "Dante Virtual Soundcard". Thus, the AudioPlus can record up to 4 stereo studio sources from any device on the network and simultaneously play-out four stereo signals onto the DANTE network that would be available for any connected device. PCs do not need to be equiped with a sound card.

1.2.16. "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.

IMPORTANT NOTE: "Dante Virtual Soundcard" does **not** support **redundant** operation.

1.2.17. 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.

- Data transport between devices that allows converting a GPI on one device into a GPO on another device in the network.

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 media.

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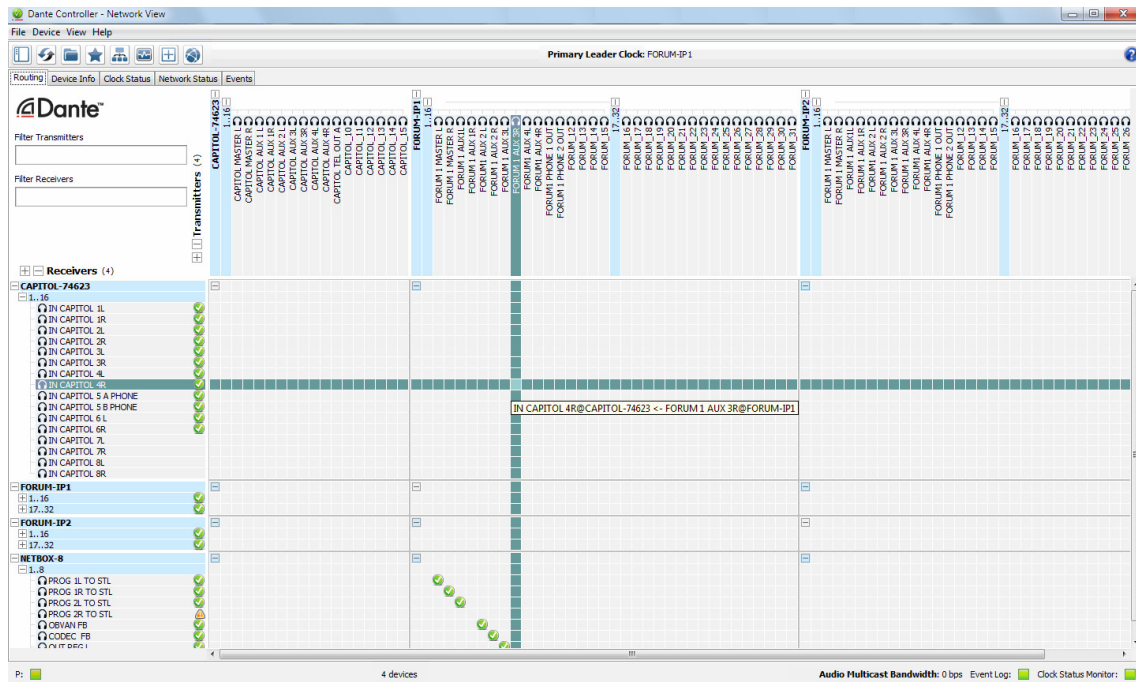
Transmit channels are advertised on the network. A receiver uses this advertisement to establish a subscription to the channel. A transmit channel can be sent to multiple receivers using unicast or multicast.

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

1.4.2. Differentiation between input and output channels.

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

- A channel that puts 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 and Channel Names.

In Dante, devices and channels are identified by names. Device and channel names 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 and channel names. 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 media 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 media 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.

- All Dante names are up to 31 characters in length. Name comparisons are case-insensitive; "Guitar" and "guitar" are treated as the same name. 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 names may use any character except '=' (equals), '.' (full stop or period) or '@' (at). Tx channel names must be unique on a device. Tx channel names do not need to be unique on the network as they are always qualified by device (channel@device).

- RX channel names follow the same rules as Tx channel names.

1.4.4. Routing Media.

Routing Terminology.

Device: A device means a Dante-enabled device, and more specifically that component of the 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 media from the media hardware onto the network.

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

Flow: Dante media routing creates flows. Each flow carries several channels of audio, or one channel of video, 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 or 1 channel of video.

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 media 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 media, 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 (labelled "Audio L" and "Audio R") on the device labelled "Source" to Rx channels 3 and 4 on the device labelled "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 media from the Tx channels to the Rx channels.

Redundancy.

Many Dante devices support redundant media 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.
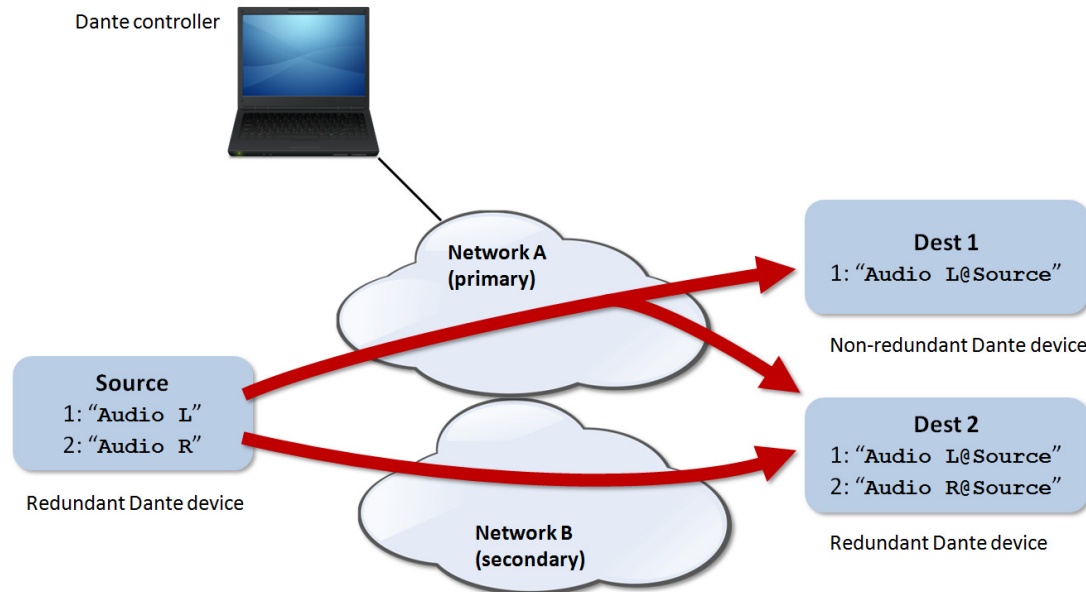
If the secondary network is connected to a device that supports redundancy, it is enabled automatically. The same media data is transmitted on both the primary and secondary networks simultaneously. In the event of a failure on one network, media will continue to flow via the other network.

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.

Media Formats.

Some Dante devices support a range of media formats (audio sample rates, or video resolutions). Devices can usually be switched between media formats, but will not support more than one at a time. AEQ equipment operates with audio at FS=48 kHz, 24 bits PCM.

It is only possible to set up a subscription between channels which have a common media 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 media routing creates 'flows'. Each flow carries one or more channels of audio or one channel of video 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, or 1 channel of video. Unicast flows are set up when a receiver subscribes to an available media 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 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 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 media from the multicast flow and the unicast flow will be removed.

Routing for Video Devices.

Video (Dante AV) devices support three major channel types:

Audio Channels: Audio channels are represented in Dante Controller by the following icon: 🎧

Audio channels for Dante video devices are treated and managed identically to audio channels for audio-only Dante devices.

Video Channels: Video channels are represented by the following icon: 🎞

Video channels contain packetised video data streams, and can be routed in the same way as audio channels. However, they typically use more bandwidth than audio channels, and require 1Gbps (or higher) switch ports.

NOTE: IGMP snooping must be enabled on network switches that will be carrying Dante video on 1Gbps network infrastructure. Refer to your switch manufacturer's documentation for information about enabling IGMP snooping.

Ancillary Channels: Ancillary channels are represented by the following icon: 🔀

Ancillary channels are 'custom' channels, defined by the device manufacturer, to carry additional data (not audio or video) between devices. Typically they are used to carry hardware control data, such as USB peripheral or infrared transport control data.

Ancillary channels are typically low bandwidth (compared to audio and video channels). Some ancillary channel types cannot be added to multicast transmit flows.

A typical Network view for a network that includes video devices (with four types of ancillary channels) is shown below. In that example:

- The 'Video Rx' channel on the AV-Display-FOH receiver is subscribed to the 'Video Tx' channel on the AV-Mixer transmitter. This subscription would cause video from the AV mixer to be displayed on the front of house display screen.
- The '01' and '02' audio channels on the Amp-FOH1 audio receiver are subscribed to the 'Left' and 'Right' Tx channels on the AV-Mixer transmitter.These subscriptions would cause the left and right audio channels from the AV mixer to be played out via the front of house amplifier.
- The 'USB' and 'IR' ancillary channels on the AV-Display-FOH receiver are subscribed to the equivalent channels on the AV-Mixer transmitter. These subscriptions would enable USB peripheral (for example, mouse and keyboard) and infrared control of the transmitter via the control ports on the receiver.

Note that control data on some types of ancillary channel (somewhat counter-intuitively) may actually flow from the receiver to the transmitter. This enables transmitting video sources to be controlled remotely at the receiver. For example, you could start and stop a Blu-Ray player (a transmitter) in another room using an infrared remote control pointed at the screen that is actually playing the video (a receiver).
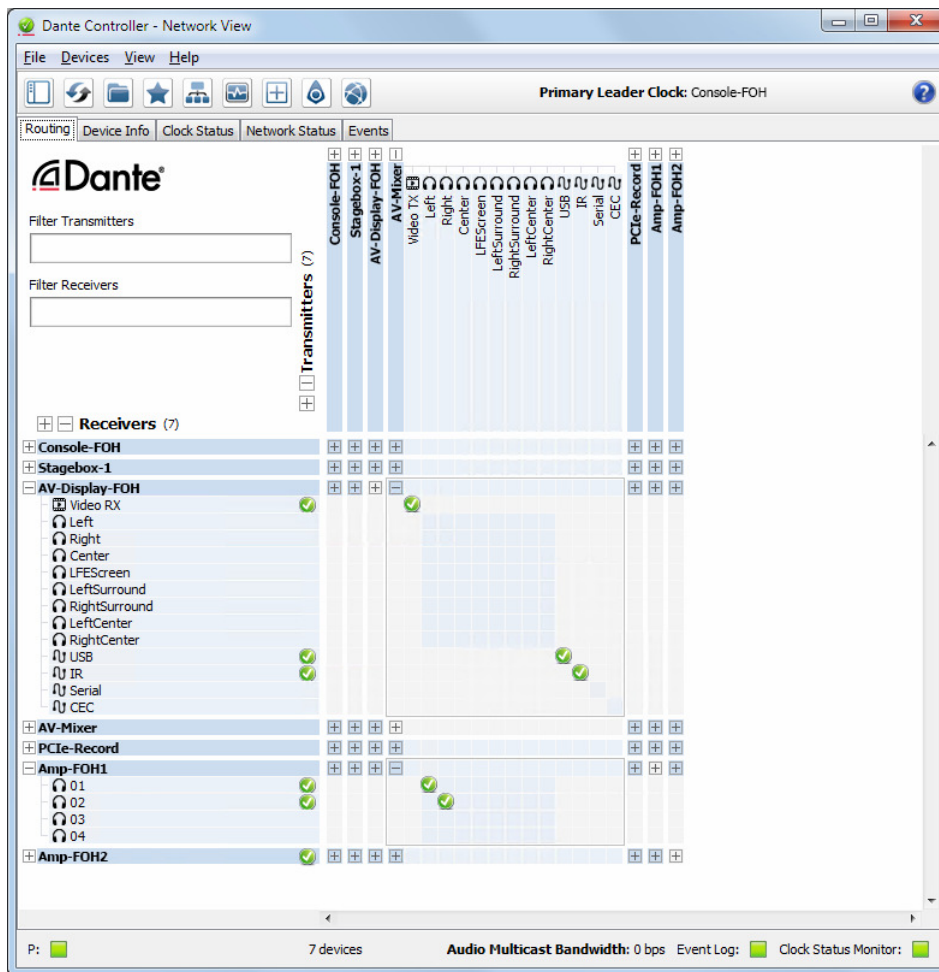
1.4.5. Clock Synchronization.

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

One Dante device will be elected as the PTP Leader Clock for the network; all other Dante devices act as a PTP Follower Clocks to the elected leader clock. Although many Dante devices may be capable of becoming PTP Leader 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 Leader' 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.

Enable Sync to External.

A Dante device set to "Enable Sync to External" 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 Leader Clock, unless there is another Dante device present with 'Preferred Leader' set.

Preferred Leader.

Sometimes it may be necessary to force a particular device to provide the PTP Leader Clock. A Dante device with 'Preferred Leader' set will always be chosen as the PTP Leader Clock. If more than one device has 'Preferred Leader' 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 leader 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 Leader) 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 Follower 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.

For Dante audio devices, 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 1ms latency. If a faster device (such as a PCIe card) is set to 0.25ms latency and is then subscribed to an Ultimo transmitter, the latency used for the subscription will be 1ms, 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. Device Lock.

Device Lock allows you to lock and unlock supported Dante devices using a 4-digit PIN (Personal Identification Number).

When a device is locked, audio will continue to flow according to its existing subscriptions, and it can be monitored, but it cannot be controlled or configured – its subscriptions and configuration settings become read-only.

To configure a locked device you must first unlock it using the PIN with which it was locked.

Locked devices can be identified by:

- A small grey padlock icon against the device name in the Network View > Routing tab

- A red background highlight when the device is moused over in the Network View > Routing tab.

- A check (tick) in the Device Lock column in the Network View > Device Info tab.

- A red padlock icon in the Device View toolbar

Not all Dante devices support Device Lock. The feature will be rolled out over time via device manufacturer firmware updates.

To check if a Dante device can be locked:

- Use the Advanced Filter to check for locked, unlocked and unsupported devices.
- Check the Device Info tab – devices that support Device Lock have a checkbox in the Device Lock column; devices that do not support Device Lock show 'N/A' in the Device Lock column.
- Open the device in Device View – if the padlock icon in the toolbar is blue or red, the device supports device lock; if it is greyed out, it does not support Device Lock.

NOTE: Earlier versions of "Dante Controller" (prior to v3.10) do not support Device Lock, and will not actively identify when Dante devices are locked. Attempts to configure or subscribe to a locked device in earlier versions of "Dante Controller" will fail silently.

Locking a Dante device.

To lock an unlocked Dante device:

Using Device View:

1. Open the device in Device View (Ctrl+D, or

   Command+D) and click the padlock icon
   The Lock Device panel is displayed.
2. In the Lock Device panel, enter a 4-digit PIN in the PIN field.
3. Enter the same PIN in the Confirm PIN field.
4. Click 'Lock'.

The padlock icon will change to red indicating that the device is now locked.

From the Device Info Tab:

1. In Network View, select the Device Info tab.
2. Click the Device Lock checkbox for the device.
3. Follow steps 2-4 from the above process.

Unlocking a Dante device.

To unlock a locked Dante device:

Using Device View:

1. Open the device in Device View (Ctrl+D, or Command+D) and click the padlock icon 🔒
2. In the Unlock Device panel, enter the 4-digit PIN in the PIN field.
3. Click 'Unlock'.
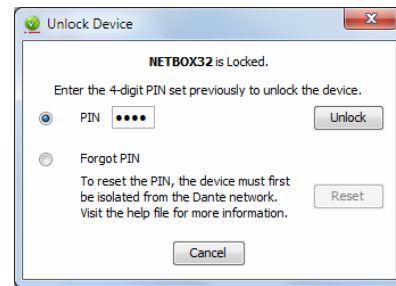
The padlock icon will change to blue 🔓 indicating that the device is now unlocked.

From the Device Info Tab:

1. In Network View, select the Device Info tab.
2. Click the Device Lock checkbox for the device.
3. Follow steps 2-3 from the above process.

Unlocking a device when you have forgotten the PIN.

If you have forgotten the PIN for a locked device, you can reset the PIN.

To reset the PIN for a locked device:

1. Isolate the device from the rest of the Dante network.
2. Disconnect and reconnect the device.
3. Wait for at least 2 minutes.
4. Use the 'Forgot PIN' option in the Unlock Device panel.

How to Isolate a Device from the Rest of the Dante Network.

There are 3 ways to isolate a device from the rest of the network.

Option 1: Remove all other Dante devices from the Dante network.

You can isolate a device by physically disconnecting all other Dante devices from the network switch, or by completely powering down all other devices, leaving on the network only the locked device and the computer running "Dante Controller".

NOTE: Dante Virtual Soundcard and Dante Via are considered to be Dante devices – all running instances of those applications must be fully stopped, even if they are on the same computer on which you are running "Dante Controller".

Option 2: Connect your "Dante Controller" computer directly to the device.

Physically remove the device from the main Dante network switch, and either connect it directly to your "Dante Controller" computer (using a normal Ethernet cable), or connect the device and your computer to a separated network switch (to which there are no other Dante devices connected).

Option 3: Use a VLAN.

Set up a Virtual Local Area Network on which there are only the locked device, and the Dante Controller computer.

Resetting the PIN for a Locked, Isolated Device.

Once you have isolated the locked device, disconnected and reconnected it, and then waited for at least 2 minutes:

1. Open the Unlock Device panel for the device (See Unlocking a Dante Device).
2. Click the 'Forgot PIN' option.
3. Click Reset.

The device is now unlocked, and can be re-locked using a new PIN if required.

Subscriptions from Unlocked Devices to Locked Devices.

If there are existing subscriptions to a device when it is locked, those subscriptions will continue to function as normal.

They can also be removed, and replaced (assuming the subscribing device is unlocked).

No new subscriptions can be made to a locked transmitter. The 'Access control' tooltips are associated with attempted subscriptions to locked transmitters.

NOTE: If you attempt to subscribe a legacy (pre-v3.10 firmware) receiver to a locked transmitter, subscription status icons for any existing subscriptions (made before the device was locked) may change to indicate an error state. However, audio will continue to flow for those subscriptions. To reset the subscription icons: Remove all subscriptions, and reinstate the original subscriptions only.

Locking Devices with Residual Connections.

Occasionally, a transmitter will have residual unused connections (transmitting but unsubscribed channels) from a previous subscription state, which need to be closed before the device is locked. This can cause an interruption to audio from that device.

When you attempt to lock a device and residual connections are detected, "Dante Controller" presents a warning dialog:
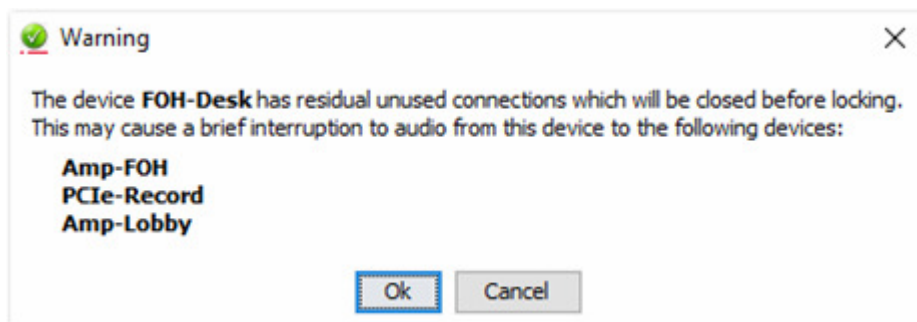
Click Ok to proceed or Cancel to abort the lock process.

While the residual connections are being closed, "Dante Controller" displays a progress dialog:
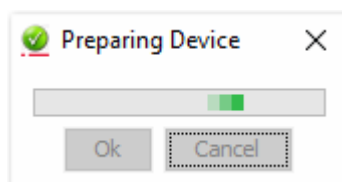
When the preparation process is finished, the standard Lock Device dialog is presented, and the device can be locked as normal.

1.4.8. 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 X_CORE, BC2000D, ATRIUM, ARENA, FORUM IP, FORUM LITE 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. XC24 modules. Front panel description.

Any number of XC24 modules can be installed in the back Input/Output slots of the X_CORE router or ATRIUM 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 switch, 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 separated networks.

2.2. ATX CTL module. Back panel description.

The ATX CTL control module of the ATRIUM digital mixing console control surface uses an AoIP Dante link to transport self-control microphone and control headphones between the module and the X_CORE frame. It has two connectors, Dante PRI. and Dante SEC., placed on the back panel of the unit, with their respective physical link signaling LEDs with the following status:

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

IMPORTANT NOTE: If the unit is wired to a dedicated audio DANTE network using a switch, only port Dante PRI. should be connected to the network switch and blinking. When there is a redundant network, primary and secondary interfaces must be connected to separated networks and both should be blinking.

2.3. ATX MTR module. Back panel description.

The ATX MTR module of the ATRIUM digital mixing console control surface uses an AoIP Dante link to transport the signal on which you want to measure the phase correlation between channels and loudness. It has a Dante connector, placed on the back panel of the unit, with its respective physical link signaling LEDs with the following status:

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

2.4. BC2214 and BC2224 modules. 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 switch, 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 separated networks.
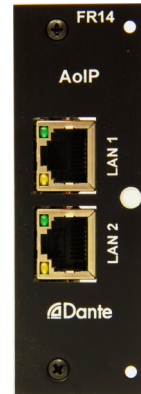
2.5. FR14 modules. Front panel description.

One or two FR14 modules can be installed in the FORUM IP 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 switch, 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 separated networks.

2.6. AoIP Dante module for FORUM LITE / CAPITOL IP. Back panel description.

Only one AoIP Dante module can be installed inside the FORUM LITE or 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 switch, 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 separated networks.

2.7. NETBOX 32 AD interface. Front panel description.

NETBOX 32 AD (and the NETBOX 32 AD MX and NETBOX 32 AD VX versions) includes 2 connectors, LAN 1 and LAN 2, placed on the back panel of the unit, each one with its respective physical link signaling LEDs.

On front panel, there are indicators related to the unit status, communications and audio levels. The ones that are interesting regarding AoIP connection are:

- **LAN** LEDs: indicate the status of the audio local area network: LAN 1 (main interface) and LAN 2 (secondary interface).
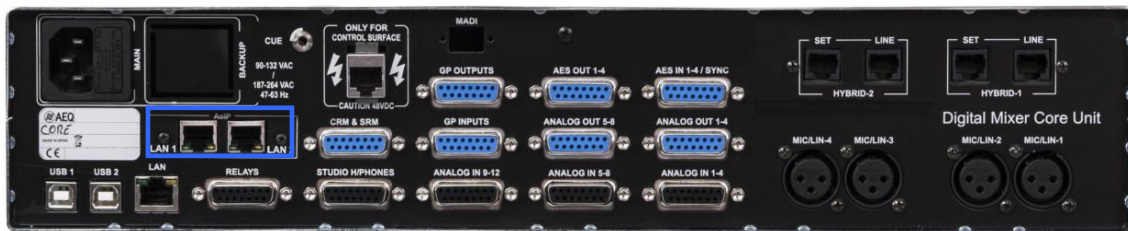
    Status:
    - Off: no local network connection.
    - Blinking green: link is established at data level.

If the unit is wired to a dedicated audio network using a switch, only LAN 1 should be blinking. If the wiring is connected in "Daisy Chain" mode, without switch, or there is a redundant network, both LEDs be blinking.

IMPORTANT NOTE: When there is a redundant network, primary and secondary interfaces must be connected to separated networks.

2.8. NETBOX 8 AD interface. Front panel description.

NETBOX 8 AD (and the NETBOX 8 AD VX version) includes 2 connectors, LAN 1 and LAN 2, placed on the back panel of the unit, each one with its respective physical link signaling LEDs.

On front panel, there are indicators related to the unit status, communications and audio levels. The ones that are interesting regarding AoIP connection are:

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

    Status:
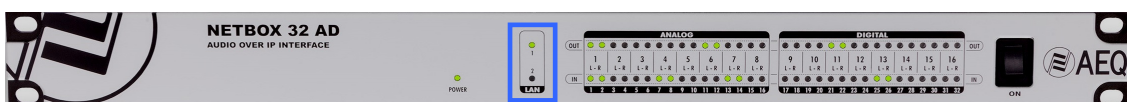   - Off: no local network connection.
    - Blinking green: link is established at data level.

If the unit is wired to a dedicated audio network using a switch, only LAN 1 should be blinking. If the wiring is connected in "Daisy Chain" mode, without switch, or there is a redundant network, both LEDs be blinking.

IMPORTANT NOTE: When there is a redundant network, primary and secondary interfaces must be connected to separated networks.

2.9. NETBOX 4 MH interface. Front panel description.

NETBOX 4 MH includes 2 connectors, LAN 1 and LAN 2, placed on the back panel of the unit, each one with its respective physical link signaling LEDs.

On front panel, there are indicators related to the unit status, communications and audio levels. The ones that are interesting regarding AoIP connection are:

- **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.

LAN 1 must always be wired, while LAN 2 is only wired when the system is installed in "switch" mode or when it is configured to separate control and AoIP networks.

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

2.10. NETBOX DSP matrix. Front panel description.
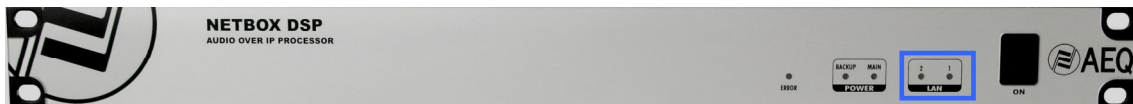
NETBOX DSP includes 2 connectors, LAN 1 and LAN 2, placed on the back panel of the unit, each one with its respective physical link signaling LEDs.

On front panel, there are indicators related to the unit and communications status. The ones that are interesting regarding AoIP connection are:

- **LAN** LEDs: indicate the status of the audio local area network: LAN 1 (main interface) and LAN 2 (secondary interface).
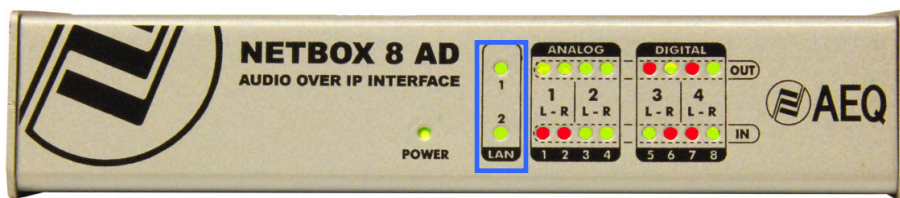
  Status:
  - Off: no local network connection.
  - Blinking green: link is established at data level.

If the unit is wired to a dedicated audio network using a switch, only LAN 1 should be blinking. If the wiring is connected in "Daisy Chain" mode, without switch, or there is a redundant network, both LEDs be blinking.

IMPORTANT NOTE: When there is a redundant network, primary and secondary interfaces must be connected to separated networks.

2.11. CrossNET matrix. Back panel description.

CrossNET includes 2 connectors, AoIP PORT/Dante LAN 1 and 2, placed on the back panel of the unit, each one with its respective physical link signaling LEDs with the following status:

- Off: no local network connection.
- Blinking green: link is established at data level.
- Steady yellow: link is established at 1Gbps (on) or 100Mbps (off).

IMPORTANT NOTE: CrossNET is configured by default in **redundant** mode and this configuration can't be modified. If the unit is wired to a dedicated audio DANTE network using a switch, only port 1 should be connected to the network switch and blinking. When there is a redundant network, primary and secondary interfaces must be connected to separated networks and both should be blinking.

2.12. TP8000 panels. Back panel description.

The panels of TP8000 series include 2 connectors, AoIP PORT/Dante LAN 1 and 2, placed on the back panel of the unit, each one with its respective physical link signaling LEDs with the following status:
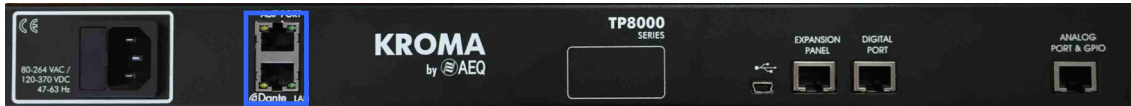
- Off: no local network connection.
- Blinking green: link is established at data level.
- Steady yellow: link is established at 100Mbps (on) or 10Mbps (off).

IMPORTANT NOTE: Panels are configured by default in **switched** mode and this configuration can't be modified (they do **not** allow **redundant** operation).

2.13. OLYMPIA 3 commentary unit. Back panel description.

OLYMPIA 3 includes 3 Ethernet connectors (a main port, placed at the right and printed as "PoE", and two secondary ports), placed on the back panel of the unit, each one with its respective physical link signalling LEDs with the following 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 unit is wired to a dedicated audio network using a switch, in main port 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 switch, in that case the main port and one of the two secondary ports should be used) or there is a redundant network (in that case the main port and the upper secondary port should be used), the green LEDs of the two selected ports should be blinking and the yellow ones should be steady on. In the case of this equipment there are other two configuration options ("USER_VIDEO" and "Redundant&Control") that use the three ports: see section 4.8.3.6 of this manual.

IMPORTANT NOTE: When there is a redundant network, primary and secondary interfaces must be connected to separated networks.

2.14. PHOENIX VENUS V3 audiocodec. Front panel description.

PHOENIX VENUS V3 includes 2 connectors, NET 1 and NET 2, placed on the back panel of the unit, each one with its respective physical link signalling LEDs. NET1 port offers optionally DANTE connectivity (it can be activated by means of a **license**) but can also be used for audio encoded audio transport and for control purposes. However, NET2 port doesn't allow access to the Dante network.

On front panel, there are 9 indicators related to the unit and communication status. The one that is interesting regarding AoIP connection is:

- **SYNC AoIP** LED: indicates the synchronization status of the optional Dante IP input/output interface.

   Status:
     • Blue (steady): properly synchronized with Dante network, acting as slave.
     • Blue (blinking): properly synchronized with Dante network, acting as master. This LED also blinks when no connection is detected on NET 1.
     • Off: the Dante interface of the unit is not activated.

IMPORTANT NOTE: PHOENIX VENUS V3 does **not** allow **redundant** operation.

2.15. SYSTEL IP 16 VoIP ON AIR Telephone System. Front panel description.

SYSTEL IP 16 includes 3 Ethernet connectors (LAN1, LAN2 and WAN) placed on the back panel of the unit, each one with its respective physical link signalling LEDs. LAN1 and LAN2 ports offer DANTE connectivity and, depending on configuraton, can also be used for control purposes. WAN port doesn't allow access to the Dante network.

On front panel, there are indicators related to the unit and communication status. The ones that are interesting regarding AoIP connection are:

- **LAN** LEDs: indicate the status of the audio local area network: LAN1 (main interface) and LAN2 (secondary interface).

   Status:
     • Off: no local network connection.
     • Blinking green: link is established at data level.

If the unit is wired to a dedicated audio DANTE network using a switch, only LAN1 should be blinking. If the wiring is connected in "Daisy Chain" mode, (without switch) or there is a redundant network, both LEDs should be blinking. In the case of this equipment there are 4 different configuration modes: see section 4.8.3.6 of this manual.

IMPORTANT NOTE: When there is a redundant network, primary and secondary interfaces must be connected to separated networks.

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; have in mind that "Dante Virtual Soundcard" does **not** support **redundant** operation.

#### 3.1.1.1. Applications installation.

"**Dante Controller**" application is provided with each system, as an application running on Microsoft Windows 7, 8.1 and 10 environments.

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

- Dante Controller Windows.
- Dante Firmware Update Manager.

The PC must be set up so it automatically obtains an IP configuration from the network (DHCP Enabled).
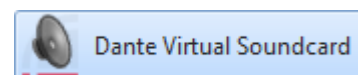
Once installed, the application is run from the Start menu:
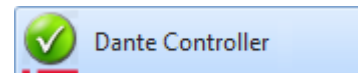
In order to get more information, please check chapter 4 of this manual.

"**Dante Virtual Soundcard**" application can be downloaded from Audinate website.

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 XC24 / BC2214 / BC2224 boards in an ATRIUM / ARENA console or X_CORE - BC2000D - CONEXIA router.

If the ATRIUM / ARENA console or X_CORE - BC2000D - CONEXIA 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 (XC24, BC2214 or BC2224), can be installed in any free back slots of the X_CORE / 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 IP 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 IP 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 IP 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 IP 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 AoIP Dante module on a FORUM LITE / CAPITOL IP console.

The FORUM LITE / CAPITOL IP consoles have their own AoIP Dante module installed and configured from factory to provide 16 Audio over IP inputs and outputs (or 32 depending on version) 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, from here to the shared studio interface 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. The two controls will share Studio and in this a NETBOX 4 MH will be installed to provide the connectivity for the common microphones to consoles and their Headphone outputs. ON-AIR signalling and the programmable keys of the Studio remote panel will also be using the system network.

3.3.1.1. Installation.

o Setup a PC with the control applications as explained in chapter 3.1.
o Double check that the digital mixing consoles are configured as described in chapter 3.2.
o Wire the PC, consoles, NETBOX 8 AD and NETBOX 4 MH in "Daisy Chain" mode according to the diagram (or, preferably, in a star topology by using a switch such as the one recommended in appendix 6).

3.3.1.2. Turning ON.

o 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 AD and NETBOX 4 MH outputs. Start the "Dante Controller" application and send a test audio.

o 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.

PC WITH CONTROL SOFTWARE

NETBOX 8 AD AUDIO INTERFACE — CENTRAL CONTROL AUDIO I/O: LINKS, PROCESSORS, CODECS, MULTILINES...

AEQ DIGITAL CONSOLE — STUDIO AUDIO I/O: MICROPHONES, CD, WORKSTATIONS, SPEAKERS, HEADPHONES...

NETBOX 4 MH AUDIO INTERFACE — STUDIO AUDIO I/O: MICROSPHONES, HEADPHONES, SIGNALLING, ASSIGNABLE KEYS

AEQ DIGITAL CONSOLE — STUDIO AUDIO I/O: MICROPHONES, CD, WORKSTATIONS, SPEAKERS, HEADPHONES...

AEQ AUDIO OVER IP SYSTEM FOR TWO DIGITAL STUDIOS, A RECORDING CABIN AND CENTRAL CONTROL

3.3.1.3. Monitoring audio and creating routes.

o Open the "Dante Virtual Soundcard" for monitoring, or alternatively prepare some receiving channels in the consoles, NETBOX 8 AD or NETBOX 4 MH audio devices in order to receive and monitor audio.
o Subscribe the input channels of each device the output channels corresponding to the Master and NETBOX 8 AD outputs. In order to check the sound from the PC, also subscribe "Dante Virtual Soundcard" to the different master and NETBOX 8 AD output flows.

3.3.1.4. Optimization.

o Check the audio quality and, if possible, adjust its latency.
o You can substitute unicast flows by more than two multicast subscriptions (this is not mandatory in networks that are not too overloaded).
o 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 this example of "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 <u>redundant network</u>, primary and secondary interfaces must be connected to <u>separated networks</u>.

