Dolby® Lake® Processor System Manual

Issue 5 Part Number 911001

For users of firmware v.5.1

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Regulatory Notices

FCC

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. 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 this 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.

Canada

This Class A digital apparatus complies with Canadian ICES-003.

EU/EMC

This equipment complies with the EMC requirements of EN55103-1 and EN55103-2 when operated in an E2 environment in accordance with this manual.

WEEE

PRODUCT END-OF-LIFE INFORMATION

This product has been designed and built by Dolby Laboratories to give many years of service, and is backed by our commitment to provide high-quality support. When it eventually reaches the end of its serviceable life, it should be disposed of in accordance with local or national legislation.

For current information please visit our web site:
http://www.dolby.com/environment

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. WARNING: To reduce the risk of fire or electric shock, do not expose this apparatus to rain or moisture.
7. Clean only with dry cloth.
8. Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.

9. No naked flame sources, such as lighted candles, should be placed on the apparatus.
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 the manufacturer.
12. Unplug this apparatus when unused for long periods of time.
13. Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as the 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.
14. Do not expose the apparatus to dripping or splashing and no objects filled with liquids, such as vases, shall be placed on the apparatus.
15. CAUTION: Troubleshooting must be performed by a trained technician. To reduce the risk of electric shock, do not attempt to service this equipment unless you are qualified to do so.
16. 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 is provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.
17. This apparatus must be earthed (grounded) by connecting to a correctly wired and earthed power outlet.
18. Ensure that your mains supply is in the correct range for the input power requirement of the unit.
19. In order to reduce the risk of electrical shock, the power cord must be disconnected when the power supply assembly is removed.
20. This equipment is designed to mount in a suitably ventilated 19" rack. Ensure that any ventilation slots in the unit are not blocked or covered.
21. To avoid exposure to dangerous voltages and to avoid damage to the unit, do not connect any Ethernet ports to telephone circuits.
22. The power cord with CEE7/7 plug which may be supplied with this unit for use in Continental Europe must be connected to a polarised mains socket, or the socket must be supplied via a residual current breaker (RCD). This power cord is not suitable for use in the UK. To use the cord in the UK cut off the CEE7/7 plug and replace with an approved BS 1363 13A plug:
    - The green and yellow core must be connected to the terminal in the plug identified by the letter E, or by the earth symbol ⏚, or coloured green, or green and yellow.
    - The blue core must be connected to the terminal marked with the letter N or coloured black.
    - The brown core must be connected to the terminal marked with the letter L or coloured red.

Fuses

WARNING: Check that the correct fuses have been installed. For continued protection against risk of fire, replace only with fuses of the same type and rating:

T 1.5A L (time-lag, 1.5 A, 20 mm, low-breaking capacity, 250 V)

Table of Contents

Regulatory Notices ..... **iii**

List of Figures ..... **vii**

List of Tables ..... **viii**

Introduction **1**

1.1 Manual Overview 1

1.2 Product Specifications 3

Configurations **5**

2.1 Basic Configurations 5

2.1.1 Configuration Naming Conventions 5

2.1.2 Dolby Lake Processor LPD 5

2.1.3 Dolby Lake Processor LP4D4 6

2.1.4 Dolby Lake Processor LP8D8 6

2.1.5 Dolby Lake Processor LP4D8 6

2.1.6 Dolby Lake Processor LP4D12 7

Signal Processing Configurations **9**

3.1 Loudspeaker Processor Configuration (CONTOUR) 10

3.2 System Equalizer Configuration (Mesa EQ) 11

3.3 Loudspeaker and Equalizer Configuration (Contour/MesaEQ) 12

Front-Panel Interface **13**

4.1 Front-Panel Connectivity and Power 13

4.1.1 Ambient Light Sensor 13

4.1.2 Ethernet Port 13

4.1.3 Ethernet Activity Indicators 14

4.1.4 Infrared Transceivers 14

4.1.5 Standby Power Button 14

4.2 Global Function Buttons 15

4.2.1 Mute Enable 15

4.2.2 Meter View 15

4.2.3 Menu Mode 15

4.3 Portal Meter Display 16

4.4 Meter Modes 18

4.5 Menu Mode 19

4.5.1 Main Menu 20

4.5.2 Main Menu → Edit Menu 20

4.5.3 Main Menu → Edit Menu → Parametric EQ Edit 21

4.5.4 Main Menu → Edit Menu → GEQ Edit 23

4.5.5 Main Menu → Edit Menu → Levels 24

4.5.6 Main Menu → Presets Menu 25

4.5.7 Main Menu → Utility Menu 26

4.5.8 Main Menu → Utility Menu → Reset Processor Menu 26
4.5.9 Main Menu → Utility Menu → Reset Processor Menu → Reset Confirmation Menus . 27
4.5.10 Processor Reset Confirmation Display 27
4.5.11 Main Menu → Utility Menu → Technical Information Menu 28
4.5.12 Main Menu → Utility Menu → Reset Networking 28
4.5.13 Main Menu → Front-Panel Configuration Menu 29
4.5.14 Main Menu → Front-Panel Configuration Menu → Access Control Menu 29
4.5.15 Main Menu → Front-Panel Configuration Menu → Access Control Menu → Password Entry Keyboard 30
4.6 Lake Contour and Mesa Quad EQ Front-Panel Reference 31
4.6.1 Lake Contour Front-Panel Functions 31
4.6.2 Mesa Quad EQ Front-Panel Functions 32

Back-Panel Interface 33
5.1 Back-Panel Overview 33
5.2 Base Platform 34
5.2.1 Power Inlet 34
5.2.2 AES/EBU I/O 34
5.2.3 MP I/O 35
5.2.4 Word Clock 35
5.2.5 Memory Slot 35
5.2.6 Ethernet—Communication and Dante Audio 36
5.2.7 S/PDIF I/O 36
5.3 Analog Cards 36
5.3.1 Analog Input Card 36
5.3.2 Analog Output Card 36
5.3.3 Iso-Float Ground Isolation System 37
5.4 CobraNet Card 38
5.5 System Interconnection Example 38

Networking 41
6.1 Dolby Lake Processor Networking Features 41
6.2 Cable Specification 41
6.3 Connecting Multiple Processors on Wired Ethernet Networks 42
6.4 Wireless Network Operation 44
6.5 Networking with Lake Contour and Mesa Quad EQ Processors 44

Connecting Digital Audio Devices 47
7.1 Internal and External Clocks 47
7.2 Clock Source Priorities 49
7.3 Cascading AES and Word Clock Input Signals 50
7.4 Signal Processing Latency 51

Index 55

List of Figures

Figure 2-1 Dolby Lake Processor LPD Configuration 5
Figure 2-2 Dolby Lake Processor LP4D4 Configuration 6
Figure 2-3 Dolby Lake Processor LP8D8 Configuration 6
Figure 2-4 Dolby Lake Processor LP4D8 Configuration 6
Figure 2-5 Dolby Lake Processor LP4D12 Configuration 7
Figure 3-1 4×12 Loudspeaker Processor Configuration 10
Figure 3-2 8×8 System Equalizer Configuration 11
Figure 3-3 Loudspeaker Processor/System Equalizer Configuration 12
Figure 4-1 Front-Panel Connector and Power Button 13
Figure 4-2 Front-Panel Global Function Buttons 15
Figure 4-3 Dolby Lake Processor Front Panel 16
Figure 4-4 Portal Display and Functionality 16
Figure 4-5 Level Metering in Action 17
Figure 4-6 Output Metering Mode (Default) 18
Figure 4-7 Physical Input Meters 19
Figure 4-8 Module Input Meters 19
Figure 4-9 Portal Reference Numbers 20
Figure 4-10 Main Menu 20
Figure 4-11 Edit Menu 20
Figure 4-12 Parametric EQ Edit Menu 21
Figure 4-13 Parametric EQ Edit Portal 2 22
Figure 4-14 Parametric EQ Edit Portals 3 and 4 22
Figure 4-15 Parametric EQ Edit Menu for Mesa Filter 23
Figure 4-16 Graphic EQ Edit Menu 23
Figure 4-17 Graphic EQ Edit Overlay Insert/Bypass 23
Figure 4-18 Overlay Insert/Bypass Portal 2 24
Figure 4-19 EQ GEQ Gain Edit Portal 3 24
Figure 4-20 Levels Edit 24
Figure 4-21 Presets Menu 25
Figure 4-22 Utility Menu 26
Figure 4-23 Reset Processor Menu 26
Figure 4-24 Partial Reset Confirmation Menu 27
Figure 4-25 Factory Reset Confirmation Menu 27
Figure 4-26 Processor Reset Confirmation Display 27
Figure 4-27 Technical Information Menu 28
Figure 4-28 Front-Panel Configuration Menu 29
Figure 4-29 Access Control Menu 29
Figure 4-30 EQ Limits Portal 30
Figure 4-31 Front-Panel Password Entry Keyboard 30
Figure 5-1 Dolby Lake Processor Back Panel 33
Figure 5-2 Base Platform 34
Figure 5-3 AES/EBU Pinout 35
Figure 5-4 Input Card 36
Figure 5-5 Output Card 36
Figure 5-6 Iso-Float Control on Analog Converter Cards 37

