THEORY

# DLC-250.4d
## AMPLIFIED LOUDSPEAKER CONTROLLER

INSTALLATION AND
PROGRAMMING GUIDE

Rev A 250103

# Technical and Safety Notices

Please read the following important technical, safety and environmental notices before installing and using your amplifier.

## Technical Notices

All reasonable design and engineering steps have been taken to ensure that these amplifiers always perform satisfactorily in their intended application and environment and will provide appropriate levels of support to ensure that all reasonable customer needs and expectations are met. Such support however is contingent on the following provisions.

1. These amplifiers are Class-I products and should be installed with a mains cable including the required earth connection to comply with the Safety Class-I.

2. These amplifiers should always be installed by competent and qualified personnel. Amplifier damage or failure caused by installation or operational errors may invalidate support, warranty or guarantees of performance.

3. These amplifiers are not suitable for use in locations where they may be accessible to minors.

4. These amplifiers are intended to be used specifically for the amplification of audio signals and for connection to moving-coil loudspeaker systems. Use of these amplifiers for amplification of signals outside the audio band (20Hz to 20kHz) or to drive transducers other than moving-coil loudspeakers may invalidate support, warranty or guarantees of performance.

5. These amplifiers should only be used within professionally installed and configured audio systems comprising input and output ancillary equipments that is known to be of an appropriate level of performance and in good operating condition. Any damage to, or unsatisfactory performance from, these amplifiers caused by inadequate or failed input or output ancillaries may invalidate support, warranty or guarantees of performance.

6. These amplifiers are intended to be installed and operated indoor in a controlled environment (pollution degree, PD2) within an ambient temperature range of 0°C to 40°C. These amplifiers are not intended for use above 2000 meters above sea level. Amplifiers installed or operated in environments outside these limits may invalidate support, warranty or guarantees of performance.

7. Specific warranty terms are the responsibility of the amplifier re-seller.

## Safety and Environmental Notices

Note: The intent of the lightning flash with arrowhead symbol in a triangle is to alert the user to the presence of uninsulated "dangerous" voltage within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to humans.

Note: The intent of the exclamation point within an equilateral triangle is to alert the user to the presence of important safety, and operating and maintenance instructions in this manual.

WARNING! TO PREVENT FIRE OR ELECTRIC SHOCK, DO NOT EXPOSE THIS EQUIPMENT TO RAIN OR MOISTURE.

Ambient Temperature Note: If this equipment is operated in a confined or multiple rack installation, the internal ambient operating temperature may exceed the external ambient temperature. It is important to ensure in these circumstances that the published maximum operating temperature for the equipment is not exceeded.

Reduced Air Flow: Ensure that rack or other closed installation does not restrict the cooling airflow required for safe and reliable operation of the equipment.

# Technical and Safety Notices

## Important Safety Instructions

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. Do not submerge the equipment in water or liquids.
7. Do not use any aerosol spray, cleaner, disinfectant or fumigant on, near or into the equipment.
8. Clean only with a dry cloth.
9. Do not block any ventilation opening. Install in accordance with the manufacturer's instructions.
10. Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.
11. To reduce the risk of electrical shock, the power cord shall be connected to a mains socket outlet with a protective earthing connection.
12. 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 a third grounding prong. The wide blade or the third prong are provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.
13. Protect the power cord from being walked on or pinched particularly at plugs, convenience receptacles, and the point where they exit from the apparatus.
14. Do not unplug the unit by pulling on the cord, use the plug.
15. Only use attachments/accessories specified by the manufacturer.
16. Unplug this apparatus during lightning storms or when unused for long periods of time.
17. 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.
18. The appliance coupler, or the AC mains plug, is the AC mains disconnect device and shall remain readily accessible after installation.
19. Adhere to all applicable, local codes.
20. Consult a licensed, professional engineer when any doubt or questions arise regarding a physical equipment installation.

## Environmental Statement

This product complies with international directives, including but not limited to the Restriction of Hazardous Substances (RoHS) in electrical and electronic equipment, the Registration, Evaluation, Authorization and restriction of Chemicals (REACH) and the disposal of Waste Electrical and Electronic Equipment (WEEE). Consult your local waste disposal authority for guidance on how properly to recycle or dispose of this product.

# Introduction and Overview

## 1. Introduction

THEORY DLC power amplifiers have been designed to provide configurable, consistent and reliable high performance audio power amplification for residential, commercial and entertainment applications. Please read this manual fully before installing and using an amplifier. If you have any questions regarding amplifier configuration, installation or operation please contact the appropriate customer support portal.

Following this introduction, the manual is divided into sections covering the following topics:

## 2. Amplifier Overview

THEORY DLC amplifiers are half rack width, 1U format power amplifiers that can drive both conventional low impedance (Lo-Z, 4-ohms to 16-ohms) loudspeakers and high impedance (Hi-Z, 70V/100V) transformer coupled loudspeakers. They provide four analog inputs, one stereo S/PDIF digital input, and either two or four outputs (Lo-Z mode), or one or two outputs (Hi-Z mode). THEORY DLC amplifiers also incorporate automatic power sharing technology that enables power to be shared proportionately as required between pairs of outputs in Lo-Z mode. THEORY DLC amplifier model output channel counts and power outputs are as follows:

**DLC-250.4d**

| Mode | Channels | Max Rated Output per Channel |
|------|----------|------------------------------|
| Lo-Z | Four | 125 Watts |
| Hi-Z | Two | 250 Watts |

### 2.1 Connections

THEORY DLC signal input and output connections are accomplished via RCA Phono and Euroblock style connectors. A GPIO (General Purpose In/Out) Euroblock connector enables some amplifier functions to be controlled, and wireless or RJ45 socket Ethernet network connection options are also provided.

THEORY DLC amplifiers have no mains power switch and are operational as soon as mains power is connected via the IEC 60320 mains socket.

### 2.2 Network Features

THEORY DLC amplifiers are TCP/IP network connected devices that require a wired or wireless network connection to access their configuration menus. The configuration menus are accessed via the THEORY DLC Control web app interface and cover Input, Zone, Output and General Settings functions. The configuration menus are fully described in **Section 4** of this manual.

# Introduction and Overview

**Audinate Dante®**

THEORY DLC amplifiers are compatible with Audinate Dante® Audio Over IP (AoIP) networks and installations.

Dante® equipped versions of THEORY DLC amplifiers enable the transmission and receipt of digital audio over an Ethernet network using the IP based Dante® protocol. Configuration and management of the IP routing for Dante® digital audio, including the setting of network parameters such as IP addresses and subnet masks, is administered by Audinate's Dante® Controller software application. Dante® Controller downloads and comprehensive guidance on the configuration and installation of Dante® based audio over IP can be found at: www.audinate.com/products/software/dante-controller.

## 3. Carton Contents

THEORY DLC amplifiers are shipped in a cardboard carton containing the amplifier unit, a mains cable appropriate for the sales territory, an accessory pack, and a document pack. The full contents is listed below.

• Amplifier unit
• Mains power cable
• Input connector x 2
• GPIO socket connector
• Output connector x 2
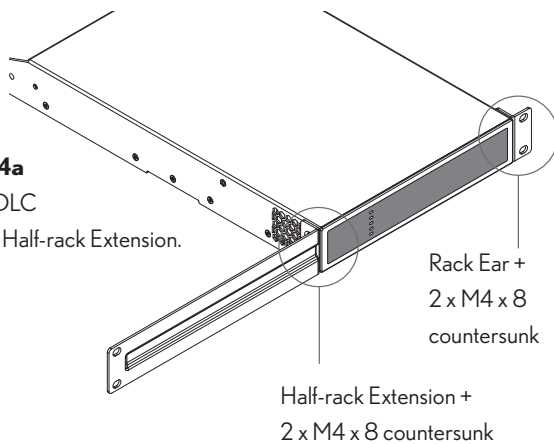• Adhesive rubber feet x 4
• Document pack
• Rack Kit

**2.3 Dimensions**

THEORY DLC amplifier dimensions and features are illustrated in **Diagram 2**. The amplifiers are primarily intended for installation in an equipment rack but can also be under-desk or wall mounted, or used free standing. They are fan-cooled and must be installed such that ventilation apertures are not obstructed.

**2.4 Firmware**

This manual describes the features, functions and user interface of THEORY DLC amplifiers running **Firmware Version 1.7.3.**

⚠ **It is strongly recommended that the firmware version installed in the amplifier in use is checked initially, and regularly thereafter. If updated firmware is available, the amplifier should be updated as a priority.**

The firmware installed in the amplifier can be identified and updated by selecting the **Device** option in the Control web app **Settings Menu**. Firmware versions can be checked, and firmware downloaded, from the THEORY DLC website: www.theoryaudiodesign.com.

