Aurora

DTX Series

DTX-44D ● DTX-88D ● DTX-1616D ● DTX-3232D ● DTX-6464D

Dante Based Audio DSP with Analog I/O

Dash
DSP Control Software

Aurora

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Technology Overview
Introduction to Dash

The Dash DSP Controller is a Windows-based, full-featured application that configures and controls the DSP hardware. Systems can be designed to perfectly match specifications and conform as requirements change or evolve. All classes of audio processing modules for signal routing and shaping are provided.

Dash provides a revolutionary way of thinking about DSP software. This is a software designed by audio professionals for audio professionals. It uses an interface layout that will be very intuitive to even the most novice integrator yet extremely powerful in its capabilities.

Quick Start

1. Install Dash software.
2. Connect DTX DSP to the same network as the computer running Dash.
3. Use the PoE connection on a DTX-44D, use the LAN connection on all other DTX devices.
4. Open Dash.
5. Click the plus (+) sign in the Device tab row.
6. Select a template that matches the device you are connecting.
7. Click the 'Device List' in the top right corner of Dash.
8. Select the desired device from the list of discovered devices and click 'Set IP'.
9. Change the IP from the default 169.254.10.227 to a valid, unused static address on the active subnet.
10. Click 'Connect'.
11. The green 'LED' next to the device name on the Device tab should now be green.
12. You are all set!

Hardware
Safety Instructions

Please review the following safety precautions. If this is the first time using this model, then read this manual before installing or using the product. If the product is not functioning properly, please contact your local dealer or Aurora for further instructions.

The lightning symbol in the triangle is used to alert you to the presence of dangerous voltage inside the product that may be sufficient to constitute a risk of electric shock to anyone opening the case. It is also used to indicate improper installation or handling of the product that could damage the electrical system in the product or in other equipment attached to the product.

The exclamation point in the triangle is used to alert you to important operating and maintenance instructions. Failure to follow these instructions could result in injury to you or damage to the product.

Be careful with electricity:
- **Power Outlet:** To prevent electric shock, be sure the electrical plug used on the product power cord matches the electrical outlet used to supply power to the Aurora product. Use the power adapter and power connection cables designed for this unit.
- **Power Cord:** Be sure the power cord is routed so that it will not be stepped on or pinched by heavy items.
- **Lightning:** For protection from lightning or when the product is left unattended for a long period, disconnect it from the power source.

Also follow these precautions:
- **Ventilation:** Do not block ventilation slots, if applicable, on the product, or place any heavy object on top of it. Blocking airflow could cause damage. Arrange components so that air can flow freely. Ensure that there is adequate ventilation if the product is placed in a stand or cabinet. Put the product in a properly ventilated area, away from direct sunlight or any source of heat.
- **Overheating:** Avoid stacking the Aurora product on top of a hot component, such as a power amplifier.
- **Risk of Fire:** Do not place unit on top of any easily combustible material, such as carpet or fabric.
- **Proper Connections:** Be sure all cables and equipment are connected to the unit as described in this manual.
- **Object Entry:** To avoid electric shock, never stick anything in the slots on the case, or remove the cover.
- **Water Exposure:** To reduce the risk of fire or electric shock, do not expose to rain or moisture.
- **Cleaning:** Do not use liquid or aerosol cleaners to clean this unit. Always unplug the power to the device before cleaning.
- **ESD:** Handle this unit with proper ESC care. Failure to do so can result in failure.

FCC

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two (2) conditions:

1. This device may not cause harmful interference.

2. This device must accept any interference received, including interference that may cause undesired operation.

Trademarks

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Front Panel Features
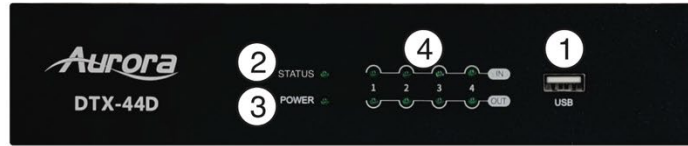
DTX-44D

DTX-88D, DTX-1616D, DTX-3232, DTX-6464D

① **USB (Audio)** – USB 2.0 Type A connector. Used in conjunction with the USB Sound card feature. Requires a USB Type-A to USB Type-A cable, included in box. The USB connection can also be used as a sound card with a PC or Mac using a generic HID audio. The driver will appear as a "Crestone USB Soundcard" in your computers sound settings.

② **Status LED** – A green LED indicates network connectivity on the LAN connection.

③ **Power LED** – A green LED indicates power to the unit is good.

④ **I/O LEDs** – A green LED indicates analog connectivity.

Rear Panel Features
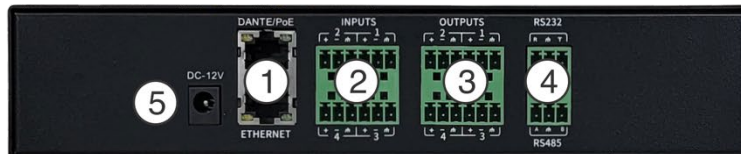
DTX-44D
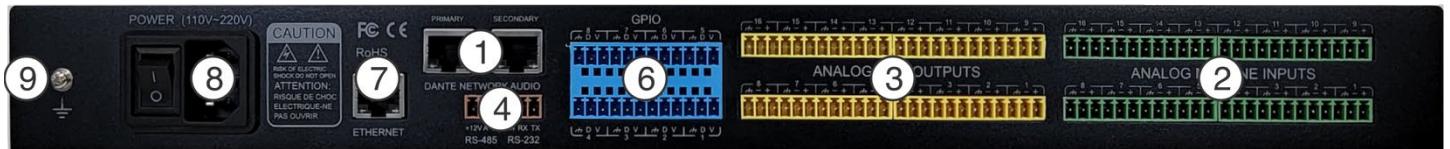
DTX-88D, DTX-1616D
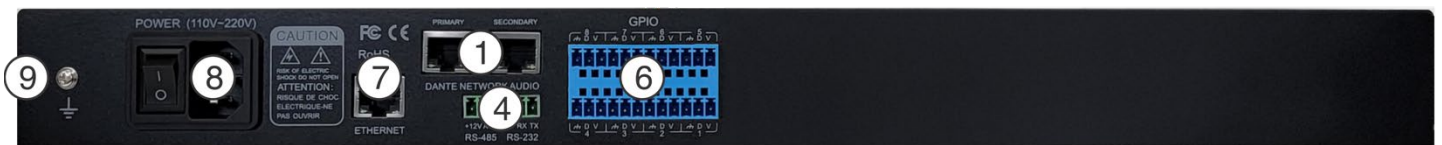
DTX-3232D, DTX-6464D

① **Dante Ethernet** – Primary and secondary Ethernet connections for Dante audio. Secondary connection can be used for to provide redundancy for the Dante audio network or can be used to daisy chain additional devices. PoE is not passed on.
DTX-44D – 10/100Mbps, PoE PD (15W) on top connector
All Others – 10/100/1000Mbps, no PoE
NOTE: This port has different MAC and IP addresses than the LAN Control Interface (not applicable on DTX-44D).

② **Analog Inputs** – Balanced or unbalanced high impedance inputs support Line or Mic level with +48VDC phantom power. Channel count varies per Model. Mating connectors provided in box.

	Signal Label	XLR	TRS
	+	Pin 2	Tip
	-*	Pin 3	Ring
	⏚	Pin 1	Sleeve
	*do not use (-) for unbalanced		

③ **Analog Outputs** – Balanced or unbalanced 600Ω outputs. Channel count varies per Model. Mating connectors provided in box.

	Signal Label	XLR	TRS
	+	Pin 2	Tip
	-*	Pin 3	Ring
	⏚	Pin 1	Sleeve
	*do not use (-) for unbalanced		

④ **Serial Communication** – RS-232 and RS-485 connections. A +12VDC connection can be used with along with the serial connections to power a remote serial device such as a RS-485 control panel. The Ground connection is shared between the RS-232 and RS-485. Mating connectors provided in box.

	Signal Label	Signal
	+12V	Aux Power
	A	RS-485 A(-)
	B	RS-485 B(+)
	⏚	GND
	RX	RS-232 Receive
	TX	RS-232 Transmit

⑤ **DC Power Input** – 12VDC, 10W, center positive power Input. Provides alternate power source to PoE. Can be used simultaneously with PoE for redundant power.

⑥ **GPIO** – General Purpose I/O. The function of the GPIO pins can be configured in the GPIO Settings section of the Dash Software. Mating connectors provided in box.

	Signal Label	Signal
	V	+3.3VDC @ 500mA MAX
	D	GPIO Common
	⏚	GND

Below are general definitions of the GPIO depending on how they are defined in Dash:

GPIO Input: The port value is considered 'High' if the voltage applied to the 'D' pin is greater than 2VDC. The port value is considered 'Low' if the voltage applied to the pin is less than 0.3VDC. Input pins can support up to 12VDC.

GPIO Output: When the port is triggered 'High', the 'D' pin will output 5VDC with a drive current of 100mA; when triggered 'Low' the pin will equal ground. ***The maximum total current if all 8 pins are configured as outputs is 500mA.***

GPIO ADC Input: When the port is configured as an ADC input, an external potentiometer can be connected as a volume control.

⑦ **LAN Control Interface** – 10/100/1000Mbps Ethernet control interface. Use this interface to connect to Dash control software or to use UDP commands from a third-party source.
NOTE: This port has different MAC and IP addresses than the Dante Audio ports.

⑧ **AC Power Input/Switch** – 110-240VAC 50/60Hz, 40W Max power inlet via IEC 320 C14 socket. Main power switch for unit must be in the ON (I) position for normal operation.

⑨ **Ground Lug** – Ground lug to provide chassis ground. Secure to earth ground according to code.

Audio Signal Flow Diagram

USB (Audio)

Dante   Dante

Signal Generator   Signal Generator   Signal Generator   Signal Generator

Phase   Phase

Gain   Gain

Ch Vol   Meters   Ch Vol   Meters   Ch Vol   Meters   Ch Vol   Meters

EXP   EXP   EXP   EXP

Comp   Comp   Comp   Comp

AGC   AGC   AGC   AGC

EQ   EQ   EQ   EQ

AFC   AFC   AFC   AFC

Auto Mixer

AEC

Auto Mix Output   Dante Ch n   Dante Ch 1   Analog Ch n   Analog Ch 1

ANC

Matrix

Filter   Filter   Filter   Filter

EQ   EQ   EQ   EQ

Delay   Delay   Delay   Delay

Limiter   Limiter   Limiter   Limiter

Meters   Meters   Meters   Meters

Phase   Phase   Phase   Phase

USB (Audio)

G   -   +

Software
Software Installation
A Windows PC with a processor of 1 GHz or higher and:

- Windows 7 or higher version.
- 1 GB free storage space.
- 1024 x 768 resolution.
- 24 bit or higher color.
- 2GB or higher memory.
- Network (Ethernet) port.

CAT5 cable or current Ethernet network

Visit web page address https://support.auroramultimedia.com/dash/

Download software

1. Install files.

After the software is installed, use one of the following methods to enable the software:

- Desktop icons
- Start menu

When starting the software for the first time, it may take some time (1-15s) to start. Please be patient.

Software Operation

After starting the software, the main screen will look like the image below:

File Menu

The File menu is for opening and saving presets to the computer during offline configuration. Presets are stored on the DTX devices by default. In the case where you are configuring a system offline, that configuration can be saved to a local file on the controlling computer. This is important because when a live device is connected to the Dash software, the current active settings of the DTX device will be uploaded to the Dash software, including all stored presets. After the device is active, a saved preset configuration can be loaded from the host computer and pushed to the device.

Here are the steps to load an offline configuration file when NOT connected to an active device.

- Click 'File | Open'
- Select the file from the local storage and click 'OK'

When the active Device tab is connected to a DTX device, the steps to open a saved file are different.

- Click the 'Load Preset' button next to the preset list
- Select the preset from the list into which you wish to load the saved configuration file.
- Select the file from the local storage and click 'OK'
- The configuration will be uploaded and saved to the device in the selected preset. The preset will NOT be made active automatically.

Settings Menus
Device Setting

NOTE: This menu selection is only active when a DTX device is connected to Dash.

This dialog window provides the basic configuration information about the connected device.

Device Name: Change the name of the device by directly typing in the field. This device name will show up in Dash anywhere the device is addressed. This name is saved to the hardware.

Device IP Address: The IP address of the LAN interface. NOTE this is a different IP address than the Dante interface and is static. Since many control systems use hardcoded IP addresses to send commands to devices, DHCP is not supported for this interface. Be sure to use static addressing on this network or use DHCP reservations to ensure the address is not duplicated on another device on the network.

Gateway: The default gateway for the network.

Netmask: The network mask associated with the desired subnet.

Mac Address: The MAC address of the LAN interface. NOTE this is a different MAC address than the Dante interface.

Default Preset: Determines the default preset that should be made active on the device after a power cycle event. It can be either one of the 16 presets or can be set to load the last active preset before power cycle.

Set As Host: Enables device mirroring. See

Appendix A: Device Mirroring for more information.

Backup Device ID: If 'Set As Host' is set to 'On' this sets the IP address of the backup device on the network.

Center Control Response: When set to on, enables control responses on the DTX device. Set this to 'ON' when using an external controller that expects a response to control messages.

Real Time Save: Saves any device changes to the active preset in real time. Setting this to 'On' can ensure that the exact state of the device is restored in the event of a power cycle if 'Previous loaded preset' is selected in the 'Default Preset' parameter. If set to 'Off' and changes are made to the device that are not saved to a preset, those changes will be lost after a power cycle event.

Enable Model Selection Box: If set to 'On', the model selection box will appear as soon the Dash software is loaded. This is set to 'Off' by default.

UDP Control Port: Sets the UDP control port for remote communication with the device.

UART Settings: *Baud Rate, Data Bits, Stop Bit, and Parity Bit* can be set for both the RS-232 and RS-485 ports of the device.

OK: Setting are saved to the device and the dialog box is closed.

Cancel: All changes are lost, and the dialog box is closed.

GPIO Setting
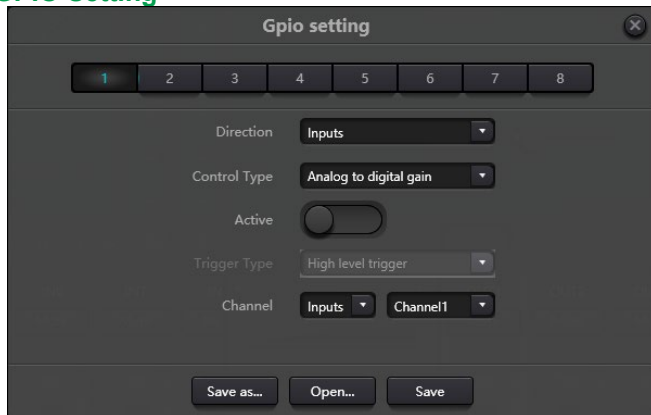
All DTX units above 4x4 channels include 8 GPIO interfaces. The "GPIO Setting" dialog allows for the configuration of this I/O.

Channel Buttons: 8 buttons across the top of the dialog box selects which GPIO channel is being configured.

Direction: Determines whether the selected channel is an input or an output. Inputs and Outputs will have different value selections for Control Type.

Active: Enables or disables the selected GPIO channel.

Control Type (inputs only): Determines the function which will control or be controlled by the GPIO. Additional parameters will differ depending on the Control Type selected. The following tables define the additional parameters based on the value of this field.

Direction = 'Input'		
Control Type Value	**Associated Dialog Box**	**Additional Parameters**
Preset: Changes the preset to a defined value when a trigger event occurs.		**Trigger Type:** 'High level trigger' will trigger the channel when the voltage on the pin is above the threshold. 'Low level trigger' will trigger the channel with the voltage on the pin is below the threshold. **Preset:** Selects which preset will be applied upon a trigger event.
Routing: Creates a matrix route point when a trigger event occurs.		**Trigger Type:** 'High level trigger' will trigger the channel when the voltage on the pin is above the threshold. 'Low level trigger' will trigger the channel with the voltage on the pin is below the threshold. **Input & Output:** Selects the two points that will be routed together upon a trigger event.
Gain: Changes the gain value on the predetermined channel when a trigger event occurs.		**Trigger Type:** 'High level trigger' will trigger the channel when the voltage on the pin is above the threshold. 'Low level trigger' will trigger the channel with the voltage on the pin is below the threshold. **Channel:** Selects which 'Input', 'Output' or 'System' channel will be affected by the gain change. **Step:** Defines the size of the gain change in dB of the gain change.
Mute/Unmute: Will mute a predetermined channel when the trigger is active and will release the mute when it becomes inactive.		**Trigger Type:** 'High level trigger' will trigger the channel when the voltage on the pin is above the threshold. 'Low level trigger' will trigger the channel with the voltage on the pin is below the threshold. **Channel:** Selects which 'Input', 'Output' or 'System' channel will be affected by the mute/unmute.

Command: Sends a hex command string via RS-232 when a trigger event occurs.	Direction: Inputs Control Type: Command Active Trigger Type: High level trigger Command: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	**Trigger Type:** 'High level trigger' will trigger the channel when the voltage on the pin is above the threshold. 'Low level trigger' will trigger the channel with the voltage on the pin is below the threshold. **Command:** String of Hex characters that will be sent over RS-232 upon a trigger event.
Analog-to-digital Gain: When a potentiometer is connected to the GPIO, the selected channel gain will be adjusted.	Direction: Inputs Control Type: Analog to digital gain Active Trigger Type: High level trigger Channel: Inputs Channel1	**Channel:** Selects which 'Input', 'Output' or 'System' channel will be affected by the gain change.

Trigger Type (outputs only): Determines which function will initiate a trigger event on the GPIO channel. Additional parameters will differ depending on the Trigger Type selected. The following tables define the additional parameters based on the value of this field.

Direction = 'Output'		
Trigger Type Value	**Associated Dialog Box**	**Additional Parameters**
Preset: Initiates a trigger event when a predefined preset is selected.	Direction: Outputs Trigger Type: Preset Output type: Output low level Active Preset: Preset 1	**Output Type:** 'Output low level' will set the channel pin to ground. 'Output high level' will set the channel pin to +5VDC. **Preset:** Defines which preset, when selected, will initiate a trigger event.
Level: Initiates a trigger event when a channel level reaches a defined threshold.	Direction: Outputs Trigger Type: Level Output type: Output low level Active Channel: Inputs Channel1 Level: 0.0	**Output Type:** 'Output low level' will set the channel pin to ground. 'Output high level' will set the channel pin to +5VDC. **Channels:** Identifies which channel will be monitored. **Level:** Sets the gain threshold, which when met, will initiate a trigger event.

Mute: Initiates a trigger event which mirrors the mute state of the predefined channel.		**Output Type:** 'Output low level' will set the channel pin to ground. 'Output high level' will set the channel pin to +5VDC. **Channels:** Identifies which channel will be monitored. When a channel is muted it will set the channel GPIO pin to the state defined in 'Output Type'. When unmuted it will revert back to the default state.

Save as...: Saves the current GPIO configuration to a file. When configuring devices offline, save the GPIO configuration to a file before connecting to a live device. When a live device is first connected, it's onboard settings will overwrite whatever is in the software to ensure proper sync. Once the deice is connected, this file can be applied and saved to the device.

Open...: Opens a dialog box to select a previously saved GPIO configuration file. The configuration will be applied to the GPIO when open.

Save: Saves the configuration to the device. This will be 'grayed out' when the device is not connected.

Group Setting

Both input and output channels can be grouped together for the purpose of gain setting and muting, all other parameters remain independent. Grouped channels can be identified by a colored mark on the channel fader, all channels in a particular group will share the same color. Up to 16 input and 16 output groups are supported.

To select channels, simply click in the intersection of the Group name and the channel number. Note that any one channel can only exist in a single group.

Grouped channels only share gain and mute settings, while Linked channels share all parameters. Keep this in mind when creating your groups. Linked channels will still mirror parameters other than gain and mute, however the gain and mute settings of the Group will take precedence over Link.

Inputs: Create Input groups.

Outputs: Create Output groups.

OK: Saves setting to device and closes the dialog box.

Clear All: Clears all group settings.

Cancel: Closes dialog box without saving changes.

Preset Name
NOTE: This menu selection is only active when a DTX device is connected to Dash.

This menu provides the facility to rename the default preset names to more standard language for easier identification. Simply type the new names in the provided field and press 'OK'. All the preset names will be updated on the device.

Panel Setting
DTX DSPs are designed to work natively with DTX wall panel controllers. This menu item opens a Panel creation application that can be used to assign and customize these DTX wall panels.

User Interface
Dash software can be controlled by up to 8 PC, Android or iOS devices by creating a custom interface. This menu opens a User Interface creation application used to create these custom interfaces.

User Admin
When connected to an active device, the Settings menu will contain an additional item to control User Administration. This provides means to password protect access to a DTX device. When connecting to a device via the Device List, a dialog will appear prompting for a username and password if Account Login is enabled. The Dash software will not connect to this device without a username and password in this case. Each DTX device maintains its own User Admin. NOTE: The username and password are not required to use Dash software, only to connect to a device. UDP control is not affected by User Admin settings.

Enable Account Login: Check this box to require a username and password to access a DTX device via Dash.

Add User: Click the 'Plus' sign at the center bottom of the dialog to add a new user.

EditPassword: Click to edit the password for the selected user.

DeleteUser: Click to delete the selected user. Admin user cannot be deleted.

Edit Password
If Account Login is enabled for a device, when connected to that device, 'Edit Password' will appear in the Setting menu. Selecting this option will display a dialog box to change the password for the logged in user.
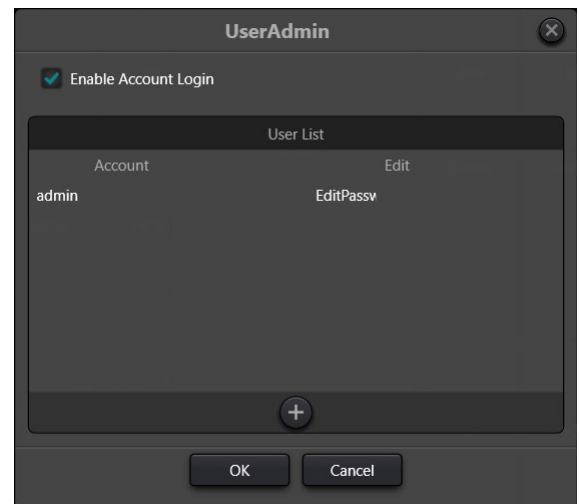
Factory Reset

In the event an Admin password is forgotten, the unit must be reset to factory defaults. See Appendix B: Factory Reset for more information.

Help

About

Displays software version information.

Document

Help file for Dash software.

Command Capture
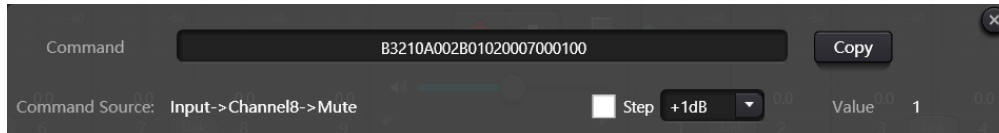
The Command Capture window provides an easy capture system for command strings. With the window open, simply click or set any parameter and the command string that corresponds to that command will appear in the window. Using the button, copy the command and use it with a third-party control system to send the command via UDP or RS-232.

Device Tabs

To the right of the Help menu are the Device tabs. Each tab represents a separate DTX DSP device. The Device Name appears as the text in the tab for easy identification. See 'Device Settings' for information on how to change the device name. To the right of the Device name is a small status indicator which will be green if the device is connected, or grey if it is not. A small (x) next to the name can be clicked to close the tab.

New devices can be added by clicking the (+) plus sign to the right of the last device tab. See Device List or more information on adding devices.

Device List

The Device list is the last item on the far right of the top menu line. The device list contains all of the active, discovered DTX devices on the network. Each device on the network will appear in the list with details about the device. Device Name, Device IP and software version. Below this information are two buttons.

Plus Sign: Click to manually add a device to the list by IP address.

Refresh: Click this to refresh the discovery of new devices on the network.

Connect/Disconnect: Connects the device to the active Device tab. NOTE that the active device tab must match the device type. If the device is already connected, the button will read 'Disconnect'. Clicking the button in this state will disconnect the device from the active Device Tab.

