unD4I-L

Four Input Dante® Interface

User Manual

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614-00025

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. When a cart is used, use caution when moving the cart/apparatus combination to avoid injury from tip-over.
14. Unplug this apparatus during lightning storms or when unused for long periods of time.
15. 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.
16. This apparatus shall be connected to a mains socket outlet with a protective earthing connection.
17. 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.
18. 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 of 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 his own expense.

$$C \, \epsilon$$

This symbol means the product must not be discarded as household waste, and should be delivered to an appropriate collection facility for recycling. Proper disposal and recycling helps protect natural resources, human health and the environment. For more information on disposal and recycling of this product, contact your local municipality, disposal service, or the business where you bought this product.

Contents

1 – Overview

The unD4I-L is a four input Dante interface ideal interface for adding mic/line inputs to a Dante system. It comes in a small form factor with integrated mounting bracket allowing it to be mounted discretely in small spaces (such as under desks) close to the sources or sinks to reduce the amount of interference-prone analog cabling that is required.

Figure 1 - Front and Rear Panels

The unD4I-L features four balanced mic/line inputs using 3-pin depluggable connectors for balanced or unbalanced connectivity. Each input supports eight different gain levels from -12dB to +45dB. Each input also supports a +48V phantom power option. Front panel indicators show each channel's gain and phantom power status for easy troubleshooting.

The unD4I-L can be powered by an external +24VDC power supply (ordered separately) but also supports the use of PoE. This allows them to be powered over the network cable from a suitable PoE source (IEEE 802.3af). The PoE power option is particularly useful when mounting in a remote location where access to a mains outlet is limited or indeed, non-existent.

There are two network connections to allow daisy chaining. Daisy chaining further simplifies system infrastructure wiring by allowing multiple devices that support it to use a single CAT 5 home run connection to a network switch. Power can also be daisy chained to additional devices that support power link connectors.

Audinate's Dante Controller or other 3rd party manufacturer's Dante routing software can be used to control the audio routing configuration of the device while the Attero Tech unIFY Control Panel application can be used to configure the device-specific features. The device also supports control by third party systems allowing external configuration of its settings such as phantom power and input gain in real time. Further information on 3rd party control can be found later in this document in section 3.3.

Additionally, the unD4I-L has support for four logic inputs and four logic outputs. These GPIO can be read and/or set via the third party control protocol. The inputs can be read either as a digital on/off or as an analog voltage between 0V and 3.3V (reported as the 12-bit ADC value in decimal). The logic inputs can also be used to trigger a customized UDP event message. There are several different event modes, selectable on an input by input basis. When an event is triggered, a custom UDP packet is transmitted to the programmed destination IP address. The logic events, message payloads and the recipient information are all configurable on an input by input basis. The logic outputs can be controlled remotely over the network using the third party control protocol or linked to mirror the digital state of one of the logic inputs.

1.1 – What's in the Box

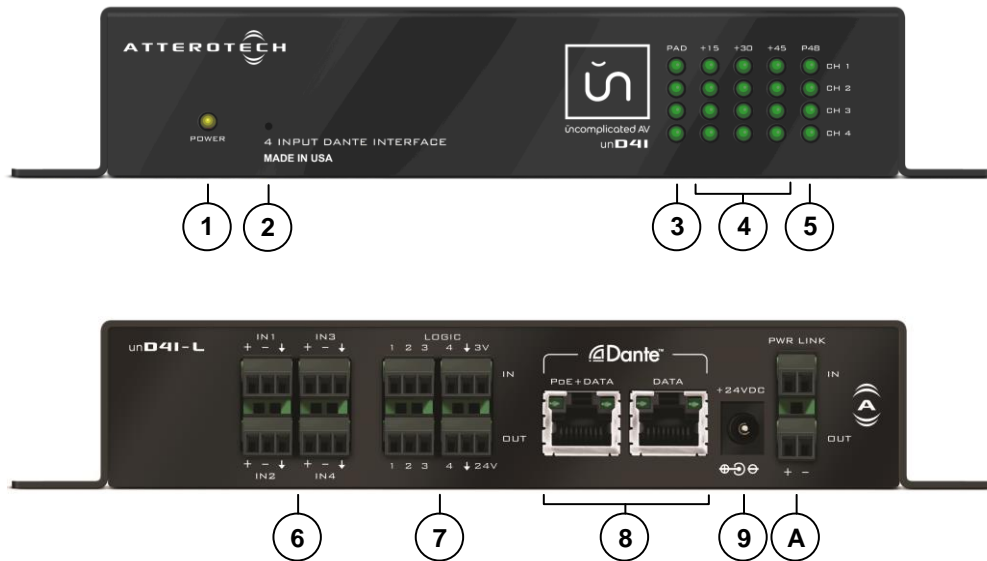The device comes supplied with the following:
  o   unD4I-L device