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

- NETBOX 32 Channel interfaces.
- NETBOX 8 Channel interfaces.
- CAPITOL IP mixing consoles.
- FR14 boards to connect FORUM IP mixing consoles.
- XC24 boards to connect ATRIUM consoles and X_CORE / TITAN routers.
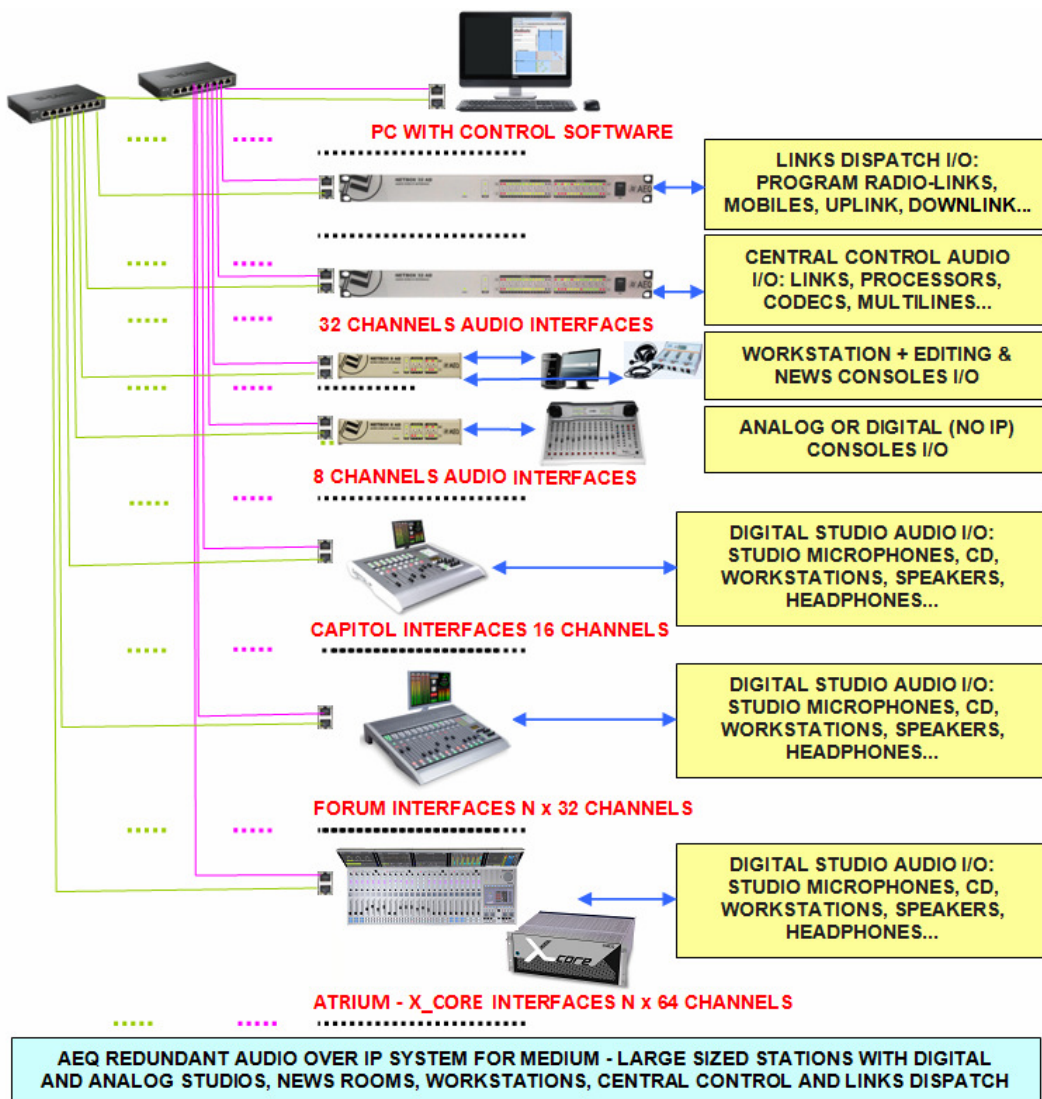
The program audio for all studios, as well as other required signals for the central control (such as clean-feed auxiliary sends for telephone systems, etc) are sourced from the NETBOX 32 AD audio outputs. The signals necessary for the studios, such as satellite downlink, audiocodecs, tuners or TV receivers, 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 channelled 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 or clean-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 LITE, FORUM IP and ATRIUM digital consoles can be provided with the corresponding multi-channel interfaces: One with 16/32 inputs + 16/32 outputs for CAPITOL IP and FORUM LITE and one or more with 32 inputs + 32 outputs for FORUM IP and 64 inputs + 64 outputs for ATRIUM. 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.
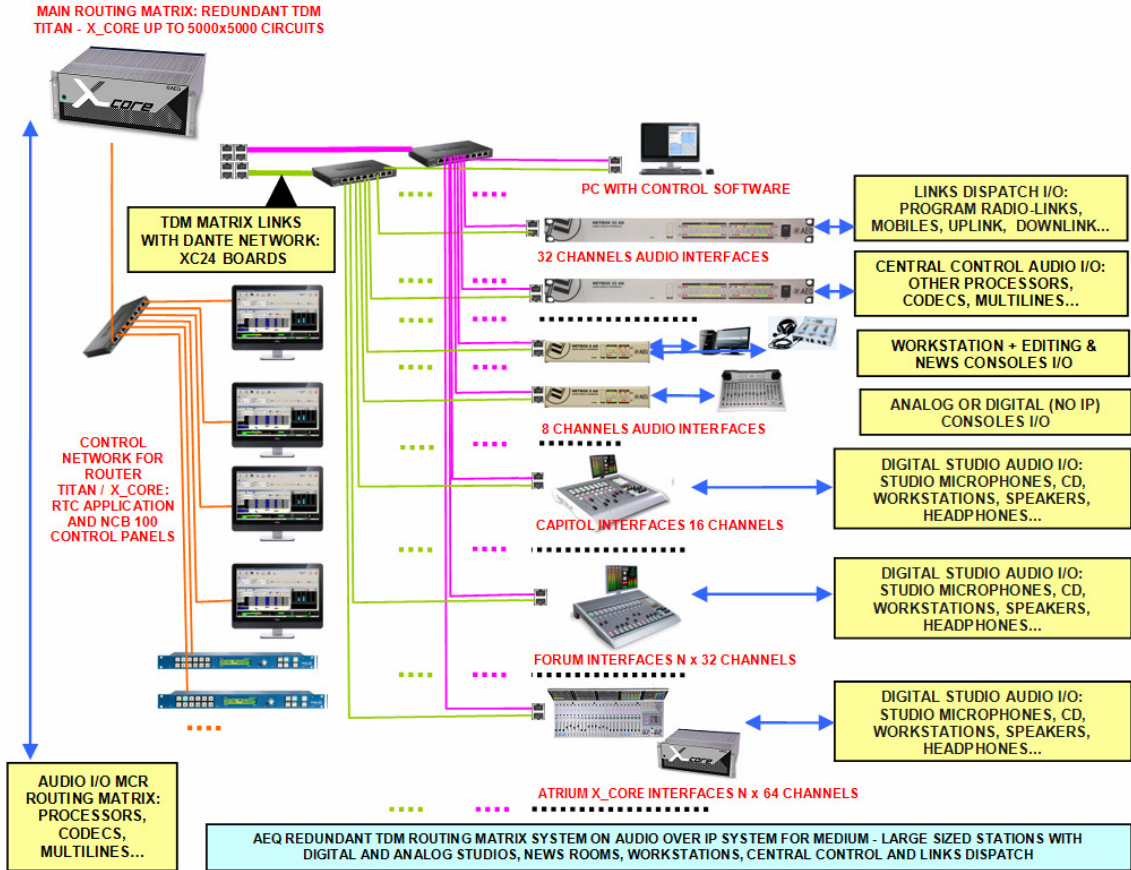
The installation, turn-on, monitoring, routing creation and optimization tasks are equivalent to those described in the corresponding paragraphs in section 3.3.1, except for the differences related to the size and complexity o the system.

3.3.3. AEQ Audio over IP system for medium to large sized stations based on TITAN / X_CORE TDM Matrix.

The following schematic shows on the left new elements compared to the previous example:

- A main matrix to which all audio originating form the Dante network is routed through a through a bank of XC24 cards installed in the TDM matrix frame
- A control network with workstations running layouts of the Real Time Control Application for the matrix and customized Control panels NCB-100 for the distributed and hierarchical control from studios and MCR
- A set of inputs and outputs from the cards installed in the central control (analog, digital, MADI for connection of third party consoles and other sources...)

We benefit that way from the performance of the TDM system (distributed control and processing of the crossing points, audio mixing, alarms, macros and salvoes executed manually or automatically, VU meters, MADI connectivity and E1/T1...) and the ease of installation and flexibility of an AoIP system.

MAIN ROUTING MATRIX: REDUNDANT TDM
TITAN - X_CORE UP TO 5000x5000 CIRCUITS

TDM MATRIX LINKS
WITH DANTE NETWORK:
XC24 BOARDS

PC WITH CONTROL SOFTWARE

LINKS DISPATCH I/O:
PROGRAM RADIO-LINKS,
MOBILES, UPLINK, DOWNLINK...

32 CHANNELS AUDIO INTERFACES

CENTRAL CONTROL AUDIO I/O:
OTHER PROCESSORS,
CODECS, MULTILINES...

WORKSTATION + EDITING &
NEWS CONSOLES I/O

ANALOG OR DIGITAL (NO IP)
CONSOLES I/O

8 CHANNELS AUDIO INTERFACES

CONTROL
NETWORK FOR
ROUTER
TITAN / X_CORE:
RTC APPLICATION
AND NCB 100
CONTROL PANELS

DIGITAL STUDIO AUDIO I/O:
STUDIO MICROPHONES, CD,
WORKSTATIONS, SPEAKERS,
HEADPHONES...

CAPITOL INTERFACES 16 CHANNELS

DIGITAL STUDIO AUDIO I/O:
STUDIO MICROPHONES, CD,
WORKSTATIONS, SPEAKERS,
HEADPHONES...

FORUM INTERFACES N x 32 CHANNELS

DIGITAL STUDIO AUDIO I/O:
STUDIO MICROPHONES, CD,
WORKSTATIONS, SPEAKERS,
HEADPHONES...

AUDIO I/O MCR
ROUTING MATRIX:
PROCESSORS,
CODECS,
MULTILINES...

ATRIUM X_CORE INTERFACES N x 64 CHANNELS

AEQ REDUNDANT TDM ROUTING MATRIX SYSTEM ON AUDIO OVER IP SYSTEM FOR MEDIUM - LARGE SIZED STATIONS WITH
DIGITAL AND ANALOG STUDIOS, NEWS ROOMS, WORKSTATIONS, CENTRAL CONTROL AND LINKS DISPATCH

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

4.1. "Dante Controller" Description.

NOTE: The information included in this manual is valid for software **version 4.2.3.1** (or higher versions).

"Dante Controller" is a software application provided by Audinate which allows users to configure and route media around Dante networks. It is available for PCs running Windows 7, 8.1 and 10, and Apple Macs running macOS 10.12.6, 10.13.6 and 10.14.

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.
- Lock and unlock Dante devices.
- 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:
  - o Changing the device name.
  - o Changing sample rate and clock settings.
  - o Viewing detailed network information.
  - o Access the device web page to upgrade firmware and license information (where supported).
  - o Identify a device for example by flashing LEDs (where supported).
- View network status information, including:
  - o Multicast bandwidth across the network.
  - o 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.
- Transmit and subscribe to AES67 RTP multicast audio flows, and SMPTE ST 2110-30 RTP multicast audio flows (DDM networks only).

The "Dante Controller" installation package also installs "Dante Updater".

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.
- - Standard wired Ethernet network interface (100Mbps or Gigabit) or Wireless LAN (Wi-Fi) interface.

Windows.

Recommended Minimum Requirement:

- - Windows 7 (SP1 and above), 8.1 and 10.

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.

If you are using a third-party firewall product, please refer to Dante FAQs on Audinate's website for more information about Dante ports.

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".

NOTE: "Dante Updater" will also be installed automatically.

4.3.3. Updating "Dante Controller" on Windows.

"Dante Controller" can be updated directly from the application itself.

NOTE: Requires an active Internet connection.

Checking for Updates Manually: From the Help menu, select "Check for Updates".

Checking for Updates Automatically: "Dante Controller" can also check for updates automatically. If an update becomes available, you will be notified via a pop-up message. To activate automatic checking, in the update dialog, select the option to check for updates automatically.

4.3.4. Uninstalling "Dante Controller" on 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 (x86)\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.
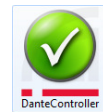
4.5. Configuring "Dante Controller".

"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. "Dante Controller" supports connection to Dante networks via Ethernet and Wi-Fi network interfaces.

The first time "Dante Controller" is run, you may be presented with the Configure Dante Interfaces dialog box, 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.
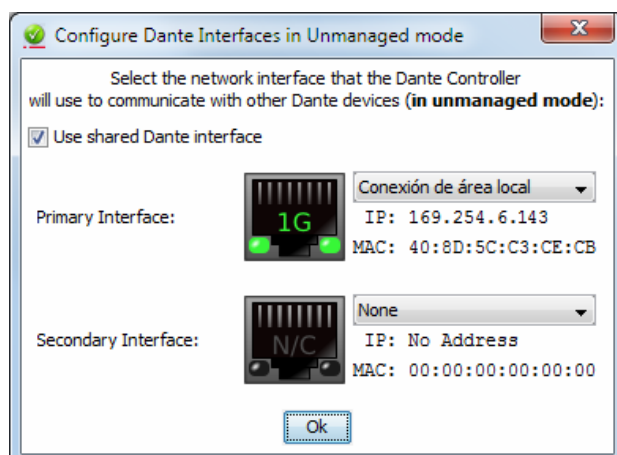
NOTE 1: In DDM networks, "Dante Controller" may use a different interface to connect with Dante devices.

NOTE 2: When connecting a network interface on your computer to a secondary Dante network with no DHCP server, the network interface should be configured with a static IP address in the 172.31.*.* range, with a subnet mask of 255.255.0.0

The icons displayed indicate the selected interface type and status:
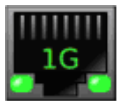
|	
	Operational 1Gbps Ethernet interface
	Operational 100Mbps Ethernet interface
	Disabled / disconnected Ethernet interface, or no interface selected
	Operational Wi-Fi interface
	Wi-Fi interface selected with no Wi-Fi network connection

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

Use Shared Dante Interface.

With this option selected, the selected primary network interface will be automatically used by other Audinate software applications installed on that computer (including Dante Via, Dante Virtual Soundcard and Dante Firmware Update Manager) when they are started. This helps to ensure that all Audinate applications are connected to the same Dante network.
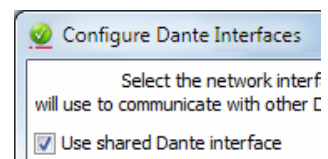
Only wired Ethernet network interfaces are supported in this mode.

With "Use shared Dante interface" deselected, "Dante Controller" is able to connect to any available Ethernet or Wi-Fi network interface, and the selection is fully independent of any other Audinate software applications.

Wi-Fi Network Connections.

To connect to a Dante network via Wi-Fi, a Wi-Fi access point must be present and enabled on the Dante network - for example, a Wi-Fi router physically connected to a network switch or Dante device in the Dante network.

NOTE: <u>Dante audio transmission over Wi-Fi is not supported</u>.

To connect to a Dante network using Wi-Fi:

1. Ensure your Wi-Fi interface is successfully connected to a Wi-Fi network.
2. Ensure "Use shared Dante interface" is deselected.
3. Select your Wi-Fi network interface in the "Configure Dante Interfaces in Unmanaged mode" dialog.

Network Interface Configuration Guidelines.

Primary only (non-redundant) Dante network.

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

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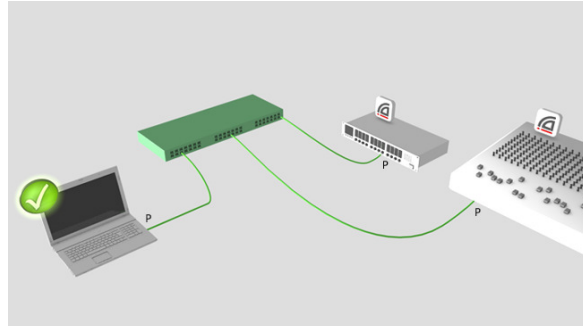
If the laptop has two network interfaces, either can be used.

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

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, the laptop (running "Dante Controller") is connected to the switch via one interface only, which is set as the primary Dante interface.
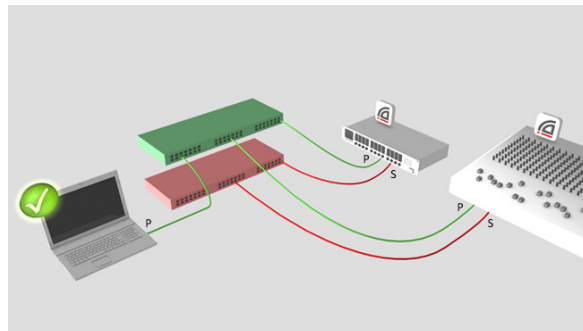
The two Dante devices (the console and the Netbox) are connected to the primary switch via their primary interfaces, and to the secondary switch via their secondary interfaces. The two switches are not connected to each other. This is a typical redundant network configuration for computers with only 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 leader clock is only connected to the primary network, its name will not resolve in the 'Leader 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, 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.
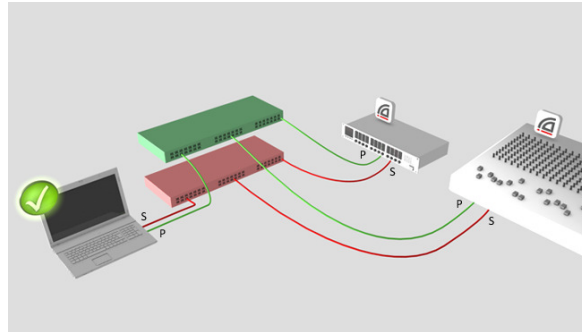
NOTE 1: You must be connected to a standard wired Ethernet network in order to use "Dante Controller". Wireless and other non-standard wired Ethernet interfaces will not appear in the Configure Dante Interfaces dialog.

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.

IMPORTANT NOTE: "Dante Virtual Soundcard" does **not** support **redundant** operation.

Connection via Wi-Fi.

To connect to a Dante network via Wi-Fi, a Wi-Fi access point must be physically connected to the Dante network (either to a network switch, or to a Dante hardware device). The Wi-Fi interface on the "Dante Controller" computer must be connected to the Wi-Fi access point.

In the example, the computer running "Dante Controller" is connected via W-Fi to a Wi-Fi access point connected to the primary Dante network.
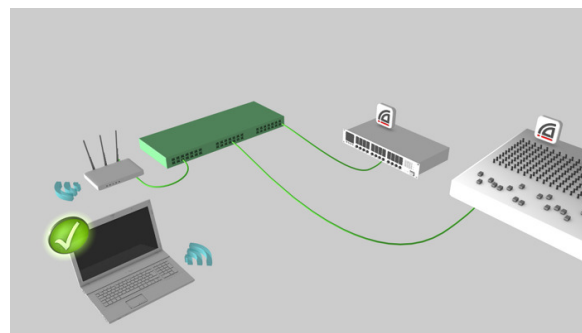
Using Wi-Fi and Multicast Transmit Flows.

When using a Wi-Fi network connection between "Dante Controller" and your Dante network, any multicast transmit flows configured in your network routing can flood the Wi-Fi link, and degrade the performance of the link.

You may be experiencing this condition if:

1. You are using a Wi-Fi network connection.
2. You have multicast transmit flows in place.
3. You observe speed or stability issues with your Wi-Fi connection.

Remedial action.

Remove or reduce the multicast traffic.

The easiest way to remedy this condition is to either remove all multicast flows and use unicast flows instead; or, reduce the amount of multicast bandwidth on the network by removing some multicast flows. There is no hard rule that specifies how much multicast traffic is too much for a Wi-Fi link - the performance of the link is the best real-world indicator.

If you are unable to remove or reduce multicast traffic, there are various ways to filter multicast audio traffic from the Wi-Fi link.

Filter multicast audio at the access point.

Depending on the type of Wi-Fi access point (or AP - typically, a W-Fi modem / router) that you have, it may automatically block 'unregistered' multicast traffic, which is multicast traffic that hasn't been specifically requested by a network device. Because "Dante Controller" will never request to join a multicast audio stream, the AP will never send multicast audio to the "Dante Controller" computer.

It should however allow multicast control traffic – this is important for "Dante Controller", because device discovery in Dante uses a multicast control protocol.

If the AP doesn't automatically block unregistered multicast, you may be able to proactively filter it out using a 'filter multicast' feature in the AP. The feature should filter the high-bandwidth multicast media traffic, but again should allow multicast control traffic. Not all APs feature automatic multicast filtering, or a 'filter multicast' configuration option. Refer to the user manual for your AP for more information.

Connect the AP to a dedicated control port on a Dante device.

Some Dante hardware devices include a 'control port', which is a Dante Ethernet port that automatically filters multicast audio traffic. Control ports should be clearly marked as such on the device.

You can connect your AP to this port, which will enable Wi-Fi connectivity between "Dante Controller" and the network, but the port will not pass multicast audio traffic to the AP. Refer to the user manual for your device for more information.

Enable IGMP snooping on the network switch.

Enabling IGMP snooping on the network switch will block multicast audio to all switch ports unless a device on that port has specifically requested to join a multicast group (stream). This means that multicast audio can flow between audio devices but will not flow over the AP to "Dante Controller". Refer to the user manual for your switch for more information.

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:
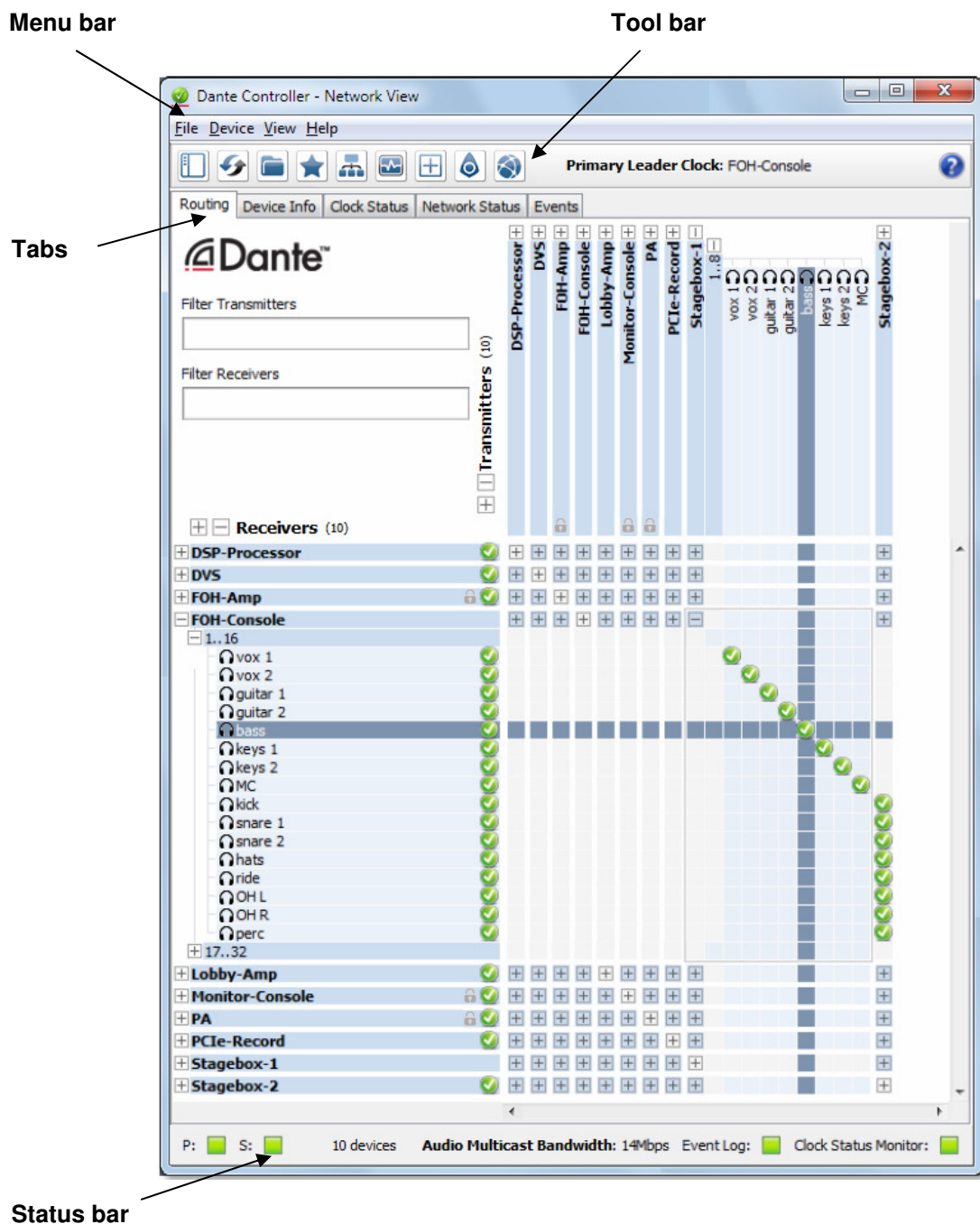
4.7.1. "Network View" Menu Bar.

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.
- "Interfaces": opens the Configure Dante Interfaces dialog.
- "Exit" (Alt + F4): exits "Dante Controller".
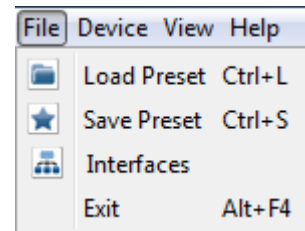
"Presets" operation is described in more detail in section 4.11 of this manual.

"**Device**":
- "Refresh" (F5): refreshes the displayed network / device data.
- "Clock Monitoring": activates the Clock Status Monitoring function.
- "Device View" (Ctrl + D): opens a new Device View window.
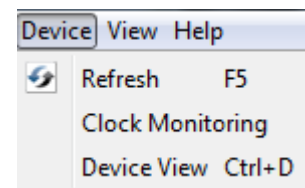
"**View**":
- "Dante Updater" (Ctrl + U): launches "Dante Updater" application.
- "Domain Configuration" (Ctrl + O): allows you to connect to a DDM server (see section 4.10.1).
- "Show Filter Pane" (Ctrl + Caps + F): shows / hides the advanced filter pane.
- "Show Channel Groups" (Ctrl + Caps + G): shows / hides the channel groups.
- "Show Hidden Devices" (Ctrl + E): allows you to view hidden devices (see section 4.10.3).
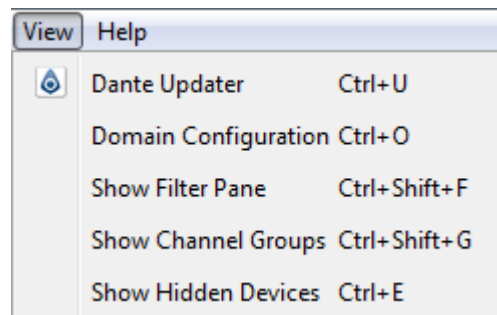
"**Help**":
- "About": shows the "Dante Controller" version, and current event log file location.
- "License": displays the license text.
- "Check for Updates": checks if there are application updates available (requires an Internet connection).
- "Analytics": disable / enable analytics data collection.
- "Online Help" (F1): opens the HTML user guide on the Audinate web server (requires an Internet connection).
- "Offline Help" (Shift + F1): opens a locally-stored PDF of this user guide (may not be the latest version of the user guide).
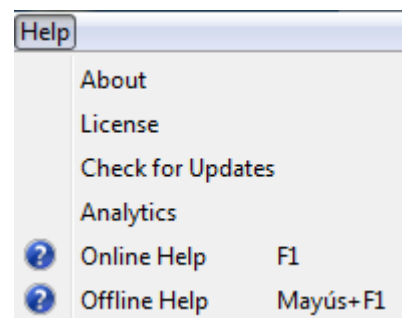
4.7.2. "Network View" Tool Bar.

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

Filter Pane: Shows / hides the advanced filter pane. For more information, check section 4.7.4.1.

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 4.11.

Save Preset: Saves the current audio routing configuration. For more information, check section 4.11.

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.

Dante Updater: Launches "Dante Updater" application. For more information, check section 4.12.

Domain Configuration: enables connection to a Dante Domain Manager server. For more information, check section 4.10.1.

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

To the right of the clock display is the currently-selected domain, and the currently logged in DDM user (when logged into Dante Domain Manager).

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 media multicast bandwidth on the network.
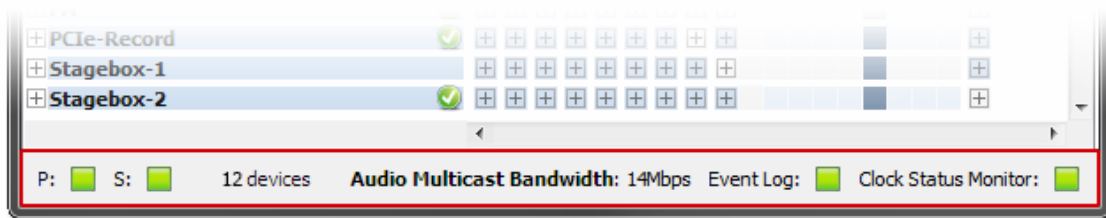

The Status Bar displays the following information:

- **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.
- The number of discovered devices on the network.
- **Audio Multicast Bandwidth:** The current Dante audio multicast bandwidth on the connected networks for unmanaged (un-enrolled) devices. 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.

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

Routing | Device Info | Clock Status | Network Status | Events
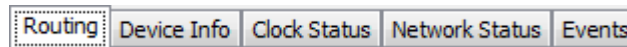
Each of these options is described below.

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 media over the network from at most one transmit channel.

Subscribing to Media 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 a media 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 (from version 3.6.2.4 of "Dante Controller" this routing can be done, and it remains done even if the device cable is removed).

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 Media 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.

Open the advanced filter pane

Enter text to filter the devices list

Expand all Tx devices

Expand all Rx devices

Collapse the device

Collapse the channel group

Expand the channel group

Configure Dante interfaces

Expand the device and view its Tx channels

Ctrl + clic to subscribe all available channels

Open the Events tab

Open the Clock Status Monitor

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.

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 before, entering the string "foh" in either of the Filter fields would display only the FOH-Amp and FOH-Console devices, and their channels.

Advanced Filter.

The Advanced Filter can be used to filter the devices displayed in the Network View Routing, Device Info, Clock Status and Network Status tabs.

Use the Advanced Filter to easily locate or display devices with specific names, channel labels, states or configuration parameters.

To open the advanced filter, click the sidebar button [icon], that changes its color to green when this option is activated

Filter groups (including the text filter) are additive (AND logic, not OR logic). The devices displayed are those that match all specified conditions. For example, entering 'amp' in the text filter and selecting '48k' in the Sample Rate filter will display all devices with the 'amp' string in the device name (or receive channel labels) which are also set to 48kHz sample rate.

Inside a filter group, selections use OR logic. For example, selecting '44.1k' and '48k' in the Sample Rate filter will display all devices set to either of those sample rates.

Text Filter.

The text filter displays devices with device names or receive channel labels that match the text string entered into the Search field.

The device name filter is case-insensitive (capitalization is ignored), and allows alphanumeric characters (a-z, 0-9) and the hyphen character (-). Wildcards are not supported.

To clear the device name filter, just delete the text in the Search field, or click the "Clear All" button.

Device State and Configuration Filters.

The device state and configuration filters can be expanded and collapsed using the plus [+] and minus [-] icons.
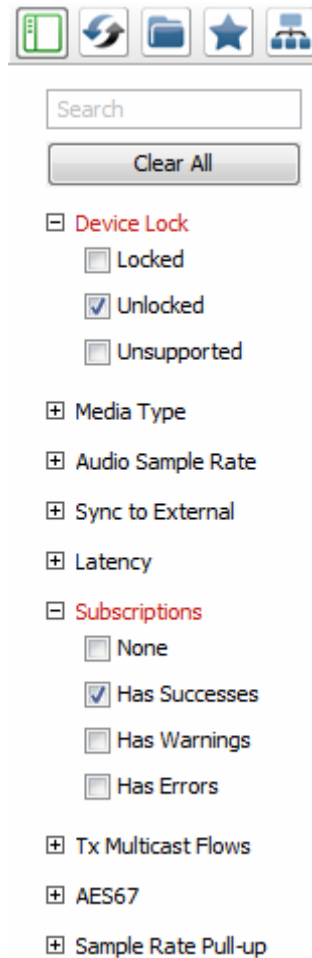
To filter devices for a particular condition or set of conditions, just select the required checkbox or combination of checkboxes.

Use the "**Clear All**" button to clear the selections from all filters.

- **Device Lock** Filter:

  Use the Device Lock filter to display devices with a specific lock state:

    - To display only locked devices, select the 'Locked' checkbox.
    - To display only unlocked devices, select the 'Unlocked' checkbox.
    - To display locked and unlocked devices, select both the 'Locked' and 'Unlocked' checkboxes.
    - To display devices that do not support Device Lock, select the 'Unsupported' checkbox.

- **Media Type** Filter (this filter is not suitable for AEQ equipment):

  Use the Media Type filter to display devices with specific channel types:

    - To display only devices with video channels, select the 'Has Video Channels' checkbox.
    - To display only devices with audio channels, select the 'Has Audio Channels' checkbox.
    - To display only devices with ancillary channels, select the 'Has Ancillary Channels' checkbox.
    - To display devices with a mix of channel types, select the appropriate checkboxes.

- **Video Subtype** Filter (this filter is not suitable for AEQ equipment):

Use the Video Subtype filter to display devices with the selected video format(s).

- **Ancillary Type** Filter (this filter is not suitable for AEQ equipment):

Use the Ancillary Type filter to display devices with specific ancillary channel types.

- To display only devices with USB channels, select the 'USB' checkbox.
- To display only devices with serial channels, select the 'Serial' checkbox.
- To display only devices with IR channels, select the 'IR' checkbox.
- To display devices with a mix of channel types, select the appropriate checkboxes.

- **Audio Sample Rate** Filter:

Use the Audio Sample Rate filter to display devices with a specific audio sample rate setting:

- To display only devices with a particular sample rate, select the appropriate checkbox.
- To display only devices with one of a selection of sample rates, click the appropriate checkboxes.

- **Sync to External** Filter:

Use the Sync to External filter to display devices with a specific Sync to External setting:

- To display only devices with Sync to External enabled, select the 'Enabled' checkbox.
- To display only devices with Sync to External disabled, select the 'Disabled' checkbox.
- To display devices with either setting, select the 'Enabled' and 'Disabled' checkboxes.
- To display devices that do not support Sync to External, select the 'Unsupported' checkbox.

- **Latency** Filter:

Use the Latency filter to display devices with a specific latency setting:

- To display only devices with a particular latency, select the appropriate checkbox.
- To display only devices with one of a selection of latencies, click the appropriate checkboxes.

- **Subscriptions** Filter:

Use the Subscriptions filter to display devices with a specific subscription state:

- To display only devices with no subscriptions, click the 'None' checkbox.
- To display only devices with one or more successful subscriptions, click the 'Has Successes' checkbox.
- To display only devices with subscription warnings, click the 'Has Warnings' checkbox.
- To display only devices with subscription errors, click the 'Has Errors' checkbox.

NOTE: 'Success' will not only display devices with only successful subscriptions – it will also display devices with a mix of successful and failed subscriptions. Similarly, 'Failure' will also display devices with a mix of failed and successful subscriptions.

- **Tx Multicast Flows** Filter:

Use the Tx Multicast Flows filter to display only devices with Tx Multicast Flows configured:

- To display only devices with one or more Tx Multicast Flows configured, select the 'Active' checkbox.

- **AES67** Filter:

    Use the AES67 filter to display devices with a specific AES67 setting:

    - To display devices with AES67 enabled, select the 'Enabled' checkbox.
    - To display devices with AES67 disabled, select the 'Disabled' checkbox.
    - To display devices with either setting, select the 'Enabled' and 'Disabled' checkboxes.
    - To display devices that do not support AES67, select the 'Unsupported' checkbox.

- **Sample Rate Pull-up** Filter (this filter is not suitable for AEQ equipment):

    Use the Sample Rate filter to display devices with a specific sample rate pull-up setting:

    - To display only devices with a particular pull-up, select the appropriate checkbox.
    - To display only devices with one of a selection of pull-ups, click the appropriate checkboxes.

