AuviTran Audio ToolBox
AxC-DANTE

Instruction Manual

Dante Interface Card

for Audio ToolBox Platform

 WARNING

Always follow the basic precautions listed below to avoid the possibility of serious injury or even death from electrical shock, short-circuiting, damages, fire or other hazards. These precautions include, but are not limited to, the following:

PRECAUTIONS

- Do not apply excessive pressure on connectors or any other part of the board. Do not touch the metallic sharp parts (pins) of the product.

- This product is electrostatic sensitive; make sure you check this before touching or using it.

- The disconnect devices of the Audio ToolBox unit are the appliance inlet of the auxiliary power supply and the appliance inlet on the rear side of the unit. These must be easily reachable.

- To prevent electric shock, unplug the unit before handling. The achievement of other operations not mentioned in this document is prohibited. Repairs can be performed only by a technician trained and qualified.

- Each connection must be Safety Extra Low Voltage kind (SELV), and must stay inside buildings.

LIMITATION OF LIABILITY

In no case and in no way, the provider of this Product (AuviTran, the distributor or reseller, or any other party acting as provider) shall be liable and sued to court for damage, either direct or indirect, caused by and to the user of the board and which would result from an improper installation or misuse of the Product. "Misuse" and "improper installation" mean installation and use not corresponding to the instructions of this manual.

Please note that graphics given in this manual (drawings and schemes) are only examples and shall not be taken for a real vision of your own equipment configuration.

AuviTran is constantly working on the improvement of the products. For that purpose, the products functionalities are bound to change and be upgraded without notice. Please read carefully the User's manual as the new functionalities will be described therein.

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http://www.auvitran.com

PACKAGE CONTAINS

- 1 AxC-DANTE card + Thumbscrews

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1 WELCOME!

Thank you for purchasing AuviTran's Audio Toolbox AxC-DANTE extension card. We hope you will enjoy using it.

You will find herewith the necessary instructions to use your product. Please read them carefully as misuse of this device might cause serious damage to you and your environment.

2 OVERVIEW

Audinate's Dante technology provides high performance digital media networking that meets the quality and performance requirements of professional audio market.

Dante is built on Internet Protocols, not on Ethernet level.

Using standard IP over Ethernet, Dante is able to run on inexpensive off-the-shelf computer networking hardware, and with use of standard QoS, can share installed networks with other data and computing traffic.

Dante provides sample-accurate synchronization and can deliver the very low latency required by professional audio. Dante's network-centric, audio independent approach to synchronization allows synchronized playback across different audio channels, devices and networks, even over multiple switch hops.

AxC-DANTE card provides to the AuviTran Audio ToolBox platform a cost effective gateway to DANTE connected devices.

Combined with other AuviTran Audio ToolBox cards, the AxC-DANTE card opens exciting possibilities to the professional audio systems:

- DANTE based stage boxes, in combination with the high performance AxC-AX4M high class mic/line preamps cards and AxC-AX4O analog out card
- DANTE bridges in combination with other network AxC card such as DANTE-MADI bridge, DANTE-EtherSound bridges, with unique connectivity possibilities (dynamic patching solution, remote control, ASIO recording/playback…)

3 WHAT'S NEW?

This document refers to Dante devices with embedded Firmware/Kernel 0x0103/2.00 and further. What's new since Firmware/Kernel 0x0102/1.09?

- Editing Dante ID directly in AVS-Monitor software.

- Added "Identify" function, to quickly now which device you are working on.

- Signal/Clip vu-meters on all 64 in/64 out channels.

- Editing clock settings directly in AVS-Monitor software.

- Editing network settings (switched/redundant) directly in AVS-Monitor software.

- Capacity to reduce number of I/O used, optimizing capabilities when plugged in AVBx3 rack.

- Added 44.1kHz sample rate frequency.

- Capacity to remote control AxC-AX4M cards directly with Yamaha console (MY16-AUD) using HA-Remote protocol.

4   TECHNICAL SPECIFICATIONS

AxC–Dante: Dante card for the AuviTran Audio ToolBox platform	
Size	200 mm x 100 mm x 40 mm – Format AuviTran Audio ToolBox platform cards
Power Supply	+12V / +3.3V - Through AuviTran Audio ToolBox backplane
Storage: Temp/Humidity	- 5°C to 70°C / 0% to 95% (non-condensing)
Operating: Temp/Humidity	0 °C to 50°C / 5% to 90% (non-condensing)
Connectors	2 x Neutrik EtherCon RJ45-XLR female connectors 2 x RJ45 connectors
Dante Operation modes	Switch – Integrated Gigabit switch Redundant with Primary and Secondary ports, replicated on ports 3 and 4
Audio Outputs	Up to 64 channels
Audio Inputs	Up to 64 channels
Sample format	24 bit
Sample rate	44.1 kHz and 48kHz; 96kHz ready
Synchronization	Automatic from Dante network

Control and monitoring Environment	
AVS-Monitor	AVS-Monitor enables to remotely set, control and monitor a Dante or EtherSound network and provides enhanced control pages to manage the specific parameters of cards inserted in the different slots
Audinate Dante Controller	For audio patch of any Dante device, and additional features: multicast/unicast; redundant mode or switch mode…
Audinate Dante Virtual Sound Card	The optional Dante Virtual Soundcard software allows your PC/Mac to connect to a Dante audio network. Note: a license purchase is required (see Audinate web site)

5 FRONT PANEL / WIRING
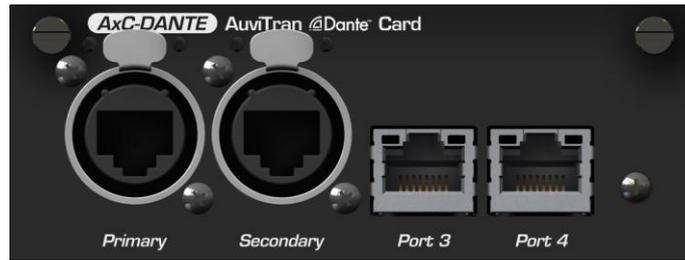
AxC-DANTE front panel

AxC-DANTE card provides 4 Giga-Ethernet ports that allow various architecture possibilities.
Two modes are available, with their own wiring restrictions. Please read carefully the following lines to avoid any mistakes and network errors when building a Dante network.

5.1 Switch Mode

① *When powered up for the first time, AxC-DANTE card starts in Switch mode.*

In Switch mode, all 4 ports are switched together and behave the same way. There is no "Primary" or "Secondary" capability. You can see your AxC-DANTE card as a regular 4 ports Giga-Ethernet switch.
This mode allows you to build daisy-chained and/or star architecture easily. In some small architecture, it can reduce or even suppress the need of external Gigabit Ethernet switch.

5.1.1 Daisy-Chain architecture
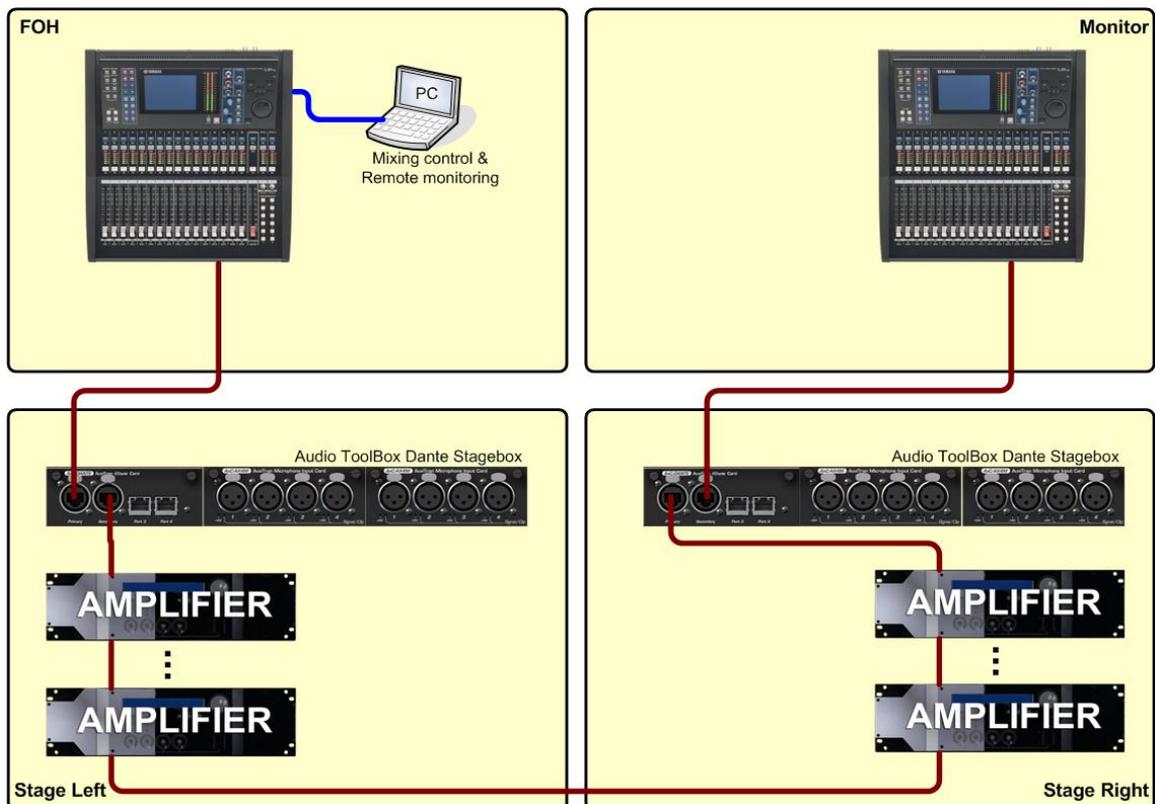
This wiring is the simplest, for the lowest cost. All devices are daisy-chained using a single Ethernet cable. Please note that in this case, failure can have serious drawbacks. If a single cable is broken, or if a device fails, the whole network behind this failure will be unavailable.
Please also be aware that each new devices chained will add latency to the network (a switch "hop"). In this example, if many amplifiers are daisy-chained, latency can raise-up dramatically.

