DPA-DAC4
Dante™ Accessory Card

Specifications are subject to change without notice.

Description

The DPA-DAC4 accessory card is designed to work in conjunction with DPA Series 4-channel amplifiers. The DPA-DAC4 is a 4-input Dante™ receiver that features digital audio transportation over standard IP networks. The DPA Series 4-channel amplifiers come standard with four balanced line inputs and an accessory card slot to add an additional 4-inputs, giving the amplifier a total of 8-inputs. All inputs can be mixed and routed to any of the four amplifier channels. All four amplifier channels have an assortment of DSP tools including level controls, EQ's, limiters, high & low pass filters, and delay to provide flexibility for a range of applications.

Features

- Dante™ digital audio platform
- 4-channel receiver
- Integrates with 4-channel DPA Series amplifiers

Dante™ Overview

Audinate® created Dante™, an uncompressed, multi-channel digital media networking technology, with near-zero latency and synchronization. Hundreds of Dante™-enabled products are available from many manufacturers, enabling you to mix devices from multiple manufacturers.

One cable does it all. Dante™ does away with heavy, expensive analog or multicore cabling, replacing it with low-cost, easily-available CAT5e, CAT6, or fiber optic cable for a simple, lightweight, and economical solution. Dante™ integrates media and control for your entire system over a single, standard IP network.

Dante™ systems can easily scale from a simple pairing of a console to a computer, to large capacity networks running thousands of audio channels. Because Dante™ uses logical routes instead of physical point-to-point connections, the network can be expanded and reconfigured at any time with just a few mouse clicks.

Since the signal audio is transmitted digitally, common analog challenges like interference from other electrical equipment, crosstalk between cables, or signal degradation over long cable runs is not a problem. Setting up Dante™ networks is easy, even the most complex networks can be set up and configured quickly and easily with Dante™, making system integration simple. Dante™ automatically handles the technical complexities.

Signal routing and system configuration with Dante™ is fast, simple, and incredibly flexible. Dante Controller™ is a powerful software application that manages devices on the network. Setting up a Dante™ network is typically just a matter of plugging devices into an Ethernet switch and connecting a computer to the network. All Dante™ devices are automatically discovered and displayed in Dante™ Controller, so a system can be up and running in seconds.

Visit www.audioinate.com for details or to learn more on using Dante™. There are many Dante™ guides available in the industry. AtlasIED offers one in the BlueBridge® DSP section of atlasied.com.

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Audio Applications

When installed, the DPA-DAC4 converts the DPA Series amplifier into a digital audio network amplifier. The combination of the digital audio transport receivers along with integrated DSP makes the DPA Series amplifier the go to solution for a variety of applications including:

- Restaurants
- Government facilities
- Schools
- Industrial facilities
- House of worship

Selecting the dBFS Reference on the DPA-DAC4

The DPA-DAC4 comes with a choice of dBFS (Decibels Full Scale) gain selections of 0dBFS = 10dBu and 0dBFS = 20dBu. Factory default for the card is 0dBFS = 20dBu. There is a 2-pin header on the card that is the OdBFS gain selection. When a shunt is applied to the header, the 0dBFS = 20dBu setting is engaged. When the shunt is removed the setting is 0dBFS = 10dBu. Most pro audio equipment gains are in the range of 20dBu – 24dBu. Read the entire manual to understand these settings.

Shunt on 0dBFS = 20dBu, factory default
Shunt off 0dBFS = 10dBu
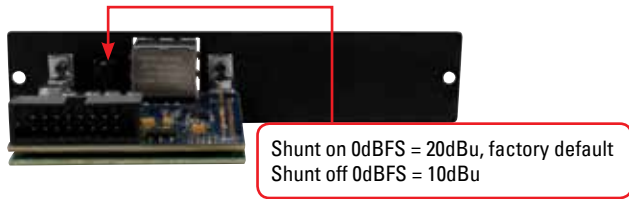
Matching Gain from a Source to the DPA Series Amplifier In a Dante™ Network