Set IP: This allows the Device IP address to be set. The list is generated by UDP discovery, so it is possible that the IP address is not in the correct subnet for the active network. This is especially true for new DTX devices that still have the default IP address set. The IP address must be set to and address on the active subnet before configuration of the device. NOTE: This IP address is for the LAN interface and is different than the IP address for the Dante Interface.
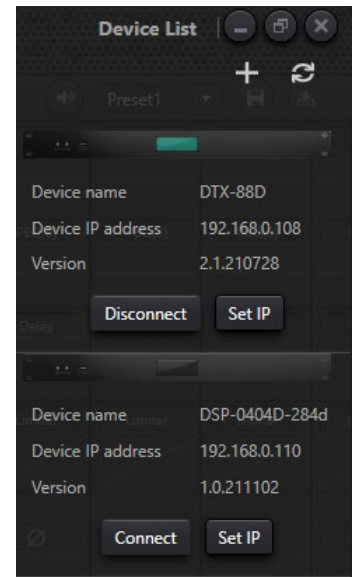
Edit Module

Below the main software logo is the Edit Module mode button with a pencil icon. Pressing this button enters to module edit mode where individual DSP Modules can be added or removed from channels. Pressing the button again, returns to normal run mode. Next to the Edit Module button is CPU and memory load indicators. These indicate the current load of the connected device and are used when adding modules. NOTE: This mode is only available on certain DTX models and is only active when a device is connected. See the section entitled Adding and Removing DSP Modules for more information about using this mode.
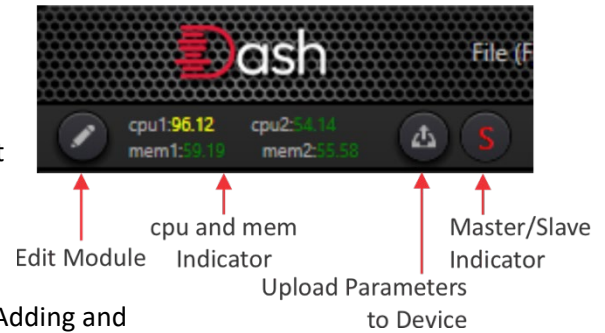
Upload Parameters to Device

This is a small button to the right of the Edit Module button. Pressing this button immediately uploads the current configuration to the connected device. This would typically not be needed in normal operation but is provided as a debugging tool to force immediate synchronization with a device. NOTE: This button is only active when a device is connected.

Master Slave Indicator

To the right of the 'Upload Parameters to Device' button is a small circle indicator. This indicates the Backup Device status of the connected DTX device. A red S indicates the device is a slave. This is the normal indication for devices that are not using the Backup Device functionality. When a DTX device is designated as a Host or Master in Device Setting dialog the indicator will display a red M.

Navigating the Home Tab

The Home tab is the main dashboard for the selected device. It is located below the Device tabs and is the first entry in the line of Module tabs. Click the word 'Home' to enter the Home tab.

Channel Layout

For both inputs and outputs channels are numbered first with analog followed by Dante. Dante channels can be identified in Dash with the Dante logo above the channel fader. This arrangement flows everywhere in the software – channel layout, Matrix, AEC, etc, everywhere channels are referenced. NOTE Dante channel numbering will follow this numbering scheme. Notice in the image of Dante Controller below that the DTX-44D starts with channel 5.

DTX Model	Channel Layout	
DTX-44D	Ch 1-4 Analog Ch 5-8 Dante	
DTX-88D	Ch 1-8 Analog Ch 8-16 Dante	
DTX-1616D	Ch 1-16 Analog Ch 17-32 Dante	
DTX-3232D	Ch 1-32 Dante	
DTX-6464D	Ch 1-64 Dante	View of DTX-44D in Dante Controller

Selecting Channels

Clicking the channel label, fader or number will select the active channel. This will be indicated with by teal border around the channel.

Changing the Channel Name

Channel names can be changed by double clicking on the name. Type the new name and hit enter to save.

Setting Channel Gain

Channel Gain can be set by either moving the fader with a mouse, or by typing the value in the gain value box directly below the fader.
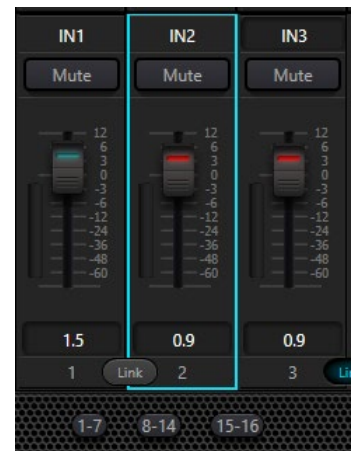
Linking Channels

Two adjacent channels can be linked by clicking the 'Link' button between them. All parameter changes to one linked channel will be duplicated on the second.

Channel Pages

At the bottom left and bottom right of the Dash window are buttons that can be used to page through channels. Clicking one of these buttons will scroll the channel bank to view the selected group of channels.

Setting Minimum and Maximum Gain

By default, the minimum and maximum gain levels on the input and output faders are set to their limits of -72dB to +12dB. Right clicking over a fader will bring up a context menu that will allow you to reduce these limits.

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Accessing Parameters

There are three ways to access parameters of a channel and its modules.

Right Click: Right clicking over a module will bring up a dialog box for the selected module and channel while staying on the Home tab.

Double Click: Double clicking on a module will bring up either the 'Inputs' tab or the 'Outputs' tab depending on the type of channel you have clicked. The tab will come up with the module you selected as the active window. This is described in more detail in the next section.

Module Tabs: Channel module parameters can be also accessed by selecting either the 'Inputs' or 'Outputs' tab from the module tabs. These tabs are described in more detail in the next section.

Module Tabs

Below the main menus and Device tabs are a series of Module tabs. The quantity of these tabs will vary depending on the capabilities of the DTX model you are using.

DTX Model	Available Module Tabs
DTX-44D	Inputs, AutoMixer, AEC, ANS, Matrix, Outputs, Meters
DTX-88D, DTX-1616D, DTX-3232D	Inputs, AutoMixer, AEC, ANS, Matrix, Outputs, Meters, Camera
DTX-6464D	Inputs, Matrix, Outputs, Meters

The detailed functions of these modules are described later in the manual.

Inputs

The Input tab maintains the input fader section across the bottom. Above the fader row is a section which slides right to left and contains all the DSP modules for the selected input channel. Modules can be navigated by sliding the section left to right with the mouse, or by clicking one of the DSP Module names in the button list at the far-right of the screen.

AutoMixer

The AutoMixer tab maintains the Input and Output fader sections divided by the Sound Card as in the Home tab. Above the fader row is the AutoMix System Module.

AEC

The AEC tab maintains the Input and Output fader sections divided by the Sound Card as in the Home tab. Above the fader row is the AEC System Module.

ANS

The ANS tab maintains the Input and Output fader sections divided by the Sound Card as in the Home tab. Above the fader row is the ANS System Module.

Matrix

The Matrix tab maintains the Input and Output fader sections divided by the Sound Card as in the Home tab. Above the fader row is the Matrix System Module.

Outputs

The Output tab maintains the output fader section across the bottom. Above the fader row is a section which slides right to left and contains all the DSP modules for the selected output channel. Modules can be navigated by sliding the section left to right with the mouse, or by clicking one of the DSP Module names in the button list at the far-right of the screen.

Meters

The Meters tab maintains the Input and Output fader sections divided by the Sound Card as in the Home tab. Above the fader row is a set of input and output meters.
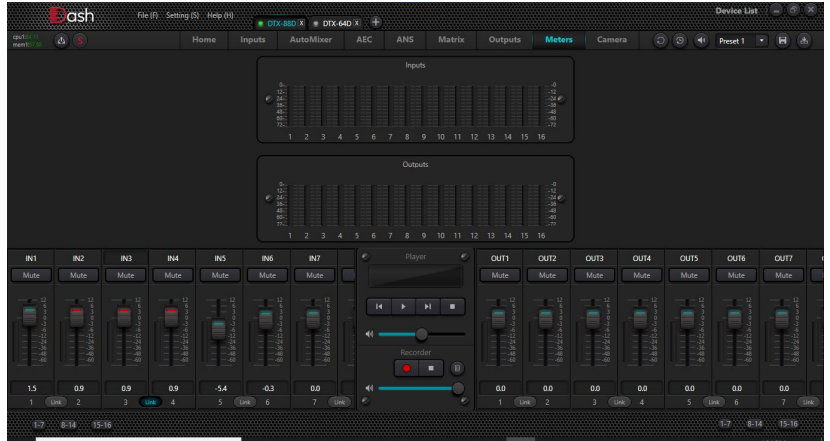
Camera

The Camera tab maintains the Input and Output fader sections divided by the Sound Card as in the Home tab. Above the fader row is the Camera Control Module.

System Mute

To the right of the Module tabs is the System Mute and appears as a round button with a speaker. Pressing this button performs a system mute of all channels. The speaker image will turn red when engaged. Click the button again to release the mute.

Presets

The final item to the far right of the Module tabs is the Preset list. Clicking the drop-down list will open it to show the list of 16 presets. Selecting an item from the list will recall the preset. The Settings menu contains the Preset Name functionality which allows for the renaming of the presets.

The save button is used to immediately save the current configuration to the selected preset on the device. This is only available on a connected device.

The Preset Load button loads a saved configuration file (.dsp) from the computer into the selected preset. Simply select the preset from the 'Preset Load' list and an open dialog will appear. Select the file from its location and hit 'Open'. The configuration will be loaded into the preset on the device. See the section titled File Menu for more information about creating a .dsp file. This is only available on a connected device.

DSP Channel Modules

The Dash DSP Control software has been designed to be incredibly flexible and includes a large variety of DSP Modules, each providing a unique function.

NOTE: The DTX-44D and DTX-6464D have fixed DSP modules, they cannot be changed.

Adding and Removing DSP Modules

DTX-88D, DTX-1616D and DTX-3232D allow for the customization of DSP Modules on a per channel basis. There are five Module Slots on each input channel and four Module slots on each output channel. Modules can be added and removed by entering 'Edit Module' mode.

From the Home tab, click the Edit Mode button which has the pencil icon. Now when you hoover your mouse over one of the module slots, the slot will be outlined in red. Right click over the highlighted module slot to get a context menu. Using the right menu functions configure the device. As you are configuring the device, keep an eye on the 'cpu:' and 'mem:' indicators next to the 'Edit Module' button. These indicate the current load of the device resources based on the current configuration. If they turn yellow, resources are getting thin. If they turn red, you have exceeded the available resources and will not be able to save the configuration.

The following functions can be performed:

Delete: Empties the selected module slot.

Clear Current Channel: Empties all module slots in the selected channel.

Clear All Channel: Empties all input or output channels on the device, depending on whether the selected channel is an input or output.

Copy Current Channel: Copies all the module slots on the current channel.

Copy to All Channels: Copies the current channel modules to all the other channels, either input or output.

Paste: Pastes a previously copied channel module set to the currently selected channel.

Module List: Lists all the available modules that can be used in the selected module slot. Selecting an item from the list will fill the highlighted slot with the selected DSP Module.

When complete, click the pencil icon again to save your changes to the device. You will be prompted to either Finish, Upload or Cancel.

Finish: Saves the changes locally in Dash but does not upload them to the connected device if one is connected. If there is a device connected it will be discontinued as the device will now be out of sync with the Dash configuration.

Update: Saves the changes to the device. This button will be 'greyed out' if there is no device connected.
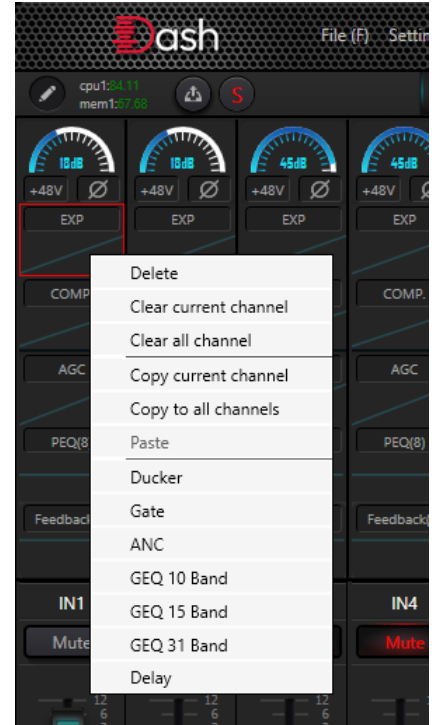
Cancel: Exits 'Edit Module' mode and discards changes.

Input Source

The Input Source Module is a fixed module that exists on every input channel of every DTX device. It provides basic input parameters for the selected channel. Since this is a fixed Module, it does not consume one of the five Module Slots available on some DTX models.

Analog Signal: Selects the analog input connected to the external analog connection for the channel source. *(Analog Inputs Only)*

Digital Signal: Selects the Dante input connected to the external analog connection for the channel source. *(Dante Inputs Only)*

Sensitivity: Microphone input gain selectable in 3dB increments from 0 to 48dB. *(Analog Inputs Only)*

Phantom Power: Provide power for external condenser microphone or other phantom powered input peripheral. Do not enable phantom power on a line input source or when the power is not required, so as not to damage the external device. *(Analog Inputs Only)*

Phase: Reverses the phase of the input signal by 180°.

Mute: Mutes the channel.

Signal Generator: Activates the internal signal generator for the selected channel instead of the analog input.

Sine Wave: Sets the output of the Signal Generator to a sine wave with a frequency between 20Hz and 20kHz. You may regulate the output level (unit: dBFS) based on your own needs. Use a fader to adjust or click the text field to designate a value.

Freq: Use this slider to set the frequency of the sine wave generated. This slider has no effect when white or pink noise is generated.

Level: Sets the level of the Signal Generator. This slider works for all three types of signal generation.

White Noise: Sets the output of the Signal Generator to white noise. White noise is a signal made of uncorrelated samples, such as the numbers produced by a random generator. When such randomness occurs, the signal will contain all frequencies in equal proportion and its spectrum will turn flat. The Freq slider will have no effect on the pink noise, however the Level slider can be used to adjust the amount of signal inserted into the channel.

Pink Noise: Sets the output of the Signal Generator to pink noise. Pink noise is a random signal, filtered to have equal energy per octave. Pink noise has equal power in proportionately wide bandwidths. The Frequency slide will have no effect on the pink noise; however, the level slider can be used to adjust the amount of signal inserted into the channel.

Expander

Expanders are helpful dynamic processing tools that increase the dynamic range of an audio signal. They are essentially the opposite of a compressor, which decreases the dynamic range of an audio signal. The most fundamental difference between and expander and a compressor is that while a compressor engages when a signal is above a defined threshold, an expander engages when a signal drops below a defined threshold. An expander is a more nuanced version of a gate in that it attenuates low level signals below a threshold and leaves those above alone.
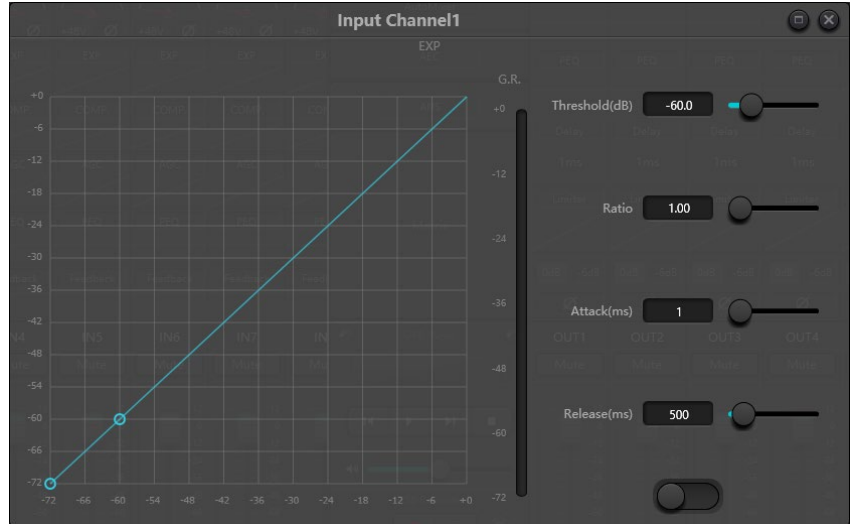
Threshold: The expander engages when the signal is below this threshold.

Ratio: Sets the slope below the threshold point on the gain curve. In other words, sets the amount of expansion that is applied.

Attack: Determines how fast the expander engages once the threshold is crossed.

Release: Determines how fast the expansion recovers after the signal returns above the threshold.

A combination of Attack and Release provides hysteresis to reduce the changing speed of gain attenuation or what is often referred to as 'breathing'.

ON/OFF: The Expander has a master on/off switch which is used to enable or disable the module. The effected expansion curve will be highlighted in the graph when the module is ON.

Compressor

Audio compression reduces the dynamic range of an audio signal. Dynamic range is the difference between the loudest and quietest parts of a waveform. Compression reduces this range by attenuating the louder signals and boosting the quieter signals. As a result, the loudest and softest parts are closer in volume, creating a more balanced sound. With the extra headroom, you can then increase the overall level of the signal.
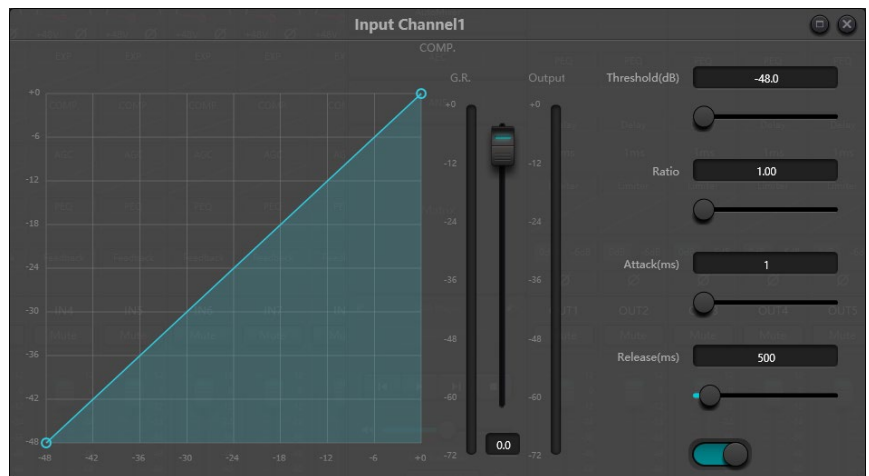
Threshold: When the signal level is higher than the threshold, the compressor/limiter begins to reduce the gain. Any signal that exceeds the threshold is regarded as overshoot signal, and its level will be reduced. The more the signal exceeds the threshold, more its level is attenuated.

Ratio: Refers to the compression ratio. The ratio determines how much attenuation to apply to a signal that has overshot the threshold level. A lower threshold will reduce a greater portion of the signal, while a higher threshold will reduce only the loudest peaks and leave the rest untouched. For example, a ratio of 4:1 means that for every 4 dB the signal rises above the threshold, the compressor will increase the output by 1 dB. However, if the ratio is 1:1, no compression will occur. Whereas a ratio of 10:1 or higher will make the compressor effectively act as a limiter.

Attack: Sets the time it takes for the compression to kick in once the signal passes the threshold. Faster attack times will immediately clamp down on the initial transients of a sound. This is good for controlling dynamics and catching transients that cause clipping. Whereas slower attack times allow more of the initial attack to punch through before compression begins.

Release: Sets the time it takes for the compression to stop once the signal falls below the threshold. Faster release times sound more natural and transparent. However, setting the release too fast can cause a "pumping" effect and other unnatural sounds. Whereas longer release times are good for smoothing out dynamics.

Output Gain: This is also called gain compensation fader. If the compressor significantly reduces the level of the signal, it may be desirable to boost output gain to compensate.

G.R. and Output Level Meter: G.R. indicates the amount of Gain Reduction (compression) applied; Output refers to the output level of the signal that has passed through the compressor module. The compression amount is displayed in an inverse level meter. If the input signal and threshold are set as -6dB and -30dB, respectively, and the ratio is 2:1, then the compression amount is 12dB; G.R. level meter will indicate around -12dB and output meter around -18dB.

ON/OFF: The Compressor has a master on/off switch which is used to enable or disable the module. The effected compression curve will be highlighted in the graph when the module is ON.

Automatic Gain Control (AGC)

Automatic Gain Control (AGC) is similar to a compressor, except while a compressor reduces the dynamic range of a signal, an AGC maintains the dynamic range while automatically boosting the signal level. The purpose of an AGC is to improve or normalize signal level while maintaining the dynamic range. For example, normalizing the level of audio playback of background music so that it is not drastically different than the level of a paging microphone, or, establishing a consistent audio between varying microphone levels in a conference. The AGC includes silence detection to prevent wild gain swings during silent periods.
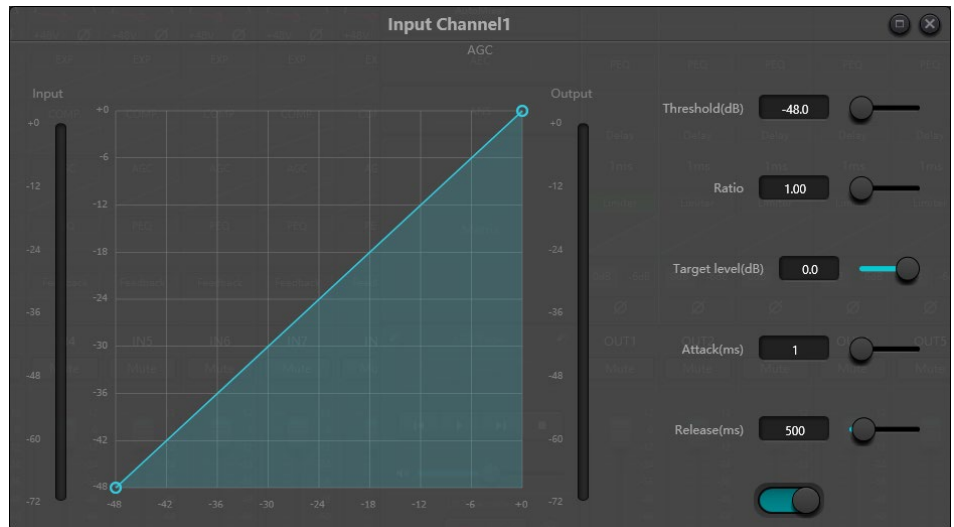
Threshold: When the signal level is lower than the threshold, the input-to-output ratio is 1:1. When the signal level is higher than the threshold, the input-to-output ratio changes according to the ratio control settings. The threshold will

typically be set just above the noise floor. This assures that the noise floor itself will not trigger the AGC, but any signal above that will.

Ratio: Sets the desired ratio between input signal and output signal.

Target Threshold: Sets the desired output signal level. If the signal is higher than the threshold, the controller will compress the signal in proportion.

Attack: Sets the time it takes for the AGC to kick in once the signal passes the threshold.

Release: Sets the time it takes for the AGC to stop once the signal falls below the threshold.

ON/OFF: The AGC has a master on/off switch which is used to enable or disable the module. The effected gain curve will be highlighted in the graph when the module is ON.

Parametric EQ

A Parametric Equalizer is an adjustable filter used to shape a signal's frequency content. The Parametric EQ allows control of multiple frequency bands and has adjustable parameters to control the center frequency, the gain or attenuation of that frequency and the Q (Quotient of Change) aka bandwidth around that frequency that is affected. While it is more complex than other types of equalizers, a Parametric EQ provides surgical precision and fine adjustment. For example, the squeal of a running air conditioner could be eliminated from a microphone signal without drastically effecting the desired audio content by using a very narrow Q with significant attenuation at the exact frequency of the squeal. The Dash software provides incredibly flexibility by offering 5, 8 and 12-band Parametric EQ modules (not available on all hardware).
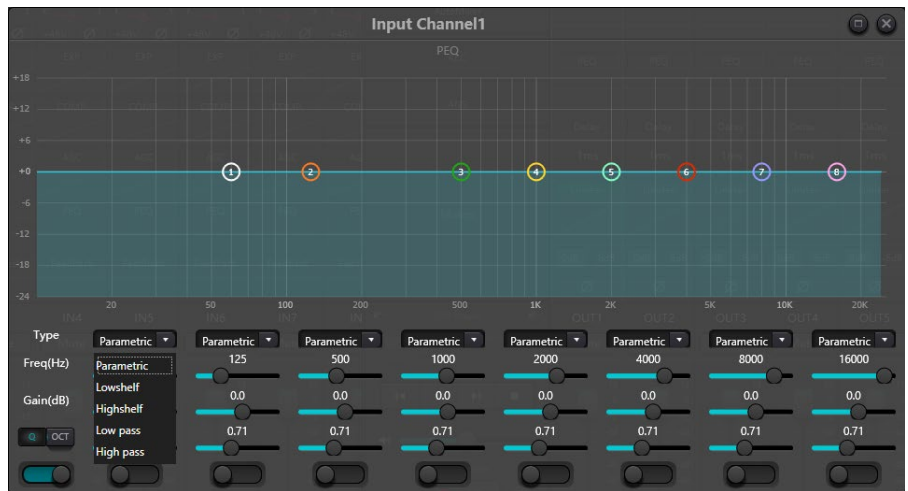
Type: Parametric EQ is a default. High & low shelf filters and high & low pass filters can also be selected. Each kind of filter has different frequency shapes to achieve different functions.

High & Low Pass Filter: The reference frequency of pass-type filter is called the cut-off frequency. Pass-type filter allows the frequencies on one side of the cut-off frequency to fully pass the filter while the frequencies on another side of the cut-off frequency are attenuated. A high pass filter allows the frequencies above the cut-off frequency to pass and filters the frequencies below the cut-off frequency, while a low pass filter allows the frequencies below the cut-off frequency to pass and filters the frequencies above the cut-off frequency.