5.1.2 Star architecture with no switch

Thanks to the 4 ports of AxC-DANTE card, previous example can be improved using a star architecture without the need of an external switch. Please have a look to the following:
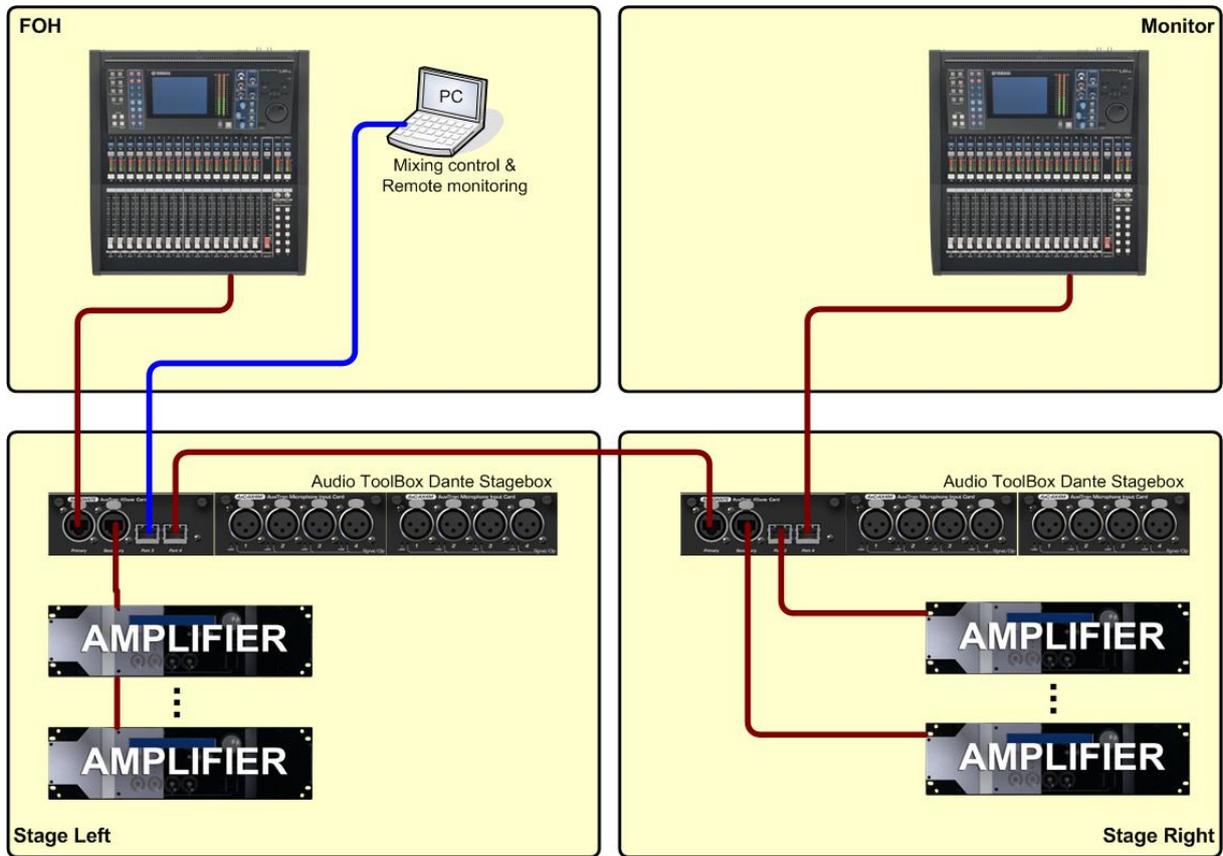
AxC-DANTE card is acting as a regular switch. Multiple amplifiers can be dispatched on AxC-DANTE remaining ports, reducing switch hops, and thus, overall latency. Security is also slightly improved, as an amplifier failure in a branch will not impact others branches.

5.1.3 Star architecture with external switch

Previous example is a great solution for small networks, and mainly signal broadcasting on amplifiers. Security is not at its best, as if an AxC-DANTE card is in failure, the whole network will fall down.

The usual way to wire a switched Dante network with maximum security is to add an external Gigabit Ethernet switch.
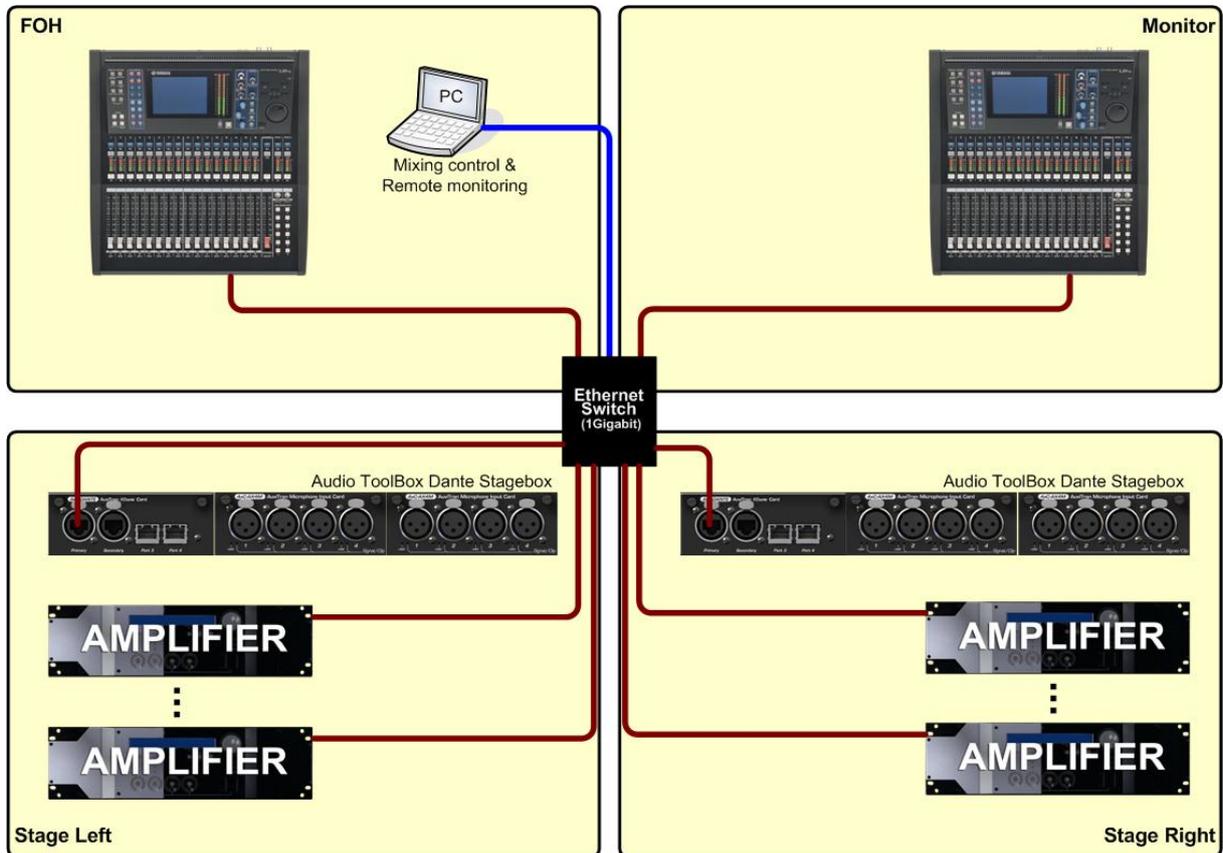
In this case, failure of a device will have no impact on others devices.
Please note that in this example, the control computer can be plugged anywhere in your network, on any device (not necessarily on the switch itself).

5.1.4   Switch mode and loop architecture

Devices really act as regular Ethernet switches. So please NEVER make a loop with your devices, as you will see the whole network fall down immediately!
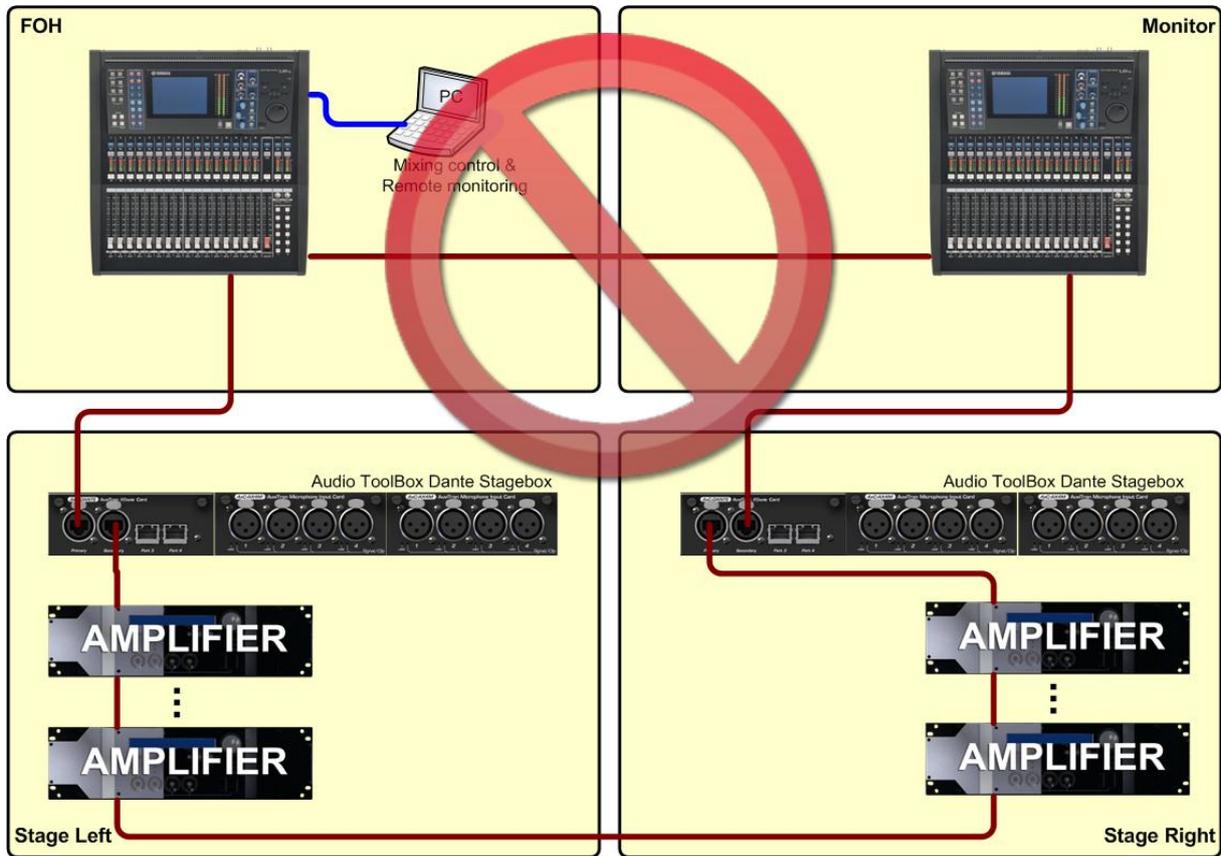
5.2 Redundant Mode

Dante device can also work in a redundant mode. When this mode is enabled, two separated Dante network are created. Theses networks are usually called "Primary" and "Secondary" networks. This mode allows you to reach the maximum security in a Dante network.

☝ *Important note: When in redundant mode, Primary and Secondary networks should NEVER be connected together. If so, the whole network will fail! Please always ensure that your devices are in the right mode and properly wired before adding them to the network.*

ⓘ When in redundant mode, AxC-DANTE connectors act as follow:
- Primary: Primary network
- Secondary: Secondary network
- Port3: Primary network (switched with Primary port)
- Port4: Secondary network (switched with Secondary port)

ⓘ In following examples, Primary network is represented in Dark-Red, and Secondary network in Orange.