# Overview

**Diagram 2**

THEORY DLC four channel amplifier dimensions.
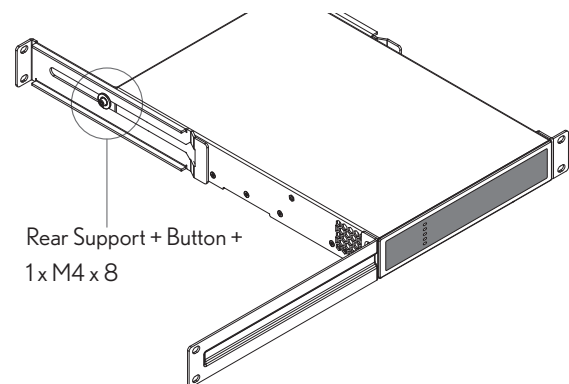(Shaded area defines ventilation space.)

80 mm
3.1 in

44 mm
1.7 in

25 mm
1.0 in

319 mm
12.6 in

220 mm
8.7 in
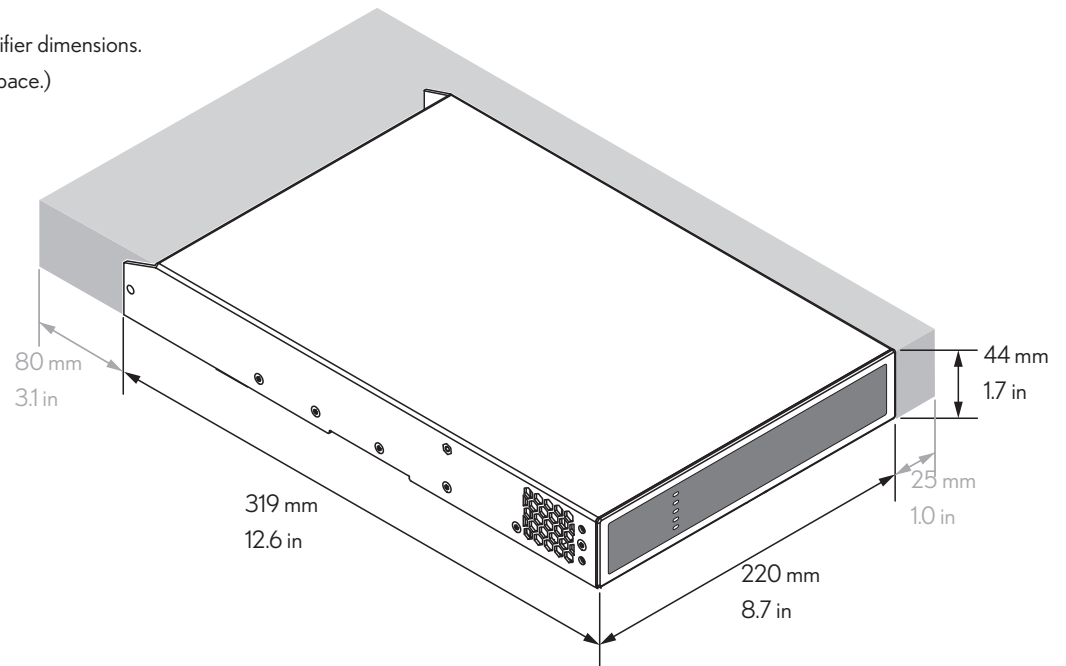
**Diagram 4a**
THEORY DLC
Rack Ear + Half-rack Extension.

Rack Ear +
2 x M4 x 8
countersunk

Half-rack Extension +
2 x M4 x 8 countersunk

**Diagram 4b**
THEORY DLC
Rack Support hardware. 2 positions.

Rear Support + Button +
1 x M4 x 8

# Installation

## 4. Installation

*Note: The desk/wall mounting components described and illustrated in Sections 4.2 to 4.3 and rear support hardware in Section 4.1 are not supplied with THEORY DLC amplifiers but are available to purchase as an accessory. Contact your amplifier re-seller for more information.*

### 4.1 THEORY DLC Mounting

The THEORY DLC amplifiers are shipped without rack mount hardware attached but can be configured for rack installation using the included one standard rack 'ear' and one half-rack extension piece as illustrated in **Diagram 4a**. The installation and equipment rack should be configured to provide appropriate ventilation airflow space around the sides and rear of the amplifier as illustrated in as illustrated in **Diagram 2**. Ventilation airflow space of at least 25 mm (1 in) should be maintained along at least one side of the amplifier at all times.

Ventilation apertures are also located on the rear panel of the amplifier and must not be obstructed. It is important to retain at least 80 mm (3.1 in) free space for airflow behind the amplifier rear panel. In addition to rack mount ears, optional rack mount rear support hardware is available and can be attached to the amplifier. Rear support hardware may be appropriate if the amplifier is to be used in a mobile rack or potentially be subject to significant movement. **Diagram 4b** illustrates the use of rack mount rear support hardware.
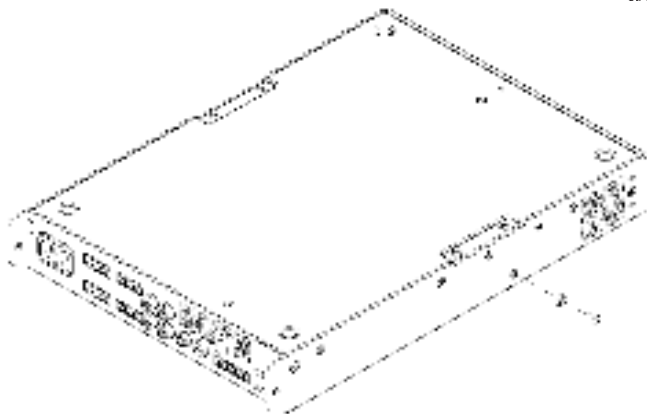
Multiple THEORY DLC amplifiers can also be mechanically connected using the bushing hardware illustrated in Diagram 4c and connecting plates illustrated in **Diagram 4d**.



Connection Plate +
4 x M3 x 6 countersunk
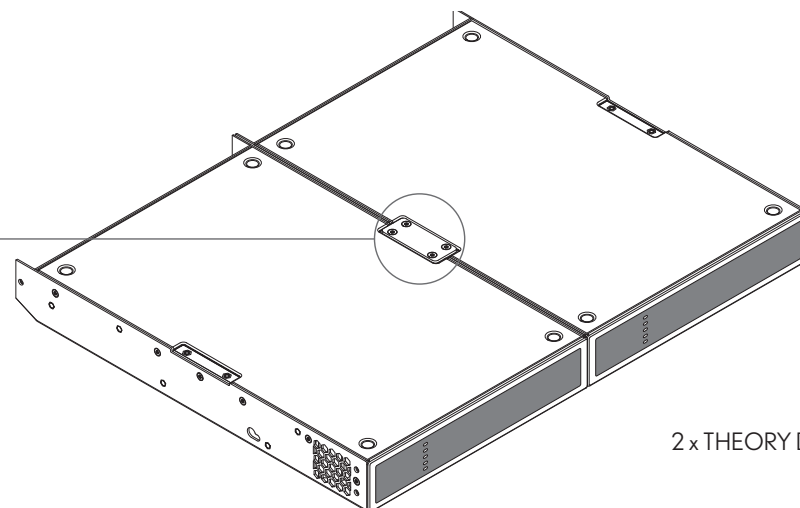
**Diagram 4d**
2 x THEORY DLC with Connection Plate. 2 positions



**Diagram 4c**
Bushing hardware to connect 2x THEORY DLC
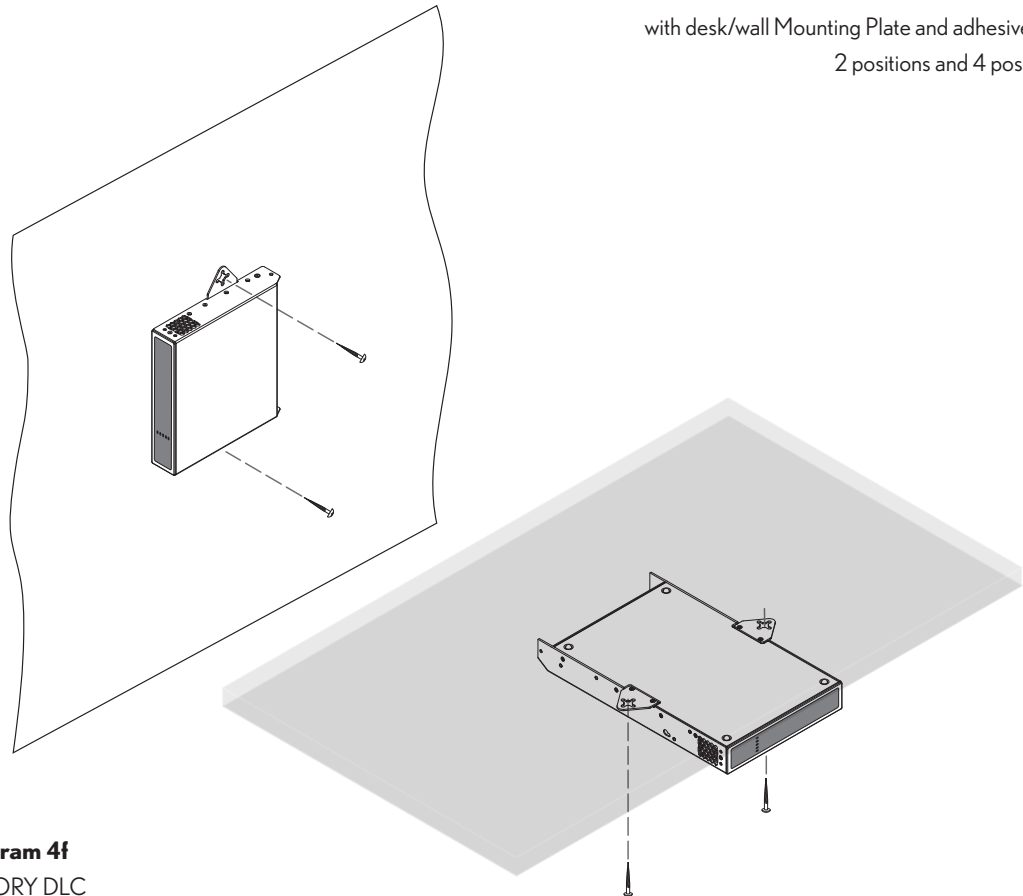
## Configuration

### 4.2 Free-standing

If not installed in an equipment rack, THEORY DLC amplifiers can be placed free-standing on a flat surface. Adhesive rubber feet are supplied for this purpose.