High & Low Shelf Filter: High shelf filter means that the gain enhances or attenuates for the frequencies above the set frequency. Low shelf filter means that the gain enhances or attenuates for the frequencies below the set frequency. The set frequency is not the 3dB cut-off frequency but refers to the center of the failing edge or rising edge of the filter. Q value affects the peak and has a mathematical relationship to the peak.

Frequency (Hz): Sets the center frequency of the filter.

Gain (dB): It refers to the amount of gain or attenuation applied at the center frequency.

Q : Q Represents 'Quotient of Change' or the bandwidth. This sets how wide a swath of frequencies are affected surrounding the center frequency. The adjustable range of Q value is 0.02-50.

When the filter is a parametric EQ filter, Q value refers to the width of the bell-shaped frequency response curve on both sides of the center frequency.

When the filter is a high & low shelf filter or a high & low pass filter, if Q>0.707, there will be peaks in the filter responses. If Q<0.707, the slope will become flatter, and the roll-off will occur in advance.

OCT: Changes the units from Q-value to octaves. When dealing with music content, measuring bandwidth in terms of octaves can provide more musical results. A wider octave setting will make the content more natural and musical, on narrow settings it allows you to know the musical notes you are affecting as determined by the center frequency.

ON/OFF: Each segment of equalizer has a switch which is used to turn on or turn off the corresponding segment. If set to OFF, the parameter position is disabled. The Parametric EQ has a master switch located on the far left, which is used to enable or disable the entire module. The effected frequency response curve will be highlighted in the graph when the module is ON.

Graphic EQ
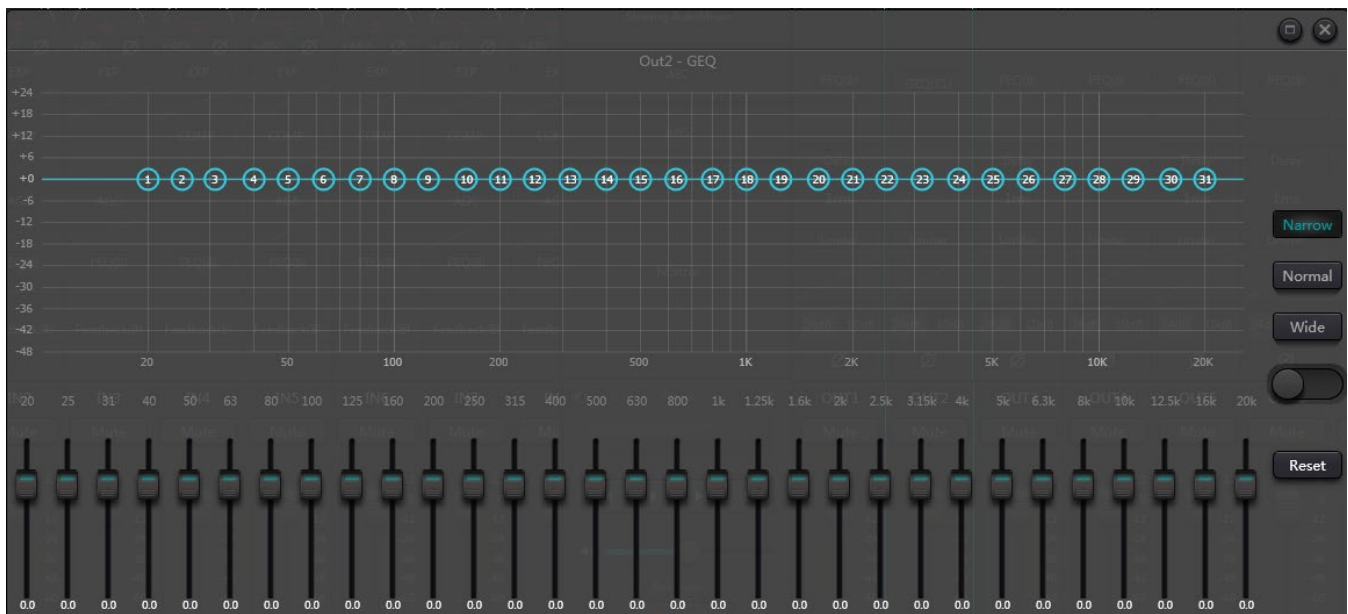
Like the Parametric EQ, the Graphic EQ is an adjustable filter used to shape a signal's frequency content. The Graphic EQ, however, is far simpler. Unlike the Parametric EQ, the Graphic EQ has its frequencies, and Q (bandwidth) fixed. Each fixed center frequency has its own gain control. There is one important thing to understand about graphic equalizers. When you adjust a slider, it also affects the neighboring frequencies. The Dash software provides incredibly flexibility by offering 10, 15and 31-band Graphic EQ modules (not available on all hardware).

Frequency Bands: Gain control for the specified frequency. Value ranges are from +12 dB to -24 dB (attenuation).

Narrow/Normal/Wide: Selects from one of three preset Q-values. This setting applies to all frequency bands.

Reset: Resets gain values for every frequency band to 0 dB and turns OFF the Graphic EQ module.

ON/OFF: The Graphic EQ has a master on/off switch which is used to enable or disable the module. The effected frequency response curve will be highlighted in the graph when the module is ON.

Adaptive Feedback Control (AFC)
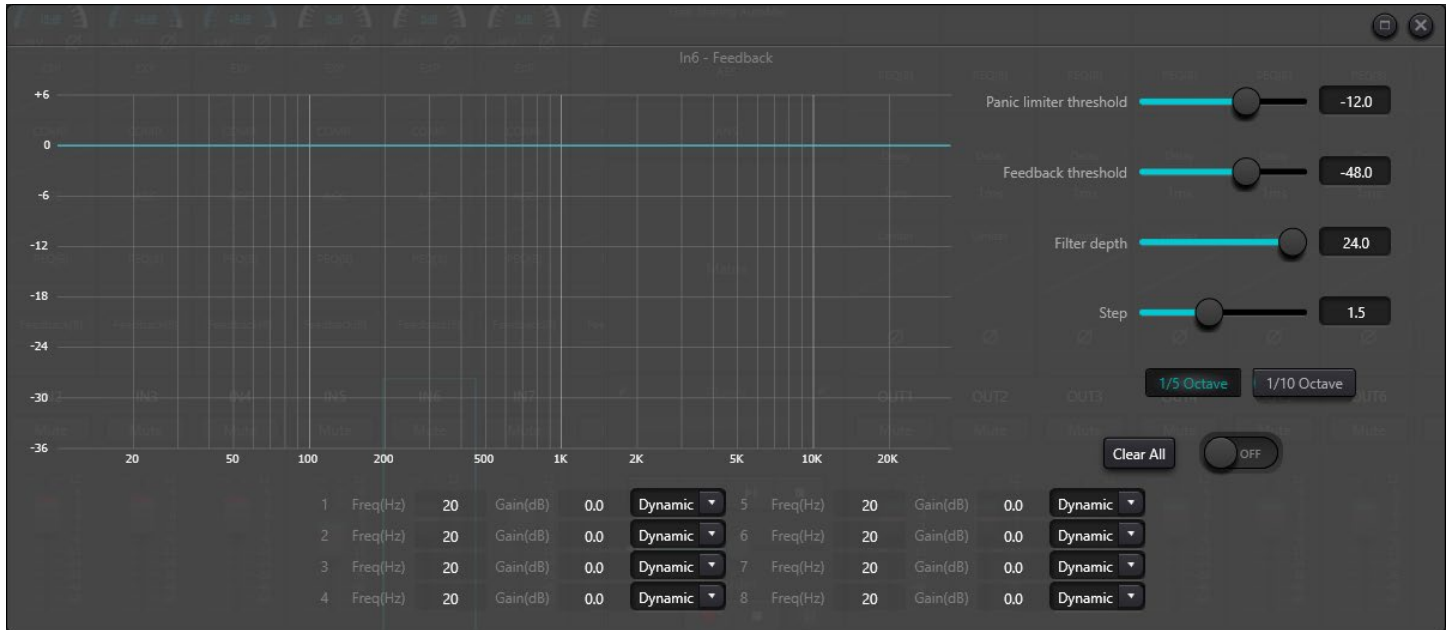
The Adaptive Feedback Control (AFC) module automatically detects and inhibits audio feedback. The module differentiates undesirable feedback from the desired audio content based on specific characteristics of the audio signal. When a feedback instance is detected, a notch filter (narrow Q) will be automatically added at the center frequency of the feedback. The applied attenuation is progressive meaning it starts with minimal attenuation at the feedback frequency, slowly increasing the attenuation, in compliance with the set parameters, until the feedback is eliminated or falls below the Feedback Threshold value.

Once a feedback event has been handled and the notch filter engaged, the filter will be locked to prevent change. These filters can be duplicated in a channel equalizer for a more permanent fixed feedback solution. There are eight (8), twelve (12) or sixteen (16) narrow-band filter slots in an automatic cycle depending on which AFC module was selected. Eight is the default.

Panic Threshold: Positively defines a feedback event. Any signal above the Panic Threshold will be considered feedback. When a signal level exceed the Panic Threshold any of the following will occur to attempt to get the feedback under control:

- Gain will be attenuated to attempt to control the feedback
- The output of the AFC module will be limited to prevent runaway feedback
- The filters sensitivity will be increased to provide faster detection

When the signal returns to below the threshold, all settings are returned to their pre-feedback event state.

Feedback Threshold: Positively defines what is NOT a feedback event. Any signal that is below this threshold is not considered feedback. Setting this threshold too high can diminish the effectiveness of the AFC.

Filter Depth: Sets the maximum attenuation of a single filter. A low setting will minimize the effect on the overall signal; however, it will also diminish the effectiveness of the AFC.

Step: Sets the Notch Depth Step Size (dB). Defines the depth of correction of each step. When a new feedback event occurs, the initial depth of the notch filter is set to twice this value. If the feedback persists, the notch will be deepened be this amount at regular intervals until the feedback is mitigated or the Filter Depth is reached. Larger values can cause 'over-correction' of the problem. In general, larger rooms should use smaller steps as the delay time of the room will cause the feedback to take longer to dissipate.

Bandwidth: 1/10 and 1/5 octave can be selected. A constant Q value applied to the notch filter, the filter will not become wider due to the increase of depth. A value of 1/10 octave should be used by default as it is narrower, it will not affect the desired signal as much as the 1/5 octave bandwidth. If feedback is persistent, the bandwidth can set at 1/5 octave because it has wider bandwidth and can catch more feedback events. The tradeoff, however, is that the notch filter will be more noticeable in the desired signal content.

Dynamic/Manual: Each of the notch filters can be set to either Dynamic or Manual mode. The default should be Dynamic as that will utilize the built-in content analysis and feedback detection algorithm. The Manual setting will effectively turn the related channel into a parametric EQ channel. Center frequency and gain can be manually set, and the Q-value is selectable using the 1/5 or 1/10 octave buttons.

Clear: Click the button to instantly clear all notch filters. This operation is generally done when recommissioning the AFC module.

Commissioning

The AFC module can be used as a tool during system commissioning to identify feedback points or as a preventive measure during normal operations. To maximize channel gain and AFC effect, use the following steps to set up the AFC.

1) Reduce the channel volume, and use the button "Clear All" to reset all notch filter parameters
2) Set up parameters for the feedback inhibition module as desired. Start with a low Panic Threshold to make sure you can identify all feedback events.
3) Open all microphones, and slowly increase channel volume until the feedback occurs. Stop increasing channel volume when the feedback occurs.
4) Wait for the AFC module to take effect; after the feedback disappears, continue to increase gain.
5) Repeat the operation until the system reaches the required gain or until all filters are fully distributed
6) Change the Panic Threshold to a maximum level just higher than the expected non-feedback signal.

After initial setup, notch filter setting can be transferred to a channel Parametric EQ for permanent suppression, freeing up the notch filter for any potential new feedback event that could occur in the future.

If a speaker is included among the devices used, it is recommended to use a compressor/limiter module on those outputs for additional protection. You should set an appropriate limiter to make sure that the speaker will not get damaged even if all notching filters slots are used or the feedback inhibitor cannot effectively control the feedback, such as in the case of excessive system gain.

ON/OFF: The AFC has a master on/off switch which is used to enable or disable the module. The effected frequency response curve will be highlighted in the graph when the module is ON.

Gate

The primary purpose of a Gate is to clamp off signals below a defined threshold, typically noise. Beyond just controlling IF a signal can pass through a channel, a Gate can also control how quickly the signal is allowed to pass, how long the Gate stays open and how soon the Gate can be fully opened again. Gates can be used in a couple of ways. First, they can be used to reduce unwanted external sounds. Think of someone speaking into a microphone in a busy office environment. You can use a Gate to reduce or eliminate the background noise when they are not speaking. Secondly, they can reduce natural channel noise. All audio equipment has an inherent noise floor. A Gate can be used on a channel where one of these devices is connected, to silence the noise when the device is silent.
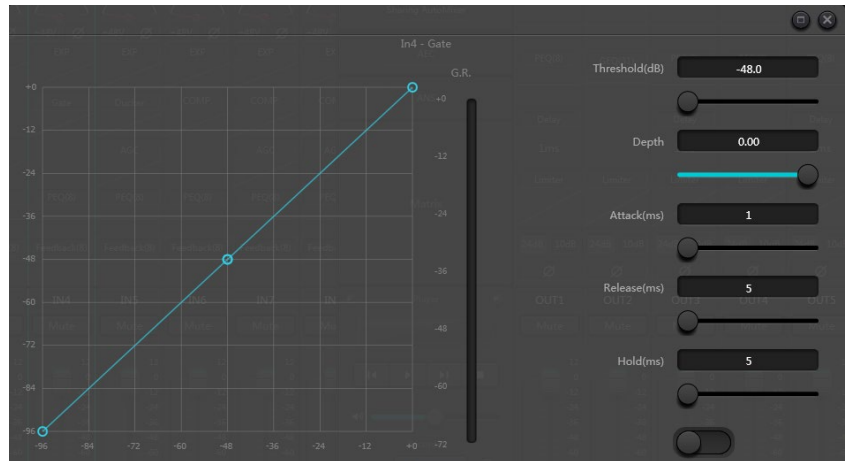
Threshold: Any signal greater than the Threshold value will open the Gate, below the Threshold will close the Gate.

Depth: Determines how much attenuation below the Threshold will be applied to gated signal.

Attack: Sets how quickly the Gate will open after the signal exceeds the Threshold.

Release: Sets how quickly the Gate will close after the signal drops below the Threshold and after Hold has expired. Release is the key to a natural sounding audio decay.

Hold: Sets the time the Gate will stay open after the Threshold has been passed. This can be important on signals with fast varying levels. A longer Hold value will keep the Gate from producing an audible 'chatter' in this scenario.

ON/OFF: The Gate has a master on/off switch which is used to enable or disable the module. The effected gain curve will be highlighted in the graph when the module is ON.
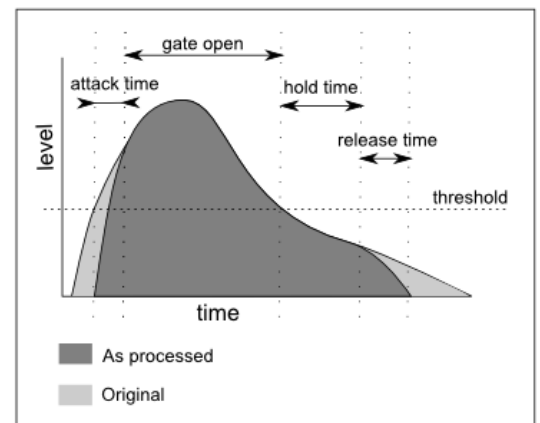
Ducker

A Ducker is a device used for lowering the level of one audio source based on the presence of another audio source. Duckers are often used in paging systems to lower the level of background music during a page. In this application, the Ducker restores the background music once the page is completed.
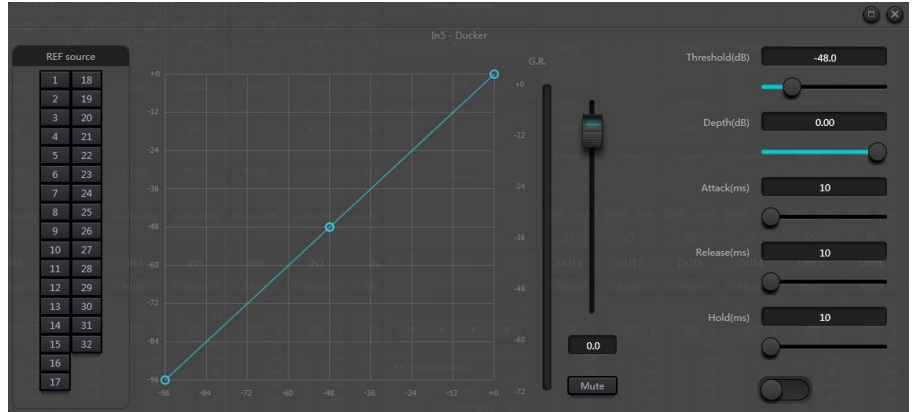
Reference Source: Sets the source channel used to trigger the Ducker. This can be more than one channel.

Threshold: When the reference source exceeds the Threshold, the Ducker engages.

Depth: Determines how much attenuation below the Threshold will be applied to ducked signal.

Attack: Sets how quickly the Ducker will engage after the reference source exceeds the Threshold.

Release: Sets how quickly the Ducker will release after the reference source drops below the Threshold and after Hold is expired.

Hold: Sets how long the Ducker will stay engaged after the reference source drops below the Threshold.

ON/OFF: The Ducker has a master on/off switch which is used to enable or disable the module. The effected gain curve will be highlighted in the graph when the module is ON.

Ambient Noise Compensation (ANC)
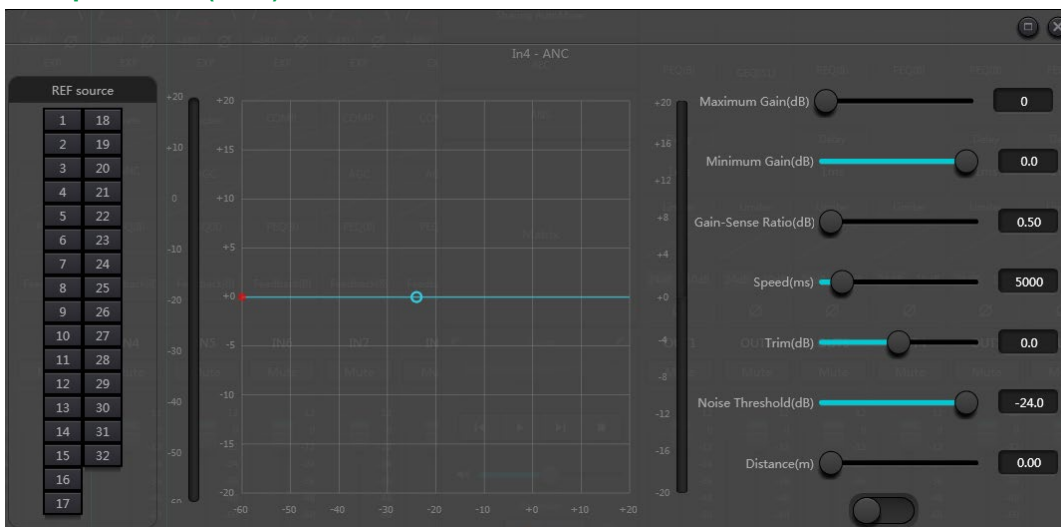
Ambient Noise Compensation (ANC) automatically adjusts the volume of the channel to compensate for ambient noise in the space. This is achieved through a sophisticated algorithm which listens to the ambient noise via a dedicated microphone. For example, consider music and announcements in a bar or restaurant setting. When the bar is empty, the

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ambient sound is low and thus, the program (music/announcements) do not to be too loud. As the bar fills, the ambient noise gets louder, and the program will get drowned out in the noise floor of the room. ANC can compensate for this by actively 'listening' to the ambient in the room and adjusting the volume accordingly.

Reference Source: Sets the source channel used as the 'listener' for ANC. This can be more than one channel, for example multiple microphones in a large space.

Maximum Gain: Sets the maximum amount gain that will be applied to the channel.

Minimum Gain: Sets the minimum gain level for the channel signal.

Gain-Sense Ratio: Sets the ratio of attenuation or gain.

Speed: Sets the speed that the ANC makes a gain correction.

Trim: Adds gain or attenuation to the resulting output of the ANC.

Noise Threshold: Level of the Reference Source above which the ANC is engaged.

Distance: Sets the physical distance between Reference Source and local signals.

ON/OFF: The ANC has a master on/off switch which is used to enable or disable the module. The effected gain curve will be highlighted in the graph when the module is ON.

High and Low Pass Filter

Each output channel has a High and Low Pass Filter (Filter). A pass filter is a useful tool in audio mixing. That's because, unlike other EQs which turn frequencies up or down, a pass filter allows you to filter out portions of the frequency spectrum. There are two main types of pass filters, high-pass filters (HPF) and low-pass filters (LPF). A high-pass filter, also referred to as a 'low-cut filter', does exactly what the name suggests. It allows only frequencies that are higher than a certain point to pass through. Simultaneously, it filters out the frequencies that are lower than that point. A low-pass filter, also referred to as a 'high-cut filter', allows only frequencies that are lower than a certain point to pass through. Simultaneously, it filters out the frequencies that are higher than that point.
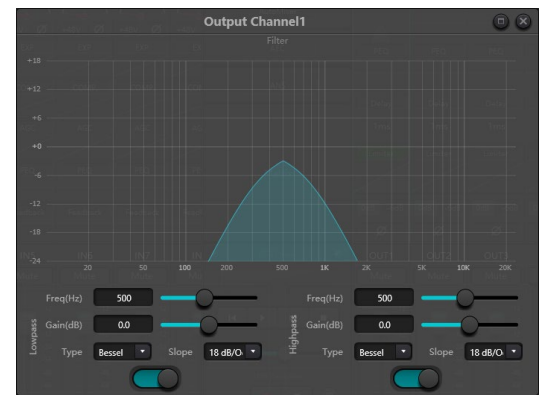
Frequency: The cutoff frequency of filters. The cutoff frequency of Bessel and Butterworth is defined at -3 dB, and the cutoff frequency of Linkwitz-riley is defined at -6dB.

Gain: Sets the gain or attenuation applied to the signal.

Type: There are three types of filters including Bessel, Butterworth, and Linkwitz-Riley.

The purpose of the Bessel filter is to achieve approximately linear phase, linear phase being equivalent to a time delay. This is the best phase response from an audible standpoint, assuming you don't want to correct an existing phase shift.

The Butterworth filter is a type of signal processing filter designed to have as flat frequency response as possible (no ripples) in the passband and zero roll off response in the stopband. However, one main disadvantage of the Butterworth filter is that it achieves this pass band flatness at the expense of a wide transition band as the filter changes from the pass band to the stop band. It also has poor phase characteristics as well.

The Linkwitz-Riley filter concept came from cascading pairs of identical two-pole Butterworth filters in low pass and high pass configurations. The result is a crossover filter that uses the same corner frequency in high pass and low pass, has no peaks or dips and is phase continuous at the crossover frequency. In other words, at the crossover frequency, both drivers are in phase, each contributing half the energy they would in their passbands.

Slope: It refers to attenuation values of transition zone of filters. There are totally 8 attenuation values including 6, 12, 18, 24, 30, 36, 42 and 48dB/Oct. For example, 24dB/Oct indicates that the attenuation range is 24dB for each octave difference existed in frequency in transition zone.

Users may click bottom activate button to activate high- or low-pass module.

ON/OFF: The Filter has two on/off switches which are used to enable or disable the High Pass and Low Pass Filters independently. The effected frequency response curve will be highlighted in the graph when the module is ON.

Delay

The Delay Module inserts delay into the output of the selected channel. Delay is often used in DSP processors for the purpose of time alignment. This can be either for time alignment of speaker elements if the outputs are used to drive different speaker drivers, or to align an audio output to a video source. In a multi-element loudspeaker or array, the sound from different drivers will take slightly different amounts of time to reach your ears. Since a woofer cone is "deeper" than a tweeter, the acoustic center of the woofer is further away from the listener's ear than the tweeter. The sound from the woofer will therefore arrive at the listener's ear slightly later than the sound from the tweeter. This can have a detrimental effect on the speaker's response around the crossover. The Delay Module can delay the output signal destined for the tweeter by a small amount of time. The result is that the acoustic waveform from both drivers will arrive at the listener's ear at the same time.
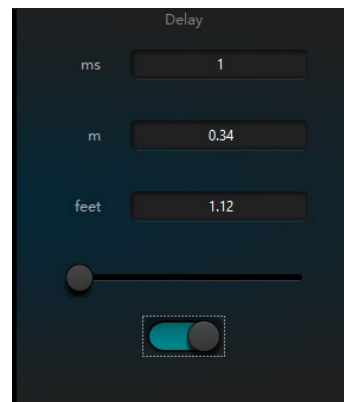
Milliseconds, Meters and Feet: All these parameters are linked, they display the same delay time measured in three different units. Entering a value in any one of the parameters will automatically be converted to the other units of measure and filled in.