5.2.1 Redundant mode with external switch
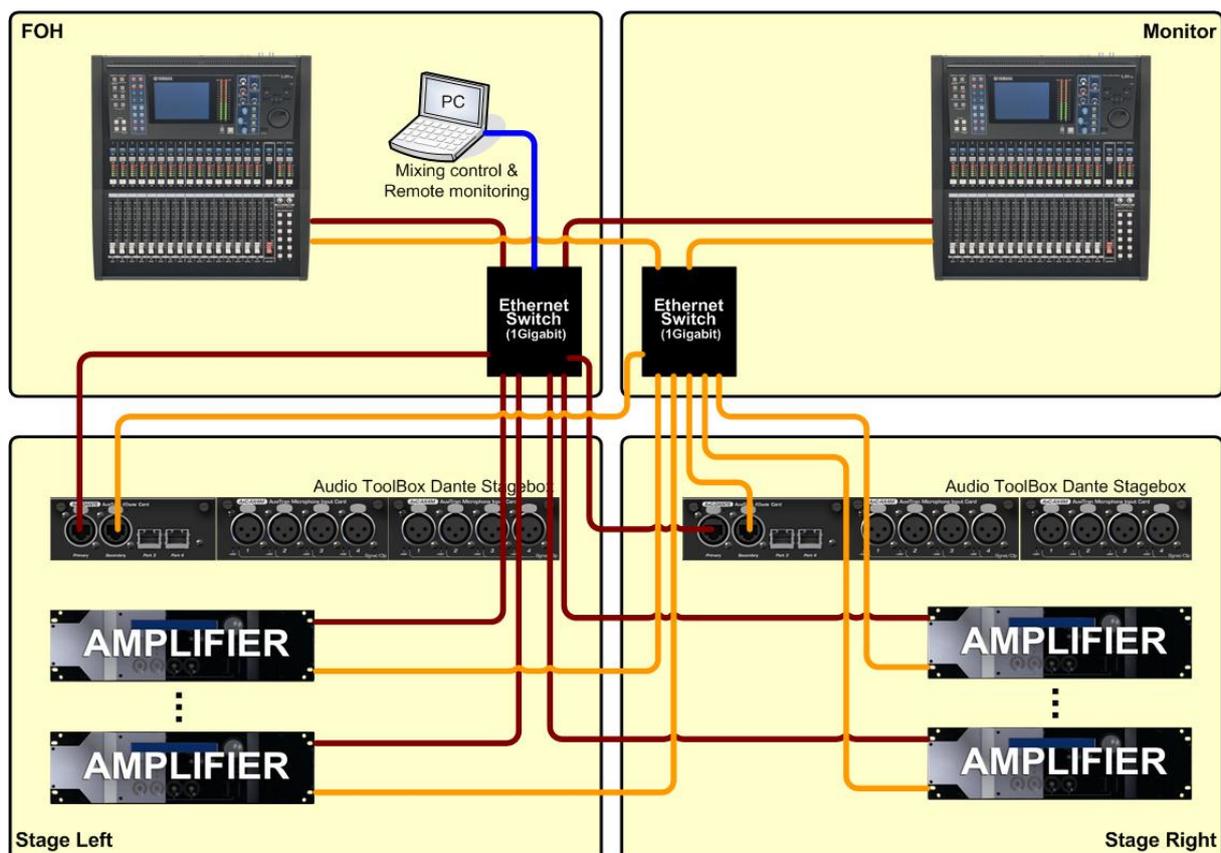
This is the typical way to wire a Redundant Dante network. All devices should be configured as Redundant **BEFORE** wiring!
Two external switches are needed in this case. One for Primary network, the other one for Secondary network. As mentioned before, theses two switches should **NEVER** be connected together.

5.2.2 Redundant mode without external switch

Thanks to AxC-DANTE 4 Ethernet ports, you can build small redundant networks without the need of any external switch. This may save costs when only cable-redundancy is needed. Please have a look to the following:
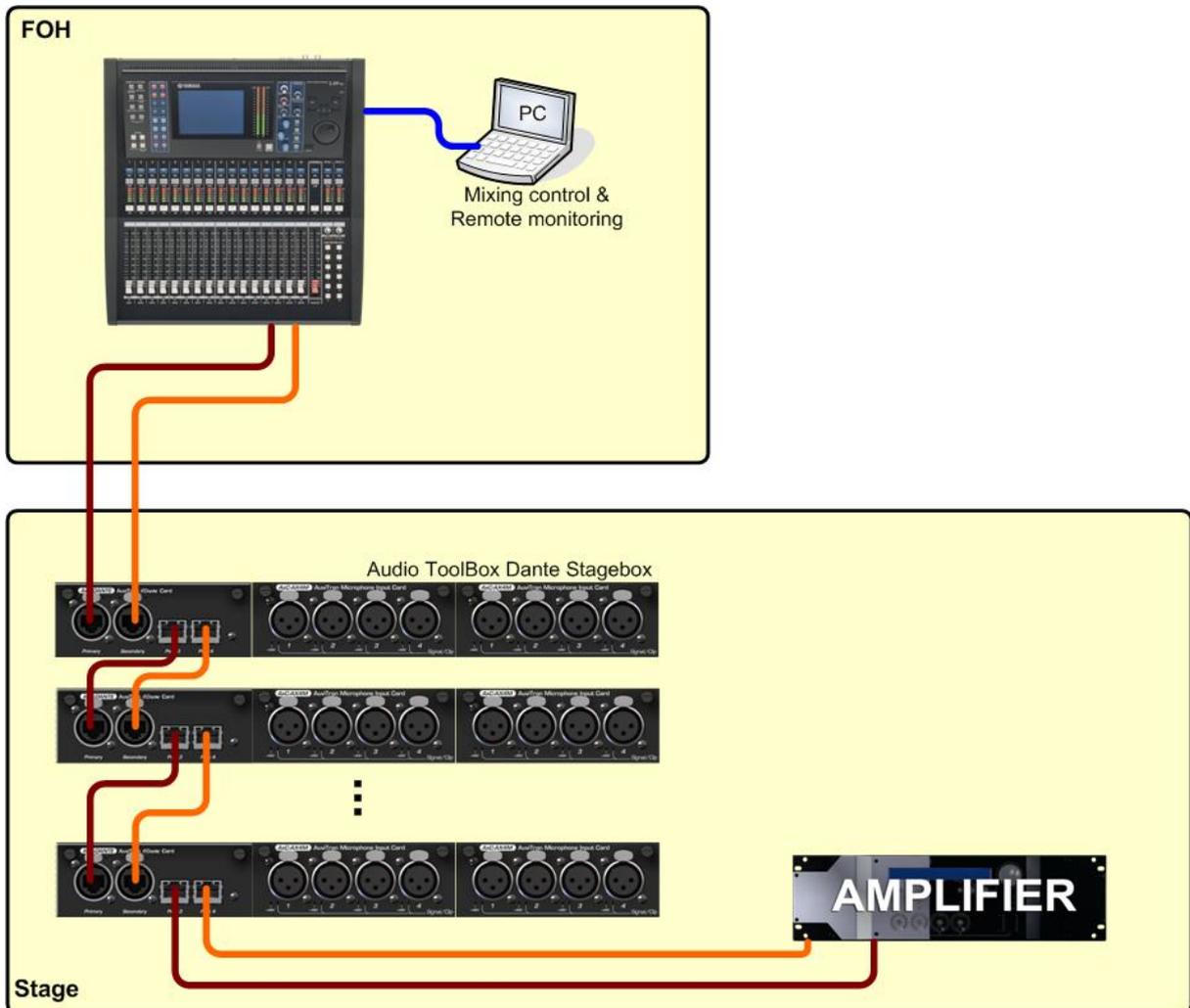
This solution will allow you to improve cable reliability of your network with no extra-cost! But as devices are daisy-chained, redundancy is not as powerful as a regular redundant network with external switches.

6   CARD INSERTION / EXTRACTION

Please refer to AuviTran Audio Toolbox AVBx3 rack user's manual in order to known how to insert/extract your card properly.

7   SOFTWARE REMOTE CONTROL

7.1 Switch / Redundant Mode

ⓘ When you power-up your card for the first time, it will start in switched mode.

⚠️ Changing switched/redundant mode will seriously affect your network architecture. A dead loop can be created if mode is changed without taking care of how RJ45 cables are plugged. A good practice is to always unplug all cables (except the one who gives you access to the card) before changing network mode.

7.1.1   Mode selection using AVS-Monitor software

When you go on control page of your Toolbox device, slot where AxC-DANTE card is plugged will display following information:
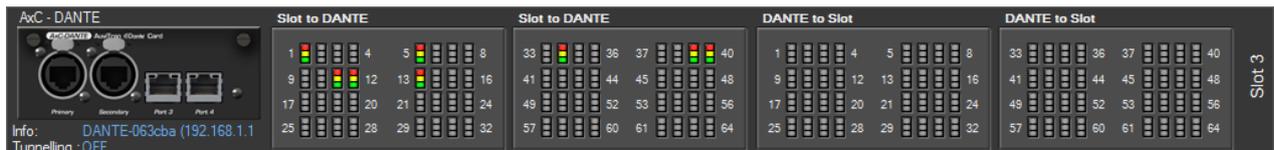
To open AxC-DANTE setup page, simply click on the front panel picture on the left. Setup page looks like following:
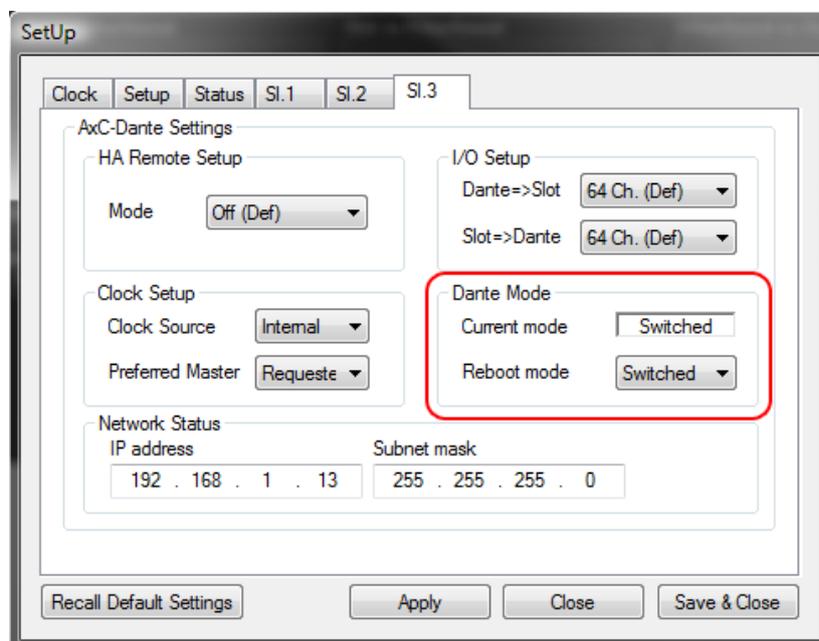
Network Setup allows you to choose if your card will work in switched or redundant mode. The current working mode is displayed, and cannot be modified. Reboot mode is the mode in which the card will be after a reboot.
To change the working mode, all you have to do is select appropriate mode in "Reboot mode" combo box, click "Apply" button, then "Save & Close" button. A reboot is then needed for the new mode to be effective.