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.
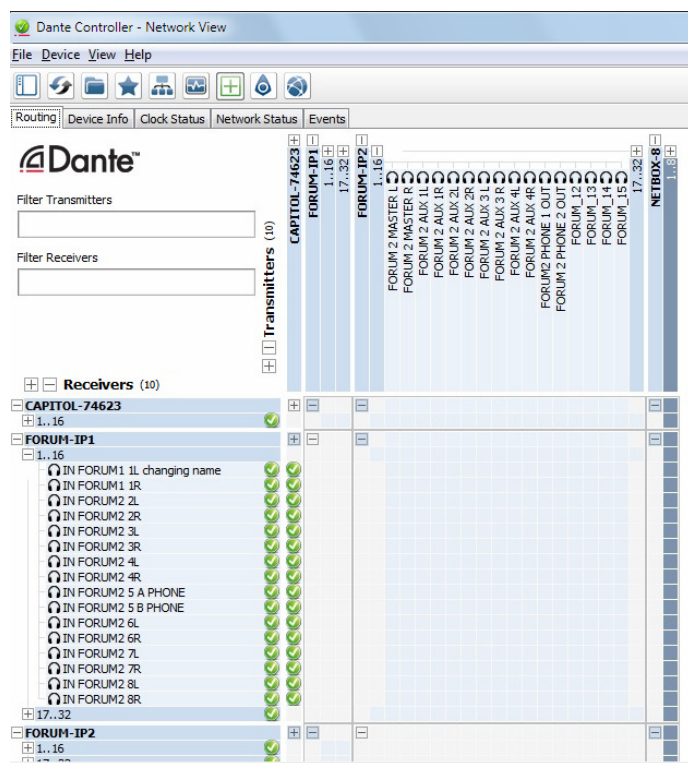
Subscription Tooltips.

Hovering the mouse over a subscription icon in the Routing tab displays a tooltip containing information about the subscription
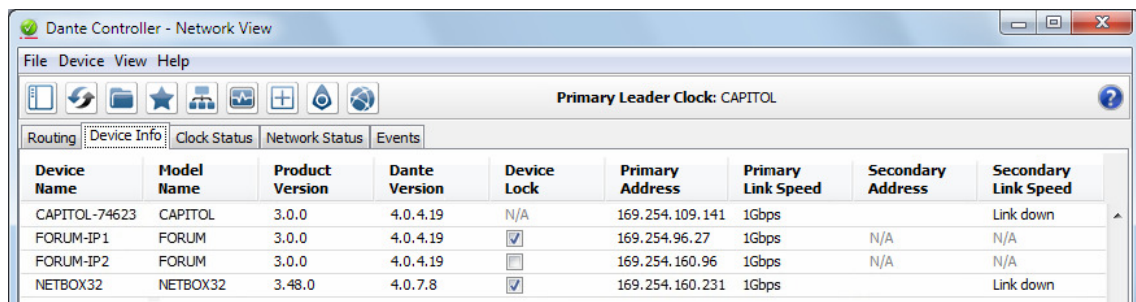
If there is no problem with the subscription, the tooltip will display the Rx channel and device name, plus the Tx channel and device name (for example, "CAPITOL_4" Rx channel of "CAPITOL-IP" device subscribed to "FORUM_4" Tx channel of "FORUM-IP2" device).

CAPITOL_4@CAPITOL-IP <- FORUM_4@FORUM-IP2
Subscription status is: Connected (unicast)
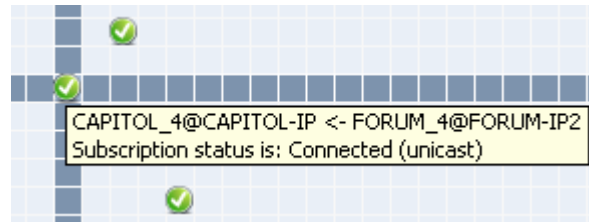
Other messages are displayed if the subscription is in any other state:

- "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 via unicast to the transmitter.
- 'Cannot change: Locked receiver': Indicates a subscription from a locked receiver. Subscriptions from locked receivers cannot be changed.
- 'Warning: Locked transmitter': Indicates that the transmitter is locked. You cannot create new subscriptions to a locked transmitter.
- 'Access control failure: Transmitter is locked': Indicates a subscription that failed because the transmitter is locked.

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.

- Model Name: The model name of the device.

- Product Version: The product version, as defined by the manufacturer.

- Dante Version: The firmware version for hardware devices, or software version for Dante software applications.

- Device Lock: The lock state of the device. You can also click this field to open the device lock / unlock dialog.

- 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.
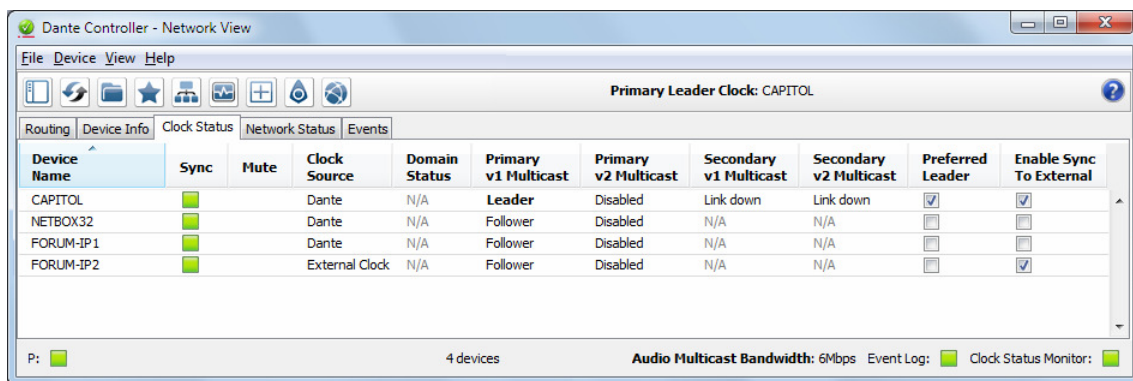
- Primary Link Speed: The Ethernet link speed of the primary interface.

- 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. For DDM networks, devices are grouped into their respective IP subnets.

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 leader clock (but not deriving its clock from an external source).
    - External: The device is deriving its clock from an external word clock source.

- "**Domain Status**" (DDM networks only): Indicates the clock's role for its domain.
    - Leader: The device is the leader clock for the domain.

- Follower: The device is a boundary clock follower (receiving unicast PTP from a domain leader in a different subnet).
- Standby: The device is a backup boundary clock.
- Disabled: The device does not currently have a domain clocking role.
- N/A: The device cannot act as a boundary clock.

- **"Primary v1 Multicast":** Indicates the state of the PTP v1 (Dante audio) clock for the primary interface. Routed DDM networks will indicate a leader clock for each IP subnet.

    - Leader: Device is the current PTP v1 Leader Clock on the primary Dante network.
    - Follower: Device is a PTP v1 Follower 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 leader (follower only), and is waiting for a clock leader 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 leader clock with +0.1% pull-up will be shown as Leader (+0.1%). See "About Clock Domains" section for more information.

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

- **"Primary v2 Multicast":** Indicates the state of the PTP v2 clock for the primary interface, for AES67 or SMPTE-enabled devices. Possible states are identical to those for Primary v1 Multicast.

- **"Secondary v1 Multicast":** Indicates the state of the PTP v1 (Dante audio) clock for the secondary interface. Possible states are identical to those for Primary v1 Multicast.

- **"Secondary v2 Multicast":** Indicates the state of the PTP v2 clock for the secondary interface, for AES67 or SMPTE-enabled devices. Possible states are identical to those for Primary v1 Multicast.

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

If 'Follower Only' is shown instead of a checkbox, it indicates that the device is not capable of acting as a leader 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 leader clock for the relevant clock domain (unless another device has 'Preferred Leader' 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 follower 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 following the external clock.

If N/A is displayed, it means that the device does not support following an external word clock.
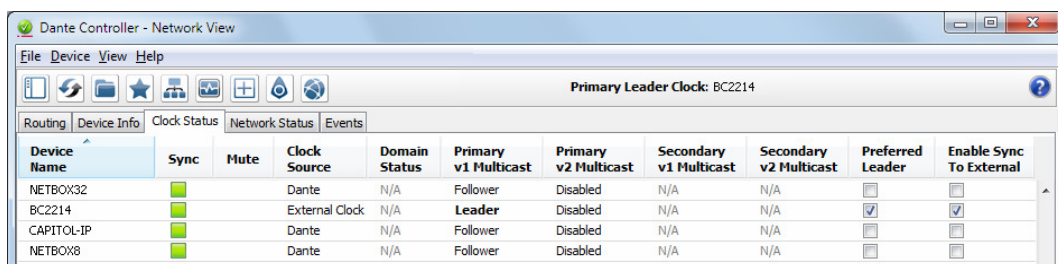
NOTE: If no clock status information is displayed for a particular device, it can indicate a ConMon (Dante control and monitoring service) failure on the device. The device may need to be reset or restored.

The way to configure DANTE synchronism of an **AEQ** device will change depending on if the unit will work in **Leader** or **Follower** mode. In the case of **FORUM, BC2000D** (Matrix or ARENA) and **ATRIUM** it will also depend on if there is one or more DANTE boards (FR14 for FORUM, BC2214/BC2224 for BC2000D and XC24 for ATRIUM) and in the case of **NETBOX DSP** if the model is NETBOX DSP 64 or one of the extended models (NETBOX DSP 96, 128 or 160, with 1, 2 or 3 additional Dante modules respectively).

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

- Device **NETBOX 8**, **NETBOX 32**, **NETBOX DSP 64**, **CAPITOL**, **FORUM** with 1 module FR14, **BC2000D** with 1 module BC2214 or BC2224 or **ATRIUM** with 1 module XC24:

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

    In the case of **NETBOX 4 MH**, **PHOENIX VENUS V3** and **OLYMPIA 3** the configuration is the same, except regarding the "Enable Sync To External" checkbox that is not available in these devices.
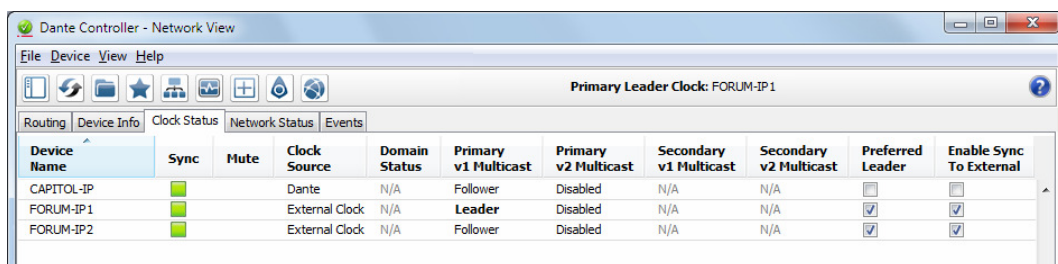

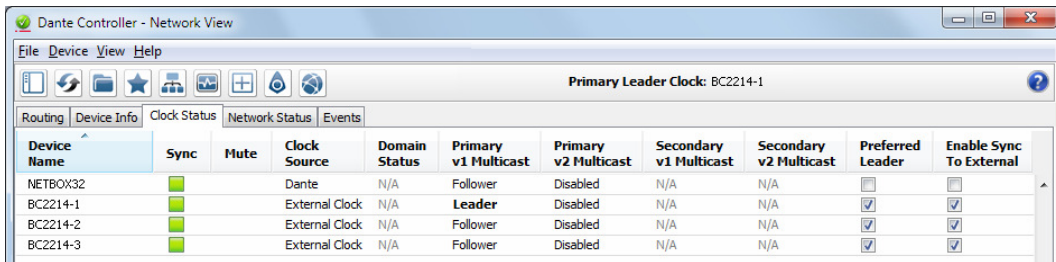| Device Name	Sync	Mute	Clock Source	Domain Status	Primary v1 Multicast	Primary v2 Multicast	Secondary v1 Multicast	Secondary v2 Multicast	Preferred Leader	Enable Sync To External
NETBOX32	■		Dante	N/A	Follower	Disabled	N/A	N/A	☐	☐
BC2214	■		External Clock	N/A	**Leader**	Disabled	N/A	N/A	☑	☑
CAPITOL-IP	■		Dante	N/A	Follower	Disabled	N/A	N/A	☐	☐
NETBOX8	■		Dante	N/A	Follower	Disabled	N/A	N/A	☐	☐

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 IP Setup", "Matrix Setup" or "Console Setup"). This step is not necessary in the case of NETBOX 4 MH, PHOENIX VENUS V3 and OLYMPIA 3.

- Device **FORUM** with 2 modules FR14, **BC2000D** with 2 or more modules BC2214 or BC2224 or **ATRIUM** with 2 or more modules XC24:

    • **Leader** mode**:** in "Clock Status" tab of "Dante Controller" **mark** the "Preferred Leader" and "Enable Sync To External" checkboxes of all the modules FR14, BC2214/BC2224 or XC24.

Device Name	Sync	Mute	Clock Source	Domain Status	Primary v1 Multicast	Primary v2 Multicast	Secondary v1 Multicast	Secondary v2 Multicast	Preferred Leader	Enable Sync To External
CAPITOL-IP	■		Dante	N/A	Follower	Disabled	N/A	N/A	☐	☐
FORUM-IP1	■		External Clock	N/A	**Leader**	Disabled	N/A	N/A	☑	☑
FORUM-IP2	■		External Clock	N/A	Follower	Disabled	N/A	N/A	☑	☑

Example 2

Example 3

- **Follower** 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

- **Follower** mode for **BC2000D** (or **ATRIUM**): in "Clock Status" tab of "Dante Controller" **mark** the "Enable Sync To External" checkbox of <u>all the modules</u> BC2214/BC2224 (or XC24) **except** of the one that will extract synchronism from the link:
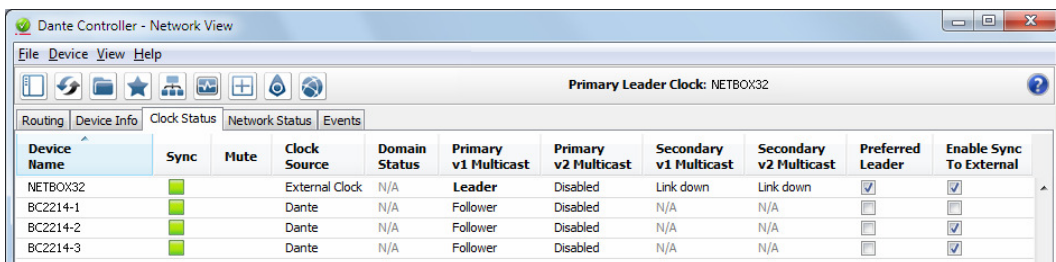 - In the case of **Matrix** (or ATRIUM console) you can prioritize from "Matrix Setup" the synchronism extraction in the boards configured as sync slaves in order to fix beforehand which one will have higher priority for that extraction function.
  - In the case of **Arena** console, it's not possible 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 IP Setup", "Matrix Setup" or "Console Setup").
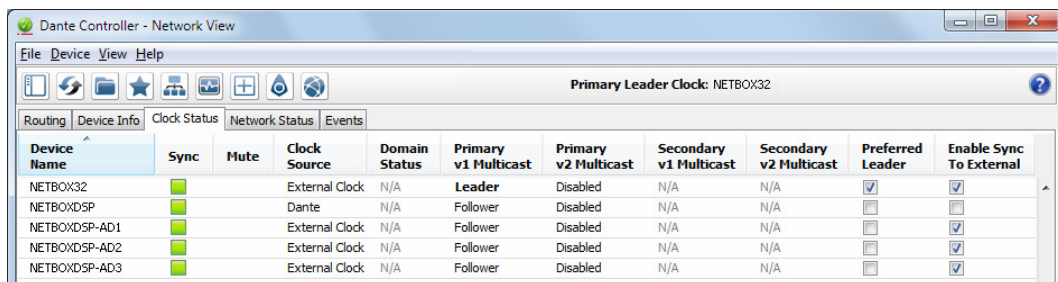
- Device **NETBOX DSP 96**, **128** or **160:**
  - **Leader** mode**:** in "Clock Status" tab of "Dante Controller" **mark** the "Preferred Leader" and "Enable Sync To External" checkboxes of the main Dante module and **only** the "Enable Sync To External" checkbox of the additional modules (1 for NETBOX DSP 96, 2 for NETBOX DSP 128 and 3 for NETBOX DSP 160).

Example 6

- **Follower** mode**:** in "Clock Status" tab of "Dante Controller" **mark only** the "Enable Sync To External" checkbox of the additional Dante modules (1 for NETBOX DSP 96, 2 for NETBOX DSP 128 and 3 for NETBOX DSP 160).

Example 7

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").

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 media to, and receive media 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 media to, or receive media from any devices on the +4.1667% clock domain, or the -1% clock domain, etc.

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

In DDM networks, each Dante domain typically uses its own special clocking domain (except in the case of media sharing between domains, when multiple Dante domains will share the same clock domain).

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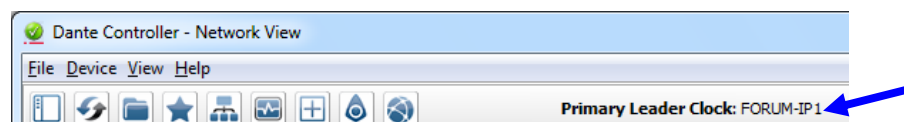
The Dante network leader clock (often also referred to as the 'Primary Leader'), is displayed at all times in the center of the toolbar of the Network View. This is the device that is providing the time sync source for all devices on the network.

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

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

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

NOTE: If the leader clock device is not directly visible to "Dante Controller" (for example, if the leader clock device is for some reason only connected to the secondary network, and "Dante Controller" is only connected to the primary network), the 'Leader 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 leader 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 leader 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 leader 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 leader 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 leader clock, or regains sync with the leader 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.
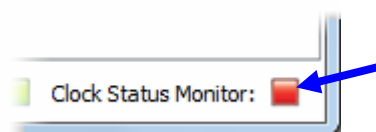
Clicking the icon opens the Clock Status Monitor, which includes 2 tabs:

- "Log": clock status event log.
- "History": clock status histogram.
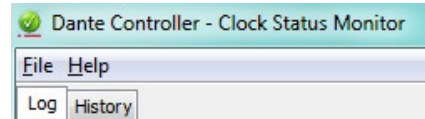
Active Monitoring.

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.
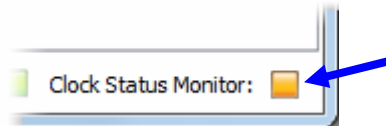
Click the icon to open the "Clock Status Monitor" window.

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.
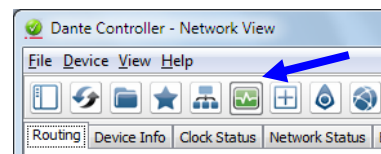
To switch it off, click the button again.

NOTE: Active monitoring does not affect passive monitoring.

Devices including an active supervision DANTE support module are:

- "Brooklyn II" module, incorporated in several AEQ systems described in this manual.
- "Ultimo" module, incorporated in several AEQ systems described in this manual.
- Dante PCIe cards.
- Dante-MY16-AUD cards.

If the device includes a "Brooklyn II" or "Ultimo" module, this is displayed in the "Dante Information" section in the "Status" tab within the corresponding "Device View" window.

"Clock Status Monitor".

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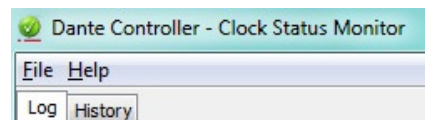
"Log".

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 leader clock.

The event types are:

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

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

<u>Clock Sync Locked</u>: Indicates that a device has regained sync with the leader clock.
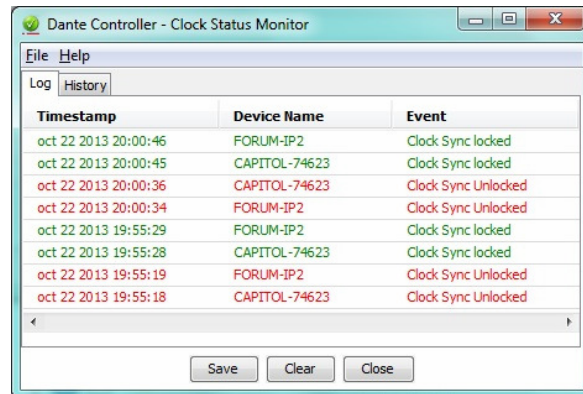
To delete all Clock Status log entries, click Clear. This will reset the Clock Status Monitor icon to green.

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 Leader status.
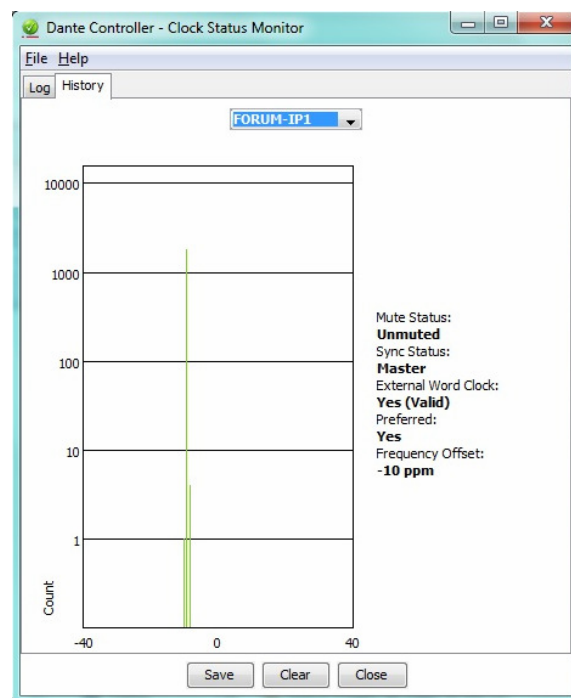
About Clock Offset.

Hardware clocks are based on a vibrating (piezoelectric) quartz crystal. All crystals are slightly different, and vibrate at slightly different frequencies. When a device ('follower') clock wants to sync to a leader network clock, its frequency must be 'pulled' up or down to match the frequency of the leader 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 follower clock will lose sync with the leader 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 leader clock.

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

- Overloaded network links.
- Poorly-implemented EEE (Energy Efficient Ethernet).
- A leader 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.
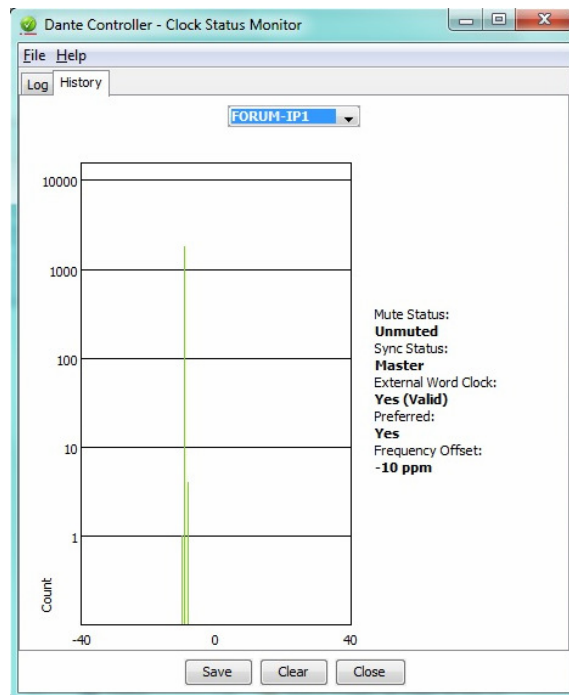
Interpreting the histogram.

The histogram can be seen as an indication of how much work a follower clock is doing to stay in sync with the leader 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 leader 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 leader clock. This can be due to overloaded network links, or poorly-implemented EEE.
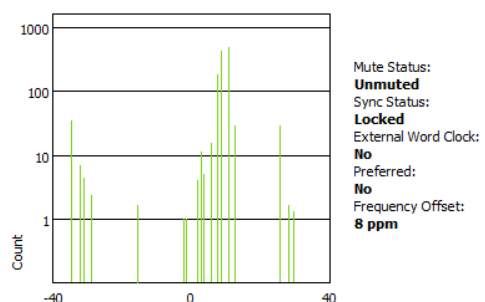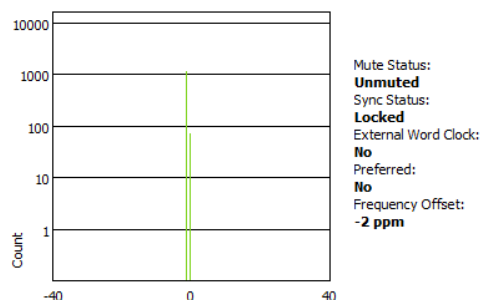
A histogram that shows measurements in amber and/or red indicates a clock that might be currently stable, but has little room for manoeuvre; its offset could easily move outside its pull range, at which point it will lose sync completely. This can result when the leader clock is derived from an inaccurate external word clock.

Mute Status:
Unmuted
Sync Status:
Locked
External Word Clock:
No
Preferred:
No
Frequency Offset:
-30 ppm
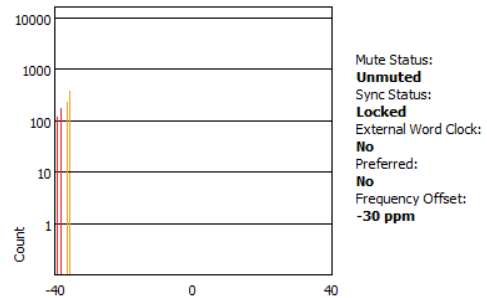
4.7.4.4. "Network Status".
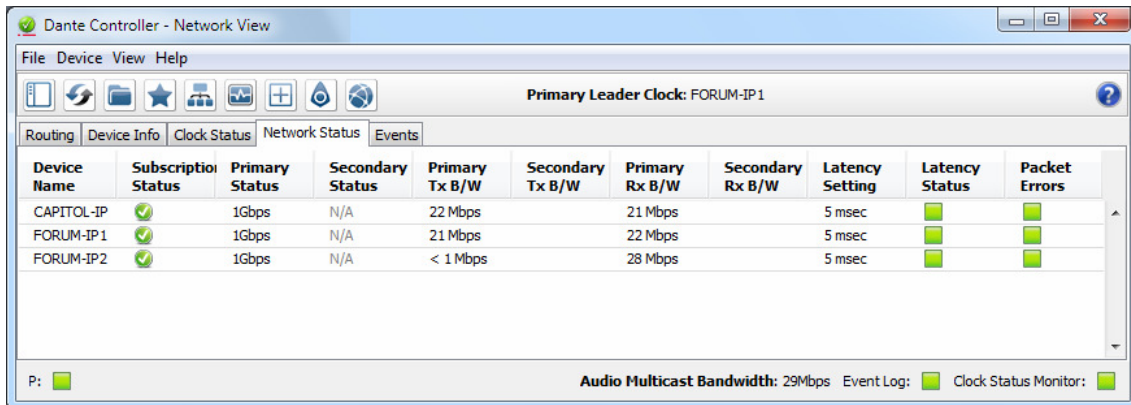
The Network Status tab provides a range of network-related information across all devices in the network.

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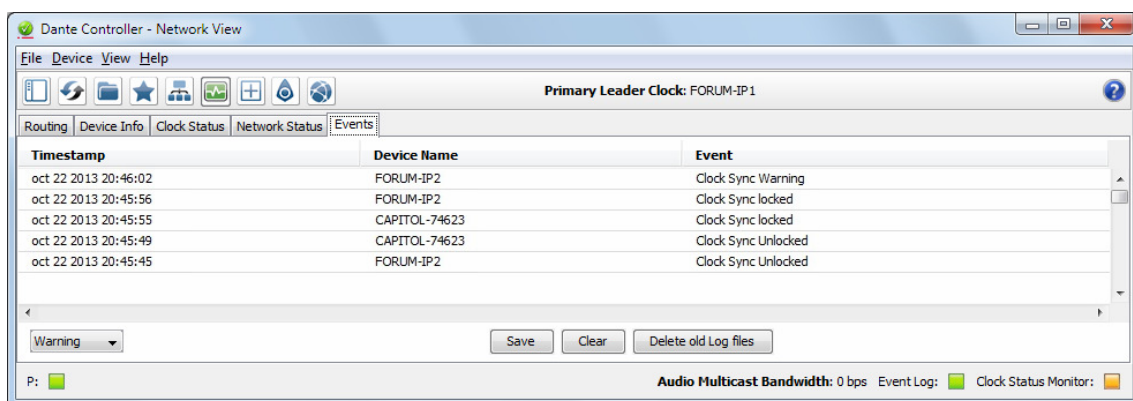
"Dante Controller" continually monitors Dante devices and the network as a whole. It is able to watch for problematic configurations, unexpected problems and communication failures between itself and Dante network devices. Events are displayed and stored in an event log.

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.
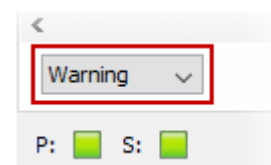
Clearing the Events List.

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 Leader.
- 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 Primary Leader.
- Multiple external clock sources.
- Cannot Elevate to Clock Leader.
- Clock Sync Warning.

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

- Request Timeout Error.
- Response Timeout Error.
- Demotion from Clock Leader.
- Demotion from Primary Leader.
- 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.
- Configuring a DHCP server on the primary network to use the IP address range reserved for secondary link local devices (172.31.*.*).

If you need further information, please refer to "APPENDIX 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. Using "**Dante Controller**": "**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 name of the device being viewed is displayed in the middle of the toolbar. In the screenshot, "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.
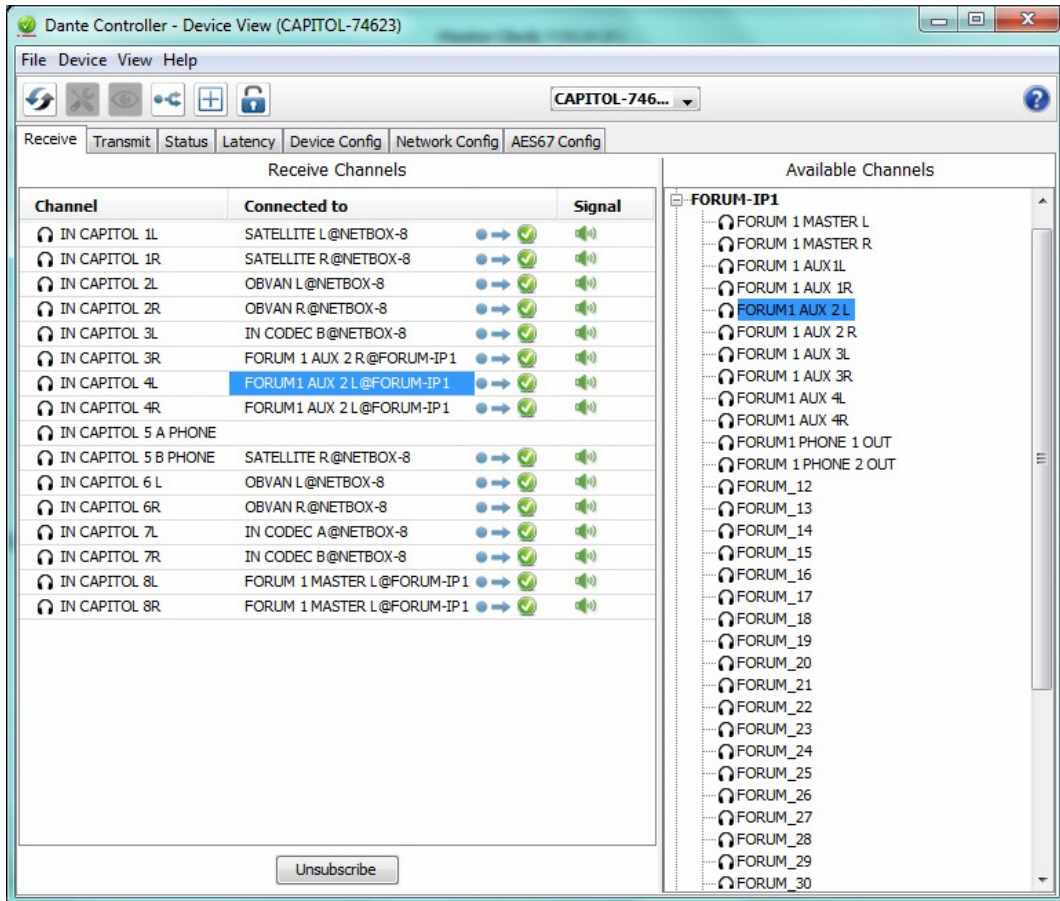
Multiple Device View windows may be opened from the Network View, so that several devices can be examined simultaneously.
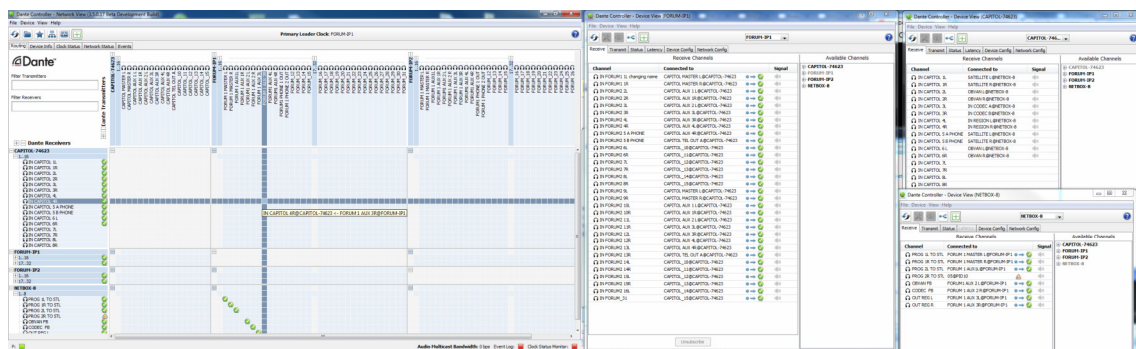
The Device View has up to seven tabs, allowing you to see different information relating to a specific Dante device:
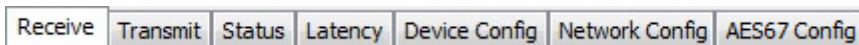
- "Receive": display and configure device's receive (Rx) channels.
- "Transmit": display and configure device's transmit (Tx) channels including multicast
- "Status": device software, clock and network status information.
- "Latency": view latency histograms (supported devices only).
- "Device Config": rename device, change sample rate and set other attributes (as relevant to device type).
- "Network Config": view and edit network configuration.
- "AES67 Config": view and edit AES67 mode 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" (Ctrl + F4).

"**Device**":
-   "Refresh" (F5): Refreshes the displayed network / device data.
-   "Create Multicast Flow" (Ctrl + M).
-   "Identity" (only available for PHOENIX VENUS V3).
-   "Lock / Unlock".
-   "Clear Domain Credentials" (Ctrl + Shift + D).

"**View**":
-   "Show Channel Groups" (Ctrl + Shift + G).
-   "View Flow Information" (Ctrl + F): Display information of transmit and receive flows.

"**Help**":
-   "About": Shows "Dante Controller" version and current log file.
-   "License": Displays the license text.
-   Online Help" (F1): Opens this HTML user guide on the Audinate web server (requires an Internet connection).
-   "Offline Help" (Shift + F1): Opens a locally-stored PDF of this user guide (may not be the latest version of the user guide).

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

There is a tool bar below the Menu bar including seven 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 only available for PHOENIX VENUS V3: when the button is pressed, "SYNC AoIP" LED of front panel starts blinking (although it can be seen only when the unit is acting as slave).

Multicast: Configure multicast transmit flows on the current device.

Channel Groups: Activates / deactivates Channel Groups.

Device Lock: Lock / unlock the device.