1.2 – Optional Extras

The following are available as options for the unD4I-L that may be ordered separately:
  o   24 V DC power supply (P/N: 900-00175)

2 – Device Installation

1	Power LED
2	Factory reset switch access
3	Pad active LED for each input
4	Input gain active indicators for each input
5	Phantom power active LED for each input
6	4 x Balanced audio inputs
7	Four logic inputs and four logic outputs
8	2 x Dante® Ethernet interface connector and indicators
9	Power Socket – Use with optional 24 V DC supply only
A	Power Link input and output

Note: *All devices have a label on one of the mounting flanges shows that devices MAC address. This is important for initial device identification as the last 6 digits make up part of the devices default network name that is shown when the device is detected by Dante Controller. The MAC address is also repeated on the bottom of the unit.*

2.1 – Mounting

Installation of the unD4I-L is very straight forward. It is recommended that the unit be secured to a flat surface with a screw through each mounting flange. Dimensions for mounting are show in the Figure 2 below. Use a No. 6 screw of a type and size that is applicable to the surface to which the device will be attached.
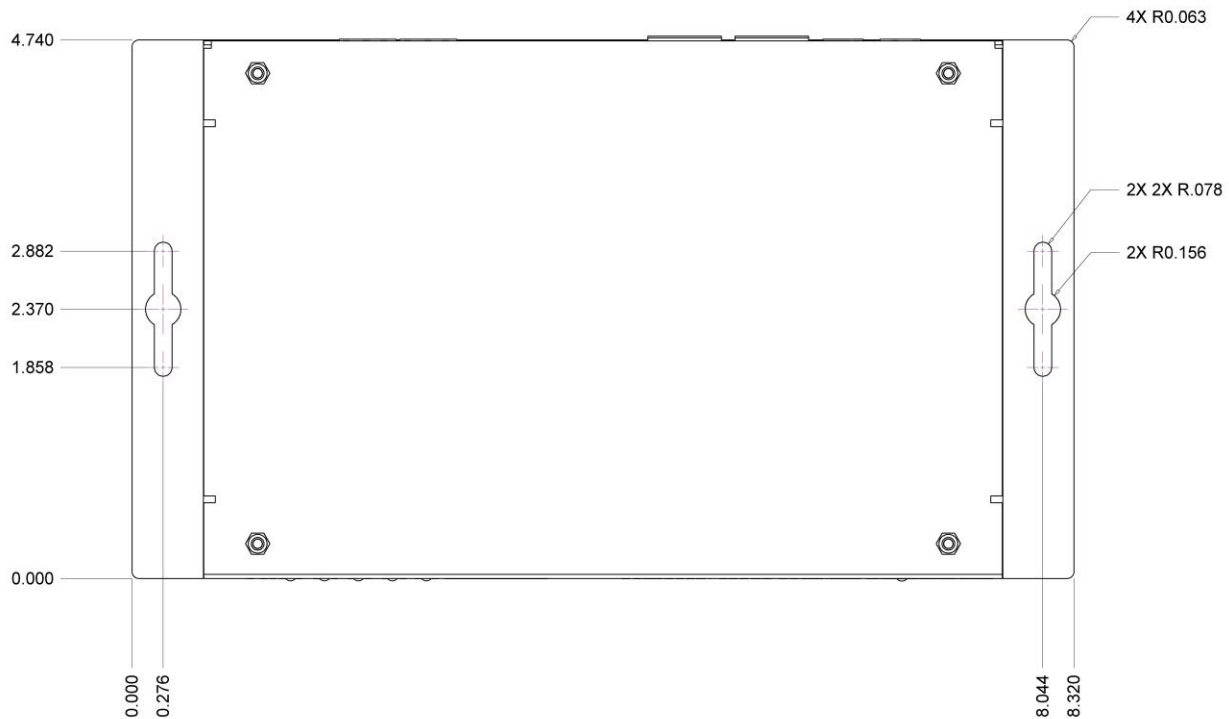

