Installation & Operation Guide

RTI DSP Matrix

AD-1616 - Audio Distribution 16 x 16 DSP Matrix

Version 1.1

It's Under Control®

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Introduction

The AD-1616 is a DSP Matrix for distribution of sixteen audio sources to sixteen zones. For projects that need more zones, up to four AD-1616 chassis can be combined to deliver 64 audio zones. The AD-1616 enables seamless routing of both digital and analog sources to any desired zone and features a comprehensive set of DSP controls. This includes a 5-band parametric EQ, allowing integrators to fine-tune acoustic characteristics and tailor sound to specific spaces, plus mixing and auto-ducking features facilitate seamless integration of microphones and doorbells, effortlessly prioritizing audio sources and ensuring smooth transitions. Configuration and DSP functions can be customized directly within Integration Designer or with the intuitive web GUI, enabling the AD-1616 to work in standalone mode or within another control system environment.

For amplification, we recommend pairing the AD-1616 with the RTI CP-16i 16 Channel Cool Power® Amplifier.

For projects that need more zones, up to four AD-1616 chassis can be combined to deliver 64 zones.

Features

- Sixteen audio sources inputs with eight analog inputs and eight digital inputs.
- Sixteen preamp stereo audio output zones to integrate external power amplifiers or subwoofers. Preamp outputs require external amplification via RTI CP-16i or third-party audio amplifiers.
- Distribute sixteen audio source inputs to sixteen zones, expandable to 64 zones by stacking up to four AD-1616 units.
- Fine-tune acoustic characteristics for each zone with the 5-band parametric EQ, mixing and auto-ducking features.
- Configure and optimize DSP and matrix settings.
- Multiple control options with RS-232, IP and IR.
- Rack mount or free-standing installation.

Package Contents

1x AD-1616
1x AD-1616 Faceplate
1x Power Cord
2x Rack Ears with Screws
4x Feet with Screws

	AD-1616
Analog Sources	8 RCA (Stereo)
Digital Sources	8 Coax and 8 Optical
Loop Out	8 Analog + 2 Digital
Amplified Zones	Preamp only. Use a CP-16i for amplification.
Preamp Zones	16 Stereo (32 Channels)
Audio Zone Expansion	Up to 64 zones by combining up to 4 AD-1616 units
Input Impedance	20kΩ
Analog Input	2 Vrms Maximum
Analog Output	2 Vrms Maximum, volume controlled
Volume Range	0-100 (-80dB - 0dB)
Digital Optical Input	Up to 192KHz/24Bit sample rate, PCM only
Digital Coaxial Input	Up to 192KHz-24Bit sample rate, PCM only
THD-N	THD+N <0.01%, 1KHZ THD+N <0.05%, 20HZ-20KHZ
SNR	>95 dB, A-weighted - input to output @ rated power @pre-out
Frequency Response	20 Hz – 20 kHz +/- 2 dB @ 4Ω and 8Ω
Dynamic Range	>95dB A-weighted
Sampling Frequency	48KHz
RTI or 3rd Party Control	IP (RJ45), RS-232 (RJ45) and IR (3.5mm mono)
AC Input Voltage	100-120V/ 220-240V~, 50/60Hz, 20W
Power Switch	Front Panel On/Off with LED power indicator
Mounting	Rack mount or free-standing
Dimensions (WxDxH)	17.2” x 16.4” x 3.5” (437 mm x 416.5 mm x 89mm)
Rack Units	2U
Weight	18.12 lb (8.22kg)
Operating Temperature	+32°F to +122°F (0°Cto +50°C)
Operating Humidity	5% to 95% Non-condensing
Warranty	Three Years (Parts & Labor)

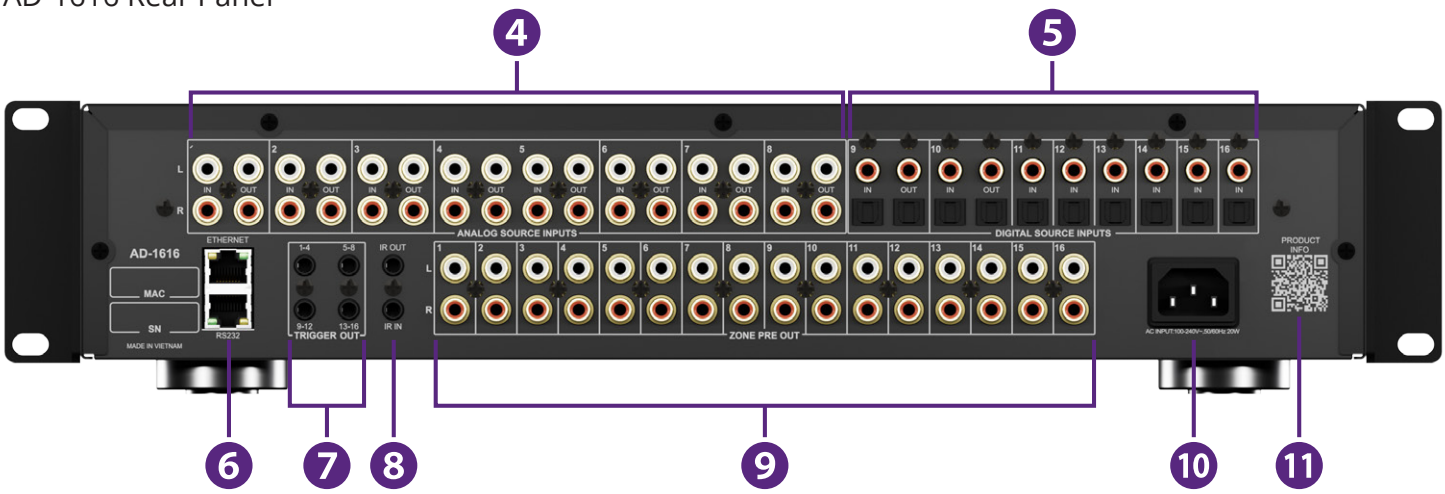
All Specifications subject to change without notice.

Panel Description

AD-1616 Front Panel

No.	Name	Description
1	Power Button	Powers on/off the matrix. Pressing and holding this button will perform various reset functions. Resetting: Network Reset: Hold the power button for 10 seconds and then release. Factory Reset: Hold the power button for 20 seconds and then release. LED indicators will flash differently based on the type of reset in progress.
3	Status LED Indicator	This LED indicator will show different network status conditions. Solid Green: Network is operating normally Flashing Green: Network issue has been detected No Light/Off: Power is off Flashing Blue: When synchronized flashing with Power LED, Factory Reset is in progress. When Power LED is solid green, only the Network settings are being reset to factory settings.
3	Status LED Indicator	This LED indicator will show different network status conditions. Solid Green: Network is operating normally Flashing Green: Network issue has been detected No Light/Off: Power is off Flashing Blue: When synchronized flashing with Power LED, Factory Reset is in progress. When Power LED is solid green, only the Network settings are being reset to factory settings.

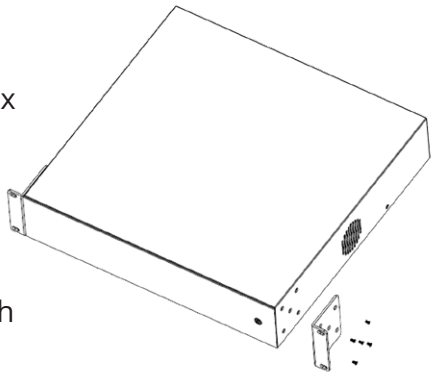
AD-1616 Rear Panel



No.	Name	Description
4	Analog Audio Inputs and Outputs	Left and Right RCA mono channel pairs with loop-outs for external audio use / extension of each source
5	Digital Audio Inputs and Outputs	Coaxial and Optical S/PDIF digital audio inputs that support a maximum of 2 channel LPCM audio. Digital inputs 9 and 10 also includes loop-outs for external audio use/extension.
6	TCP/IP and RS-232 Control Interfaces	Ethernet connects to a TCP/IP local area network for WEB GUI access and 3rd party control. For serial control, connect this port directly to an RTI processor via a standard CAT-5e or better patch cable.
7	5-12V Output Triggers	This matrix can control up to 4 additional devices using these output triggers. This connection accepts a 3.5mm mono (TR) plug that is then connected to downstream devices to manage their power states.
8	IR In and Out	Control this matrix using IR commands using either a direct connection to a 3rd party control system or an external IR receiver (sold separately) connected to the IR In port. Received IR input signals are concurrently relayed out of the IR Out port to allow daisy-chaining multiple matrix. Please note that the IR command set is a subset of all available commands.
9	Stereo Zone Pre-Outputs	16 Left and Right RCA mono channel pairs with variable level outputs to be connected to an external matrix or processor.
10	IEC Power Connector and Fuse	Connect to an appropriately rated power source using the included IEC power cable.
11	Product Information QR Code	Scan this QR code with a mobile device for quick and easy access to installation and other product resources (internet required).

Installation

Rack Installation

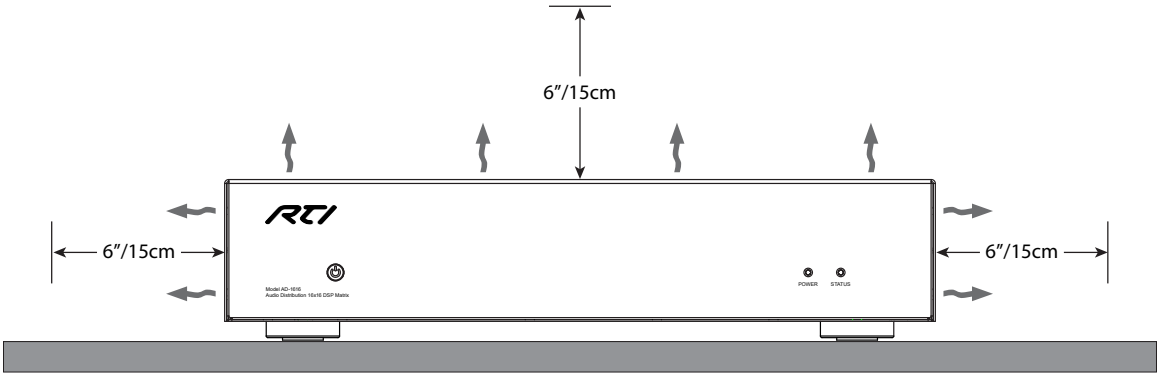


The AD-1616 matrix is shipped with rack-mounting accessories. This matrix will consume 2RU or rack-mounting space. By default, the matrix is shipped with attached footpads for installation in a cabinet or on a shelf. These feet are not required to be removed for rack installation when keeping a 1RU space below the unit for proper ventilation. These feet can be removed if desired. Please use the included hardware to attach the rack-mount ears to the matrix's chassis.

⚠ Please note that a 1RU space should be maintained above and below the chassis, when possible, to allow the flow of air to provide proper ventilation for the product. Failing to do so may cause the unit to operate at a higher temperature and may lead to a shortened lifespan or damage/failure.

Cabinet / Shelf Installation

Place the matrix on a shelf or cabinet that has at least 6" (15cm) of space on both sides, behind, and above to allow proper ventilation and allow air to circulate and dissipate heat. If placing in a cabinet, please ensure that there is adequate ventilation, either passive or active, so that the ambient temperature in the allotted space does not exceed 104°F (40°C).