Delay Slider: Provides a graphical way to enter the delay value.

ON/OFF: The Delay has a master on/off switch which is used to enable or disable the module. The 'Delay' indicator will be green when the module is ON.

Output Setting

The Output Setting Module is a fixed module that exists on every output channel of every DTX device. It provides basic output parameters for the selected channel. Since this is a fixed Module, it does not consume one of the four output Module Slots available on some DTX models.

Phase: Reverses the phase of the output signal by 180°.

Mute: Mutes the output.
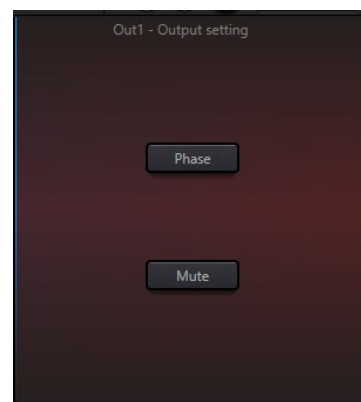
DSP System Modules
Gain Sharing Auto Mixer

The Dash Gain Sharing AutoMixer is a multichannel mixer that automatically lowers the level of non-active audio sources such as microphones while simultaneously riding the level of active sources to maintain the desired target gain. This eliminates the need for tedious and often impractical live mixing of audio sources. The alternative is to just leave all source channels open, however that can severely degrade the overall quality and user experience allowing hum, background noise, etc. from inactive open microphones to be mixed with the desired signals. The Dash Gain Sharing AutoMixer solves that problem elegantly by using the intelligence of the DSP to optimize the audio mix, prioritizing desired content while diminishing undesired content.

Gain Sharing provides the most natural sounding mix of multiple microphones. Some AutoMixers use gating technology to gate inactive microphones while maintaining a defined maximum Number of Open Mics (NOM). While this technique functionally 'works', one can imagine the unnatural sounding result as microphones are being effectively muted and unmuted during conversation. A Gain Sharing Automixer uses mathematics to reduce the individual gain of a microphone as microphones are added. Fundamentally, for every doubling of the NOM, the AutoMixer reduces the overall gain by 3dB. The effect is a seamless, natural, and conversational sounding mix.

There are two groups of control parameters in the Gain Sharing AutoMix module: main control parameters and channel control parameters.

Main Control Parameters

Gain: Sets the desired target gain for the output of the AutoMix.

Slope: Determines how aggressive the gain sharing is. Low Slope settings cause the module to behave just like a conventional mixer. High slope settings cause the inputs to attenuate more deeply for inactive microphones, similar to a gate. A value of around 2.0 provides the most natural sounding effect in most applications.

Response: Sets the speed at which the AutoMix operates. A faster response time may be needed if different speakers are speaking in quick succession however a response value that is too fast could cause unwanted 'pumping' of the audio between spoken words. Conversely, too slow of a response could cut off the beginning sounds of words. However, the very nature of the Gain Sharing algorithm provides for a faster on time than off, to help prevent this effect, even at very fast Response settings. Practice shows that the most natural effect will be produced with a Response value between 100ms and 1000ms.

Mute: Mutes the output of the AutoMixer.

ON/OFF: The Auto Mixer has a master on/off switch which is used to enable or disable the module. The 'Gain Sharing AutoMix' indicator will be green when the module is ON.

Channel Control Parameters

Fader/Gain: Sets the channel gain. Faders can be used to tell the Gain Sharing algorithm the desired relative level of each channel. NOTE: Channel gain is after the input to the AutoMix engine. Channel level may still influence the gain adjustment of other channels even if the fader is all the way down.

Priority: Sets the priority level of the selected channel. This value feeds into the AutoMix engine and can influence automatic gain adjustment decisions. Priority values range from 0 to 10. The higher the value the higher the priority of the channel.

AutoMixer: Enables AutoMix participation of the selected channel.

Mute: Mutes the channel. NOTE: Mute is after the input to the AutoMix engine. A muted channel may still influence the gain adjustment of other channels in the AutoMix.

AutoMixer Application Notes

Both channel gain and channel mute in the AutoMix module are after the AutoMix engine in the signal chain. Therefore, as long as the channel is participating in the AutoMix it will influence the algorithm – even if the channel is muted or the gain is all the way down.

If two or more channels have the same signal level, the channel with the highest priority will get more auto gain. It should be noted that great care should be given when assigning priority values. It is best to avoid wide differences in between channel priorities for example 0 and 10. If the channel with a value of 10 can recognize even background noise as valid content and then channels with a priority of 0 could be masked all together and never added to the AutoMix. This effect gets worse with higher Slope values. If it is necessary to have such diverse priorities, it is recommended to add a gate or expander to the highest priority channels to eliminate unwanted noise.

Gating AutoMixer

In addition to a Gain Sharing AutoMixer, Dash provides the option of a more traditional Gating AutoMixer (Relative Threshold). When in Edit Module mode, right clicking on the AutoMixer slot in the top center of the Home Tab, provides the option of using either a Gain Sharing AutoMixer or a Gating AutoMixer.

As the name implies, a Gating Auto Mixer employs active noise gates to only allow active channels to go through and prevent inactive channels from contributing to the overall mix. A channel is considered active if it is able to breach the threshold set for the noise gate.

Main Control Parameters

Gain: Sets the desired target gain for the output of the AutoMix.

Hold: Sets the amount of time a channel remains open after the signal on that channel falls below the Noise Threshold. This ensures that a slight pause when speaking does not close the channel.

Off Gain: Sets the amount of attenuation when the channel is inactive/closed. It does not affect the AutoMix logic. Setting this value too high will allow a room noise and echo on the gated channel to come through.

Sensitivity: Determines how far above the Noise Threshold the channel must be to open the gate.

NOM Atten: Sets the logarithmic attenuation of the output based on the Number of Open Mics. The output is attenuated by this value each time the NOM doubles. For example, if the value is set to 3dB, then when there are two open mics (NOM = 2) the attenuation is 3dB. When NOM equals 4 then 6dB of attenuation is applied, NOM equals 8 then 9dB, etc.

NOM Limit: Sets the maximum number of open microphones (channels) allowed at any given time.

Noise Threshold: Noise Floor Tracking follows the steady or slowly changing noise of equipment fans, HVAC, and so on. In order for a channel to open its gate, the signal must exceed the Noise Threshold control.

Last On: Leaves the last channel that was used in the open condition, until another channel signal exceeds the Threshold.

Mute: Mutes the output of the AutoMixer.

ON/OFF: The Auto Mixer has a master on/off switch which is used to enable or disable the module. The 'Gain Sharing AutoMix' indicator will be green when the module is ON.

Channel Control Parameters

Fader/Gain: Sets the channel gain. Faders can be used to tell the Gain Sharing algorithm the desired relative level of each channel. NOTE: Channel gain is after the input to the AutoMix engine. Channel level may still influence the gain adjustment of other channels even if the fader is all the way down.

Priority: Sets the priority level of the selected channel. This value feeds into the AutoMix engine and can influence automatic gain adjustment decisions. Priority values range from 0 to 10. The higher the value the higher the priority of the channel.

AutoMixer: Enables AutoMix participation of the selected channel.

Mute: Mutes the channel. NOTE: Mute is after the input to the AutoMix engine. A muted channel may still influence the gain adjustment of other channels in the AutoMix.

Default: Sets the default channel. When all other channels are gated, the single default channel will be opened.

Acoustic Echo Cancellation (AEC)

Acoustic Echo Cancellation (AEC) is important for audio teleconferencing when simultaneous communication (or full-duplex transmission) of speech is necessary. In acoustic echo cancellation, a measured microphone signal contains two signals: the near-end speech signal (program or local) and the far-end echoed speech signal (reference or remote). The goal of AEC is to remove the reference signal from the microphone signal so only the program signal is transmitted.

AEC is not just useful in telephony applications; they can be used anywhere one signal (remote) needs to be removed from a second signal (local). For example, consider a drive-thru ordering system at a restaurant. The person taking the order (remote) speaks into a microphone and that audio is broadcast so the person in the car (local) can hear it. The audio coming from the speaker is in a unique acoustic environment. The audio can reflect off the car, the curb, other building and back into the talk back microphone. The order taker would hear back everything they said as an echo. By implementing AEC, the remote audio from the order taker can be subtracted out of the talk back mic audio, eliminating the echo.

Local Input: Selects the source or sources which contains the desired audio signal as well as unwanted echo from the remote audio signal.

Remote Input: Selects the source or sources for the audio signal which will be subtracted from the Local Input.

Non-Linear Processor (NLP): Sets the 'tail time' in the NLP. The 'tail time' is the length of time the reference (or remote) signal will be compared with the program (or local) signal and used for echo estimation. If the AEC has an NLP value shorter than the length of the longest echo, echo will still be heard in the program signal. The following preset values can be selected:

Selection	Tail Time
Conservative	128ms
Moderate	256ms
Aggressive	512ms

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ON/OFF: The AEC has a master on/off switch which is used to enable or disable the module. The 'AEC' indicator will be green when the module is ON.

Note: Use the output of the AEC to route the resulting audio in the Matrix. Do not add the both the AEC and the local source into the Matrix together or the desired effect will be lost.

Automatic Noise Suppression (ANS)

Automatic Noise Suppression (ANS) module can remove audio that it detects is noise. It utilizes an intelligent algorithm which distinguish human voice from other sounds and treats the latter as noise. The noise is then subtracted from the original audio source.

Input Selection: Selects source or sources for ANS.

Level: Sets the attenuation of the non-human voice audio.
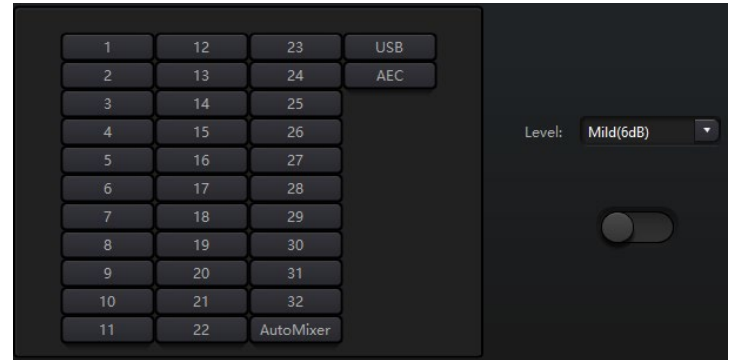
Value	Attenuation
Mild	6dB
Medium	10dB
Aggressive	15dB

 ON/OFF: The ANS has a master on/off switch which is used to enable or disable the module. The 'ANS' indicator will be green when the module is ON.

Matrix
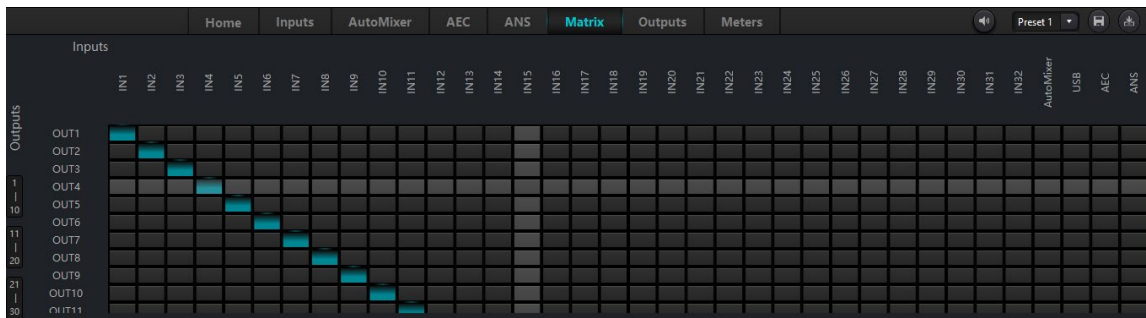
The Matrix in the Dash software is the heart of the DSP. It is a true mixing matrix and has dual functions. At the most basic level it is a signal router. Simply clicking at the intersection of an input and output routes the input to the output. A blue highlight indicates a route point.

The Matrix can also be used as an audio mixer. If it desired to route two or more inputs to the same output, simply click the intersection of all desire inputs to the desired output. The selected input channels will be mixed and routed to the selected output. Additional balance control of the input channels can be achieved by right clicking the blue intersection point. This will bring up a small fader window where the amount of input signal can be adjusted. The resulting adjustment will be displayed at the intersection. If the intersection has no text, that indicates a gain adjustment of 0dB.

Camera Tracking

The Camera Tracking tab is split into two distinct functional categories. The first two sections are tied together to configure Automatic Voice Tracking Cameral Control. The two sections to the furthest right of the panel function as live, Manual Camera Control.

The Automatic Voice Tracking Camera Control is an advanced and highly flexible feature which allows for seamless automation of camera switching to provide 'broadcast-like' production of meetings and conferences. Every input on the DTX device can be used as an activation trigger. All enabled inputs are monitored for activity. When the signal level exceeds the preset Tracking threshold a camera preset can be changed and/or a custom serial command can be sent. For example, a preset can be sent to change the preset of a camera and simultaneously send a command to an Aurora VTX decoder or a video switcher to change which camera is being displayed.

Voice Tracking

Threshold: Sets tracking threshold. When the signal from an enabled channel exceeds the tracking threshold, the camera tracking settings for that channel are executed.

Default Channel: Sets the default channel. When all other channels are below the threshold, the camera tracking settings for the Default Channel are executed.

Reaction Time: Sets the amount of time a signal must be above the threshold before executing a camera tracking setting.

Hold Time: Sets the shortest length of activation before another trigger is executed.
When a person begins speaking the camera can be repositioned to view them after Reaction has expired and will remain on them at least as long as defined in Scroll Time.

Send Interval: Sets the interval between successive consecutive camera commands.

Send Repeat: The number of consecutive times a camera command is sent.

Enable: Enables Automatic Voice Tracking Camera Control.
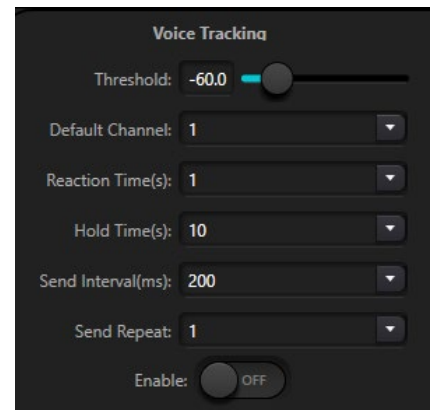
Channels

This section is used in conjunction with the Voice Tracking settings. Each input channel in the DSP can be selected and optionally enabled to participate in the Automatic Voice Tracking Camera Control.

Channel No: Selects the current input channel.

Priority: Sets the priority for the selected input channel. If multiple channels exceed the Trigger threshold, the highest priority channel will have its camera control settings executed. A lower number has a higher priority.
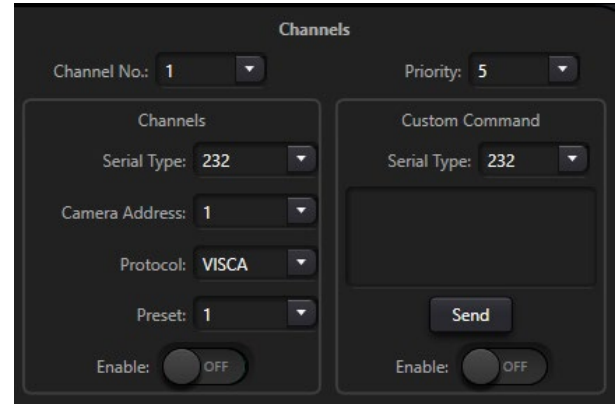
Channels

All the following parameters apply to the channel selected above in Channel No. Every channel has its own set of parameters.

Serial Type: Selects either RS-232 or RS-485 for camera communication.

Camera Address: The address of the camera that will be associated with the selected input channel.

Protocol: Communication protocol for the camera associated with the selected input channel.

Preset: Selects which camera preset will be triggered. These are presets on the camera and are defined using the procedure defined by the camera manufacturer.

Enable: This indicates that the selected input channel is participating in Automatic Voice Tracking Camera Control by sending camera presets. This can be used in conjunction with Custom Command.

Custom Command

All the following parameters apply to the channel selected above in Mic No. Every channel has its own set of parameters.

Serial Type: Selects either RS-232 or RS-485 to communicate with an external device.

Command Textbox: Enter the command string to be sent to an external device.

Send: Immediately sends the command when pressed.

Enable: This indicates that the selected input channel is participating in Automatic Voice Tracking Camera Control by sending a custom command. This can be used in conjunction with camera presets.

Save: Saves all the Automatic Voice Tracking Camera Control settings to the connected DTX device.

Live Controls

This section of controls is separate from the Automatic Voice Tracking Camera Control functionality. These parameters allow direct live control of the camera. This can be useful in creating camera presets to be used in Automatic Voice Tracking Camera Control without having to use a third-party application.

Camera Control

Serial Type: Selects either RS-232 or RS-485 for camera communication.

Camera Address: The address of the camera that will be associated with the selected input channel.

Protocol: Communication protocol for the camera associated with the selected input channel.

Camera Speed: Sets the PTZ speed of the camera.

Camera Control Buttons: Provides control capability over the connected camera including pan, tilt, zoom focus and iris settings.

Camera Presets

Preset: Selects the active camera preset.

Call: Send preset change message to the camera.

Save: Saves the current camera settings to the selected preset on the camera.

Clear All: Clears all camera presets.
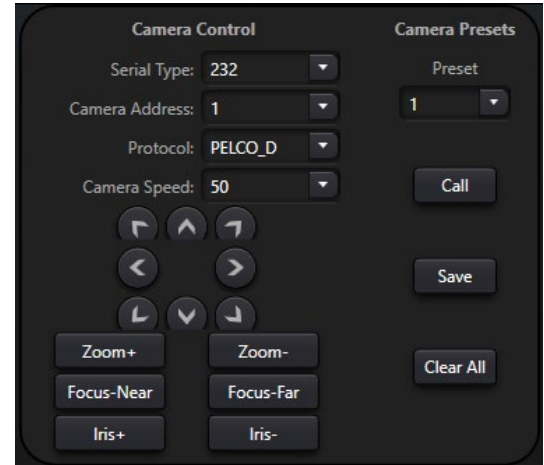
USB Soundcard
PC or MAC USB Sound Driver

At the most basic level, a USB connection to a DTX DSP can be used as a sound card with a PC or Mac using a generic HID audio. The driver will appear as a "Crestone USB Soundcard" in your computers sound settings. The USB connection shows up in the Matrix as both an input and an output for routing and mixing audio. Connecting a DTX device to a computer via USB requires a USB Type-A to USB Type-A cable which is included in the box. This is the perfect solution for using the DTX as a source for conferencing applications such as Zoom or Teams.

USB Soundcard Module

The USB Soundcard is a system module built into all DTX hardware and can be used for both playback and recording. This module allows playback and recording without the need for external software. When connected to a computer via USB, audio files stored on the computer can be added to the playlist and played on the connected computer. Similarly, the module can be used to record audio to a storage location on the PC.
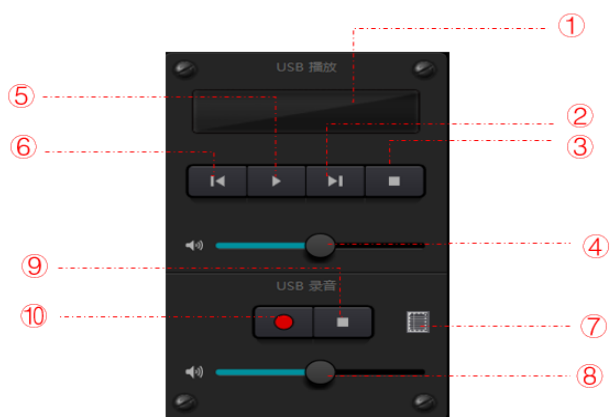
① Song playing information, double click to enter playlist

② Next song

③ Pause

④ Song volume adjustment

⑤ Play

⑥ Prev. song

⑦ Sound recording list

⑧ Sound recording volume adjustment

⑨ Stop recording

⑩ Start recording

Appendix A: Device Mirroring

Some DTX models support device mirroring. This provides real-time synchronization of configuration between a Master and Slave DSP. In the event of a catastrophic failure of the Master DSP, the functionality will switch over to the Slave DSP within 3 seconds. This feature is configured in the Device Setting menu.

Appendix B: Factory Reset

There are times it may be necessary to restore a DTX to factory defaults. One primary example is if User Administration is enabled, and the user password is forgotten. Factory reset can be performed via UDP command to the unit.

1) Verify that the firmware version of the DTX is at least 2.1.210611 or above.
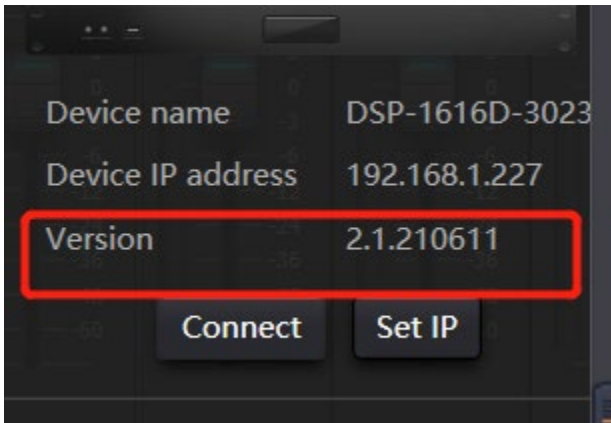
2) Send the Factory Reset hex command via UDP to port 6001 of the DTX unit using a UDP sender app such as Packet Sender or Hercules. The Factory Reset code can be found on a sticker affixed to the DTX. The code can be identified as starting with 'A5'.

If your DTX does not have such a sticker, for security reasons, you will need to contact Aurora support to obtain the code.

Appendix C: Control Protocol
External Control

All DTX DSP devices can be controlled through external third-party controllers which support UDP or RS-232. All DSP parameter setting, and reporting is supported as well as preset recall.

When using UDP control, the default port is 50000. When using RS-232 control, the default baud rate is 115200, 8 bits, 1 stop bit and no parity. Keep in mind that for stable RS-232 communications, the interval between messages should be greater than 100ms. All port settings can be modified in the 'Device Setting' menu to suit your application.

In the event that the external controller expects a reply, turn on 'Center Control Response' in the 'Device Setting' menu.

Control Protocol

There are two versions of the DTX control protocol referred to as V1 and V2. V1 is the default protocol that is used by the DTX software. These are the Hex strings that can be obtained using the Command Capture feature of the Dash software. V1 messages are always 12 Bytes in length and are designed to address single channels or modules in a quick concise manner.

The V2 protocol is a variable length protocol and is primarily designed to address multiple input or output channels at a time. In addition, V2 supports some useful system commands.

For most remote automation tasks, V1 will be preferred.

V1 Protocol
Protocol Header

b[0]	b[1]	b[2]	b[3]
0xB3	Message Type	Checksum	Version

Message Start: 0xB3 indicates start of message.

Message Type (b[1]): Defines the type of message as follows

Value	Function
0x21	Parameter SET
0x22	Parameter GET
0x13	Preset SET
0x74	Other Controls

Checksum (b[2]): All Bytes b[0] thru b[11] are summed, with b[2] set to 0x00. The LSB is the checksum and that value is inserted in to b[2].

Version: Provided for legacy purposes. This value should always be 0x00 for V1 communications.

Message Type = Parameter SET (0x21)

For Parameter Set operations, bytes b[4] thru b[11] will be in the following format:

b[4]	b[5]	b[6]	b[7]	b[8]	b[9]	b[10]	b[11]
Module ID		Parameter Type		Parameter 1		Parameter 2	

IMPORTANT
Bytes b[4] – b[11] are treated as 16 bit WORDs with the lower positioned byte being the LSB and the higher byte position being MSB. So, for a message directed to an Input Channel, the Message Type is 0x012B. In this case, b[4] shall be set to 0x2B and b[5] set to 0x01. This convention remains true for Parameter Type, Parameter 1 and Parameter 2 values.

- **Module ID:** The Module ID defines which channel or module in the DTX that is being addressed. These Module IDs can be found in **Control Type = Debug (0x09)**

Enables debugging via the serial port.

b[4]	b[5]	b[6]	b[7]	b[8]-b[11]
0x07	0x00	Reserved	Reserved	Enable

Length: Length byte (b[2]) will always be 0x08.

Enable: When debugging is On, the system will output the runtime log to the serial port. 0x01 = Debugging On, 0x00 = Debugging Off.

Appendix D: Module Types. Note that some module IDs are channel specific. Each channel of the Module has a distinct Module ID. These are sequential and cover 32 channels. For example, Input Channel EQ has a Module ID for channel 1 of 0x0061and goes through 0x0080 for channel 32. So, to address the EQ on input channel 12, you would use Module ID 0x006C.

Parameter Type: Within each Module ID table are the Parameter Types. For example, to activate phantom power on an input channel, you would use Module ID 0x012B with a Parameter Type of 0x0004.