Help: Opens this HTML user guide on the Audinate web server (requires an Internet connection).

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 7 tabs below the tool bar that we describe in detail below:
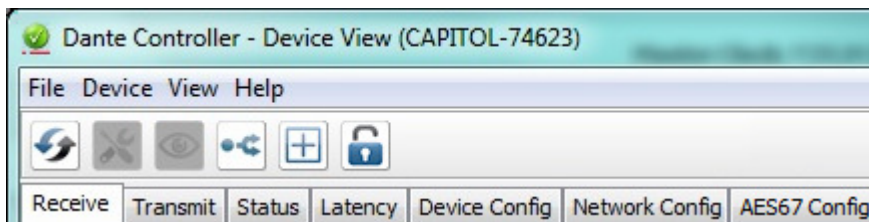
4.8.3.1. "Receive".

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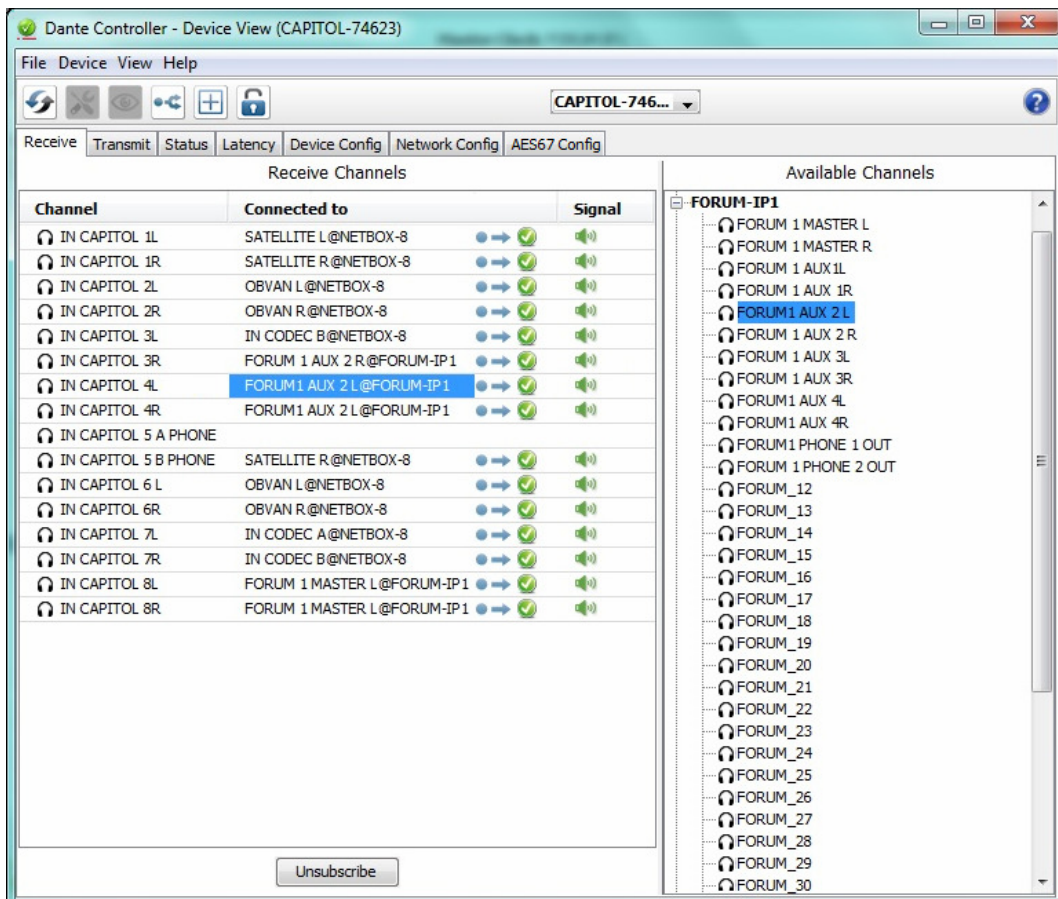
The tab is split into two panes: Receive Channels and Available Channels.

"**Receive Channels**"**:** The receive channels area, shown in the left area of the screen, contains 3 columns:

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

- "**Connected To**"**:** Lists the Tx channel that the receive channel is currently subscribed to, plus the status of both primary and secondary subscriptions, using the following icons.

  Subscription is OK and media 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.

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

- "**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".

"**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 media to itself (from version 3.6.2.4 of Dante Controller this routing can be done, and it remains done even if the device cable is removed).

For devices with many channels, you can click the Channel Groups button to group available channels into sets of 16.

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.
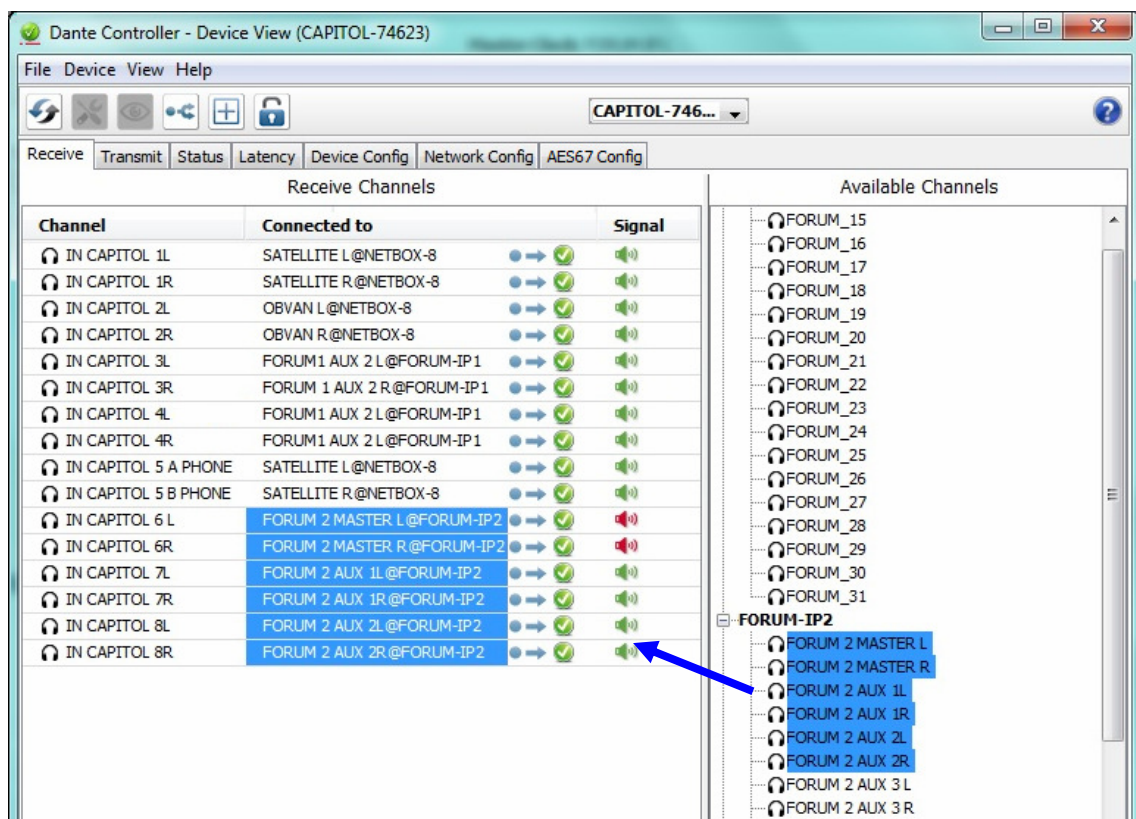
Canceling subscriptions.

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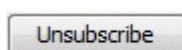
It is possible to cancel more than one subscription at once, by selecting several at the same time (by holding the Ctrl key down) and then clicking on the "Unsubscribe" button (or "Del" key).

4.8.3.2. "Transmit".

The "Transmit" tab is used to inspect and modify the transmit configuration of a device.
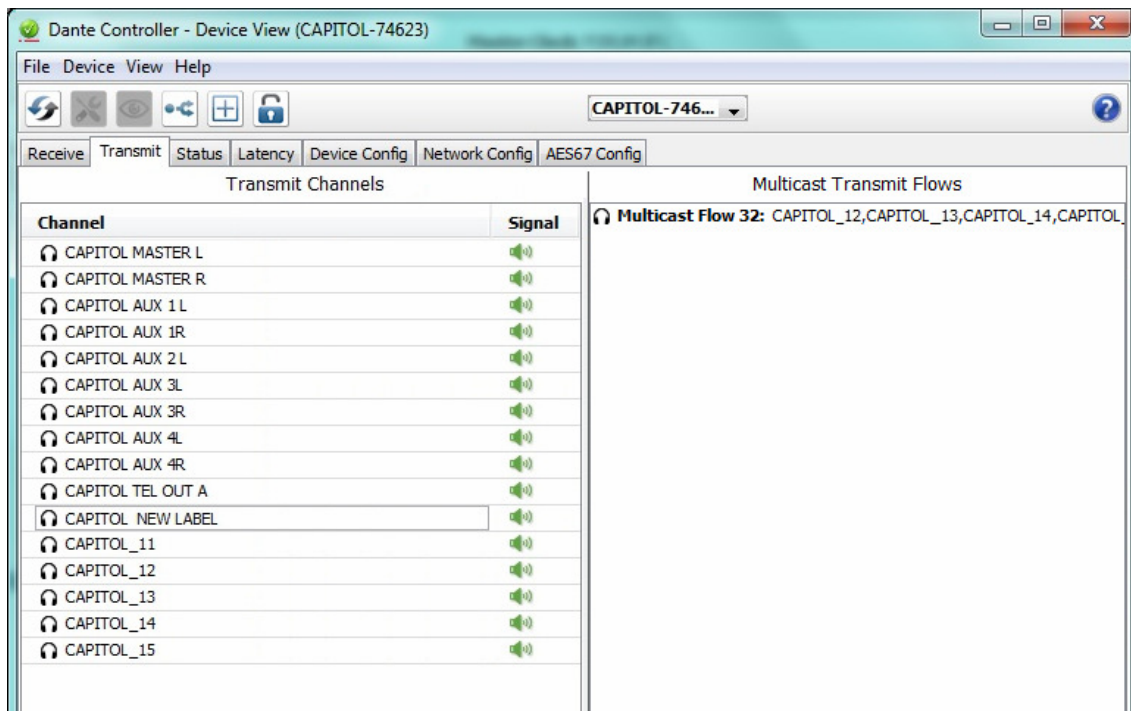
The Transmit Tab is arranged in two areas:

"**Transmit Channels**": The area on the left pane of the tab shows the Tx channels for the device. It allows you to edit channel names (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 names. Tx channel names must be unique for the device.

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.

"**Multicast Transmit Flows**": The area on the right pane of the tab shows 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. NOTE: Unicast flow details are displayed in the Flow Information dialog.

4.8.3.3. "**Status**".

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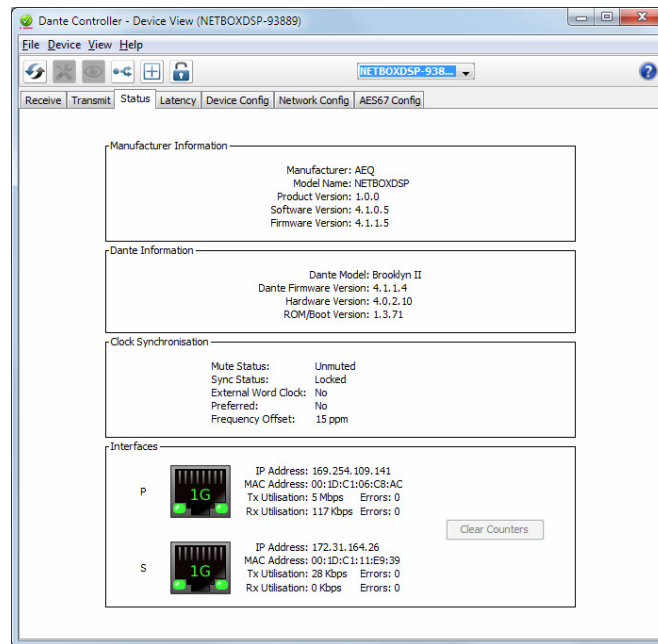
The tab is divided into four sections. The information presented on this tab can be very useful when investigating networking or clocking issues in the system. The Refresh button can be used to update this information if required.

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

The available sections are as follows:

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

- "Manufacturer": The name of the device manufacturer.
- "Model Name": The model name of the 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:

- "Dante Model": The Dante device type.
- "Dante Firmware Version": The version of the Dante firmware running on the device.
- "Hardware Version": The version of the hardware firmware running on the device.
- "ROM/Boot Version": The version of the ROM or bootloader.

"**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 leader mode. 'Yes' indicates that the card is set to preferred leader mode.
- "Frequency Offset": Indicates the offset from the network clock leader 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 button "Clear Counters" allows you to reset the packet errors history for the device.

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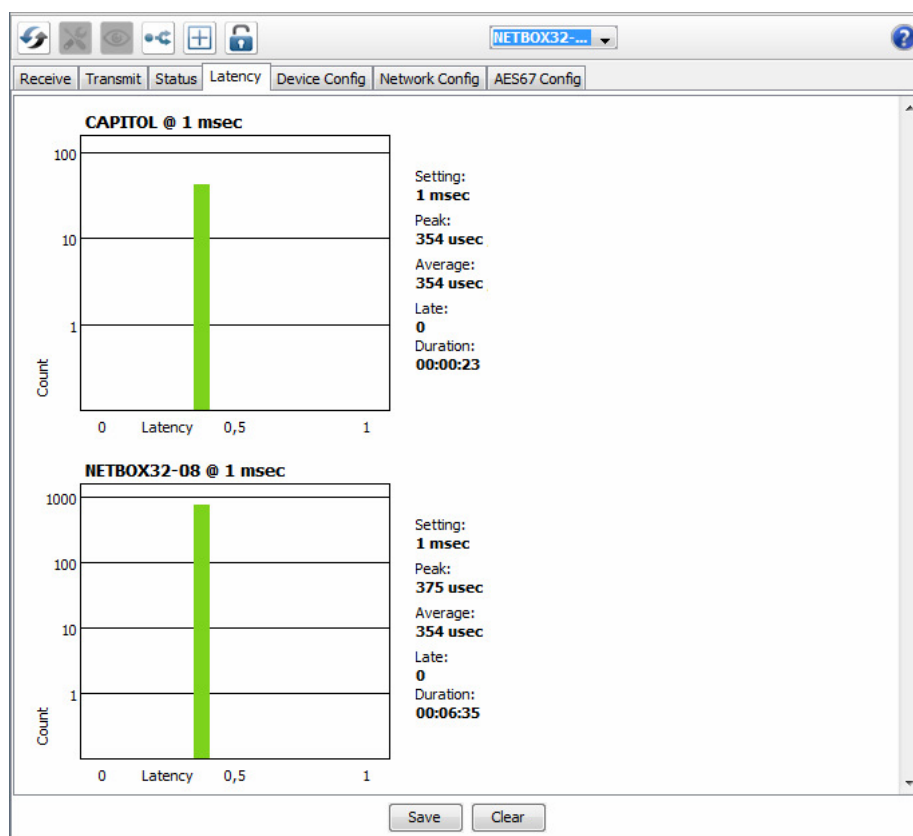
To clear the histogram, click Clear. Latency measuring will then restart.

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.
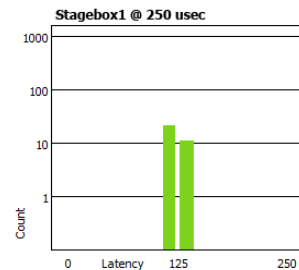
If any bars are amber, it means that some packets are arriving near the limit of the latency setting. Network traffic fluctuations could potentially lead to extra delay which could cause packets to arrive late. A histogram of this type indicates that the receiver latency should be increased if possible..
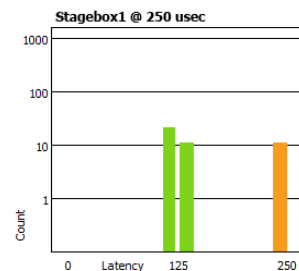
If any bars are red, it indicates lost packets, and audio loss. The receiver latency should be increased, or the network reconfigured.
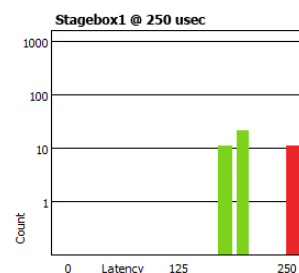
4.8.3.5. "Device Config".

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", "Encoding" ("Preferred Encoding") and "Clocking" ("Unicast Delay Requests"). The remaining parameters are configured from its own user interface on the PC or Mac.
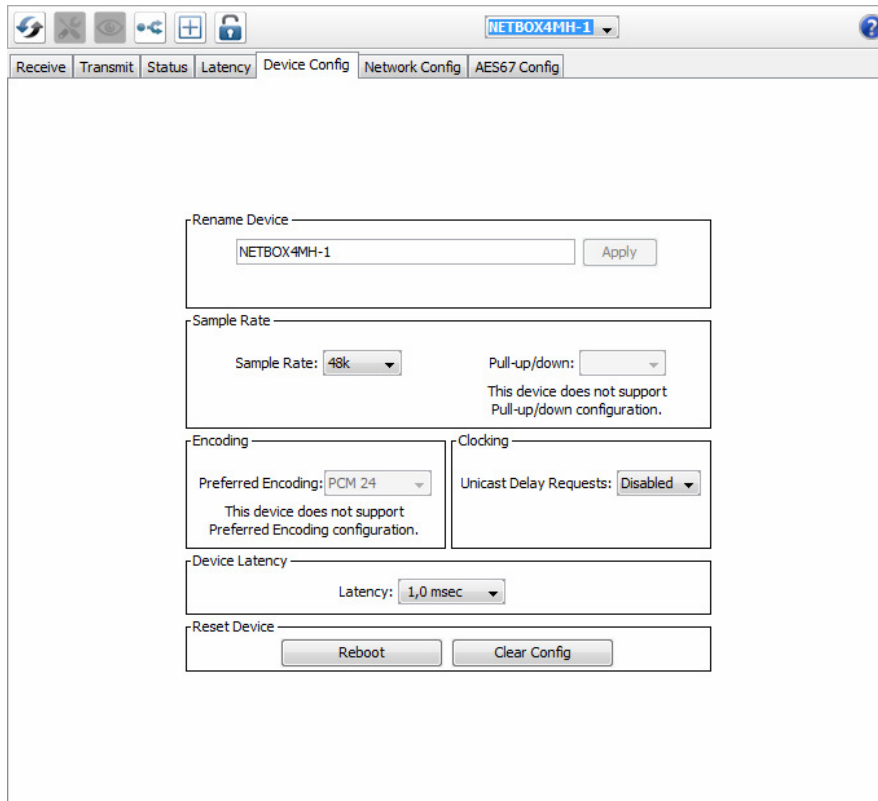
These are the configurable parameters:

- "**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:
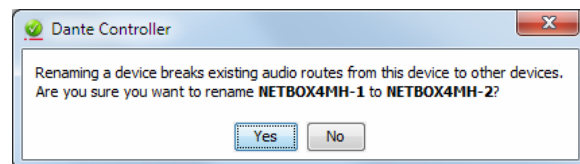
  See 1.4.3 chapter for information about name conflicts and device name rules.

- "**Sample Rate**":
  - "**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 preferred encoding. This parameter is only available for "**Dante Virtual Soundcard**". Select a value and click "Yes" to modify it.

- "**Clocking**": Delay requests are messages sent by clock followers to the clock leader to establish the time it takes for data to traverse the network between the devices. By default, delay requests are multicast messages, and in networks with lots of devices, they can add up. Enabling "**Unicast Delay Requests**" forces clock follower devices to send delay requests to the clock leader using unicast instead, which reduces multicast traffic.

  NOTE: "Unicast Delay Requests" does not have to be enabled on the clock leader, only on the clock seguidores.

  IMPORTANT NOTE: Some older Dante devices do not support Unicast Delay Requests. Before enabling the feature for your clock followers, check that your current clock leader supports the feature, by attempting to enable it for the device. If the clock leader device does not support unicast delay requests, do not enable it on your clock followers (it may prevent your devices from synchronizing). You can however choose an alternative clock leader that does support it, and then enable it for the clock followers that also support 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 in the drop down menu and click "Yes" to apply the latency to all flows that the device is receiving.

  IMPORTANT NOTE: 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:
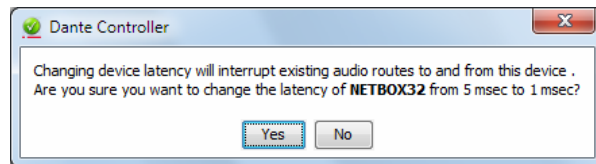
  NOTE: DANTE networks feature an extremely low latency. The 150 µsec option is not available for devices including an internal switch, as all AEQ AoIP devices. Taking into account these internal switches and connecting two units using a simple straight cable, we already have two switches, and if one more is connected in between, we now have three. The maximum latency value recommended by AEQ is 1 msec, still allowing for network topologies of certain complexity. 5 msec latency is still unnoticeable, so in case that audio cut-offs appear, it can be increased to 2 or 5 msec. The "Dante Virtual Soundcard" must be configured from its own PC window to 4, 6 or up to even 10 msec.

  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:

  - o   User-defined device name.
  - o   User-defined channel labels.
  - o   Clock configuration (clock leader / external clock leader setting).
  - o   Static IP addresses.
  - o   Redundancy configuration.
  - o   Sample rate setting (including pull-up/down).
  - o   Latency setting.
  - o   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).
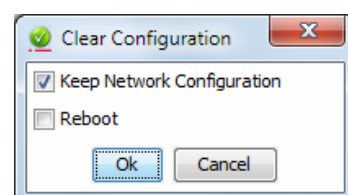
A reboot is required after clearing the configuration for the changes to take effect. Some devices will allow you to automatically reboot after clearing the configuration. If this option is not available, a manual reboot is required.

4.8.3.6. "**Network Config**".

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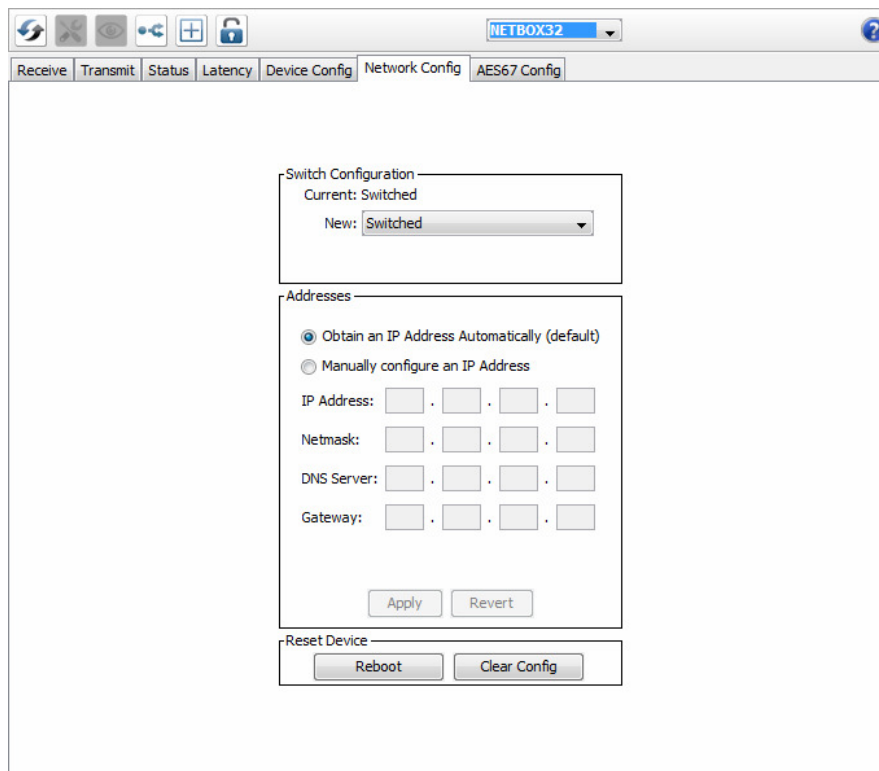
The available sections are:

- "**Dante Redundancy**" / "**Switch Configuration**": 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.

    - "**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 (except NETBOX DSP).
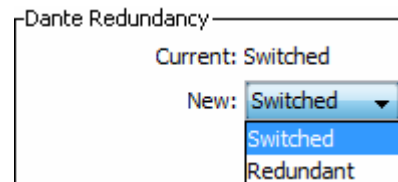
    - "**Redundant**": When a device is set to Redundant, the device will duplicate Dante audio traffic to both Ethernet ports, allowing the implementation of a redundant network via the secondary port. Not all devices support redundancy. All AEQ devices covered by this manual include two Ethernet ports, but two of them (NETBOX 4 MH and PHOENIX VENUS V3) don't support this feature.

        IMPORTANT NOTE: When there is a redundant network, device primary and secondary interfaces must be connected to **separated networks.**

In the case of **NETBOX 8**, **NETBOX 32** and **NETBOX DSP** there are 2 additional options:

- "**Redundant-control-only-primary**"
  (for firmware version 4.0.4.22 or higher)**:** This option configures the devices as redundant but the control of the unit at local level (by means of "NetBox Tool" application) can be accomplished only through primary network. When the configuration of a device is changed from this option to "Redundant" (or vice versa) you must press the "Refresh" button after rebooting the unit in order to get the information correctly shown.

- "**Primary&Control**" (for firmware version 4.0.9.2 or higher)**:** This option separates Dante primary network and local control network (the one associated to "NetBox Tool" application). The first one is accesed only through upper Ethernet port and the second one through lower Ethernet port. In this case there is no Dante secondary network.

In the case of **SYSTEL IP 16** there are 4 options available:

- "**Redundant**"**:** This option configures the devices as redundant (LAN1 gives access to Dante primary network and LAN2 to the secondary one) and the control of the unit at local level can be accomplished through any of them. The third port (WAN) is used for VoIP SIP signalling calls.

- "**AoIP_LAN/WAN**"**:** This option configures the devices as redundant (LAN1 gives access to Dante primary network and LAN2 to the secondary one) and the control of the unit at local level can be accomplished only through the third port (WAN), that is also used for VoIP SIP signalling calls.

- "**AoIP_LAN_WAN**"**:** The port LAN1 gives access to Dante primary network, the port LAN2 allows you to control of the unit at local level and the port WAN is used for VoIP SIP signalling calls. In this case there is no Dante secondary network.

- "**Redundant primary only control**"**:** This option configures the devices as redundant (LAN1 gives access to Dante primary network and LAN2 to the secondary one) and the control of the unit at local level can be accomplished only through LAN1. The port WAN is used for VoIP SIP signalling calls.

In the case of **OLYMPIA 3** there are 4 options available:

- "**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. In this case any of the 3 ports provides Dante connection (there is only primary network) and control of the unit at local level.

- "**Redundant**"**:** This option configures the devices as redundant: the primary interface is the one printed as "PoE" and the secondary one is the upper port of the double connector (the lower port is not operative in this case). The control of the unit at local level can be accomplished through any of those 2 ports (the lower port of the double connector is not operative for control purposes either).

- "**USER_VIDEO**"**:** This option works the same way as "Redundant" option but the lower port of the double connector can be used to connect an auxiliary equipment to the network (IP video monitor, PC, etc).

- "**Redundant&Control**": This option works the same way as "Redundant" option but the <u>control</u> of the unit at local level can be accomplished only through the lower port of the double connector, therefore the AoIP and control networks are separated.

- "**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: Redundancy configuration and assigning static IP addresses require a device reboot.

4.8.3.7. "**AES67 Config**".

For supported devices (Brooklyn II v3.9.x devices and up, and Ultimo X), the "Device View" also includes an "AES67 Config" tab that allows the selection of AES67 mode for the device.
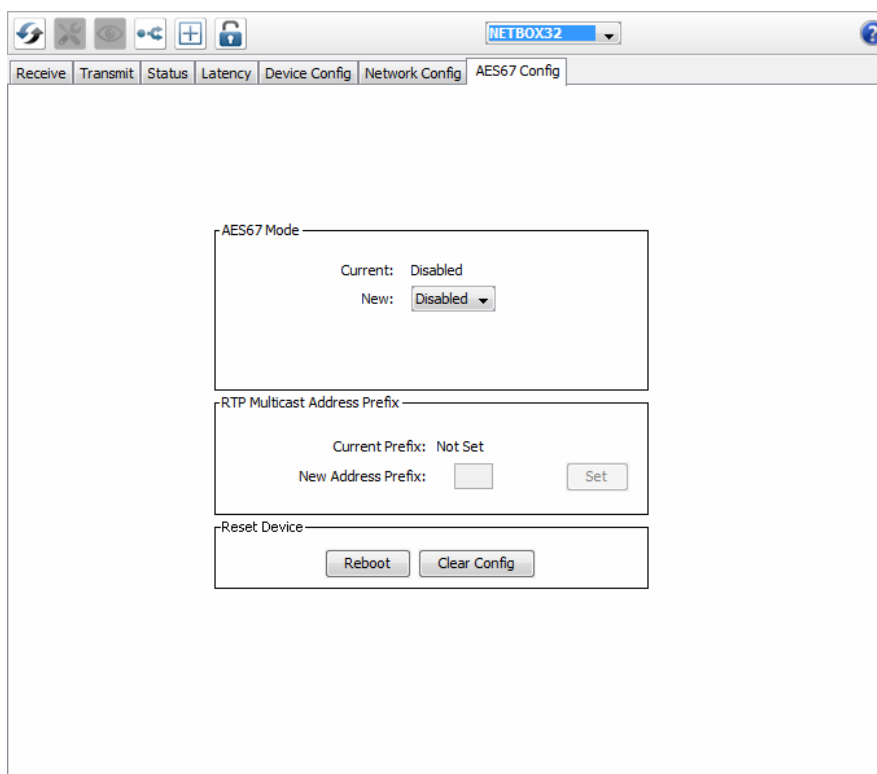
AES67 is a standard for audio over IP interoperability. Devices in AES67 mode are able to transmit and receive AES67 multicast flows to / from non-Dante AES67-enabled devices. Between Dante devices, Dante's native audio transport protocol is used instead (even when AES67 is enabled for both devices).

NOTE: When the device is enrolled in a domain, AES67 configuration is controlled via DDM instead, and the "AES67 Config" tab is not available.

- "**AES67 Mode**": Select "Enabled" to enable AES67 mode for the device. Use the "Create Multicast Flow" panel to create AES67 flows.

- "**RTP Multicast Address Prefix**": You can use the "RTP Multicast Address Prefix" field to specify a multicast subnet, for cases where device(s) on your Dante network are fixed to a particular address range.

NOTE: Presets do not support AES67 flows.

AES67 configuration in order to exchange audio with RAVENNA or other AES67 implementations involves several applications and every single case must be evaluated with the manufacturer of the other unit. Generally AEQ is not offering this service as a usual technical support, so it's partially out of its control. If you need this service, please check price and viability with our Sales Department, dependent on the availability of the other manufacturer.

Compatibility with Digigram and Genelec units has been verified and questions about that can be answered.

The configuration procedures with different manufactures are published as application notes in: http://www.aeqbroadcast.com/products/aeq-aoip-networking

4.9. Using "Dante Controller": Flow Information.

The Flow Information Summary dialog displays any audio, video or ancillary flows to and from the device.

To open the Flow Information Sumarry dialog, open the Device View for the device and select View > View Flow Information.

In the example below, the device supports 32 audio transmit flows and 32 audio receive flows.
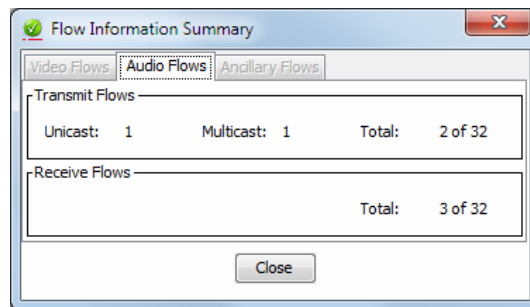
4.9.1. Multicast Transmit Flow Configuration.

Click the button [icon] of Device View tool bar or select the "Create Multicast Flow" option in "Device" drop-down menu to open the Create Multicast Flow dialog box that allows the user to aggregate several channels to a new multicast flow.
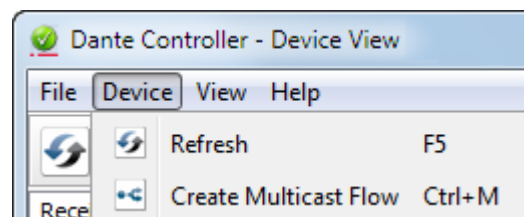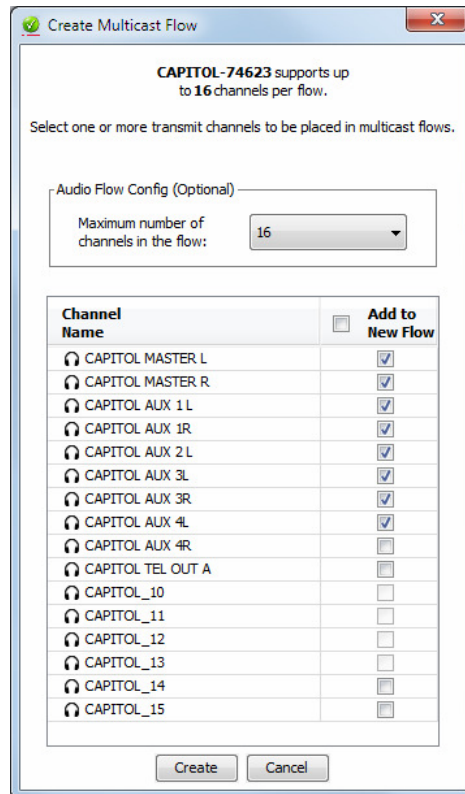
This window shows a list of the Tx channels for the device, and allows you to add them to the new multicast flow that is being created, by checking the tick box next to each channel name. You can add all the device channels at once by checking the tick box next to "Add to New Flow". Once you have selected 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 16 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.
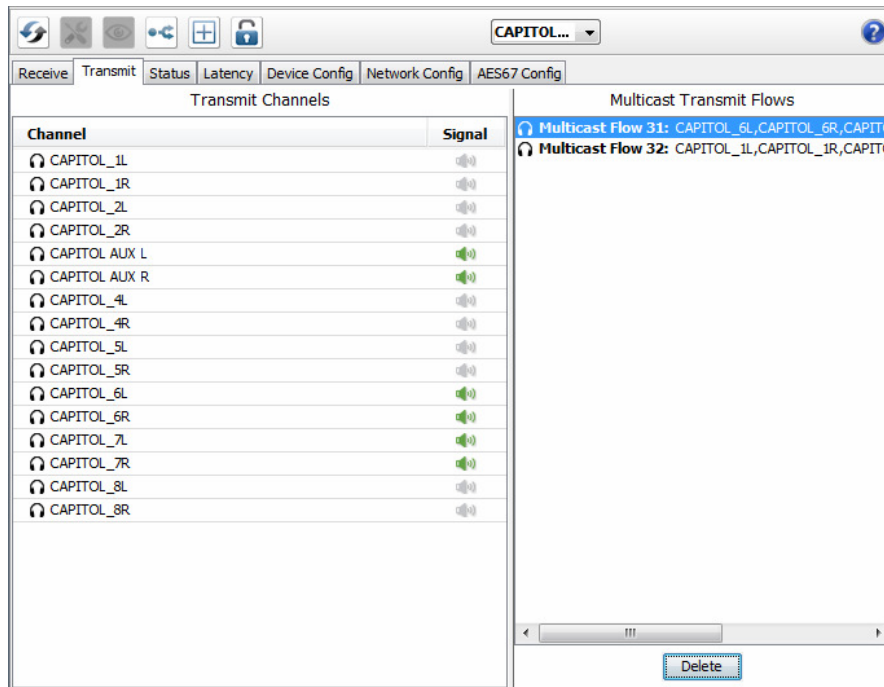
By default, Dante devices 'prefer' multicast over unicast. When you click a transmit channel to make a subscription, the receiver will automatically connect to the channel via a multicast flow, if one exists. Likewise, when a channel that did not form part of an existing multicast flow is added to a 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.
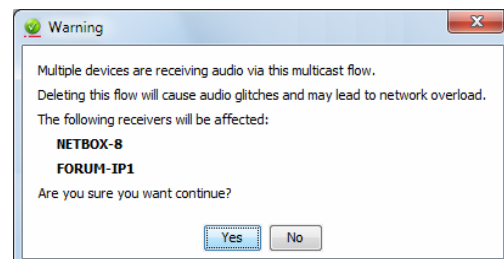
A good rule of thumb is to use multicast when there are more than two receivers for a specific audio channel. You should also assume that the flow will flood throughout the entire network, and therefore consume bandwidth on all network links.

