



Axon DBU

Dante™, Bluetooth®, USB Audio
Connectivity Interface



User Manual

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IMPORTANT SAFETY INSTRUCTIONS

The symbols below are internationally accepted symbols that warn of potential hazards with electrical products.



This symbol, wherever it appears, alerts you to the presence of un-insulated dangerous voltage inside the enclosure -- voltage that may be sufficient to constitute a risk of shock.



This symbol, wherever it appears, alerts you to important operating and maintenance instructions in the accompanying literature. Please read the manual.

1. Read these instructions.
2. Keep these instructions.
3. Heed all warnings.
4. Follow all instructions.
5. Do not use this apparatus near water.
6. Clean only with a dry cloth.
7. Do not block any ventilation openings. Install in accordance with the manufacturer's instructions.
8. Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.
9. Do not defeat the safety purpose of the polarized or grounding-type plug. A polarized plug has two blades with one wider than the other. A grounding type plug has two blades and third grounding prong. The wider blade or the third prong is provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.
10. Protect the power cord from being walked on or pinched particularly at plugs, convenience receptacles, and the point where they exit from the apparatus.
11. Only use attachments/accessories specified by Attero Tech
12. Use only with the cart, stand, tripod, bracket, or table specified by the manufacturer, or sold with the apparatus.
13. Unplug this apparatus during lightning storms or when unused for long periods of time.
14. Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.
15. When permanently connected, on all-pole mains switch with a contact separation of at least 3mm in each pole shall be incorporated in the electrical installation of the building.
16. If rack mounting, provide adequate ventilation. Equipment may be located above or below this apparatus but some equipment (like large power amplifiers) may cause an unacceptable amount of hum or may generate too much heat and degrade the performance of this apparatus.



TO REDUCE THE RISK OF FIRE OR ELECTRIC SHOCK, DO NOT EXPOSE THIS APPARATUS TO RAIN OR MOISTURE.

WARRANTY INFORMATION

For a copy of the QSC Limited Warranty, visit the QSC website at www.qsc.com

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules and EN55022. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at their own expense.



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1 - Overview



1 - DBU Front and Rear

The Attero Tech by QSC Axon DBU is a surface-mount, Dante/AES67 network audio interface offering bidirectional USB (up to 2x2 channels) and stereo Bluetooth integration into network AV systems, such as the Q-SYS Ecosystem. Geared for simple, bring-your-own-device support, the DBU allows for PC or mobile device connectivity in a compact form factor that can be easily mounted under a table or in a rack. Installation is simplified with the available Q-SYS Control plugin, letting integrators quickly deploy the Axon DBU into a Q-SYS system without any scripting.

1.1 - What's in the Box

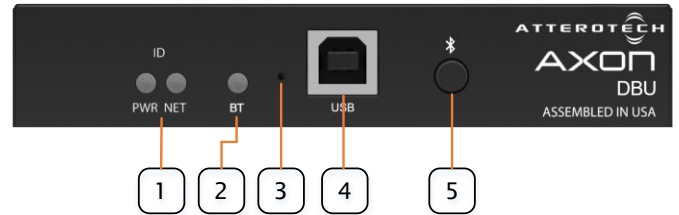
The DBU comes supplied with the following:

- Axon DBU device
- 1- 3ft Type B USB cable
- Two removable mounting flanges

1.2 - Optional Accessories

- 1 RU Rack/Surface Mount Tray Kit

1.3 - Device Features - Front Panel



	Description
1	LED status indicators
2	Bluetooth® LED status indicator
3	Factory reset access
4	USB audio connection
5	Bluetooth® pairing/connect button

1.4 - Device Features - Rear Panel



	Description
1	Dante™/AES67 Ethernet interface connector and indicators
2	DC input jack (center positive)

2 – Product Installation

2.1 - Mounting

The DBU has provides flexible mounting options:

- **Unit Surface Mounting**- The DBU is supplied with two “L”-shaped mounting brackets that can be attached to either side of the unit. Once fitted, these brackets can be used to secure the DBU to any a flat surface. The brackets can be fitted with the flange facing up or down which allows the unit to be fitted under a desk for example.



2 - Under Table Surface Mounting

Installation Mounting Template

An installation mounting template is provided to simplify the process of installing the DBU in surface mount configuration.

These templates can be downloaded from the QSC website.