- **Parameter 1 and Parameter 2:** Parameter meanings and values can be found in each Module ID table in **Control Type = Debug (0x09)**

Enables debugging via the serial port.

b[4]	b[5]	b[6]	b[7]	b[8]-b[11]
0x07	0x00	Reserved	Reserved	Enable

Length: Length byte (b[2]) will always be 0x08.

Enable: When debugging is On, the system will output the runtime log to the serial port. 0x01 = Debugging On, 0x00 = Debugging Off.

Appendix D: Module Types under their respective Parameter Type. Not all Parameter Types use both Parameter Values. In this case, the unused parameter position gets set to 0x0000. There are several types of value types used in defining parameter values.

- **Boolean**: Either 0x0000 or 0x0001. Used to defines states such as On, Off, Enable, Disable. **NOTE:** Be sure to reference the Module ID tables for the correct representations. Some 'On' values equate to 0x0001 while other 'Enable' values equate to 0x0000.
- **Integer**: Simply the Integer representation of a HEX value. For example, 0x01A4 equates to the Integer 420.
- **Zero Based Integer**: This is typically used for channel identification. The HEX value is simply treated as an integer representing a channel number where channel 1 = 0x0000, channel 2 = 0x0001, etc.
- **Signed Integer**: The HEX value is treated as a signed Integer. For example, a value of 0xFFE8 equates to an integer of -24.
- **Signed Integer / 100**: This is generally used for values which require a decimal value such as Gain. To set gain to -6.21dB, the HEX value of 0xFD93 would be used, were 0xFD93 equates to a signed integer of -621 which when divided by 100 equals -6.21.
- **Matrix Point**: This is the only parameter value where the data is treated as BYTEs instead of WORDs. There are two channels associated with a Matrix Point. These are zero based channels, meaning channel 1 is 0x00. In this instance, b[8] is set to the input channel and b[9] is set to the output channel.

Examples:

To SET the Gain on Input Channel 4 to a value of -4.50dB, send the message 0xB32140002B01010003003EFE

To clear a Matrix Point between Input Channel 20 and USB Out, send the message 0xB321AF00A600010014200000

To SET a Matrix Point between USB In and Output Channel 2, send the message 0xB3219E00A600010021010100

To SET the compression ratio to 4.8 on Input Channel 24, send the message 0xB321F00038000300E0010000

Message Type = Parameter GET(0x22)

For Parameter Get operations the Data bytes will be in the same format as Parameter SET operations. The Parameter values will be ignored, except in the case where a parameter is pointing to a specific channel or bank. For example, to get the Gain value of input channel 2, send a GET message to Module ID 0x012B, Parameter Type 0x0001, with Parameter 1 set to 0x01, Parameter 2 will be ignored. The response message will also be a Parameter GET message with the Version Byte (b[3]) set to 0xE0 and will have the Parameter values set to the current state.

IMPORTANT
In order to receive responses to Parameter GET messages, Control Center Response must be turned on the DTX hardware. This setting is found in the Device Setting menu when connected to an active DTX device. To turn this setting on remotely, the following V2 command can be sent: 0xB3742C010401000001 (see V2 Protocol). When programming an external controller, it is best practice to send this message at least once to guarantee control responses are enabled.

Examples:

To GET the Mute state of Input Channel 14:

GET Message	0xB32210002B0102000D000000	
Response	0xB32210E02B0102000D000100	Channel is Muted

To GET the state of the Matrix Point between USB In and Output Channel 10:

GET Message	0xB322A500A600010021090000	
Response	0xB322A5E0A600010021090100	Matrix Point Active

To GET the Gain Compensation value of the Compressor on Input Channel 5:

GET Message	0xB3220000250006000000000	
Response	0xB32200E0025000600FDFB0000	Gain Compensation is -10.27dB

Message Type = Preset SET(0x13)

To recall a preset configuration on a DTX device, use the Preset SET Message Type. Set b[4] to the Zero Based Integer that represents the desired preset, Preset 1 = 0x00, etc. All other bytes are set to 0x00. The Data bytes will be in the following format:

b[4]	b[5]	b[6]	b[7]	b[8]	b[9]	b[10]	b[11]
Preset	0x00	0x00	0x00	0x00	0x00	0x00	0x00

Example:

To recall the configuration stored in preset number 5, send the message 0xB313F4000400000000000000

V2 Protocol

Protocol Header

b[0]	b[1]	b[2]	b[3]	b[4]-b[131]
0xB3	Message Type	Length	Version	Data

Message Start: 0xB3 indicates start of message.

Message Type (b[1]): Defines the type of message as follows

Value	Function
0x21	Parameter SET
0x22	Parameter GET
0x13	Preset SET
0x74	Other Controls

Length (b[2]): Length specifies the length of the relevant payload. Note that different message types may count different Bytes as payload. Be sure to read each Message Type section carefully. **NOTE:** Setting an incorrect Length value can produce unexpected results.

Version: Provided for legacy purposes. This value should always be 0x01 for V2 communications.

Data: The format of the Data bytes will be determined by the Message Type value. These formats are defined below.

Message Type = Parameter SET (0x21)

For Parameter Set operations the Data bytes will be in the following format:

b[4]	b[5]	b[6]	b[7]	b[8]-b[71]
Input/Output	Start Channel	End Channel	Parameter Type	Parameter Value

Length: For Message Type 0x21, the Length (b[2]) will be the count of bytes starting with Parameter Value (b[8]).

Input/Output (b[4]): Determines whether to address an input or output channel.

Value	Function
0x02	Input
0x01	Output

Start Channel (b[5]): Zero based start channel number for desired range of channels. For example, channel 1 = 0x00, channel 2 = 0x01, etc.

End Channel (b[6]): Zero based end channel for desired range of channels. If setting a single channel this value will be the same as Start Channel.

Parameter Type (b[7]): Refer to Error! Reference source not found. for Parameter Type values. Use only Parameters associated with Input Source (0x012B) when b[4] is 0x02 or Output (0x0127) when b[4] is 0x01.

Parameter Value (b[8]-b[71]): Defines parameter value to set. Each value should be represented by two bytes. Use only the Parameter 2 values from Error! Reference source not found. since Parameter 1 (channel) values are already covered by b[5] and b[6].

Examples:

To SET the Gain on Input Channel 1 thru 8 to a value of -6.0dB, send the message
0xB321100102000701ABFDABFDABFDABFDABFDABFDABFDABFD

Message Type = Parameter GET(0x22)

For Parameter Get operations the Data bytes will be in the same format as Parameter SET operations with the exception that the Parameter Value bytes (9-72) will need to be set to 0x00. The response message from the device will have these bytes filled in with the acquired parameter values. There must be enough Parameter Value place holder bytes to match the desired response, two bytes per channel. The Length (b[2]) will be the number of channels times two bytes per Parameter Value - or **b[2] = (b[6] – b[5] + 1) * 2**. The response message will also be a Parameter GET message with the Version Byte (b[3]) set to 0xE1 and will have the Parameter values set to the current state.

> **IMPORTANT**
> In order to receive responses to Parameter GET messages, Control Center Response must be turned on the DTX hardware. This setting is found in the Device Setting menu when connected to an active DTX device. To turn this setting on remotely, the following V2 command can be sent: 0xB3742C010401000001. When programming an external controller, it is best practice to send this message at least once to guarantee control responses are enabled.

Example:

To GET the gain settings on input channels 1 to 8, send the following message

GET Message	0xB322100102000701000000000000000000000000000000000000	
Response	0xB32210E10200070196F632023DFD0B0203FC3202B5FB7502	Channel 1 Gain = -24.1dB, etc

Message Type = Preset SET(0x13)

For preset SET operations the Data bytes will be in the following format:

b[4]	b[5]	b[6]	b[7]	b[8]-b[71]
Preset	-	-	-	-

Length: Length (b[2]) will always be 0x01.

Preset (b[4]): Zero based preset number (0x00 – 0x0F).

Example:

To recall Preset 2, send the message 0xB313010101

Message Type = Other Controls(0x74)
Other controls include but are not limited to GPIO, RS-232, RS-485 and Central Control replies. The Control Type is determined by b[4] and will be one of the following values:

Control Type (b[4]): Determines what function is to be controlled according to the following table:

Value	Control Type
0x01	GPIO
0x02	RS-232 Send
0x03	RS-485 Send
0x04	Control Center Response
0x05	Device Info
0x06	Preset Reset
0x07	RS-485 Direction
0x08	UDP Forward
0x09	Debug Enable

Data Length (b[5]): Length of the data portion of the message (b[8]…b[n]).

Reserved (b[6] & b[7]): These bytes will always be 0x00.

- **Control Type = GPIO (0x01)**

b[4]	b[5]	b[6]	b[7]	b[8]	b[9]	b[10]	b[11]
0x01	0x04	Reserved	Reserved	GPIO Dir	Start GPIO	End GPIO	Value

Length: Length byte (b[2]) will always be 0x08.

GPIO Dir (b[8]): Sets input or output for the selected GPIO pins. When GPIO Dir is an Output (0x01), this will be a SET command. When GPIO Dir is an Input (0x00) this will be a GET command.

Value	Function
0x00	Input
0x01	Output

Start GPIO (b[9]): Zero based start channel number for desired range of channels. For example, channel 1 = 0x00, channel 2 = 0x01, etc.

End GPIO (b[10]): Zero based end channel for desired range of channels. If setting a single channel this value will be the same as Start GPIO.

Value (b[11]): When 'GPIO Dir' (b[8]) is set to be an output, Value SETs the state of the output GPIO pin. For GPIO inputs, this byte is used as a return field to GET the GPIO input pin state. This value byte is bit mapped to channels 1-8 where channel 1 is the lsb and channel 8 is the msb. Bit values are as follows

Value	Function
0x00	Low

0x01	High

NOTE: Only consecutive output channels defined by b[9] & b[10] will be affected by a SET message. A value of all zeros (0x00) or all ones (0xFF) can be sent and only the defined range will be affected.

Examples:

To set GPIO channels 1-8 to the High state, send message 0xB374080104000000010007FF

To set GPIO channels 5 & 7 to the High state, 6 & 8 to the Low state and leave all other pins alone send the message 0xB37408010104000001040750

To GET the states of all GPIO, pins send the message 0xB37408010104000000000700

- **Control Type = RS-232 Send (0x02) and Control Type = RS-485 Send (0x03)**

   Sends a message string out of the selected serial port.

b[4]	b[5]	b[6]	b[7]	b[8]-b[131]
Control Type	Message Length	Reserved	Reserved	Message

Control Type (b[4]): Defines the desired serial port to be addressed.

Value	Function
0x02	RS-232
0x03	RS-485

Message Length (b[5]): Length of the message that will be sent via the serial port.

Message (b[8]-b[131]): Message payload to be sent.

Example:

To output string "Hello, DSP." from RS232 send message B37410010200000048656c6c6fa3ac4453502e00

- **Control Type = Control Center Response (0x04)**

   Enables or Disables DTX response to incoming UDP messages. This setting MUST be enabled to use GET commands and can also be manually set in the Device Setting menu in the Dash software.

b[4]	b[5]	b[6]	b[7]	b[8]
0x04	0x01	Reserved	Reserved	Response Switch

Response Switch (b[8]): Sets the Control Center Response switch.

Value	Function
0x00	OFF
0x01	ON

Example:

To enable Control Center Responses, send the message 0xB37408010400000001

- **Control Type = Device Info (0x05)**

  Returns the Device Name and channel counts of a DTX DSP.

b[4]	b[5]	b[6]	b[7]	b[8]- b[23]	b[24]	b[25]	b[26]	b[27]
0x05	0x14	Reserved	Reserved	Device Name	AIn	AOut	DIn	DOut

  Length: Length byte (b[2]) will always be 0x14.

  Device Name (b[8] … b[23]): Name of the Device as set in Device Setting menu. Each byte represents an ASCII character.

  Analog Input Channels (b[24]): The number of Analog Audio Input Channels supported by this device.

  Analog Output Channels (b[25]): The number of Analog Audio Output Channels supported by this device.

  Dante Input Channels (b[26]): The number of Dante Audio Input Channels supported by this device.

  Dante Output Channels (b[27]): The number of Dante Audio Output Channels supported by this device.

  Example:

  To retrieve Device Info, send the message
  0xB374140105140000000000000000000000000000000000000000000000

  A valid response would be 0xB37414E1051400004454582D3136313644000000000000010101010
  This equates to a device named "DTX-1616D" with 16x16 Analog and 16x16 Dante Audio Channels.

- **Control Type = Preset Reset (0x06)**

b[4]	b[5]	b[6]	b[7]
0x06	0x00	Reserved	Reserved

  Length: Length byte (b[2]) will always be 0x04.

  Example:

  To reset the unit back to the current preset values and discard unsaved changes send the message
  0xB374040106000000

- **Control Type = RS-485 Direction (0x07)**

b[4]	b[5]	b[6]	b[7]	b[8]-b[11]
0x07	0x00	Reserved	Reserved	Direction

  Length: Length byte (b[2]) will always be 0x08.

  Direction: Set the direction of the RS-485 port. 0x01 = Input, 0x00 = Output.

- **Control Type = UDP (0x08)**

  Forwards a UDP message to a designated IP Address and Port.

b[4]	b[5]	b[6]	b[7]	b[8]-b[11]	b[12]-b[13]	b[14]- b[15]	b[16]-b[131]
0x08	0x00	Reserved	Reserved	IP Address	Port	Data Length	UDP Data

  Length: Length byte (b[2]) will be set to the total length in bytes of the message starting with and including b[4] – b[n].

  IP Address: Destination IP address. Each Octet of the address gets one byte. Octet 1 is stored in b[8], Octet 2 is stored in b[9], etc. So for an address of 192.168.1.165, b[8] is the hex representation of integer 192 or 0xC0, b[9] is 0xA8, b[10] is 0x01, and b[11] is 0xA5.

  Port: Represents the destination UDP port as a 2 byte WORD with b[12] being the LSB. Port 2323 in hex is 0x0913, so b[12] = 0x13 and b[13] = 0x09.

  Data Length: A 2-byte WORD representing the length in bytes of UDP Data. Like Port, b[14] is the LSB.

  UDP Data: The message that will be forward to IP Address on Port. ASCII data must be converted to Hex.

  Example:

  To forward the message "HELLO, DSP!" to 192.168.0.99 on port 7000 send the message
  B374180108000000c0a80063581B0c0048656c6c6f2C204453502100

- **Control Type = Debug (0x09)**

  Enables debugging via the serial port.

b[4]	b[5]	b[6]	b[7]	b[8]-b[11]
0x07	0x00	Reserved	Reserved	Enable

  Length: Length byte (b[2]) will always be 0x08.

  Enable: When debugging is On, the system will output the runtime log to the serial port. 0x01 = Debugging On, 0x00 = Debugging Off.

Appendix D: Module Types

Module ID = Input Source(0x012B)

Name		Value	Range
Parameter Type = Gain(0x0001)			
Parameter 1	Channel	Zero Based Integer	0-31 (equates to Ch1 – Ch32)
Parameter 2	Gain	Signed Integer / 100	-72.0 to +12.0dB
Parameter Type = Mute(0x0002)			
Parameter 1	Channel	Zero Based Integer	0-31 (equates to Ch1 – Ch32)
Parameter 2	Mute	0 = Off, 1 = On	
Parameter Type = Sensitivity(0x0003)			
Parameter 1	Channel	Zero Based Integer	0 to 31 (equates to Ch1 – Ch32)
Parameter 2	Sensitivity	Integer Value * 3	0 to 48dB in 3dB steps
Parameter Type = Phantom Power(0x0004)			
Parameter 1	Channel	Zero Based Integer	0 to 31 (equates to Ch1 – Ch32)
Parameter 2	Power	0 = Off, 1 = On	
Parameter Type = Signal Generator Type(0x0005)			
Parameter 1	Channel	Zero Based Integer	0 to 31 (equates to Ch1 – Ch32)
Parameter 2	Type	0 = Off, 1 = Sine, 2 = White, 3 = Pink	
Parameter Type = Signal Generator Frequency(0x0006)			
Parameter 1	Channel	Zero Based Integer	0 to 31 (equates to Ch1 – Ch32)
Parameter 2	Frequency	Integer Value of Hex	20 to 20000Hz
Parameter Type = Sine Wave Gain(0x0007)			
Parameter 1	Channel	Zero Based Integer	0 to 31 (equates to Ch1 – Ch32)
Parameter 2	Gain	Signed Integer / 100	-72.0 to 0.0dB
Parameter Type = Channel Name(0x0008)			
Parameter 1	Channel	Zero Based Integer	0 to 31 (equates to Ch1 – Ch32)
Parameter 2		0x00	
Parameter Type = Phase(0x0009)			
Parameter 1	Channel	Zero Based Integer	0 to 31 (equates to Ch1 – Ch32)
Parameter 2	Phase Reverse	0 = Off, 1 = On	
Parameter Type = Gain Nudge(0x000A)			
Parameter 1	Channel	Zero Based Integer	0 to 31 (equates to Ch1 – Ch32)
Parameter 2	Increment Size	Signed Integer / 100	-3, -2, -1, +1, +2 or +3dB
Parameter Type = Link(0x000B)			
Parameter 1	Channel	Integer of Lowest Channel in Link Pair	1 to 32 (Not Zero Based)
Parameter 2	Link	0 = Off, 1 = On	
Parameter Type = Channel Level(0x000C)			
Parameter 1	Channel	Zero Based Integer	0 to 31 (equates to Ch1 – Ch32)
Parameter 2	Level	Signed Integer / 100	-72.0 to +12.0dB

Module ID = System Control (0x0128)

Name		Value	Range
System Gain(0x0001)			
Parameter 1		0x00	
Parameter 2		0x00	
System Mute(0x0002)			
Parameter 1	Mute	0 = Off, 1 = On	
Parameter 2	n/a	0x00	

Module ID = Output(0x0127)

Name		Value	Range
Parameter Type = Gain(0x0001)			
Parameter 1	Channel	Zero Based Integer	0-31 (equates to Ch1 – Ch32)
Parameter 2	Gain	Signed Integer / 100	-72.0 to +12.0dB
Parameter Type = Mute(0x0002)			
Parameter 1	Channel	Zero Based Integer	0-31 (equates to Ch1 – Ch32)
Parameter 2	Mute	0 = Off, 1 = On	
Parameter Type = Channel Name(0x0003)			
Parameter 1	Channel	Zero Based Integer	0 to 31 (equates to Ch1 – Ch32)
Parameter 2		0x00	
Parameter Type = Phase(0x0004)			
Parameter 1	Channel	Zero Based Integer	0 to 31 (equates to Ch1 – Ch32)
Parameter 2	Phase Reverse	0 = Off, 1 = On	
Parameter Type = Sensitivity(0x0005)			
Parameter 1	Channel	Zero Based Integer	0 to 31 (equates to Ch1 – Ch32)
Parameter 2	Sensitivity	Integer Value * 3	0 to 48dB in 3dB steps
Parameter Type = Gain Nudge(0x0006)			
Parameter 1	Channel	Zero Based Integer	0 to 31 (equates to Ch1 – Ch32)
Parameter 2	Increment Size	Signed Integer / 100	-3, -2, -1, +1, +2 or +3dB
Parameter Type = Link(0x0007)			
Parameter 1	Channel	Integer of Lowest Channel in Link Pair	1 to 32 (Not Zero Based)
Parameter 2	Link	0 = Off, 1 = On	
Parameter Type = Channel Level(0x0008)			
Parameter 1	Channel	Zero Based Integer	0 to 31 (equates to Ch1 – Ch32)
Parameter 2	Level	Signed Integer / 100	-72.0 to +12.0dB

Module ID = Matrix(0x00A6)

Name		Value	Range
Parameter Type = Matrix Point(0x0001)			
Parameter 1	Channels	Zero Based Integer LSB Input Channel, MSB Output Channel	0-31 (equates to Ch1 – Ch32) Other In: 32 = AutoMix, 33 = USB, 34 = AEC, 35 = ANS Other Out: 32 = USB
Parameter 2	Active	0 = Off, 1 = On	
Parameter Type = Matrix Point Gain(0x0002)			
Parameter 1	Channel	Zero Based Integer LSB Input Channel, MSB Output Channel	0-31 (equates to Ch1 – Ch32) Other In: 32 = AutoMix, 33 = USB, 34 = AEC, 35 = ANS Other Out: 32 = USB
Parameter 2	Gain	Signed Integer / 100	-72.0 to +12.0dB

Module ID = Input CH1 Expander (0x0001) thru Input CH32 Expander (0x0020)

	Name	Value	Range
Parameter Type = Enable(0x0001)			
Parameter 1	Enable	0 = Enable, 1 = Disable	
Parameter 2	n/a	0x00	
Parameter Type = Threshold(0x0002)			
Parameter 1	Threshold	Signed Integer / 100	-72.0 to 0.0dB
Parameter 2	n/a	0x00	
Parameter Type = Ratio(0x0003)			
Parameter 1	Ratio	Signed Integer / 100	1.00 to 20.00
Parameter 2	n/a	0x00	
Parameter Type = Attack(0x0004)			
Parameter 1	Attack	Signed Integer	1 to 500ms
Parameter 2	n/a	0x00	
Parameter Type = Release(0x0005)			
Parameter 1	Release	Signed Integer	1 to 10,000ms
Parameter 2	n/a	0x00	

Module ID = Input CH1 Compressor (0x0021) thru Input CH32 Compressor(0x0040)

	Name	Value	Range
Parameter Type = Enable(0x0001)			
Parameter 1	Enable	0 = Enable, 1 = Disable	
Parameter 2	n/a	0x00	
Parameter Type = Threshold(0x0002)			
Parameter 1	Threshold	Signed Integer / 100	-48.0 to 0.0dB
Parameter 2	n/a	0x00	
Parameter Type = Ratio(0x0003)			
Parameter 1	Ratio	Signed Integer / 100	1.00 to 20.00
Parameter 2	n/a	0x00	
Parameter Type = Attack(0x0004)			
Parameter 1	Attack	Signed Integer	1 to 500ms
Parameter 2	n/a	0x00	
Parameter Type = Release(0x0005)			
Parameter 1	Release	Signed Integer	1 to 10,000ms
Parameter 2	n/a	0x00	
Parameter Type = Gain Compensation(0x0006)			
Parameter 1	Release	Signed Integer / 100	-72.0 to +6.0dB
Parameter 2	n/a	0x00	

Module ID = Input CH1 AutoGain (0x0041) thru Input CH32 AutoGain(0x0060)

Name		Value	Range
Parameter Type = Enable(0x0001)			
Parameter 1	Enable	0 = Enable, 1 = Disable	
Parameter 2	n/a	0x00	
Parameter Type = Threshold(0x0002)			
Parameter 1	Threshold	Signed Integer / 100	-72.0 to -20.0dB
Parameter 2	n/a	0x00	
Parameter Type = Target Level(0x0003)			
Parameter 1	Release	Signed Integer / 100	-20.0 to 0.0dB
Parameter 2	n/a	0x00	
Parameter Type = Ratio(0x0004)			
Parameter 1	Ratio	Signed Integer / 100	1.00 to 20.00
Parameter 2	n/a	0x00	
Parameter Type = Attack(0x0005)			
Parameter 1	Attack	Signed Integer	1 to 500ms
Parameter 2	n/a	0x00	
Parameter Type = Release(0x0006)			
Parameter 1	Release	Signed Integer	1 to 10,000ms
Parameter 2	n/a	0x00	

Module ID = Input CH1 EQ (0x0061) thru Input CH32 EQ(0x0080)

Name		Value	Range
Parameter Type = Enable(0x0001)			
Parameter 1	Enable	0 = Enable, 1 = Disable	
Parameter 2	n/a	0x00	
Parameter Type = Band Enable(0x0002)			
Parameter 1	**Parametric:** Band Number **Graphic:** Q	**Parametric:** Zero Based Integer **Graphic:** 1=Wide, 2=Normal, 3=Narrow	**Parametric:** 0-11
Parameter 2	Enable	0 = On, 1 = Off	
Parameter Type = Frequency(0x0003)			
Parameter 1	Band Number	Zero Based Integer	0 to 30 (Bands 1 – 31)
Parameter 2	**Parametric:** Frequency **Graphic:** Gain	**Parametric:** Signed Integer **Graphic:** Signed Integer / 100	**Parametric:** 20 to 20,000Hz **Graphic:** -24.0 to +12.0dB
Parameter Type = Gain(0x0004)			
Parameter 1	Band Number	Zero Based Integer	0 to 30 (Bands 1 – 31)
Parameter 2	Gain	Signed Integer / 100	-24.0 to +18.0dB
Parameter Type = Q Value(0x0005)			
Parameter 1	Band Number	Zero Based Integer	0 to 30 (Bands 1 – 31)
Parameter 2	Q Value	Signed Integer / 100	0.02 to 50.0
Parameter Type = Type(0x0006)			
Band Number	Band Number	Zero Based Integer	0 to 30 (Bands 1 – 31)
Parameter 2	Type	0=Low Pass , 1=High Pass, 2=reserved , 3=reserved , 4=reserved , 5=reserved , 6=Parametric , 7=Low Shelf , 8=High Shelf	

Module ID = Input CH1 Feedback Suppression (0x0081) thru Input CH32 Feedback Suppression (0x00A0)