Connections

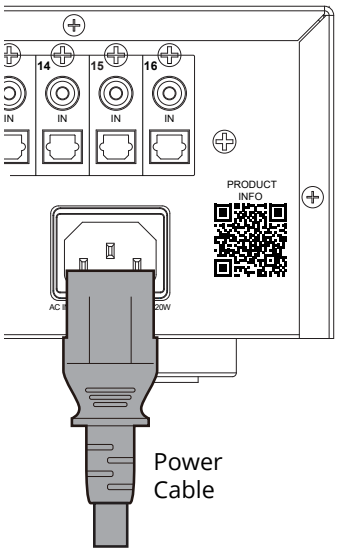
The AD-1616 is equipped with connectivity that supports both analog and digital audio sources. Outputs are presented as RCA style stereo connectors. Peripheral data ports for various means of control are also present, such as RS-232 and RJ-45. Please see below for proper connection instructions.

⚠ Please note that all connections, sources, outputs, or data cables, should be made when the matrix is not powered as doing so may cause damage/harm to either the matrix, outputs, or the installer. Please ensure that power is not on, or power is not connected to the matrix before proceeding to add or remove any connections to the matrix.

Power

Power is supplied to the AD-1616 (Type C14 male) directly via an AC power mains outlet using the included IEC power cable. An appropriate region-specific IEC power cable (Type C13 female to US/UK/EU/AU) is included with each matrix. This product is capable of operating between 100-240V in both 50/60Hz regions.

1. Connect the included IEC power cable (Type C13 female) to the matrix's power input (Type C14 male).
2. Connect the region-specific power plug to a main's AC power outlet. Please ensure that this matrix is connected to an AC outlet that can supply the rated power draw (20W).



Control Interfaces

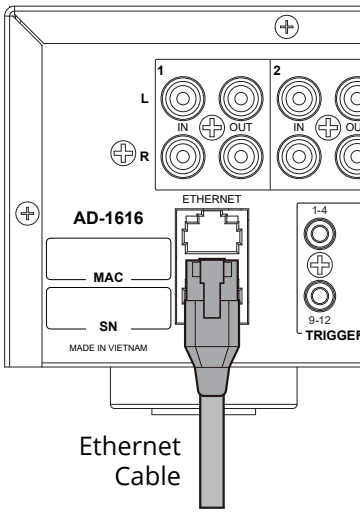
The AD-1616 is equipped with various control interfaces that allow external control of the matrix. The connections include IR, RS-232, and 12V trigger ports. Cables for these connections are not supplied and will need to be sourced by the installer.

Ethernet Control

The AD-1616 can be controlled via TCP/IP using built-in API commands. Please see the API appendix for a list of commands that are applicable to these products.

1. Connect the RJ-45 connector (male) from one side of a CAT-5e or better patch cable to the RJ-45 (female) connector port labeled "Ethernet" on the matrix. Please ensure that the cable connector is fully seated. RTI recommends the TIA-568B termination schema, however TIA-568A is also acceptable.

2. Connect the RJ-45 connector (male) on the opposite end of the CAT-5e or better patch cable to the RJ-45 (female) connector port on either an active network switch/hub/router or a computer.



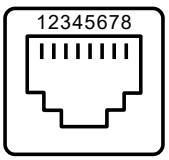
Serial Control

The AD-1616 matrix uses a proprietary RJ-45 port and wiring schema that is intended to be directly connected/used with an appropriate companion port on an RTI processor. If using a 3rd party serial device for control, please use the pin-out below for constructing a compatible cable for use in the desired application to control this matrix using RS-232 serial communication.

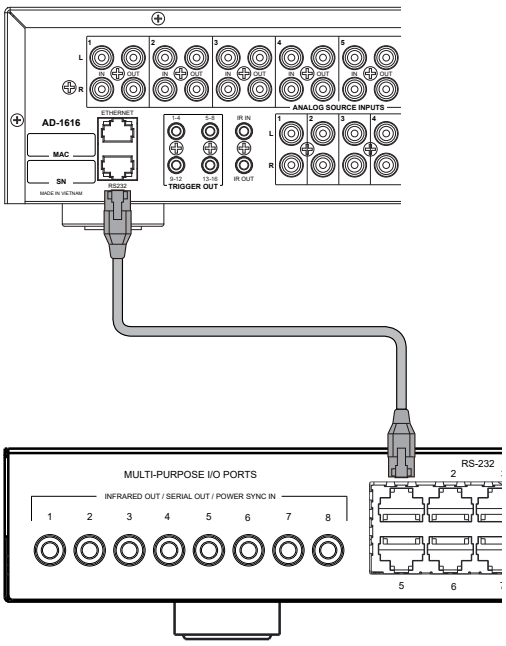
1. Connect the RJ-45 connector (male) from one side of a CAT-5e or better patch cable to the RJ-45 (female) connector port labeled "RS232" on the matrix. Please ensure that the cable connector is fully seated. RTI recommends the TIA-568B termination schema, however TIA-568A is also acceptable.
2. Connect the RJ-45 connector (male) on the opposite end of the CAT-5e or better patch cable to the RJ-45 (female) connector port on a compatible RTI processor.

	AD-1616 Pinout		RTI XP Control Processor Pinout	
Pin	Signal Name	Signal Description	Signal Name	Signal Description
1				
2				
3				
4	GND	Signal Ground/Common	GND	Signal Ground/Common
5	TXD	Transmit Data	RXD	Receive Data
6	RXD	Receive Data	TXD	Transmit Data
7				
8				

Baud rate: 9600 • Data bits: 8 • Parity: None • Stop bits: 1



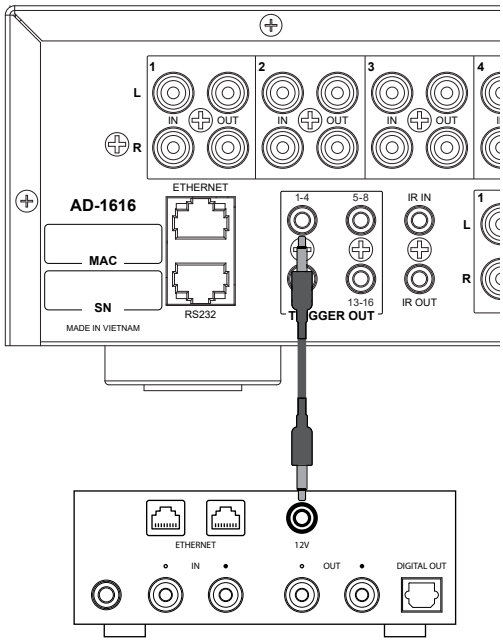
RJ-45 RS-232 Port



12V Trigger

The AD-1616 matrix can trigger the power state of downstream devices using the supplied dual 12V trigger ports. These ports will apply 12V DC (12V DC via tip, ground via sleeve). via a 3.5mm mono mini-jack when the matrix is powered on. Conversely, when the matrix is in the off or standby state, 12V DC will no longer be provided.

1. Connect the male connector on one end of a 3.5mm mono mini-jack cable to one of the ports labeled “Trigger” on the matrix. All 4 ports function simultaneously and can be used to trigger control of up to 4 downstream devices that support 12V DC triggering.
2. Connect the male connector on the opposite end of the 3.5mm mono mini-jack cable to a downstream device that is capable of supporting 12V triggering (12V DC via tip, ground via sleeve).

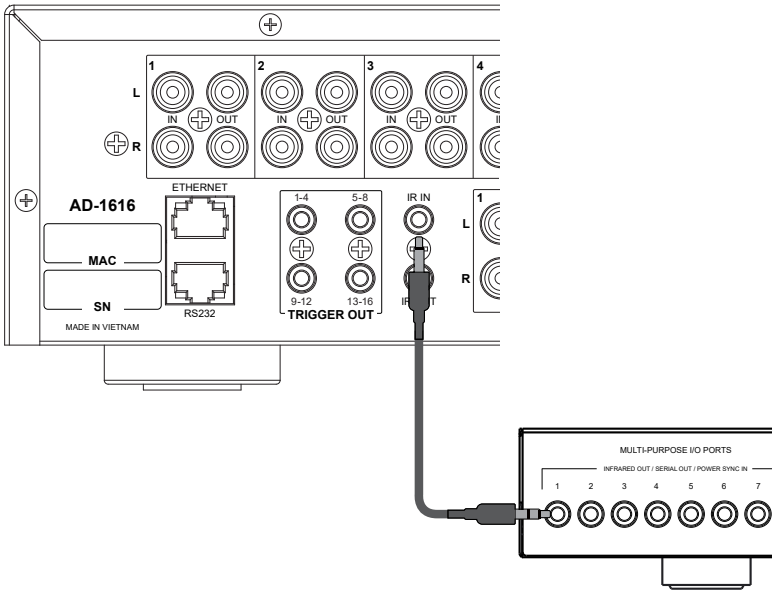


Music Streamer

IR In & Out

The AD-1616 matrix can receive IR input directly from an RTI processor or other 3rd party IR control device. Additionally, any received IR signals are relayed to the port labeled “IR Out” for use with an additional downstream matrix for concurrent control. Direct connection to an RTI processor requires the use of a specialized cable (not included) that has a 3.5mm stereo mini-jack on one end (connects to the processor) and a 3.5mm mono mini-jack on the opposite end (Connects to the matrix).

⚠ Please note that the RTI platform and products utilize 12V IR signaling levels for operation.



RTI Control Processor

1. Connect the male mono connector (tip and sleeve) of the 3.5mm mono/stereo mini-jack cable to the port labeled “IR In” on the matrix.
2. Connect the male stereo connector (tip, ring , and sleeve) on the opposite end of the 3.5mm mono/stereo mini-jack cable to the IR out port on a compatible RTI processor or other compatible 3rd party IR device.

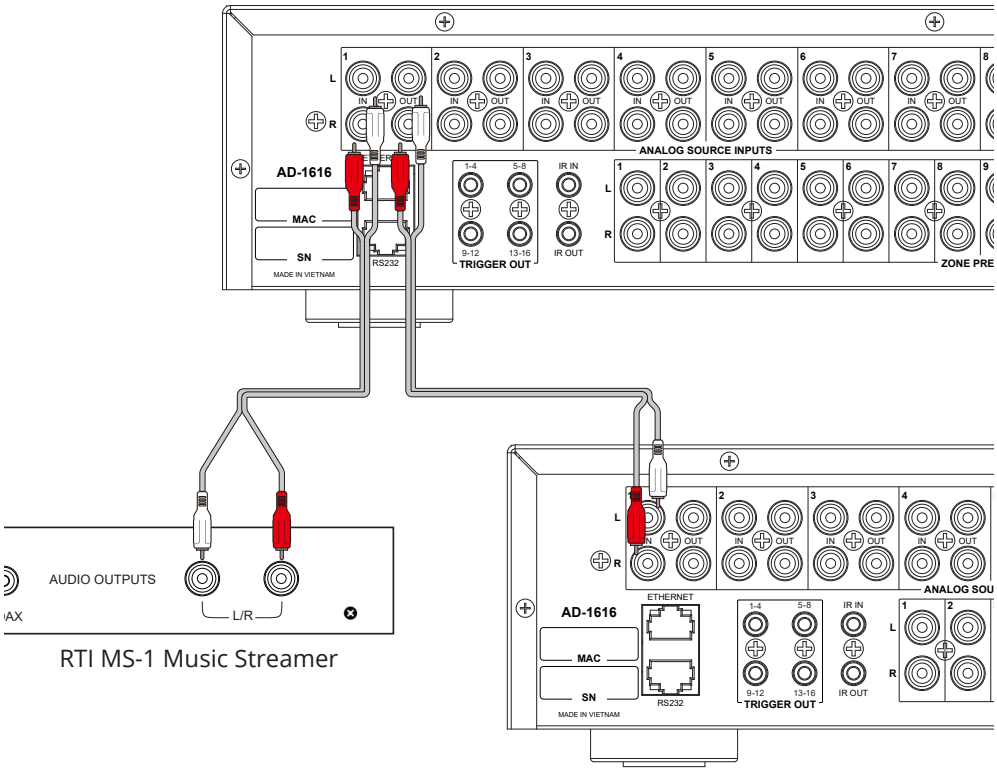
Source Audio Inputs

The AD-1616 matrix can accept both analog and digital audio sources for matrixing to analog audio pre-outs. The analog inputs have been designed for use with line-level audio sources. Digital inputs accept mono or stereo LPCM signals with a resolution up to 24-bit 192kHz.