Figure 2 - Mounting Information

All connections should be made before the power is applied.
- o Attach any audio sources that will be used to the inputs. The inputs are balanced so be sure to check what output type the source to be connected uses in order to find how to connect it correctly (see Hardware Connections section).
- o Attach any logic devices to the logic inputs and/or logic outputs.

Note: All Attero Tech products are tested using UTP cabling and it is recommended that UTP cabling be used when installing them. STP cabling can be used for installation though care must be taken not introduce grounding issues into the system by doing so.

When powering using PoE:
- o Attach the PoE + Data Dante I/F port to a spare PoE-enabled port on a PoE switch using a CAT-5 cable. If a midspan injector is being used, connect a spare input port to the Dante network switch using a CAT-5 cable, and then connect the corresponding output port to the PoE + Data Dante I/F of the unD4I-L.

Note: Using the "Data only" port connected to a PoE-enabled port on a PoE switch will not power the unit.

When powering using an optional external supply:
- o Attach either Dante I/F port to a spare port on the Dante network switch using a CAT-5 cable.
- o Attach the power supply to the power input jack and then power up the external supply.

If all steps are performed correctly, the power light on the front should be lit. There may also be some activity on the Dante I/F LED indicators. With no Dante network, both LEDs will remain off. If an active connection is made both LEDs will come on and if there is network activity, the yellow LED will then flash.

2.2 – Daisy Chaining and Power Linking

A unique feature of the unD4I-L is the ability to allow daisy chaining of devices. This allows units in close proximity to one another (or other devices that support daisy chaining and power linking) to utilize a single home run of Ethernet cable back to the switch thus saving on installation costs. Daisy chaining simply requires the new device be connected to the spare Ethernet port of the last device in the chain. Not only can the Ethernet connection be daisy chained, power can also be daisy chained too by connecting the power link power output on the last active device to the power link input on the new device. This works even if the initial device in the chain is powered by PoE.

The number of devices that can be daisy chained is limited. The maximum that can ever be daisy chained is 6 devices in a single chain. Beyond that the number of switch hops may cause audio problems due to excessive latency and increased clock jitter. The other limitation is the power supply if power is also being daisy chained from device to device.

- o PoE - If power is supplied to the first device via PoE, the daisy chain limit is restricted to the initial device plus two others (trying to do more will cause the POE to over current).
- o Standalone – If power is supplied to the first device via a standalone supply, the supplies maximum power output determines the number of devices it can support (assume 4W @ 24V DC per device).

Note: Take care in estimating the power usage for any unD4I-L that is interfaced to logic devices. The logic outputs are capable of sinking large amounts of current. The peak power consumption of the unD4I-L when sinking all four logic outputs at its maximum sink current is ~10W (when the rear panel 24V logic supply is used). In applications where the unD4I-L is used, it is recommended to use local power supplies and avoid daisy-chaining where possible to simplify the potential power supply issues.

To daisy chain a device, connect an Ethernet cable from the data only port of the powered unit to one of the ports of the device to be chained. This supplies the network information only. To chain the power, connect the "Link out" connector of the powered unit to the "Link in" connector on the device to be chained. If the second unit is another unD4I-L, a third unit could be chained by connecting it in the same way to the second unit and so on.

Network Configuration Note: If the devices are installed in a networked daisy-chain topology, it is highly recommended to only configure unicast flows from each of the devices' Dante transmitters in the chain. The addition of multicast flows along the daisy chain can overwhelm the switches in the chain with unnecessary multicast audio traffic resulting in potential latency and network clock synchronization issues, especially on the units installed at the end of the daisy-chain network segment.