- **Rack Mounting** - The DBU is a 1/3 rack width device and 1RU high. It can be mounted into a rack using the rack tray accessory (*sold separately*). The accessory tray can hold up to three 1/3rd rack width AXON units.

When used with the rack shelf, the DBU is attached to the tray with mounting screws installed through its base. The “L” brackets are then used as the rack ears by installing them to the side flanges of the tray.



3 - Rack Mount Tray

Tray Surface Mounting

The tray accessory may also be installed in a surface mount orientation. In this configuration, brackets are installed along the upper lip of on the sides of tray, allowing it to be mounted on any flat surface thus allowing multiple units to be installed easily on a wall or under a table too.



4 - Tray Surface Mounting Configuration

**Note: Complete CAD drawings can be downloaded from the Attero Tech website. Please contact Attero Tech for any further product related information that is not accessible on the website.*

2.2 – Power & Network Connectivity

The DBU can be powered using either PoE or a 24V power supply attach to the power jack input.

When powering using PoE:

- Attach the DBU’s Ethernet port to a PoE-enabled port on a PoE switch or midspan injector using CAT-5e or better cabling.

When powering using an optional external supply:

- Attach DBU’s Ethernet port to a port on the audio network switch using CAT-5e or better cable.
- Attach the power supply to the power input jack and then power up the external supply.

2.3 – LED Status Indications

The DBU is equipped with various LED indicators. The following chart indicates the available LED status information:

LED	Device Status	Status Indication (LED)
Multiple	Booting	PWR - Solid Yellow NET - Solid Red
	Critical error	Slow Blink Red (PWR / NET)
	"Identify" mode	Slow Blink White (PWR / NET)
	Firmware Update	Fast Blink Blue (PWR / NET)
	Factory Reset	Fast Blink Green (PWR / NET)
PWR	Power on (OK)	White
NET	No PTP sync	Solid Red
	PTP sync - Slave	Solid Green
	PTP sync - Master	Solid White
BT	Bluetooth Disabled	Off
	Idle	Solid Green
	Discoverable	Blink Blue
	Connected	Solid Blue
	Poor Connection	Fast Blink Purple
	Pair Button Disabled	Three Blink Yellow (on press)
	USB Priority Enabled	Solid White

5 - Status Indicators

3 – Device Configuration

The DBU product is supported for setup and monitoring within Attero Tech's unIFY Control Panel software. Additionally, QSYS Designer plugins are available to provide seamless integration with the QSYS DSP platform.

For a complete description of the DBU software controlled features found in unIFY Control Panel, consult the DBU unIFY Manual on the QSC website.

Refer to the QSC website for the latest links to integration support resources.

3.1 – IP Address Setup

***** **IMPORTANT** *****
 Failure to correctly configure IP addresses will not allow a DBU device to correctly authenticate in the unIFY Control Panel software, and configuration and control to and from the DBU will not be possible.

In order to configure a DBU or to update DBU firmware, a PC will need to be able to communicate with it over the network. While all DBU devices will be discovered regardless of the IP address setup on the PC (the DBU utilizes mDNS for device discovery), full communication can only occur if the PC and the device have compatible IP addresses.

By default, DBU is set to get a dynamic IP address. As with all Dante™ devices, if the DBU device does not find a DHCP server to retrieve an IP address from, it will give itself a local link address (sometimes also known as an automatic private IP address or APIPA) instead. A local link address is always in the range 169.254.x.y.

To ensure communication, the PC can either be also set to get a dynamic IP address, or be given a static IP address in the range 169.254.x.y. In some cases the PC

Further information on IP setup for an audio system using Dante™ can be found in the FAQ's on the Audinate website (<https://www.audinate.com/resources/faqs>).

3.2 – Networking Information

The DBU uses the following IP addresses, services and ports for communications on the network.

Port	TCP / UDP	Multicast IP	Description	Default Configuration
68	UDP	N/A	DHCP	Non-configurable
5353	UDP	224.0.0.251	mDNS – Device Discovery	Non-configurable
319-320	UDP	224.0.1.129	PTP – Clocking	Non-configurable
49494	UDP	N/A	DBU control	Non-configurable
49500	UDP	239.70.0.0	Multicast Async Notifications	Disabled
49501	UDP	239.70.0.0	Metering Data	Enabled

6 - Ports and Protocols

3.2.1 – Multicast Messaging

The DBU will communicate some information on the Ethernet network via multicast Ethernet packets.