THEORY DLC amplifiers can also be attached to the underside of desks or wall mounted using connecting plate hardware (optional accessory, not included). The adhesive rubber feet should also be used in these circumstances to minimise the possibility of vibration between the amplifier and mounting surface. Wall and desk mounting is illustrated in Diagrams 4e and 4f.

It is important in any free standing installation that airflow through the amplifier's side panel mounted fans and rear panel ventilation apertures is not compromised by adjacent items. At least 80mm (X in) of free space behind the amplifier and 25mm along at least one side should be retained at all times.

Adhesive Foot
4 positions

Mounting Plate +
2 x M3 x 6 countersunk
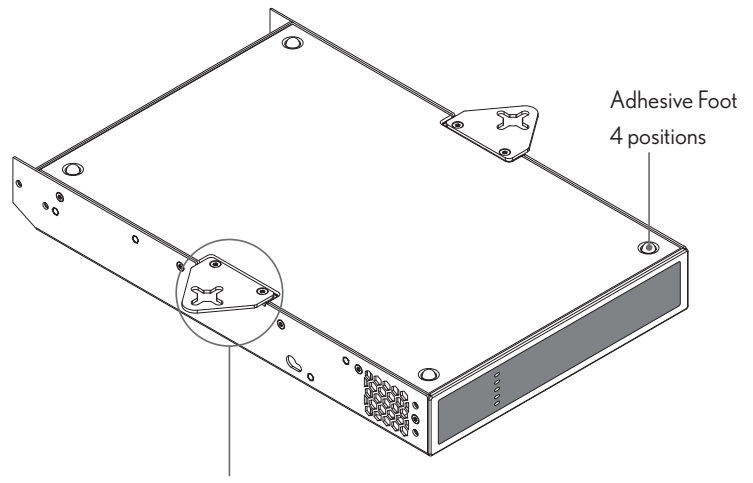
**Diagram 4e**
THEORY DLC
with desk/wall Mounting Plate and adhesive feet.
2 positions and 4 positions.

**Diagram 4f**
THEORY DLC
wall and under-desk mount.

# Configuration

## 5. Configuration

Before making input, output and GPIO connections, an initial THEORY DLC amplifier configuration should be established. It is particularly important that the amplifier output  format is configured appropriately for the speakers that are to be connected.

Configuration requires that THEORY DLC amplifiers are connected to mains power and network services. These connections are described in the following two sections.

### 5.1 Mains Power Connection

THEORY DLC amplifiers incorporate a power factor corrected power supply and can be used with mains input voltage from 100V AC to 240V AC, 50/60Hz. Use the mains cable supplied with the amplifier and connect it to a mains supply.

THEORY DLC amplifiers have no mains power switch and are operational as soon as mains power is connected.

### 5.2 Network Services

THEORY DLC amplifiers are configured via a web page interface called THEORY DLC Control. Before the configuration menus can be accessed, THEORY DLC amplifiers must be connected to the same TCP/IP network as the computer or mobile device that is to be used for configuration access.

5.2.1 Wired (Ethernet) Network Connection

To connect a THEORY DLC amplifier to a TCP/IP network using a wired connection (Ethernet) follow the steps below.

**1.** Use an Ethernet cable to connect the THEORY DLC amplifier rear panel Network Control socket to a free socket on a network router or switch, or directly to an Ethernet equipped laptop or desktop computer.

**2.** Connect the THEORY DLC amplifier to mains power using the supplied mains cable. Wait for the front panel Network indicator to illuminate blue to indicate that the amplifier has network connectivity.

**3.** THEORY DLC amplifiers are configured to use DHCP for network connection. A network scanning app can be used to identify the IP address. DHCP and Fixed IP address option settings can be found in the Settings Tab menu described in Section 5.3.5.

5.2.2 Wireless (WiFi) Network Connection

To connect a THEORY DLC amplifier to a TCP/IP network using a wireless connection (WiFi) follow the steps below.

**1.** With the THEORY DLC amplifier connected to mains power, wait for the front panel WiFi indicator to illuminate blue.

**2.** Use a mobile, laptop or desktop device to search for available WiFi networks. Connect to, THEORY DLC (product serial number)' using the password, **'password'.** The amplifier serial number can be found on its rear panel.

**3.** Open a computer or mobile device web browser and enter the IP address: 192.168.4.1. The THEORY DLC Control Web App interface will open to enable amplifier configuration as required.

**4.** Select the Web App Settings Tab followed by WiFi > WiFi Mode > Client to configure the amplifier to connect to the required WiFi network. The WiFi network name and password will be required.

It is strongly recommended that the THEORY DLC amplifier Access Point WiFi password is changed following initial wireless connection.

# Configuration

### 5.3 Configuration Menus

Opening a web browser that is network connected to a THEORY DLC amplifier initially displays the THEORY DLC Control Web App **Dashboard** illustrated in **Diagram 5a**. The Dashboard is the 'home' page from which all other configuration options can be accessed.

The Dashboard displays the amplifier status, output zones and the configuration menu tabs. It also enables immediate access to zone volume control  The functions available under each configuration menu tab are described in the following sections.

### 5.3.1 Input Tab

The **Input Tab** provides **naming**, **mono/stereo selection**, **sensitivity**, and **gain trim** for each amplifier input channel. An internal pink noise source, provided for system testing and set up, can also be enabled or

disabled, and adjusted for gain via the Input Tab. **Diagram 5b, 5c, 5d and 5E** illustrates the **Input Tab**. Dante Input Tab, Input EQ and Input Mix displays respectively.

*Note: The inputs displayed in the Dante® input tab will correspond to those configured and enabled in the Dante® Controller Mac OS or Windows application. If no inputs are displayed they must first be enabled in Dante® Controller.*

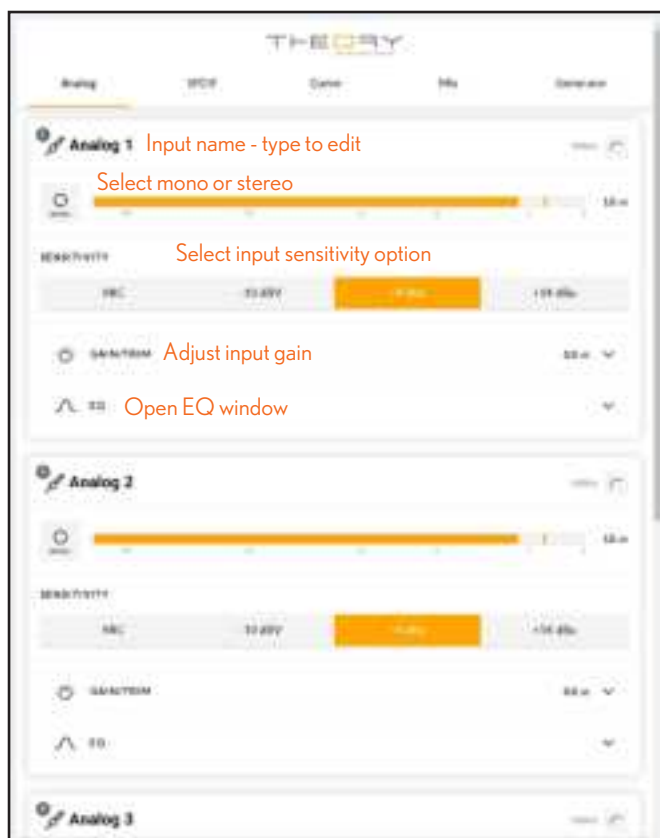**Diagram 5b**
Input Tab display
(two inputs only shown)
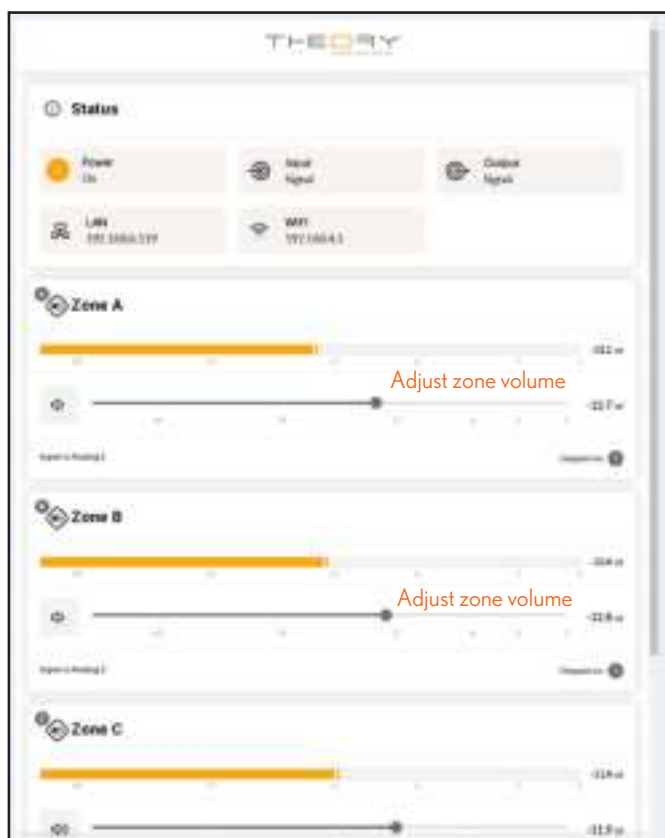