Additionally, if there are a significant number multicast audio flows configured on the Dante network, it is recommended that the core network switches that interface to the daisy-chained network segments be configured with the appropriate IGMP settings to shield the chain from unnecessary multicast audio traffic. The example shown in Figure 3 highlights how an IGMP enabled switch can eliminate unnecessary multicast audio traffic from the unD4I-L daisy chain segment. The red connections show devices that are configured for multicast audio flows and the green are unicast flows and each show the network segments that are traversed by the associated audio traffic.
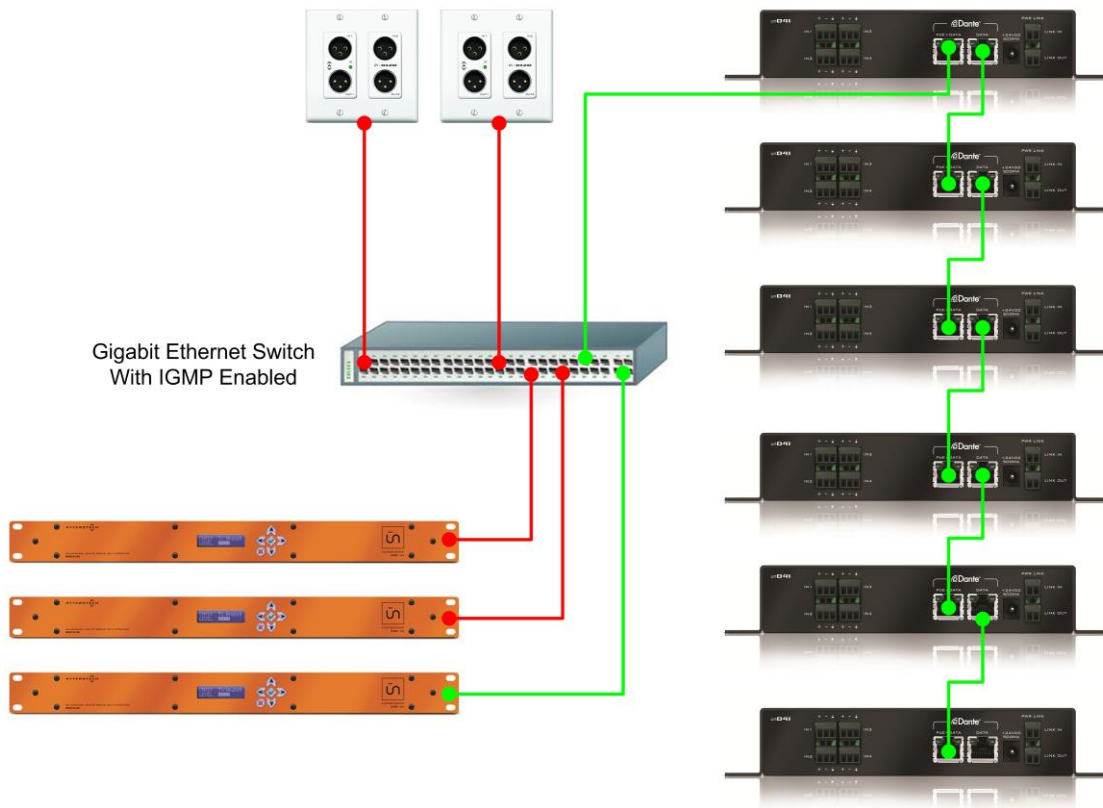
Figure 3 - Network Configuration Example with Daisy Chain

2.3 – Hardware Connections

The unD4I-L accepts unbalanced or balanced audio from source devices. Refer to the following diagrams and instructions for connecting different types of audio devices. Professional grade audio cabling is recommended to achieve the best audio performance throughout the system.