3.2.1.1 – Metering Data

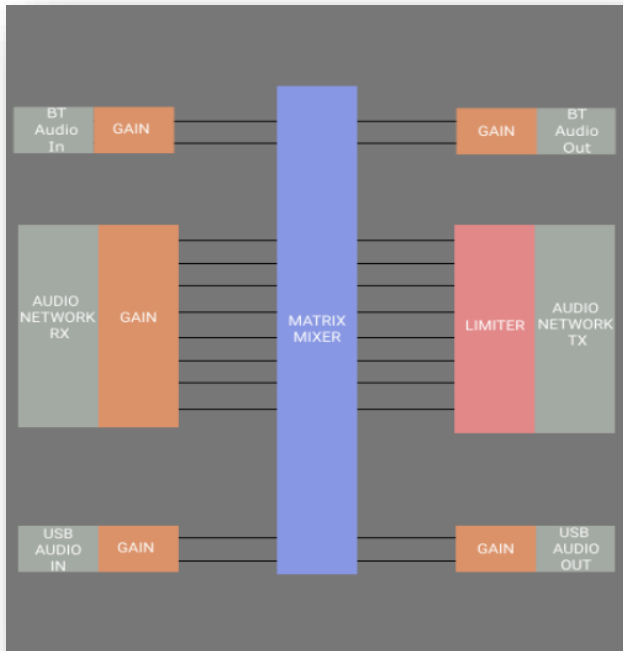
When requested, the DBU will send metering data via multicast to the network. The metering data will be available to all devices on the network. This allows multiple control systems to receive metering data without flooding the network with unicast traffic being sent the metering data individually. unIFY Control Panel and the Axon DBU Q-Sys plugin make use of the metering functionality of the DBU. For integrating metering data with other control systems, see the Control protocol document for further information.

3.2.1.2 – Multicast Async Notifications

The DBU allows for the configuration of optional asynchronous notifications. By default these notifications are disabled. The following events will trigger an asynchronous multicast notification: USB device is connected/disconnected (when USB Priority Mode is enabled), Bluetooth® state changes (enters/exits pairing mode, connects successfully, fails to connect), Connected Bluetooth® device changes song/album/artist. See the Control Protocol document for further information.

3.3 – Audio I/O and DSP Setup

All audio input, output and internal audio DSP setting may be configured through unIFY Control Panel. The Axon DBU features three audio input and output types: Bluetooth® Audio, Dante™/AES67 Network Audio, and USB Audio. All inputs and outputs allow a gain setting which ranges from -100 dB to +20 dB configurable in 1 dB steps as well as a mute setting. The DBU audio inputs are mixed by the internal matrix mixer which determines where and at which level the audio inputs are present at the audio outputs.



7 - DSP Signal Flow Diagram



8 - Matrix Mixer Settings

3.3.1 – Matrix Mixer

The DBU features a 10x7 matrix mixer. Each cross point of the matrix mixer can be configured between -100dB and 0 dB. The mixer contains the following inputs/outputs:

Inputs		Outputs	
Net RX 1	Dante™/AES67 Receive Channel 1	Net TX 1	Dante™/AES67 Transmit Channel 1
Net RX 2	Dante™/AES67 Receive Channel 2	Net TX 2	Dante™/AES67 Transmit Channel 2
Net RX 3	Dante™/AES67 Receive Channel 3	Net TX 3	Dante™/AES67 Transmit Channel 3
Net RX 4	Dante™/AES67 Receive Channel 4	Net TX 4	Dante™/AES67 Transmit Channel 4
USB In 1	USB Audio Input Channel 1 (Left)	USB Out 1	USB Audio Output Channel 1 (Left)
USB In 2	USB Audio Input Channel 2 (Right)	USB Out 2	USB Audio Output Channel 2 (Right)
BT In 1	Bluetooth® Audio Input 1 (Left/Mono)	BT Out	Bluetooth® Audio Output
BT In 2	Bluetooth® Audio Input 2 (Right/Mono)		
Voice Cue	Event Triggered Voice Cue Audio Clips		
Tone Generator	Diagnostic Tone Generator		

**Note: When the DBU USB Audio mode is “Speakerphone” “USB In 2” and “USB Out 2” are not applicable.*

**Note: When the DBU Bluetooth® mode is “Media Bridging (Only)” “BT Out” is not applicable.*

3.3.2– Tone Generator

The DBU features an internal tone generator which can be used for diagnostic purposes. The tone generator can be configured between 10 Hz and 20 kHz and from -100 dB to 0 db. The DBU’s matrix mixer can be configured to output the tone on the desired audio output.