Understanding the gain structure is very important to avoid clipping the audio signal or amplifier output. There are three potential ways to clip the signal chain.
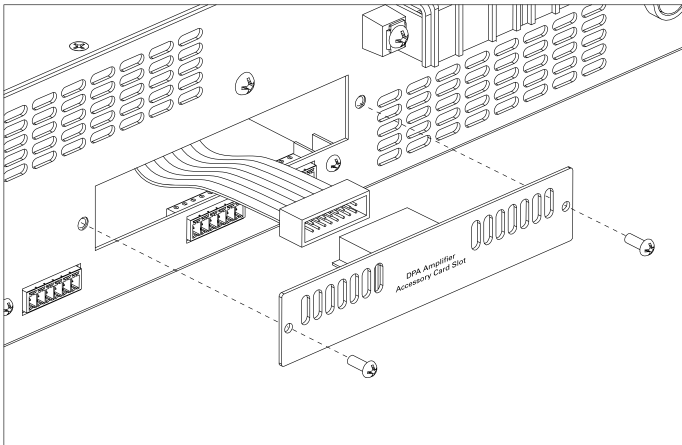
1. **Amplifier Input Clipping** - This occurs when the applied input signal exceeds the maximum input level of the amplifier input stage.

2. **Amplifier Output Clipping** - Driving the amplifier to maximum output level requires 0dBu or .775V of signal when all level faders in the GUI are set to "0" or all up. Exceeding this level will cause the amplifier output stage to clip.

3. **Digital Clipping** - This occurs when the 0dBFS levels are exceeded. This is very important to understand. Several examples are provided to help understand digital to analog gain structure. **Note:** AtlasIED recommends to always place a limiter set for 0dB in the signal path prior to the Network Output of the transmitting device. This is the best way to prevent clipping the DPA-DAC4.

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DPA-DAC4 Card Installation

**Note:** Accessory card installation must be done by a qualified technician.

1. Remove the DPA amplifier from the AC mains source. **Note**: In standby mode there are DC voltages present. The DPA amp must be removed from the AC Mains source in order to prevent damage to the card or amplifier.

2. Remove the two screws (M3 x 8mm Pan Head Black) holding the DPA Accessory blank panel.

3. Remove the ribbon cable from the cover plate.

4. Connect the accessory card to the ribbon cable by carefully aligning the ribbon cable connector to the mating PCB connector. Do not force. If aligned correctly the cable will mate easily.

5. Carefully guide the accessory card into the slot without forcing the PCB or cable.

6. After the card is inserted and the accessory panel is flush to the chassis, align the two screw holes and secure them together by inserting two M3 x 8mm screws.

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The following example illustrates an AtlasIED BlueBridge® digital signal processor sending audio over the network via Dante™ to an optional DPA-DAC4 Dante™ card.

Please note the following:

1. Audio signal is applied to the analog input of the BlueBridge® DSP. For this example, a .775V / 0dBu signal was applied.

2. The analog signal is converted to digital in the DSP domain, processed and routed onto the Dante™ Network output of the BlueBridge® DSP. The signal chain throughout the BlueBridge® DSP is kept at 0dBu.

3. The Dante™ Network output or Transmitter level is set for a maximum signal of 0dBu and remains the same through transmission through the network without any signal degradation or amplitude loss. The input sensitivity of the DPA amplifiers is 0dBu / .775V. This means the analog input signal to the amp is set properly to achieve full power output from the amplifier without clipping any part of the signal chain.

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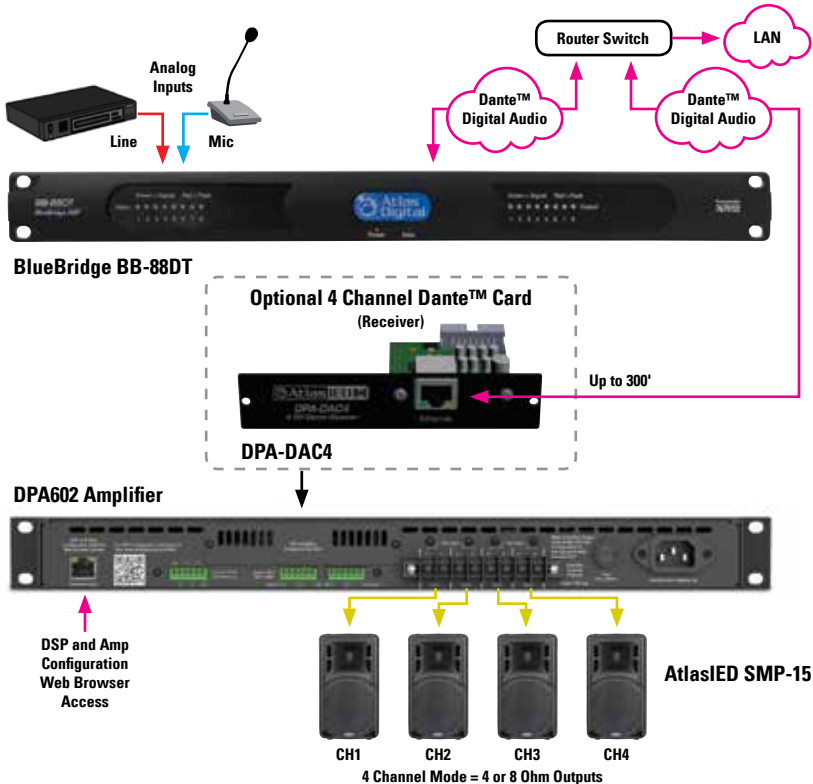
DPA Setup after DPA-DAC4 Installation