2.3.1 – Input from an Unbalanced Source

To connect a 2-wire unbalanced source to the unD4I-L, connect the positive output of the unbalanced source to the positive input of the unD4I-L. Connect both the source and unD4I-L input grounds together, and short the negative input of the unD4I-L to ground at the input of the unD4I-L.
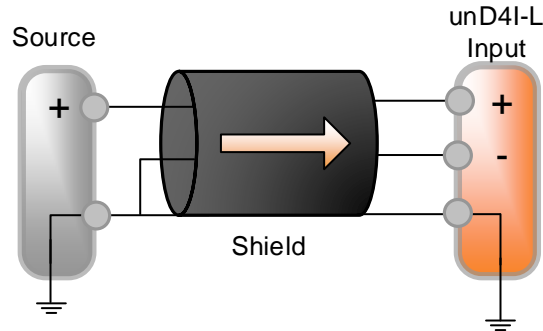
Figure 4 - 2-Wire Unbalanced Source Connection

To connect unbalanced sources with a 3-wire connection, short the negative conductor to the shield at the source connection.
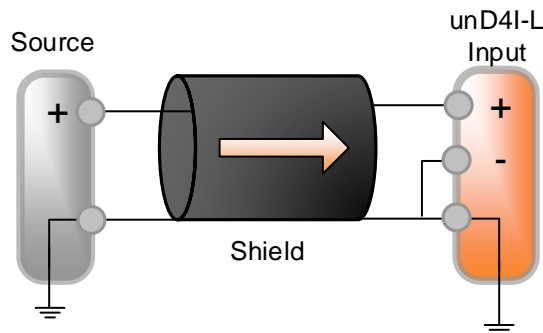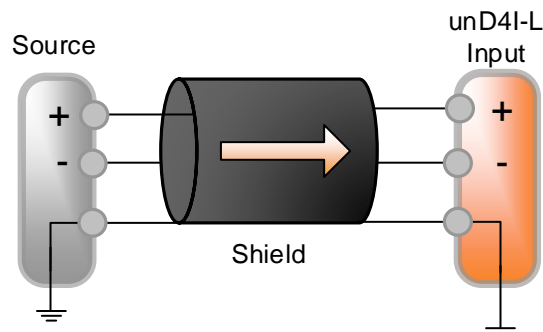
Figure 5 - 3-Wire Unbalanced Source Connection

2.3.2 – Input from a Balanced Source

To connect balanced sources to the unD4I-L, connect positive output to positive input, negative output to negative input, and connect the grounds together through the cable shield.

Figure 6 - Balanced Source Connection

2.4 – Logic Inputs

Figure 7 - Logic I/O Pinout

The logic inputs of the unD4I-L can be used as analog inputs to measure a voltage or as digital inputs. In either case the maximum input voltage must be between 0V and 3.3V. The input connections provide both a ground reference and a 3.3V supply. The current limited 3.3V supply connection is provided on the rear panel near the logic inputs for easy access. Note also that only a single ground is required for logic input signals originating from the same device.

All programmable logic input feature configuration is performed using the unIFY Control Panel software.

2.4.1 – Analog-Input Mode

When used as an analog input, the voltage applied must be between 0V and 3.3V. The unD4I-L will convert that into a 12-bit number where 0 = 0V and 4095 = 3.3V. A typical application for using an analog input may be a volume control where the volume is controlled by a potentiometer. The position of the potentiometer can be measured by the unD4I-L and a control system can read the value and adjust the volume accordingly.
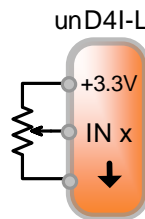
Figure 8 - Analog Mode Interfacing

2.4.2 – Digital Input Mode

When the logic inputs are used as digital inputs, the input turns on when the input voltage rises above 1.85V and will turn off again when the voltage falls below 1.2V. Typical drive circuits could be simple switches or open collector and push-pull logic outputs from another device.
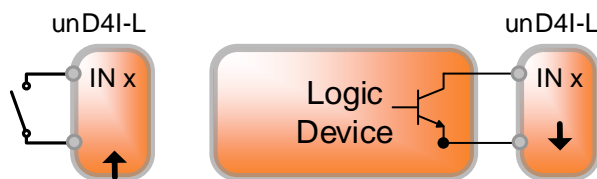
Figure 9 - Digital Mode Interfacing

A typical use case for the logic inputs are the use of a latching switch used to indicate the mute state of the microphones interfaced to the unD4I-L to a networked audio DSP (or control system) in the audio system. When the end user closes the switch a network message cab be configured to be sent to the DSP. When the switch closes or opens, the change in mute state is indicated back to the DSP or control system.