7.1.2 Mode selection using Dante Controller software

Network mode selection can also be down using Dante Controller. To do so, launch Dante Controller Software.
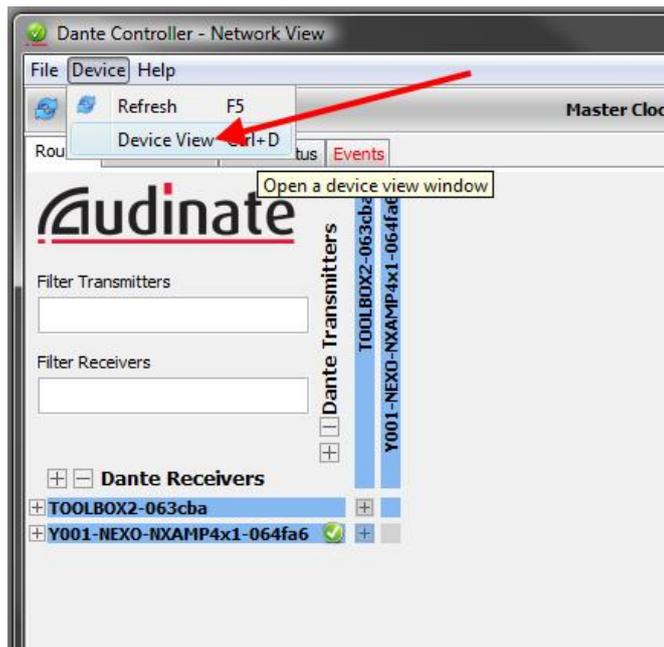
Select "Device → Device View". A new window will open.
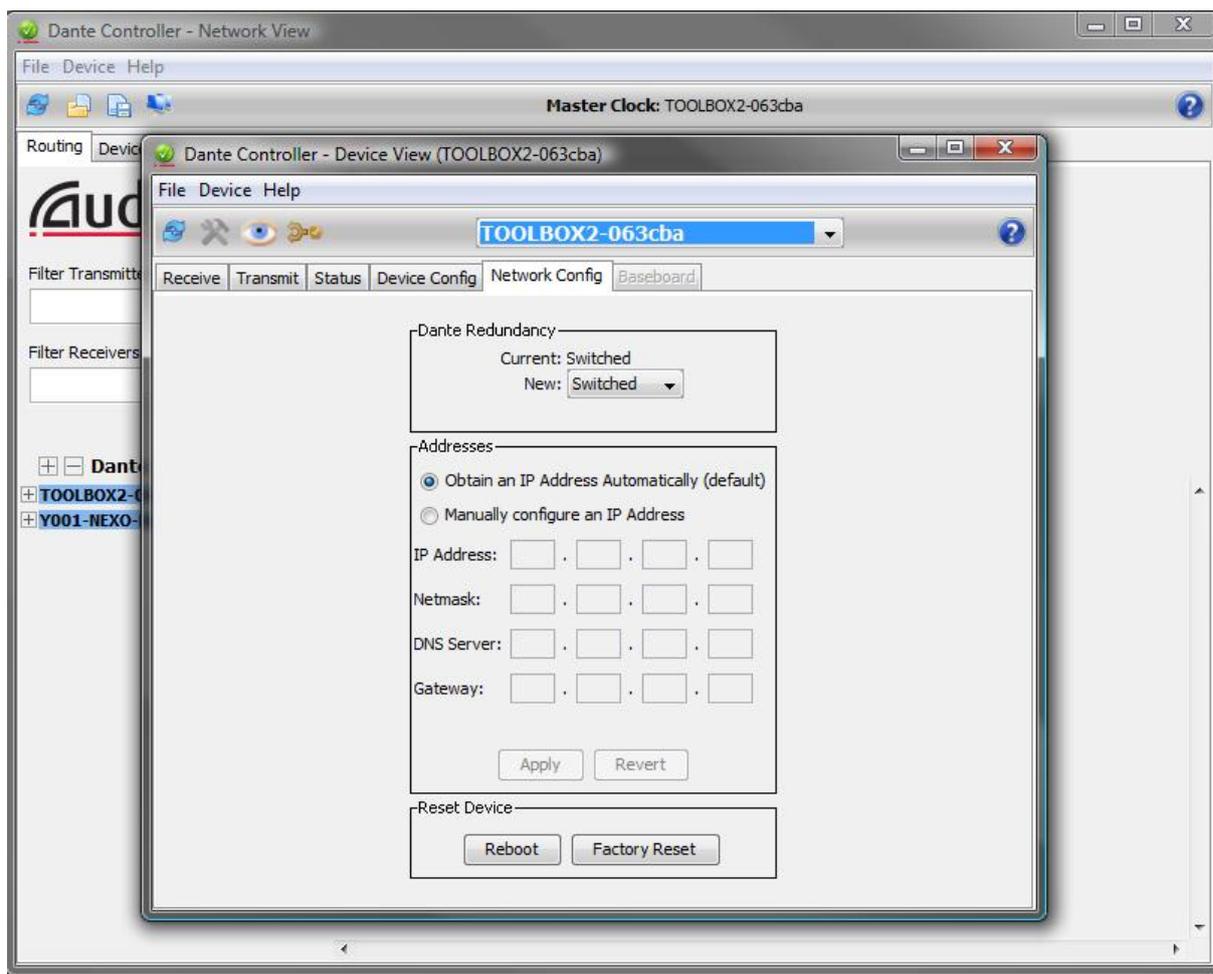
Select your AxC-DANTE card in the device list, and go to "Network Config" tab. This tab will indicates you the current active mode, and will allow you to change it if needed. To do so, select the desired mode in the "New" list:
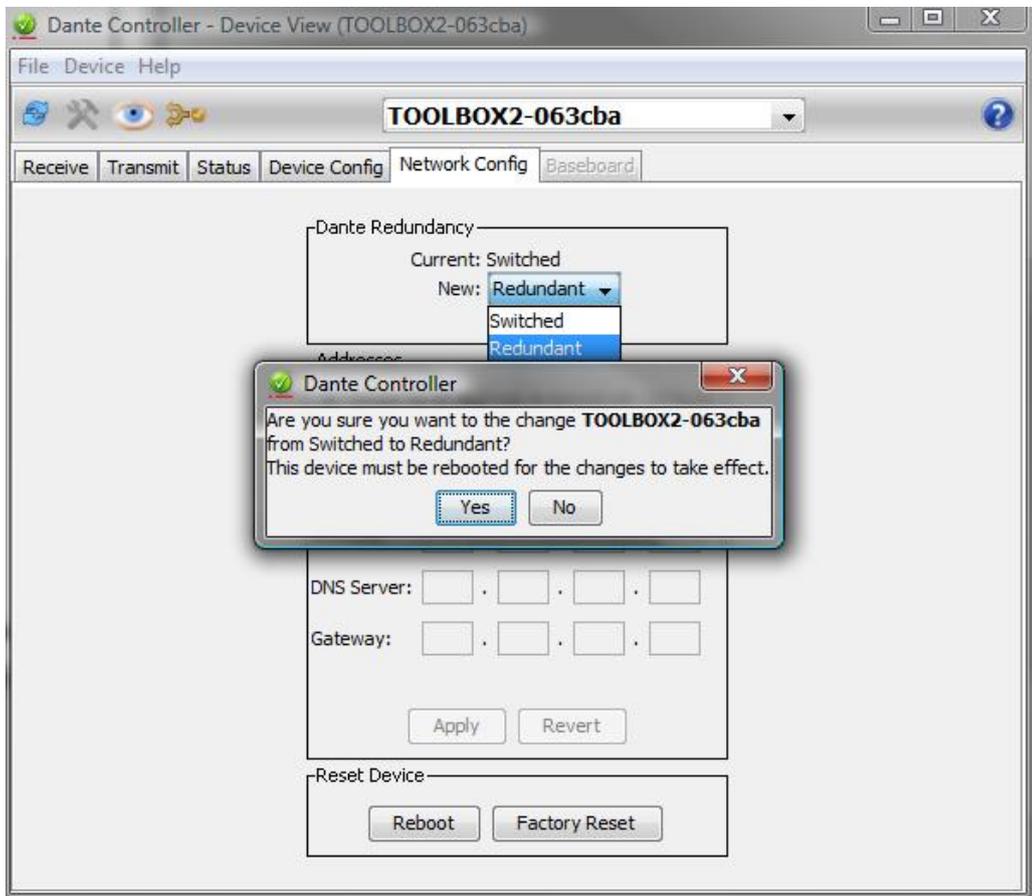
Once done, you will be invited to reboot your device. After that, please refresh the window. You will see that the new mode is now active:
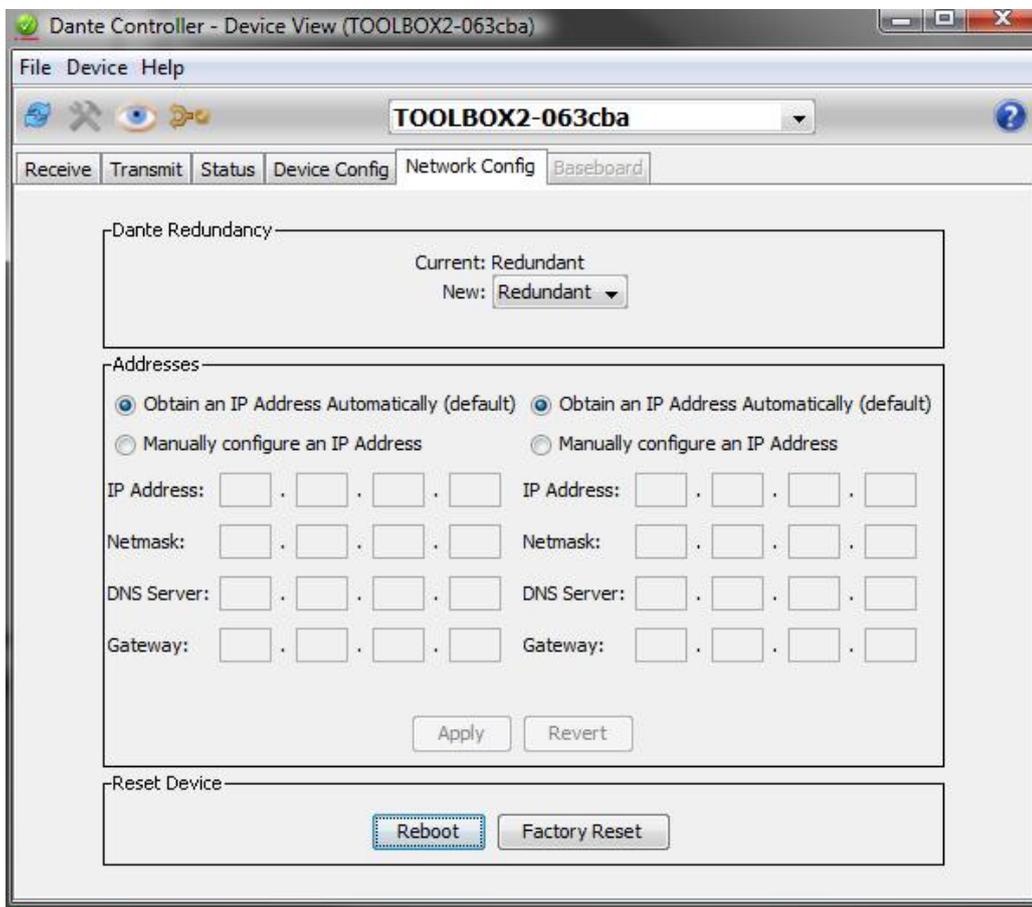
7.2 Fixe / Dynamic IP configuration