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. Using "Dante Controller" with "Dante Domain Manager".

"Dante Domain Manager" (DDM) is a complete management solution for Dante systems. With DDM, integrators can define specific AV device groupings, by room, building and site, allowing for the creation of independent Dante Domains, and enabling a single Dante Domain to encompass multiple network subnets.

DDM provides robust security for IT departments and AV managers, including user authentication and encrypted control, role administration and integration with Active Directory. System managers gain complete visibility and accountability with a suite of dashboards, audit trails, alerts and SNMP support.

DDM is a virtualized application that runs on desktop and server platforms, with an intuitive and highly responsive web interface for desktop, tablet and mobile browsers.

For more information about DDM, please refer to Audinate website.

4.10.1. Viewing Domains in "Dante Controller".

To view enrolled devices in "Dante Controller", the user must connect to the DDM server using their configured DDM credentials, and then select the appropriate domain for viewing.

To connect to a DDM server:

1. Click the button in the "Network View" toolbar.
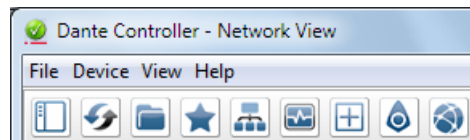
The DDM User Login dialog is displayed:
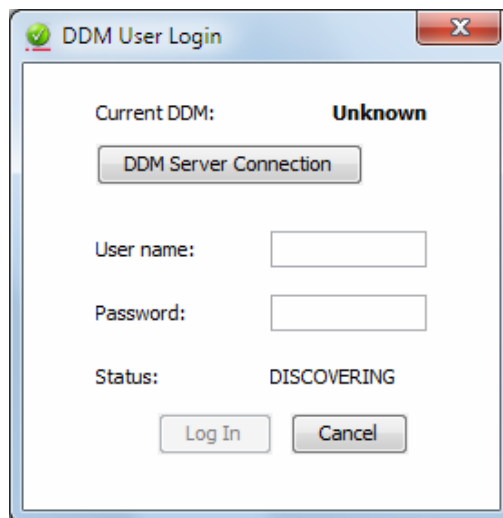
2. Click DDM Server Connection. The DDM Server Connection dialog is displayed:
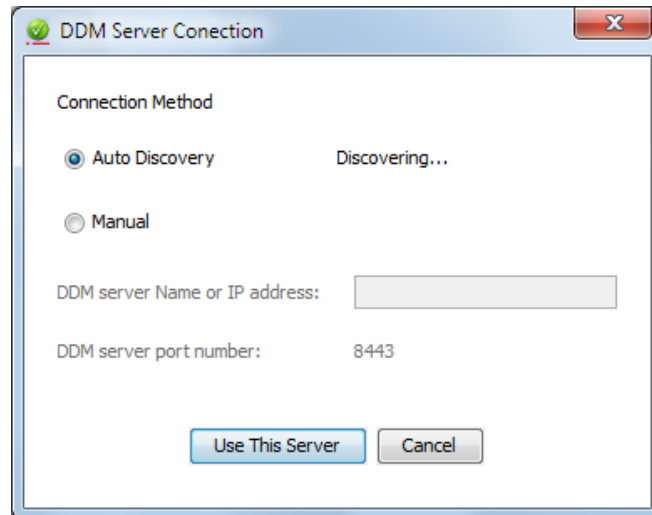
3. In the DDM Server Connection dialog, either:
   - Select 'Auto Discovery' to search for a DDM server automatically*, or:
   - Select 'Manual' to provide a specific IP address or FQDN (requires DNS) and port number of DDM server.
4. Click Use This Server.
5. In the DDM User Login dialog, enter your username and password.
6. Click Log In.

* Auto Discovery requires DNS if "Dante Controller" and the DDM server are in different IP subnets.

To select a domain for viewing, select the required domain from the Domain drop-down menu in the "Dante Controller" main toolbar.

The domains and devices you are able to view and configure are determined by your DDM user account privileges.
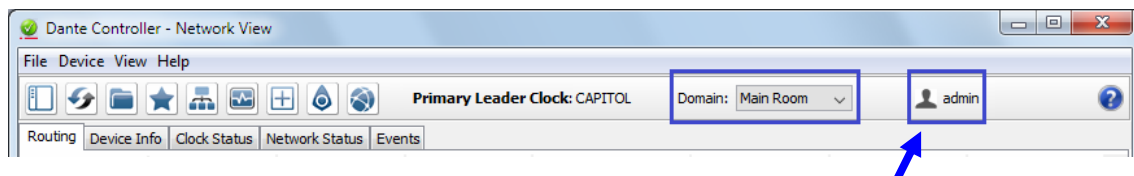
The currently logged in user is displayed next to the Domain drop-down menu.

NOTE: When connected to the <unmanaged> domain, "Dante Controller" will only display devices in the local subnet.

4.10.2. Virtual Devices.

DDM supports the sharing of audio between domains using the concept of 'virtual' devices.

A virtual device is a 'projection' of a real device, which can appear in multiple domains simultaneously, and can be subscribed to by real devices in those domains. It presents in "Dante Controller" as an independent transmitter, but is really just a logical entity which acts as a subscription proxy for a real device.

Virtual devices are instantiated when real devices are shared between domains using DDM. They cannot be created using "Dante Controller".

Using DDM, you can control the domains in which a virtual device appears, and which channels on the real device are exposed by the virtual device. Virtual devices can be assigned their own individual device names.

In "Dante Controller", virtual devices are represented using green device names. The number of transmit channels they present is dependent on the number of channels that have been shared on the real device (using DDM).

When you subscribe to a virtual device, the audio you receive is from the real device. Virtual devices cannot subscribe to other devices.

NOTE: The usual configuration options are disabled for virtual devices.

4.10.3. Legacy Devices.

Devices with some legacy (pre-v4.0) versions of firmware can be 'associated' with domains using DDM. This adds them to the relevant clock domain, and allows them to exchange audio with devices enrolled in the same domain, which are also on the same IP subnet (legacy devices do not support audio routing between subnets).

When legacy devices are associated with a domain, they only appear in "Dante Controller" when you are logged into the relevant domain (unless they have been specifically revealed - see Hidden Legacy Devices below).

NOTE: "Dante Controller" must be connected to the same subnet as a legacy device in order for it to appear in the "Dante Controller" interface.

IMPORTANT NOTE: When legacy devices are associated with a domain, they are not protected from unauthorized access via "Dante Controller". Also, when associated, they are placed in a dedicated clock domain and thus can no longer exchange audio with unmanaged devices.

If a legacy device is moved to an unmanaged Dante network without first being de-associated, it will not appear by default in "Dante Controller". "Dante Controller" notifies you with a spy icon (next to the network status icons at the bottom left of the UI) if you have hidden devices on your network:
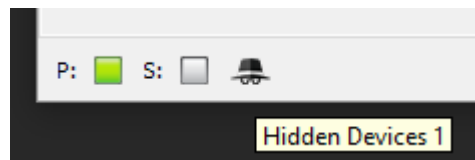
To view hidden devices in "Dante Controller", select "View" > "Show Hidden Devices".

4.10.4. Domain Credentials.

When a device is enrolled in a Dante domain, information about the relevant DDM server and the domain in which it is enrolled is saved to the device. When the device is unenrolled, the domain membership information is cleared, and the device returns to the unmanaged (unenrolled) domain.

If an enrolled device is moved out of the DDM network to another network without first being unenrolled, it will not appear in "Dante Controller", because its domain credentials indicate that it is still enrolled in a domain. In these circumstances it is necessary to clear its domain credentials so that it appears as an unmanaged device in "Dante Controller" and can be used again.

To clear the domain credentials for a device, it must first be isolated using the same method for resetting a device lock PIN:

1. Isolate the device.
2. Open the Device View for the device.
3. From the Device menu, select Clear Domain Credentials.

For more information about DDM, please refer to Audinate website.

4.11. 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.
- Create network configurations for special, or periodic events, and then switch back to the standard configuration when desired.
- Quickly apply one or more configuration settings to a number of devices simultaneously - for example, setting all devices on your network to the same sample rate (global configuration).
- Use Dante Controller as an off-line editing tool – off-line edit the saved preset configuration for reuse in new network configuration deployments.

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.

NOTE: The presets feature is not currently supported in DDM networks.

4.11.1. 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.

4.11.2. Saving Presets.

To save a Preset that includes all device parameters:

1. Click the ⭐ button in the "Network View" toolbar.
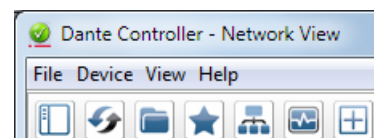
"Save Preset" (Ctrl + S) can also be selected in "File" option through the "Network View" toolbar.
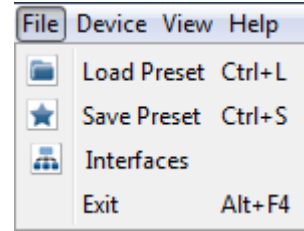
2. Select the devices that you wish to include in the preset. By default, all available devices are selected; you can clear that selection by pressing "None" button and select all devices again by pressing "All" button.

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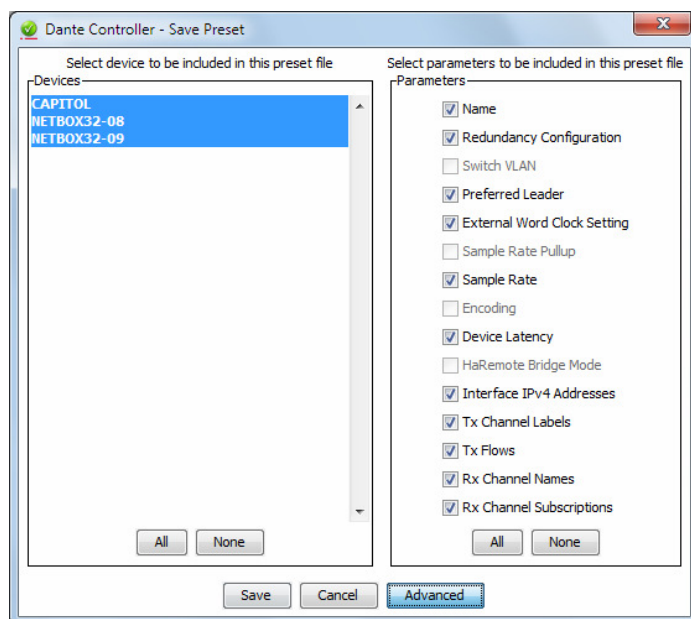
The 'Save a Preset File' dialog box will appear, allowing the user to select a folder a file name for the Preset files that will be created.

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

4.11.3. Applying Presets.

To load and apply a previously saved preset, click the 📁 button in the "Network View" toolbar.
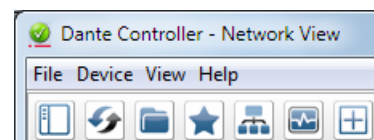
"Load Preset" (Ctrl + L) can also be selected in "File" option through the "Network View" toolbar.
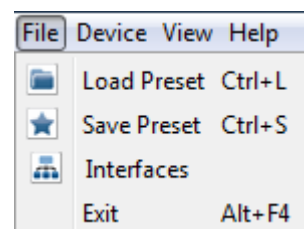
The "Apply Preset" dialogue is shown then, arranged in 4 columns, representing the logical steps in applying a preset (from left to right).
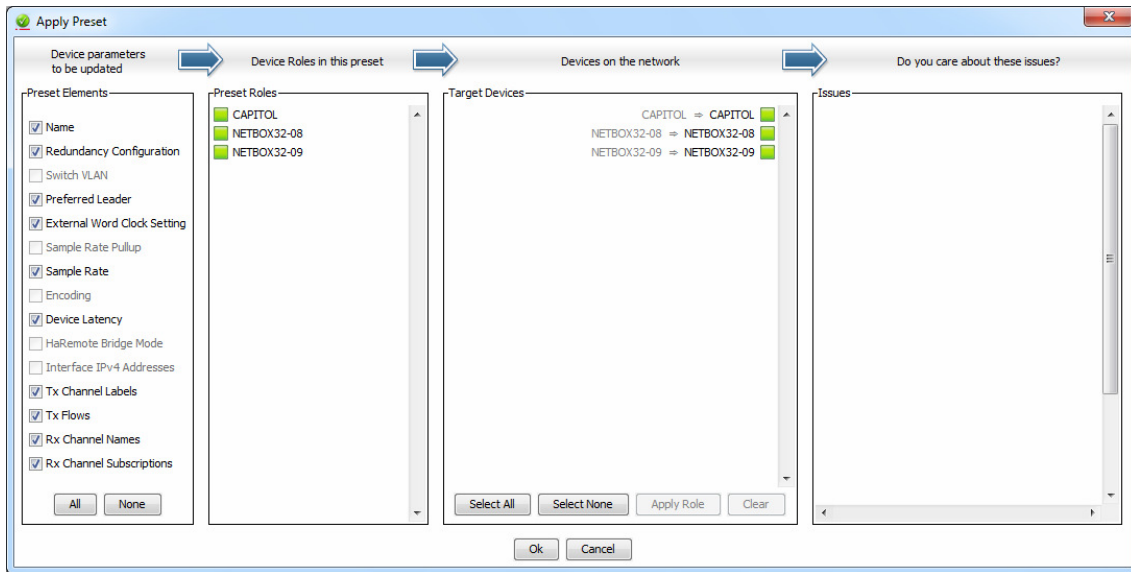
The 4 columns are:

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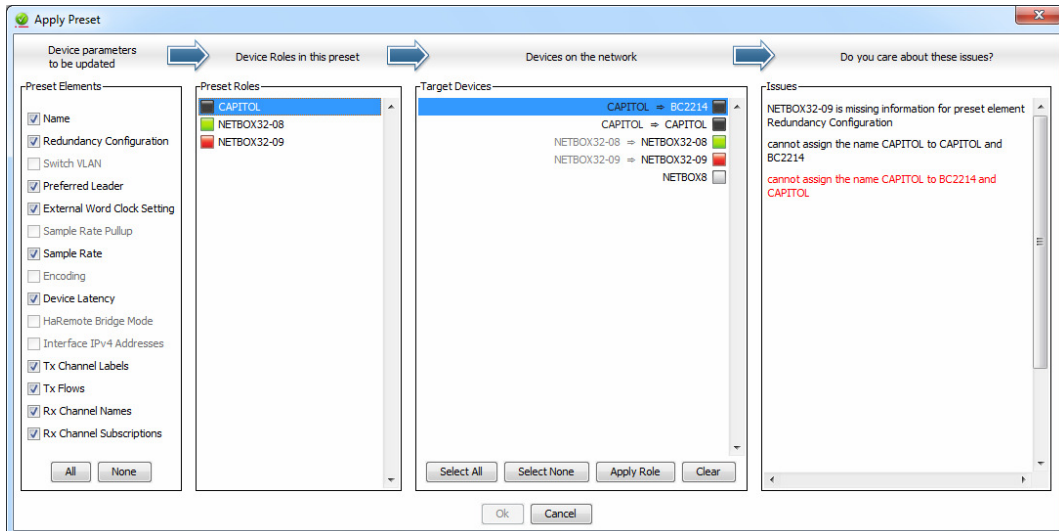
You can apply a role to multiple devices. You cannot apply multiple roles to one device.

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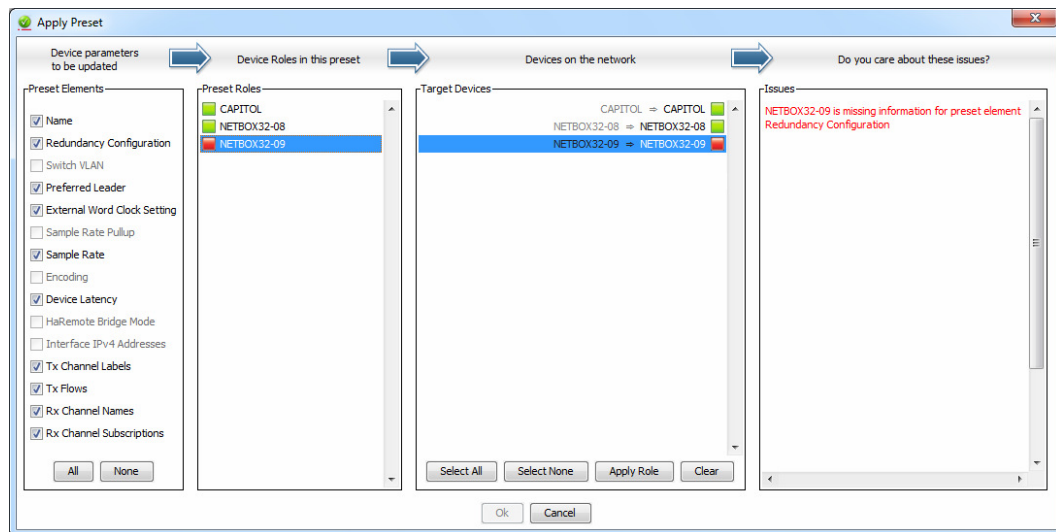
- "**Issues**". The Issues column lists all issues identified by "Dante Controller". Clicking a role or a target device will highlight the issues associated with that role or role assignment.

  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.
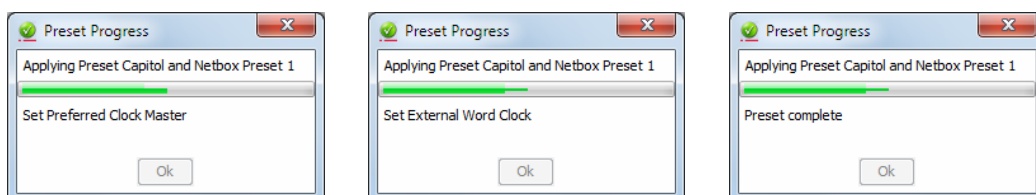
Global Configuration.

You can use the Presets feature for global configuration, i.e. applying one or more configuration settings to a number of devices simultaneously.

For example, if you want to apply the same sample rate to all devices on your network:

1. Set one of your devices to the required sample rate.
2. Click the ⭐ button in the "Network View" toolbar.
3. Click "None" button, then select only the relevant device.
4. Click "Advanced" button.
5. Click "None" button, then select the device "Sample Rate" checkbox.
6. Click "Save" button.
7. Load the preset by clicking the 📁 button in the "Network View" toolbar or by selecting "File" > "Load Preset".
8. In the "Preset Roles" column, select the relevant role.
9. In the "Target Devices" column, click "Select All" button.
10. Click "Apply" button, then click "Ok".

This will set all devices to the same sample rate, but will leave all other device configuration settings untouched.

4.12. "**Dante Updater**".

"Dante Updater" is a desktop application that allows you to update the Dante firmware and software on Dante hardware devices. It is installed automatically when you install "Dante Controller".

The application is linked to an online database containing firmware update files for products from multiple manufacturers. When the application is connected to a Dante network, it scans the network and identifies the firmware versions for each discovered Dante device.

To launch "Dante Updater", click the 💧 button in the "Network View" toolbar.
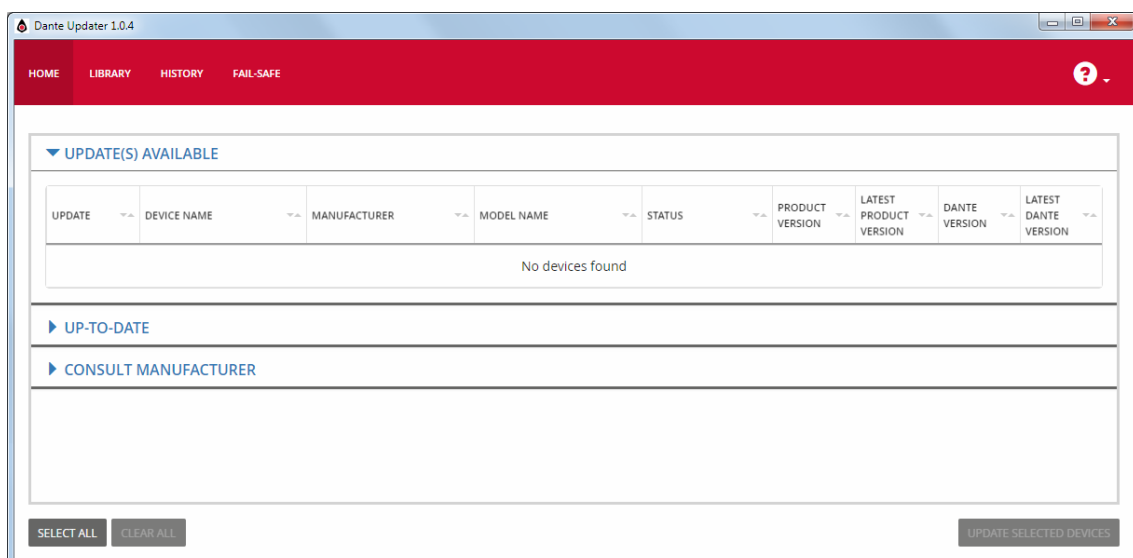
IMPORTANT NOTE: This application is **not** suitable for **AEQ** equipment. The AEQ devices described in this manual should be upgraded by means of "**Dante Firmware Update Manager**" application (see section 6 of this manual).

5. CONTROL TERMINAL. "DANTE Virtual Soundcard".

NOTE: The information included in this manual is valid for software **version 4.1.2.5** (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.

IMPORTANT NOTE: "Dante Virtual Soundcard" does **not** support **redundant** operation.

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 (SP1), 8.1 or 10, Server 2012 R2, 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:
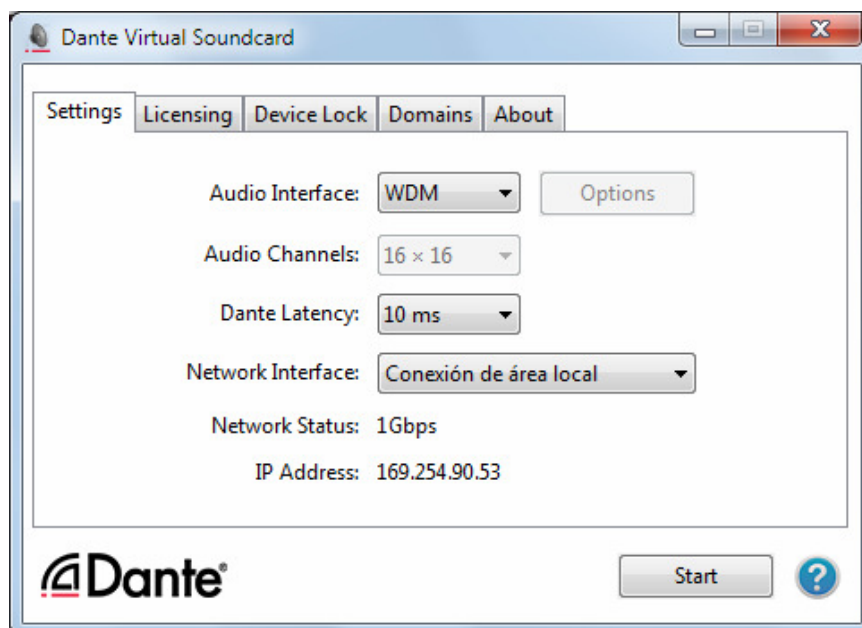
Supporting services.

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, 4445, 4455.
- Dante Control and Monitoring: 8700-8708, 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 accept the terms, click Close.
4. Click Install.
5. 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 re-enter 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 various ways:

- Windows 7: Start > Programs > Audinate > Dante Virtual Soundcard > Dante Virtual Soundcard.
- Windows 8.1 or 10: Windows key / menu > All apps > Audinate > Dante Virtual Soundcard.
- 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:
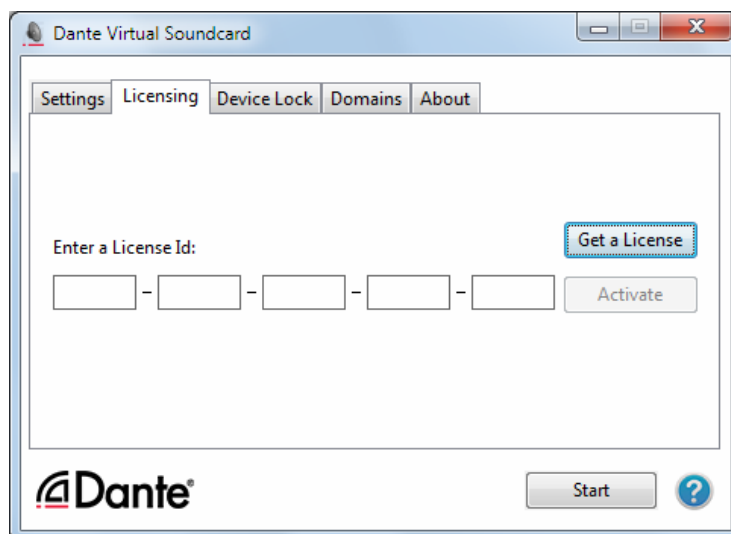
You are required to register with Audinate at www.audinate.com and provide an email address to obtain a valid License ID for "Dante Virtual Soundcard". If the machine on which you are installing "Dante Virtual Soundcard" is connected to the Internet, click the "Get a License" button to be taken directly 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.
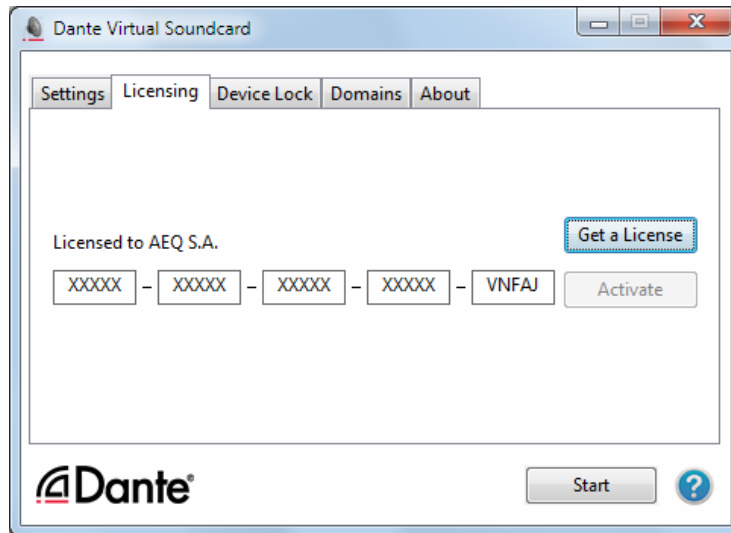
If you are using a trial license the Control Panel a "Trial version licensed to..." message and remaining trial time info will appear. In order to continue using "Dante Virtual Soundcard" after the trial period has expired, you will need to purchase a full license.

5.4. Configuring "**Dante Virtual Soundcard**".

It is important to understand that the Control Panel that is displayed when you start the application is a means of configuring and controlling "Dante Virtual Soundcard", it is NOT the "Dante Virtual Soundcard" itself. The actual "Dante Virtual Soundcard" runs as a background process.

When you open the "Dante Virtual Soundcard" Control Panel, you are presented with a window with four tabs: "Settings", "Licensing", "Device Lock", "Domains" 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".

Locking "Dante Virtual Soundcard":

You can lock and unlock "Dante Virtual Soundcard" from the control panel, or remotely using "Dante Controller". Refer to section 1.4.7 for information about locking Dante devices remotely.

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. Settings cannot be changed when device lock is active.

To change settings:

1. Completely quit out of any audio applications that are using the "Dante Virtual Soundcard".
2. Ensure device lock is inactive.
3. Stop "Dante Virtual Soundcard".
4. Change your "Dante Virtual Soundcard" settings.
5. Restart "Dante Virtual Soundcard".
6. 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.
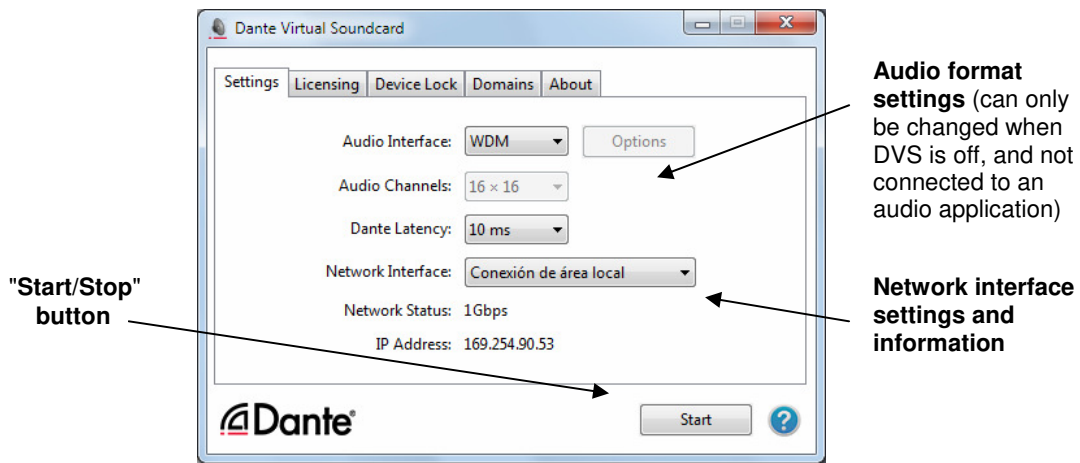
"Start/Stop" Button.

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 stop "Dante Virtual Soundcard". Stopping "Dante Virtual Soundcard" during a recording can lead to driver instability issues.

NOTE: "Dante Virtual Soundcard" can be either on or off (running or stopped) 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.

IMPORTANT NOTE: "Dante Virtual Soundcard" does **NOT** support **redundant** operation.

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.
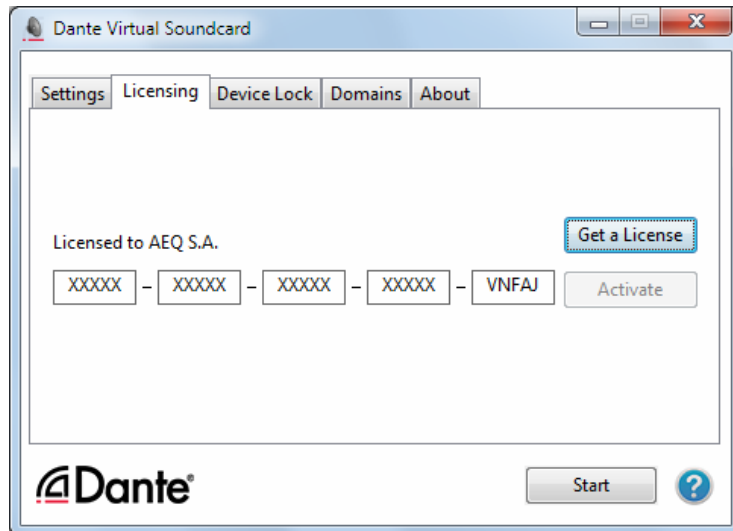
5.4.4. "Device Lock" Tab in "Dante Virtual Soundcard".

The "Device Lock" tab allows you to lock and unlock "Dante Virtual Soundcard".
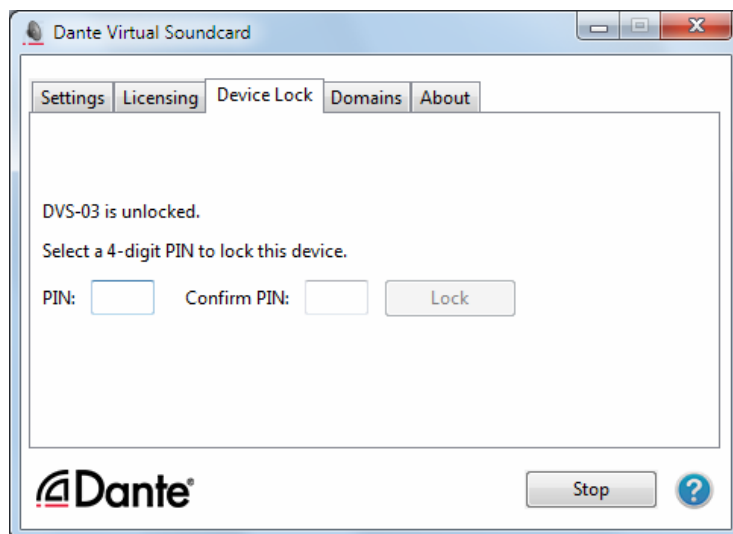
"Device Lock" is a Dante feature that allows you to lock and unlock supported Dante devices using a 4-digit PIN (Personal Identification Number).

When a device is locked, audio will continue to flow according to its existing subscriptions, but it cannot be configured or controlled over the network – its subscriptions and configuration settings become read-only. When "Dante Virtual Soundcard" is locked, you cannot use the control panel to change its settings.

To configure or control "Dante Virtual Soundcard" when it has been locked, you must first unlock it directly using the control panel, or remotely using the PIN with which it was locked.

Locking "**Dante Virtual Soundcard**"**.**

You can lock "Dante Virtual Soundcard" from the control panel using the "Device Lock" tab, or remotely using "Dante Controller".

Refer to section 1.4.7 for information about locking Dante devices remotely.

To lock "Dante Virtual Soundcard" directly from the control panel:

1. Select the "Device Lock" tab.
2. Enter a 4-digit number in the "PIN" field.
3. Re-enter the PIN in the "Confirm PIN" field.
4. Click "Lock".

The controls in the "Settings" tab will become inactive, and you will be unable to remotely configure "Dante Virtual Soundcard" or change its subscriptions using "Dante Controller".

When "Dante Virtual Soundcard" is locked, a red padlock icon is displayed at the bottom of the control panel:
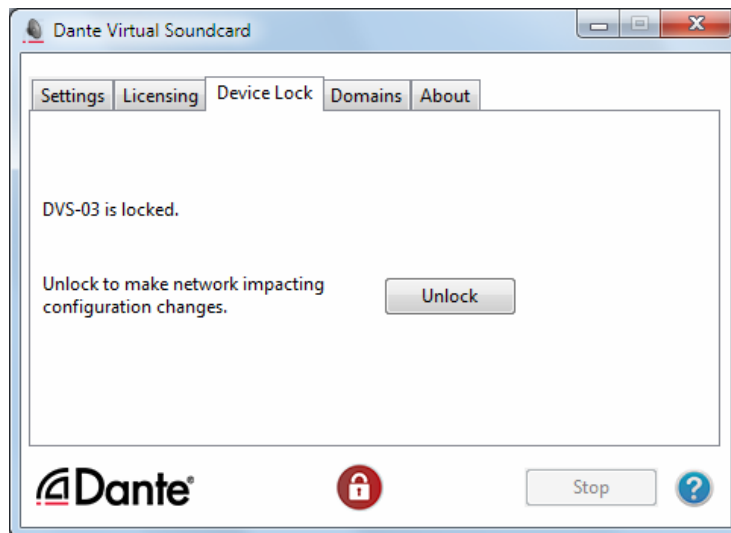
You can also easily identify locked devices in "Dante Controller".