Name		Value	Range
Parameter Type = Enable(0x0001)			
Parameter 1	Enable	0 = Enable, 1 = Disable	
Parameter 2	n/a	0x00	
Parameter Type = Feedback Point Frequency(0x0002)			
Parameter 1	Feedback Storage Slot	Zero Based Integer	0 to 7
Parameter 2	Frequency	Signed Integer	20 to 20,000Hz
Parameter Type = Feedback Point Gain(0x0003)			
Parameter 1	Feedback Storage Slot	Zero Based Integer	0 to 7
Parameter 2	Gain	Signed Integer / 100	-24.0 to 0.0dB
Parameter Type = Octave(0x0004)			
Parameter 1	Octave	0x000A = 1/10th, 0x0014 = 1/5th	
Parameter 2	n/a	0x00	
Parameter Type = Type(0x0005)			
Parameter 1	Feedback Storage Slot	Zero Based Integer	0 to 7
Parameter 2	Type	0 = Dynamic, 1 = Manual	
Parameter Type = Step(0x0006)			
Parameter 1	Release	Signed Integer / 100	0.5 to 3.0
Parameter 2	n/a	0x00	
Parameter Type = Reserved(0x0007)			
Parameter 1	n/a	0x00	
Parameter 2	n/a	0x00	
Parameter Type = Panic Limit Threshold(0x0008)			
Parameter 1	Threshold	Signed Integer / 100	-36.0 to 0.0dB
Parameter 2	n/a	0x00	
Parameter Type = Filter Depth(0x0009)			
Parameter 1	Depth	Signed Integer / 100	1.0 to 24.0
Parameter 2	n/a	0x00	
Parameter Type = Feedback Threshold(0x000A)			
Parameter 1	Threshold	Signed Integer / 100	-96.0 to-24.0dB
Parameter 2	n/a	0x00	

Module ID = Echo Cancellation (0x00A3)

Name		Value	Range
Parameter Type = Enable(0x0001)			
Parameter 1	Enable	0 = Enable, 1 = Disable	
Parameter 2	n/a	0x00	
Parameter Type = Non-Linear Processor(0x0002)			
Parameter 1	NLP	0 = Conservative, 1 = Moderate, 2 = Aggressive	
Parameter 2	n/a	0x00	

Module ID = Echo Cancellation Source (0x00A2)

Name		Value	Range
Parameter Type = Source(0x0001)			
Parameter 1	Channel	**Local:** Zero Based Integer, 0x0020 = AutoMixer; **Remote:** 0x0100 && Zero Based Channel), 0x0121 = USB	
Parameter 2	Select	0 = Off, 1 = On	

Module ID = AutoMix (0x00A1)

Name		Value	Range
Parameter Type = Total Mute(0x0001)			
Parameter 1	Mute	0 = Off, 1 = On	
Parameter 2	n/a	0x00	
Parameter Type = Total Gain(0x0002)			
Parameter 1	Gain	Signed Integer / 100	-72.0 to +12.0dB
Parameter 2	n/a	0x00	
Parameter Type = Slope0x0003)			
Parameter 1	Slope	Signed Integer / 100	1.0 to 3.0
Parameter 2	n/a	0x00	
Parameter Type = Response Time(0x0004)			
Parameter 1	Response	Signed Integer	1 to 5,000ms
Parameter 2	n/a	0x00	
Parameter Type = Channel AutoMix Enable(0x0005)			
Parameter 1	Channel	Zero Based Integer	0 to 31 (equates to Ch1 – Ch32)
Parameter 2	Activate	0 = Off, 1 = On	
Parameter Type = Channel AutoMix Mute(0x0006)			
Parameter 1	Channel	Zero Based Integer	0 to 31 (equates to Ch1 – Ch32)
Parameter 2	Mute	0 = Off, 1 = On	
Parameter Type = Channel autoMix Gain(0x0007)			
Parameter 1	Channel	Zero Based Integer	0 to 31 (equates to Ch1 – Ch32)
Parameter 2	Gain	Signed Integer / 100	-72.0 to +12.0dB
Parameter Type = Priority(0x0008)			
Parameter 1	Channel	Zero Based Integer	0 to 31 (equates to Ch1 – Ch32)
Parameter 2	Priotiry	Signed Integer	1 to 10
Parameter Type = Enable(0x0009)			
Parameter 1	Enable	0 = Enable, 1 = Disable	
Parameter 2	n/a	0x00	

Module ID = Noise Suppression(0x00A5)

Name		Value	Range
Parameter Type = Enable(0x0001)			
Parameter 1	Enable	0 = Enable, 1 = Disable	
Parameter 2	n/a	0x00	
Parameter Type = Level(0x0002)			
Parameter 1	Level	0 = 6dB, 1 = 10dB, 2 = 15dB, 3 = 18dB	
Parameter 2	n/a	0x00	

Module ID = Noise Suppression Source (0x00A4)

Name		Value	Range
Parameter Type = Source(0x0001)			
Parameter 1	Channel	**Local:** Zero Based Integer, 0x0020 = AutoMixer, 0x0021 = USB, 0x0022 = AEC	
Parameter 2	Select	0 = Off, 1 = On	

Module ID = Output CH1 Filter (0x00A7) thru Output CH32 Filter (0x00C6)

Name		Value	Range
Parameter Type = High Pass Enable(0x0001)			
Parameter 1	Enable	0 = Enable, 1 = Disable	
Parameter 2	n/a	0x00	
Parameter Type = High Pass Type(0x0002)			
Parameter 1	Type	0 = Bessel, 1 = Butterworth, 2 = Linkwitz Reily	
Parameter 2	n/a	0x00	
Parameter Type = High Pass Slope(0x0003)			
Parameter 1	Slope	Signed Integer	6, 12, 18, 24, 32, 36, 42, 48dB/Octave
Parameter 2	n/a	0x00	
Parameter Type = High Pass Frequency(0x0004)			
Parameter 1	Frequency	Signed Integer	20 to 20,000Hz
Parameter 2	n/a	0x00	
Parameter Type = High Pass Gain(0x0005)			
Parameter 1	Gain	Signed Integer / 100	-15.0 to +15.0dB
Parameter 2	n/a	0x00	
Parameter Type = Low Pass Enable(0x0006)			
Parameter 1	Enable	0 = Enable, 1 = Disable	
Parameter 2	n/a	0x00	
Parameter Type = Low Pass Type(0x0007)			
Parameter 1	Type	0 = Bessel, 1 = Butterworth, 2 = Linkwitz Reily	
Parameter 2	n/a	0x00	
Parameter Type = Low Pass Slope(0x0008)			
Parameter 1	Slope	Signed Integer	6, 12, 18, 24, 32, 36, 42, 48dB/Octave
Parameter 2	n/a	0x00	
Parameter Type = Low Pass Frequency(0x0009)			
Parameter 1	Frequency	Signed Integer	20 to 20,000Hz
Parameter 2	n/a	0x00	
Parameter Type = Low Pass Gain(0x000A)			
Parameter 1	Gain	Signed Integer / 100	-15.0 to +15.0dB
Parameter 2	n/a	0x00	

Module ID = Output CH1 Delay (0x00E7) thru Output CH32 Delay(0x0106)

Name		Value	Range
Parameter Type = Enable(0x0001)			
Parameter 1	Enable	0 = Enable, 1 = Disable	
Parameter 2	n/a	0x00	
Parameter Type = Milliseconds(0x0002)			
Parameter 1	Milliseconds	Signed Integer (add to Microseconds)	0 to 1200ms
Parameter 2	n/a	0x00	
Parameter Type = Microseconds(0x0003)			
Parameter 1	Microseconds	Signed Integer / 100 (add to Milliseconds)	0 to 999µs
Parameter 2	n/a	0x00	

**Module ID = Output CH1 EQ (0x00C7) thru Output CH32 EQ(0x00E6)**

Name		Value	Range
Parameter Type = Enable(0x0001)			
Parameter 1	Enable	0 = Enable, 1 = Disable	
Parameter 2	n/a	0x00	
Parameter Type = Band Enable(0x0002)			
Parameter 1	**Parametric:** Band Number **Graphic:** Q	**Parametric:** Zero Based Integer **Graphic:** 1=Wide, 2=Normal, 3=Narrow	**Parametric:** 0-11
Parameter 2	Enable	0 = On, 1 = Off	
Parameter Type = Frequency(0x0003)			
Parameter 1	Band Number	Zero Based Integer	0 to 30 (Bands 1 – 31)
Parameter 2	**Parametric:** Frequency **Graphic:** Gain	**Parametric:** Signed Integer **Graphic:** Signed Integer / 100	**Parametric:** 20 to 20,000Hz **Graphic:** -24.0 to +12.0dB
Parameter Type = Gain(0x0004)			
Parameter 1	Band Number	Zero Based Integer	0 to 30 (Bands 1 – 31)
Parameter 2	Gain	Signed Integer / 100	-24.0 to +18.0dB
Parameter Type = Q Value(0x0005)			
Parameter 1	Band Number	Zero Based Integer	0 to 30 (Bands 1 – 31)
Parameter 2	Q Value	Signed Integer / 100	0.02 to 50.0
Parameter Type = Type(0x0006)			
Band Number	Band Number	Zero Based Integer	0 to 30 (Bands 1 – 31)
Parameter 2	Type	0=Low Pass , 1=High Pass, 2=reserved , 3=reserved , 4=reserved , 5=reserved , 6=Parametric , 7=Low Shelf , 8=High Shelf	

Module ID = Output CH1 Limiter (0x0107) thru Output CH32 Limiter (0x0126)

Name		Value	Range
Parameter Type = Enable(0x0001)			
Parameter 1	Enable	0 = Enable, 1 = Disable	
Parameter 2	n/a	0x00	
Parameter Type = Threshold(0x0002)			
Parameter 1	Threshold	Signed Integer / 100	-72.0 to 0.0dB
Parameter 2	n/a	0x00	
Parameter Type = Release(0x0005)			
Parameter 1	Release	Signed Integer	1 to 10,000ms
Parameter 2	n/a	0x00	

Appendix E: User Interface Creation

Aurora's Dash software includes facility to create a custom User Interface to control DTX DSP devices. This custom UI can be run locally on a PC or on any iOS or Android device using a free app.
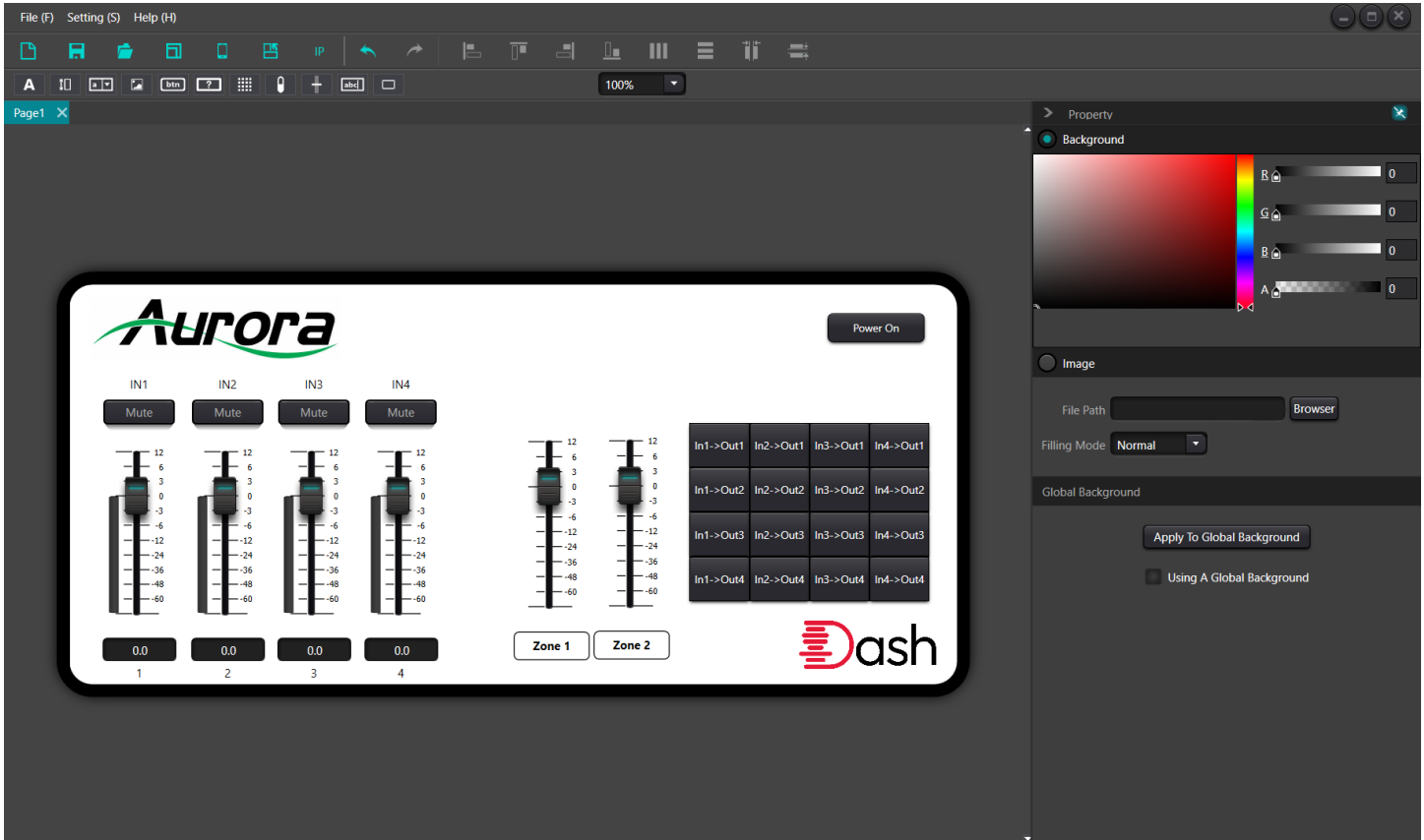
Quick Start

- Install iOS or Android app on device
- Select a Template
- Drag Objects from the Object Bar to the Page
- Set the IP address and parameters of each Object
- Style Page and Objects to taste
- Sync to device

Running the Custom User Interface

The Dash Custom User Interface can be viewed on any one of three supported platforms. For a Windows PC with Dash installed, the UI can be run directly by just double clicking the design file. On iOS and Android phones and tablets the design can be run using a downloaded app.

PC

A saved project file is a fully encapsulated file which can just be run on a PC which already has Dash installed. Double clicking on the saved file will open it as an encapsulated app running the custom User Interface. See the description of the File Menu for instructions on saving a project. Below is a screen capture of an encapsulated file with a description of the features.
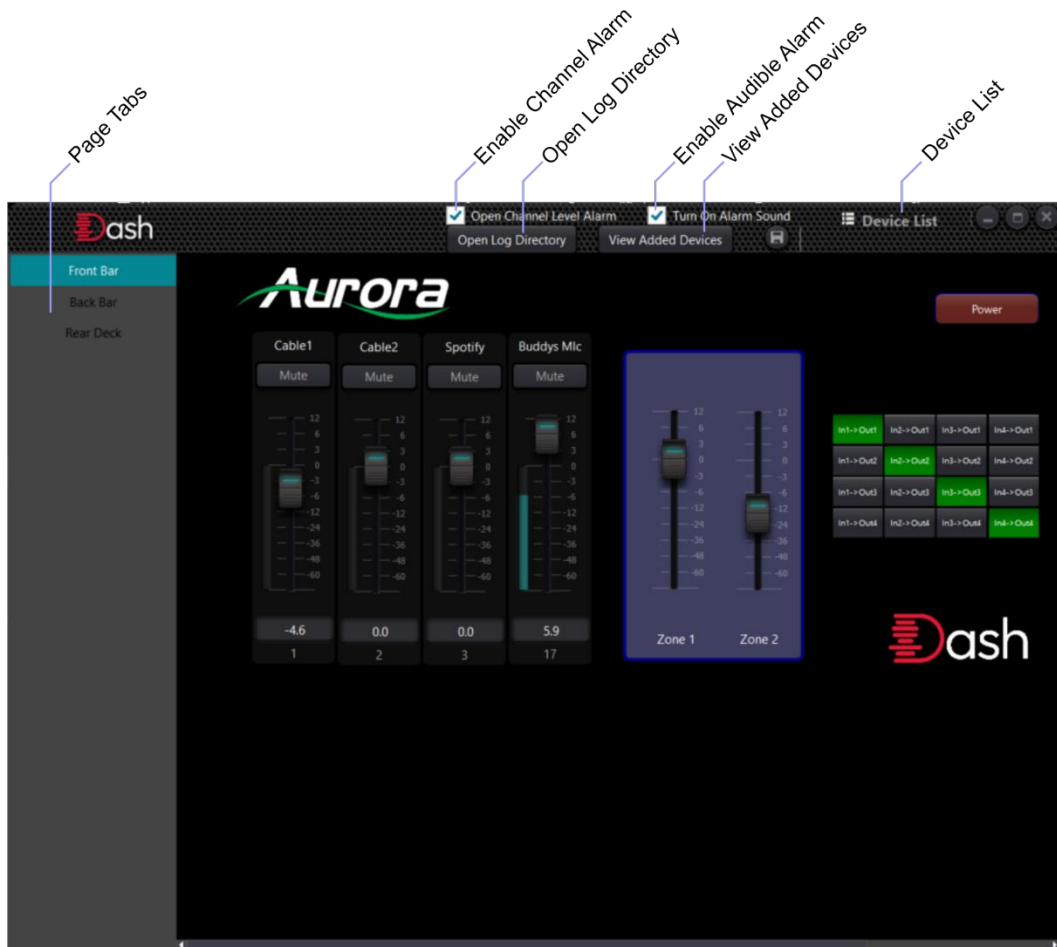
Page Tabs: Navigation between pages in a Custom UI. Click on the page name to activate.

Enable Chanel Alarm: Meter Objects can be set to trigger an alarm if the signal level exceeds or drops below set levels. The control will flash red, and an audible alarm will sound. This check box will defeat this feature when unchecked.

Open Log Directory: Opens directory where the log files are stored.

Enable Audio Alarm: If Enable Channel Alarm is checked, this checkbox determines if the audible alarm is sounded in response to a level trigger. If this check box is unchecked, a level trigger will still flash the control red, but no sound will be heard.

View Added Devices: This functionality is not active.

Device List: This is like the Device List in Dash. It shows details about devices that are in active communication with the Custom UI.

iOS

To install the DSP Pro app on an iOS phone or tablet, simply go to the Apple Store and search for "DSP Pro" and install the app. See Sync'ing to a Device for instructions on how to push your design to the app.

Android

The Android version of DSP Pro is not available on the Google Play store at this time. The .apk (app) file can be obtained directly from Aurora and installed manually on an Android device. Contact your Aurora representative to obtain the file. Download the apk file to your device by either direct URL link, cloud drive, email, etc. Click on the file to install the app. See Sync'ing to a Device for instructions on how to push your design to the app.

Workspace
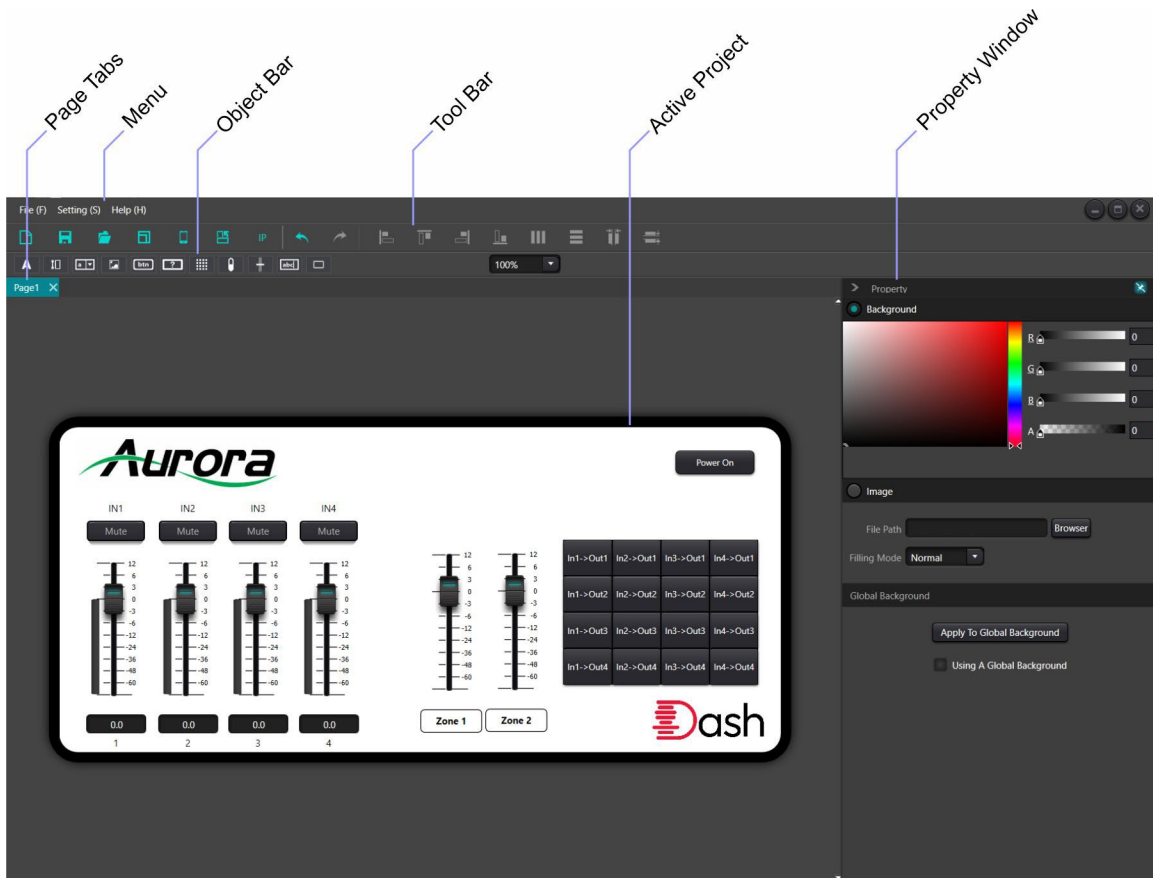
The Workspace is comprised of several areas that will be discussed in detail in this manual. The Tool Bar and Object Bar will the primary elements that will be used in creating your designs. The Property Window is context sensitive and will change depending on what object is currently selected. Below the Object Bar are the Page Tabs. The Dash Custom User Interface supports multiple pages to allow for complex and organized designs. Simply clicking on the Page name will

change the view to that page. The active page name will be highlighted. To change the Page name, double click on the name and type the new one. Clicking out of the Page name will save the new name.

Right Click Menus

Right clicking anywhere in the Active Project area will bring up one of two standard menus. Right clicking on the background brings up a small context menu.

Select All: Selects all objects in the active page.

Paste: Pastes copied objects from the clipboard.

Clear All: Clears all objects on the active page.

Property: Opens the Properties Window if closed.

Right clicking on any other object selects the object and opens the second context menu.

Copy: Copies the selected object to the clipboard.

Delete: Deletes the selected object.

Send to Back: Moves the selected object to the back layer.

Bring Forward: Moves the selected object forward one layer.

Send to Bottom: Moves the selected object backward one layer.

Bring Top: Moves the selected object to the top layer.

Group: Groups the selected objects together.

Ungroup: Ungroups previously grouped objects. This command will also ungroup a Routing Object into individual Check Buttons.

Property: Opens the Properties Window if closed.

Menu Bar

File

Open: Opens a saved project from local storage. If an active project is currently loaded, a dialog box will appear asking if you wish to overwrite the current page. If you answer 'Yes', the existing project will be cleared an the new one opened. If you answer 'No', the new project will be added as a new page to the existing project.

Save: Saves current project to local storage. The saved file is not only a snapshot of the project, but it can also be run as a standalone Dash user interface. This file can be double clicked on any PC that has the Dash software installed.

Settings

Resolution: Opens the Template selector

Help

About: Opens About Dialog

Tool Bar

New Page: Multiple control pages are supported in the Dash UI Creator. This button adds a new page.

Save: Saves current project to local storage. The saved file is not only a snapshot of the project, but it can also be run as a standalone Dash user interface. This file can be double clicked on any PC that has the Dash software installed.

Open: Opens a saved project from local storage. If an active project is currently loaded, a dialog box will appear asking if you wish to overwrite the current page. If you answer 'Yes', the existing project will be cleared an the new one opened. If you answer 'No', the new project will be added as a new page to the existing project.

Template: Opens the Template selection Dialog. See Templates for more information.

Sync: Opens the Sync dialog. See Sync'ing to a Device for more information.

Rotate: Rotates the layout between Portrait and Landscape.

Global IP Replace: Opens a tool to quickly find and replace IP addresses in the design. Enter the IP address which you wish to FIND in the Source IP Address field and the address you will use to replace in the Destination IP Address field. The Range combo box allows you to limit the replacement range to a specific page or all pages.

Undo / Redo: Perform an Undo operation on the previous edit or Redo to reverse and Undo operation.