① **Fixed IP mode is only available on kernel firmware 1.09 and greater.**

Dante devices need to have an IP address to work properly. IP addresses should be in the same sub-network for them to communicate. Exactly like a computer, there is two ways to obtain an IP address:

7.2.1 Dynamic IP

Dante device will automatically obtain an IP address from the network. To do so, a DHCP server MUST run inside the network. This server will give IP addresses to all devices automatically.
If no DHCP server is running on your network, Dante devices will start with a default IP address (typically "169.254.x.y", with netmask "255.255.0.0"). Please ensure that your computer network interface card is properly configured to have access to this address range.

In the same configuration tab than before, please select "Obtain an IP Address Automatically (default).
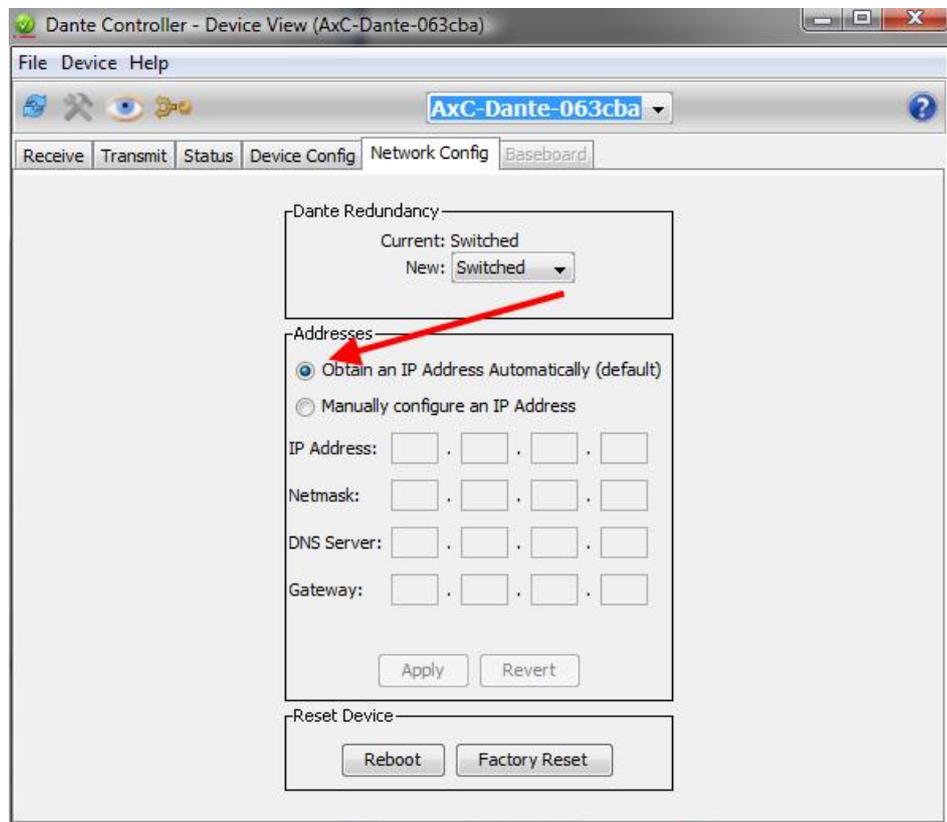
7.2.2 Fixed IP address

If you do not have a DHCP server in your network, or of you want to manage yourself all IP addresses to match your needs, you can switch the device to a "fixed" IP address mode:
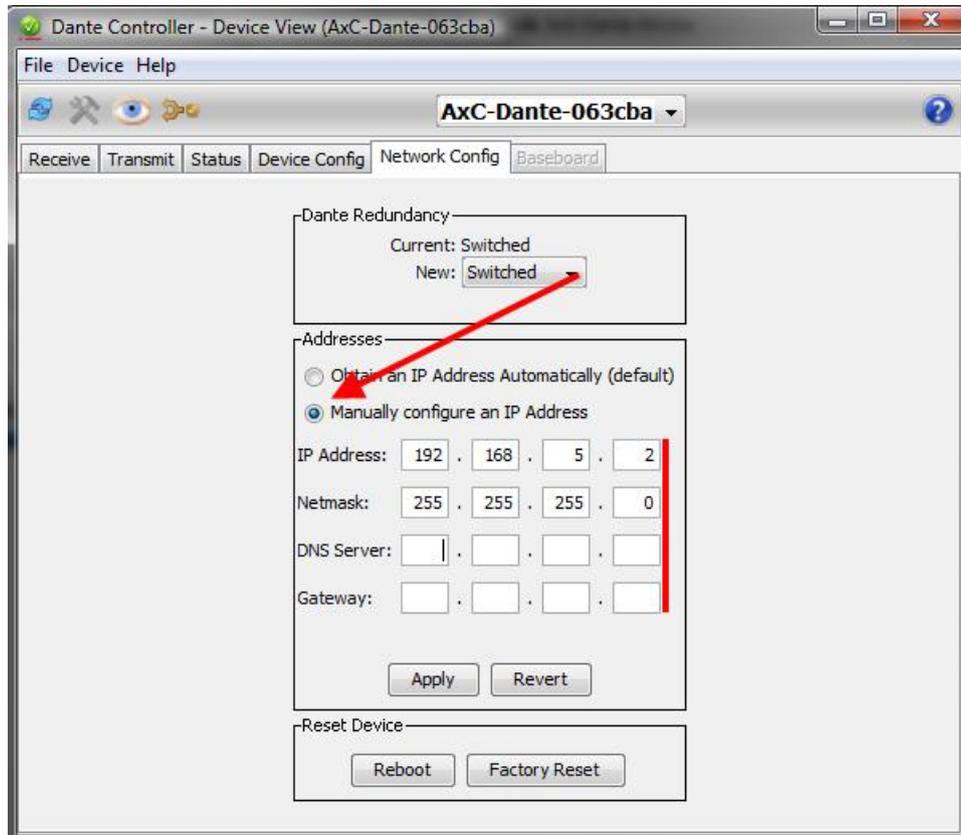
Fill-in the blanks depending on your needs, then apply the configuration. You will be invited to reboot your module for the changes to take effect.

7.3 Clock Setup

There are two ways to configure audio clock inside your Audio Toolbox:
- Audio Toolbox is slave, and receive audio clock from Dante network
- Audio Toolbox is master, and will feed the clock to the Dante network

7.3.1 Dante Master – ToolBox Slave

To let Dante network be clock-master, and synchronise your ToolBox on the AxC-DANTE card, please proceed as follow.

In AVS-Monitor Software, please open the AxC-DANTE Setup page, and select the clock source to be "Internal".
The "Preferred Master" setup is not mandatory. It only depends if you want this particular card to be master clock of your Dante Network or not.
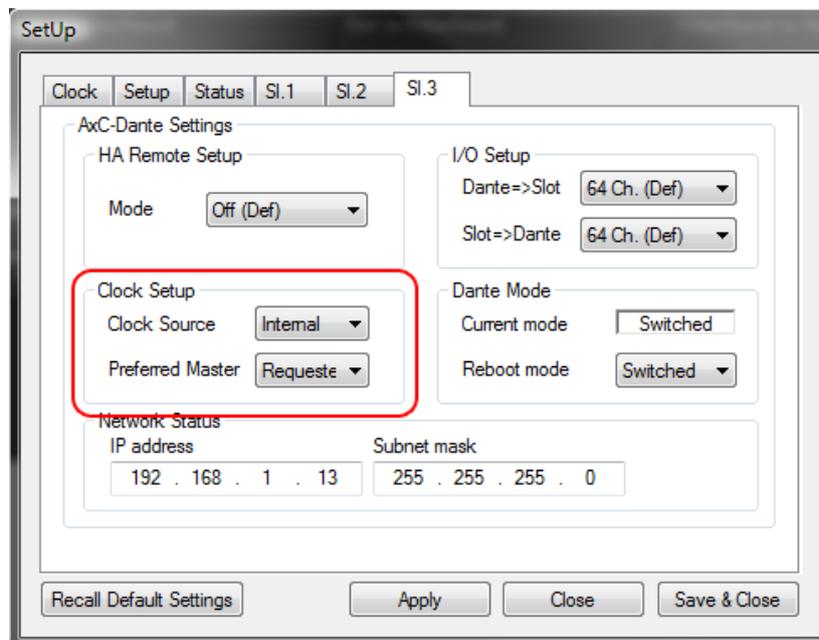
Then, in AVS-Monitor Software, please open the ToolBox clock setup page, and select the clock source to be your AxC-DANTE card.
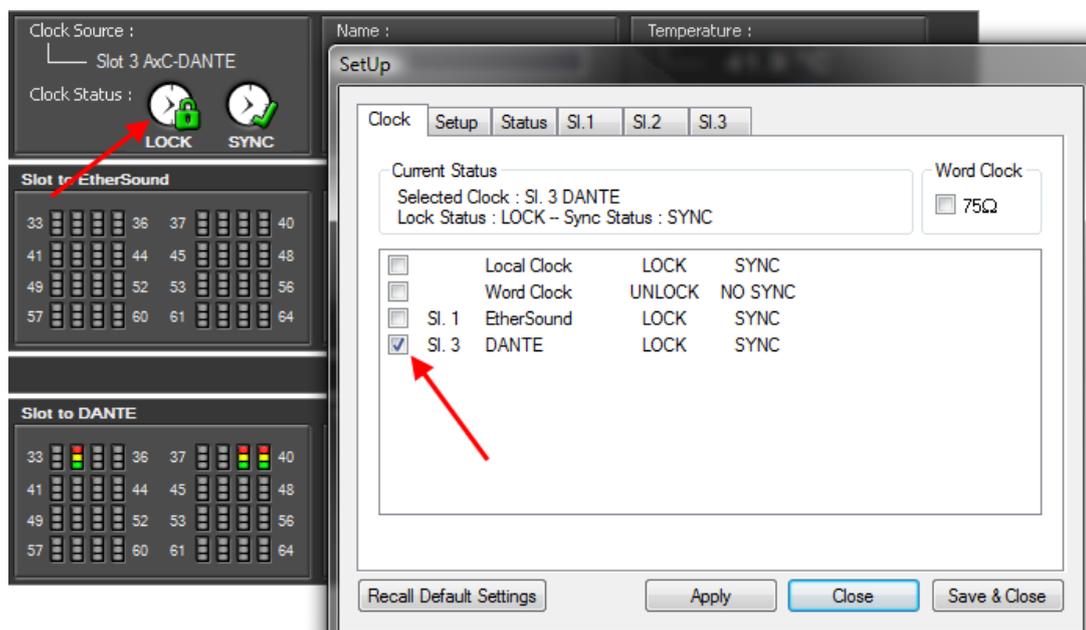
7.3.2 Dante Slave – ToolBox Master

To force your Dante network to be synchronised on your Toolbox clock, please proceed as follow.