Figure 5-7 CobraNet Card 38
Figure 5-8 Typical Sound System Application 39
Figure 5-9 Wireless Connectivity with Tablet PC 39
Figure 6-1 Simple Wired Network Connection 42
Figure 6-2 Complex Wired Network Connection 43
Figure 6-3 Example Wireless Network Configuration 44
Figure 6-4 Mixed-Mode Network Connection 45
Figure 7-1 Dolby Lake Processor Clock System 48
Figure 7-2 Primary Clock [Auto] Clock Logic 50
Figure 7-3 Connectors and Termination Lift Switch 51
Figure 7-4 Termination Lift Switch 51
Figure 7-5 Cascading Word Clock Connection 51
Figure 7-6 Dolby Lake Processor Latencies 52

List of Tables

Table 4-1 Lake Contour Front-Panel Functions 31
Table 4-2 Mesa Quad EQ Front-Panel Functions 32
Table 5-1 AES/EBU Pin List 35
Table 5-2 Iso-Float Status LED 38
Table 6-1 Common Ethernet Cable Categories 42
Table 7-1 Common Input-Output Latencies 52

Introduction

The Dolby® Lake® Processor marks the next generation in digital loudspeaker and equalization technology. With unsurpassed audio quality and the most advanced loudspeaker processing available, it will improve the sound of any system. Effortless control is provided through the Dolby Lake Controller software, or the exclusive front-panel Portal metering and control interface.

The Processor platform offers complete, native-digital signal processing functionality, with support for up to 4-in, 12-out loudspeaker applications and 8 in, 8-out EQ applications. The signal processing can also be changed to provide an EQ 4×4 configuration together with a loudspeaker 2×6 configuration.

The Processor includes several advanced technologies for improving sound quality. These include Raised Cosine Equalization™ (the foundation underlying the Ideal Graphic EQ™ and Lake Mesa EQ™ interfaces), plus linear phase crossovers, LimiterMax™ loudspeaker protection, and Iso-Float™ ground isolation.

1.1 Manual Overview

This manual provides detailed reference information for the Dolby Lake Processor system hardware. The manual is organized as follows:

- Chapter 1, Introduction (this chapter).
- Chapter 2, Configurations, describes the various hardware configurations that are supported by the Processor.
- Chapter 3, Signal Processing Configurations, presents the three different signal processing configurations that provide loudspeaker processing and system equalizer processing.
- Chapter 4, Front-Panel Interface, presents the front-panel Portal metering and control interface.
- Chapter 5, Back-Panel Interface, describes all of the connections and controls provided on the back panel of the Processor.
- Chapter 6, Networking, explains the networking capabilities of the Processor, and illustrates common networking connections.

- Chapter 7, Connecting Digital Audio Devices, explains how to interface the Processor with other digital audio devices, as well as the various latencies incurred when connecting analog, synchronous digital, and asynchronous digital devices.

The Processor is complemented by the Dolby Lake Controller software interface. For more information on the Controller software, please refer to the *Dolby Lake Controller Manual*.

1.2 Product Specifications

Audio Performance
Conversion Resolution
24-bit
Internal Sample Rate
96 kHz
Internal Data Path
32-bit floating point
System Propagation Delay
<2 ms from any input to any output (analog or digital)
Maximum Available Delay
2 s from any input to any output

Sample-Rate Converters
Operating Sample Rates
44.1, 48, 88.1, 96 kHz
Resolution
24-bit
THD + Noise
0.00003% typical, 20 Hz to 20 kHz, unweighted
Dynamic Range
140 dB typical, 20 Hz to 20 kHz, unweighted

Back-Panel Interface
Analog I/O Connectors
XLR
AES/EBU I/O Connectors
25-pin D-connector, with selectable termination on pairs 1 and 2
S/PDIF I/O Connectors
Toslink™ optical
Word Clock Input
BNC with selectable termination
Ethernet
Auto 10/100, Auto Uplink: (2) RJ-45, (1) EtherCon®
Power
3-pin IEC, 2 fuses T 1.5A L, 5 × 20 mm

Digital-to-Analog Outputs
Frequency Response
+0/–0.1 dB, 3 Hz to 20 kHz
THD + Noise
0.0004% typical at 1 kHz
0.00056% typical, 20 Hz to 20 kHz, unweighted
Dynamic Range
113 dB typical, 20 Hz to 20 kHz, unweighted
Output Impedance
50Ω
Maximum Output Level
+21 dBu
Crosstalk
–100 dB, 2 Hz to 40 kHz

Analog-to-Digital Inputs
Frequency Response
+0/–0.2 dB, 2 Hz to 20 kHz
THD + Noise
0.00022% typical at 1 kHz, 0.00033% typical, 20 Hz to 20 kHz, unweighted at +21 dBu headroom setting
Dynamic Range
116 dB typical, 20 Hz to 20 kHz, unweighted at +21 dBu headroom setting
Input Impedance
20 kΩ balanced, 10 kΩ unbalanced
Maximum Input Level
+26 dBu
Input Sensitivity Settings for Digital Full-Scale
+10, +16, +21, +26 dBu
Common Mode Rejection
65 dB, 20 Hz to 20 kHz, 75 dB typical at 1 kHz, 70 dB typical at 20 kHz
Crosstalk
–100 dB, 2 Hz to 40 kHz

Combined A/D and D/A
THD + Noise
0.0005% typical at 1 kHz, 0.00063% typical, 20 Hz to 20 kHz, unweighted
Dynamic Range
113 dB typical, 20 Hz to 20 kHz, unweighted

AES/EBU I/O and S/PDIF I/O
Supported Resolutions
Up to 24 bits
Supported Sample Rates
44.1, 48, 88.1, 96 kHz

Dante
Supported Resolution
24 bits
Supported Sample Rate
96 kHz
Number of I/O channels
8 input and 16 output channels

Power Requirements
100–240 VAC ±10%, 120 W maximum

Dimensions and Weight
2-RU rackmount: 8.74 × 48.26 × 35 cm (3.44 × 19 × 13.78 inches); net: 9 kg (20 lb)

Configurations

The Dolby® Lake® Processor provides native digital processing with AES/EBU, S/PDIF, and Dante inputs and outputs. Analog and CobraNet™ I/O is possible through interchangeable cards. This chapter provides an overview of each hardware configuration supported by the Processor.

2.1 Basic Configurations

There are five basic Dolby Lake Processor configurations; each has a unique model number to distinguish it.

2.1.1 Configuration Naming Conventions

At the beginning of the name is the acronym *LP* for *Lake Processor*. The letters and numbers following LP define the input and output configuration. *LPD* stands for *Lake Processor Digital*, where *Digital* represents both inputs and outputs. Because the Processor has AES/EBU, S/PDIF, and Dante digital I/O native to the platform, the base acronym is LPD. As an example, the model number LP4D8 represents the configuration: Lake Processor, four analog inputs, digital I/O, and eight analog outputs. The letter *D* separates inputs from outputs.

2.1.2 Dolby Lake Processor LPD

Figure 2-1 Dolby Lake Processor LPD Configuration

The LPD provides the foundation of the Dolby Lake processing system. With native-digital I/O in AES/EBU, S/PDIF, and Dante formats, the LPD provides an ideal solution for all-digital live sound systems, digital console channel inserts, and digital studio processing. Four card slots are provided for upgrading to incorporate analog converter cards or a CobraNet® card.