Analog Audio Inputs

The AD-1616 analog inputs feature connectivity via standard RCA style connectors. This matrix can support both stereo and mono sources. Additionally, all analog audio inputs feature audio outputs that mirror the input source signals for use with additional downstream matrix or other external equipment.

1. Connect either one (mono) or both (stereo) RCA male connectors from one end of an RCA mono/stereo cable to the RCA input connectors (1-8) on the matrix.
2. Connect the audio connectors (e.g. RCA, stereo mini-jack, etc.) on the opposite end of the RCA cable to an appropriate line-level audio source.
3. Optionally, connect either one (mono) or both (stereo) RCA male connectors from one end of an RCA mono/stereo cable to the RCA output connectors (1-16) on the matrix to the analog audio inputs on a downstream AD-1616 matrix using steps 1 and 2 above.



RTI MS-1 Music Streamer

Digital Audio Inputs

The AD-1616 digital audio inputs support either a S/PDIF optical (TOSLINK) or coaxial connector. Additionally, digital audio inputs 9 and 10 feature audio outputs that mirror the input source signals for use with additional downstream matrix or other external equipment.

1. Connect the male connector from one end of an optical or coaxial digital audio cable to one of the optical or coaxial digital audio input ports (9-16) on the matrix.
2. Connect the male connectors on the opposite end of the optical or coaxial digital audio cable to an appropriate digital line-level audio source.
3. Optionally, connect the male connector from one end of an optical or coaxial digital audio cable to one of the optical or coaxial digital audio output ports (9-10) on the matrix to the digital audio inputs on a downstream AD-1616 matrix using steps 1 and 2 above.

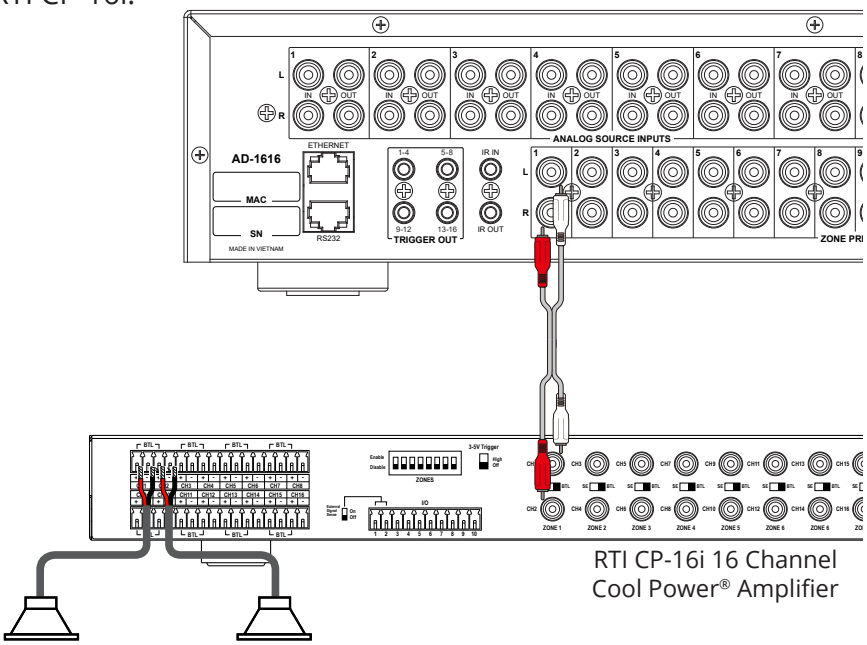
Zone Pre-Out Outputs

The AD-1616 matrix is designed for use with an external amplifier. The outputs are presented as RCA style connectors and feature variable gain/volume control.

Stereo Mode

The AD-1616 features 16 stereo pairs of analog audio outputs. By default, each matrix is set to stereo operation mode whereby channels are separated into left and right designations.

1. Connect either one (mono) or both (stereo) RCA male connectors from one end of an RCA mono/stereo cable to the RCA output connectors (1-16) on the matrix.
2. Connect the audio connectors (e.g. RCA, stereo mini-jack, etc.) on the opposite end of the RCA cable to an amplifier, e.g. RTI CP-16i.



RTI CP-16i 16 Channel
Cool Power® Amplifier

Web Interface

The Web based GUI (graphical user interface) designed for the AD-1616 matrix allows for all administrative and configuration options for successful deployment and operation. It can be accessed through a modern browser, e.g. Chrome, Safari, Firefox, etc.

To access the Web GUI page:

1. To achieve quick and easy access to the Web GUI of the matrix, please ensure that a Local Area Network (LAN) with access to a DHCP server is available. This will ensure valid IP address assignment for communication between a local PC and the matrix.
2. Connect the Ethernet port on the matrix to a local area network using a CAT-5e/6/6a cable and instructions in the Connections portion of this manual.
3. Connect a local PC to the same network as the matrix.
4. The matrix can be accessed using its mDNS address. Please Input the following URL into the browser and press Enter:

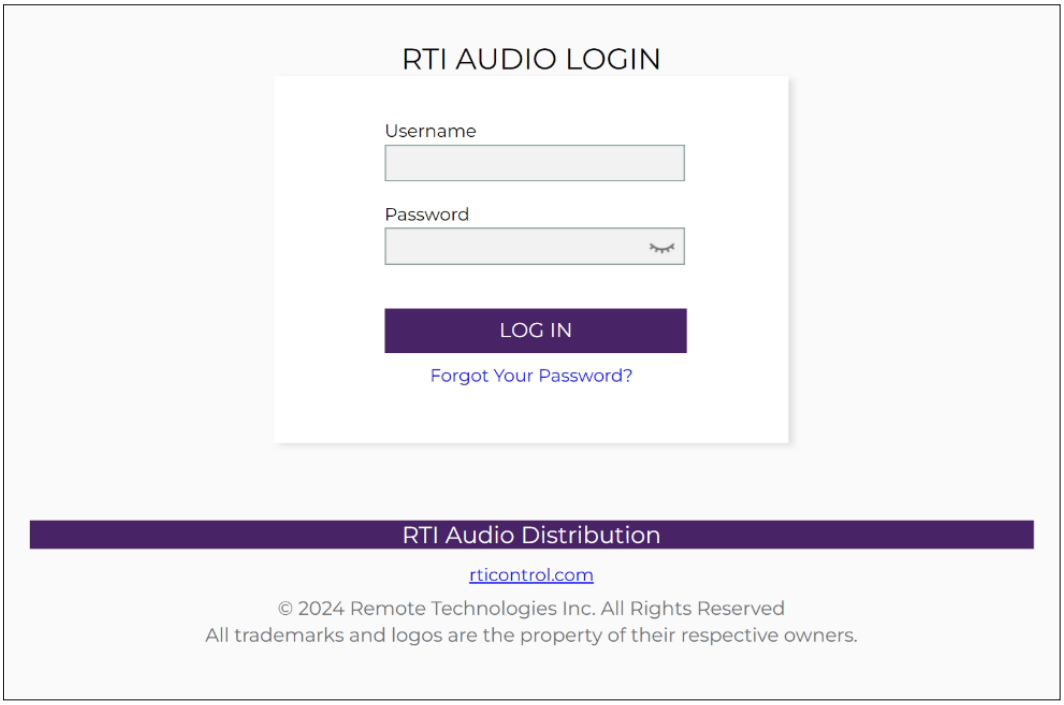
   mDNS URL: _AD-1616_XXXXXX.local

   The “XXXXXX” in the URL is the last 3 pairs or 6 digits of the matrix’s MAC address which can be found on either the back of the unit, or on the Quick Start Guide included with the product. For example, if the MAC address on an AD-1616 is AA:BB:CC:DD:EE:FF, the mDNS address is “_AD-1616_DDEEFF.local”.

Note: The default IP mode for this device is DHCP.

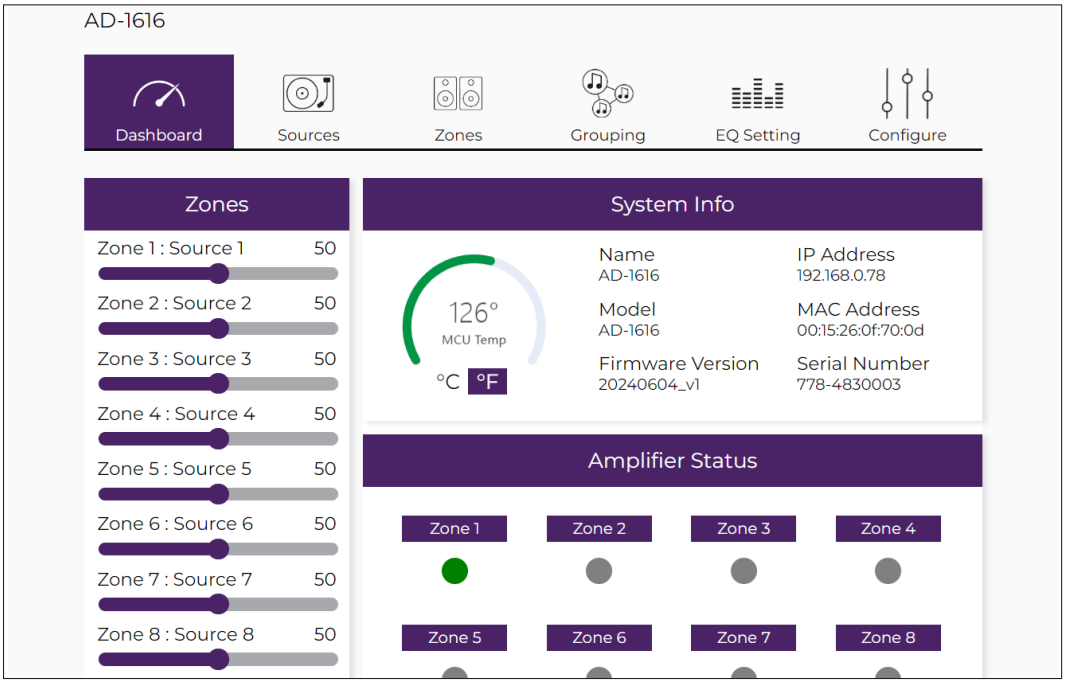
Alternately, if the IP address of the matrix is known, the address can be directly inserted into a browser’s address bar.