3.3.3 – Voice Cues

The DBU has the option of enabling “Voice Cues”. Voice cues are small pre-defined sound bites which can automatically play from the DBU when certain events transpire. The DBU supports the following four voice cue events:

Pairing/Connect Mode Initiated: The DBU has initiated Bluetooth® pairing/connection. This can be triggered by the press of the Pair button on the front of the DBU or can be triggered by a remote command to enter pairing/connection mode.

Pairing/Connect Mode Ended: The DBU has exited Bluetooth® pairing/connection mode. This is triggered after entering pairing/connection mode and no Bluetooth® device pairs/connects to the DBU within the 60 second timeout period.

Pairing/Connect Successful: The DBU has successfully connected to a Bluetooth® device. This is triggered after a Bluetooth® connection is successfully established. This connection can be initiated by a remote Bluetooth® device or after entering pairing mode.

Pairing/Connect Failed: The DBU has failed to connect to the remote Bluetooth® device. This is triggered when the DBU and remote Bluetooth® device have initiated pairing/connection, but the process fails.

By default, Voice cues are played over Dante™/AES67 channels 3 and 4, but this can be customized by configuring the DBU’s matrix mixer. See “Audio I/O and DSP Setup”

unIFY Control Panel is able to load default English language voice cues as well as the option to load custom voice cues into the DBU. Custom voice cue audio files must be formatted as 16-bit, 16 kHz mono wav files prior to uploading to the DBU. The DBU allows a maximum of 5 seconds for the “Pair/Connect Mode Initiated” voice cue, a maximum of 3 seconds for the “Pairing/Connect Mode Ended” and “Pairing/Connect Successful” voice cues, and a maximum of 10 seconds for the “Pairing/Connect Failed” voice cue. If the audio files are not in the correct format or within the above length constraints, the DBU will reject them.

3.4 – Bluetooth® Pairing/Connect Modes

3.4.1– Manual Mode

This usage model is intended for applications where casual users of a public venue (sports bar, spa, stadium luxury box, fitness center) have access to connect their devices to the audio system but headaches are minimized by eliminating automatic reconnect and pairing history features.

In this mode, users connect their Bluetooth® audio enabled smart device by simply pressing the front panel “PAIR” button. The blue Bluetooth® status LED will begin flashing to indicate that the DBU is now visible to other Bluetooth® devices and accepting pairings. This pairing period lasts 60 seconds after which the status LED will stop flashing and turn off and the DBU will disable its Bluetooth® interface.

**Note: The default Bluetooth friendly name visible to other devices is “DBU-XXXXXX” where “XXXXXX” is the DBU’s primary Ethernet MAC address. This name can be customized by the installer using the unIFY Control Panel software.*

If a successful pairing is made during the pairing period, the status LED will stop flashing and turn constantly on.

To disconnect a Bluetooth device from the DBU, press and hold the PAIR button for 5 seconds and then release it. The status LED will turn off, and the connection will be reset. Another device may now be connected by repeating the pairing process.

3.4.2– Reconnect Mode

In this mode, the DBU maintains a pool of the last 8 paired devices and any previously paired device on that list will be permitted to reconnect when in range of the DBU without requiring the front panel button to be pressed. The user simply selects the DBU friendly name on their smart device.

Any new devices that are paired are added to the paired device list. If the list already full, a device from the list will be removed and the new device added in its place.

3.4.3– Exclusive Mode

This mode is intended for restricted/personal use and works similarly in operation to reconnect mode. However, rather than allow any known device from the pairing list to reconnect, only a specific device can be used with that particular DBU.

To setup a device as the exclusive device, set the DBU to “Exclusive” mode, clear the pairing list, and then pair the desired exclusive device to the unit. The DBU makes a note of this device and from that point on, only that exclusive device will be allowed to reconnect to that particular DBU when in range. As with the reconnect mode, reconnection is done without requiring the front panel button to be pressed by simply selecting that particular DBU on their smart device.