2.1.3 Dolby Lake Processor LP4D4

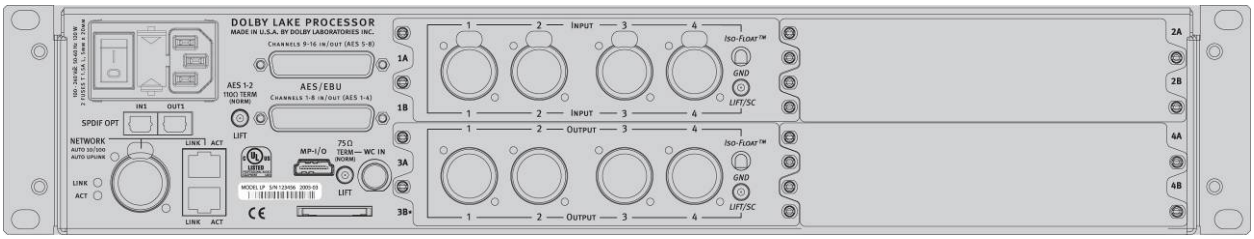

Figure 2-2 Dolby Lake Processor LP4D4 Configuration

Two analog converter cards added to provide four analog inputs and four analog outputs for EQ-purposed signal processing.

2.1.4 Dolby Lake Processor LP8D8

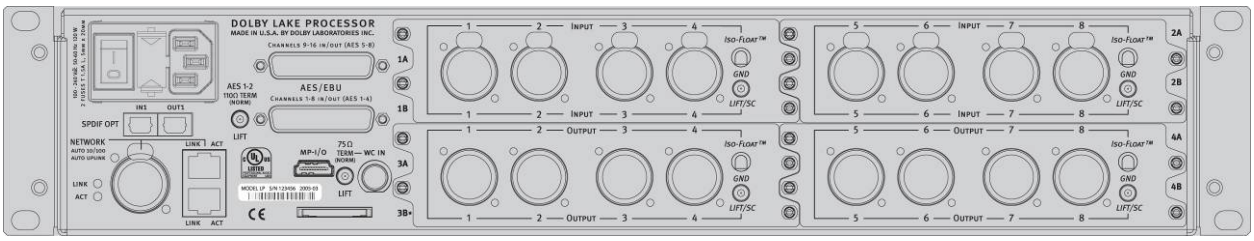

Figure 2-3 Dolby Lake Processor LP8D8 Configuration

The LP8D8 provides eight channels each of analog inputs and outputs.

2.1.5 Dolby Lake Processor LP4D8

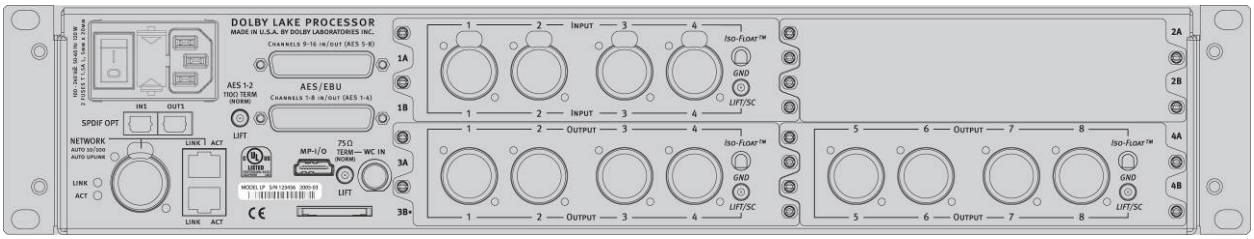

Figure 2-4 Dolby Lake Processor LP4D8 Configuration

The LP4D8 delivers loudspeaker processing in a four analog input, eight analog output configuration.

2.1.6 Dolby Lake Processor LP4D12

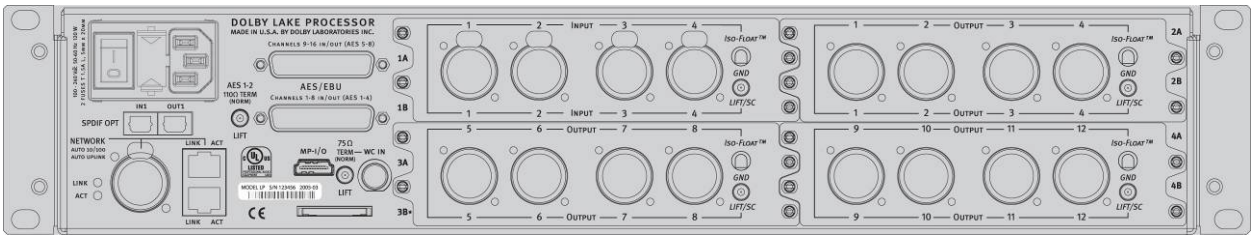

Figure 2-5 Dolby Lake Processor LP4D12 Configuration

The LP4D12 provides 4 analog inputs and 12 analog outputs.

Signal Processing Configurations

The Dolby® Lake® Processor provides three different signal processing configurations that allow for loudspeaker processing, system equalization, or a combination of both. This chapter presents the details of these three configurations.

The signal processing configurations complement the possible hardware configurations but are not tied to them. You can choose to run a loudspeaker processor signal processing configuration or a system equalizer signal processing configuration regardless of the hardware configuration.

The signal processing configuration can be changed through the Processor front panel, or through the Dolby Lake Controller software user interface. Please refer to Chapter 4 of this manual for details on how to change the signal processing configuration from the front panel. Please refer to the *Dolby Lake Controller Manual* for further details on changing the signal processing configuration from the Controller.

3.1 Loudspeaker Processor Configuration (CONTOUR)

The Dolby Lake Processor provides a 4×12 loudspeaker processor configuration, as shown in the simplified block diagram in Figure 3-1.

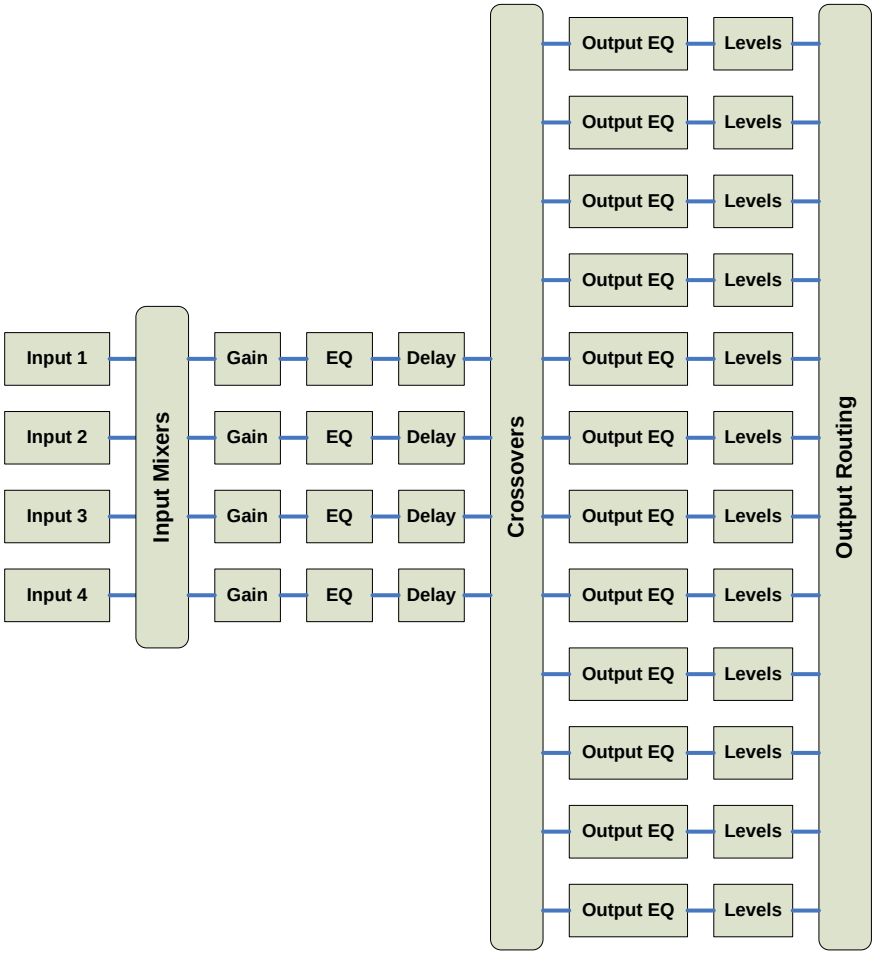

Figure 3-1 4×12 Loudspeaker Processor Configuration

The diagram presents the underlying signal processing architecture of the loudspeaker processor configuration. Four channels of input processing are routed through crossovers to further EQ and levels processing before being sent through an output router that allows for any processed channel to be delivered to any physical output.