**Diagram 5a**
Configuration Dashboard display

*Note: When adjusting input gain, the input level display should remain orange. If it displays red, the input gain should be reduced.*

# Configuration



**Diagram 5c**
Input EQ display



**Diagram 5d**
Dante® Input display

### 5.3.2 Zone Tab

The **Zone Tab** enables installation zones to be defined and named, and provides access to further sub-menus. Zones might be bar or restaurant areas for example, or different rooms in a home. For all Zone Tab menus, the installation zone under configuration is selected by highlighting one of the zone identifiers (A, B, C or D) at the top of the page. **Diagram 5f and 5g** illustrates the **Zone Tab** and **Source** menu displays.

- The **Source** menu option enables inputs to be assigned to zones and **Input Priority** or **Input Ducking** to be configured. The **Input Priority** function enables an alternative input to replace and mute the input primarily routed to the zone under configuration when the alternative input exceeds a preset level.

The **Input Ducking** function enables an alternative input to replace and attenuate the input primarily routed to the zone under configuration when the alternative input exceeds a preset level.

*Note: Input Priority and Input Ducking parameters can be either set to default values or their Threshold, Attack, Hold and Release values set as required. Input Priority can also be set to ignore the volume level set for the specified zone and take a specific override volume.*

- The **Volume** menu allows minimum and maximum zone volume limits to be set, and enables external GPIO volume control to be applied to individual zones. The GPIO configuration menu can be found under the **Settings Tab,** and notes on connecting an external volume control via the GPIO interface can be found in Section 5.5 of this manual.

# Configuration
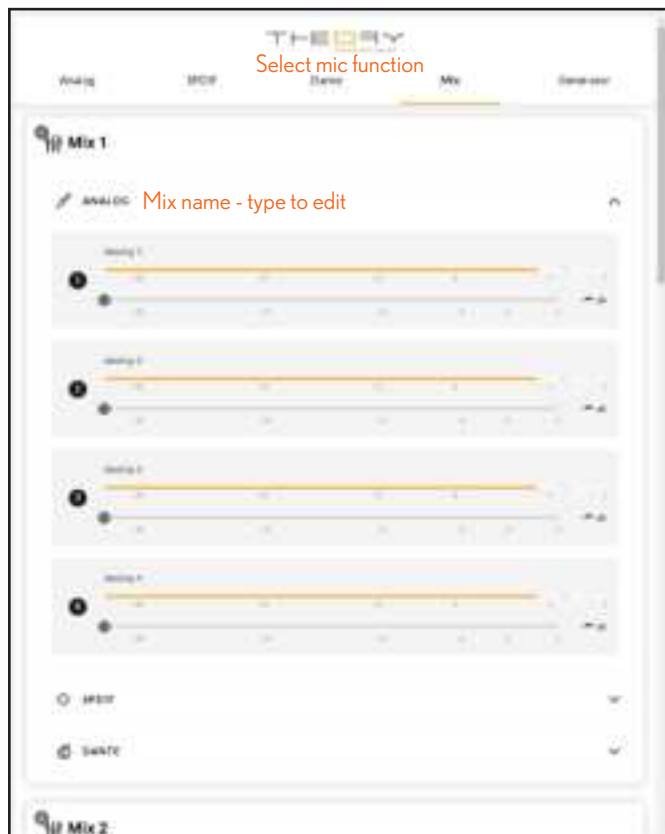


**Diagram 5e**
Input Mix display

*Note: If an amplifier is controlled via a third-party control system API, volume level limits set via the Input Tab will not apply.*

• The **Restrictions** menu enables zone inputs or input mixes to be restricted from routing to particular zones.

*Note: Routing restrictions cannot be applied to priority zone inputs.*

*Note: If an amplifier is controlled via a third-party control system API, input routing restrictions set via the Input Tab will not apply.*

• The **Compressor** option enables default or custom signal compression to be applied to individual zones.
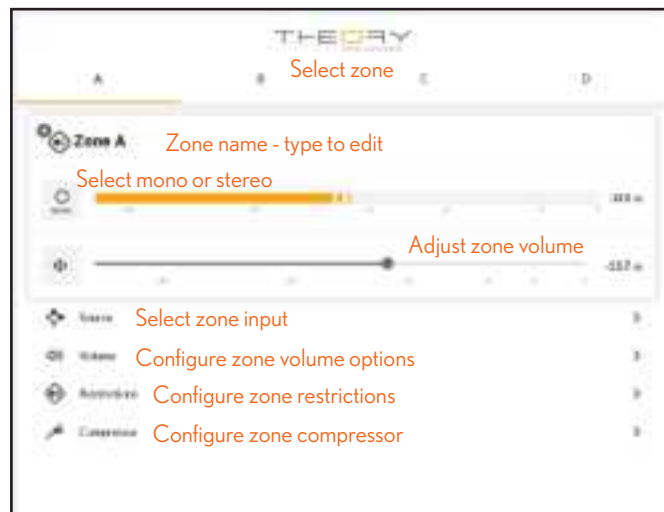


**Diagram 5f**
Zone Tab display



**Diagram 5g**
Zone Source menu display

*Note: Compression can be useful to reduce the volume difference between loud and quiet audio material. The lower the compression threshold is set, the more the difference between loud and soft will be reduced. The overall zone volume may need to be increased when compression is used. The default compression parameters are appropriate for most installations.*

# Configuration

## 5.3.3 Output Tab

The **Output Tab** enables amplifier outputs to be named, linked to zones, and provides access to **Delay**, **Room Equalizer** and **Speaker Preset** menus. **Diagram 5h** illustrates the **Output Tab** display.

For all **Output Tab** menus, the amplifier output under configuration is selected by highlighting one of the output identifiers at the top of the display.

*Note: The number of individual outputs available for configuration will depend on the THEORY DLC amplifier model and the input, zone and output mode configuration. The diagrams following illustrate a four output amplifier.*

• The **Routing** menu enables zones to be assigned to amplifier outputs.

*Note: Routing for zones specified as stereo will automatically offer three output options: left channel, right channel or summed mono. The summed mono signal can potentially be used to drive a mono subwoofer or a 70/100V mono speaker line.*
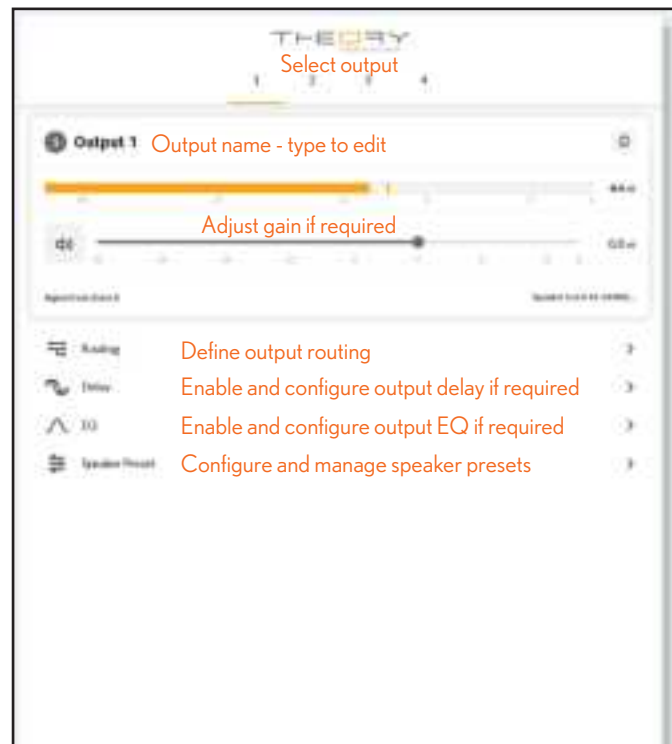