Once the DBU has been associated with a device, both the front panel pair button and the remote “pair” command sent via the network are disabled and will have no effect.

In order to attach a different device, either pairing list has to be cleared or the device mode needs to be changed.

**Note: In all modes once paired/connected, the Bluetooth® friendly name is able to be detected by other devices. However, while another device may be able to pair and save to its Bluetooth® device list when in this state, breaking the connection of the currently active device will not be possible.*

3.5- Bluetooth® Audio Bridging

3.5.1 – Media Bridging (only)

In this mode (A2DP profile), users may stream audio from media applications on the paired device. The user is protected from errant streaming of call audio over Bluetooth® link.

The media bridging mode is an excellent solution for applications such as hospitality, retail and fitness center background music where users want to maintain call privacy while sharing media audio from their device's media applications.

**Note: When Media Bridging (A2DP profile) is enabled, the DBU becomes a dedicated audio sink device. Audio can only be transmitted to the DBU in this configuration.*

3.5.2- Call Bridging (only)

In this mode (HFP profile), users may stream incoming/outgoing calls from the paired device to/from the Dante/AES67 network or USB input and output. In this mode, the user is protected from errant streaming of media audio over Bluetooth® link.

The call bridging mode provides call connectivity for conferencing system users' Bluetooth equipped devices to a networked audio based conferencing system. The addition of Bluetooth connectivity provides simple bridging of far end meeting participants for on the fly meeting productivity and backup conferencing connectivity in case of VoIP and Web-based conferencing service failures. The application diagram below highlights the general system connectivity for a networked audio conferencing system utilizing Bluetooth call bridging with Attero Tech's call bridging enabled networked audio products.

3.5.3- Call & Media Bridging

In this mode (A2DP and HFP profile), users may stream audio from media applications on the paired device and also stream incoming/outgoing calls from the paired device. Typically, when the paired device is not on a call, the paired device will perform Media Bridging (A2DP profile) and when the paired device enters a call the device will automatically switch to Call Bridging (HFP profile).

**Note: If your application requires call privacy, it is recommended to not utilize the combined call and media bridging mode as call audio will be shared automatically over the audio connection.*

3.6- Bluetooth® Pass-through AVRCP (AV Remote Control Protocol)

Many installed AV systems in both residential and commercial markets feature control products with customizable user interfaces. With a connected Bluetooth audio device as a source, it is desirable to have access to the device information and source content (artist / album / song) for use on the control system UI. Additionally, the end user of the system may control the source from any control panel that has this. This is useful if the device is left somewhere to charge and is out of reach to simply change songs or stop the audio playback.

Control API access is be available for the following AVRCP pass through commands:

- a) Play
- b) Pause
- c) Next Track
- d) Previous Track
- e) Volume Up
- f) Volume Down

The AVRCP controls are provided within unIFY Control Panel for system commissioning and testing.

3.7- USB Audio Modes

The USB audio interface on the front of the DBU allows the user to use the DBU as a USB sound device for a connected PC or other USB enabled audio device. The USB interface has two main audio modes: “Speakerphone” and “2x2 Sound Card”.

3.7.1 – Speakerphone

In this mode, the DBU’s USB audio interface is configured as a 1 input, 1 output sound device. This mode is used primarily for conferencing. This mode features two additional settings which effect how the USB audio interface is presented to the host PC.

3.7.1.1- System AEC (Acoustic Echo Cancellation)

When the “System AEC” option is enabled, the DBU presents itself to the host PC as an “Echo-canceling speakerphone” device. This indicates to the host PC that echo cancellation is being handled by the DBU (or is being handled elsewhere in the audio system). This informs the host PC that it will not need to provide any echo cancellation functionality for this device. If this settings is disabled, the DBU presents itself to the host PC as a “Speakerphone” device or “Speakerphone, no echo reduction” device.

3.7.1.2- Telephony

This setting enables additional telephony related communications between the DBU and the host PC. The DBU is capable of remotely sending a “hook switch” and “phone mute” command to the host PC initiated via the network control protocol. The hook switch command indicates whether the phone is on or off the hook. The phone mute command informs the host PC the phone’s mute button has been pressed. See the DBU’s protocol control document for further information.

3.7.2- 2x2 Sound Card

In this mode, the DBU’s USB audio interface is configured as a simple 2 input, 2 output sound interface. This allows the host PC to play and receive stereo audio over the USB interface. This mode should primarily be used for the playback and recording of media to/from the audio system.