The input mixer, crossover, and output router blocks are all configured through the Dolby Lake Controller software. Output channels are grouped within the software user interface to provide partitioned views of output channel processing. For example, the factory reset loudspeaker processor configuration provides four three-way crossovers.

If the Processor hardware is configured with analog outputs, an identical signal is delivered to both analog and digital outputs of the same channel number. For example, in the factory reset Dolby Lake Processor LP4D8, the same signal is present on analog output 1 as on digital output 1.

3.2 System Equalizer Configuration (Mesa EQ)

The Dolby Lake Processor provides an 8×8 system equalizer configuration, as shown in the simplified block diagram in Figure 3-2.

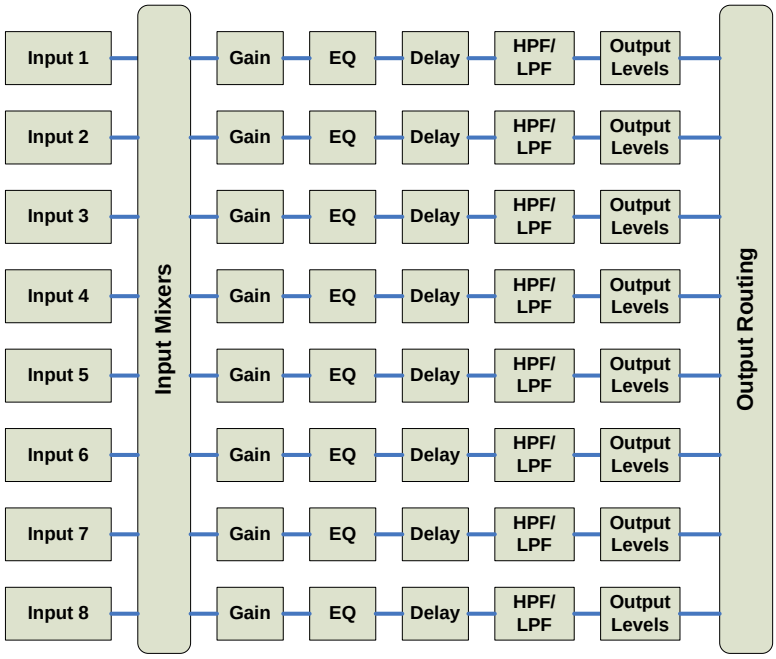

Figure 3-2 8×8 System Equalizer Configuration

The system equalizer configuration provides eight independent channels of processing. Each channel of processing can derive its input signal from any combination of the eight input signals, and each output can be delivered to any physical output. As with the loudspeaker processor configuration, an identical signal is delivered to both analog and digital outputs of the same channel number.

3.3 Loudspeaker and Equalizer Configuration (Contour/MesaEQ)

The Dolby Lake Processor provides a third configuration, which is a combination of loudspeaker processor and system equalizer configurations. This split-mode configuration provides a 2×6 loudspeaker processor and a 4×4 system equalizer configuration, as shown in the simplified block diagram in Figure 3-3.

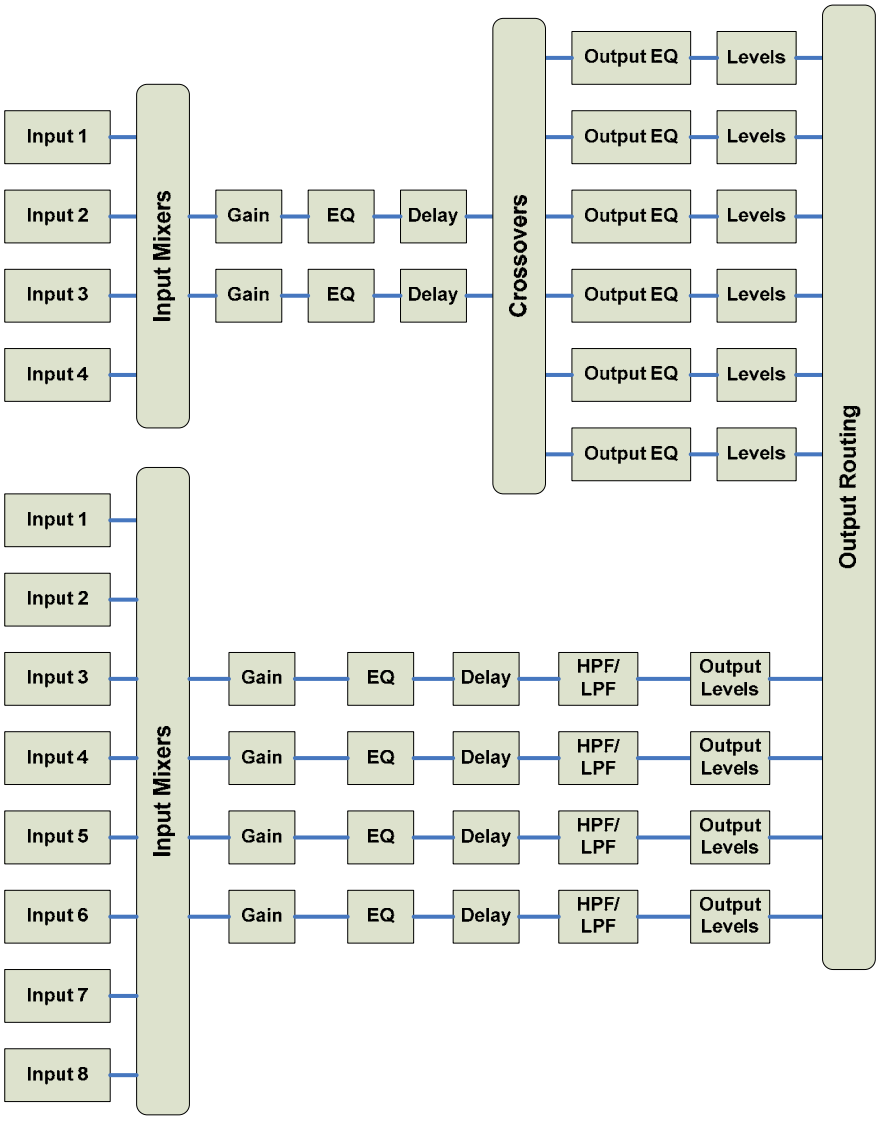

Figure 3-3 Loudspeaker Processor/System Equalizer Configuration

In this configuration, as with both the loudspeaker processor and system equalizer configurations, any channel of processing can be sent to any physical output, as signified by the single output router component of the block diagram.

Front-Panel Interface

The Dolby® Lake® Processor provides exclusive front-panel metering and control through our Portal interface. Each of the four front-panel Portals can represent multiple channels of level and limiter metering. Portals also provide user-configurable text labels and mute controls. The front panel also includes Ethernet connectivity, and global function buttons that provide input muting, metering, and menu navigation control.

This chapter details the functionality provided by the Processor front panel.

4.1 Front-Panel Connectivity and Power

The right side of the Dolby Lake Processor front panel provides a variety of connectivity options. Figure 4-1 identifies each feature.