**Diagram 5h**
Output Tab display

**Diagram 5i**
Speaker Preset Parameters
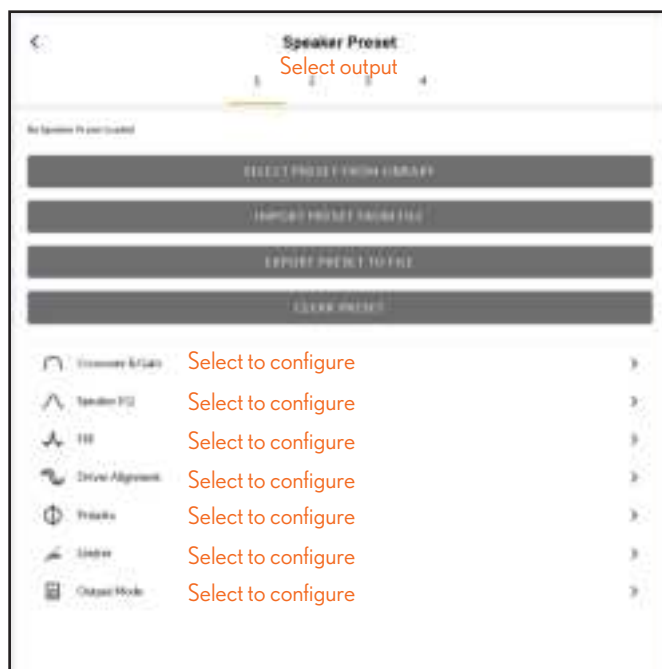


• The **Delay** menu enables delay to be applied to individual amplifier outputs.

• The **Equalizer** menu enables parametric equalization to be applied to individual amplifier outputs. Equalizer settings configured for one amplifier output can be copied and applied to other outputs.

• The **Speaker Preset** menu enables a set of speaker parameters to be adjusted, and preset configurations to be created, exported, imported or cleared.

  Speaker Presets can be simply applied to the selected amplifier output or imported, chosen from a library, exported or cleared. **Diagrams 5i** to **5l** illustrate the application of speaker presets.

**Speaker Preset** data provided by THEORY or PRO AUDIO TECHNOLOGY for use with their speakers can be imported and applied to amplifier outputs. To import speaker preset parameters follow the steps described below and illustrated in the diagrams.

# Configuration

**Diagram 5j**

Speaker Preset import file selection



**Diagram 5k**

Speaker Preset applied



- The **System Information** menu provides text fields for the recording of installation data.

- The **Device** menu records amplifier specific information such as the model number and firmware version. A firmware update routine and identifier button can also be found under the Device menu.

- The **External Devices** menu enables a DLC-CTRL wall mount control to be paired with an amplifier and configured. Each individual amplifier zone to be controlled will require its own control device. **Diagram 5n** illustrates the **External Devices** display.

- Name zones by typing in the Zone Name field.

- Adjust the zone volume if required by using the slider.

- Define a mono or stereo zone by selecting the appropriate option. Defining a stereo zone will reduce the total number of further zones available.

- Specify an input for the zone by selecting from the drop-down menu. Selecting a stereo input for a mono zone will automatically sum the stereo channels to mono.

*Note: When configured in Hi-Z mode DLC-250.4d amplifiers operate in 'bridged' format where the output of two channels is combined. This means that the number of output channels available in Hi-Z mode is half that available in Lo-Z mode.*

1. Select either the **FROM LIBRARY** or **IMPORT FILE** option from the **Speaker Preset** menu. If no import option is visible, select **CLEAR** to delete any existing speaker preset data.

2. If selecting the **IMPORT FILE** option, browse your device for the appropriate '.zcp' format speaker preset data file. If selecting the **FROM LIBRARY** option, select the appropriate speaker model from the library. The preset data will be applied to the selected amplifier output as soon as the file import is complete.

### 5.3.4 Settings Tab

The **Settings Tab** enables miscellaneous amplifier settings to be configured and installation data to be recorded. The Settings Tab provides access to further sub-menus. **Diagram 5m** illustrates the **Settings** Tab.
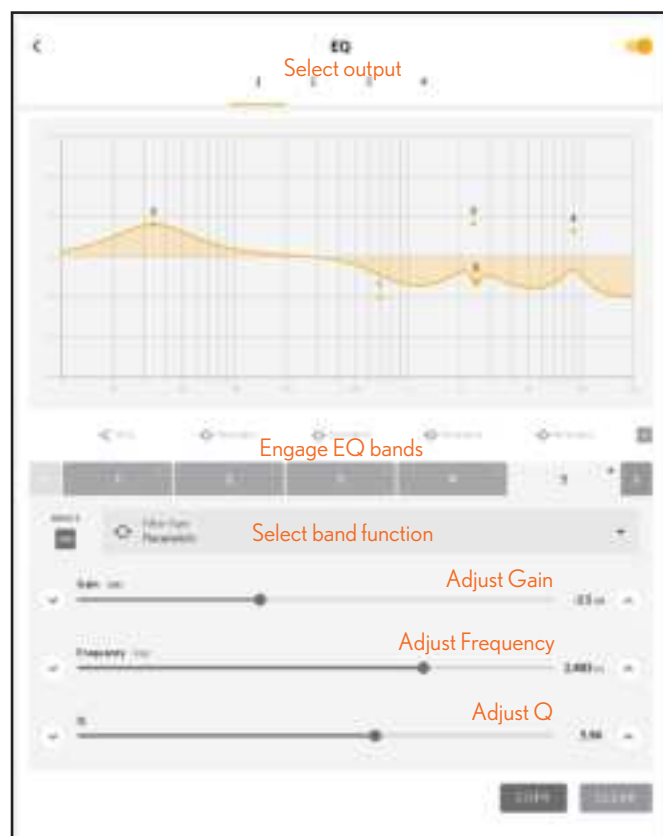
# Configuration

**Diagram 5l**

Speaker Preset parameter adjustment

*Note: Mono signals might be mono at source, created though combining the left and right channels of a stereo signal (summed mono) or treating the left and right channels of a stereo signal independently (split mono).*

- Name zones by typing in the Zone Name field.

- Adjust the zone volume if required by using the slider.

- Define a mono or stereo input by selecting the appropriate option. Defining a stereo input will reduce the total number of discrete inputs available.

- Specify an input for the zone by selecting from the drop-down menu. Selecting a stereo input for a mono zone will automatically sum the stereo channels to mono.

- The **Backup & Restore** menu enables amplifier configuration data to be downloaded to an external archive, and enables previously saved configuration files to be uploaded and adopted by the currently connected amplifier.

- The **Speaker Library** menu enables management of speaker preset libraries. Existing libraries of speaker preset files (.zcl) can be created or imported, and existing libraries edited or fully deleted. **Diagram 6o** illustrates the creation and management of speaker preset libraries.

- The **Security** menu enables a password to be set in order to protect against unauthorised access to the amplifier Control Web App.

Password protection is particularly important when an amplifier is connected to a wired network as the a WiFi password is no longer required to gain access to Control Web App.

# Configuration

*Note: It is recommended that a Control Web App password is different from that required to gain access to the amplifier via WiFi.*

- The **Power Management** menu enables various automatic switch-on options to be engaged. The Power Management menu also offers timed Standby and Mute functions.

*Note: In Eco mode the network is switched off during standby. When the amplifier has Dante® enabled, use the Audio (Digital) or Network Only settings.*

- The **Output Routing** menu enables specified inputs or zones to be routed to the amplifier S/PDIF outputs. The output level can also be adjusted.

  Any zone or input can be routed to either digital output, including inputs not actively assigned to a zone. Primary or priority input status is immaterial. The specified input is always routed to the specified output to be available for use by downstream devices.

*Note: When a zone is selected for the digital S/PDIF (or Dante®) output - the output signal is variable. However, when an input signal is routed out an S/PDIF (or Dante®) output, the signal will be fixed.*

*Note: The digital output function is especially useful when amplifiers are to be daisy chained and a specific input; a central paging mic, for example, is required to be routed to multiple amplifiers.*

- The **Dante**® menu enables identification of Dante® capable devices present on the AoIP network. Dante® devices must be appropriately enabled and configured using Dante® Controller. Use Dante® Controller to activate AES67 mode if required.

- The **GPIO** menu enables configuration of the multi-purpose GPIO interface pins. A description of the individual settings is detailed in THEORY DLC Control.

- The **LAN** menu enables configuration and reset of the wired network options and parameters.

- The **WiFi** menu enables configuration and reset of the wireless network options and parameters.