In AVS-Monitor Software, please open the AxC-DANTE Setup page, and select the clock source to be "External".
The "Preferred Master" setup IS mandatory, because this particular card has to be master clock of your Dante Network, in order to spread the Toolbox clock all over Dante network.
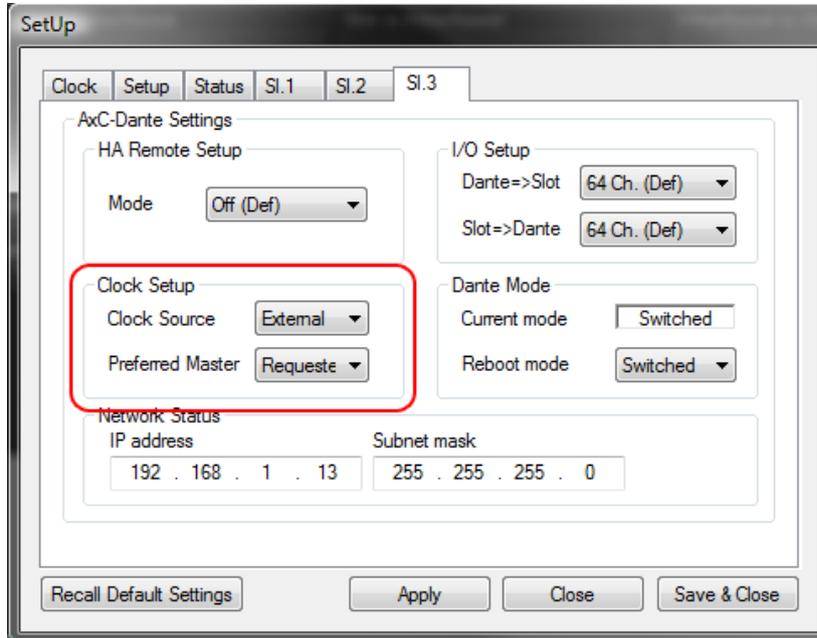
Then, in AVS-Monitor Software, please open the ToolBox clock setup page, and select the clock source to be something else than the AxC-DANTE card:
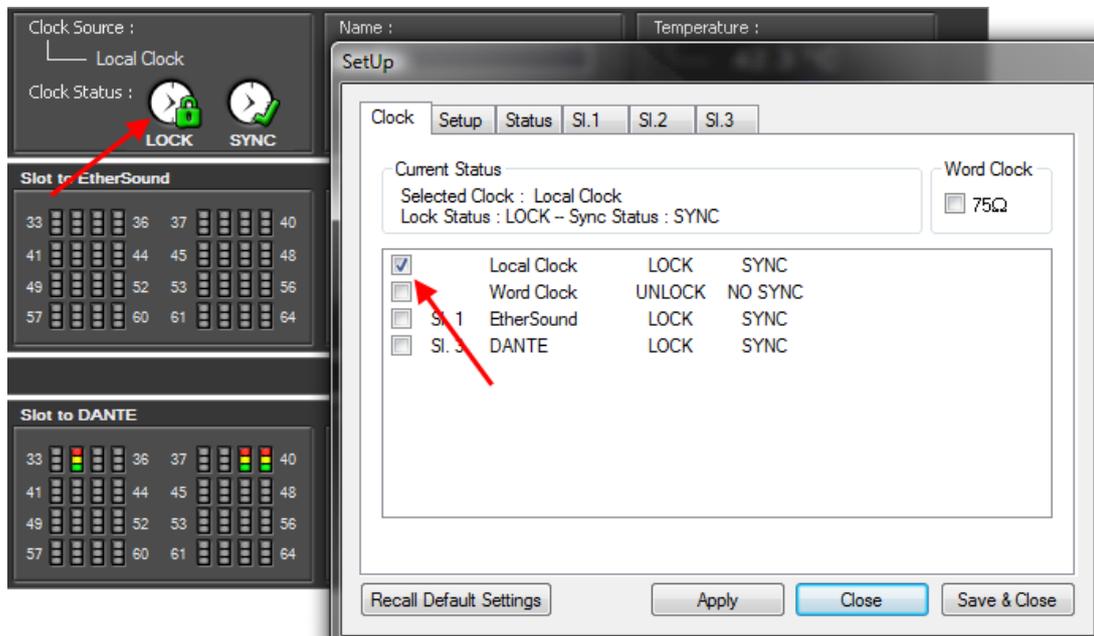
7.4 Audio Routing

7.4.1 Basic Audio Routing

On ToolBox devices, audio channels are automatically routed between slots with a priority from slot 1 (highest priority) to slot 3 (lowest priority). If you insert AxC-DANTE card in slot 1:
- All audio samples coming from Dante network will be sent to Slot 2 with a maximum of 64 channels. If card inserted in slot 2 cannot handle 64 channels, remaining channels will be sent to Slot 3.
- In the same way, all audio samples to send to Dante network will be taken from Slot 2 with a maximum of 64 channels. If card in slot 2 don't have 64 inputs, then remaining channels will be taken from Slot 3.

Once you know that, the patch can be done using Dante Controller software in order to route Audio ToolBox ins and outs to/from Dante Network.

Let's take an example:

We have an Audio ToolBox with AxC-DANTE card in slot 1, AxC-AX4M (4 microphone inputs) in slot 2 and AxC-AX4O (4 line level analog outputs) in slot 3.

All 4 microphone inputs will automatically be routed to Dante input channels #1 to #4. Channels #5 to #64 are unused.
Dante outputs channels #1 to #4 will automatically be routed to analog outputs #1 to #4. Dante outputs #5 to #64 are unused.

In Dante Controller Patch window, this will brings you to this:
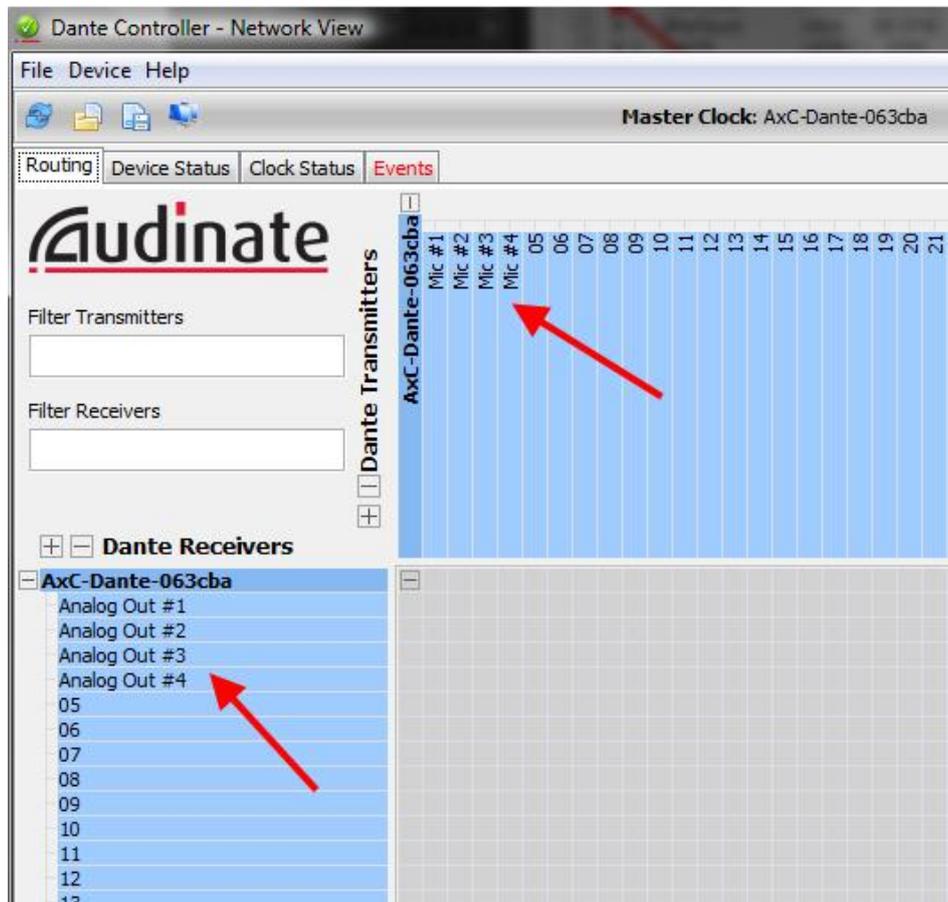
7.4.2 Reducing maximum I/O number

AxC-DANTE card have a maximum of 64 audio inputs + 64 audio outputs. Default max I/O setting is set to 64 in + 64 out. However, you can reduce the number of inputs and outputs you wants to use on your AxC-DANTE card, in order to fit your needs.

Let's take an example:

This AVBx3 rack is filled with 1 AxC-ES100 card, 1 AxC-DANTE card, and 1 AxC-MADI card. This is a perfect multi-platform bridge.
Each card can handle 64 channels (64 in + 64 out), but AVBx3 rack can only handle 64 channels in each way. Without any special configuration, all 64 channels are routed between AxC-DANTE card and AxC-ES100 card. There is no more room for AxC-MADI card that becomes useless.

To bypass this limitation, you can reduce the number of I/Os effectively used on your AxC-DANTE (and AxC-MADI) card. For example, if you set AxC-DANTE card to 32 in + 32 out, and AxC-MADI in the same way, you will be able to route Dante AND Madi to the EtherSound card.