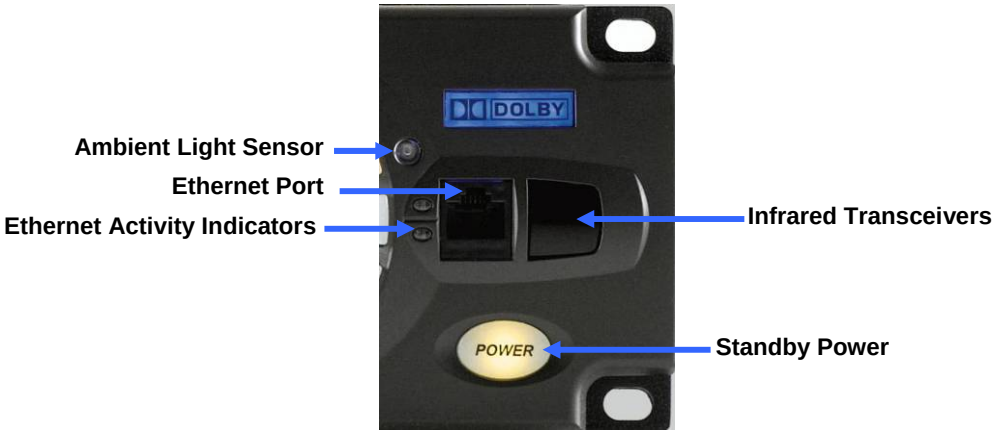

Figure 4-1 Front-Panel Connector and Power Button

4.1.1 Ambient Light Sensor

Not currently in use.

4.1.2 Ethernet Port

A standard RJ45 Ethernet connector is provided on the front panel for ease of access to the network. The connection features auto-10/100 and auto-uplink functions to make networking fast and easy. Auto 10/100 allows you to connect the Dolby Lake Processor to either 10Base-T or 100Base-T Ethernet networks without having to consider this issue. Auto uplink allows

you to connect any Ethernet cable, whether it is wired internally as a crossover or straight-through cable.

The front-panel Ethernet connection is intended for temporary connections of Dolby Lake Controller computers. Please use the Ethernet connections located on the back panel for permanent wiring in racks or into existing network infrastructure in installations.

4.1.3 Ethernet Activity Indicators

Activity indicators located next to the Ethernet port provide both link and activity status.

4.1.4 Infrared Transceivers

Not currently in use.

4.1.5 Standby Power Button

The standby power button will turn audio processing off, and engage a Low Power mode. The standby power button must be held down for a minimum of one second to turn the Processor on or off.

The primary power switch is located on the back panel, as part of the power inlet connection.

4.2 Global Function Buttons

The left side of the Dolby Lake Processor front panel provides three global function buttons. Figure 4-2 identifies each function.

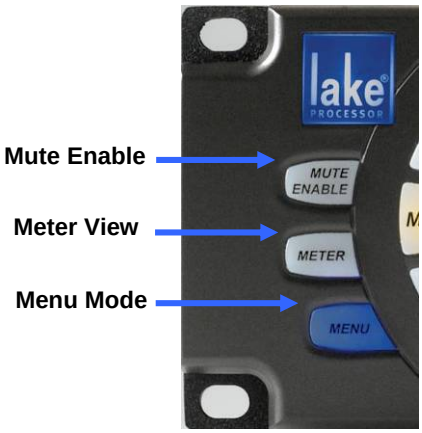

Figure 4-2 Front-Panel Global Function Buttons

4.2.1 Mute Enable

Used in tandem with the Portal displays, the **Mute Enable** button enables the ability to mute input channels, module inputs, and output channels. The **Mute Enable** button must be depressed to engage muting, and the button flashes to indicate that muting has been enabled.

If Mute Enable mode is not disengaged manually, it will automatically disable after two minutes.

Holding the **Mute Enable** button for two seconds will lock Mute Enable mode until the button is manually pressed again.

4.2.2 Meter View

The **Meter** button toggles through multiple meter views on the Portal displays. By default, each Portal shows output channel metering. By pressing the **Meter** button, you can toggle to view physical input meters and module input meters.

4.2.3 Menu Mode

The **Menu** button provides access to front-panel control of the Dolby Lake Processor, utilizing a menu-driven interface that allows you to navigate through available functionality via the Portal displays. Menu mode provides a familiar interface, as it follows the same logic as the button-bar menu interface found in the Dolby Lake Controller software. Portal metering and control are detailed later in this chapter.

4.3 Portal Meter Display

The Portal provides a revolutionary metering display that allows for multiple channels of metering on a single circular display. The Dolby Lake Processor provides four Portals on the front panel, as shown in Figure 4-3.

Figure 4-3 Dolby Lake Processor Front Panel

Figure 4-3 shows a variety of Portal output-channel meter views, including four-way, two-way, and three-way crossover modules, and a three-auxiliary-output module. As this figure illustrates, each Portal represents all audio channels that are part of a given processing module. Each custom LCD Portal display provides three ten-character user-configurable text displays, two 104-segment rings, 16 mute and soft-function buttons, arrow keys, and one **ME** button for Portal control and parameter adjustment.

Figure 4-4 highlights Portal display and functionality in the default meter view of output metering for a Lake Contour™ module.

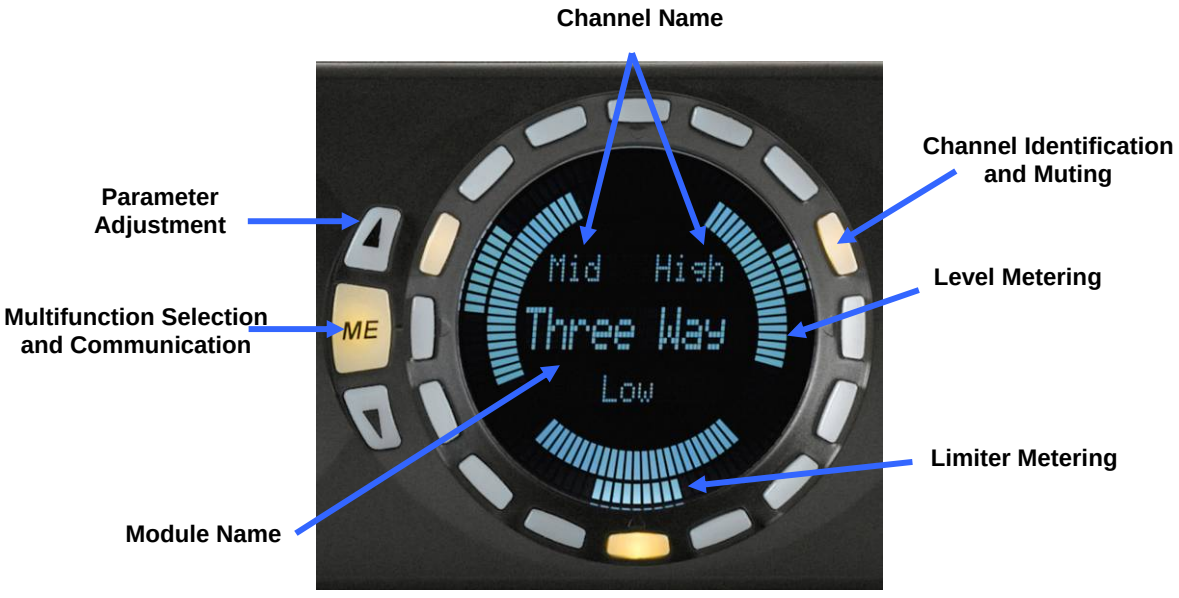

Figure 4-4 Portal Display and Functionality

Channel Labels

Each channel represented by the Portal has a user-defined channel label, displayed on either the upper or lower text display depending on the physical location of the meter display. Channel labels can be configured using the Dolby Lake Controller software.

Channel Identification and Muting

The Portal is surrounded by a circle of buttons that provide multiple soft functions. In the default output-channel meter view, these buttons identify the physical location and mute status of each output channel. When the **Mute Enable** button is engaged, these buttons are also used to mute/unmute output channels.

Level Metering

The inner ring of metering segments is divided into multiple level meters. In the example shown in Figure 4-4, three output level meters are shown on the Portal.

The Portal displays level metering as an envelope function emanating from the center point of the channel meter. As level increases and decreases, the meter expands in both directions and then contracts as shown in Figure 4-5.

Figure 4-5 Level Metering in Action

The same envelope function is used in the other Portal views to display physical input and module input metering.

Limiter Metering

The outer ring of metering segments is divided into multiple limiter meters. Similar to level metering, the Portal displays limiter metering as an envelope function emanating from the center point of the channel limiter. As limiting increases, the meter expands in both directions.