Align Objects: Use the mouse to draw a rectangle around multiple objects or hold down the Ctrl key while selecting multiple objects. Click the Left, Top, Right or Bottom buttons to align the selected objects accordingly.

Object Spacing: Use the mouse to draw a rectangle around multiple objects or hold down the Ctrl key while selecting multiple objects. Use the "Equidistance in Horizontal Direction" or "Equidistance in Horizontal Direction" to equally space all selected objects equally between the outer two objects or "Custom Distance in Horizontal Direction" or "Custom Distance in Horizontal Direction" for more precise spacing.

Object Bar
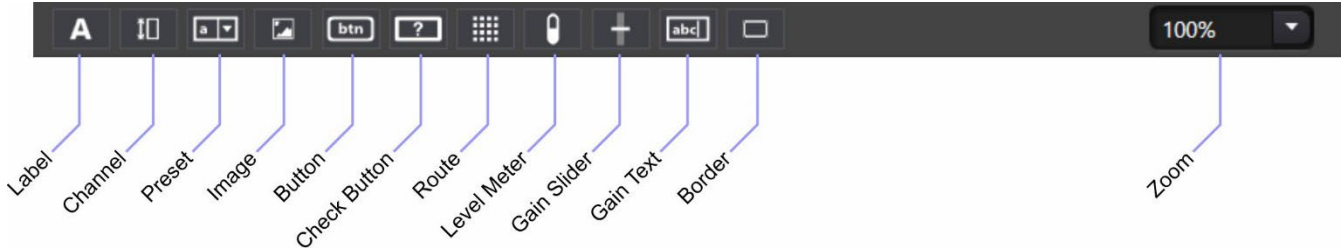
The Object Bar allows for the selection of various objects into the current Page workspace. With your mouse, simply click and hold the Object icon from Object Menu and drag it to the desired location on the Page. When the mouse button is released, the object will be created. The object can them be dragged and/or sized to the proper position on the page. See section impler and more accurate method is to use the 'Device Template' tab of the Template Dialog.

> **QUICK TIP**
> Click and Hold to drag objects from the Object Bar to the Page.

To automatically create the perfect template for your device, first have the target device connected to the same network as the Dash Software and run the DSP Plus app (see

Running the Custom User Interface for information about installing the apps). Now, select the 'Device Template' tab or click the 'Refresh' icon at the top left corner of the tab. The list will populate with all devices on the network that are running the DSP Plus app. Simply select the desired target device and click 'Apply'. The software will poll the device and create a perfectly compatible Template and add it to the Template list for future use.

Manual Template Creation

If you already know the precise resolution and density of the device, you can manually enter those values and create a Template. From the Local Template tab, click the blue 'Plus' icon at the top left of the dialog box.

Name: Enter a user-friendly name to easily identify the Template.

Idiom: Select Phone, Pad or PC from the list.

Platform: Identifies the OS platform of the target device.

Resolution: The screen resolution of the target device.

Density: TBD

Objects for detailed information on each Object type.

The Zoom combo box allows for the adjustment of the zoom level of the active project.

Templates

Templates are used to set the usable area of the target device. The Template selection dialog is available from the Menu Bar by selecting Settings | Resolution or by clicking the Template icon from the Tool Bar. Either method will bring up the Template Dialog. Simply select one of the preset Templates from the list and click 'Apply'. If the project is blank, it will create a new project page. If this is done while a project is open, it will change the project Template to the newly selected Template. **NOTE:** This may make already placed objects out of the page boundaries, these objects will have to be adjusted. After a Template is selected, the orientation of the page can be altered using the Rotate button from the Tool Bar.
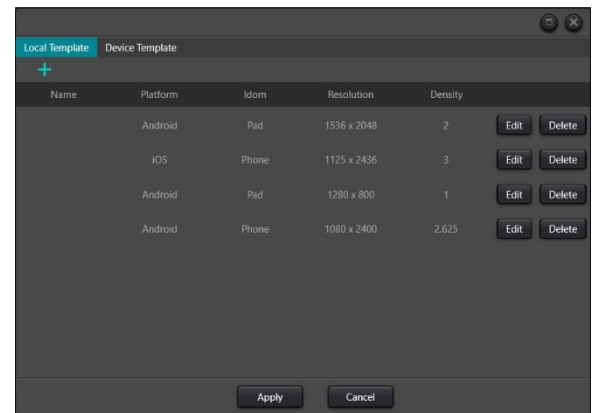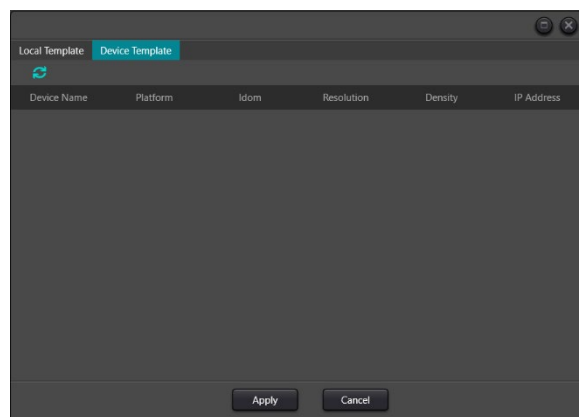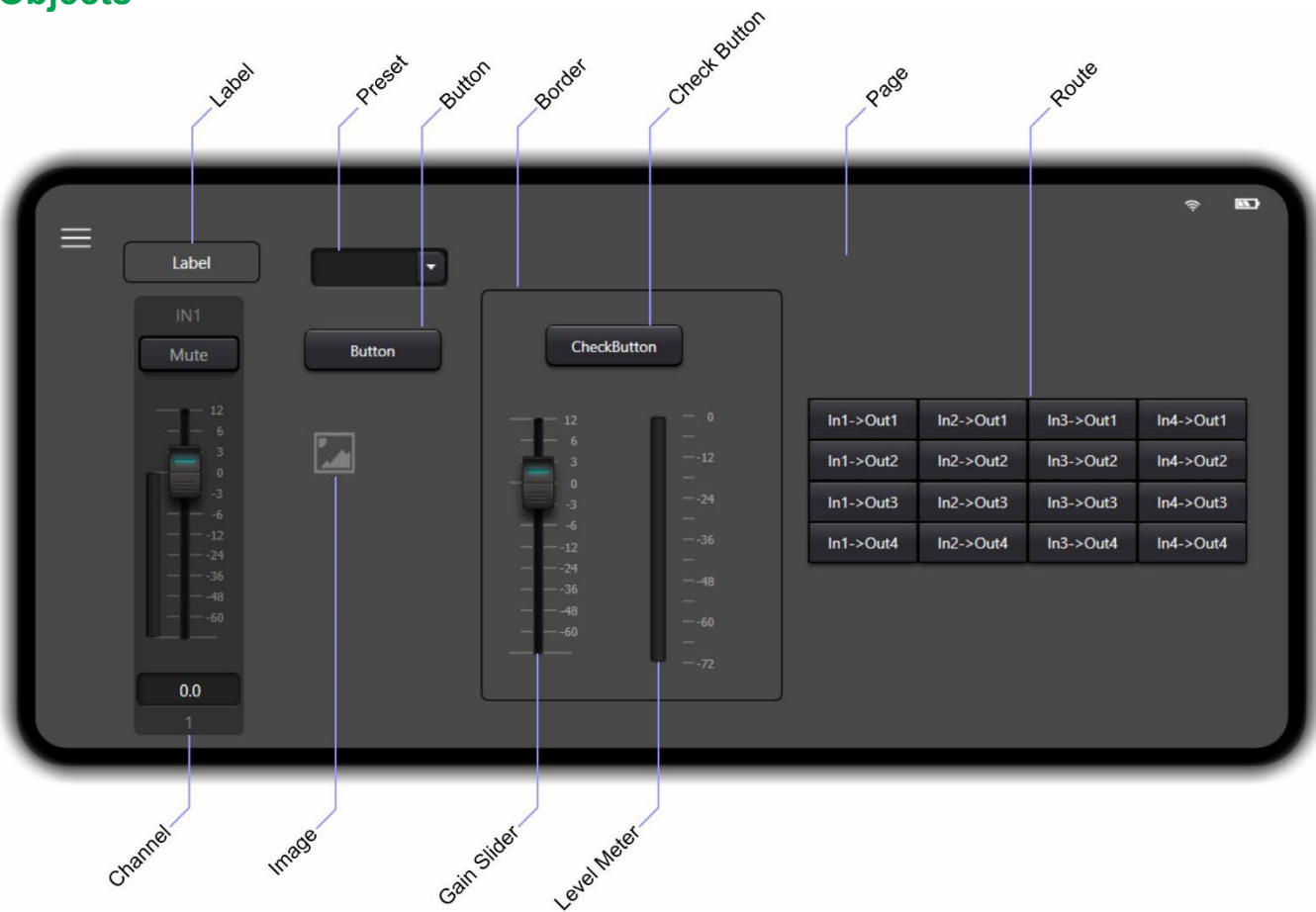

The Template list can be maintained by using the Delete button to remove a Template from the list or Edit to change the parameters of the selected Template. See Manual Template Creation for more information about the Edit Template dialog.

Automatic Template Creation

If the desired Template is not displayed in the preset list, it can be either manually entered by clicking the blue 'Plus' icon at the top left of the dialog, or a much simpler and more accurate method is to use the 'Device Template' tab of the Template Dialog.

To automatically create the perfect template for your device, first have the target device connected to the same network as the Dash Software and run the DSP Plus app (see

Running the Custom User Interface for information about installing the apps). Now, select the 'Device Template' tab or click the 'Refresh' icon at the top left corner of the tab. The list will populate with all devices on the network that are running the DSP Plus app. Simply select the desired target device and click 'Apply'. The software will poll the device and create a perfectly compatible Template and add it to the Template list for future use.

Manual Template Creation

If you already know the precise resolution and density of the device, you can manually enter those values and create a Template. From the Local Template tab, click the blue 'Plus' icon at the top left of the dialog box.

Name: Enter a user-friendly name to easily identify the Template.

Idiom: Select Phone, Pad or PC from the list.

Platform: Identifies the OS platform of the target device.

Resolution: The screen resolution of the target device.

Density: TBD

Objects

Page

The Page object is the background of the application upon which device Objects are placed. There can be multiple pages in a single project. Pages are added using the 'New Page' button on the Tool Bar and can be navigated using the Page Tabs just below the Object Bar.

Page Name: Double click on the page name in the Page Tab to rename the page.

Background: Select this radio button to use a solid color background. Colors can be selected by sliding the color target around in the palate. The palate can be changed by adjusting the hue slider. Alternately, numeric RGB values can be entered to get a precise color. The 'A' adjustment changes the transparency from fully transparent to fully opaque.

Image: Select this radio button to use an image background for the page.

File Path: Selects a local file to use as an image background for the page.

Fill Mode: Determines the fill method used to apply the image to the background. Select one of the following:

- **Normal** – The image is used unaltered. Edges may be cropped, or background may not be fully covered depending on the resolution of the image.
- **Fill** – Stretches the image to fill the background. The background will be completely covered, the full image is used but may be distorted.
- **Uniform** – Zooms the image to fill the background. The background may have uncovered space on the top and bottom or left and right, the full image is used, and it will not be distorted.
- **Uniform to Fill** – Zooms the image to fill the entire background. The background will be completely covered, the image may have some edges cropped, but will not be distorted.

Apply to Global Background: Clicking this button applies the current page background to all pages.

Using a Global Background: This checkbox indicates that a Global Background is being used for the current page.
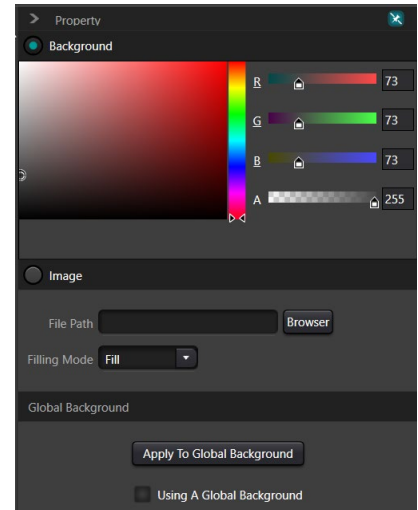
Label

Label is a customizable text object used for adding clarity or instruction to your design.

Text: This is the text that will be displayed.

Width: The width of the bounding box in pixels. This does not affect font size.

Height: The height of the bounding box in pixels. This does not affect font size.

Font: The font used to display the text. Select from the drop-down list.

Font Size: Select the desired font size from the drop-down list. Bold and/or Italic can be applied using the two round buttons next to the Font Size.

Corner Radius: Set the corner radius of the bounding box in pixels.

Horizontal Alignment: Sets Left, Centered or Right justification for the text in relation to the bounding box.

Vertical Alignment: Set the Top, Center or Bottom justification for the text in relation to the bounding box.

Border Thickness: Sets the line thickness of the bounding box in pixels. Setting this to a value of 0 will make the bounding box invisible.

Border Brush: Sets the color of the bounding box. With this selected, use the color selector at the bottom of the Properties Window to select the desired color. Setting the 'A' value (transparency) to 0 will also make the bounding box invisible regardless of the Border Thickness.

Foreground: Sets the text color and transparency. With this selected, use the color selector at the bottom of the Properties Window to select the desired color.

Background: Sets the background color and transparency of the bounding box. With this selected, use the color selector at the bottom of the Properties Window to select the desired color.
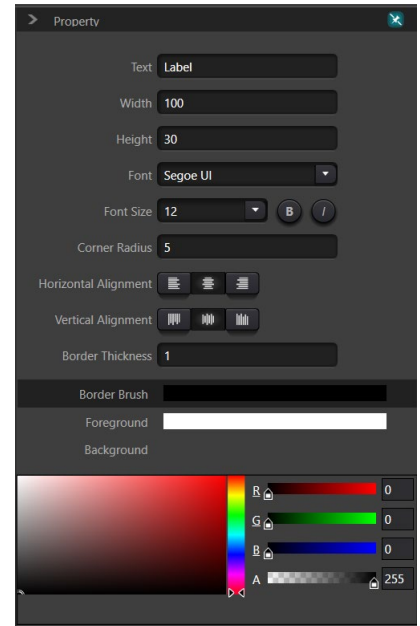
Channel

The Channel object is a bundled object which includes a Gain Slider, a Level Meter, Channel Name, Gain Text Value and Mute in a single customizable object. The Channel object can be configured as either an input or output channel. When the Custom User Interface app is connected to a live DTX device, Channel Name, Gain and Mute values will be replaced with the live values on the device.

Width: Adjusts the width of the Channel object. Note that only the bounding box, Mute button and Gain Test Value scale in this direction.

Height: Adjusts the height of the Channel object. Note that only the bounding box, Gain Slider and Level Meter scale in this direction.

Corner Radius: Set the corner radius of the bounding box in pixels.

Device IP: Sets the IP address of the DTX device that this object will control. Note that a single Custom User Interface can control multiple DTX devices.

Channel Type: Determines whether the Channel object will control an input or output channel.

Index Chanel: Select the channel number that this Channel object will control.

Foreground: Sets the text color and transparency of the Channel Name and Gain Scale. With this selected, use the color selector at the bottom of the Properties Window to select the desired color.

Background: Sets the background color and transparency of the bounding box. With this selected, use the color selector at the bottom of the Properties Window to select the desired color.
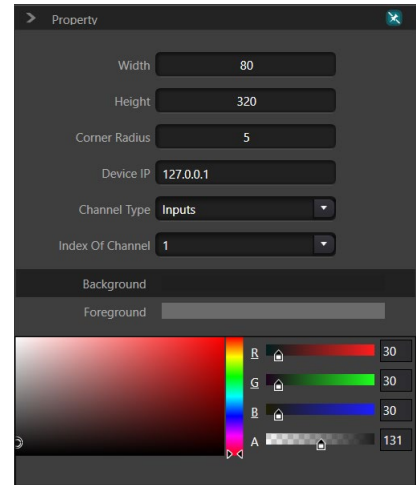
Preset

Creates a Preset selection drop-down box. The presets which are made visible can be customized. When the Custom User Interface app is connected to a live DTX device, the preset names assigned on the device will replace the generic (preset 1, …) seen in this creation tool.

Width: Sets the width of the object.

Preset: Preset numbers which are checked will appear in the drop-down list.

Device IP: Sets the IP address of the DTX device that this object will control. Note that a single Custom User Interface can control multiple DTX devices.
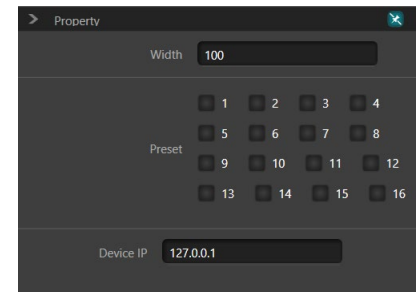
Image

The Image object allows logos, or any other standard image file to be displayed in the User Interface.

File Path: Selects a local file to use as an image to be placed on the page.

Width: Sets the desired width of the image in pixels.

Height: Sets the desired height of the image in pixels.

Constrain Proportions: If this is checked, the aspect ratio of the image will be maintained. Note that with this checked, changing the width or height values will automatically change the other to maintain proper proportions.
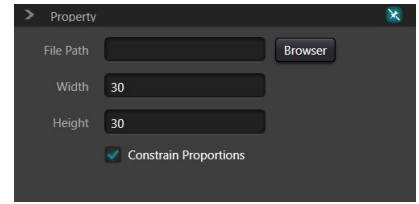
Button

The Button object can trigger single, stateless commands. It is not tied to any specific DTX command and can be fully customized. There are two tabs in the Button Property Window, Text and Command. These are described below.

<u>**TEXT TAB**</u>

Text: This is the text that will be displayed on the face of the Button.

Width: The width of the Button in pixels. This does not affect font size.

Height: The height of the Button in pixels. This does not affect font size.

Corner Radius: Set the corner radius of the Button in pixels.

Font: The font used to display the Button text. Select from the drop-down list.

Font Size: Select the desired font size from the drop-down list. Bold and/or Italic can be applied using the two round buttons next to the Font Size.

Border Thickness: Sets the line thickness of the Button's border in pixels. Setting this to a value of 0 will make the border invisible.

Foreground: Sets the text color and transparency. With this selected, use the color selector at the bottom of the Properties Window to select the desired color.

Background: Sets the background color and transparency of the Button. With this selected, use the color selector at the bottom of the Properties Window to select the desired color.

Border Brush: Sets the color of the Button's border. With this selected, use the color selector at the bottom of the Properties Window to select the desired color. Setting the 'A' value (transparency) to 0 will also make the border invisible regardless of the Border Thickness.
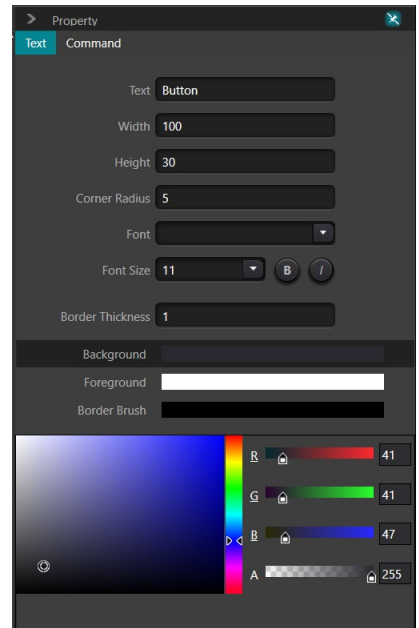
COMMAND TAB

While the Button object is not tied to any specific DTX command, it is highly flexible in that it can be programmed to send a single or multiple UDP or serial commands. To add a command to the Button, simply click the blue 'Plus' icon at the bottom right of the Command Tab of the Button Properties Window. Repeat to add additional commands.

Type: Selects the type of command to be sent when pressed. Choose from UDP, RS232 or RS485.

Coding: Defines the format of the data payload. Select Hexadecimal for HEX commands or ASCII for text-based commands.

Command: Enter the command to be transmitted upon button press.

IP Address: If Type is set to UDP, this sets the destination IP address.

Port: If Type is set to UDP, this is sets the UPD port to communicate with on the destination device.
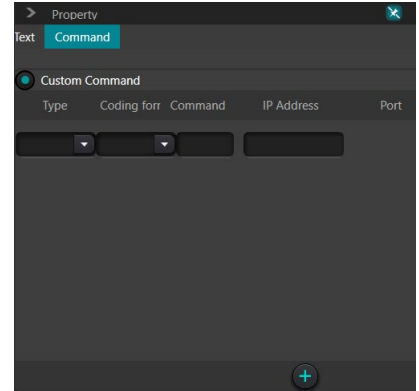
Check Button

Unlike the previous Button object, the Check Button object is a two-state button. It also supports a host of built in DTX commands as well as the ability to use it for custom commands. Like the Button object, the Check Button Properties Window has two tabs, Text and Command described below.

TEXT TAB

Text: This is the text that will be displayed on the face of the Check Button.

Width: The width of the Check Button in pixels. This does not affect font size.

Height: The height of the Check Button in pixels. This does not affect font size.
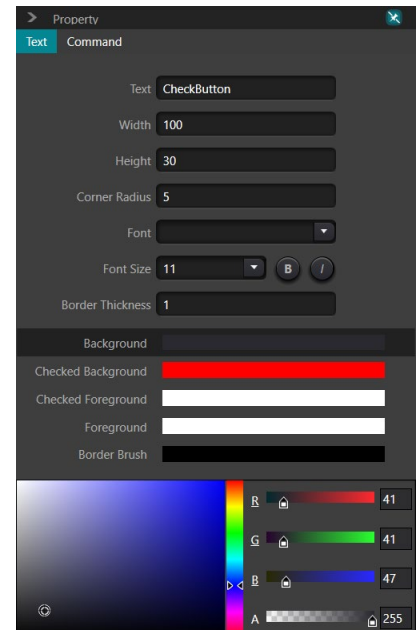
Corner Radius: Set the corner radius of the Check Button in pixels.

Font: The font used to display the Check Button text. Select from the drop-down list.

Font Size: Select the desired font size from the drop-down list. Bold and/or Italic can be applied using the two round buttons next to the Font Size.

Border Thickness: Sets the line thickness of the Check Button's border in pixels. Setting this to a value of 0 will make the border invisible.

Background: Sets the background color and transparency of the Check Button in the unchecked state. With this selected, use the color selector at the bottom of the Properties Window to select the desired color.

Checked Background: Sets the background color and transparency of the Check Button in the checked state. With this selected, use the color selector at the bottom of the Properties Window to select the desired color.

Checked Foreground: Sets the text color and transparency in the checked state. With this selected, use the color selector at the bottom of the Properties Window to select the desired color.

Foreground: Sets the text color and transparency in the unchecked state. With this selected, use the color selector at the bottom of the Properties Window to select the desired color.

Border Brush: Sets the color of the Check Button's border. With this selected, use the color selector at the bottom of the Properties Window to select the desired color. Setting the 'A' value (transparency) to 0 will also make the border invisible regardless of the Border Thickness.

<u>COMMAND TAB</u>

While the Check Button can issue one of several DTX commands. In addition, it can be programmed to send a single or multiple UDP or serial commands. For DTX commands, select 'System Command' and complete the properties. The available properties will change depending on the Control Zone selection. To add a custom command to the Button, simply click the blue 'Plus' icon at the bottom right of the Command Tab of the Button Properties Window. Repeat to add additional commands.

System Command: Select this radio button to use the Check Button for one of several built in DTX commands.

Control Zone: Selects which type of DTX command will be sent. Select from Inputs, Outputs, System or Matrix. When Matrix is selected, the matrix point is determined by the Input Channel and Output Channel values.

Input Channel: When Control Zone is set to Inputs or Matrix, selects the Input Channel to be addressed.

Output Channel: When Control Zone is set to Outputs or Matrix, selects the Output Channel to be addressed.

Control Type: Sets the control parameter that will be set. When Control Zone is set to Inputs, values are Mute, Phantom and Phase. When Outputs is selected, the values are Mute and Phase. When System is selected only Mute is available which will control the system wide mute. This property is not available when Matrix is the Control Zone value.

Device IP: Sets the IP address of the DTX device that this object will control. Note that a single Custom User Interface can control multiple DTX devices.

Custom Command: When this radio button is selected, one or more custom commands will be sent instead of a built-in DTX command.
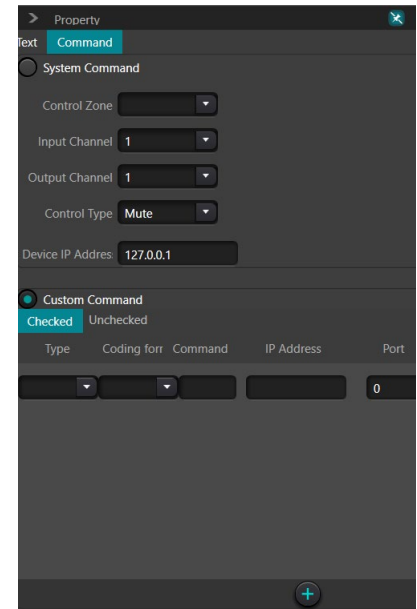
Checked/Unchecked Tabs: Each state of the Check Button can have separate custom commands. When Checked is highlighted the command list will be executed when the Check Button changes to the checked or depressed state. When Unchecked is highlighted the command list will be executed when the Check Button changes to the unchecked or raised state.