Login



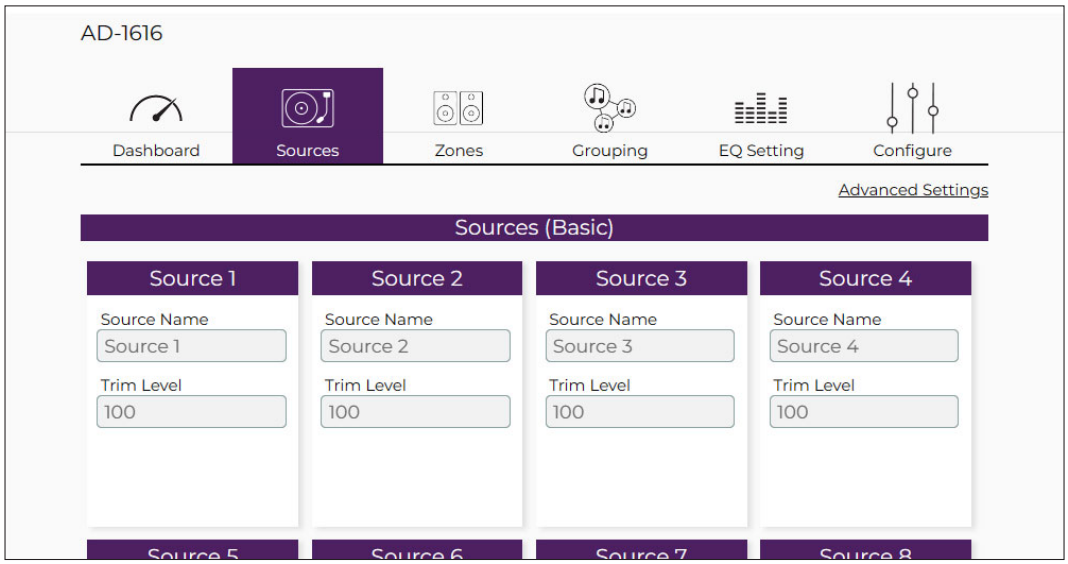
Option	Description
Username	Enter the username to access the WEB GUI. The default username is “admin”.
Password	Enter the password to access the WEB GUI. The default password is “RTI123”.
Link	Use this link to access the RTI website. This appears on every page of the WEB GUI.

Dashboard



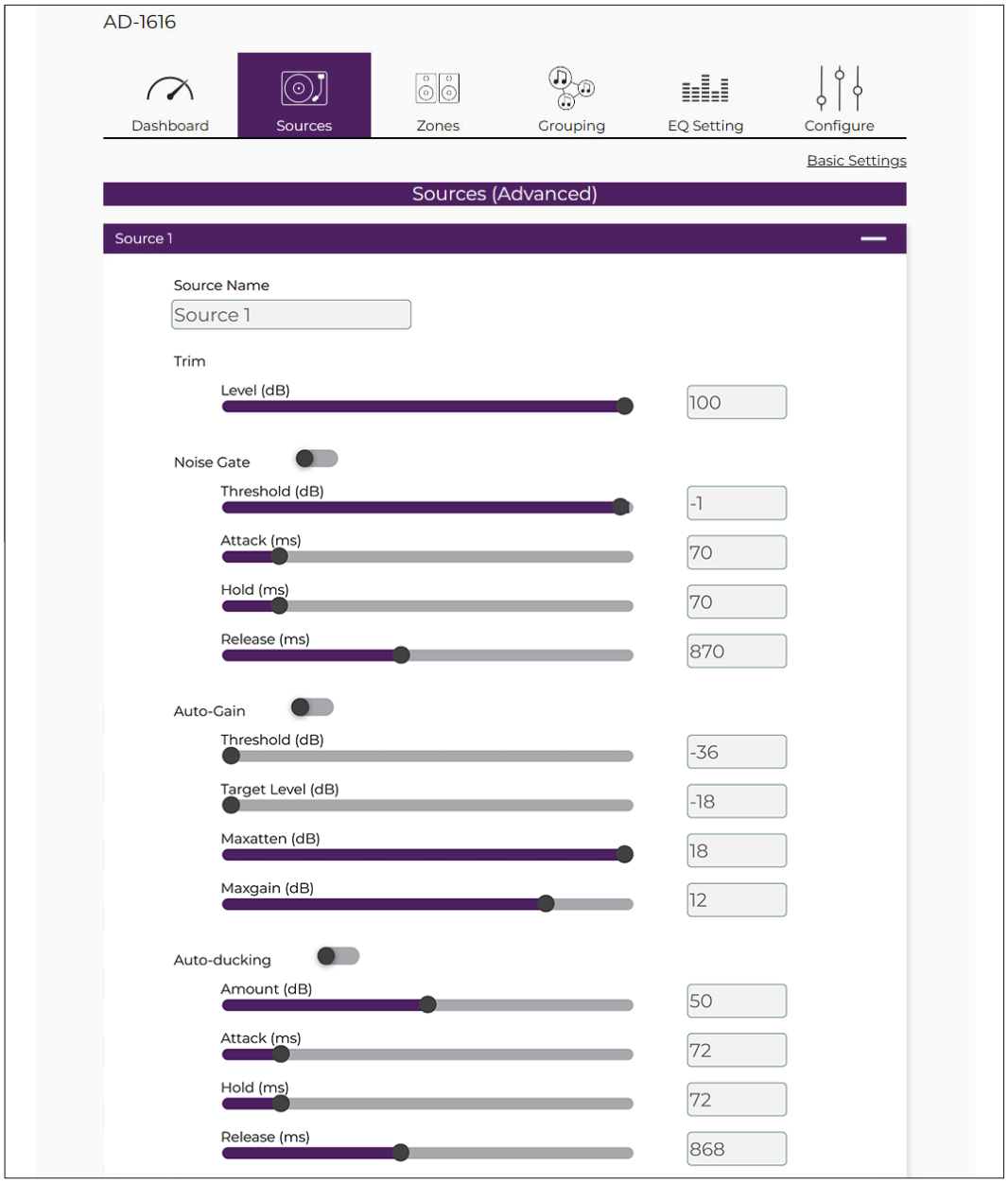
Option	Description
Zones	Displays all zones along with their assignable names and numeric volume levels (0-100). The volume can be adjusted using the sliding bar.
System Info	The System Info section displays the following: • Temperature: The color-coded radial gauge displays the current internal temperature and indicates via color whether the matrix is operating within acceptable (green) or unacceptable (red) limits. Click on the C or F to change the unit to either Celsius or Fahrenheit. • Name: Displays the name given to the matrix (modifiable elsewhere in the GUI). • Model: This is the model of the matrix. • Firmware Version: Displays the current firmware version. • IP Address: Displays the matrix's IP address. • MAC Address: Displays the matrix's MAC address. • Serial Number: Displays the matrix's serial number.
Matrix Status	This section is designed to visually show the user when a particular zone(s) is in operation. • Zones in operation will display a green indicator. • Zones that are not in operation will display a gray indicator.

Sources (Basic)



Option	Description
Source Name	The source name can be modified to help identify or define a source. The name entered here will be visible in various locations of the GUI where sources are referenced.
Trim Level	The audio level of each incoming source can be trimmed down and adjusted to reduce the input level of overdriven sources, or for personal tastes. Input a value between 0 and 100. Optionally, the keyboard up and down arrow keys can be used to increment and decrease each value by 1 between 0 and 100. Optionally, the keyboard up and down arrow keys can be used to increment and decrease each value by 1.
Source Type	Each matrix has a limited number of digital inputs that can be assigned. These digital connections are available for inputs 9-16 on the AD-1616. For these source inputs, users can choose between the following options: • Analog: Uses the assigned input's analog input. • Optical: Uses the assigned input's optical TOSLINK style S/PDIF input. • Coaxial: Uses the assigned input's coaxial RCA style S/PDIF input.

Sources Advanced

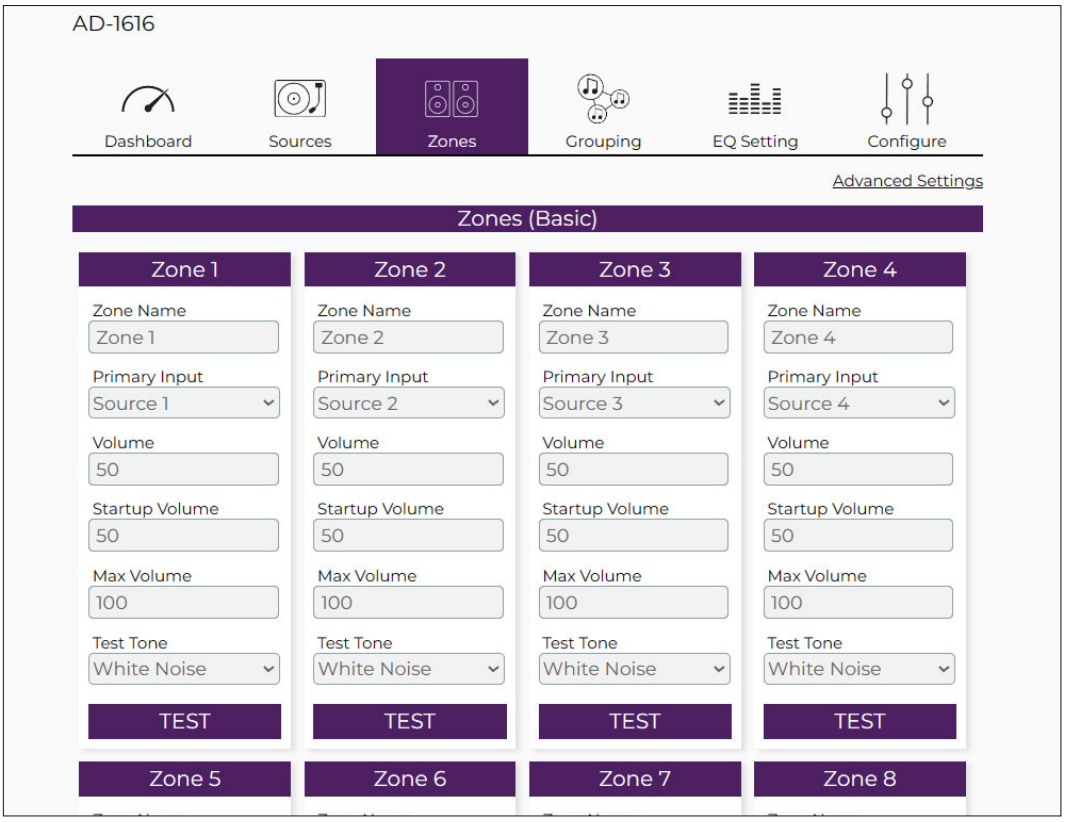


Option	Description
Sources	Each source is displayed with user definable options. **Please note that Trim and Auto-Ducking are available for all sources, while Noise Gate and Auto-Gain are only available for source 1 on AD-1616.**
Source Name	The source name can be modified to help identify or define a source. The name entered here will be visible in various location in the GUI where sources are referenced.

Option	Description
Trim Level	The audio level of each incoming source can be trimmed down and adjusted to reduce the input level of overdriven sources, or for personal tastes. Input a value between 0 and 100. Optionally, the keyboard up and down arrow keys can be used to increment and decrement each value by 1.
Noise Gate	Noise Gate: Eliminate sounds below a set sound level, commonly used with microphones to minimize unwanted background noise. • Enable/Disable: Enables or disables the noise gate. • Threshold: Set the threshold (dB) where audio below the set value will close the noise gate. Values are between -96 to 0. • Attack: Set the amount of time (ms) it takes to fully open the noise gate once audio has been detected and is above the threshold value. The noise gate will be opened linearly (faded up) across the time value set. Values are between 10 to 500 • Hold: Set the minimum amount of time (ms) that the audio source needs to be below the threshold value for the noise gate to be released. Values are between 10 to 500. • Release: Set how slowly (ms) the noise gate is closed once audio has fallen below the threshold and the hold time value is reached. The noise gate will be closed linearly (faded down) across the time value set. Values are between 10 to 2000.
Auto-Gain	Auto-Gain: Automatically amplifies (increases) or attenuates (decreases) the audio volume level of a source's input signal to achieve a comfortable audio listening level. This is separate from trim that reduces the entire audio signal level. • Enable/Disable: Enables or disables the auto-gain. • Threshold: Set the minimum threshold (dB) level for an audio signal that is needed to activate amplification. This ensures that amplification is not applied to noise when there is no active audio. Values are between -36 to -20. • Target Level: Set the target audio level (dB) that auto-gain will use to determine when to activate amplification or attenuation. Values are between -18 to -3. • Max Attenuation: Sets the maximum level of attenuation (dB) that can be removed from a source audio signal when it is above the target level. Values are between 11 to 18. • Max Gain: Sets the maximum level of amplification (dB) that can be added to a source audio signal when it is below the target level and above the threshold. Values are between 0 to 15.