1. Please read the DPA manual for access to the DPA Series amplifier control GUI interface. Proceed to step #2 after accessing the GUI.

2. In the Setup page go to the Amplifier Configuration Tab. On this page select the box "Enable Accessory Inputs"

3. Go to the I/O Router page and route Inputs 5-8 to an output.

4. Priority Mute functions & Remote Level can be assigned in the "Mute, Link & Port" page.

Figure 1
DPA Setup Page
(Select Amp Config Page)

Figure 2
DPA Configuration Page
(Select Enable Accessory Inputs)

Figure 3
DPA I/O Router Page
(Confirm Fader Knobs are Present)

Figure 4
DPA Mute, Link, and Port Page
(Select Mute Function if Required)

Connecting the DPA-DAC4 to a Dante™ Network

Refer to the example below on how to connect a simple Dante™ network audio system. There are three items needed to make a Dante™ network, (1) gigabit router, Dante™ transmitter and a Dante™ receiver. In the illustration example below the AtlasIED BlueBridge® BB-168DT is the transmitter and the DPA-DAC4 is the receiver. The DPA-DAC4 installed into the DPA amplifier becomes the DPA amplifiers Inputs 5-8. The router and the CAT5e cable connect the devices together.

Figure 5 is a configuration snapshot of the GUI of the BB-168DT. Analog inputs 1-4 are routed to a limiter, then onto the network outputs 1-4. Where signal goes from the BB-168DT network output is determined by a separate software called Dante Controller™. Dante Controller™ is a free software that allows connectivity and signal routing within Dante™ devices.
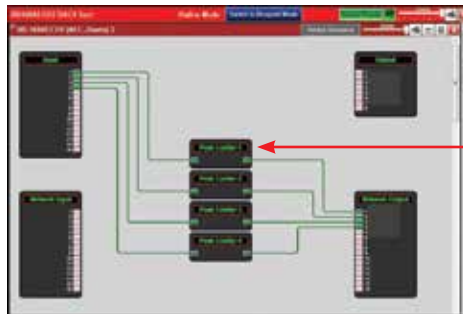
Note: Always add a limiter before the network output. Set the limiter threshold to 0dBu to prevent clipping the input of the DPA amplifier.

Figure 5

Figure 6 shows the BB-88DT and DPA-DAC4 on the Dante™ Network. The DPA amplifier model number will not appear in the Dante™ Controller GUI because the amplifier is not the recognized Dante™ device, the DPA-DAC4 is. The accessory card installed in the amplifier combines the digital and analog platforms. The cells that have been connected are indicated by the green highlighted circle with the check mark. These highlighted cells indicate the routing of the BB-88DT transmitters 01, 02, 03, 04 (BB-88DT network output 1, 2, 3, 4) to the DPA-DAC4 (Atlas4-0a004b) receiver channels 1, 2, 3, 4 (DPA amplifier inputs 5-8).
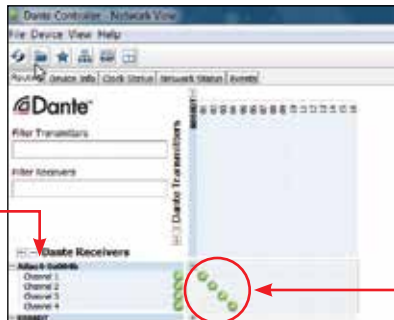
Note: Can be renamed in Dante Controller™

Green check circles indicate a specific channel connection between the Dante™ transmitting device and the Dante™ receiving device.

Figure 6

Specifications are subject to change without notice.

Figure 7 shows input signal on the DPA amplifier Inputs 5-8 (DPA-DAC4 receiver Inputs 1-4). Figure 8 shows the DPA GUI with Input 5 routed to Output 1. **Note:** In order to avoid input clipping from the DPA-DAC4 when high signal levels come from the DSP network output, set the input level to "0" or max. To reduce the amplifier levels, adjust the amplifier output level faders.