NOTE: You cannot lock "Dante Virtual Soundcard" when it is enrolled in a domain.

Unlocking "**Dante Virtual Soundcard**"**.**

You can unlock "Dante Virtual Soundcard" directly from the control panel (using the "Device Lock" tab), or remotely using "Dante Controller".

Refer to section 1.4.7 for information about locking Dante devices remotely.

To unlock "Dante Virtual Soundcard" directly from the control panel:

1. Select the "Device Lock" tab.
2. Click "Unlock".

5.4.5. "**Domains**" **Tab in** "**Dante Virtual Soundcard**"**.**

When "Dante Virtual Soundcard" is enrolled in a "Dante Domain Manager" (DDM) system, the "Domains" tab displays information about the DDM server.
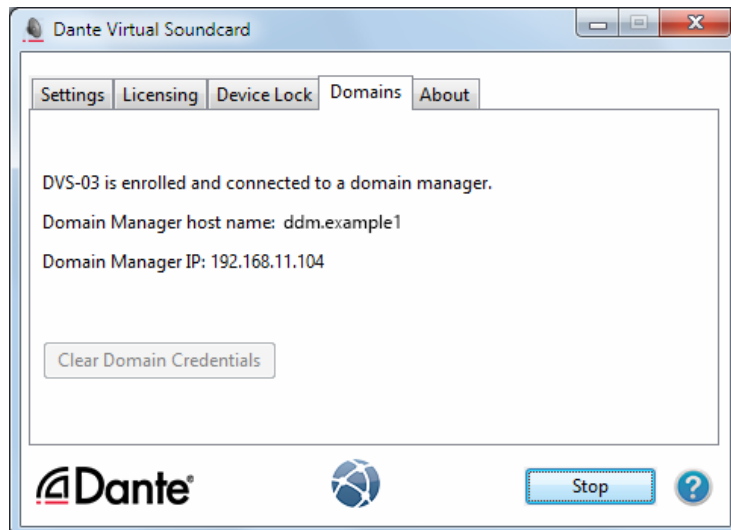
When "Dante Virtual Soundcard" is enrolled, a domain icon is displayed at the bottom of the control panel on all tabs.

Refer to Audinate website for more information about Dante domains and enrolling devices.

NOTE: You cannot lock "Dante Virtual Soundcard" when it is enrolled in a domain.

If the DDM server is unavailable, a warning icon is displayed at the bottom of the control panel:

If the DDM administrator has blocked configuration of Dante Virtual Soundcard when it is enrolled in a domain, the control panel becomes read-only and this icon is displayed at the bottom of the control panel:

Clear Domain Credentials.

When "Dante Virtual Soundcard" is enrolled in a domain, it stores information locally about the domain and DDM server, so that it can automatically rejoin its domain when it is restarted. The "Clear Domain Credentials" button removes this information.

Use "Clear Domain Credentials" if you have moved the computer running "Dante Virtual Soundcard" to a different network, or uninstalled DDM, without first un-enrolling "Dante Virtual Soundcard" from its domain. This will ensure that "Dante Virtual Soundcard" can be automatically discovered when it is next connected to a DDM network.

5.4.6. "**About**" **Tab in** "**Dante Virtual Soundcard**".

The "About" tab displays:

- The version of "Dante Virtual Soundcard" that you have installed.
- A hyperlink to open-source licenses relevant to the software (for reference only).
- Patents information.
- A hyperlink to the end user license agreement.
- A hyperlink to the Audinate website.
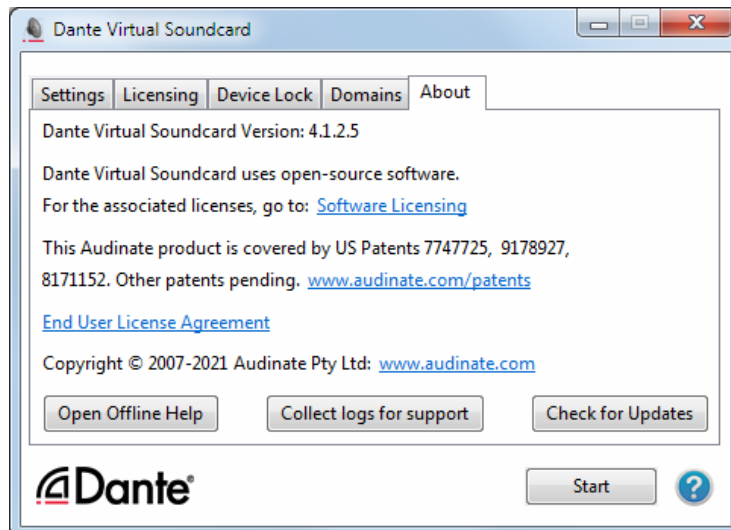
The "About" tab also allows you to:

- "Open Offline Help": the offline help is a locally-installed PDF of the user guide, which may not be the latest version - use the help button to view the latest online HTML version of the user guide (requires an Internet connection).
- "Collect logs for support": you should not use this feature unless instructed to do so by Audinate Technical Support.
- "Check for updates": if a new version is available, you can download it to your hard drive and install it from there.

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:
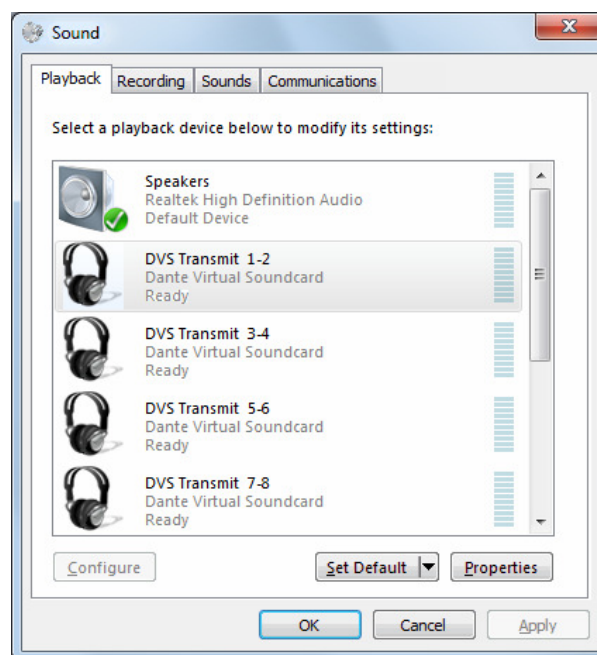
NOTE: Dante Virtual Soundcard stereo pairs will appear as selectable audio interfaces in Windows regardless of the current mode - i.e. with Dante Virtual Soundcard in ASIO mode, it will still appear as a set of selectable audio interfaces in the Windows sound playback options dialog. Similarly, in WDM 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.
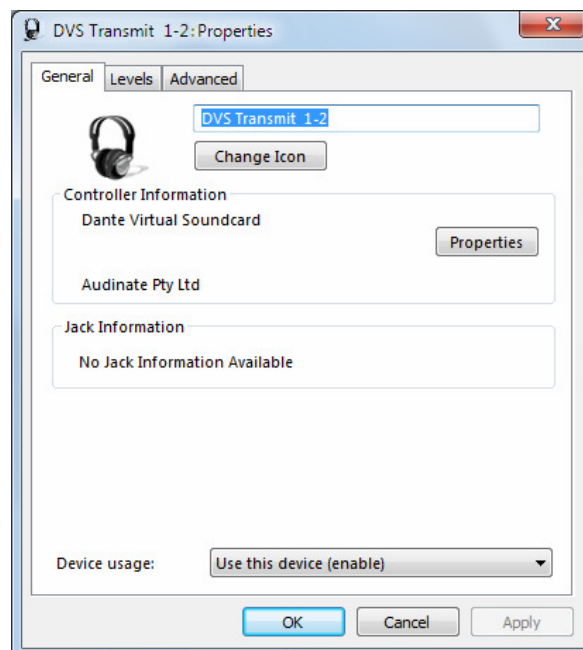
6. "DANTE FIRMWARE UPDATE MANAGER": FIRMWARE UPGRADING SOFTWARE.

6.1. "Dante Firmware Update Manager" description.

NOTE: The information included in this manual is valid for software **version 3.10.2.4** (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" or "Ultimo" module included in the AEQ equipments described in this manual. It is available for PCs running Windows 7 (SP1), 8.1 and 10, and Apple Macs running OS X 10.9.5, 10.10.5 and 10.11.

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 Technical Service (support@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 two ways:

-   From the Start menu: Start > All Programs > Audinate > Dante Firmware Update Manager > Dante Firmware Update Manager.
-   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 "Manufacturer Information" section (see section 4.8.3.3 of this manual):
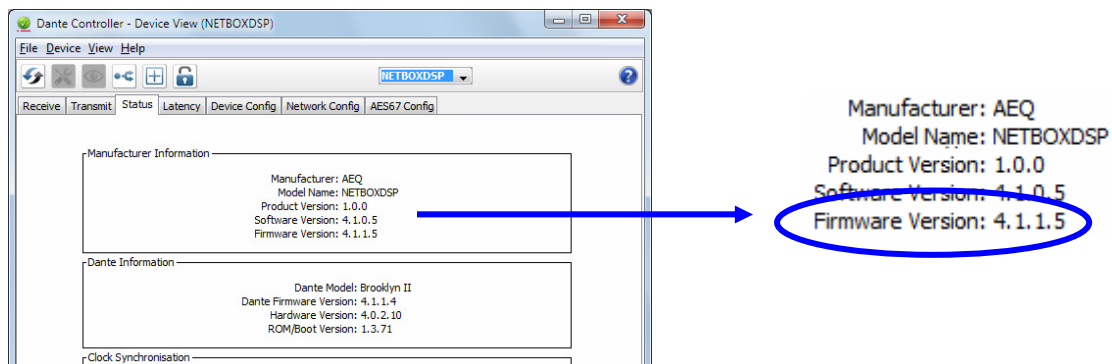
If the device includes a "Ultimo" module (for example, PHOENIX VENUS V3) it may be the **Ultimo X** or the **Ultimo 4x4** model, models with different firmware versions associated. The "Status" tab on the "Device View" of the device allows you to find out the installed model by checking the "Dante Model" field in the "Dante Information" section (**Ultimo X** model appears as UltimoX4 and **Ultimo 4x4** appears as Ultimo4).
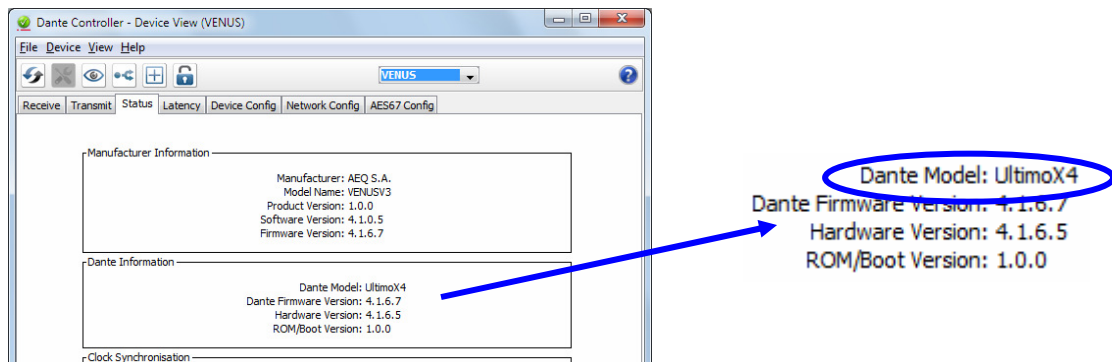
6.2. Firmware upgrading procedure.

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

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

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 AEQ Technical Service (**support@aeq.es**).
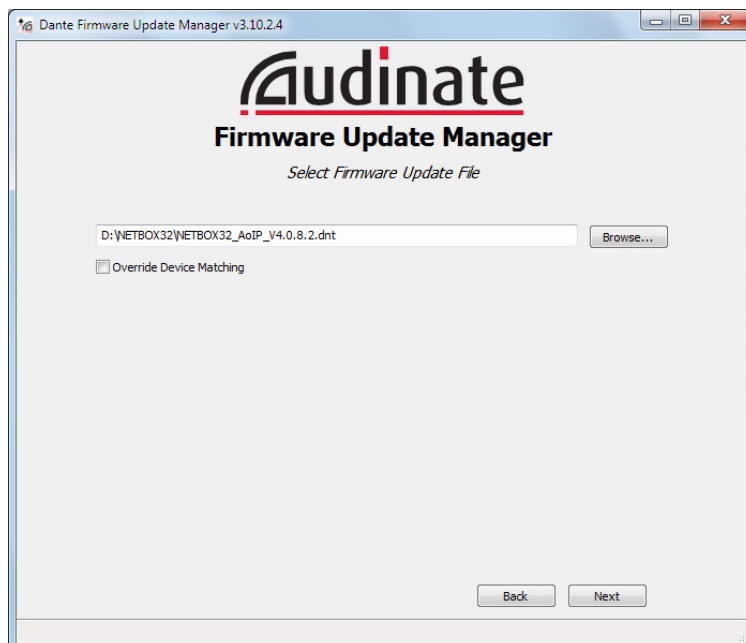
4. In the window that appears, after a few seconds, a list of the discovered DANTE devices is shown.
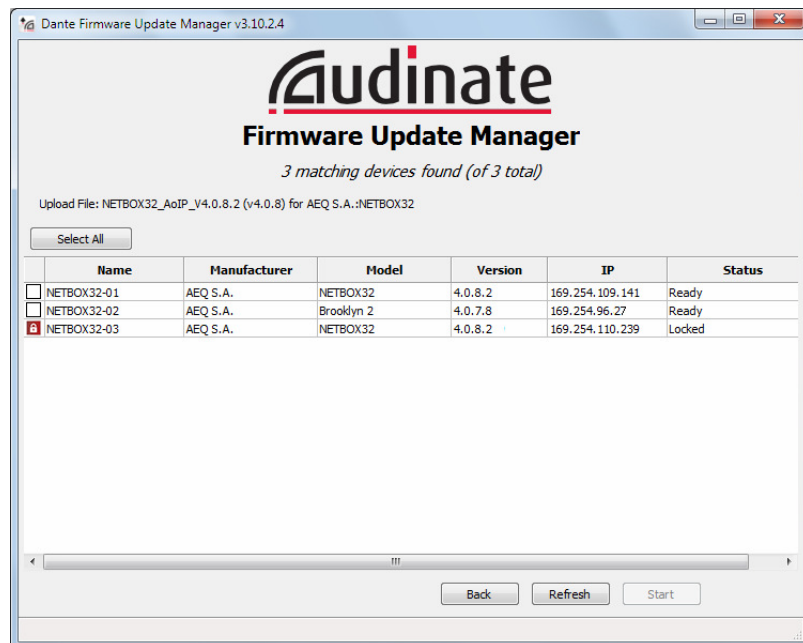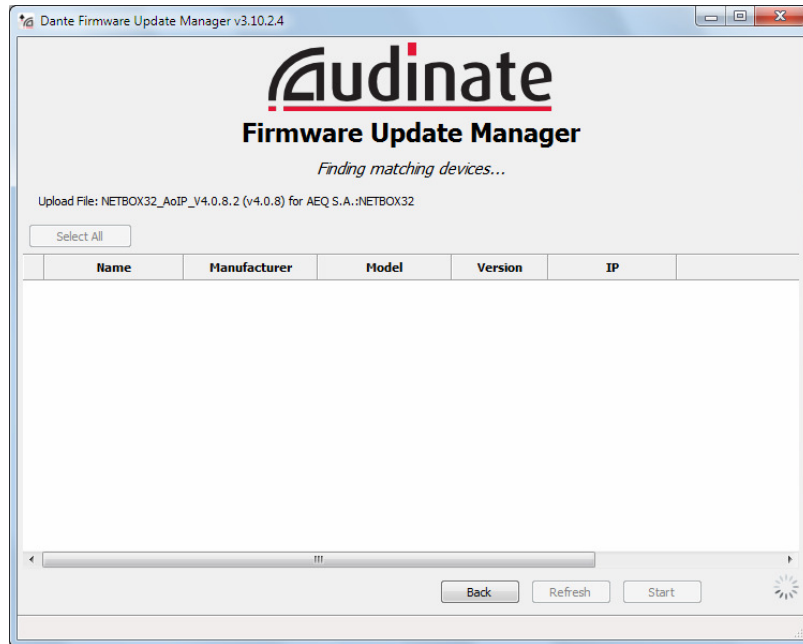
Click the checkbox/es of the device/s you wish to update:
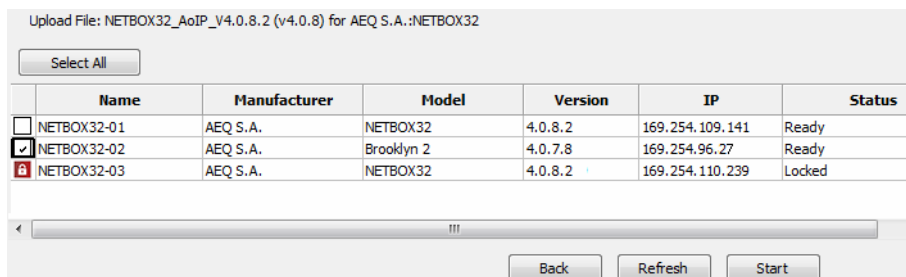
NOTE: Locked devices cannot be updated. Locked devices are indicated by a padlock icon in the device list. To update a locked device, unlock it first using "Dante Controller".
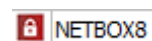
Click "**Start**" button to start upgrading process.

In the window that appears, accept to continue:
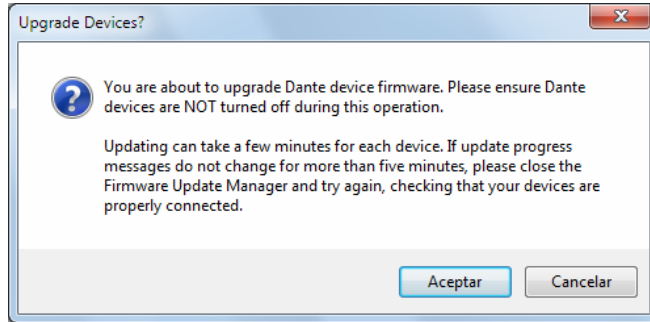
5. Then the upgrading process starts and the "Status" column shows its progress:

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
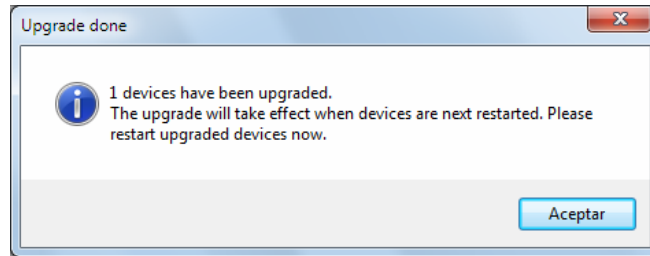
and the "Status" column will indicate:

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:

Upload File: NETBOX32_AoIP_V4.0.8.2 (v4.0.8) for AEQ S.A.:NETBOX32

Select All

	Name	Manufacturer	Model	Version
☐	NETBOX32-02	AEQ S.A.	NETBOX32	4.0.8.2

7. TECHNICAL SPECIFICATIONS.

- 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 type of device and network performance and complexity).
- 2 RJ45 Ethernet ports per interface, 1000 BASE-T or 100 BASE-T depending on the device, 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.

- TP8116 / TP8416: 2 bidirectional.
- NETBOX 4 MH: 4 bidirectional.
- PHOENIX VENUS V3: 4 bidirectional.
- NETBOX 8: 8 bidirectional.
- OLYMPIA 3: 8 bidirectional.
- FORUM LITE: 16 or 32 bidirectional.
- CAPITOL IP: 16 or 32 bidirectional.
- FR14 (FORUM IP): 32 bidirectional.
- BC2214 (ARENA - BC 2000 D-CONEXIA): 32 bidirectional.
- NETBOX 32: 32 bidirectional.
- SYSTEL IP 16: 32 bidirectional.
- CrossNET 72: 32 bidirectional.
- BC2224 (ARENA - BC 2000 D-CONEXIA): 64 bidirectional.
- XC24 (ATRIUM - X_CORE-CONEXIA): 64 bidirectional.
- NETBOX DSP 64: 64 bidirectional.
- CrossNET 104: 64 bidirectional.
- NETBOX DSP 96: 96 bidirectional.
- CrossNET 136: 96 bidirectional.
- NETBOX DSP 128: 128 bidirectional.
- CrossNET 168: 128 bidirectional.
- NETBOX DSP 160: 160 bidirectional.

October 2021. Specifications subjected to evolutionary changes. Download the latest version of the manual at www.aeq.es, www.aeq.eu or www.aeqbroadcast.com.

8. A.E.Q. GUARANTEE.

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

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

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

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

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

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

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

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

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

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

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

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

APPENDIX 1. 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 Dante Control and Monitoring manager. Dante Controller cannot function without this connection. This problem is most likely caused by the Dante Control and Monitoring ('conmon') service or daemon stopping unexpectedly. Click OK to restart Dante Controller. You may also need to manually restart the Dante Control and Monitoring service, or the computer, if the problem reoccurs'	**Affects:** Windows only. **Meaning:** The 'Dante Control and Monitoring' service is not responding. This can occur after a computer has been in sleep mode. **Action:** Restart Dante Controller. In the event that does not work, reboot your PC, or restart the Dante Control and Monitoring service via Control Panel > Administrative Tools > Services.
'The installed version [x] of the Dante Control and Monitoring service ('ConMon') is out of date. This version of Dante Controller requires ConMon version [x] or later. Please reinstall Dante Controller to resolve this issue. Dante Controller will now exit'	**Affects:** Windows and macOS. **Meaning:** Usually this is because the required service (ConMon) that is installed with Dante Controller has been overwritten with an older version by another Dante software product installation. **Action:** Reinstall Dante Controller. This will update the ConMon service to the latest version.
'The installed version [x] of the Dante Discovery service is out of date. This version of Dante Controller requires Dante Discovery version [x] or later. Please reinstall Dante Controller to resolve this issue. Dante Controller will now exit'	**Affects:** Windows only. **Meaning:** Usually this is because the required service (Dante Discovery) that is installed with Dante Controller has been overwritten with an older version by another Dante software product installation. **Action:** Reinstall Dante Controller. This will update the Dante Discovery service to the latest version.

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/s 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.
- If your secondary network is using Link Local (no DHCP server), all devices on that network will be in the 172.31.*.* range. The secondary network interface for the computer must be manually configured (using static IP addressing) to the same range.

- 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 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" (see section 1.4.4 of this manual). 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. Also, mixing DHCP and Link Local on the same network can cause issues. It is often necessary to have all devices and the computer on either DHCP or Link Local.

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 ![icon] in the Network View toolbar of Dante Controller.
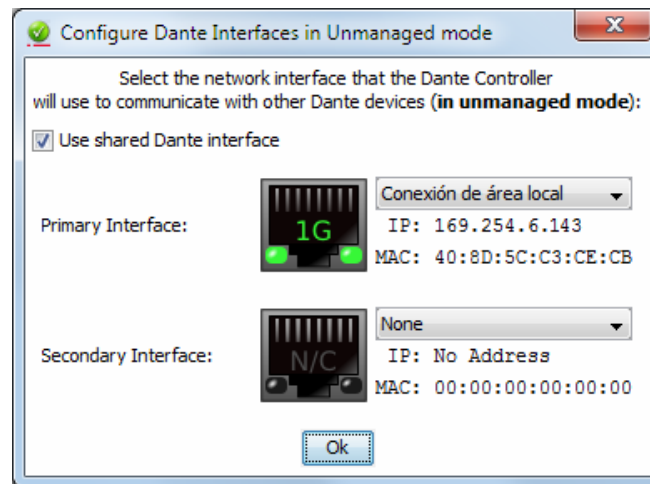
- It can also be viewed on the Dante Virtual Soundcard Settings tab.
- If the Dante network is standalone and does not have a DHCP server installed, this address should be 169.254.*.*
- If the Dante network is using a DHCP server, the IP address should conform to the addressing scheme it is using.

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

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

Device Name	Model Name	Product Version	Dante Version	Device Lock	Primary Address	Primary Link Speed	Secondary Address	Secondary Link Speed
CAPITOL-74623	CAPITOL	3.0.0	4.0.4.19	N/A	169.254.109.141	1Gbps		Link down
FORUM-IP1	FORUM	3.0.0	4.0.4.19	☑	169.254.96.27	1Gbps	N/A	N/A
FORUM-IP2	FORUM	3.0.0	4.0.4.19	☐	169.254.160.96	1Gbps	N/A	N/A
NETBOX32	NETBOX32	3.48.0	4.0.7.8	☑	169.254.160.231	1Gbps		Link down

- 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.

APPENDIX 2. Installation details: configuration of ATRIUM / ARENA consoles and X_CORE / BC2000D matrices for use with AoIP multichannel boards.

A2.1. Scope.

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

A2.1.1. ATRIUM / ARENA, X_CORE / 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 consoles and matrices is not transferred to the channels that appears in "Dante Controller" application, so both systems must be configured separately. Also note that:

- DANTE identifies stereo lines as dual mono, so different names are assigned to left and right channels forming stereo line. Therefore, stereo lines must be managed as dual mono lines.
- ATRIUM / ARENA displays support only up to 7 characters per normal label and up to 4 per short label.
- 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 **XC24 / BC2224** boards in ATRIUM / ARENA consoles and X_CORE / 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.

ATRIUM / ARENA console.

Inputs Labels in ATRIUM / ARENA	Inputs Short labels in ATRIUM / ARENA	Reception channels Labels in DANTE Controller
AOIP01	IP01	XC24_1L / BC2224_1L
		XC24_1R / BC2224_1R
AOIP02	IP02	XC24_2L / BC2224_2L
		XC24_2R / BC2224_2R
AOIP03	IP03	XC24_3L / BC2224_3L
		XC24_3R / BC2224_3R
AOIP04	IP04	XC24_4L / BC2224_4L
		XC24_4R / BC2224_4R
AOIP05	IP05	XC24_5L / BC2224_5L
		XC24_5R / BC2224_5R
AOIP06	IP06	XC24_6L / BC2224_6L
		XC24_6R / BC2224_6R
AOIP07	IP07	XC24_7L / BC2224_7L
		XC24_7R / BC2224_7R
AOIP08	IP08	XC24_8L / BC2224_8L
		XC24_8R / BC2224_8R
AOIP09	IP09	XC24_9L / BC2224_9L
		XC24_9R / BC2224_9R
AOIP10	IP10	XC24_10L / BC2224_10L
		XC24_10R / BC2224_10R
AOIP11	IP11	XC24_11L / BC2224_11L
		XC24_11R / BC2224_11R
AOIP12	IP12	XC24_12L / BC2224_12L
		XC24_12R / BC2224_12R

AOIP13	IP13	XC24_13L / BC2224_13L
		XC24_13R / BC2224_13R
AOIP14	IP14	XC24_14L / BC2224_14L
		XC24_14R / BC2224_14R
AOIP15	IP15	XC24_15L / BC2224_15L
		XC24_15R / BC2224_15R
AOIP16	IP16	XC24_16L / BC2224_16L
		XC24_16R / BC2224_16R
AOIP17	IP17	XC24_17L / BC2224_17L
		XC24_17R / BC2224_17R
AOIP18	IP18	XC24_18L / BC2224_18L
		XC24_18R / BC2224_18R
AOIP19	IP19	XC24_19L / BC2224_19L
		XC24_19R / BC2224_19R
AOIP20	IP20	XC24_20L / BC2224_20L
		XC24_20R / BC2224_20R
AOIP21	IP21	XC24_21L / BC2224_21L
		XC24_21R / BC2224_21R
AOIP22	IP22	XC24_22L / BC2224_22L
		XC24_22R / BC2224_22R
AOIP23	IP23	XC24_23L / BC2224_23L
		XC24_23R / BC2224_23R
AOIP24	IP24	XC24_24L / BC2224_24L
		XC24_24R / BC2224_24R
AOIP25	IP25	XC24_25L / BC2224_25L
		XC24_25R / BC2224_25R
AOIP26	IP26	XC24_26L / BC2224_26L
		XC24_26R / BC2224_26R
AOIP27	IP27	XC24_27L / BC2224_27L
		XC24_27R / BC2224_27R
AOIP28	IP28	XC24_28L / BC2224_28L
		XC24_28R / BC2224_28R
AOIP29	IP29	XC24_29L / BC2224_29L
		XC24_29R / BC2224_29R
AOIP30	IP30	XC24_30L / BC2224_30L
		XC24_30R / BC2224_30R
AOIP31	IP31	XC24_31L / BC2224_31L
		XC24_31R / BC2224_31R
AOIP32	IP32	XC24_32L / BC2224_32L
		XC24_32R / BC2224_32R

Outputs Labels in ATRIUM / ARENA	Outputs Short labels in ATRIUM / ARENA	Transmission channels Labels in DANTE Controller
aoip01	ip01	XC24_1L / BC2224_1L
		XC24_1R / BC2224_1R
aoip02	ip02	XC24_2L / BC2224_2L
		XC24_2R / BC2224_2R
aoip03	ip03	XC24_3L / BC2224_3L
		XC24_3R / BC2224_3R
aoip04	ip04	XC24_4L / BC2224_4L
		XC24_4R / BC2224_4R
aoip05	ip05	XC24_5L / BC2224_5L
		XC24_5R / BC2224_5R
aoip06	ip06	XC24_6L / BC2224_6L
		XC24_6R / BC2224_6R
aoip07	ip07	XC24_7L / BC2224_7L
		XC24_7R / BC2224_7R
aoip08	ip08	XC24_8L / BC2224_8L
		XC24_8R / BC2224_8R
aoip09	ip09	XC24_9L / BC2224_9L
		XC24_9R / BC2224_9R

aoip10	ip10	XC24_10L / BC2224_10L
		XC24_10R / BC2224_10R
aoip11	ip11	XC24_11L / BC2224_11L
		XC24_11R / BC2224_11R
aoip12	ip12	XC24_12L / BC2224_12L
		XC24_12R / BC2224_12R
aoip13	ip13	XC24_13L / BC2224_13L
		XC24_13R / BC2224_13R
aoip14	ip14	XC24_14L / BC2224_14L
		XC24_14R / BC2224_14R
aoip15	ip15	XC24_15L / BC2224_15L
		XC24_15R / BC2224_15R
aoip16	ip16	XC24_16L / BC2224_16L
		XC24_16R / BC2224_16R
aoip17	ip17	XC24_17L / BC2224_17L
		XC24_17R / BC2224_17R
aoip18	ip18	XC24_18L / BC2224_18L
		XC24_18R / BC2224_18R
aoip19	ip19	XC24_19L / BC2224_19L
		XC24_19R / BC2224_19R
aoip20	ip20	XC24_20L / BC2224_20L
		XC24_20R / BC2224_20R
aoip21	ip21	XC24_21L / BC2224_21L
		XC24_21R / BC2224_21R
aoip22	ip22	XC24_22L / BC2224_22L
		XC24_22R / BC2224_22R
aoip23	ip23	XC24_23L / BC2224_23L
		XC24_23R / BC2224_23R
aoip24	ip24	XC24_24L / BC2224_24L
		XC24_24R / BC2224_24R
aoip25	ip25	XC24_25L / BC2224_25L
		XC24_25R / BC2224_25R
aoip26	ip26	XC24_26L / BC2224_26L
		XC24_26R / BC2224_26R
aoip27	ip27	XC24_27L / BC2224_27L
		XC24_27R / BC2224_27R
aoip28	ip28	XC24_28L / BC2224_28L
		XC24_28R / BC2224_28R
aoip29	ip29	XC24_29L / BC2224_29L
		XC24_29R / BC2224_29R
aoip30	ip30	XC24_30L / BC2224_30L
		XC24_30R / BC2224_30R
aoip31	ip31	XC24_31L / BC2224_31L
		XC24_31R / BC2224_31R
aoip32	ip32	XC24_32L / BC2224_32L
		XC24_32R / BC2224_32R

X_CORE / BC2000D matrix.
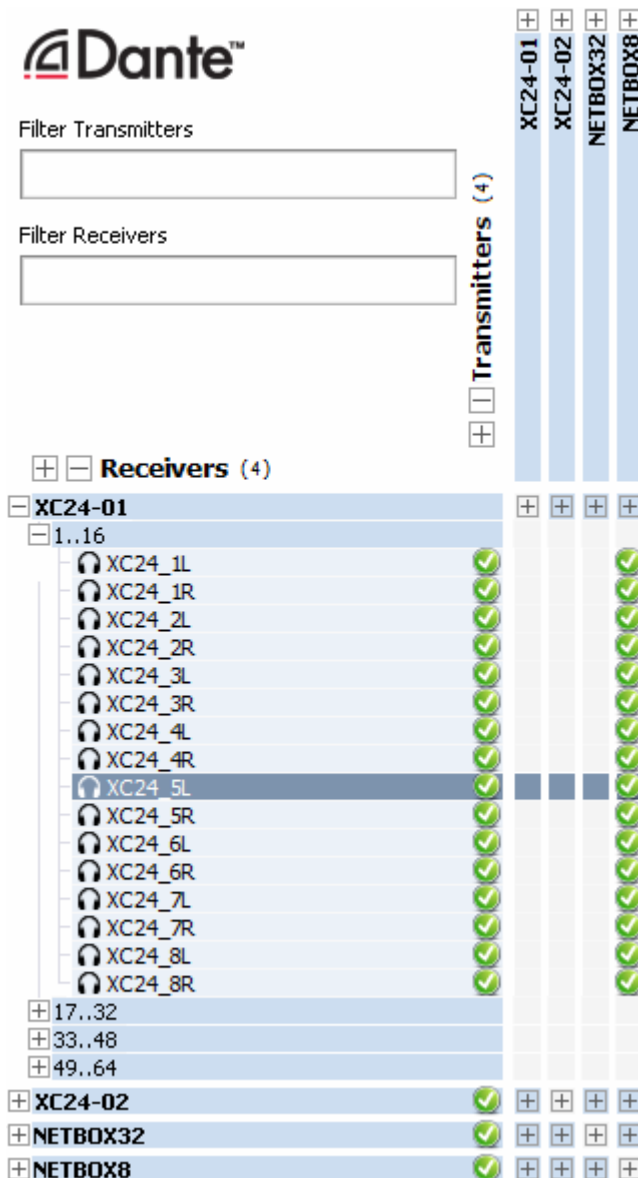
Inputs Logical lines in Matrix Setup	Reception channels Labels in DANTE Controller
AOIP IN 0001	XC24_1L / BC2224_1L
	XC24_1R / BC2224_1R
AOIP IN 0002	XC24_2L / BC2224_2L
	XC24_2R / BC2224_2R
AOIP IN 0003	XC24_3L / BC2224_3L
	XC24_3R / BC2224_3R
AOIP IN 0004	XC24_4L / BC2224_4L
	XC24_4R / BC2224_4R
AOIP IN 0005	XC24_5L / BC2224_5L
	XC24_5R / BC2224_5R
AOIP IN 0006	XC24_6L / BC2224_6L
	XC24_6R / BC2224_6R