**Diagram 5m**
Settings Tab menu



**Diagram 5n**
The External Devices display

# Configuration

## 5.4 Setup and Signal Routing

Thanks to their network based configuration features, THEORY DLC amplifiers offer considerable versatility in terms of sources, signal routing, installation zones and output modes. Inputs can be freely assigned to installation zones, and those zones assigned freely to the available amplifier outputs in either Lo-Z or Hi-Z modes.

This versatility enables, for example, one amplifier simultaneously to drive both Lo-Z and Hi-Z speakers, or for different inputs to be routed to different output zones.

The following paragraphs describe and illustrate  the recommended procedure for configuring input, zone and output routing. A general signal flow schematic is also illustrated in **Diagram 5p.**
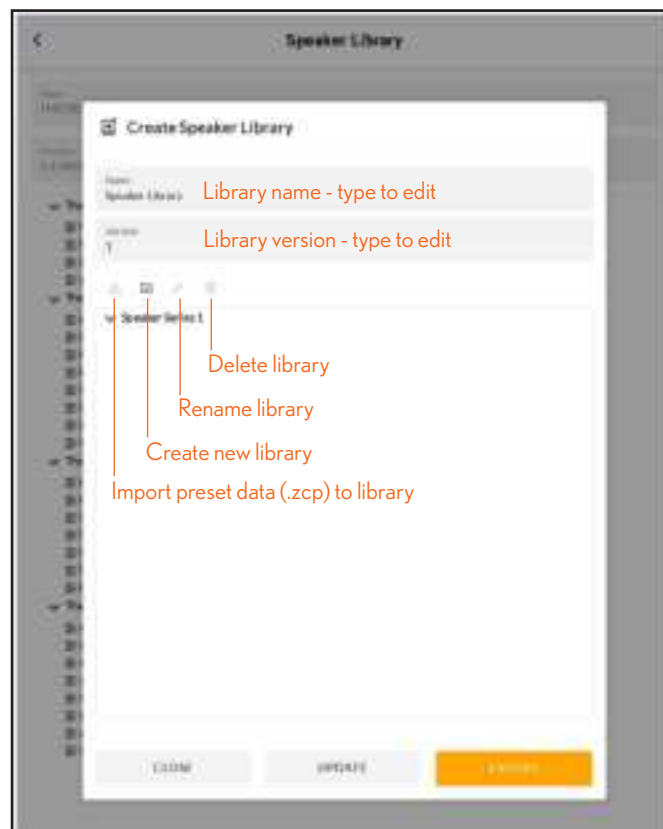
### 5.4.1 Input Setup

Open the configuration Dashboard and select the **Input Tab**. The Input Tab is shown in **Diagram 5b.**

- To edit default input names simply select and type in the Input Name field.

- Define a mono or stereo input by selecting the appropriate option. Defining a stereo input will reduce the total number of discrete inputs available.

- Select an input sensitivity option from the drop-down menu: +14dB, +4dB, -10dB and 'microphone' options are available. Generally, the +14dB or +4dB options are appropriate for 'professional audio' source hardware with balanced outputs, while the -10dB option is more appropriate for 'consumer audio' source hardware with unbalanced outputs. The 'microphone' option provides the significantly greater sensitivity required for microphones.

*Note: Only dynamic microphones are suitable for connection. Phantom power for condenser microphones is not provided.*

- If necessary, adjust the input gain using the slider or up/down icons. Gain adjustment is intended to be used for fine output level adjustment following initial use. If necessary, adjust the input EQ using the 5 band equalizer.



Library name - type to edit

Library version - type to edit

Delete library

Rename library

Create new library

Import preset data (.zcp) to library

### 5.4.2 Zone Setup & Routing

Open the configuration Dashboard and select the **Zone Tab**. The Zone Tab is shown in **Diagram 5f.**

- Select the zone to be configured. The number of zones available and their channel format (stereo or mono) will depend on the amplifier model, input setup and output mode (Lo-Z or Hi-Z). For example:

- A four output amplifier can have the following zones configured:
  - 2 x stereo Lo-Z zones
  - 4 x mono Lo-Z zones
  - 2 x mono Hi-Z
  - 1 x mono Hi-Z + 1 x stereo Lo-Z zone
  - 1 x mono Hi-Z + 2 x mono Lo-Z zones

## Signal Flow Schematic

**Diagram 5p**

**Input Setup**

| | | |
|---|---|---|
| Analog 1 | Input Sensitivity | Input Gain |
| Analog 2 | Input Sensitivity | Input Gain |
| Analog 3 | Input Sensitivity | Input Gain |
| Analog 4 | Input Sensitivity | Input Gain |
| SPDIF (stereo) | | Input Gain |
| Pink Noise | Gain | |

**Zone Setup & Routing**

Input Selection

| Level Adjustment | Compressor |
|---|---|
| Level Adjustment | Compressor |
| Level Adjustment | Compressor |
| Level Adjustment | Compressor |

Output Matrix Zones A - D Outputs 1 - 4

**Room Adjustment Parameters**

| Gain Trim | Delay | EQ |
|---|---|---|
| Gain Trim | Delay | EQ |
| Gain Trim | Delay | EQ |
| Gain Trim | Delay | EQ |

**Speaker Adjustment Parameters**

| Crossover | EQ | Polarity | Driver Alignment | Limiter |
|---|---|---|---|---|
| Crossover | EQ | Polarity | Driver Alignment | Limiter |
| Crossover | EQ | Polarity | Driver Alignment | Limiter |
| Crossover | EQ | Polarity | Driver Alignment | Limiter |

**Output Setup**

| | |
|---|---|
| BTL Amplifier 2 x Low-Z 1 x Hi-Z | Output 1 |
| | Output 2 |
| BTL Amplifier 2 x Low-Z 1 x Hi-Z | Output 3 |
| | Output 4 |

# Configuration

## 5.5 GPIO Setup and Connection

⚠ THEORY DLC amplifiers provide a GPIO socket that enables remote control of volume, standby, mute and trigger functions. The GPIO connector pin functions are described in the **GPIO Settings** menu illustrated in **Diagram 5q**. The connection of GPIO based remote volume control and standby/mute are illustrated in **Diagram 5r** and **Diagram 5s** respectively.

⚠ Note: The GPIO connector must not be used for any unintended purpose. Amplifier damage may result from incorrect use of GPIO.

⚠ Note: Shielded cable must be used when connecting standby switches and potentiometers via GPIO.

⚠ Note: GPIO Pin 8 has a low output impedance and is able to supply a maximum current of 10mA.

*Note: GPIO Pin 1 and Pin 3 both offer ground connections: Pin 1 is connected directly to the amplifier chassis.*
*Pin 3 is connected to the chassis via a 220 Ohm resistor. The 'soft ground' connection of Pin 3 is potentially useful for managing ground loops that may cause audible hum.*
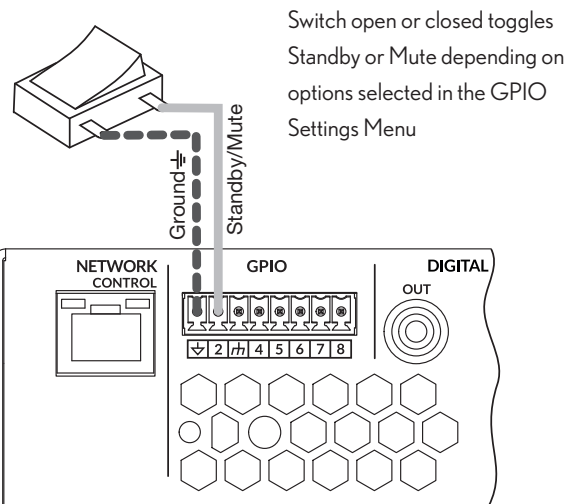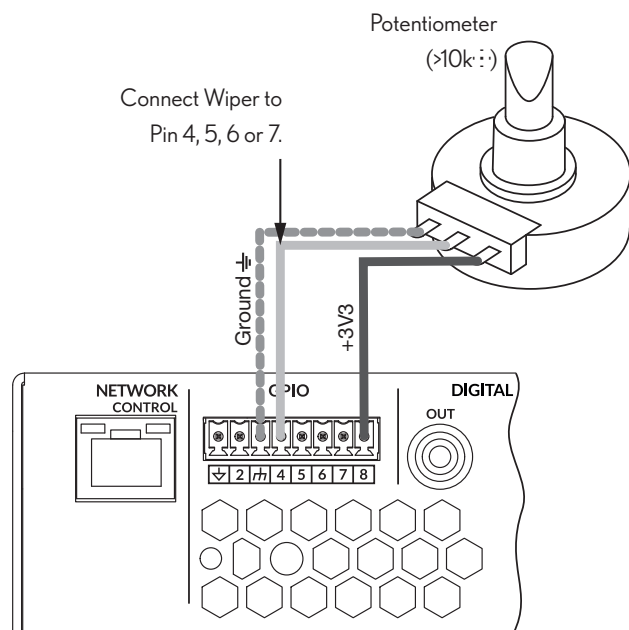


**Diagram 5q**
GPIO Settings Menu

# Configuration

**Diagram 5r**

Potentiometer connections for remote volume control via GPIO.