Figure 7

Figure 8

Input meters indicate proper input signal (0dBu) from the Dante™ network transmitter to achieve maxim amplifier output without clipping.

Ideal output level before amplifier output clipping.

Note: Input fader set to 0, or all the way up, to reduce input clipping from the DPA-DAC4.

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Setting Levels In The DPA Amplifier to Avoid Clipping

It is important to set the input levels within the system to avoid clipping the amplifier input or the output DPA-DAC4 card. **Note:** The best way to prevent clipping the DPA-DAC4 is to place a limiter set for 0dB in the signal path prior to the network output of the transmitting device (always recommended). This is shown in Figure 5. Follow these guidelines for setting the gain structure.

1. Set the DPA-DAC4 card to 0dBFS = 20dBu. The shunt needs to be on.

2. In the DPA GUI I/O Router page set the input level to 0dB. This is shown in Figure 8

3. In the DPA GUI Output Level page set the output levels to -40dB.

4. Most of the time a DSP processor will be used as the Dante™ Transmitter. It is highly recommended that a limiter is placed before the network output. This is shown in Figure 5. Set the limiter maximum output to 0dB or +3dB. This will prevent the amplifier input or DPA-DAC4 from clipping, but will be enough signal to achieve maximum amplifier output. **Note:** The DPA-DAC4 clips at +7dBu.

5. Increase the levels until the input meters in the DPA are achieving 0dB. This shown in Figure 7. If the levels are reaching +3dB, adjust the network output levels or the limiter on the DSP.

6. After the proper input levels have been set, adjust the DPA amplifier output level to the desired sound levels.

Selecting the Router OR Network Switch – Important!

It is extremely important when selecting a router or switch for the Dante™ network; not all routers or switches are the same. The size of the Dante™ network will influence which router or switch is needed to handle network traffic. There are three things to look for at a minimum or system dropouts may occur. Refer to Audinate® for products they recommend.

1. Gigabit speed.

2. If using a network switch, it must be a "managed switch" type.

3. If using a router with a built-in switch, it should have DD-WRT firmware or Open Source firmware.

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Dante™ Items to Know or Think About

1. **Fixed Levels** - Signal level cannot be added or reduced within Dante Controller™. It is strictly a signal router.

2. **What Does 0dBFS Mean** - In the previous example, the signal output of the BlueBridge® DSP onto the Dante™ network is 0dBu, so the signal within the BlueBridge® DSP can be increased by 20dBu before clipping the Dante™ network. This defines the relationship of 0dBFS = 20dBu (0dB "Full Scale") from the source, which in this case the source is the BlueBridge® DSP. When interfacing Dante™ networks, it is very important to know the source and receiver 0dBFS specification.

3. **DPA-DAC4, -10dB Setting** - If the setup is identical as describe above, but the DPA-DAC4 card is set to 0dBFS = 10dBu, how would that affect a DPA amplifier? The signal coming into the DPA amp would be -10dB down and the amp could never reach full output because the DPA amplifier requires 0dBu to reach full output power. To correct the low input level to the amp, increase the signal from the source (BlueBridge® DSP) by 10dBu. Keep in mind within BlueBridge® there is only 10dBu of headroom before digitally clipping the input of the DPA-DAC4. Be careful when adding EQ boost. If adding 6dB of EQ boost at 100Hz, there is only 4dB of headroom at 100Hz before clipping. If the DPA-DAC4 was set to 20dBu = 0dFS there would be 14dB of headroom at 100Hz. This is why it's so important to know the 0dBFS reference points between devices in the Dante™ network.

4. **Industry Standard** - At the time of this information, there is no industry standard between companies for scaling 0dBFS gain levels in equipment. In a digital studio this is usually not an issue because most of the same brand is used or a limited number of products are interfaced. However, with live sound or commercial audio there can be multiple brands used in one job. Dante™ can be great for connectivity between devices but be aware of gain structure matching.

5. **Interfacing Data with Different Manufactures Equipment** - To help understand scaling here are some examples:
- Source device 0dBFS = 20dBu, transmits to a receiver with a 0dBFS = 20dBu reference, the output is 0dBu. This scenario is ideal when using the DPA amplifiers.
- Source device 0dBFS = 20dBu, transmits to a receiver with a 0dBFS = 10dBu reference, the output is -10dBu. To get full output of the DPA amplifiers you have to increase the network output levels by 10dBu to get 0dBu into the DPA amplifiers input.
- Source device 0dBFS = 10dBu, transmits to a receiver with a 0dBFS = 20dBu reference, the output is +10dBu. This combination will give too much signal into the DPA amplifier. Reduce the signal from the DSP Network output.
- Source device 0dBFS = 10dBu, transmits to a receiver with a 0dBFS = 10dBu reference, the output is 0dBu.