AOIP IN 0007	XC24_7L / BC2224_7L
	XC24_7R / BC2224_7R
AOIP IN 0008	XC24_8L / BC2224_8L
	XC24_8R / BC2224_8R
AOIP IN 0009	XC24_9L / BC2224_9L
	XC24_9R / BC2224_9R
AOIP IN 0010	XC24_10L / BC2224_10L
	XC24_10R / BC2224_10R
AOIP IN 0011	XC24_11L / BC2224_11L
	XC24_11R / BC2224_11R
AOIP IN 0012	XC24_12L / BC2224_12L
	XC24_12R / BC2224_12R
AOIP IN 0013	XC24_13L / BC2224_13L
	XC24_13R / BC2224_13R
AOIP IN 0014	XC24_14L / BC2224_14L
	XC24_14R / BC2224_14R
AOIP IN 0015	XC24_15L / BC2224_15L
	XC24_15R / BC2224_15R
AOIP IN 0016	XC24_16L / BC2224_16L
	XC24_16R / BC2224_16R
AOIP IN 0017	XC24_17L / BC2224_17L
	XC24_17R / BC2224_17R
AOIP IN 0018	XC24_18L / BC2224_18L
	XC24_18R / BC2224_18R
AOIP IN 0019	XC24_19L / BC2224_19L
	XC24_19R / BC2224_19R
AOIP IN 0020	XC24_20L / BC2224_20L
	XC24_20R / BC2224_20R
AOIP IN 0021	XC24_21L / BC2224_21L
	XC24_21R / BC2224_21R
AOIP IN 0022	XC24_22L / BC2224_22L
	XC24_22R / BC2224_22R
AOIP IN 0023	XC24_23L / BC2224_23L
	XC24_23R / BC2224_23R
AOIP IN 0024	XC24_24L / BC2224_24L
	XC24_24R / BC2224_24R
AOIP IN 0025	XC24_25L / BC2224_25L
	XC24_25R / BC2224_25R
AOIP IN 0026	XC24_26L / BC2224_26L
	XC24_26R / BC2224_26R
AOIP IN 0027	XC24_27L / BC2224_27L
	XC24_27R / BC2224_27R
AOIP IN 0028	XC24_28L / BC2224_28L
	XC24_28R / BC2224_28R
AOIP IN 0029	XC24_29L / BC2224_29L
	XC24_29R / BC2224_29R
AOIP IN 0030	XC24_30L / BC2224_30L
	XC24_30R / BC2224_30R
AOIP IN 0031	XC24_31L / BC2224_31L
	XC24_31R / BC2224_31R
AOIP IN 0032	XC24_32L / BC2224_32L
	XC24_32R / BC2224_32R

Outputs Logical lines in Matrix Setup	Transmission channels Labels in DANTE Controller
AOIP OUT 0001	XC24_1L / BC2224_1L
	XC24_1R / BC2224_1R
AOIP OUT 0002	XC24_2L / BC2224_2L
	XC24_2R / BC2224_2R
AOIP OUT 0003	XC24_3L / BC2224_3L
	XC24_3R / BC2224_3R
AOIP OUT 0004	XC24_4L / BC2224_4L
	XC24_4R / BC2224_4R

AOIP OUT 0005	XC24_5L / BC2224_5L
	XC24_5R / BC2224_5R
AOIP OUT 0006	XC24_6L / BC2224_6L
	XC24_6R / BC2224_6R
AOIP OUT 0007	XC24_7L / BC2224_7L
	XC24_7R / BC2224_7R
AOIP OUT 0008	XC24_8L / BC2224_8L
	XC24_8R / BC2224_8R
AOIP OUT 0009	XC24_9L / BC2224_9L
	XC24_9R / BC2224_9R
AOIP OUT 0010	XC24_10L / BC2224_10L
	XC24_10R / BC2224_10R
AOIP OUT 0011	XC24_11L / BC2224_11L
	XC24_11R / BC2224_11R
AOIP OUT 0012	XC24_12L / BC2224_12L
	XC24_12R / BC2224_12R
AOIP OUT 0013	XC24_13L / BC2224_13L
	XC24_13R / BC2224_13R
AOIP OUT 0014	XC24_14L / BC2224_14L
	XC24_14R / BC2224_14R
AOIP OUT 0015	XC24_15L / BC2224_15L
	XC24_15R / BC2224_15R
AOIP OUT 0016	XC24_16L / BC2224_16L
	XC24_16R / BC2224_16R
AOIP OUT 0017	XC24_17L / BC2224_17L
	XC24_17R / BC2224_17R
AOIP OUT 0018	XC24_18L / BC2224_18L
	XC24_18R / BC2224_18R
AOIP OUT 0019	XC24_19L / BC2224_19L
	XC24_19R / BC2224_19R
AOIP OUT 0020	XC24_20L / BC2224_20L
	XC24_20R / BC2224_20R
AOIP OUT 0021	XC24_21L / BC2224_21L
	XC24_21R / BC2224_21R
AOIP OUT 0022	XC24_22L / BC2224_22L
	XC24_22R / BC2224_22R
AOIP OUT 0023	XC24_23L / BC2224_23L
	XC24_23R / BC2224_23R
AOIP OUT 0024	XC24_24L / BC2224_24L
	XC24_24R / BC2224_24R
AOIP OUT 0025	XC24_25L / BC2224_25L
	XC24_25R / BC2224_25R
AOIP OUT 0026	XC24_26L / BC2224_26L
	XC24_26R / BC2224_26R
AOIP OUT 0027	XC24_27L / BC2224_27L
	XC24_27R / BC2224_27R
AOIP OUT 0028	XC24_28L / BC2224_28L
	XC24_28R / BC2224_28R
AOIP OUT 0029	XC24_29L / BC2224_29L
	XC24_29R / BC2224_29R
AOIP OUT 0030	XC24_30L / BC2224_30L
	XC24_30R / BC2224_30R
AOIP OUT 0031	XC24_31L / BC2224_31L
	XC24_31R / BC2224_31R
AOIP OUT 0032	XC24_32L / BC2224_32L
	XC24_32R / BC2224_32R

NOTE 1: When there is more that one XC24 / BC2224 module in ATRIUM / ARENA console or X_CORE / BC2000D matrix, the devices could be labelled in "Dante Controller" as XC24-01 / BC2214-01, XC24-02 / BC2214-02… XC24-n / BC2214-n in order to identify them (or with any other name that allows to identify them easily on each installation).

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 "Atrium Setup" / "Console Setup", "Matrix Setup" and "Dante Controller" applications, just like the device names, depending on each installation characteristics.

NOTE 3: When **BC2214** modules are installed instead of BC2224 in ARENA console or BC2000D matrix, the process is exactly the same but, instead of 32 stereo inputs and outputs, there are **16 stereo inputs and outputs** available per device. The names of the lines in console or matrix are the same but reaching only 16 and the reception and transmission channels in "Dante Controller" will be changed to BC2214_1L, BC2214_1R… BC2214_16L, BC2214_16R.

A3.1. Scope.

The purpose of this appendix is to review and set the information of the FORUM IP, FORUM LITE and CAPITOL IP 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 IP, FORUM LITE, CAPITOL IP 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 IP, FORUM LITE 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 identifies stereo lines as dual mono, so different names are assigned to left and right channels forming stereo line. Therefore, stereo lines must be managed as dual mono lines.
- FORUM IP, FORUM LITE 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 IP, FORUM LITE 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 IP console.

Inputs Labels in FORUM IP	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 IP	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 IP console, the devices could be labelled in "Dante Controller" as FORUM-1 and FORUM-2 in order to identify them (or with any other name that allows to identify them easily on each installation).

When there is more than one FORUM IP console in the system, the devices could be labelled in "Dante Controller" as FORUM01-1, FORUM01-2, FORUM02-1, FORUM02-2… FORUMn-1, FORUMn-2 in order to identify them (or with any other name that allows to identify them easily on each installation).
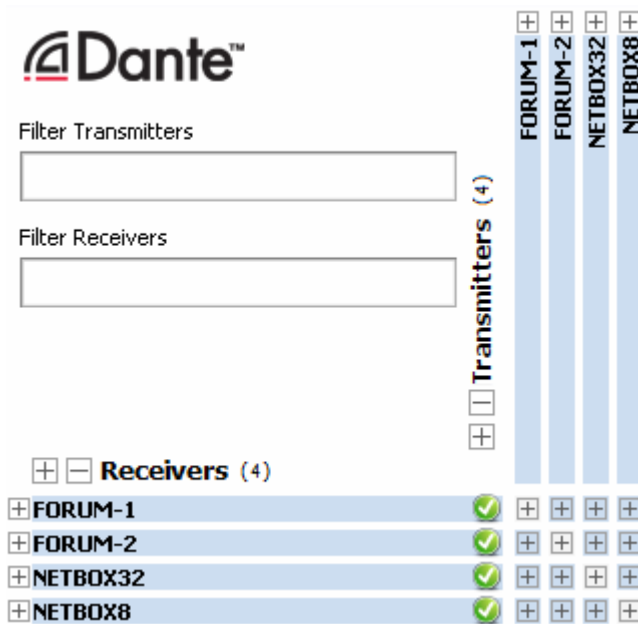
NOTE 2: The previous tables show the names of the input/out lines and reception/transmission channels that are configured by default and that can be edited by means of "FORUM IP Setup" and "Dante Controller" applications, just like the device names, depending on each installation characteristics.

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:
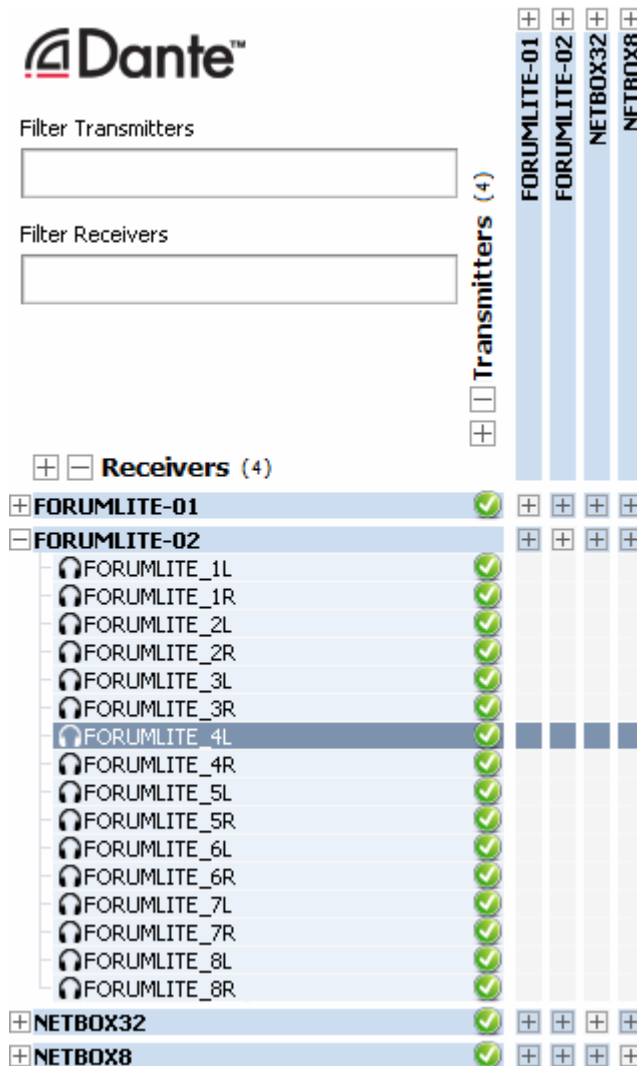
FORUM IP buses	Outputs Labels in FORUM IP	Transmission channels Labels in DANTE Controller
PROGRAM	aoip01	FORUM_PROGRAM_L
		FORUM_PROGRAM_R
AUDITION	aoip02	FORUM_AUDITION_L
		FORUM_AUDITION_R
AUX1	aoip03	FORUM_AUX1_L
		FORUM_AUX1_R

FORUM LITE console.

Inputs Labels in FORUM LITE	Reception channels Labels in DANTE Controller
AOIP01	FORUMLITE_1L
	FORUMLITE_1R
AOIP02	FORUMLITE_2L
	FORUMLITE_2R
AOIP03	FORUMLITE_3L
	FORUMLITE_3R
AOIP04	FORUMLITE_4L
	FORUMLITE _4R
AOIP05	FORUMLITE_5L
	FORUMLITE_5R
AOIP06	FORUMLITE_6L
	FORUMLITE_6R
AOIP07	FORUMLITE_7L
	FORUMLITE_7R
AOIP08	FORUMLITE_8L
	FORUMLITE_8R

Outputs Labels in FORUM LITE	Transmission channels Labels in DANTE Controller
aoip01	FORUMLITE_1L
	FORUMLITE_1R
aoip02	FORUMLITE_2L
	FORUMLITE_2R
aoip03	FORUMLITE_3L
	FORUMLITE_3R
aoip04	FORUMLITE_4L
	FORUMLITE_4R
aoip05	FORUMLITE_5L
	FORUMLITE_5R
aoip06	FORUMLITE_6L
	FORUMLITE_6R
aoip07	FORUMLITE_7L
	FORUMLITE_7R
aoip08	FORUMLITE_8L
	FORUMLITE_8R

NOTE 1: When there is more than one FORUM LITE console in the system, the devices could be labelled in "Dante Controller" as FORUMLITE-01, FORUMLITE-02… FORUMLITE-n in order to identify them (or with any other name that allows to identify them easily on each installation).

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 LITE 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:

| FORUM LITE buses	Outputs Labels in FORUM LITE	Transmission channels Labels in DANTE Controller
PROGRAM	aoip01	FORUMLITE_PROGRAM_L
		FORUMLITE_PROGRAM_R
AUDITION	aoip02	FORUMLITE_AUDITION_L
		FORUMLITE_AUDITION_R

NOTE 3: There are two versions of that AoIP Dante module: one with 16 input and 16 output channels, which is the one represented in the previous tables, and another one with 32 input and 32 output channels.

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 could be labelled in "Dante Controller" as CAPITOL-01, CAPITOL-02… CAPITOL-n in order to identify them (or with any other name that allows to identify them easily on each installation).
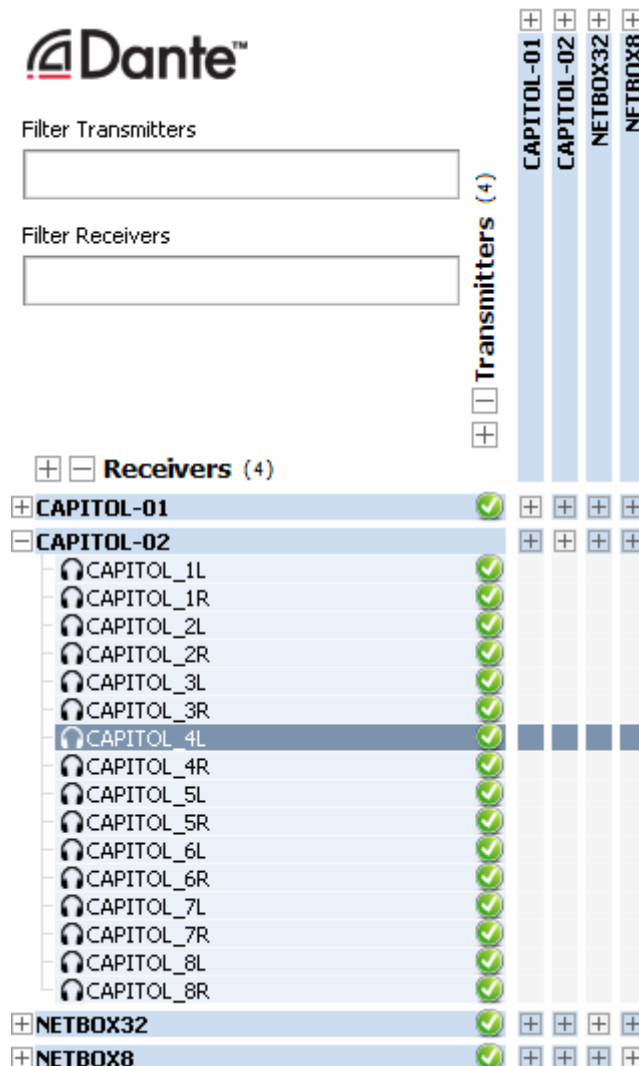
NOTE 2: The previous tables show the names of the input/out lines and reception/transmission channels that are configured by default and that can be edited by means of "CAPITOL IP Setup" and "Dante Controller" applications, just like the device names, depending on each installation characteristics.

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

NOTE 3: There are two versions of that AoIP Dante module: one with 16 input and 16 output channels, which is the one represented in the previous tables, and another one with 32 input and 32 output channels.

A3.2. Configuration software.

A3.2.1. "Administration" menu.

A3.2.1.1. "Configurations" submenu.
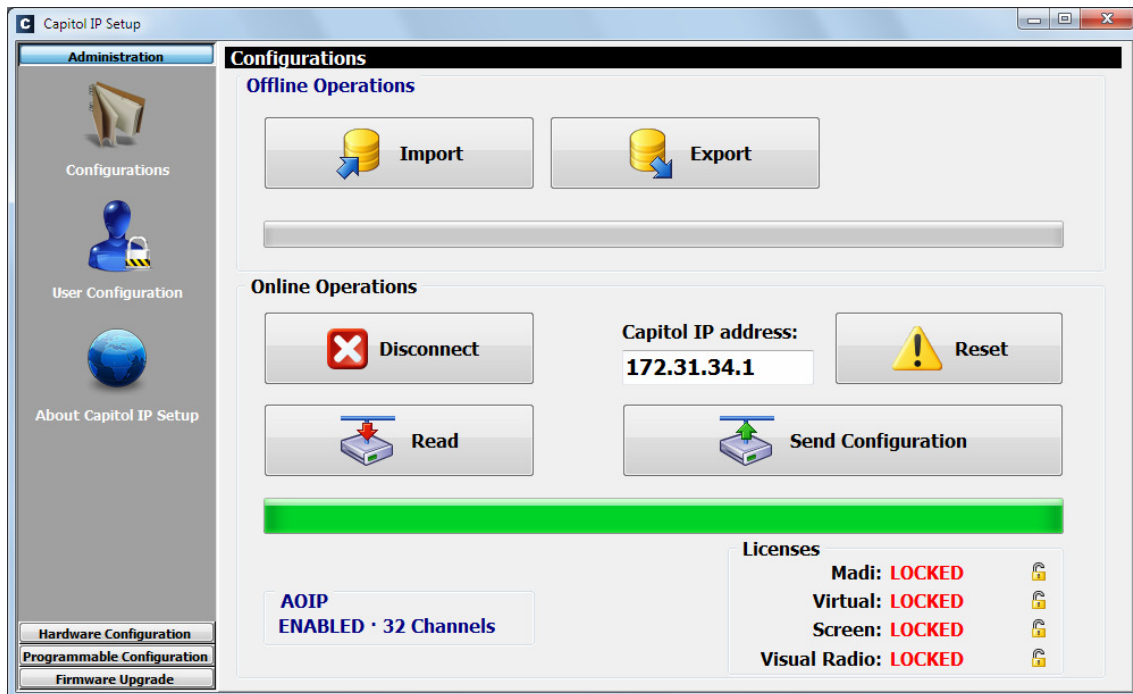
The following options appear once the connection between the computer where application is installed and the console is established.

- "**AOIP**": In the case of FORUM LITE / CAPITOL IP console, this section indicates whether the AoIP (audio over IP) functionality is "ENABLED" at physical level or not ("DISABLED"), that is, whether the IP module is installed in the audio core or not. When enabled, it also indicates if the installed hardware allows to use a maximum of 16 or 32 AoIP channels.

  In the case of FORUM IP 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):
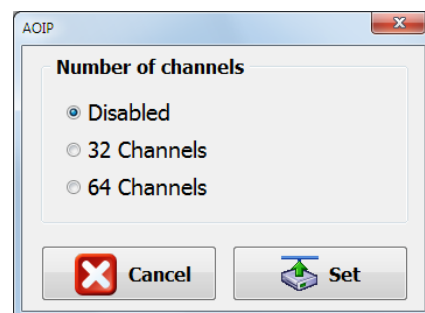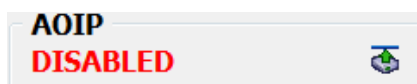

- "**Licenses**": allows you to activate the MADI link functionality. You must purchase a mandatory usage license first. For more information, please consult the console user manual.

  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.
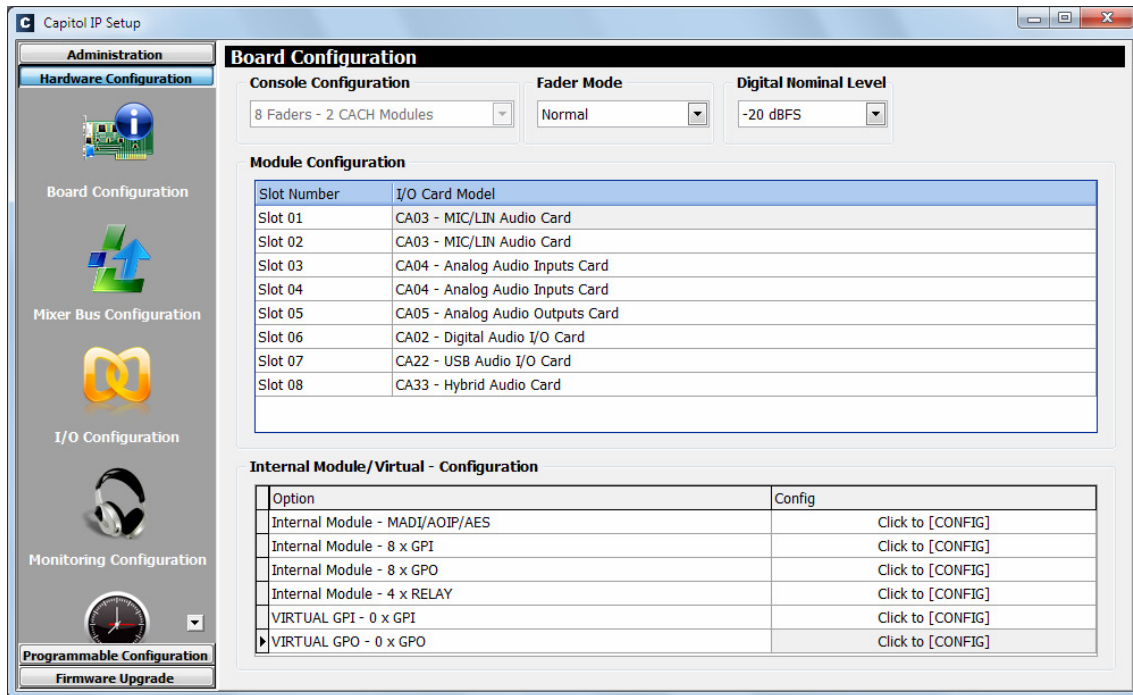
In order to configure the multichannel modules, first you need to access the "Internal Module - MADI/AOIP/AES" option for FORUM LITE / CAPITOL IP, or "Internal Module - MADI/AOIP" in the FORUM IP case, by clicking first "Click to [CONFIG]" and then clicking again on the "CONFIG" button that will appear.

A window will appear then, comprising 2 tabs in FORUM IP and 3 in FORUM LITE / 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.
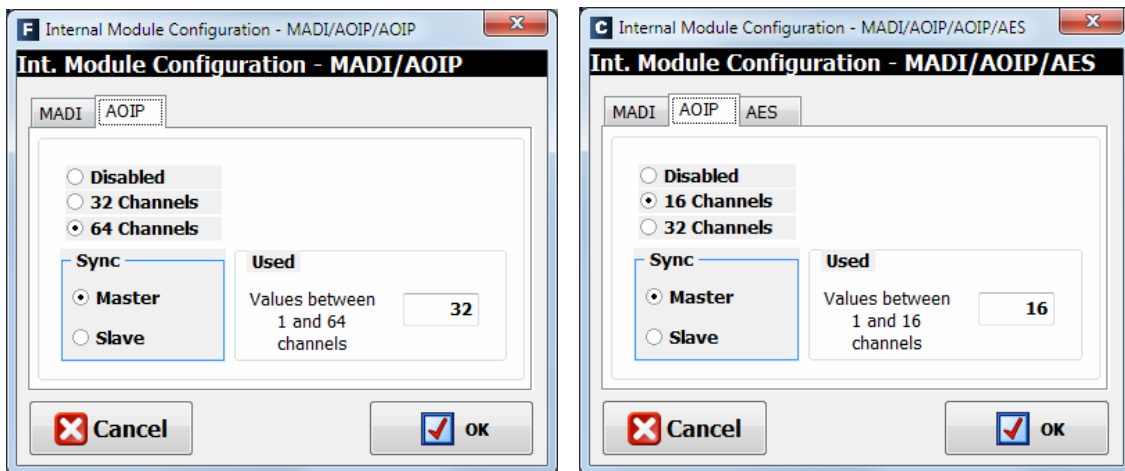
The configuration options are as follows (the last 2 are displayed only when the option is enabled):

  o "**Disable**"**:** to deactivate it.
  o "**16 Channels**" (for FORUM LITE / CAPITOL IP): activates it with a maximum of 16 channels.
  o "**32 Channels**" (for FORUM LITE / CAPITOL IP): activates it with a maximum of 32 channels.
  o "**32 Channels**" (for FORUM IP): for the activation of a single FR14 module in slot 14, with a maximum of 32 channels.
  o "**64 Channels**" (for FORUM IP): for the activation of two FR14 modules, one in slot 14 and the other in 13, with a maximum of 64 channels.
  o "**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").
  o "**Used**"**:** allows you to configure how many of the available mono channels are actually in use.

AES: this tab appears only in FORUM LITE / CAPITOL IP 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.
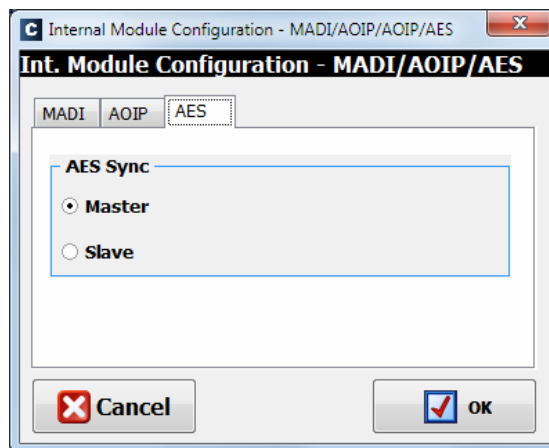
"**VIRTUAL GPI**" and "**VIRTUAL GPO**" options, at the bottom of "Internal Module/Virtual - Configuration" submenu, allow you to configure the virtual GPIOs of the console. For more information, please consult the user's manual of the unit.

FORUM IP 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).
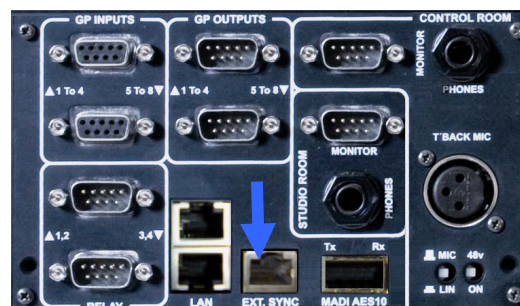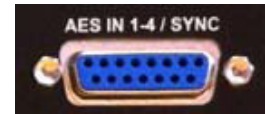

If a valid external AES11 or Word Clock synchronization signal is present, this one **prevails** over the external sync configuration on multichannel link (MADI or AoIP). If this signal is not present, then the external synchronization can be obtained from the multichannel link (MADI or AoIP) by configuring 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.

FORUM LITE / 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 labelled as aoip 01, aoip 02,… (in lowercase letters). They are also all stereo by default.
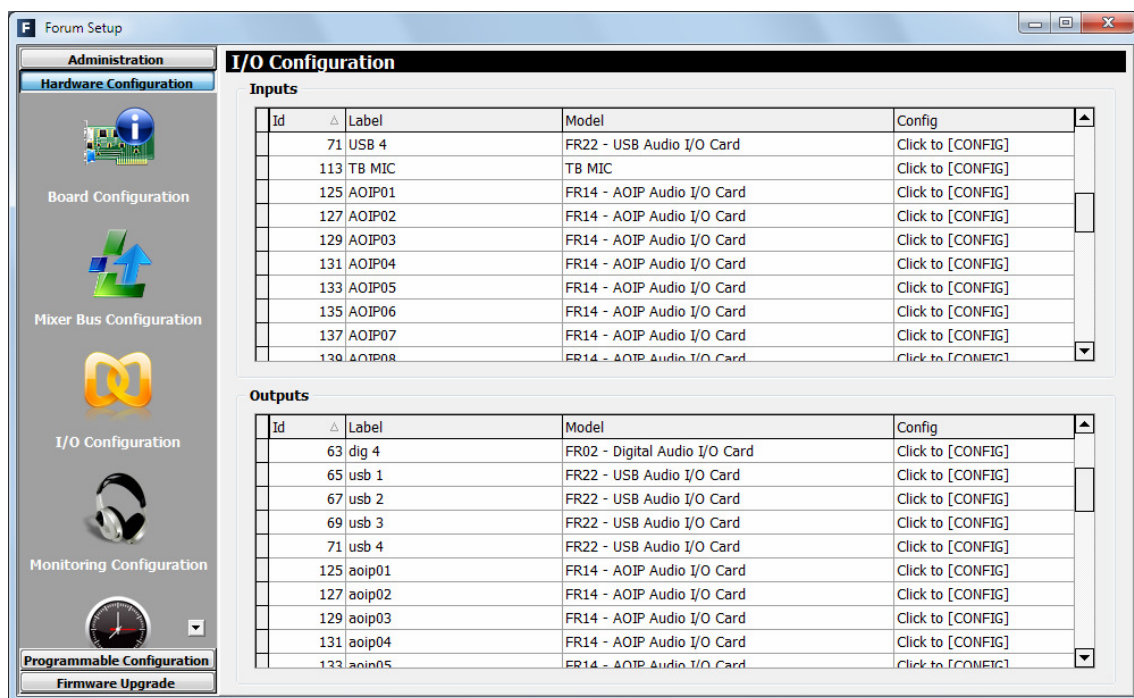
Inputs configuration.

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 "Mode" and "Show Channel in Fader Menu" options (if the input is configured as "Visible" it will be possible to associate it to a fader).
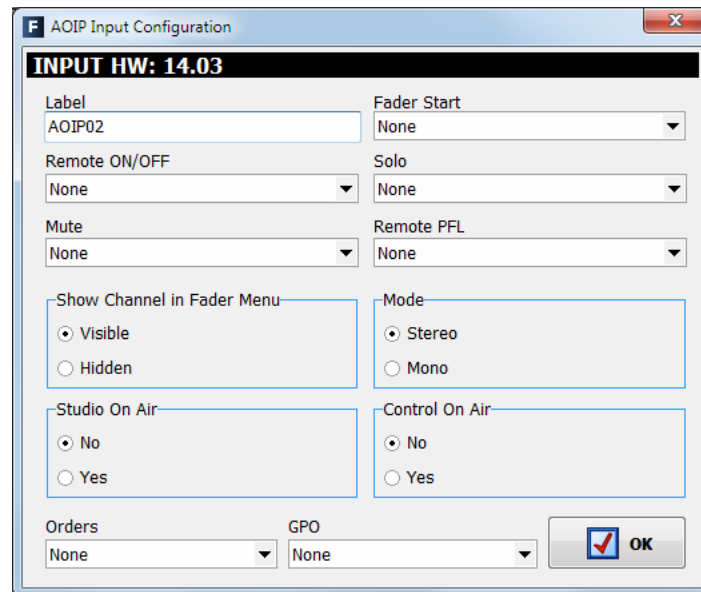
- **Headers:** indicates the type and position of the module that is configured at that moment.
  - "**AoIP Input Configuration**": means that an "AoIP" type input is being configured.
  - "**INPUT HW:xx.0y**": means that we are setting the input "y" of the card located in the slot xx. For instance:
    - "**INPUT HW:14.01**": means that input "1" of a card located in the virtual slot 14, assigned to the AoIP board in FORUM LITE / 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 IP, 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 IP, 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 IP or FORUM LITE / CAPITOL IP control surface.

- "**Show Channel in Fader Menu**": allows you to select whether the selected input channel can be associated ("Visible") or not ("Hidden") to a channel from AEQ FORUM IP or FORUM LITE / CAPITOL IP control surface through "FADER" menu. An example of a typically "Hidden" signal would be the time TOPS.

- "**Mode**": 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 IP and FORUM LITE / 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.

For more information about the other fields, please consult the user's manual of the unit.

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 "Mode" 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).
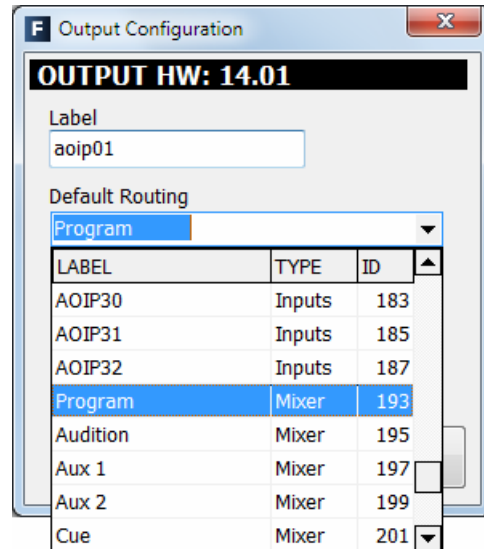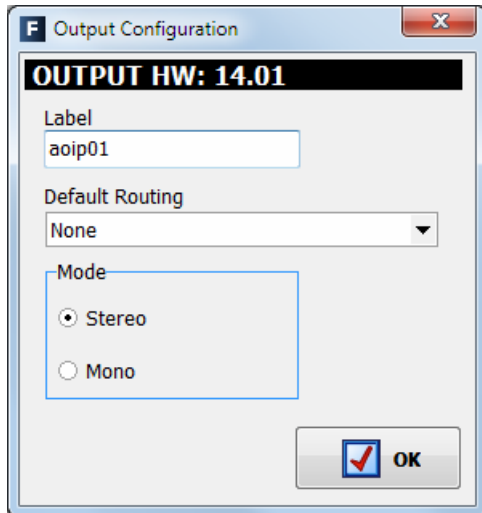
- **Headers:**
  - "**OUTPUT HW:xx.0y**"**:** means that we are setting the output "y" of the card located in the slot xx. For instance:
    - "**OUTPUT HW:14.01**"**:** means that output "1" of a card located in the virtual slot 14, assigned to the AoIP board in FORUM LITE / CAPITOL IP, is being configured.
    - "**OUTPUT HW:14.01**"**:** means that output "1" of a card located in the slot 14, assigned to the first AoIP board in FORUM IP, 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 IP, 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 IP or FORUM LITE / CAPITOL IP control surface (by default outputs are labelled 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 labelled in capitals.