*Note: Diagram 6d illustrates use of the GPIO connector.*

Potentiometer
(>10k :)

Connect Wiper to
Pin 4, 5, 6 or 7.

Ground

+3V3



Switch open or closed toggles Standby or Mute depending on options selected in the GPIO Settings Menu

Ground

Standby/Mute



**Diagram 5s**

Connections for remote standby/mute switch via GPIO.

*Note: Diagram 6c illustrates  use of the GPIO connector.*

# Connections

## 6. Connections

THEORY DLC amplifier rear panel connections are illustrated in **Diagram 6a.**

### 6.1 Mains Power Connection

THEORY DLC amplifiers incorporate a power factor corrected universal power supply and can be used with mains input voltage from 100V AC to 240V AC, 50/60Hz. Use the mains cable supplied with the amplifier.

THEORY DLC amplifiers have no mains power switch and are operational as soon as mains power is connected. **Ensure that all signal, GPIO and output connections are made before connecting the amplifier to mains power.**

### 6.2 Input Connection

All THEORY DLC amplifier models provide four balanced or unbalanced analog audio inputs and a stereo S/PDIF digital audio input. Any input channel can be routed to any output channel. Input routing options can be configured via the amplifier network interface. See **Section 5** of this manual.

#### Analog Inputs
THEORY DLC analog inputs are of line level format with a default input sensitivity of +4dBu (full output voltage swing/sensitivity) in all output modes. Input signal levels up to +24dBu can be handled without input clipping. Input sensitivity options can be set via the amplifier network interface. See **Section 5** of this manual.

Balanced input connections to the amplifiers are made via male 'Euro Block'

connectors. Connecting cables to the supplied female input connectors is illustrated in **Diagram 6b.**

Unbalanced input connections to the amplifiers are made via RCA phono sockets connected in parallel with the balanced inputs.

#### Digital Inputs
THEORY DLC amplifier S/PDIF stereo digital audio input connections are made via a single RCA Phono socket. The S/PDIF input is connected by default to amplifier installation Zones A (left) and B (right).

#### Digital Outputs
THEORY DLC amplifier S/PDIF stereo digital audio output connections are made via a single RCA Phono socket. The S/PDIF output signal by default reflects the input to amplifier installation Zones A and B and is intended to be used for daisy-chaining  THEORY DLC amplifier.

*Note: 75a RCA Phono cables specifically intended for digital audio should always be used for S/PDIF connections. Standard Phono cables can be used but may not result in optimal performance.*
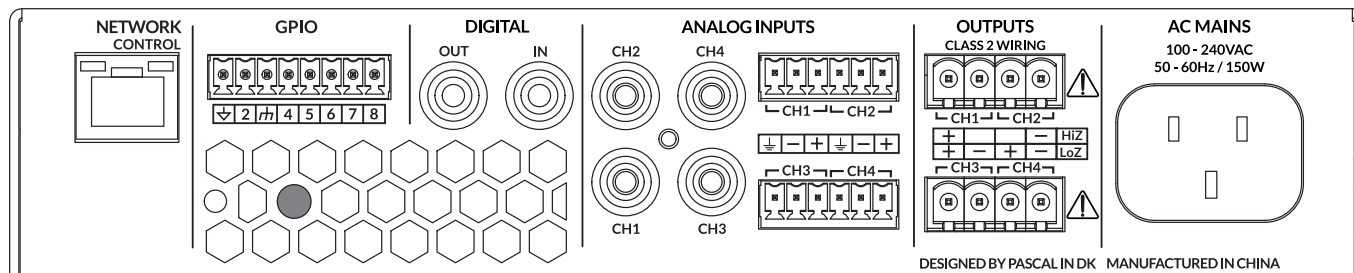
*Note: The S/PDIF output level is by default set at -10dB to reduce the possibility of downstream input clipping.*

### 6.3 Output Connections

Output connections from the amplifiers are achieved via male 'Euro Block' connectors. Ensure that speaker connection polarity is correct throughout the installation:

**Diagram 6a**
THEORY DLC rear panel connections.

# Connections

In the case of Lo-Z speaker connections, positive (+) amplifier terminals should always be connected to positive speaker terminals and negative (–) amplifier terminals always connected to negative speaker terminals.

In the case of Hi-Z speaker connections, the two speaker cable conductors should be connected between the positive (+) terminal of Output 1 and the negative terminal (-) of Output 2, and likewise for Outputs 3 and 4.

Output mode options (Lo-Z or Hi-Z) can be configured via the amplifier network interface. See **Section 5** of this manual.

Connecting cables to the supplied female **output** connector is illustrated in **Diagram 6c.**

## 6.5 Speaker Cable Gauge

THEORY DLC speaker connection cable gauge should be chosen appropriately to reflect the type of installation. The adjacent tables specify the appropriate cable gauge for less than 0.5dB cable loss with different installation types and cable lengths.

## 6.5 GPIO Connections

If any THEORY DLC GPIO functionality is required, cables will need to be connected to the supplied GPIO connector. Connecting cables to the GPIO connector is illustrated in **Diagrams 6d**.

## 6.6 Network Connections

THEORY DLC amplifiers are TCP/IP network connected devices that are configured via a web page based interface. Wired (Ethernet) and wireless (WiFi) connection options are available. Connecting THEORY DLC amplifiers to a TCP/IP network is described in **Section 5** of this manual

**Cable Gauge Table**

Lo-Z installations, 0.5dB attenuation. 4 Ω & 8 Ω loads

| Cable Cross Section (mm$^2$) | Cable Gauge (AWG) | Max Cable Length (Metres, 4 Ω load) | Max Cable Length (Metres, 8 Ω load) |
|---|---|---|---|
| 0.75 | 18 | 5 | 10 |
| 1.5 | 16 | 10 | 20 |
| 2.5 | 14 | 17 | 35 |

**Cable Gauge Table**

70V Hi-Z installations, 1.0dB attenuation
20 speakers evenly distributed

| Cable Cross Section (mm$^2$) | Cable Gauge (AWG) | Max Cable Length (Metres), (125 W/channel) | Max Cable Length (Metres), (250 W/channel) |
|---|---|---|---|
| 0.75 | 18 | 90 | 45 |
| 1.5 | 16 | 180 | 90 |
| 2.0 | 14 | <250 | 150 |
| 3.5 | 12 | <250 | <250 |

*Note: Cable lengths should not exceed 250m.*

**Cable Gauge Table**

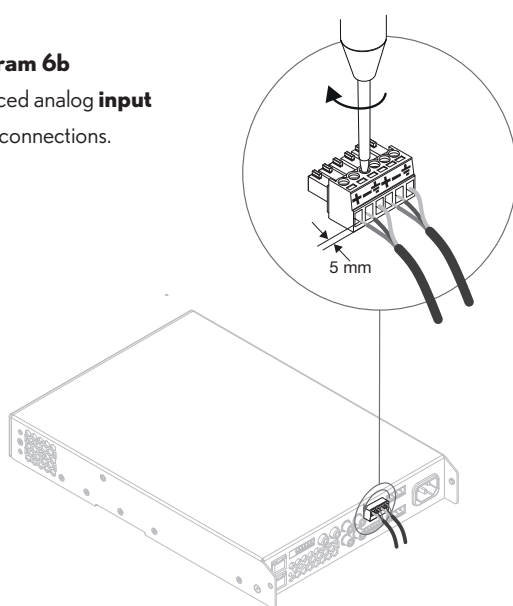100V Hi-Z installations, 1.0dB attenuation
20 speakers evenly distributed

| Cable Cross Section (mm$^2$) | Cable Gauge (AWG) | Max Cable Length (Metres), (125 W/channel) | Max Cable Length (Metres), (250 W/channel) |
|---|---|---|---|
| 0.75 | 18 | 190 | 90 |
| 1.5 | 16 | <250 | 180 |
| 2.0 | 14 | <250 | <250 |
| 3.5 | 12 | <250 | <250 |

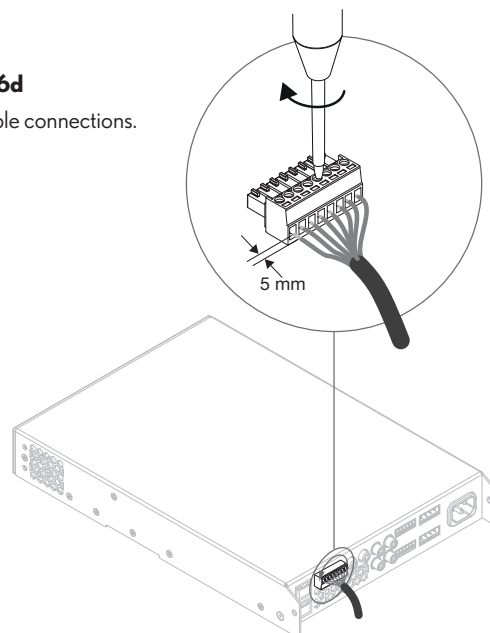*Note: Cable lengths should not exceed 250m.*