2.5 – Logic Outputs

The logic outputs can be used to drive external indicators or devices. The outputs can be driven directly from a 3ʳᵈ party control system or can be linked to the digital state of one of the unD4I-L inputs. The logic inputs feature two operational modes that can be configured based upon the physical configuration of the logic output interface.

2.5.1 – Sink Mode

The logic outputs can be used to indicate the logic state in a sink mode configuration. This mode is optimized for driving moderately heavy loads such as relay coils. In this mode, the outputs can sink up to 50mA from a 5V to 24V power supply.

When the logic outputs are wired in this mode, the logic outputs will work as active-low outputs when integrated with the 3rd party control protocol or the unIFY Control Panel software.
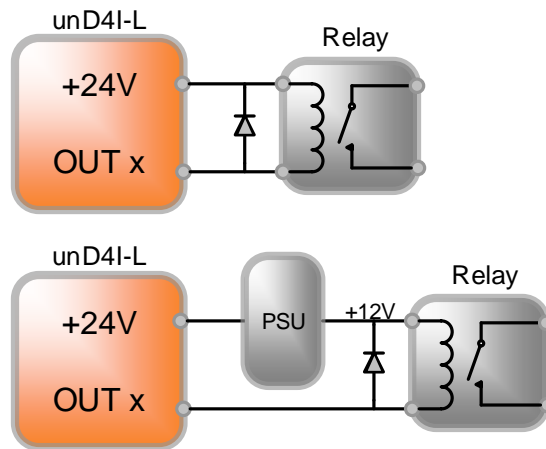
Figure 10 - Sink Mode Examples

Note: If used with an inductive load such as a relay, an external freewheeling diode must be placed across the logic output and the supply connection. Use a 1N4004 or similar diode for this application.

The unD4I-L has an in-built, current limited 24V DC supply connection available on the rear panel terminal block. This supply connection is not intended to be used to supply power to other devices. Additionally, the use of an external supply is also supported.

2.5.2 – Source Mode

In the source mode configuration, the logic outputs can be used to source 3V at up to 10mA for direct connection to LEDs or other logic devices. If a larger voltage or current is needed, wire the outputs in the sink mode configuration as described in the next section.
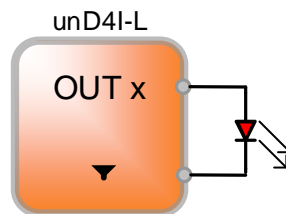
Figure 11 - Source Mode Example

When the logic outputs are wired in this mode, the logic outputs will work as active-high outputs when integrated with the 3rd party control protocol or the unIFY Control Panel software.

2.6 – Factory Reset

The unD4I-L have a factory reset option. Using it will reset all the devices parameters back to their factory defaults including all the Dante settings such as device name, channel names as well as the device settings such as input select. The devices IP address mode is also reset back to getting a dynamic IP.

Access to the factory reset button is through a small circular hole on the front of the unit, next to the power LED.

To use the factory reset, insert a small screwdriver or paperclip into the hole to activate the factory reset switch. There should be a noticeable "click" when it's activated. Hold the switch in for 5 to 10 seconds then release. If the factory reset was successful, the status LED on the front will clear and the first two columns will flash briefly before going through their startup states.

3 – Device Configuration

There are two parts of the device that require software to setup. First the audio routing, and second the configurable features of the device itself.

Certain 3rd party manufacturers provide audio routing functionality from within their own configuration application. Check the applications manual/help or contact the manufacturer in question to see if this is supported. If not supported by a 3rd party tool, the audio routing may be carried out using Audinate's Dante Controller. Dante Controller can be obtained from the Audinate website and is available for both Mac and PC. Instructions on how to use this application and about setting up routes on a Dante network can also be found on Audinate's website.