Option	Description
Auto-Ducking	Applies a ducking circuit that will temporarily reduce the audio level of the primary audio source, allowing the assigned secondary source audio to take focus. This is a feature that is useful for when an audio source only requires a momentary interruption, such as PA announcements or a doorbell chime. Another useful function for this would be to connect a voice assistant device, such as an Amazon Echo, Apple Homepod, or Google Home to a source input and use this as the secondary audio source that can interrupt a zone's audio output whenever the virtual assistant is active, thus allowing for seamless voice assistant integration into a distributed audio system. • Enable/Disable: Enables or disables auto-ducking. • Amount: Set the amount of volume attenuation (dB) to be applied to the primary audio source when the auto-ducking is triggered/active. Values are between 0 to 100. • Attack: Set the time (ms) it takes for the volume of the primary audio source to reach the target amount of attenuation when auto-ducking is triggered. The primary audio source volume will be reduced linearly (faded down) across the entire time value set. Values are between 10 to 500. • Hold: Set the minimum amount of time (ms) that the assigned secondary source needs to be inactive for auto-ducking to release the primary audio source. Values are between 10 to 500. • Release: Set the time (ms) auto-ducking will take to increase the primary audio source to its original audio level once the assigned secondary source is inactive. The audio gain of the primary audio source will be linear (faded up) across the time value set. Values are between 10 to 2000.

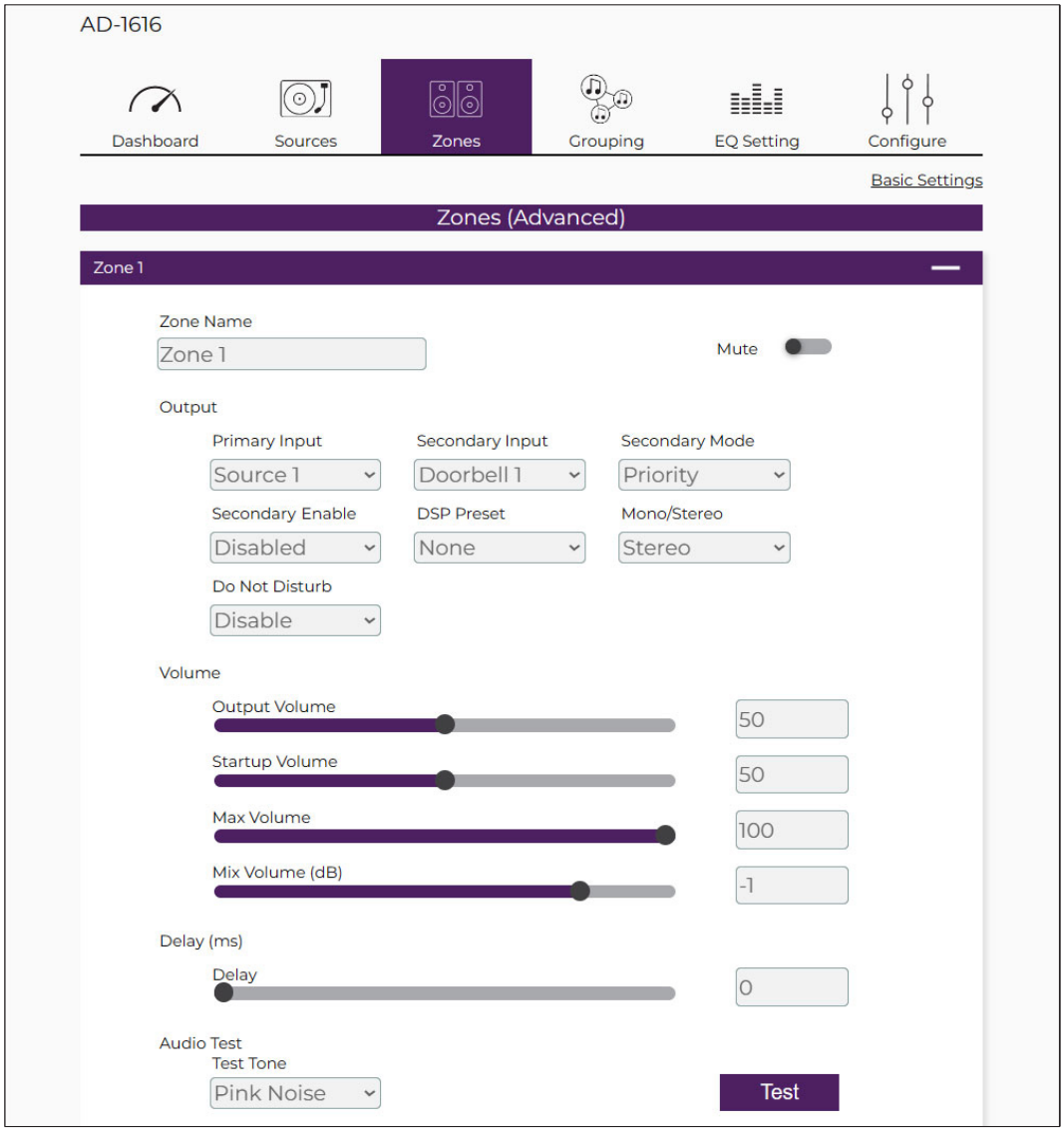
Zones (Basic)



Option	Description
Zones	Each zone is displayed with user definable options.
Zone Name	The zone name can be modified to help identify or define a zone. The name entered here will be visible in various locations of the GUI where zones are referenced.
Primary Source	Selects the primary audio source from the available sources in a drop-down list. Additionally, a zone can also be set to “Off” which will disable any audio output and puts the zone into a standby state.
Volume	Sets the zone volume level (relative) to a value from 0 -100.
Startup Volume	Sets the startup volume level (relative) of the zone when the matrix or zone is powered on. Values are between 0 to 100.

Option	Description
Max Volume	Set the max allowable volume level (relative) of a zone that can be achieved via all interfaces and APIs. Volume levels that are attempted to be set higher than this value will defer to the maximum level set here and an error will be shown in the GUI.
Test Tone	Various test tones can be enabled per zone that are an excellent tool for uses such as testing audio connectivity and signal path, setting/adjusting volume levels, or properly aiming directional speakers, to name a few. The following noise options are available: • White Noise: Contains audio noise with an equal amount of audio intensity, not loudness or energy, across the entire frequency spectrum. • Pink Noise: Contains noise with an unequal amount of audio energy with lower frequencies having a higher intensity due to the reduction of amplitude that is linearly applied as frequencies increase. • Gray Noise: Contains noise with a perceived amount of equal loudness across the frequency spectrum based on the human auditory range, however this noise is presented as a general approximation and will be perceived differently as each person's hearing ability varies.
Test	Press the test button to begin emitting the selected noise out of a zone. Press this button again to discontinue the noise.

Zones (Advanced)



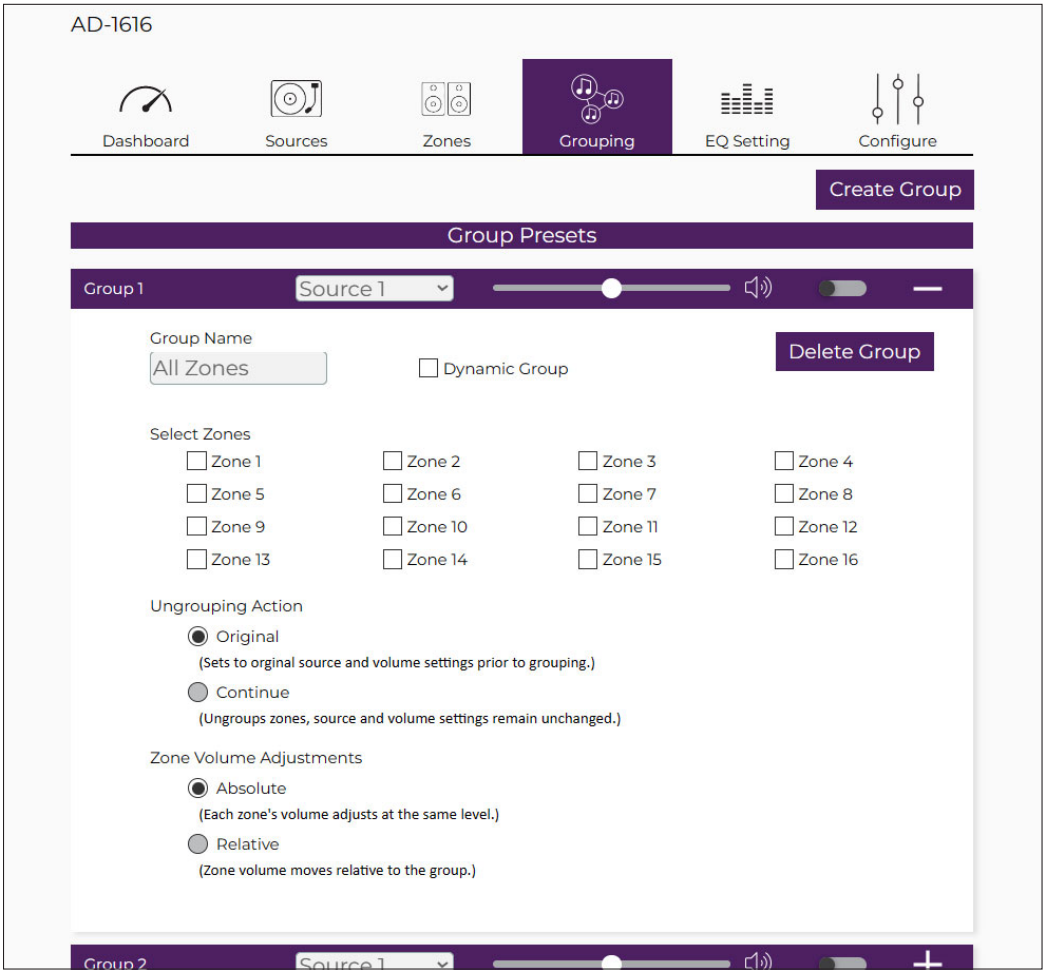
Option	Description
Zones	Each zone is displayed with user definable options.
Zone Name	The zone name can be modified to help identify or define a zone. The name entered here will be visible in various locations of the GUI where zones are referenced.
Mute	Sets muting for a zone.

GUI Elements	Description / Options
Primary Source	Selects the primary audio source from the available sources in a drop-down list. Additionally, a zone can also be set to “Off” which will disable any audio output and puts the zone into a standby state.
Secondary Source	Selects the secondary audio source from the available sources and doorbell chimes in a drop-down list. Available options are: • Sources: 1 through 8 on the AD-1616. • Doorbell 1: A generic audio chime sound that can be activated using an external trigger via the API or control interfaces. • Doorbell 2: A second generic audio chime sound that can be activated using an external trigger via the API or control interfaces. Useful in large residences/facilities with more than one point of entry and doorbell ringer. • Doorbell 1 & 2: A generic audio chime notification that activates when either Doorbell 1 or 2 is triggered. Useful for zones that need to be notified when any Doorbell ringer is triggered.
Secondary Mode	This option sets the operating mode for the secondayr source. Use this feature to set how the secondary source interacts with the primary source when it is activated, or audio is detected. • Priority: When audio on the secondary source is detected, it will take priority over the primary source completely, effectively muting the primary source and outputting secondary source only. • Mix: Both the primary source and secondary source are concurrently active, summing their signals together. The summed audio can have its volume adjusted using the setting in the next section. • Auto-Ducking: When this mode is active, the auto-ducking parameters set in the advanced source settings will take effect, effectively lowering the primary audio volume to allow the secondary source to take focus when audio is detected and meets the threshold parameters.
Secondary Enable	This option sets the operational state of a secondary source for a particular zone. This function is provided as an easy means to disable and enable the availability of the secondary source. • Enable: Enables Secondary Source. • Disable: Disables Secondary Source.