Module Label

For loudspeaker processor modules, the module label is shown in the Portal's middle text display. In Mesa EQ™ mode, each Portal shows two module labels on the top and bottom text displays. The module label can be configured using the Controller software.

Multifunction Selection and Communication

The **ME** button on the left side of each Portal provides module selection and muting, menu navigation, and communication indication.

ME button functionality includes:

- Temporary display of the frame label on the center line of the selected Portal
- Identification of modules on the main work area and module scroll bar in the Dolby Lake Controller
- Selection of functions in Menu mode
- Muting of the module input (in Output Metering mode) when mute enable is engaged for loudspeaker processing modules
- Flashing white to indicate communication between the modules and the Controller

Parameter Adjustment

Primarily used in Menu mode, the up and down arrow buttons provide parameter adjustment along with the ability to scroll through function lists. These arrow buttons are illuminated to indicate when they are active.

4.4 Meter Modes

The default Metering mode provides output channel metering, with each Portal representing all outputs of each processing module. Figure 4-6 illustrates the default Metering mode, and provides an indication of the channel identification/mute soft buttons that are illuminated to signify the center point of the channel meter.

Figure 4-6 Output Metering Mode (Default)

In output channel view, pressing the **Mute Enable** button allows you to mute any output channel by pressing the corresponding channel identification button.

By pressing the **Meter** button, highlighted on the left side of the front panel in Figure 4-6, the meter view changes to display physical input meters. This Metering mode is shown in Figure 4-7.

Figure 4-7 Physical Input Meters

Each physical input channel is represented across the Portal displays. Depending upon the input channel configuration, these meters indicate the relevant digital or analog type being used via the Portal text displays.

In physical-input channel view, pressing the **Mute Enable** button allows you to mute any physical-input channel by pressing the corresponding channel identification button.

Pressing the **Meter** button again toggles to the display module input meters, as shown in Figure 4-8.

Figure 4-8 Module Input Meters

In module input view, the meters show the post-input mixer audio level for the input of each processing module.

In module input view, pressing the **Mute Enable** button allows you to mute any module input by pressing the corresponding channel identification button. This has the same effect as pressing the **ME** button when in output metering view.

In any of the meter views, the **Menu** button enters the Main menu of Menu mode. Menu mode is detailed in the following section.

4.5 Menu Mode

When the **Menu** button is pressed, the Portals display the Main menu, as shown in Figure 4-10. Pressing the **ME** button navigates to the next menu down in the system. Pressing the **Menu** button navigates to the next menu up in the system. Pressing the **Menu** button from the top-level Main menu exits Menu mode, and the Portals return to displaying metering information.

Within this section, Portals are referenced by number, as shown in Figure 4-9.

Figure 4-9 Portal Reference Numbers

The numbers will be used to help clarify Portal functionality in Menu mode, as detailed in the following sections.

4.5.1 Main Menu

Figure 4-10 Main Menu

From the Main menu, access Edit, Presets, Utility, or Front Panel Config menus by pressing the corresponding **ME** button.

Pressing the **Menu** button will exit Menu mode and return to Meter mode.

4.5.2 Main Menu → Edit Menu

Figure 4-11 Edit Menu

Portal 1 displays module metering and mute status as per normal operation: Mute Enable and Module Input/Output Metering modes are available during Edit mode.

Throughout all edit menus, Portal 1 displays the module selected for editing. The up and down arrows on this Portal provide the ability to scroll through the modules on the processor.

The illuminated buttons above and below the text labels on Portals 2 and 3 provide access to PEQ, GEQ, and Levels Edit submenus.

Note: The first two default module overlays are used for front-panel editing. If additional overlays are present in the Controller, they are not displayed here. Group EQ overlays are not editable via the front panel.

These overlays can be any combination of PEQ or GEQ—the relevant user label is displayed and the associated PEQ or GEQ edit menu is displayed as described in the next sections.

If an overlay is set as hidden in the Controller, then the option to view or edit the overlay is disabled. If an overlay is set to view only, then access is allowed, although all edit controls are disabled.

Portal 4 is intentionally blank.

4.5.3 Main Menu → Edit Menu → Parametric EQ Edit

Figure 4-12 Parametric EQ Edit Menu

Portal 1 shows the module currently selected for editing: use the up and down arrows to change the selected module. Use **Meter** to change metering modes and Mute Enable in conjunction with channel selector or **ME** button to mute and unmute channels as per normal operation.

Portal 2 displays the selected filter frequency, filter type, and the filter insert/bypass status. Use the controls to select and change these parameters. To insert/bypass this overlay, press the up or down arrows until you reach the end of the filter list. Overlay bypass is described in additional detail in Section 4.5.4.

Figure 4-13 Parametric EQ Edit Portal 2

Portal 3 (and Portal 4 for Mesa filters only) displays the bandwidth, frequency, and gain of the selected filter. The outer ring provides a visual reference of the frequency range that is being affected by this filter, with bottom left being the lowest frequency and bottom right the highest frequency.

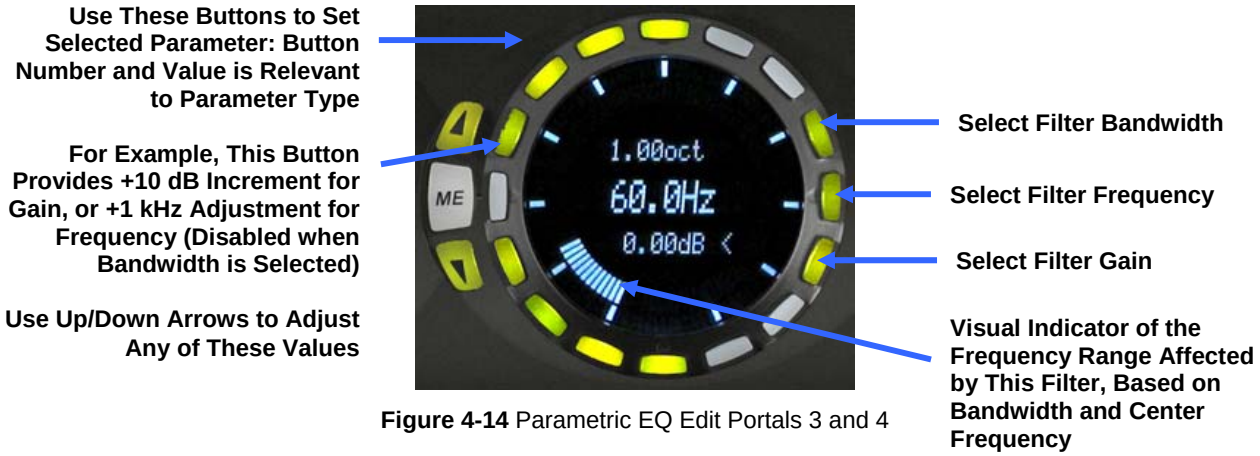

Figure 4-14 Parametric EQ Edit Portals 3 and 4

Portal 4 is used for Mesa filters only, to show the details for the second related filter component. For Mesa filters the visual scale and gain values are identical on both Portals; the bandwidth and frequency are independently adjustable. An example of the Parametric EQ Edit menu for a Mesa filter is shown in Figure 4-15.

Figure 4-15 Parametric EQ Edit Menu for Mesa Filter

4.5.4 Main Menu → Edit Menu → GEQ Edit

The Graphic EQ edit menu provides a simplified interface to change the gain of an EQ filter, and to insert or bypass each filter, along with an overlay insert/bypass feature.

Figure 4-16 Graphic EQ Edit Menu

Portal 1 shows the module currently selected for editing. Use the up and down arrows to change the selected module. Use **Meter** to change metering modes and **Mute Enable** in conjunction with channel selector or **ME** button to mute and unmute channels as per normal operation.

Portal 2 displays the selected frequency, and the insert/bypass status of the filter as described in Section 4.5.3. To insert/bypass the entire overlay, press the up/down arrow keys until the front panel looks similar to that shown in Figure 4-17.

Figure 4-17 Graphic EQ Edit Overlay Insert/Bypass

Figure 4-18 shows the controls for Portal 2 when the overlay is selected.