3.8 – USB Priority Mode

The DBU allows for the configuration of a “USB Priority Mode”. When this mode is enabled, the USB interface has priority over the Bluetooth® interface. If “USB Priority Mode” is enabled, the Bluetooth® interface is automatically muted whenever a USB device is connected to the DBU. If the Bluetooth® interface is connected when the USB device is connected, the Bluetooth® connection continues and is not dropped, but the audio to/from the remote Bluetooth® device is muted for the duration the USB device is connected. Upon disconnection of the USB device, the BT audio unmutes and returns.

3.9 – Factory Reset

***** IMPORTANT *****
The factory reset returns the entire device to its factory defaults. Using this feature will mean all custom settings will be cleared.

**NOTE: The factory reset is a useful way of quickly restoring communications with a device which has an unknown static IP address, as a factory reset returns the device's network settings to getting a dynamic IP. Having successfully completed a factory reset of the device, setting the PC's IP address to also obtain a dynamic IP address should then allow the PC to communicate fully with that device.*

The factory reset button is accessed through a small hole on the front of the unit using a small screwdriver or a paperclip. A factory reset is initiated by pressing and holding this button for 5 seconds or more while the device is running and then releasing it. If done correctly, a second or two after the button is released, the PWR indicator will all turn yellow as the device reboots and it will then go through a normal start-up procedure. If the indicators do not change a couple of seconds after releasing the button, that is an indication the reset button not being held long enough and the factory reset was not applied.

Having applied a successful factory reset, on the network side, any customized Dante™ settings such as device name and receive subscriptions will all be set back to their defaults. The device will also revert to retrieving an IP address dynamically. The power-up defaults for the audio settings are also cleared.

3.10 – Firmware Updates

The DBU supports field firmware updates. The updates are applied via the network using the smart firmware update tool within the Attero Tech unIFY Control Panel. This software is available on the QSC website. The latest DBU firmware file is available from the QSC website also.

4 – ARCHITECTS & ENGINEERS SPECIFICATION

The networked audio interface shall provide the ability to interface a USB and/or Bluetooth® audio enabled device to a Dante™ and/or AES67 audio network and remote Dante™ or AES67 enabled audio devices.

The device's Dante™/AES67, Bluetooth® and USB inputs shall be mixable to any applicable Dante™/AES67, Bluetooth or USB output on the device.

The device shall support interconnectivity with other Dante™ and AES67 networked audio devices.

The device shall support bidirectional call-bridging capabilities as well as unidirectional media streaming receiver functionality.

The device shall accept either +24VCD or IEE 802.3af standard from an IEEE 802.3af PoE compliant switch or midspan injector.

The device shall provide desktop, under table, rack and tray mounting options.

The device shall include a software plugin for simple interfacing with QSC Q-SYS based DSP systems.

The device shall be compliant with the RoHS, WEEE and REACH directives.

The device shall be compliant with the EMI/EMC/ESD requirements for FCC and CE.

The device shall be the Attero Tech, Axon DBU.

Device Specifications

USB Interface	
Connector Type	USB 2.0 Type B
USB Audio Support	Speakerphone (1x1), USB Audio 2.0, 48kHz 16-bit 2x2, USB Audio 2.0, 48kHz, 16-bit
Bluetooth Interface	
Connection Type	Bluetooth v4.2
Supported Profiles	A2DP, HFP, AVRCP
A2DP Codices	SBC

Dante™/AES67 Network	
Physical Layer	Ethernet
Connector (s)	RJ-45
Cable Quality	CAT-5e or better, UTP
Transmission Speed	1 Gbps
Supported Bit Rates	16, 24
Supported Sample Rates	44.1kHz, 48kHz (default)
Minimum Audio Latency	1ms
AES67 Support	AES67, SAP based stream discovery
Power Specifications	
PoE Power	802.3af/at Class 0
Power Consumption	< 4W Max
Local Power	+24V DC
Physical Dimensions	
Height	1.0"
Width	5.394"
Depth	5.642"
Weight	1.4 lbs.
Regulatory Compliance	
Certifications	FCC Part 15, Subpart B, Class A EMC CE (EN55032 EMC / EN55035 ESD) WEEE RoHS REACH
Environmental Operating Specifications	
Operating Temperature	0 to 40° C