- "**Mode**": allows you to configure the logical output channel as Mono or Stereo. By default, all the outputs channels of AEQ FORUM IP or FORUM LITE / 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.
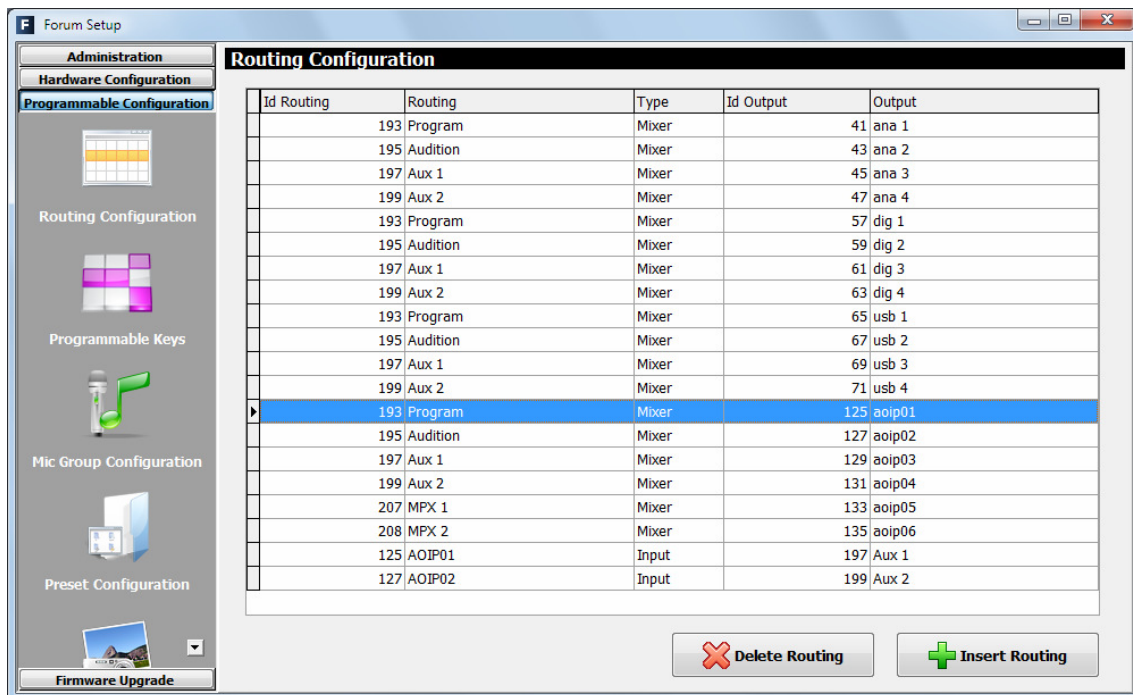

A3.2.3. "**Programmable Configuration**" **menu.**

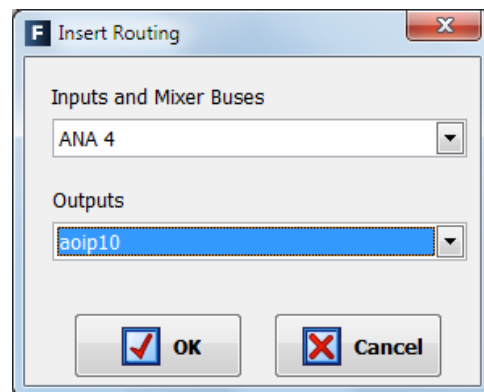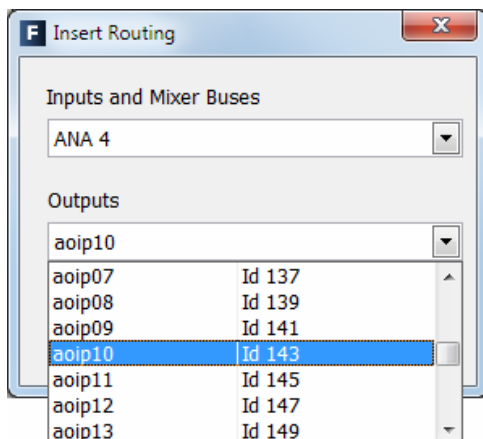**A3.2.3.1.** "**Routing Configuration**" **submenu.**

"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.

"**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 IP or FORUM LITE / 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.
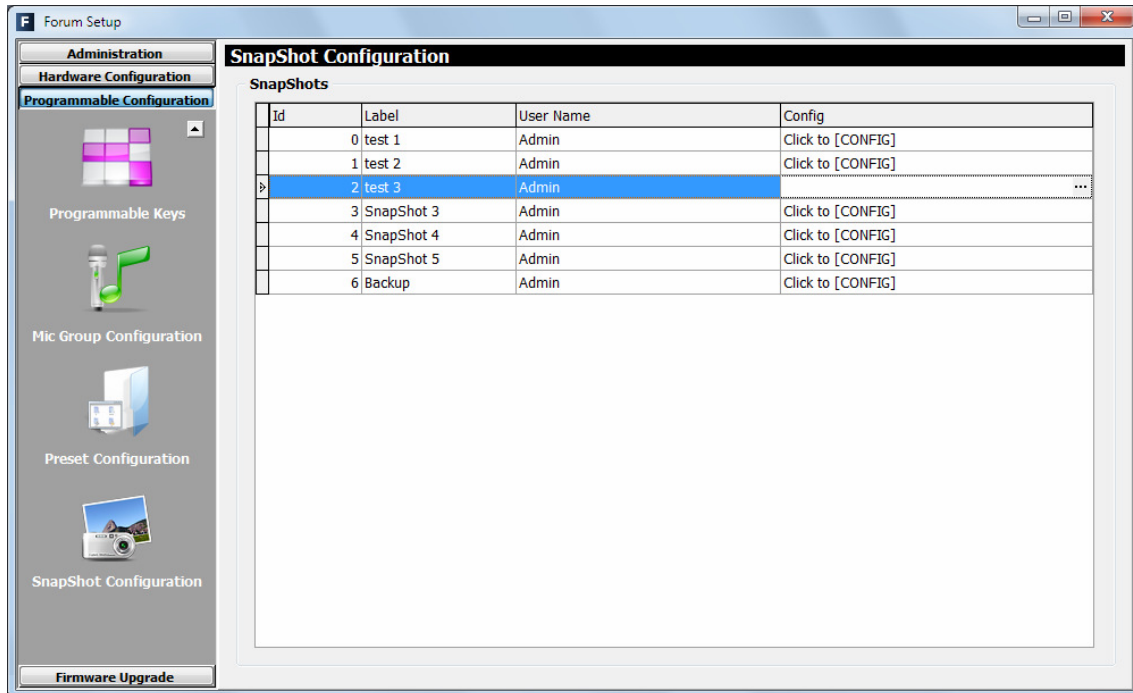
The main screen of this submenu is presented as a list of all the snapshots stored (there are up to 7 available snapshots), ordered by their "**Id**" and with a "**Label**" or name as identifier.

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 LITE / FORUM IP and up to 20 for GRAND FORUM IP). These faders are numbered from left to right, starting in 1 up to 8 in CAPITOL IP, up to 12 in FORUM LITE and up to 20 in FORUM IP. In the case of AEQ FORUM IP 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 IP, meaning up to 4, 8 or 12 channels, respectively; or 1 to 5 modules in GRAND FORUM IP, 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.
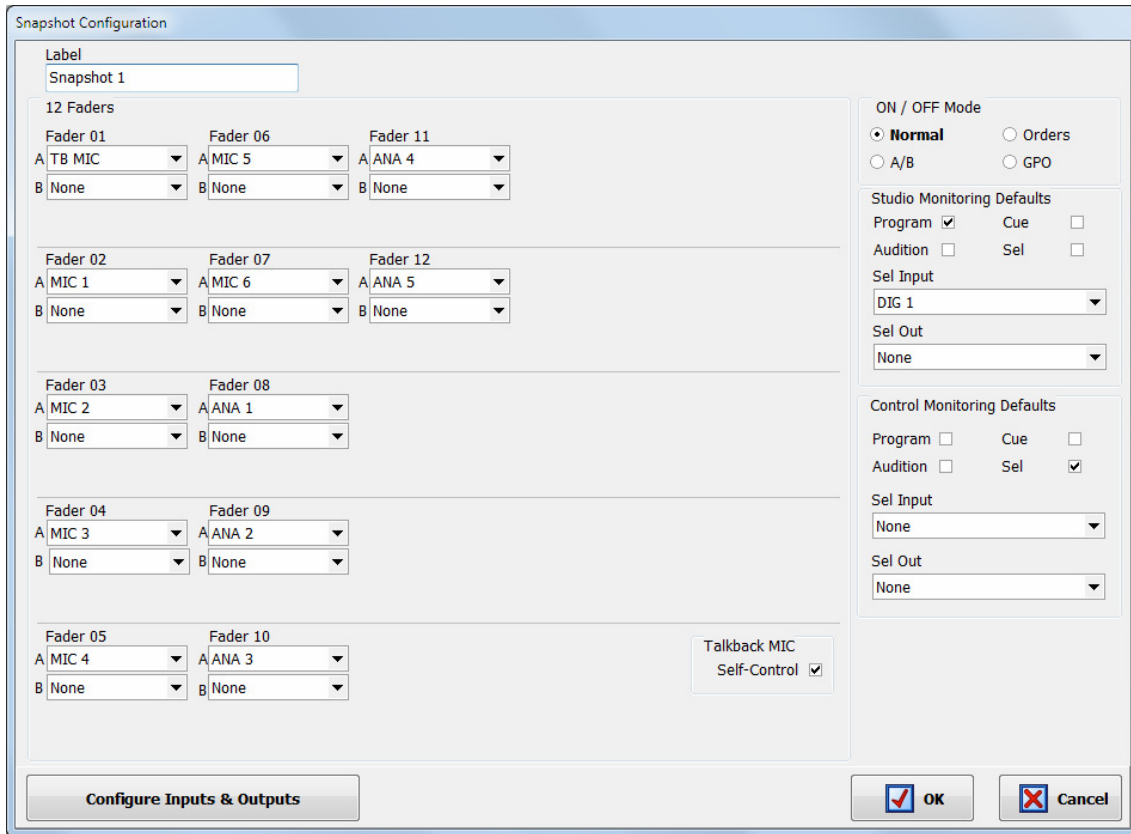
Advanced configuration of inputs and outputs.

Within the "Configure Inputs & Outputs" advanced configuration screen, accessed by pressing the corresponding button, the complete list of all the available audio input and output channels is shown. For more information, please consult the user's manual of the unit.
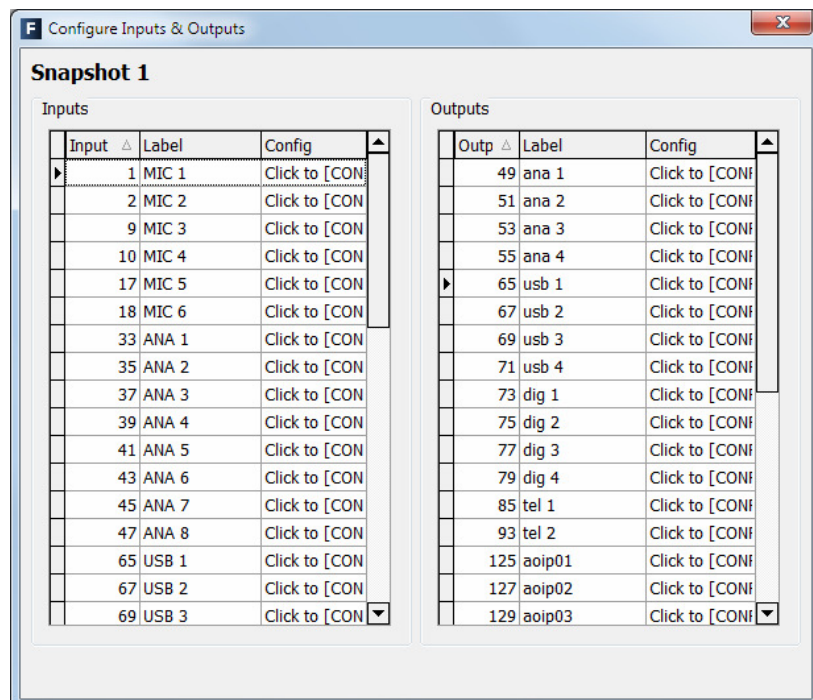
A3.3. Multichannel audio configuration internal menu options.

Among other options, the internal menu of the console allows for the online modification of the routing configured from the setup software, and also the activation of the different memories or snapshots.
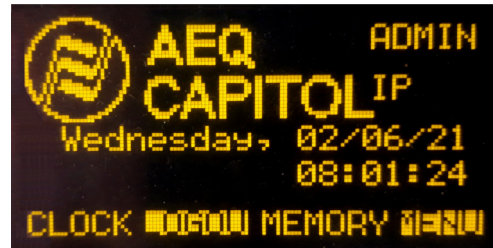
A3.3.1. "**MEMORY**" menu.

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.
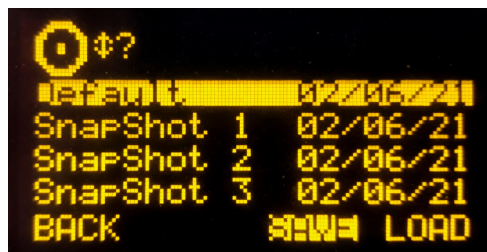

The options available through the contextual keys below the screen, from left to right, are:

- "**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.

For more information, please consult the user's manual of the unit.

**A3.3.2. Multichannel routing configuration.**
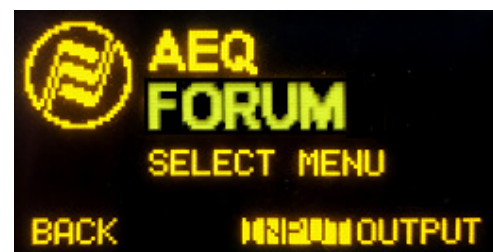
Pressing the "MENU" key in the initial screen will take you to the "MAIN MENU" screen and, from this one, by pressing "**SELECT**" you can access to the menu that allows you to perform advanced configuration of audio inputs/outputs, internal routing and processes. There are two options, "INPUT" and "OUTPUT", 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. For more information about this advanced information screen, please consult the user's manual of the unit.
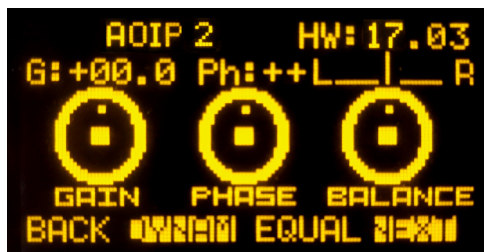

NOTE: When the input audio channel selected in the "INPUTS" list is assigned to a fader channel, you can also access to this advanced information screen by pressing the "**SELECT**" key of the corresponding channel, working this key as a quick access to this submenu.

You can access the expanded information menu about the audio signal present in this input channel, by pressing the "**NEXT**" key:
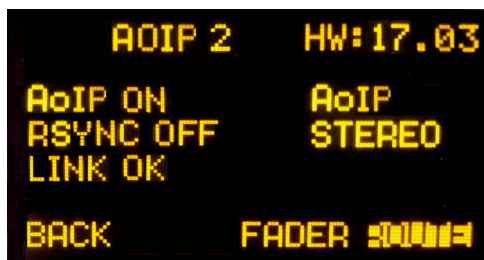
The "**ROUTE**" key gives you access to the menu for control and configuration of the internal routing of the equipment.
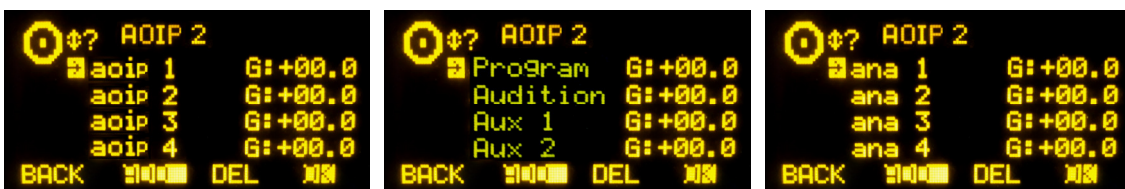

In the first example, by clicking "ADD" and the "OK" the "AOIP7" input of the AoIP multichannel link is sent directly to "aoip 1" output. In the second one, to "Program" bus, and in the third image, to "ana 1 output". By default, all are stereo signals, unless the user configures the opposite.

For more information, please consult the user's manual of the unit.

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.
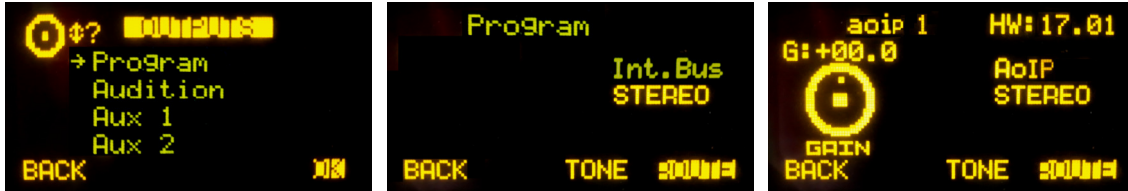
You can access a more detailed description of each one of the output audio channels by turning any of the 3 associated encoders and pressing then the "OK" contextual key or any of these encoders.

The "**ROUTE**" option allows you to manage the internal routing of the signals of the console toward that output signal or bus.

For more information about this advanced information screen, please consult the user's manual of the unit.

APPENDIX 4. Installation details: configuration of NETBOX 4 MH, NETBOX 8 AD, NETBOX 32 AD and NETBOX DSP.

A4.1. Scope.

The purpose of this appendix is to detail the default nomenclature of audio channels in NETBOX 4 MH, NETBOX 8 AD, NETBOX 32 AD and NETBOX DSP in order to ease installation and configuration of a multichannel AoIP audio system.

A4.1.1. NETBOX 4 MH, NETBOX 8 AD, NETBOX 32 AD, NETBOX DSP and DANTE internal systems correspondence.

Have in mind that:

- DANTE identifies stereo lines as dual mono, so different names are assigned to left and right channels forming stereo line. Therefore, stereo lines must be managed as dual mono lines.
- The names of the input and output lines for NETBOX 4 MH, NETBOX 8 AD and NETBOX 32 AD that appear respectively in "NetBox4MH" and "NetBox Tool" applications are not editable.

The names that are associated by default to input/output lines of NETBOX 4 MH, NETBOX 8 AD, NETBOX 32 AD and NETBOX DSP (as they appear in "NetBox4MH" and "NetBox Tool" applications) 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. In the case of NETBOX DSP there are only Dante transmission and reception channels, so there is no need to establish that correspondence.

NETBOX 4 MH.

Inputs Labels in NetBox4MH	Transmission channels Labels in DANTE Controller
MIC 1 / LINE 1 L	NBOX4MH_1L
MIC 2 / LINE 1 R	NBOX4MH_1R
MIC 3 / LINE 2 L	NBOX4MH_2L
MIC 4 / LINE 2 R	NBOX4MH_2R

Outputs Labels in NetBox4MH	Reception channels Labels in DANTE Controller
HP 1 L / LINE 1 L (PRIMARY) or HP 1 L / LINE 1 L (SECONDARY)	NBOX4MH_1L or NBOX4MH_2L
HP 1 R / LINE 1 R (PRIMARY) or HP 1 R / LINE 1 R (SECONDARY)	NBOX4MH_1R or NBOX4MH_2R
HP 2 L / LINE 2 L (PRIMARY) or HP 2 L / LINE 2 L (SECONDARY)	NBOX4MH_1L or NBOX4MH_2L
HP 2 R / LINE 2 R (PRIMARY) or HP 2 R / LINE 2 R (SECONDARY)	NBOX4MH_1R or NBOX4MH_2R
HP 3 L (PRIMARY) or HP 3 L (SECONDARY)	NBOX4MH_1L or NBOX4MH_2L
HP 3 R (PRIMARY) or HP 3 R (SECONDARY)	NBOX4MH_1R or NBOX4MH_2R
HP 4 L (PRIMARY) or HP 4 L (SECONDARY)	NBOX4MH_1L or NBOX4MH_2L
HP 4 R (PRIMARY) or HP 4 R (SECONDARY)	NBOX4MH_1R or NBOX4MH_2R

NETBOX 8 AD.

Inputs / Outputs Labels in NetBox Tool	Transmission / reception 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 AD.

Inputs / Outputs Labels in NetBox Tool	Transmission / reception 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 could be labelled in "Dante Controller" as NETBOX4MH-01, NETBOX4MH-02… NETBOX4MH-n, as NETBOX8-01, NETBOX8-02… NETBOX8-n or as NETBOX32-01, NETBOX32-02… NETBOX32-n in order to identify them (or with any other name that allows to identify them easily on each installation).
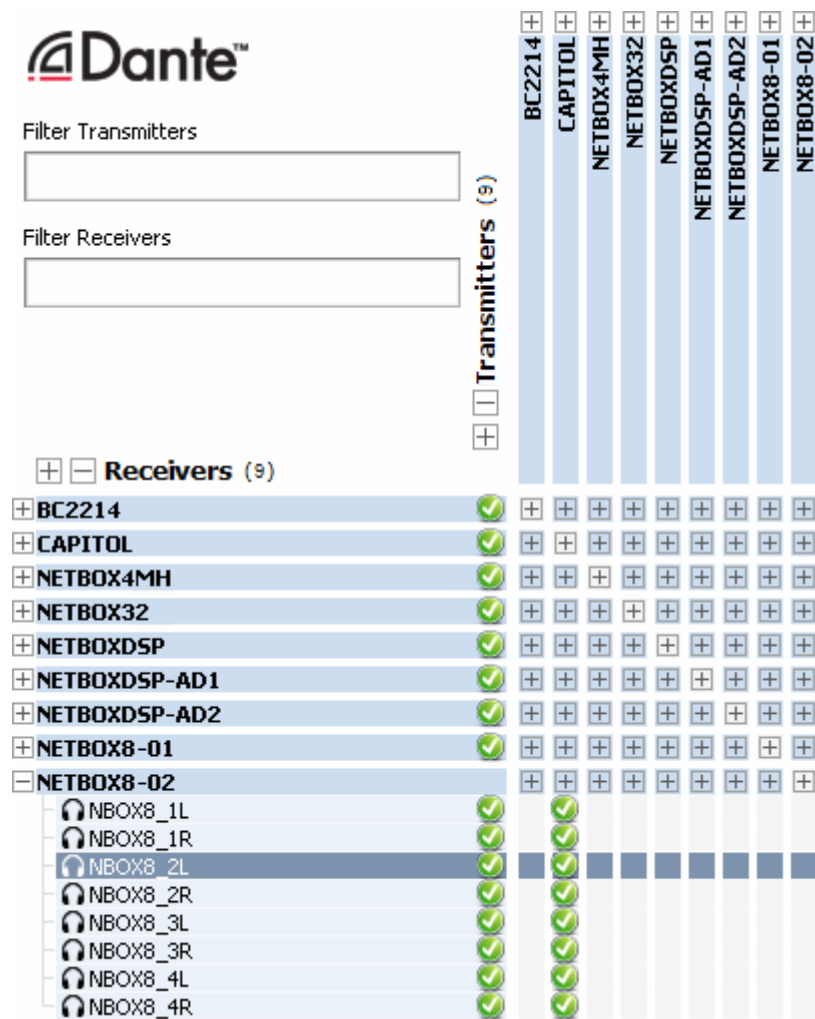
NOTE 2: In the case of **NETBOX DSP 64** the names of the transmission / reception channels in "Dante Controller" are NBOXDSP_1L, NBOXDSP_1R, NBOXDSP_2L... NBOXDSP_31R, NBOXDSP_32L and NBOXDSP_32R.

In the case of **NETBOX DSP 96**, "Dante Controller" will show the main module with the previously described channels and a second device corresponding to the additional module with 32 transmission / reception channels (named as NBOXDSP_1L, NBOXDSP_1R, NBOXDSP_2L... NBOXDSP_15R, NBOXDSP_16L and NBOXDSP_16R).

In the case of **NETBOX DSP 128**, "Dante Controller" will show the main module with the previously described channels and 2 additional devices corresponding to the 2 additional modules with 32 transmission / reception channels per module (named as NBOXDSP_1L, NBOXDSP_1R, NBOXDSP_2L... NBOXDSP_15R, NBOXDSP_16L and NBOXDSP_16R).

In the case of **NETBOX DSP 160**, "Dante Controller" will show the main module with the previously described channels and 3 additional devices corresponding to the 3 additional modules with 32 transmission / reception channels per module (named as NBOXDSP_1L, NBOXDSP_1R, NBOXDSP_2L... NBOXDSP_15R, NBOXDSP_16L and NBOXDSP_16R).

The main module could be labelled in "Dante Controller" as NETBOXDSP and the additional modules as NETBOXDSP-AD1, NETBOXDSP-AD2 and NETBOXDSP-AD3 in order to identify them (or with any other name that allows to identify them easily on each installation).

NOTE 3: 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.

APPENDIX 5. Installation details: configuration of OLYMPIA 3.

A5.1. Scope.

The purpose of this appendix is to detail the default nomenclature of audio channels in OLYMPIA 3 in order to ease installation and configuration of a multichannel AoIP audio system.

A5.1.1. OLYMPIA 3 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 OLYMPIA 3 is not transferred to the channels that appears in "Dante Controller" application, so both systems must be configured separately. Also note that:
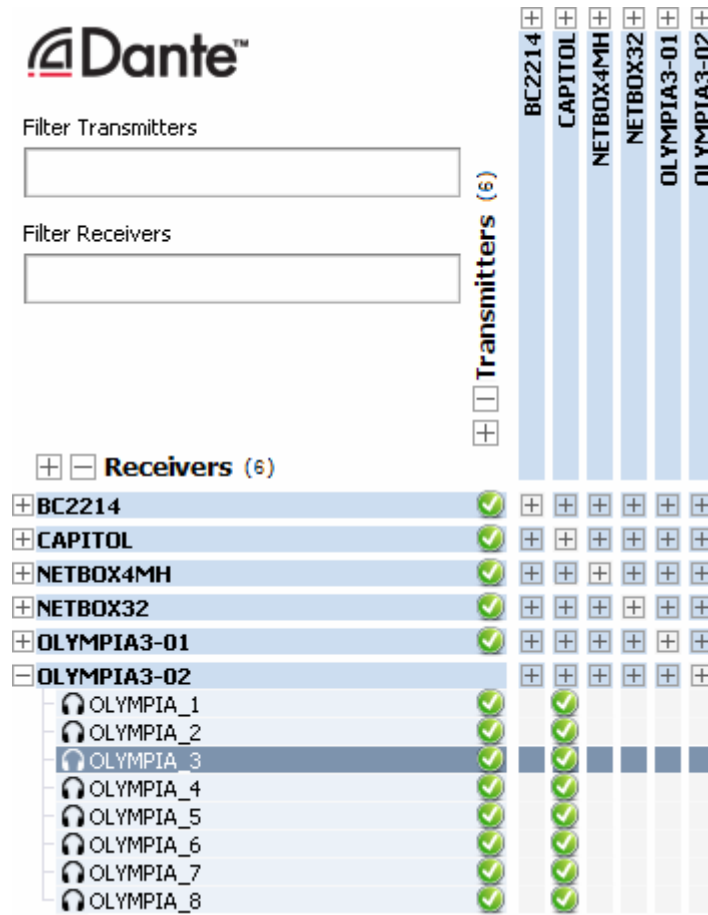
- DANTE identifies stereo lines as dual mono, so different names are assigned to left and right channels forming stereo line. Therefore, stereo lines must be managed as dual mono lines.
- OLYMPIA 3 displays support only up to 8 characters per label.

AoIP inputs and outputs in OLYMPIA 3 are assigned by default to certain logical inputs and outputs of the unit, and you can edit this assignment by means of "OLYMPIA 3 CU Control" application.

The names that are associated by default to AoIP input/output lines in OLYMPIA 3 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.

Inputs / Outputs Labels in OLYMPIA 3 CU Control	Reception / transmission channels Labels in DANTE Controller
AoIP1	OLYMPIA_1
AoIP2	OLYMPIA_2
AoIP3	OLYMPIA_3
AoIP4	OLYMPIA_4
AoIP5	OLYMPIA_5
AoIP6	OLYMPIA_6
AoIP7	OLYMPIA_7
AoIP8	OLYMPIA_8

NOTE 1: When there is more than one OLYMPIA 3 in the system, the devices could be labelled in "Dante Controller" as OLYMPIA3-01, OLYMPIA3-02… VENUS-n in order to identify them (or with any other name that allows to identify them easily on each installation).

NOTE 2: The previous table shows 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.

APPENDIX 6. Installation details: configuration of PHOENIX VENUS V3.

A6.1. Scope.

The purpose of this appendix is to detail the default nomenclature of audio channels in PHOENIX VENUS V3 in order to ease installation and configuration of a multichannel AoIP audio system.

A6.1.1. PHOENIX VENUS V3 and DANTE internal systems correspondence.
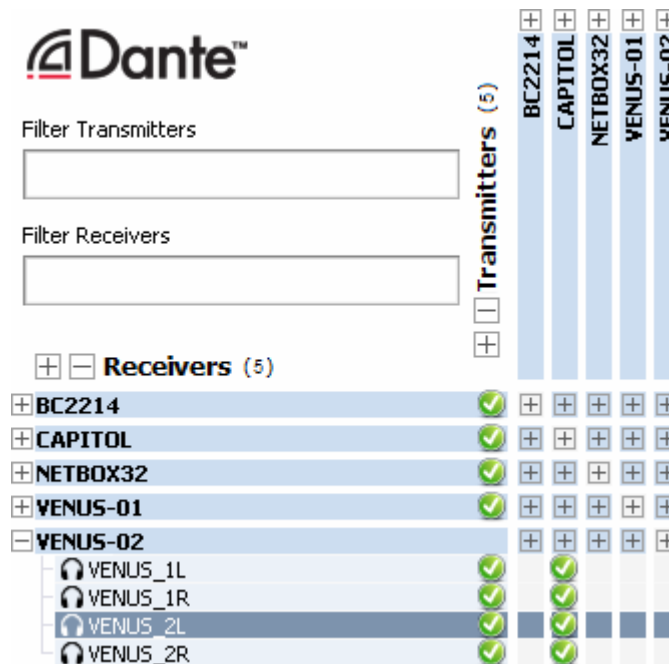
Have in mind that:

- DANTE identifies stereo lines as dual mono, so different names are assigned to left and right channels forming stereo line. Therefore, stereo lines must be managed as dual mono lines.

PHOENIX VENUS V3 features 2 communication channels (CH1 and CH2) that can be configured with analog, digital or AoIP inputs. Regarding the outputs, you must select one of the 2 available options: "Analog+Digital" or "Analog+AoIP". Obviously, AoIP inputs/outputs are available only when Dante optional interface is activated by means of the corresponding license.

The correspondence between the inputs/outputs of both communication channels and the associated channels that appears in "Dante Controller" are detailed next.

Inputs / Outputs Labels in ControlPHOENIX	Reception / transmission channels Labels in DANTE Controller
CH1 L	VENUS_1L
CH1 R	VENUS_1R
CH2 L	VENUS_2L
CH2 R	VENUS_2R

NOTE 1: When there is more than one PHOENIX VENUS V3 in the system, the devices could be labelled in "Dante Controller" as VENUS-01, VENUS-02… VENUS-n in order to identify them (or with any other name that allows to identify them easily on each installation).

NOTE 2: The previous table shows 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.

APPENDIX 7. DANTE based AEQ AoIP Ethernet Switches.

A7.1. 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:

- Switches must be Gigabit rated (1000 Mbps). In the case of NETBOX 4 MH and PHOENIX VENUS V3, 100 Mbps switches can also be used.
- 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:

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 generally for AEQ AoIP after the aforementioned setup was carried out:

- Cisco SG300
- Cisco SG200
- Netgear GS724T

NETBOX 4 MH admits **PoE** or **PoE+** power supply**.** This option advises the use of switches that provide that type of power supply. Some switches of Cisco SG300 and SG350 family are suitable, with different capacity regarding Ethernet ports and PoE+ power:

- Cisco SG300 - 10 PP-K9 with 62 W PoE for 8 ports (2 of them for NETBOX 4 MH).
- Cisco SG350 - 10 MP-K9 with 128 W PoE for 8 ports (5 of them for NETBOX 4 MH).
- Cisco SG300 - 52 MP-K9 with 740 W PoE for 48 ports (30 of them for NETBOX 4 MH).

When a NETBOX 4 MH is added to a system with a switch previously selected that is not a PoE or PoE+ one and there is no socket where the NETBOX 4 MH should be installed, a **PoE+ injector** can be installed between a switch port and the unit. For this purpose, the following switch is approved:

- Linksys Profesional LACPI30 - PoE Injector.

A7.2. Configuration of CISCO switches for AEQ AoIP systems.

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.

Although PoE+ switches of the 300 and 350 series are suggested, the configuration procedure for those series is similar to the following one for the 200 series.

Configuration procedure for the Cisco SG200 family of switches for use with DANTE technology

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.
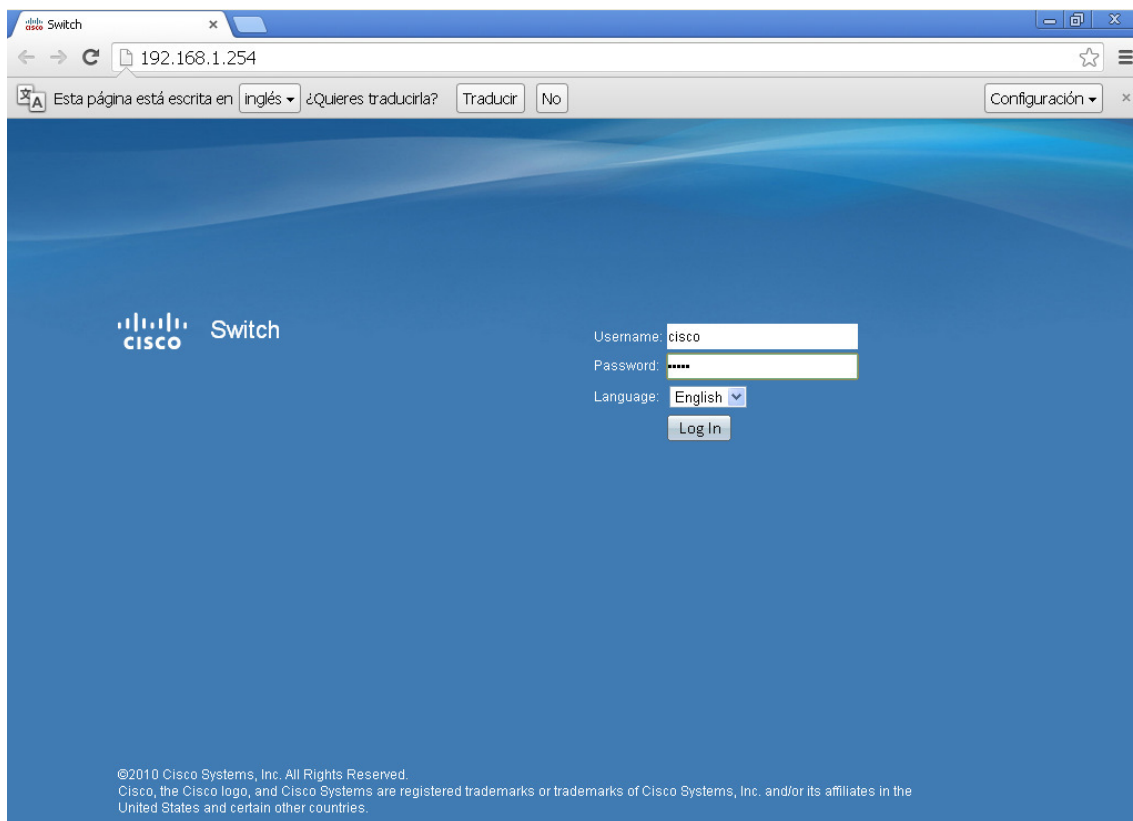
3. Go to section Quality of Service →DSCP to Queue:
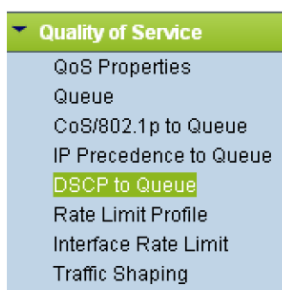
We will see some decimal values and a priority:
Ingress DSCP= <decimal value>
Output Queue=Priority (1 corresponds to the lowest priority, 4 is the highest)

Ingress DSCP	Output Queue
0(BE)	1

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:

Small Business
CISCO SG 200-08 8-Port Gigabit Smart Switch   Save   cisco   Language

6. By clicking on the Save button, you will be redirected to another page to save the values in the switch.
Click on Apply.

APPENDIX 8. 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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>
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