Note: The unD4I-L will be shown using a default device name of "unD4I-L-######" where '######' is the last six characters of the devices MAC address.

Configuration of the unD4I-L specific features is carried out using the Attero Tech uniFY Control Panel application. This application is available from the Attero Tech software page on the QSC website. It should be used to examine and modify the device specific features such as mic/line gain level, and phantom power settings. For the unD4I-L, it also allows configuration of the logic input and output options.

3.1 – IP Address Setup

*** **IMPORTANT** ***
Failure to correctly configure IP addresses will not allow an unD4I-L device to correctly authenticate in the uniFY Control Panel software and while it will show up in Dante Controller, the input and output channels won't be visible and routing of audio to and from the device will not be possible.
****

In order to configure an unD4I-L, both to set up internal parameters and also setup audio routing, the PC will need to be able to communicate with the devices over the network. While all Dante devices will be discovered regardless of the IP address setup on the PC, communication can only occur if the PC and the device have compatible IP addresses.

By default, an unD4I-L is set to get a dynamic IP address. As with all Dante devices, if the unD4I-L does not find a DHCP server to retrieve an IP address from, it will give itself an local link address sometimes also known as an automatic private IP address (APIPA) instead. A local link IP address is always in the range 169.254.x.y.

To ensure communication, the PC can either be set to get a dynamic IP address, or be given a static IP address in the range 169.254.x.y with a subnet mask of 255.255.0.0. The PC may require a restart for the IP address changes to take effect.

In some applications, IP addresses of devices may need to be set to something specific and that can be done once initial communication has been established. Bear in mind however that if a static IP address is assigned to a device and that static IP address is in a different range to the IP it was previously using to communicate with the PC, the PC will lose communication with the device until such time as the PC's IP address is also changed to an IP in the new range.

Further information on IP setup for an audio system using Dante can be found on Audinate's FAQ page on the Audinate website.

3.3 – Software Control

The unD4I-L is fully supported in unIFY Control Panel V2.0 onwards (units with older code may need V1.7.6). For a full description of the software and configuration features refer to the integrated help documentation within the unIFY Control Panel application.

3.4 – 3rd Party Control

The unD4I-L supports 3rd party control allowing external system to manage the devices settings such as phantom power, mic/line gain options and control of presets.

Information on the commands the unD4I-L supports, as well as details of how to use the 3rd party UDP interface are available for download from unD4I-L product page on the QSC website.

There are two control interface types available. The first type is a Dante proprietary interface (-C) which is typically used by devices already that have built-in support for Attero Tech devices. The second type supports a 3rd party UDP interface (-U) and is available to anyone to use with any device capable of sending and receiving UDP messages.

3.5 – Command Interface Type

The type of command interface a specific device supports is defined by the Dante firmware it has been loaded with. There are two methods to determine which Dante firmware and thus which command interface that is:

1) unIFY Control Panel V2.0 or later: Right-clicking on the device in the device list, mouse over the "Device Info" option and then look for the "Control Type" option. A "-C" means the device is using the Dante Proprietary interface. A "-U" means the device is using the Direct UDP interface.

2) Dante Controller": Double-click on the device in question in the routing grid to display the "Device View" form, select the "Status" tab and look for the "Firmware Version" parameters in the "Device Information" section.

Firmware Version	Control Interface
V1.0.0	Dante Proprietary (-C)
V2.0.0	Direct UDP (-U)

All Attero Tech by QSC "un" devices ship with the –U control option. However, this control option can be easily changed in the field by updating the device's firmware. Firmware updates can be done within unIFY Control Panel Software (v2.3 and later). The latest firmware .SFU files can be downloaded from the Attero Tech Product Firmware page on the QSC website.

3.6 – Using the Command Interface

In order to make use of the command interface, regardless of type, the Dante interface of the unD4I-L simply needs to be configured with an IP address that is compatible with the device doing the controlling. The control devices should then be able to converse with the unD4I-L through the Dante interface without any further configuration necessary.