Option	Description
DSP Preset	This option applies a custom DSP preset that is created and set in the EQ Settings section of this GUI. The multi-band equalizer can be used for a number of purposes, from adjusting the sound quality to account for an output's response, to setting personal preferences for listening to audio in a particular style, or to set high/low-pass filters for creating bi-amping or subwoofer setups. Choose from up to 9 saved presets.
Mono/Stereo	Set this option to choose what listening mode each zone will use. • Stereo: In this mode, audio outputs are treated as a pair with the Left and Right outputs of a zone are routed specifically to the Left and Right audio inputs of a source. If a source only has a single Left or Right connection to this matrix, only the respective Left or Right outputs will be active. • Mono: In this mode, the Left and Right audio inputs from a source are summed and output from both the Left and Right outputs of a zone.
Do Not Disturb	This feature is complimentary to the grouping capabilities of this matrix. When zones are grouped with others in the Grouping section of this GUI, it may be desirable to temporarily exclude one or more zones from having its audio source or volume change inadvertently due to its group affiliations. For example, if all zones are part of a" Whole Home" group that links all zones together to listen to the same audio source at specific volume levels, all zones will switch to the specified source and have their volume levels adjusted to the group's setting when the "Whole Home" group is activated. If a user in one of these zones are actively listening to a source and does not wish to be disturbed, the Do Not Disturb option can be enabled that will temporarily exclude that zone from being affected by any group activation that it is normally a part of, thus allowing the currently routed source and volume to remain unaffected for undisturbed listening. • Enable: Enables Do Not Disturb mode and will not allow a zone from taking part in any group actions. • Disable: Disables Do Not Disturb mode and allows a zone to take part in any group actions that it is currently assigned to.
Volume	Sets various volume parameters based on the settings for the primary and secondary sources in the section above. • Output Volume: Sets the zone volume level (relative) to a value from 0 -100. • Startup Volume: Sets the startup volume level (relative) of the zone when the matrix or zone is powered on.

Option	Description
Volume	• Max Volume: Set the max allowable volume level (relative) of a zone that can be achieved via all interfaces and APIs. Volume levels that are attempted to be set higher than this value will defer to the maximum level set here. • Mix Volume (dB): Applies a volume reduction for the summed audio when mixing the primary and secondary sources. This is needed when summing 2 sources that when combined can potentially overdrive the audio volume output.
Delay	This option will apply an audio delay (ms) on the output stage of the matrix that is useful to correct synchronization issues that can arise from mixing equipment in a solution. Audio synchronization issues can occur from audio and video sources that are processed separately or can be an issue when applying audio to multiple zones that are intended to work synchronously but destination devices (e.g. speakers) are located far enough away to suffer a delay due to sound travel. This option can be applied to tune systems for several different scenarios as desired. Values are between 0 – 50.
Audio Test	Various test tones can be enabled per zone that are an excellent tool for uses such as testing audio connectivity and signal path, setting/adjusting volume levels, or properly aiming directional speakers, to name a few. The following noise options are available: • White Noise: Contains audio noise with an equal amount of audio intensity, not loudness or energy, across the entire human range of hearing frequency spectrum. • Pink Noise: Contains noise with an unequal amount of audio energy with lower frequencies having a higher intensity due to the reduction of amplitude that is linearly applied as frequencies increase. • Gray Noise: Contains noise with a perceived amount of equal loudness across the frequency spectrum based on the human auditory range, however this noise is presented as a general approximation and will be perceived differently as each person's hearing ability varies. • Press the test button to begin emitting the selected noise out of each zone. Press this button again to discontinue the noise.

Grouping



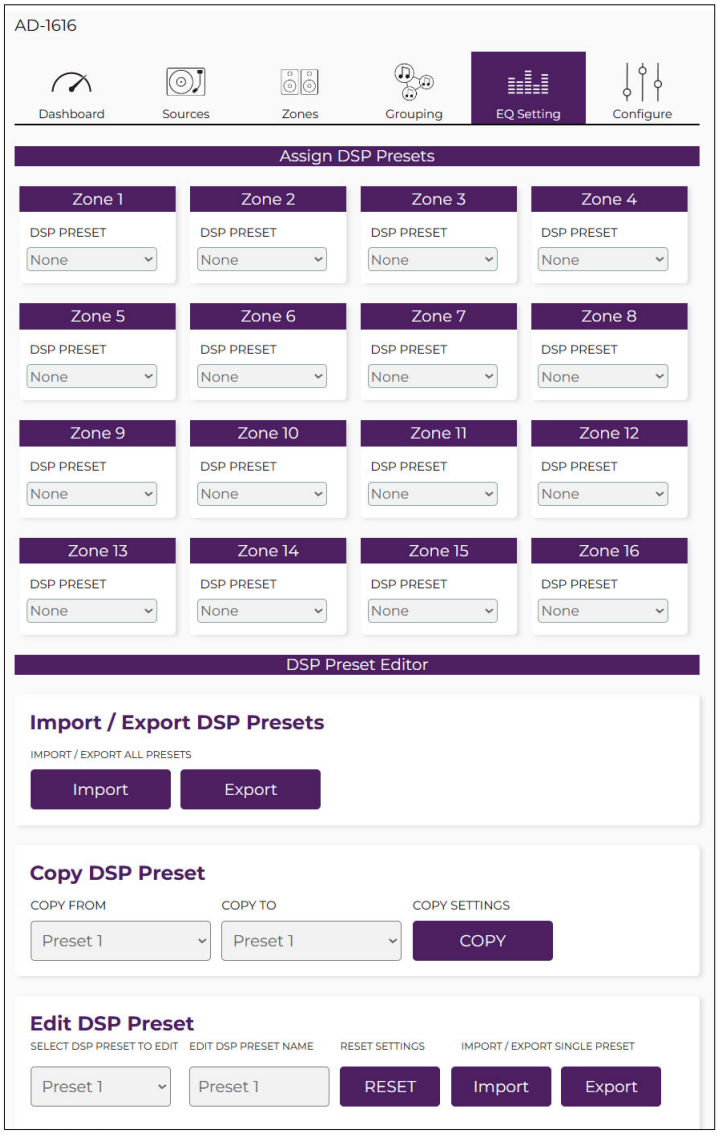
Option	Description
Group Presets	Grouping is a feature that will essentially tie the source routing and audio volume of multiple zones together. When a group is active, zones that are part of the active group will not be able to individually select their source. Each included zone in a group will be able to adjust their volume level depending on the group's Zone Volume Adjustments setting. This allows all zones in a group, as a whole, to have their source and volume settings managed in unison. This is useful for setting up scenarios where it is desirable to listen to a singular source across different zones for a unified listening experience. The most common example of this is a "Whole Home" or "Whole Venue" group where every speaker in an entire home or facility outputs the same audio source and the volume level of each

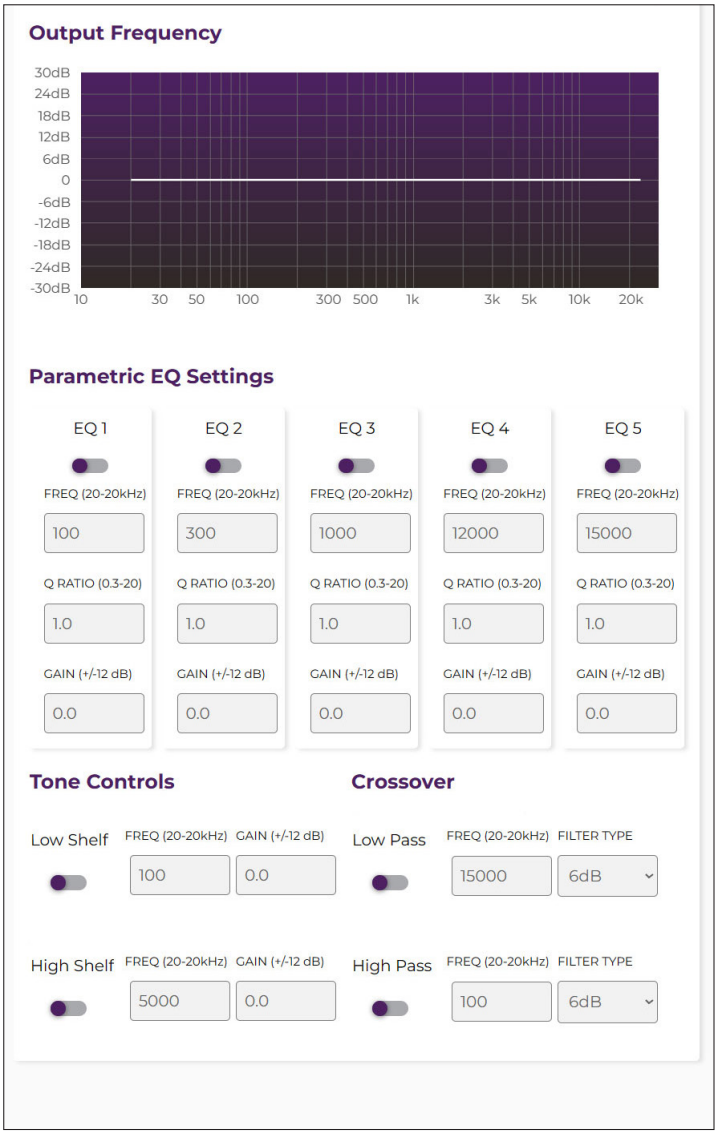
Option	Description
Group Presets	zone is set to a group level and then adjusted in tandem from a single volume control interface for easy sitewide control. • Please note that only 1 group can be active at any given time. Activating a group that is currently not active will immediately override any current group and settings that are active.
Create Group	Use this option to populate the section below with a customizable group preset. Each click of this button will create an additional group preset. A maximum of 8 group presets can be created and stored within the matrix's memory.
Group 1-8	Each group will have a section in the page that can be minimized and will contain parameters for modifying the group's properties. Each group is identified by a header row that contains the following: • Source Selection: The drop-down menu to the right of the group ID lists is used to select the source that is assigned to the group ID. • Volume Slider: To the right of the source selection drop-down is a volume slider that is used to set the group volume when the group is active. • Mute/Un-mute: The mute icon will display the current status of muting for the group. Press this icon to mute/un-mute the audio for the group when the group is active. • Enable/Disable Group: The group active toggle will enable/disable the group. • Minimize: Use the minimize bar to collapse/open a group to help declutter the page when multiple groups are present. Group properties are located below the group header and contains the following options: • Group Name: The group name can be modified to help identify or define a group. The name entered here will be visible in various locations of the GUI where groups are referenced. • Fixed Group: This option is only available for groups 1-4. When this option is selected the group will no longer be able to be modified externally via the API or changed when the group is active. When unchecked, and for groups 5-8, groups are dynamic and can be modified via the API to adjust the group zone assignments as desired even during operation or if the group is active. • Delete Group: Use this button to delete the group.