Type: Selects the type of command to be sent when the state is changed. Choose from UDP, RS232 or RS485.

Coding: Defines the format of the data payload. Select Hexadecimal for HEX commands or ASCII for text-based commands.

Command: Enter the command to be transmitted upon state change.

IP Address: If Type is set to UDP, this sets the destination IP address.

Port: If Type is set to UDP, this is sets the UPD port to communicate with on the destination device.

Route

The Route object controls the DTX matrix. This control is a preset grouping of Check Buttons and have the same set of visual customizations available. When the control is first dragged into a project, a dialog box will appear prompting the user for the input and output channel count and IP address of the DTX device.
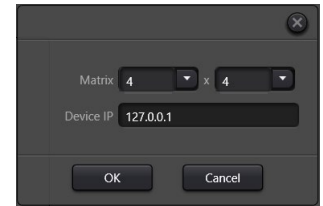
Matrix: Sets the number of Input and Output channels to display. Available values are 4, 8, 12, 16 & 32. The first selection determines the number of inputs and the second determines the number of outputs. The channels will always start at channel one and will be consecutive. The result will be an array of Check Buttons with Inputs as columns and Outputs as rows.

Device IP: Sets the IP address of the DTX device that this object will control. Note that a single Custom User Interface can control multiple DTX devices.

Text: This is the text that will be displayed on the face of every Check Button in the Route Object. **NOTE:** By default text on the Check Buttons in the Route Object will be in the format 'IN[Ch number]->Out[Ch number]'. Changing this field will change all Check Buttons to the same text. If it desired to have a custom label on each Check Button face, right click on the object and select 'Ungroup'. Now each button will have its own set of properties.
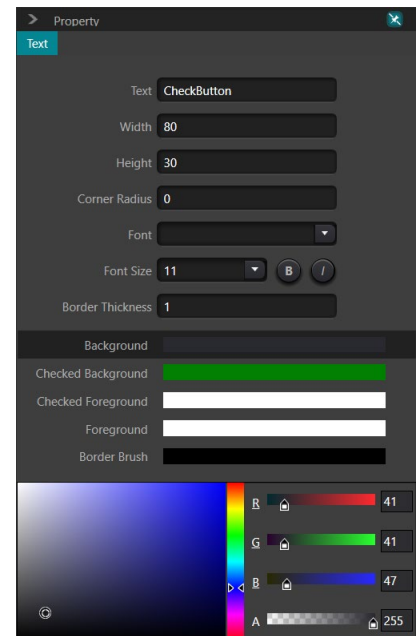
Width: The width of each individual Check Button in pixels. This does not affect font size.

Height: The height of each individual Check Button in pixels. This does not affect font size.

Corner Radius: Set the corner radius of each individual Check Button in pixels.

Font: The font used to display the Check Button text. Select from the drop-down list.

Font Size: Select the desired font size from the drop-down list. Bold and/or Italic can be applied using the two round buttons next to the Font Size.

Border Thickness: Sets the line thickness of each individual Check Button's border in pixels. Setting this to a value of 0 will make the border invisible.

Background: Sets the background color and transparency of each individual Check Button in the unchecked state. With this selected, use the color selector at the bottom of the Properties Window to select the desired color.

Checked Background: Sets the background color and transparency of each individual Check Button in the checked state. With this selected, use the color selector at the bottom of the Properties Window to select the desired color.

Checked Foreground: Sets the text color and transparency in the checked state. With this selected, use the color selector at the bottom of the Properties Window to select the desired color.

Foreground: Sets the text color and transparency in the unchecked state. With this selected, use the color selector at the bottom of the Properties Window to select the desired color.

Border Brush: Sets the color of each individual Check Button's border. With this selected, use the color selector at the bottom of the Properties Window to select the desired color. Setting the 'A' value (transparency) to 0 will also make the border invisible regardless of the Border Thickness.

Level Meter

The Level Meter object displays real time metering data for either an input or output channel. The object includes an alarming feature which monitors a loss of signal and/or peak level.

Width: The width of the Level Meter in pixels. This does not affect font size.

Height: The height of the Level Meter in pixels. This does not affect font size.

Corner Radius: Set the corner radius of the Level Meter in pixels.

Level Mark: Selects which side of the Meter the level markings should be displayed. Choose either left, right or no markings.

Device IP: Sets the IP address of the DTX device that this object will control. Note that a single Custom User Interface can control multiple DTX devices.

Channel Type: Determines whether the Level Meter object will display an input or output channel.

Index Chanel: Select the channel number that this Level Meter object will display.

Alarm: Determines what if any levels will trigger an alarm in the Custom User Interface. When an alarm is triggered, the Level Meter object will flash red and an audible sound will be heard on the host device. There are two options for triggering an alarm. Check the first box to create a loss of signal alarm which will trigger when the signal drops below the
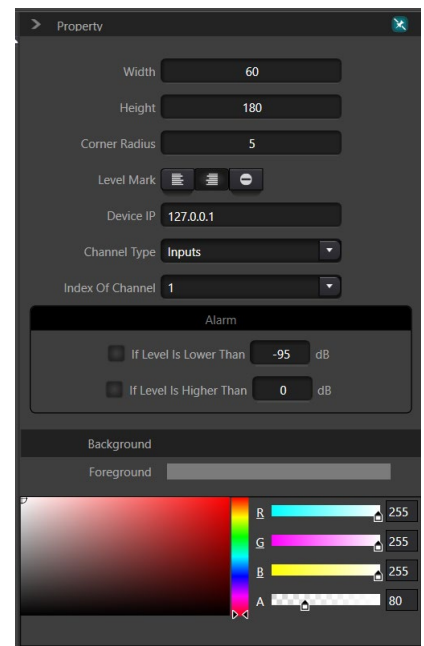
level indicated in the input box. Check the second box to create a peak level alarm which will trigger when the signal goes above the level indicated in the input box. Both the loss of signal and peak level thresholds can be manually set.

Foreground: Sets the text color and transparency of the Level Scale. With this selected, use the color selector at the bottom of the Properties Window to select the desired color.

Background: Sets the background color and transparency of the bounding box. With this selected, use the color selector at the bottom of the Properties Window to select the desired color.

Gain Slider

The Gain Slider object adjusts either an input or output channel gain. It has the same functionality as the Channel object without the Meter, Channel Name, Mute or Gain Text.

Width: Adjusts the width of the Gain Slider object.

Height: Adjusts the height of the Gain Slider object

Corner Radius: Set the corner radius of the bounding box in pixels.

Device IP: Sets the IP address of the DTX device that this object will control. Note that a single Custom User Interface can control multiple DTX devices.

Channel Type: Determines whether the Gain Slider object will control an input or output channel.

Index Chanel: Select the channel number that this Gain Slider object will control.

Foreground: Sets the text color and transparency of the Gain Scale. With this selected, use the color selector at the bottom of the Properties Window to select the desired color.

Background: Sets the background color and transparency of the bounding box. With this selected, use the color selector at the bottom of the Properties Window to select the desired color.
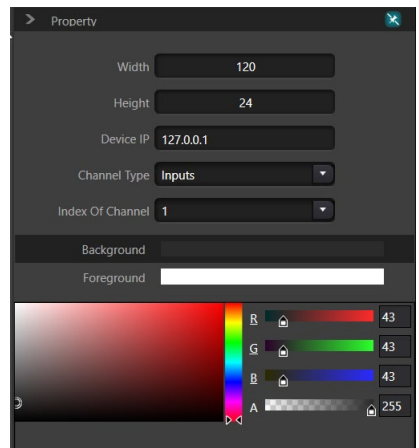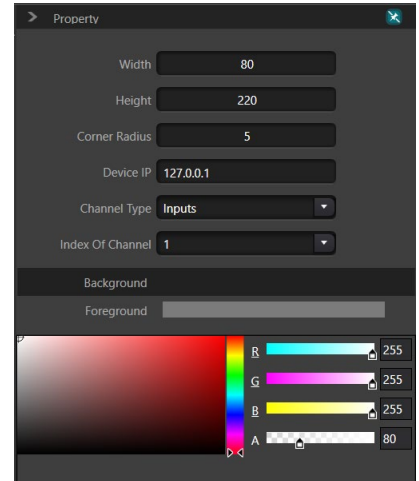
Gain Text

The Gain Text object controls the gain of either an input or output channel. Gain is set by simply typing in the gain value.

Width: Adjusts the width of the Gain Text object.

Height: Adjusts the height of the Gain Text object

Device IP: Sets the IP address of the DTX device that this object will control. Note that a single Custom User Interface can control multiple DTX devices.

Channel Type: Determines whether the Gain Text object will control an input or output channel.

Index Chanel: Select the channel number that this Gain Text object will control.

Foreground: Sets the text color and transparency. With this selected, use the color selector at the bottom of the Properties Window to select the desired color.

Background: Sets the background color and transparency of the bounding box. With this selected, use the color selector at the bottom of the Properties Window to select the desired color.

Border

The Border object is a passive object used to visually group objects on the page.

Width: Adjusts the width of the Border object.

Height: Adjusts the height of the Border object

Corner Radius: Set the corner radius of the Border in pixels.

Border Thickness: Sets the line thickness of the Border in pixels. Setting this to a value of 0 will make the border invisible.

Border Brush: Sets the color of the Border. With this selected, use the color selector at the bottom of the Properties Window to select the desired color. Setting the 'A' value (transparency) to 0 will also make the border invisible regardless of the Border Thickness.
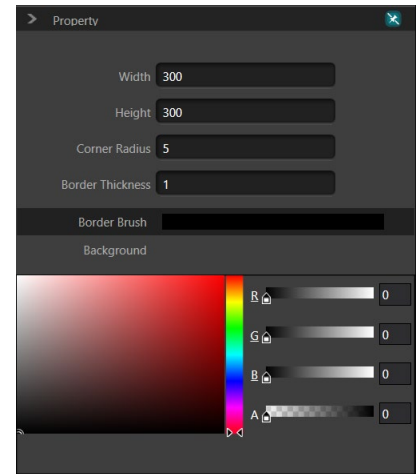
Background: Sets the background color and transparency of the Border. With this selected, use the color selector at the bottom of the Properties Window to select the desired color.

Sync'ing to a Device

When your design project is complete, it can be pushed out to an iOS or Android device. This can be accomplished very easily be following a few simple steps.

1) Verify that the target device(s) (phone or tablet) is on the same network as the computer running Dash and that the DSP Pro app is running. For information about installing the DSP Pro app, see Running the Custom User Interface.

2) Click the Sync icon [ ] from the Tool Bar.

3) The sync dialog will open and begin scanning for target devices. All compatible devices on the network will appear in the list.

4) Select the target device(s) to which you wish to push the project by checking the box(es) in the far-left column or click 'Select All'.

5) Click the 'Sync' Button.

Appendix F: Serial Port to UDP Conversion

DTX DSPs support RS-232 to UDP translation. When a DTX device receives a serial message where the first four bytes are 'UDP:' the message will be translated and sent via the LAN port. The protocol for this function is as follows:

b[0]-b[3] (prefix)	b[4]-b[7]	b[8]-b[9]	b[10]	B[11]	<128bytes
0x3a504455	IP Address	Port	Data Length	Reserved	Data

Prefix (b[0]-b[3]): Four byte prefix that identifies the message as a serial to UDP translation message. Should always be ASCII 'UDP:' or the hex equivalent 0x3A504455.

IP Address (b[4]-b[7]): Destination IP address for the UDP message.

Port (b[8]-b[9]): UDP port on destination device.

**Data Length (b[10]):** Length of the Data portion of the message, not including prefix, address and port.

Data: Message payload. Maximum 128 bytes.

For example, when sending a "HELLO DSP" message to a device at 192.168.1.22 port 50000, the protocol would look as follows:

b[0]-b[3] (prefix)	b[4]-b[7]	b[8]-b[9]	b[10]	B[11]	<128bytes
0x3a504455	0x1610A8C0	0xC350	0x09	0x00	0x505344204F4C4C4548

Use Case

When using an external controller which does not have a network port or network access, a DTX device can be used to communicate via UDP over the network. The Controller Host is connected to the serial port of a DTX device, and that device performs the translation into UPD and broadcasts to the network. Other DTX devices or any third-party devices on the network can be controlled via the Controller Host serial port.
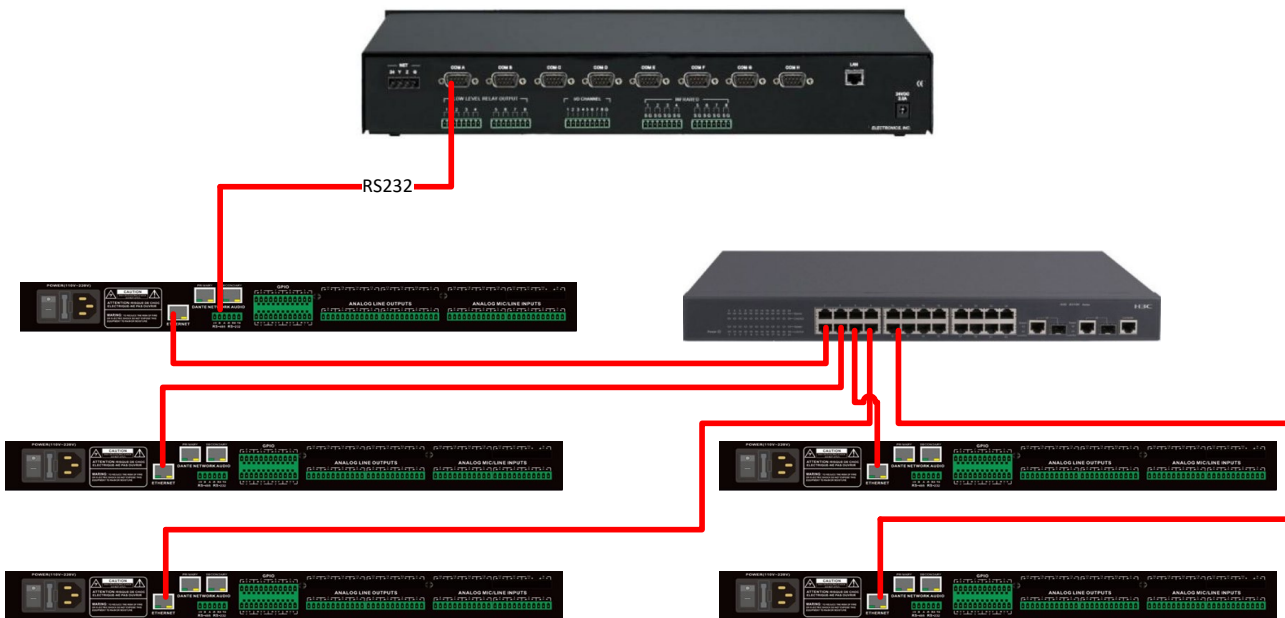
Appendix G: Specifications

Audio	DTX-44D	DTX-88D	DTX-1616D	DTX-3232D	DTX-6464D
Analog I/O Channels	4×4	8×8	16×16	-	-
Dante I/O Channels	4×4	8×8	16x16	32×32	64×64
Input					
Analog Input Gain	0/6/12/18/24/30/36/42/48 dB			n/a	n/a
Input Impedance	5.4KΩ				
Frequency Response	(20 Hz to 20 kHz)±0.5dB				
THD+N	<-94dB @17dBu				
Maximum level	+ 18dbu				
Input Dynamic Range	110dB				
Analog Noise Floor	-89 dBu (A-weighted)				
Channel Isolation	108 dB (1 kHz)				
Phantom Power	+48V/10mA max				
Output					
Output Dynamic Range	112dB			n/a	n/a
Output Impedance	600Ω				
Audio Shaping Tools					
Expander	✓	✓	✓	✓	✓
Compressor	✓	✓	✓	✓	✓
Parametric EQ	8 band	5, 8 & 12 band	5, 8 & 12 band	5, 8 & 12 band	8 band
Graphic EQ	-	10, 15 & 31 band	10, 15 & 31 band	10, 15 & 31 band	-
Gate	-	✓	✓	✓	-
Ducker	-	✓	✓	✓	-
High and Low Pass Filter	✓	✓	✓	✓	✓
Delay	✓	✓	✓	✓	✓
Limiter	✓	✓	✓	✓	✓
DSP Resources					
Automatic Gain Control (AGC)	✓	✓	✓	✓	-
Adaptive Feedback Control (AFC)	✓	✓	✓	✓	-
Ambient Noise Compensation (ANC)	-	✓	✓	✓	-
Acoustic Echo Cancellation (AEC)	2	1	1	1	0
Automatic Noise Suppression (ANS)	✓	✓	✓	✓	-
Mixing Matrix	✓	✓	✓	✓	✓
Voice Activated Camera Control	-	✓	✓	✓	-
Interface					
Ethernet Port (RJ-45)	2 Dante Audio	2 Dante Audio 1 LAN	2 Dante Audio 1 LAN	2 Dante Audio 1 LAN	2 Dante Audio 1 LAN
USB Port (Type-A)	1 USB Audio	1 USB Audio	1 USB Audio	1 USB Audio	1 USB Audio
Serial Port (Terminal Block)	1 RS-232 1 RS-485	1 RS-232 1 RS-485	1 RS-232 1 RS-485	1 RS-232 1 RS-485	1 RS-232 1 RS-485
GPI/O Port (Terminal Block)	-	8x8 GPI/O	8x8 GPI/O	8x8 GPI/O	8x8 GPI/O
Power					
Power	DC12V/PoE48V	110-240 VAC 50-60 Hz	110-240 VAC 50-60 Hz	110-240 VAC 50-60 Hz	110-240 VAC 50-60 Hz
Power Consumption	10 W	25 W	35 W	15 W	15 W
Enclosure					
Chassis	Half Rack	1U	1U	1U	1U

Appendix H: Architect and Engineers Specification

DTX-44D

The audio DSP shall have 4 balanced inputs and 4 balanced output channels for microphone or line-level analog audio signals, each independently controllable with removable euro block connectors. The DSP shall have Dante® digital audio networking up to 4 input and 4 output channels on 2 RJ-45 jacks, USB audio and 2 serial ports on a removable euro block. One of the RJ-45 jacks shall support PoE PD at 15W to power the DSP. An additional 12VDC input jack shall be provided as a secondary power source.

The audio DSP shall be a 1/2 RU rack mountable chassis and include configurable signal processing, including but not limited to: signal routing and mixing, equalization, filtering, dynamics, delay, as well as Automatic Gain Control (AGC), Adaptive Feedback Control (AFC), Acoustic Echo Cancellation (AEC) and Automatic Noise Suppression (ANS) with no additional licenses. The audio DSP shall be controlled, configured and monitored via Dash software, UDP or serial control.

The audio DSP shall be compliant to UL60065 (8th edition), CAN/CSA-C22.2 No.60065 (8th edition), IEC/EN60065 (8th edition), UL62368-1 (2nd edition), CAN/CSA C22.2 No. 62368-1-14 (2nd edition), and IEC/EN 62368-1 (2nd edition); EN 55032:2015, EN 61000-3-2:2014, EN 61000- 3-3:2013, EN 55035:2017, FCC Part 15B Class A, AS/NZS CISPR 32:2015, ICES-003 Class A, and CISPR13.

Warranty shall be five years. The audio DSP shall be Aurora Multimedia DTX-44D.

DTX-88D

The audio DSP shall have 8 balanced inputs and 8 balanced output channels for microphone or line-level analog audio signals, each independently controllable with removable euro block connectors. The DSP shall have Dante® digital audio networking up to 8 input and 8 output channels on 2 RJ-45 jacks, an Ethernet connection for control and programming on a separate RJ-45 jack, USB audio, and 8 channels of configurable GPIO and 2 serial ports on a removable euro block.

The audio DSP shall be a 1 RU rack mountable chassis and include configurable signal processing, including but not limited to: signal routing and mixing, equalization, filtering, dynamics, delay, as well as Automatic Gain Control (AGC), Ambient Noise Compensation (ANC), Adaptive Feedback Control (AFC), Acoustic Echo Cancellation (AEC), Automatic Noise Suppression (ANS) and Automatic Voice Tracking Camera Control with no additional licenses. The audio DSP shall be controlled, configured and monitored via Dash software, UDP or serial control.

The audio DSP shall be compliant to UL60065 (8th edition), CAN/CSA-C22.2 No.60065 (8th edition), IEC/EN60065 (8th edition), UL62368-1 (2nd edition), CAN/CSA C22.2 No. 62368-1-14 (2nd edition), and IEC/EN 62368-1 (2nd edition); EN 55032:2015, EN 61000-3-2:2014, EN 61000- 3-3:2013, EN 55035:2017, FCC Part 15B Class A, AS/NZS CISPR 32:2015, ICES-003 Class A, and CISPR13.

Warranty shall be five years. The audio DSP shall be Aurora Multimedia DTX-88D.

DTX-1616D

The audio DSP shall have 16 balanced inputs and 16 balanced output channels for microphone or line-level analog audio signals, each independently controllable with removable euro block connectors. The DSP shall have Dante® digital audio networking up to 16 input and 16 output channels on 2 RJ-45 jacks, an Ethernet connection for control and programming on a separate RJ-45 jack, USB audio, and 8 channels of configurable GPIO and 2 serial ports on a removable euro block.

The audio DSP shall be a 1 RU rack mountable chassis and include configurable signal processing, including but not limited to: signal routing and mixing, equalization, filtering, dynamics, delay, as well as Automatic Gain Control (AGC), Ambient Noise Compensation (ANC), Adaptive Feedback Control (AFC), Acoustic Echo Cancellation (AEC), Automatic Noise Suppression (ANS) and Automatic Voice Tracking Camera Control with no additional licenses. The audio DSP shall be controlled, configured and monitored via Dash software, UDP or serial control.

The audio DSP shall be compliant to UL60065 (8th edition), CAN/CSA-C22.2 No.60065 (8th edition), IEC/EN60065 (8th edition), UL62368-1 (2nd edition), CAN/CSA C22.2 No. 62368-1-14 (2nd edition), and IEC/EN 62368-1 (2nd edition); EN 55032:2015, EN 61000-3-2:2014, EN 61000- 3-3:2013, EN 55035:2017, FCC Part 15B Class A, AS/NZS CISPR 32:2015, ICES-003 Class A, and CISPR13.

Warranty shall be five years. The audio DSP shall be Aurora Multimedia DTX-1616D.

DTX-3232D

The audio DSP shall have Dante® digital audio networking up to 32 input and 32 output channels on 2 RJ-45 jacks, an Ethernet connection for control and programming on a separate RJ-45 jack, USB audio, and 8 channels of configurable GPIO and 2 serial ports on a removable euro block.

The audio DSP shall be a 1 RU rack mountable chassis and include configurable signal processing, including but not limited to: signal routing and mixing, equalization, filtering, dynamics, delay, as well as Automatic Gain Control (AGC), Ambient Noise Compensation (ANC), Adaptive Feedback Control (AFC), Acoustic Echo Cancellation (AEC), Automatic Noise Suppression (ANS) and Automatic Voice Tracking Camera Control with no additional licenses. The audio DSP shall be controlled, configured and monitored via Dash software, UDP or serial control.

The audio DSP shall be compliant to UL60065 (8th edition), CAN/CSA-C22.2 No.60065 (8th edition), IEC/EN60065 (8th edition), UL62368-1 (2nd edition), CAN/CSA C22.2 No. 62368-1-14 (2nd edition), and IEC/EN 62368-1 (2nd edition); EN 55032:2015, EN 61000-3-2:2014, EN 61000- 3-3:2013, EN 55035:2017, FCC Part 15B Class A, AS/NZS CISPR 32:2015, ICES-003 Class A, and CISPR13.

Warranty shall be five years. The audio DSP shall be Aurora Multimedia DTX-3232D.

DTX-6464D

The audio DSP shall have Dante® digital audio networking up to 64 input and 64 output channels on 2 RJ-45 jacks, an Ethernet connection for control and programming on a separate RJ-45 jack, USB audio, and 8 channels of configurable GPIO and 2 serial ports on a removable euro block.

The audio DSP shall be a 1 RU rack mountable chassis and include configurable signal processing, including but not limited to: signal routing and mixing, equalization, filtering, dynamics, delay. The audio DSP shall be controlled, configured and monitored via Dash software, UDP or serial control.

The audio DSP shall be compliant to UL60065 (8th edition), CAN/CSA-C22.2 No.60065 (8th edition), IEC/EN60065 (8th edition), UL62368-1 (2nd edition), CAN/CSA C22.2 No. 62368-1-14 (2nd edition), and IEC/EN 62368-1 (2nd edition); EN 55032:2015, EN 61000-3-2:2014, EN 61000- 3-3:2013, EN 55035:2017, FCC Part 15B Class A, AS/NZS CISPR 32:2015, ICES-003 Class A, and CISPR13.

Warranty shall be five years. The audio DSP shall be Aurora Multimedia DTX-6464D.

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