When using asynchronous event messaging, all event messages will be transmitted from a separate secondary Ethernet interface. This secondary interface will require its own unique IP address separate from the Dante interface (configuration of this is done though unIFY Control Panel). The secondary interface cannot be used to receive control messages.

*Note: Even though there are two Ethernet interface for the unD4I-L and two external ports, the unD4I-L does *NOT* support a separate control network connection. Like other Attero devices, the unD4I-L is designed to use a single network that combines both Dante data and control data.*

4 – ARCHITECTS & ENGINEERS SPECIFICATION

4.1 –A&E Specifications

The Dante interface unit shall provide four mic/line analog inputs on the rear panel via 3-pin depluggable connectors. Selectable gains of 0dB, +15dB, +30dB, and +45dB and a +48V phantom power option shall be provided via software for each input. The unit shall provide two RJ-45 network connectors to allow Dante Daisy Chaining (DDC) of multiple units. The internal analog to digital signal conversion shall be performed at 24-bit resolution with a sampling frequency of 48kHz. The Dante interface unit shall receive power over the Ethernet cable from an IEE 802.3af compliant network switch or from an external +24V supply.

The Dante interface shall have four logic inputs and four logic outputs. The logic outputs shall be programmable such that customized network messages can be sent on detection of logic input state changes. The logic inputs shall be also be capable of operating in an analog mode to report changes in voltage input levels with customized network messages.

The logic outputs shall be capable of sinking up to 50mA when interfaced to a 24V supply or sourcing up to 20mA @ 5V. The logic output states shall be remotely controlled by software.

The Dante interface unit shall be compatible with Attero Tech unIFY software for flexible control and monitoring in system applications. The Dante interface shall be compliant with the RoHS directive. The Dante interface unit shall be Compliant with the EMI/EMC requirements for FCC and CE.

The Dante interface unit shall be the Attero Tech unD4I-L.

4.2 – Device Specifications

Audio Inputs	
Input Type:	Balanced and RF filtered
Gain:	0dB, +15dB, +30dB and +45dB, software selectable 12dB pad, software selectable
Input Impedance:	>1.8K ohms at any gain
Maximum Input Levels:	+8dbu @ 0dB gain, -7dBu @ +15dB gain, -22dBu @ +30db gain -37dBu @ +45dB gain without pad With 12dB pad, maximum input levels are 12dB higher
Phantom Power:	+48V, software selectable
Audio Performance	
EIN:	-115dBu
System THD+N:	<0.02% at any gain, input signal 3dB below maximum
Frequency Response	20Hz – 20kHz, +/- 1dB
Logic I/O	
Inputs	4 Inputs, 0 to 3.3V input voltage range, software configurable for analog or digital operational modes
Outputs	4 Outputs, 50mA sinking capability (5V to 24V external supply) 10mA @ 3V sourcing capability

Dante Network	
Physical Level:	Standard Ethernet
Connector:	Single RJ-45
Cable Quality:	CAT-5
Transmission Speed:	100 Mbps

Power Requirements	Class 0 802.3af PoE PD compliant +24V DC
Power Consumption	10W Max (all logic outputs active in sink mode supplied interfaced to onboard 24V logic supply) 4.9W Max (w/no active logic I/O)
Dimensions	8.32" W x 1.50" H x 4.74" D
Weight	1.7lbs
Compliance	FCC CFR 47 Parts 15B ICES-003 CE (EN55022) RoHS

APPENDIX A–Reference Documents

The following table lists the relevant reference documents.

Document Title	Location
unIFY 3rd Party Software API	QSC website
Dante Firmware Update Quick Start	QSC website

Document Information

Document title:	unD4I-L
Document file name:	614-00025 unD4I-L User manual.docx
Revision number:	<01>
Issued by:	Attero Tech
Issue Date:	10/16/2017
Status:	Released

Revision History

Revision	Date	Author	Description of change
00_a	10/16/17	CNL	Initial draft based on unD4I/unD4I-L manual revision 06_a
00_b	10/16/17	CNL	Updates after review by Alex B. Ready for release
01	10/16/17	CNL	Initial release
01_a	03/14/18	SGG	Warranty Updated