Option	Description
Group 1-8	• Select Zones: Click on each checkmark box to include it in the group. Zones that are included in the group will be switched to the selected source and volume properties set in this section when the group becomes active. Do Not Disturb can be enabled ad hoc as necessary even if the desired zone is part of an active group and will allow temporary omission from the group's source and volume setting changes. • Ungrouping Action: The current state of a zone (e.g. source selection and volume level) is saved to internal memory when a group is activated, therefore when the group is disabled these settings can be recalled or ignored when restoring a zone to its pre-grouping operating state. The options are as follows: Original: Recalls and applies the pre-group activation state (source and volume settings) of each zone within the group when it is disabled (ungrouped). Zones that are assigned to an active group but are set to Do Not Disturb mode will not be affected when that group is activated or deactivated. Continue: This option will keep the current source and volume settings that were active when the group was deactivated. This means that zone settings are not saved into memory when the group is activated, and once the zone is deactivated (ungrouped) all zones will continue with whichever source and volume settings were last active with the group, however each zone will revert to default functionality whereby they can change their source and volume levels without affecting any other zone. • Zone Volume Adjustments: There are 2 prevailing methods of affecting volume levels in unison across zones when they are grouped, and both are available here: Absolute: This method of unified volume control will set each zone to the same set level (0 to 100) when a group is activated. Volume adjustments to the group will affect all zones equally and in unison. Please note that in this mode, if a particular zone is regularly set to a lower or higher volume level than others due to a zone's affectual size, this method of volume control may be undesirable as the balance of sound across all grouped zones will be equal in power and may be perceived softer/louder in one zone versus another. In this case, it would be more appropriate to use the Relative mode.

Option	Description
Group 1-8	Relative: This method of unified volume control allows each zone to be set to individual volume levels that will retain their differential values when the group's volume is adjusted. For example, if zone 1 is set to a level of 50, and zone 2 is set to a level of 40, when the group's volume is increased by a value of 10, zone 1 will now be at volume level 60 and zone 2 will be at volume level of 50, thus each zone will retain their relative volume in reference to one another. This is the preferred method of volume adjustment when creating a grouped audio preset where the perceived volume of sound will be balanced across zones when physically moving from one to another or to keep the volume softer/louder in a desired zone. This setting can be adjusted as needed when a group is active to allow individual audio balancing/adjustment for each zone as needed or desired. • Zone Volume: This section will differ in content depending on the number of zones that are included in the group preset. Each group will be represented here with a volume slider and volume level (relative). When the Zone Volume Adjustments setting is set to Absolute, each zone volume level will be unavailable for adjustment and is only affected by the group volume slider in the group header at the top of the preset. When the Zone Volume Adjustments setting is set to Relative, each zone's volume level is adjustable, and when the group volume slider at the top of the preset is adjusted, each group's volume will move relative to one another. When an individual zone's volume is adjusted by a user, this change in volume is memorized and the relative level will be changed for all volume adjustments thereafter. The group's volume level that is displayed in the preset header will be represented by the volume level of the lowest zone number ID that is present in the group. If a zone is set to Do Not Disturb, it will not be adjustable from this interface and will be unavailable.

EQ Setting





Option	Description
EQ Setting	The EQ Setting tab is where DSP (Digital Signal Processing) presets can be generated and managed. The AD-1616 contains a 5-band parametric equalizer with additional tone and crossover controls that can be used to tune the output audio to achieve a particular sound profile or meet a specific function or application. Examples for employing these equalization settings are: • Adjusting the audio output to achieve a linear frequency response from a speaker.

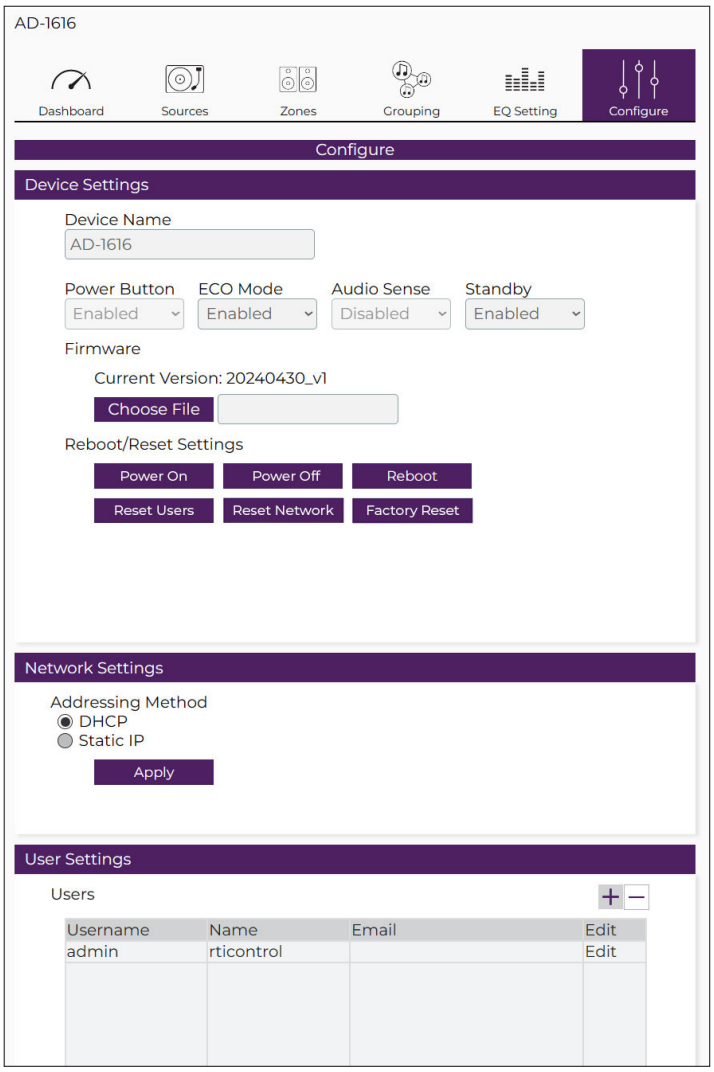
Option	Description
EQ Setting	• Implementing a low or high shelf to set the tone of the sound to have more bass or treble. • Setting a low or high pass filter to function as a crossover to bi-amp speakers or create a specific sub-woofer output. Users can create up to 9 DSP Presets that can be saved, copied, imported, or exported as needed.
Assign DSP Presets	Each zone can have a predefined preset assigned to it that will affect its output signal. Please note that the presets that are selected here are associated with the primary outputs of each zone. The secondary source assigned to a zone can have a DSP preset associated with it and can be set/managed in the Advanced Zone settings page of this GUI. • Use the DSP Preset dropdown box for each zone to select a DSP preset. Options are between None and DSP Presets 1 - 9. If a DSP preset has been saved with a Preset Name, that name will appear here rather than its numerical DSP ID.
DSP Preset Editor	This section contains all functions for setting and maintaining each DSP preset. Options are: • Import/Export DSP Preset: Use these options to import and export individual or all DSP presets for back-up or replicating settings on other RTI AD series of products. Import (All): Use the Import button under the Import/Export All Presets header to open a dialog box to select a DSP settings file that contains presets that will overwrite ALL DSP presets stored in this product. Please note that this action cannot be undone. The source file for this import process must be from the export (All) file from this or another similar RTI AD series audio product. Export (All): Use the Export button under the Import/Export All Presets header to open a dialog box to save a DSP settings file that contains ALL the presets stored in this product. This file can be used as a backup or saved for use with other RTI AD series products. Import (Single): The import action will require choosing a preset to overwrite prior to using the import action. Select a preset to edit using the dropdown box under the Edit DSP Preset header in the section below. Then, use the Import button under the Import/Export Single Presets header to open a

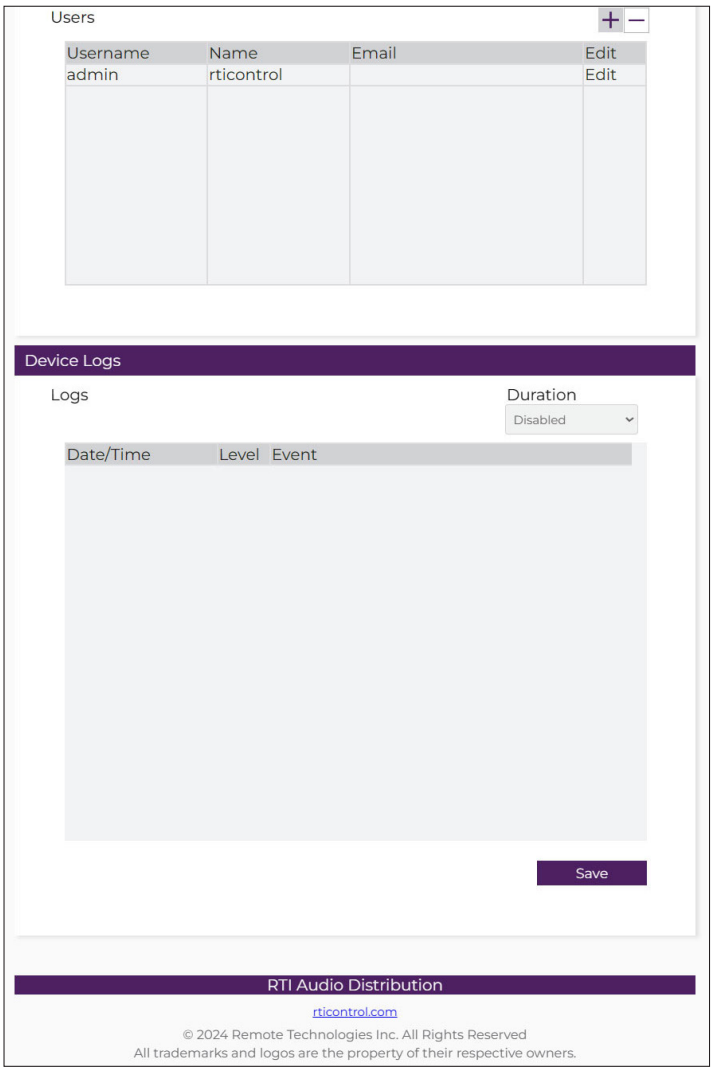
Option	Description
DSP Preset Editor	dialog box to select a DSP settings file that contains a single preset that will overwrite the selected preset. Please note that this action cannot be undone. The source file for this import process must be from the export (Single) file from this or another similar RTI AD series audio product. Export (Single): The export action will require choosing a preset to save prior to using the export action. Select a preset to edit using the dropdown box under the Edit DSP Preset header in the section below then use the Export button under the Import/Export Single Presets header to open a dialog box to save a DSP settings file that contains the selected preset. This file can be used as a backup or saved for use with other RTI AD series products. • Copy DSP Preset: Use this option to copy a selected DSP preset to another slot/position. This is useful for replicating an existing DSP preset and using it as a starting point for testing or adjusting settings without losing any currently saved DSP preset. To copy a DSP preset, first select an existing one from the dropdown box under the Copy From header. Next, select a DSP preset slot in the dropdown box under the Copy To header. The selected preset can be empty or contain an existing profile. Lastly, click on the COPY button to initiate the copy function. Please note that this action cannot be undone, so please make sure that all selectable options are correct before proceeding with the copy procedure. It may be worthwhile to export all presets as a backup to revert to previous settings if needed. • Edit DSP Preset – These settings are used to define a DSP preset by generating an equalization curve based on the settings of up to 5 frequency points along with their bandwidth and level (i.e. parametric equalization). Additionally, low/high shelf filters and low/high pass filters can also be added in conjunction with the parametric EQ to obtain a desired equalization outcome. Select DSP Preset to Edit: Select the DSP preset that is intended to be modified by choosing a preset profile from the dropdown box provided. Up to 9 profiles can be edited and saved. Edit DSP Name: It is recommended to give the DSP preset a name for easy identification. The name entered here will be visible in various locations of the GUI where DSP presets are referenced. Please note that the name is