Figure 4-18 Overlay Insert/Bypass Portal 2

Portal 3 is used for changing the gain of the selected filter. (This portal is blank when the overlay status is selected in Portal 2.)

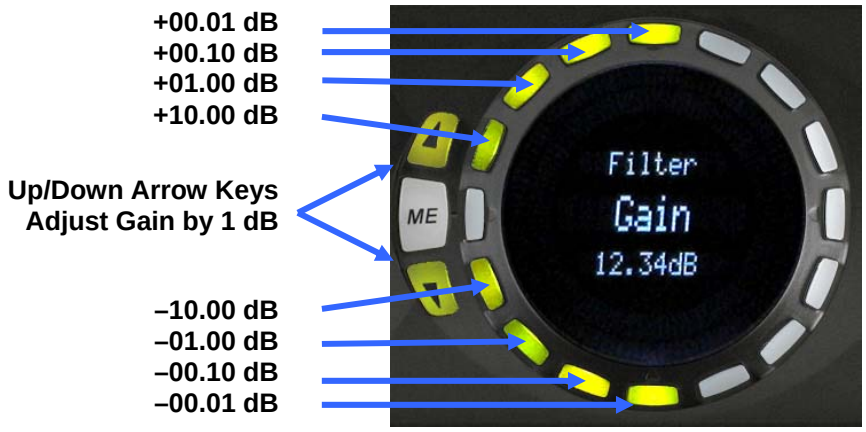

Figure 4-19 EQ GEQ Gain Edit Portal 3

Portal 4 is intentionally blank.

4.5.5 Main Menu → Edit Menu → Levels

Figure 4-20 Levels Edit

Portal 1 shows the module currently selected for editing. Use the up and down arrows to change the selected module. Use **Meter** to change metering modes and Mute Enable in conjunction with channel selector or **ME** button to mute and unmute channels as per normal operation.

Portal 2 displays the channel of the module that is selected for editing. Use the up or down arrows to change, which is confirmed by the flashing of the relevant selector/mute button on Portal 1. (The **ME** button flashes if the Module Input is selected.)

Portal 3 displays the parameter of the selected channel that is being edited. The following Level parameters are available for editing via the front-panel interface:

- Gain
- Polarity
- Delay
- Limiter MaxRMS Level
- Limiter MaxRMS Corner
- Limiter MaxRMS Attack
- Limiter MaxRMS Release
- Limiter MaxPeak Level

Use the up/down arrows to select the parameter for editing.

Portal 4 displays the current value for the selected parameter and allows adjustment of that value using the up/down arrows or the fine adjustment keys where relevant.

If a combination of module/channel/parameter selection is not relevant, the value is displayed as N/A and all buttons are inactive. Where level controls have been locked by a system designer, they display the word **Locked**.

4.5.6 Main Menu → Presets Menu

Figure 4-21 Presets Menu

The Presets menu provides the ability to select and recall any one of the 30 presets available in the Dolby Lake Processor's memory. Presets must be stored to the Processor using the Controller software, or the Dolby Lake Preset Manager Utility.

The up and down arrow keys in Portal 2 are used to scroll through available presets. Pressing the **ME** button on Portal 1 recalls the selected preset.

Pressing the **Menu** button returns you to the Main menu.

4.5.7 Main Menu → Utility Menu

Figure 4-22 Utility Menu

The Utility menu provides access to three submenus: **Reset Processor**, **Technical Info**, and **Reset Networking**. Press the corresponding **ME** button to access either submenu.

Pressing the **Menu** button returns you to the Main menu.

4.5.8 Main Menu → Utility Menu → Reset Processor Menu

Figure 4-23 Reset Processor Menu

The Reset Processor menu allows you to reconfigure the signal processing of the Processor. Pressing one of the four **ME** buttons will commence the reconfiguration process.

Selecting **Contour Reset** performs a partial factory reset, configuring the processor as four Classic 3-Way Contour loudspeaker processor modules.

Selecting **Cntr/Mesa Reset** performs a partial factory reset, configuring the processor as two Classic 3-Way Contour loudspeaker processor modules and four Mesa EQ modules.

Selecting **Mesa EQ Reset** performs a partial factory reset, configuring the processor as eight Mesa EQ modules.

Selecting **Factory Reset** performs a full factory reset, removing all Presets, all Network configuration settings, and deleting all user data. The processor will be configured as either a Contour or Mesa EQ, depending on the analog card configuration.

All of these options invoke a confirmation menu providing relevant warnings as shown in Figure 4-24 and Figure 4-25.

Pressing the **Menu** button returns you to the Utility menu.

4.5.9 Main Menu → Utility Menu → Reset Processor Menu → Reset Confirmation Menus

The reset confirmation menus prompt the user to confirm a configuration change or factory reset. The menus are similar to those shown in Figure 4-24 but provide different warnings for Portal 2 and 3 depending on the type of reset being performed.

Figure 4-24 Partial Reset Confirmation Menu

Figure 4-25 Factory Reset Confirmation Menu

For a full factory reset, the module configuration after reset is based on the analog I/O configuration. For example, if you have an LP4D12, the Contour loudspeaker processor configuration is recalled. If you have an LP8D8, the Mesa EQ processor configuration is recalled.

Press the **ME** button on the left Portal to confirm performing a factory reset, or press the **ME** button on the right Portal to cancel the reset procedure.

4.5.10 Processor Reset Confirmation Display

Figure 4-26 Processor Reset Confirmation Display

The Processor reset confirmation display is shown when performing a full or partial factory reset, as outlined in the previous sections.

The front panel will be restored to the output-channel Meter mode, displaying the associated signal processing configuration upon completion of the reset procedure.

4.5.11 Main Menu → Utility Menu → Technical Information Menu

The Technical Information menu displays details pertinent to the configuration of the Processor. Portal 1 shows help text to indicate that the up and down arrow keys on the other Portals will toggle through information relevant to each category.

Figure 4-27 Technical Information Menu

Portal 2 displays values relating to the current firmware loaded on the Processor.

Portal 3 displays identification and address information. Use the up and down arrow keys to display the IP address, the subnet mask, the MAC address, the frame ID (which uniquely identifies the Processor), and various network statistics that may be required for support purposes if a problem occurs. Use the **ME** button to activate/deactivate text scrolling for values that are more than ten characters.

Portal 4 displays temperature (degrees Celsius) and fan information. Use the up and down arrow keys to display the current internal temperature and status, the fan speed, and the fan threshold. The threshold value determines the internal temperature at which the fan speed will increase. These values are adjustable from the Dolby Lake Controller.

4.5.12 Main Menu → Utility Menu → Reset Networking

The Reset Networking function allows you to reset the network. The reset is done immediately, no reset confirmation is displayed. Should a communication problem occur with a particular processor, this function can be used to restart Ethernet on this processor without interrupting audio.

Should the problem persist and be isolated to a single processor, try power cycling the processor at a convenient time. Generic communication problems are more likely to be related to Microsoft® Windows® network settings, or a problem with your Dolby Lake Controller/Processor network configuration.

4.5.13 Main Menu → Front-Panel Configuration Menu

The Front-Panel Configuration menu provides access to controls for LCD and LED brightness, LCD viewing angle, delay units, and front-panel security options (Access Control).

Figure 4-28 Front-Panel Configuration Menu

Portal 1 provides independent controls for front-panel LCD and LED brightness. To select a value for the arrows to adjust, use the Portal 1 buttons that are illuminated in Figure 4-28.

Portal 2 provides viewing angle control. Adjust this value to provide optimal Portal display performance depending upon the mounting location of the Processor. By default, the Portals display best directly on-axis to the front of the Processor. Adjusting the viewing angle improves display performance when mounting the Processor low to the ground or high in a rack.

Portal 3 provides the ability to change how the delay units are displayed for front-panel edit control purposes. Choose from Milliseconds, Feet, or Meters by using the illuminated arrows.

Tapping **ME** on Portal 4 navigates to the Access Control submenu where various front-panel security features can be enabled as described in the following sections.

4.5.14 Main Menu → Front-Panel Configuration Menu → Access Control Menu

Figure 4-29 Access Control Menu

The Access Control menu provides options to set EQ limits and to lock out various front-panel controls.