**Diagram 6b**
Balanced analog **input** cable connections.

5 mm

**Diagram 6d**
**GPIO** cable connections.

5 mm

**Diagram 6c**
**Output** cable connections.

5 mm

Low-Z Mode

5 mm

Hi-Z Mode
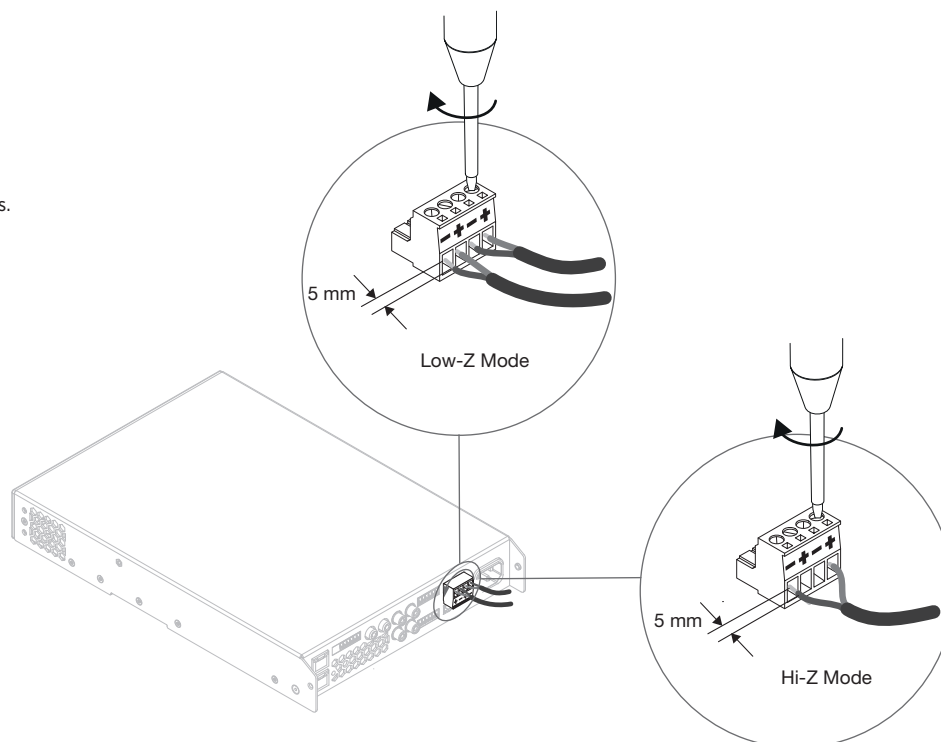
**The exclamation point printed next to the output terminals of the amplifiers is, in addition to the CLASS 2 WIRING text, intended to alert users to the risk of hazardous voltages. Output connectors that could pose a risk are marked with the exclamation point. Do not touch the output terminals while the amplifier is switched on. Make all connections with the amplifier switched off.**

# Operation

## 7. Operation

Once all connections have been made and configuration options selected, THEORY DLC amplifiers are ready for use. If an input signal above -60dB is present on any input, the front panel Input and Standby indicators will illuminate blue to indicate normal amplifier operation. Audio will be heard from any connected speakers.

*Note: THEORY DLC amplifiers will not switch on from Standby Mode unless an input signal is present, a network 'ON' command is received, or an external standby switch (or 12V trigger) is operated. Standby behaviour can be configured via the Power Management menu of the Settings Tab.*

Amplifier outputs will mute if no input signal is present for 5 minutes, and the amplifier will switch automatically to Standby Mode if no signal is present on any input for more than 15 minutes. Alternative standby and mute delay times can selected via the **Settings Tab**. Amplifier cooling fan speed is temperature controlled. The fan will switch off when the amplifier enters standby mode.

### 7.1 Front Panel Indicators

THEORY DLC amplifier front panel indicators illuminate to indicate the following operational states:

**Status:**    Off – Mains power disconnected.
              Blue – Amplifier operational.
              Pulse Blue – Standby Mode.
              Amber – GPIO triggered Standby Mode.

**Input:**    Off – No input signal present.
              Blue– Signal present on one or more inputs.
              Amber – Signal limiting/clipping on one or more inputs.

**Output:**    Off – No output signal present.
              Blue – Signal present on one or more outputs.
              Amber – Signal limiting/clipping on one or more outputs.
              Red – One or more channel pair is in
              overload/protection mode.

**Network:**  Off – No Ethernet network detected.
              Blue – Ethernet network detected.

**WiFi:**    Off – WiFi disabled.
              Blue – WiFi enabled.

## 7.2 Automatic Power Sharing

THEORY DLC amplifiers incorporate a power sharing feature that automatically shares the total power available from the amplifier's internal power supply across each pair of output channels. If one channel temporarily demands more than the amplifier's continuous power rating while other channel is demanding less, the excess power available from the internal power supply is automatically made available to the over-power channel. Power sharing optimises the amplifier's ability to deliver maximum power into dynamic loudspeaker loads when playing music programme material.

## 7.3 Default Reset

THEORY DLC amplifiers can be returned to their default settings via either the Control Web App Settings Tab or the hardware reset pinhole button. The reset pinhole button is located on the underside panel of the amplifier.

To reset the amplifier using the pinhole button, follow the steps below:

- Disconnect the amplifier from mains power.

- Use an appropriate tool to press and hold the reset pinhole button while simultaneously reconnecting mains power.

- Continue to hold the reset pinhole button for a few seconds as the amplifier restarts.

The amplifier will restart with all settings at their default state. Any previously configured settings will be deleted.

# Specifications

| Model | DLC-250.4 |
|---|---|
| Total System Power | 500 W |
| Output Power @ 4/8Ω | 4 x 125 W |
| Output Power @ 70/100V* | 2 x 250 W |
| Powershare (up to) Across all channels** | 2 x 250 W |
| Power Consumption | 150W |
| Dimensions | 44 x 220 x 319 mm (1.7 x 8.7 x 12.6 in) |
| Weight | 2.8kg (6.2 lbs) |
| Output Circuitry | UMAC™ Class D - full bandwidth PWM modulator with ultra-low distortion |
| Output Voltage | 70Vp / 140Vpp (unloaded) // Bridged 140Vp / 280 Vpp (unloaded) |
| Signal To Noise-Ratio | >106dB (A-weighted, 20Hz-20kHz, 8Ω load) |
| THD+N (typical) | < 0.05% (20Hz-20kHz, 8Ω load, 3dB below rated power) |
| Frequency Response | 20Hz-20kHz (+0/-0.25dB (8Ω load, 3dB below rated power) |
| Protection Circuits | Short circuit -, DC -, Undervoltage -, Temperature - and Overload protection |
| Power Supply | UREC™ universal mains switch mode power supply with Power Factor Correction (PFC) and standby converter |
| Operating temperature | 0-40°C |
| Operating Voltage/ Frequency | Universal Mains, 100V-240V, 50Hz-60Hz |
| Standby Consumption | < 0.5W |
| Accessories | 2x Rack ears 1x ½ rack plate extension 2x surface mount plates (not included) 2x Rear supports (not included) |
| Power Ratings | 1% THD @ 120Vac and 230Vac |

*100V line mode is @ -1dB (Ω 90 V)
**DLC-250.4d may only Powershare across Ch1/2 and Ch3/4

# Specifications

## Power Efficiency Data

The following table describes the efficiency and power performance of THEORY DLC amplifiers.
The table also includes the derived thermal losses.

| 1/8th Full Power | | | | | |
|---|---|---|---|---|---|
| Load (Ohms) | Power In (W) | Power Out (W) | Efficiency (%) | Thermal Loss (W) | Thermal Loss (BTU) |
| 4 | 107 | 62.5 | 58.6 | 44.5 | 152 |

| Standby and Idle | | | | |
|---|---|---|---|---|
| Standby (mW) | Idle @ 120V (W) | Idle @ 120V (BTU) | Idle @ 230V (W) | Idle @ 230V (BTU) |
| <500* | 14.5 | 49 | 15.9 | 54 |

*As per compliance to ErP

## Propagation Delay Data

The following table describes the input/output latency performance of THEORY DLC amplifiers.

| 4 Channel Amplifiers | | | | |
|---|---|---|---|---|
| | | OUT | | |
| | | Analogue | S/PDIF | Dante®* |
| IN | Analog | 1177μS | 458μS | 1520μS |
| | S/PDIF | 1833μS | 1104μS | 2166μS |
| | Dante®* | 1895μS | 1166μS | 2125μS |

*Dante® network latency not included.

Note: Dante® latency is measured in a Dante® to Dante® connection setup. The propagation delay is both measured from both analog inputs and digital inputs. The total delay of: Amp1 SPDIF input to Dante® out -> Amp2 Dante® input to SPDIF output is 4333μs. Out of this the network latency accounts for 1000μs and the ASCRs accounts for 3 x 1000μs. Out of the final 333μs seconds, the DSP accounts for roughly 208μs, leaving 125μs for the Dante® chip processing. For this test the Dante® process occurs twice resulting in a 62,49μs delay per Dante® transmission.

# Notes