Option	Description
DSP Preset Editor	automatically saved upon entry, so no saving action needs to be initiated by the user. Reset Settings: Use the Reset button to revert the equalization curve to a flat response, thereby deleting any setting adjustments that are associated with the currently selected DSP preset. Output Frequency: The visual graph displayed here represents the output frequency curve that is being generated based on the settings input in the Parametric EQ Settings, Tone Controls, and Crossover sections. The equalization range denotes an effective frequency range between 20Hz and 20kHz, with +/-12dB of adjustment for each band and filter type. Parametric EQ Settings: Use the options in this section to define up to 5 distinct equalization bands along with their associated parameters. These parameters include: - Frequency: Set the center frequency for the equalization point. Set between 20Hz and 20kHz. - Q Ratio: Set the width of the frequency band (ratio) that determines how narrow or wide the gain/level adjustment will affect the frequency curve. Set between 0.3 – 20. - Gain: The level of adjustment that is desired for the selected frequency. Set between -12dB to +12dB. Tone Controls: Tone control is implemented as low/high shelf filters that can either increase or decrease what is commonly referred to as “Bass” and “Treble” tones. Options are: - Low Shelf: Setting the low shelf filter will adjust all frequencies below a set point that can either be increased or decreased based on the gain setting Frequency: Set between 20Hz to 20kHz. Gain: Set between -12dB to +12dB. - High Shelf: Setting the high shelf filter will adjust all frequencies above a set point that can either be increased or decreased based on the gain setting Frequency: Set between 20Hz to 20kHz. Gain: Set between -12dB to +12dB.

Option	Description
DSP Preset Editor	Crossover: Crossover control is implemented as low/high pass filters that will split the frequency bands, cutting off frequencies above or below their set points. Options are: - Low Pass: Setting the low pass filter will decrease all frequencies above a set point and includes a per-octave roll-off filter. The filter type can be set to dictate how aggressive the slope decreases the amplitude of the frequencies above the set point. Frequency: Set between 20Hz to 20kHz. Filter Type: Set to 6dB, 12dB, 18dB, or 24dB - High Pass: Setting the high pass filter will decrease all frequencies below a set point and includes a per-octave roll-off filter. The filter type can be set to dictate how aggressive the slope decreases the amplitude of the frequencies below the set point. Frequency: Set between 20Hz to 20kHz. Filter Type: Set to 6dB, 12dB, 18dB, or 24dB

Configure





Option	Description
Configure	The Configure page is used to manage important operational functions of the matrix. Settings such as the global device name, IP configuration, firmware management, and reboot functions are found here.
Device Name	The device name can be modified to help identify this product. The name entered here will be visible in various locations of the GUI where the device name is referenced.
Power Button	The feature manages access to the front panel power button that can be used to allow/disallow the use of this button to control the on and off, or standby, states of the matrix.

Option	Description
Power Button	The feature manages access to the front panel power button that can be used to allow/disallow the use of this button to control the on and off, or standby, states of the matrix. • Enabled: Allows access to the front panel power button. When enabled, power can be managed by the front panel button and API commands. • Disabled: Disallows access to the front panel power button. When disabled, power can only be managed by API commands.
ECO Mode	The ECO mode feature can be enabled and will put the matrix in a completely OFF state when the matrix is turned off. When this feature is disabled, the matrix will be put into a normal standby state that powers down major aspects of the matrix but leaves the TCP/IP and other control interfaces energized when the matrix is turned off. When ECO mode is disabled, the standby state ensures a quicker start-up time in comparison to the ECO mode enabled state. Please note that matrix will consume more power when this feature is disabled, and the matrix is powered off than when this feature is enabled.
Audio Sense	The audio sense feature will automatically power on the matrix when any source audio signal is detected. • Enabled: Audio sense is enabled and will. Power on the matrix when audio is sensed on any of the source inputs. • Disabled: Audio sense is ignored, and the matrix can only be powered on using the power button or API commands.
Standby	The standby feature will turn the unit off (please see the ECO mode above for the power state when placed into standby) after 15 minutes have elapsed without any audio being detected on any inputs.
Firmware	This section of the configure page is dedicated to managing the hardware and software firmware for the matrix. The current version is noted. • Choose File: Clicking on this button will open a dialog box to select a firmware file. Once selected, a submit button will appear. • Submit – Once the submit button is pressed, the unit will begin the firmware update process which can take up to 5 minutes.
Power/Reboot/ Reset Settings	Use options in this section to control the power state, reboot or reset different aspects of the matrix. Options include: • Power On: Use this button to power on the matrix when it is in the Off/ Standby state. • Power Off: Power off the matrix.

GUI Elements	Description / Options
Power/Reboot/ Reset Settings	• Reboot: Use this button to reboot the matrix. This will not change or reset any functions or features of the matrix and current settings are retained through a reboot process. • Reset Users: Use this button to reset all saved users and their access levels and revert to the factory default admin account only. • Reset Network: Use this button to factory reset the network settings. The default for the network uses the DHCP addressing method. • Factory Reset: Use this button to return the unit to its factory default settings. Please note that this is a complete reset of all features, functions, users, and network settings. This process cannot be undone.
Network Settings	Use these settings to set the network addressing method, along with their relevant settings. Changing settings in this section will affect the IP address that hosts this web interface, as well as the IP address that is used by external devices that use the TCP/IP interface for control of this unit via API commands. A reboot is necessary for these changes to take effect. • DHCP: This is the default IP addressing method. This requires a DHCP server to be available on the same network that the matrix is connected to. If a DHCP server is not available, the matrix will assign its own random address. • Static IP: When this IP addressing method is selected, the user must input the IP address, subnet address, and gateway address that is needed to operate on a private network segment. Please review and note all settings before saving as an incorrect or forgotten setting will make access and/or recovery to the matrix's GUI or control interfaces difficult to achieve.
Users	The Users section is provided that will allow the addition of multiple user accounts that can have access to either the operational or administrative features of this matrix.
Device Logs	Device logs capture information and events that are useful when troubleshooting issues.

Safety Suggestions

Read and Follow Instructions
Read all safety and operating instructions before operating the unit.

Retain Instructions
Keep the safety and operating instructions for future reference.

Heed Warnings
Adhere to all warnings on the unit and in the operating instructions.

Accessories
Only use attachments/accessories specified by the manufacturer.

Heat
Keep the unit away from heat sources such as radiators, heat registers, stoves, etc., including amplifiers that produce heat.

Power
Unplug this apparatus during lightning storms or when unused for long periods of time.

Power Sources
Connect the unit only to a power supply of the type described in the operating instructions, or as marked on the unit.

Power Sources
Connect the unit only to a power supply of the type described in the operating instructions, or as marked on the unit.

Power Cord Protection
Route power supply cords so that they are not likely to be walked on or pinched by items placed on or against them, paying particular attention to the cord plugs at power receptacles and at the point at which they exit from the unit.

Water and Moisture
Do not use the unit near water—for example, near a sink, in a wet basement, near a swimming pool, near an open window, etc.

Object and Liquid Entry
Do not allow objects to fall or liquids to be spilled into the enclosure through openings.

Servicing
Do not attempt any service beyond that described in the operating instructions. Refer all other service needs to qualified service personnel.

Damage Requiring Service
The unit should be serviced by qualified service personnel when:

- The power supply cord or the plug has been damaged.
- Objects have fallen or liquid has been spilled into the unit.
- The unit has been exposed to rain.
- The unit does not appear to operate normally or exhibits a marked change in performance.
- The unit has been dropped or the enclosure has been damaged.

Cleaning

To clean this product, lightly dampen a lint-free cloth with plain water or a mild detergent and wipe the outer surfaces.
NOTE: Do not use harsh chemicals as damage to the unit may occur.

Federal Communications Commission Notice

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the device.

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

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

1. This device may not cause harmful interference.
2. This device must accept any interference received including interference that may cause undesired operation.

Industry Canada Compliance Statement

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received including interference that may cause undesired operation.

Cet appareil est conforme avec Industrie Canada exempts de licence standard RSS (s). Son fonctionnement est soumis aux deux conditions suivantes:

1. Ce dispositif ne peut causer des interférences nuisibles.
2. Cet appareil doit accepter toute interférence reçue y compris des interférences qui peuvent provoquer un fonctionnement indésirable.

Declaration oF Conformity (DoC)

The Declaration of Conformity for this product can be found on the RTI website at:
www.rticontrol.com/declaration-of-conformity

Contacting RTI

For news about the latest updates, new product information, and new accessories, please visit our web site at: www.rticontrol.com
For general information, you can contact RTI at:

Remote Technologies Incorporated
5775 12th Ave. E Suite 180
Shakopee, MN 55379
Tel. +1 (952) 253-3100
info@rticontrol.com

Service & Support

If you are encountering any problems or have a question about your RTI product, please contact RTI Technical Support for assistance (see the Contacting RTI section of this guide for contact details).

RTI provides technical support by telephone or e-mail. For the highest quality service, please have the following information ready:

- Your Name
- Company Name
- Telephone Number
- E-mail Address
- Product model and serial number (if applicable)

If you are having a problem with hardware, please note the equipment in your system, a description of the problem, and any troubleshooting you have already tried.

Please do not return products to RTI without return authorization.

Limited Warranty

RTI warrants new products for a period of three (3) years (excluding consumables such as rechargeable batteries which are warrantied for one (1) year) from the date of purchase by the original purchaser (end user) directly from RTI / Pro Control (herein referred to as "RTI"), or an authorized RTI dealer.

Warranty claims may be initiated by an authorized RTI dealer using the original dated sales receipt or other proof of warranty coverage. In the absence of the receipt of purchase from the original dealer, RTI will provide warranty coverage extension of six (6) months from the date code of the product. Note: RTI warranty is limited to the provisions set forth in this policy and does not preclude any other warranties offered by third parties who are solely responsible for those other warranties.

Except as specified below, this warranty covers defects in product material and workmanship. The following are not covered by the warranty:

- Product purchased via unauthorized sellers or internet sites will not be serviced- regardless of purchase date.
- Damages caused by accident, misuse, abuse, neglect or acts of God.
- Cosmetic damage, including, but not limited to, scratches, dents and normal wear and tear.
- Failure to follow instructions contained in the Product Installation Guide.

- Damages due to products used in an application or environment other than that for which it was intended, improper installation procedures or adverse environmental factors such as incorrect line voltages, improper wiring, or insufficient ventilation.
- Repair or attempted repair by anyone other than RTI and Pro Control or authorized service partners.
- Failure to perform recommended periodic maintenance.
- Causes other than product defects, including lack of skill, competence or experience of user.
- Damage due to shipment of this product (claims must be made to the carrier).
- Altered unit or altered serial number: defaced, modified or removed.

RTI Control is also not liable for:

- Damages caused by its products or for failure of its products to perform, including any labor costs, lost profits, lost savings, incidental damages, or consequential damages.
- Damages based upon inconvenience, loss of use of the product, loss of time, interrupted operation, commercial loss, any claim made by a third party or made on behalf of a third party.
- Loss of, or damage to, data, computer systems or computer programs.

RTI's liability for any defective product is limited to repair or replacement of the product, at the sole discretion of RTI. In cases where the warranty policy conflicts with local laws, the local laws will be adopted.

Disclaimer

The information contained in this document is subject to change without notice. Remote Technologies Incorporated shall not be liable for errors or omissions contained herein or for consequential damages in connection with the furnishing, performance, or use of this guide.

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