To do so, please proceed as following:

In AVS-Monitor Software, please open the AxC-DANTE Setup page. Default I/O Setup is set to 64 inputs and 64 outputs.
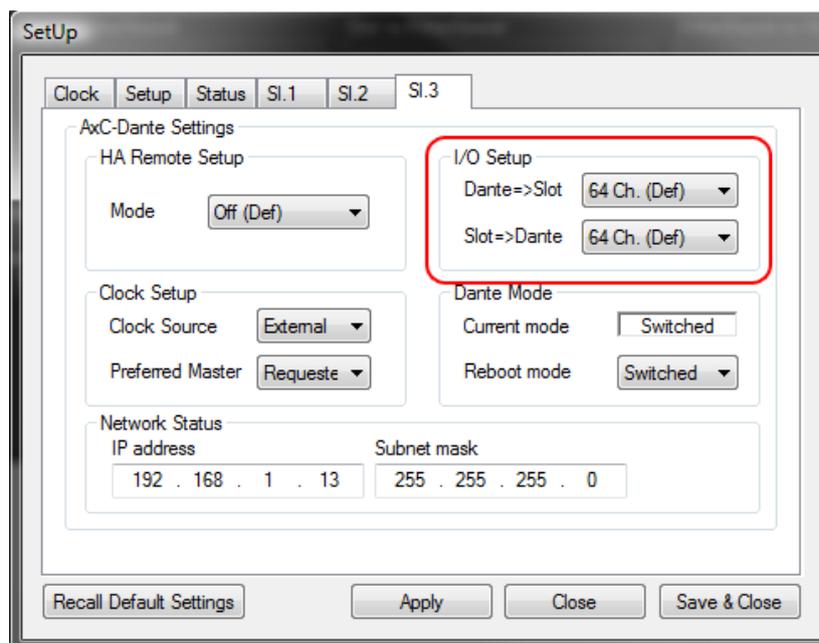
You can then change max I/O number using both combo boxes. In our example, we will set both In and Out to 32 channels. Once done, please click "Apply" button, then "Save & Close".
Device needs to be restarted for modification to take effect.
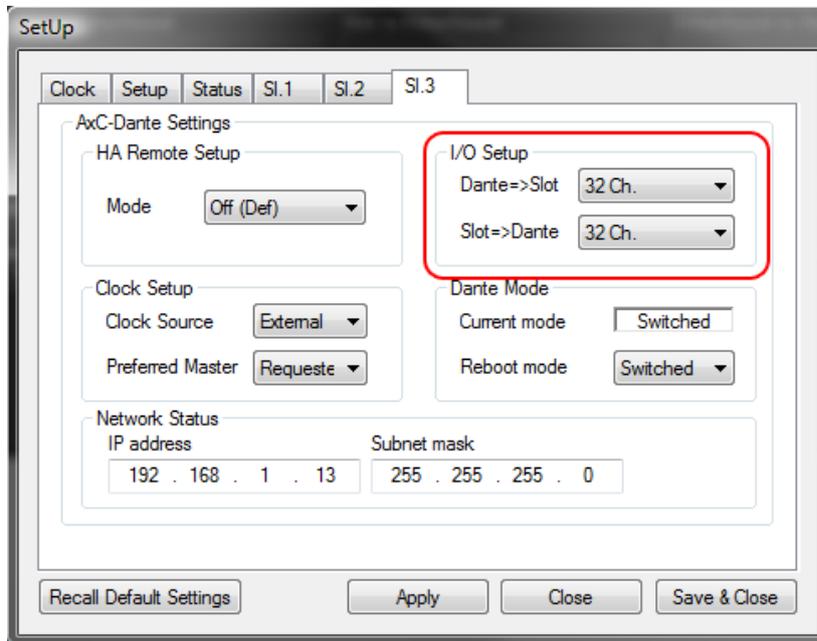
7.5 Sample Rate

AxC-DANTE can work at 48kHz or 44.1kHz sample rate frequency. The working sample rate can be easily changed using Dante Controller software. To do so, go to "Device → Device View" in Dante Controller software. A new window will open. Select your device, and go to "Device Config" Tab.
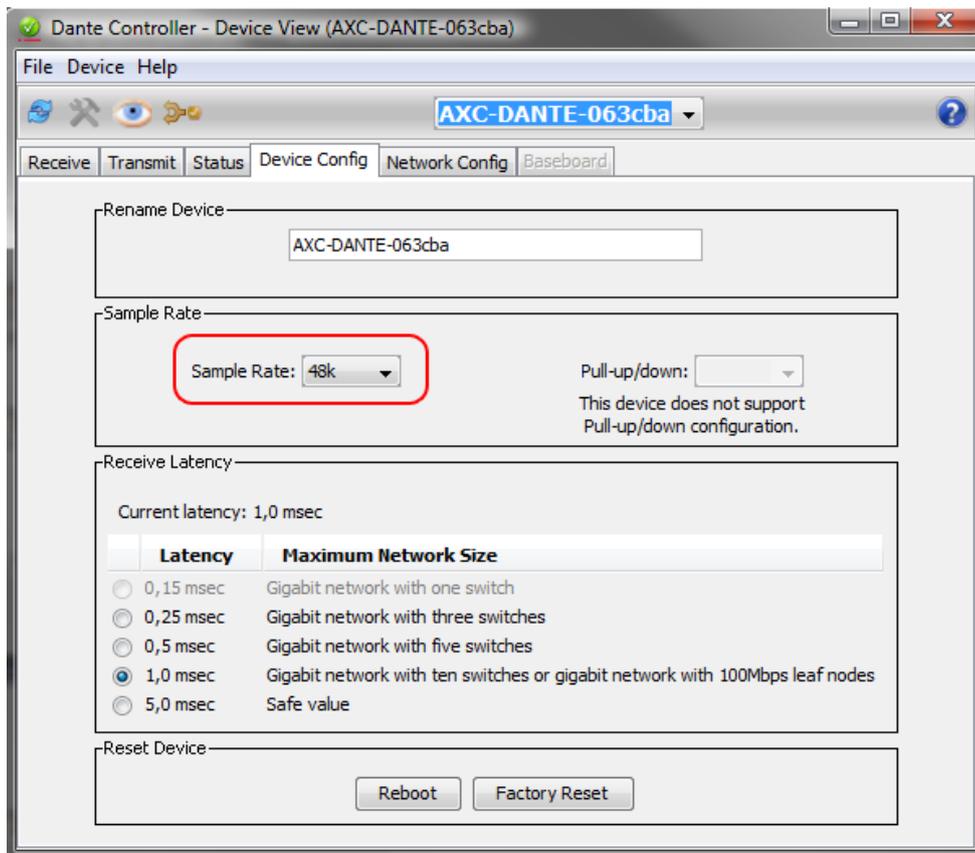
To adapt the sample rate to fit your needs, simply use the Sample Rate combo box to choose desired frequency. It is best to reboot the device after changing this setting.

Please keep in mind that only device with the same sample rate can be patched together. All other devices in your Audio Toolbox rack should also be configured to the right sampling frequency to avoid audio issues.

7.6 Vu-Meters

AVS-Monitor Control page displays real-time signal/clip vu meters for all AxC-DANTE 64 inputs and 64 outputs audio channels.
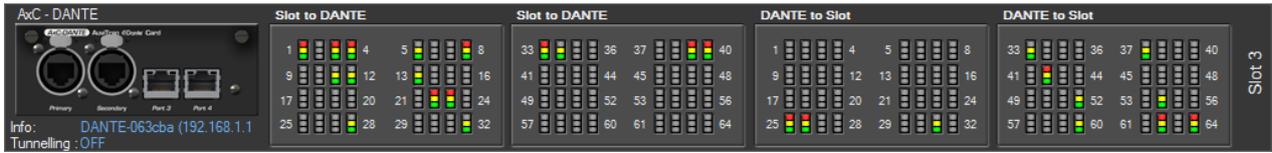
Refresh time is approximately 10 times per second. On the left, "Slot to DANTE" vu-meters are audio channels that come from Toolbox backplane, and go "to" the Dante network. On the right, "DANTE to Slot" vu-meters are audio channels that come from the Dante network, and go "in" the Toolbox backplane.

Signal/clip vu-meters have 4 states:
- OFF: signal is below -48dBFs
- GREEN : signal is between -48dBFs and -18dBFs
- GREEN + YELLOW : signal is between -18dBFs and -0.5dBFs
- GREEN + YELLOW + RED : signal is over -0.5dBFs

7.7 Identify Card

Dante Controller software can help you identifying a particular card in the network. This is done by clicking the "eye" icon in the Device View window.
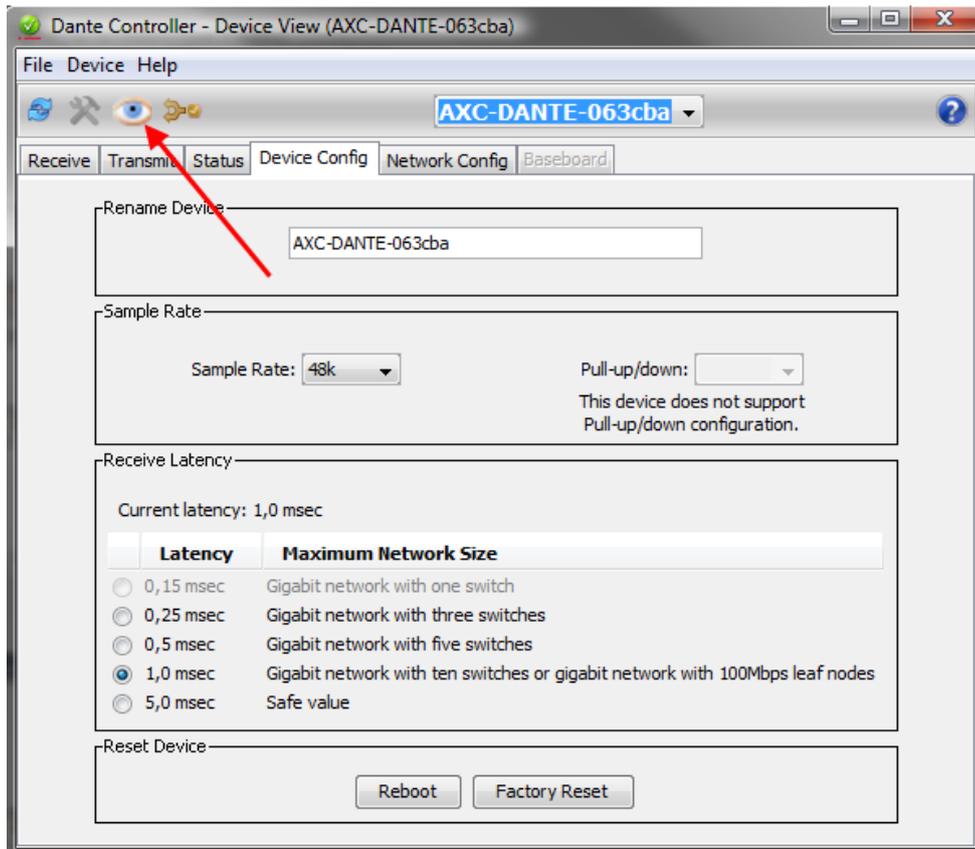
Select the card you want to identify, and click this icon. The card will blink all its front panel LEDs during few seconds, making a visual identification really easy.