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6. **Understanding Digital Noise vs Headroom** - If headroom before clipping is a concern, the higher the ratio between 0dBFS and output level, the less likely clipping will be an issue. If the application is paging and background music then a lower number is ok because the headroom is not as critical. In live sound reinforcement applications such as a church band or a concert, more headroom and gain is needed for dynamics. The issue with higher gain in a product is the higher the gain the higher the noise output. To combat high gain output noise, use a Dante™ Transmitter product with good signal to noise ratio specification, such as 100dB or better. For instance, AtlasIED BlueBridge® DSP has a signal to noise ratio of 110dB. The noise is very low before it is amplified, assuring low noise out of the DPA amplifier. Look at the input and output 0dBFs reference points and the noise floor specification. If they are not listed call the manufacturer.

Specifications

Description	4 input Dante™ receiver card for the DPA Series amplifiers
Connection	Single RJ-45
Cable Quality	CAT-5
Gain Settings	0dBFS = 20dBu & 0dBFS = 10dBu PCB shunt selectable
Indicators	Ethernet network activity LED green / yellow
Amplifier Interface	16 pin DPA amplifier connections
Electrical Specifications	
Dante™ Transmission Speed	100Mbps
Frequency Response	20Hz - 20KHz +/- 1dB
THD	.06% @ 1KHz
Maximum Output Level	7dBu
Noise	10dB Gain Setting = -83dBu
	20dB Gain Setting = -77dBu
Mechanical	
Dimension	H 0.97" x W 4.7" x D 2.5" (H 24.6mm x W 119mm x D 63mm)
Weight	2.6oz (.07kg)
Color	Black
Material	Steel

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Limited Warranty

All products manufactured by AtlasIED are warranted to the original dealer/installer, industrial or commercial purchaser to be free from defects in material and workmanship and to be in compliance with our published specifications, if any. This warranty shall extend from the date of purchase for a period of three years on all AtlasIED products, including SOUNDOLIER brand, INNOVATIVE ELECTRONIC DESIGNS brand, and AtlasIED brand products except as follows: one year on electronics and control systems; one year on replacement parts; and one year on Musician Series stands and related accessories. Additionally, fuses and lamps carry no warranty. AtlasIED will solely at its discretion, replace at no charge or repair free of charge defective parts or products when the product has been applied and used in accordance with our published operation and installation instructions. We will not be responsible for defects caused by improper storage, misuse (including failure to provide reasonable and necessary maintenance), accident, abnormal atmospheres, water immersion, lightning discharge, or malfunctions when products have been modified or operated in excess of rated power, altered, serviced or installed in other than a workman like manner. The original sales invoice should be retained as evidence of purchase under the terms of this warranty. All warranty returns must comply with our returns policy set forth below. When products returned to AtlasIED do not qualify for repair or replacement under our warranty, repairs may be performed at prevailing costs for material and labor unless there is included with the returned product(s) a written request for an estimate of repair costs before any nonwarranty work is performed. In the event of replacement or upon completion of repairs, return shipment will be made with the transportation charges collect.

EXCEPT TO THE EXTENT THAT APPLICABLE LAW PREVENTS THE LIMITATION OF CONSEQUENTIAL DAMAGES FOR PERSONAL INJURY, ATLASIED SHALL NOT BE LIABLE IN TORT OR CONTRACT FOR ANY DIRECT, CONSEQUENTIAL OR INCIDENTAL LOSS OR DAMAGE ARISING OUT OF THE INSTALLATION, USE OR INABILITY TO USE THE PRODUCTS. THE ABOVE WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES INCLUDING BUT NOT LIMITED TO WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

AtlasIED does not assume, or does it authorize any other person to assume or extend on its behalf, any other warranty, obligation, or liability. This warranty gives you specific legal rights and you may have other rights which vary from state to state.

Service

Should your DPA-DAC4 require service, please contact the AtlasIED warranty department at 1-877-689-8055, ext. 277 or support.atlassound.com to obtain an RA number.

AtlasIED Tech Support can be reached at 1-800-876-3333 or support.atlasied.com.

Visit our website at www.AtlasIED.com to see other AtlasIED products.

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