7.8 Renaming Dante-ID

⚠️ Each Dante device has a unique MAC address, and a unique logical ID attached to it. This logical ID is called the Dante ID. Communication and audio routing is made thanks to this Dante ID. From this point, it is highly recommended to change Dante ID when no audio is playing, to avoid any undesired noise or audio loss!

Dante ID should be unique inside a Dante network. To avoid any unwanted double ID, MAC address (that is always unique) is automatically added at the end of the Dante ID.

To change your card's Dante ID, simply click on the current ID. A pop-up windows will open, inviting you to enter the new name.
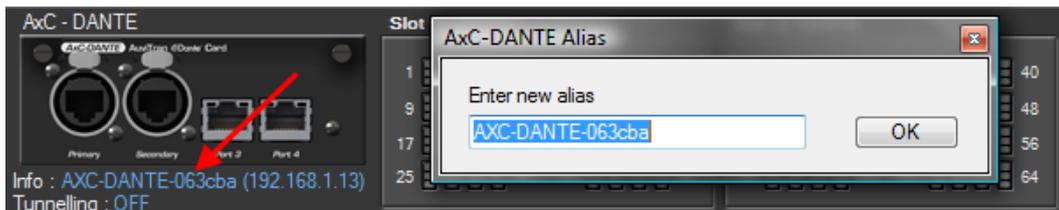
Simply enter the new name, and click "OK" button. Don't take care of MAC address, it will automatically be added after the name you've entered.

ⓘ *The first character of the Dante ID should be a letter from "A" to "Z" (or "a" to "z"). No other character will be allowed. If the entered name is too long, it will be truncated to leave room for MAC address.*

7.9 AxC-AX4M HA-Remote control

Since Firmware/Kernel 0x0103/2.00, your AxC-DANTE card can handle Yamaha HA-Remote messages coming from a MY16-AUD card, in order to remote control your AxC-AX4M cards directly on your Yamaha mixing console.

ⓘ *To enable HA-Remote on your Yamaha desk and MY16-AUD card, please refer to manufacturer user's manual.*

AxC-DANTE card can emulate AD8HR/SB168 devices, when plugged in an AuviTran Audio Toolbox equipped with AxC-AX4M Microphone input cards. When this emulation is enabled, the Yamaha desk will "see" your Audio Toolbox as being an AD8HR device.
As multiple Audio Toolbox (virtual AD8HR) can be controlled simultaneously, each device need to have a unique HA-Remote ID. This ID can be set in AxC-DANTE control page, using AVS-Monitor software.
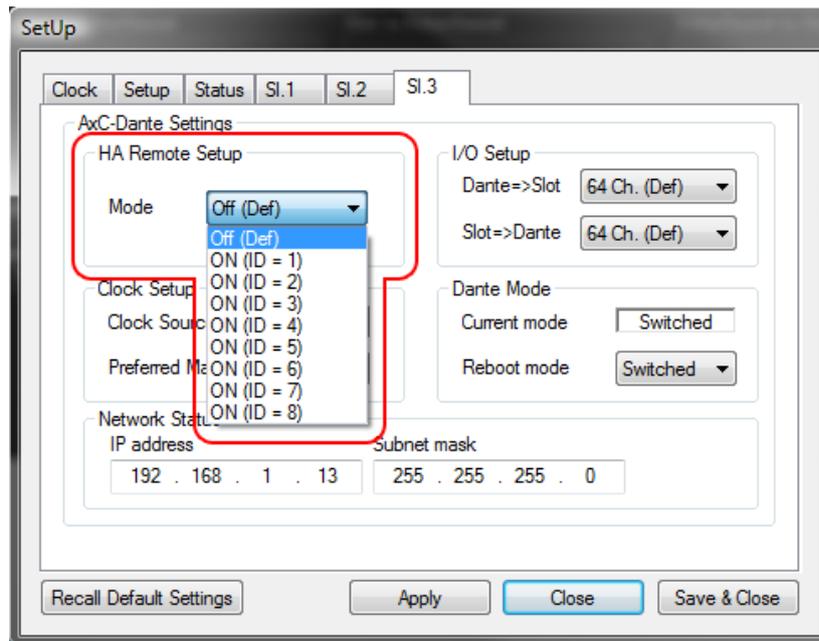
Default HA-Remote mode is "OFF". To start emulating an AD8HR, simply turn-on HA-Remote by selecting an ID.

Please remember that an AD8HR is a device that can handle 8 inputs. AxC-AX4M card handle only 4 inputs. From this point, a unique ID can cover up to 2 AxC-AX4M cards.
When HA-Remote is turned on, AxC-DANTE will automatically enumerate all AxC-AX4M cards present in the rack (up to 2 in AVBx3 device, up to 6 in AVBx7 device). It will then auto-increment IDs if more than 2 AxC-AX4M cards are detected. Let's take an example.

HA-Remote architecture
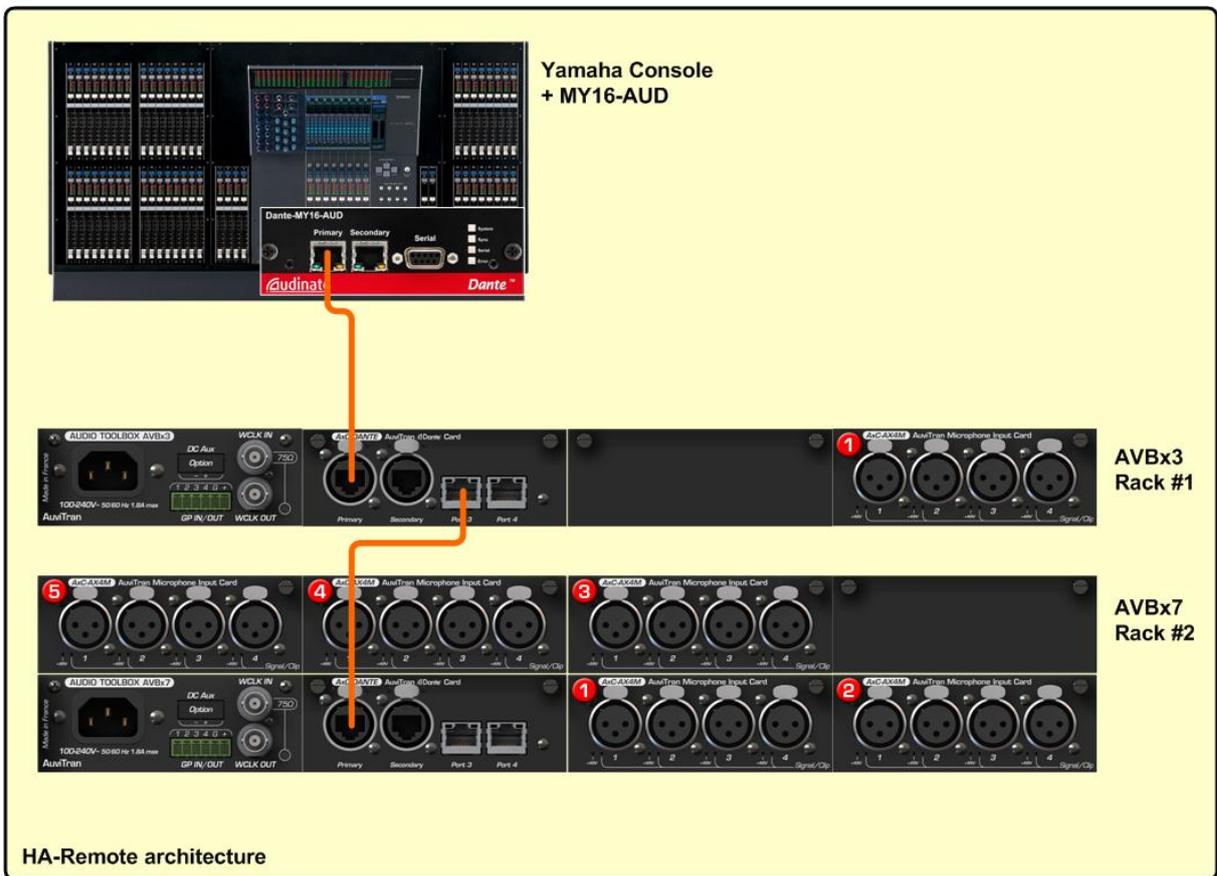
In this example, we have a Yamaha console equipped with MY16-AUD card, an Audio Toolbox AVBx3 equipped with one AxC-AX4M card, and an Audio Toolbox AVBx7 equipped with five AxC-AX4M cards. The configuration will be the following:

- Rack #1 will be assigned with ID #1. As an ID can handle up to 2 AxC-AX4M cards, it will be "fully" used even if only one card is plugged.
- Regarding previous point, rack #2 will receive ID #2. As 5 cards are plugged, it will also automatically use ID #3 and ID #4 (3 IDs = 2 x 2 cards + 1 card).
- If another rack should be plugged later, next ID available would be ID #5.

Regarding Yamaha desk "external HA racks", we will have following situation:

- External rack #1: will display 8 channels, but only the first 4 channels are really used (AVBx3, card #1). Channels 5 to 8 will be useless.
- External rack #2: will display 8 channels. Channels 1 to 4 handle AVBx7 card #1, channels 5 to 8 handle AVBx7 card #2.
- External rack #3: will display 8 channels. Channels 1 to 4 handle AVBx7 card #3, channels 5 to 8 handle AVBx7 card #4.
- External rack #4: will display 8 channels, but only the first 4 channels are really used (AVBx7, card #5). Channels 5 to 8 will be useless.

8   FREQUENTLY ASKED QUESTION

- How do I know if my AxC-DANTE card is in Switched or Redundant mode?

There is no front-panel information (LEDs or so on) to answer this question. To know in which mode is configured you card before adding-it inside a network:
- connect a computer directly on Primary Port
- disconnect all others ports
- refer to chapter 7.1 "Switch / Redundant Mode" page 13

- I have audio clicks noises inside my network!

Audio clicks are typically a misconfiguration of audio clocks between all devices inside your network. To ensure your AxC-DANTE card and your Audio ToolBox host are properly configured, please refer to chapter 7.3 "Clock Setup", page 18.

- I cannot patch from/to my AxC-DANTE card!

Patch can be impossible:
- If your network bandwidth is full. If so, please consider removing some patch, or try to use multicast patch when possible.
- Your device may be set to another sample rate than the source/destination device. Please check its sample rate as described in chapter 7.5 "Sample Rate" page 22.

- My audio patch displays an orange warning icon instead of the green check.

Your device is patched to a module that does not exist anymore. Please check if the source/destination device is not removed from the network, or if its Dante ID has changed (see chapter 7.8 "Renaming Dante-ID" page 24).