Use the arrows on Portal 1 to select the menu or function, and use the **ME** button to change the status between locked and unlocked. These menus and functions can be locked:

- Edit—Removes access to the Edit Menu
- Presets—Removes access to the Presets Menu
- Utility—Removes access to the Utility Menu

- Mute—Disables the Mute Enable and all mute buttons on the front panel
- Brightness—Set the front-panel brightness and view angle as view only
- Network—Disables network communication on the processor (that is, the processor cannot be seen on the Dolby Lake Controller network)

Portal 2 provides configuration for the minimum and maximum EQ limits for front-panel editing purposes. For example, a system designer could restrict the front-panel edit ability for EQ filters to a maximum of +6 and a minimum of –12. Use the up and down arrows or the accurate value entry buttons as shown in Figure 4-30.

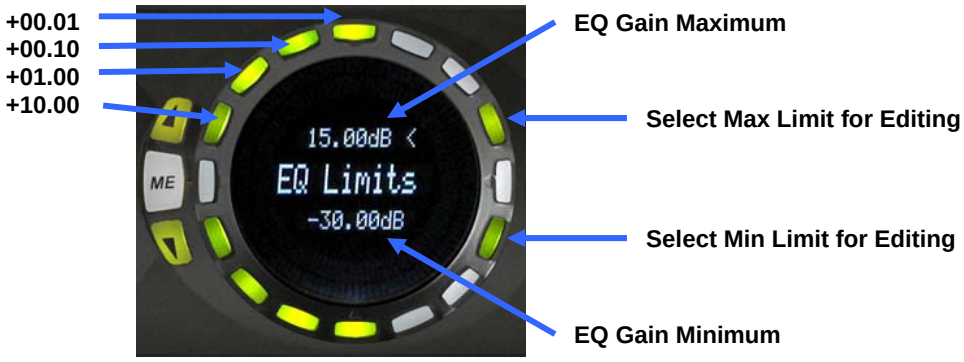

Figure 4-30 EQ Limits Portal

Portal 3 is intentionally blank.

Press **ME** on Portal 4 to lock the adjustments made using Portals 1 and 2. The following front-panel keyboard is displayed for password entry.

4.5.15 Main Menu → Front-Panel Configuration Menu → Access Control Menu → Password Entry Keyboard

Figure 4-31 Front-Panel Password Entry Keyboard

Press a button associated with each character to enter the password. The text will appear on the center line of Portal 1.

Use the up arrow on any Portal to change between uppercase, lowercase, and numeric/punctuation keyboards.

Use the down arrow on any Portal to delete the last character entered.

Press **ME** to enter the password. A confirmation menu will be displayed. Press **ME** on Portal 1 to confirm password, or press **ME** on Portal 4 to cancel password entry.

4.6 Lake Contour and Mesa Quad EQ Front-Panel Reference

The Lake Contour and Mesa Quad EQ™ have a minimal front-panel interface that allows you to recall presets, mute input and output channels, and perform other simple system functions. The following tables provide a reference for these functions that may be useful when integrating Contour and Mesa processors with a network of Dolby Lake Processors.

4.6.1 Lake Contour Front-Panel Functions

Table 4-1 Lake Contour Front-Panel Functions

Function	Action [Button]	Effect in Processor	Effect in Controller
Select Processor	Press [SEL].	No effect.	The text on the module icon is highlighted yellow in the work area, and the module scroll bar in the Modules menu locates the selected processor.
Display Module Names	Press+hold [SEL].	The module name and base configuration scroll across the front panel of the processor.	The text on the module icon is highlighted yellow in the work area, and the module scroll bar in the Modules menu locates the selected processor.
Display Channel Name	Press+hold [SEL] then press+hold Input or Output Mute button.	The selected input/output channel name as defined in the Controller will scroll across the front panel of the processor.	The text on the module icon is highlighted yellow in the work area, and the module scroll bar in the Modules menu locates the selected processor.
Display Current Firmware Version	Press+hold [SEL] then press+hold [A]+[B] together.	Firmware versions will scroll across the front panel of the processor.	The text on the module icon is highlighted yellow in the work area, and the module scroll bar in the Modules menu locates the selected processor.
Factory Reset (Partial)	Press+hold [1]+[4] while turning on processor.	All data with the exception of frame/system presets and IP address are reset to the factory default state.	If the frame is in the work area, a resync will occur and the modules will show as out of sync.
Factory Reset (Full)	Press+hold [1]+[5] while turning on processor.	All data is reset to a factory default state.	If the frame is in the work area, a resync will occur and the modules will show as out of sync.
Enter and Exit Preset Mode	Press+hold [SEL] then press+hold [1]+[6] together.	The characters **PRST** appear on the front panel. While in this mode, all buttons function differently.	If a different preset is recalled, the Controller will resync, resulting in out-of-sync modules if the selected frame is in the work area.

4.6.2 Mesa Quad EQ Front-Panel Functions

Table 4-2 Mesa Quad EQ Front-Panel Functions

Function	Action [Button]	Effect in Processor	Effect in Controller
Select Processor	Press [SEL].	No effect.	The text on the module icon is highlighted yellow in the work area, and the module scroll bar in the Modules menu locates the selected processor.
Display Module Names	Press+hold [SEL].	The module name and base configuration scroll across the front panel of the processor.	The text on the module icon is highlighted yellow in the work area, and the module scroll bar in the Modules menu locates the selected processor.
Display Channel Name	Press+hold [SEL] then press+hold Input or Output Mute button.	The selected input/output channel name as defined in the Controller will scroll across the front panel of the processor.	The text on the module icon is highlighted yellow in the work area, and the module scroll bar in the Modules menu locates the selected processor.
Display Current Firmware Version	Press+hold [SEL] then press+hold input 1 and output 1 mute buttons together.	The ARM and DSP firmware versions will scroll across the front panel of the processor.	The text on the module icon is highlighted yellow in the work area, and the module scroll bar in the Modules menu locates the selected processor.
Factory Reset (Partial)	Press+hold input 2 and output 3 mute buttons while turning the processor on.	All data with the exception of frame/system presets and IP address are reset to the factory default state.	If the frame is in the work area, a resync will occur and the modules will show as out of sync.
Factory Reset (Full)	Press+hold input 2 and input 4 mute buttons while turning the processor on.	All data is reset to a factory default state.	If the frame is in the work area, a resync will occur and the modules will show as out of sync.
Enter and Exit Preset Mode	Press+hold [SEL] then press+hold input 4 and output 4 mute buttons together.	The characters **PRST** appear on the front panel. While in this mode, all buttons function differently.	If a different preset is recalled, the Controller will resync, resulting in out-of-sync modules if the selected frame is in the work area.

Back-Panel Interface

The Dolby® Lake® Processor back panel provides connections for analog and digital audio, networking, and more. This chapter provides a detailed description of each connection on the back panel of the Processor.

5.1 Back-Panel Overview

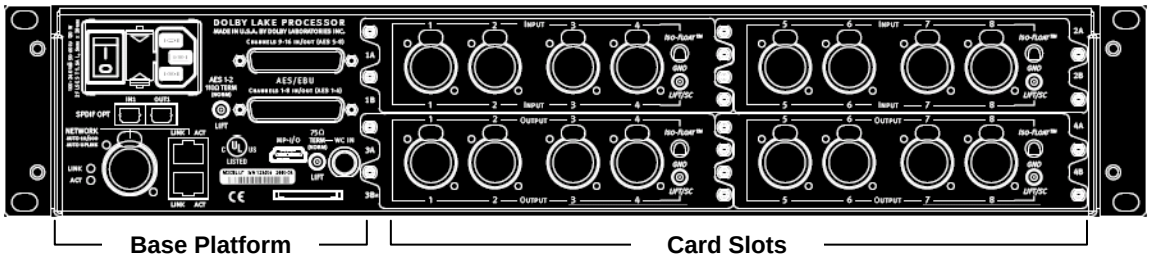

Figure 5-1 Dolby Lake Processor Back Panel

The base platform provides various connections for interfacing with digital audio equipment and Ethernet network. The card slots can handle analog and CobraNet™ inputs and outputs by using the relevant I/O cards.

5.2 Base Platform

The base platform is detailed in Figure 5-2.

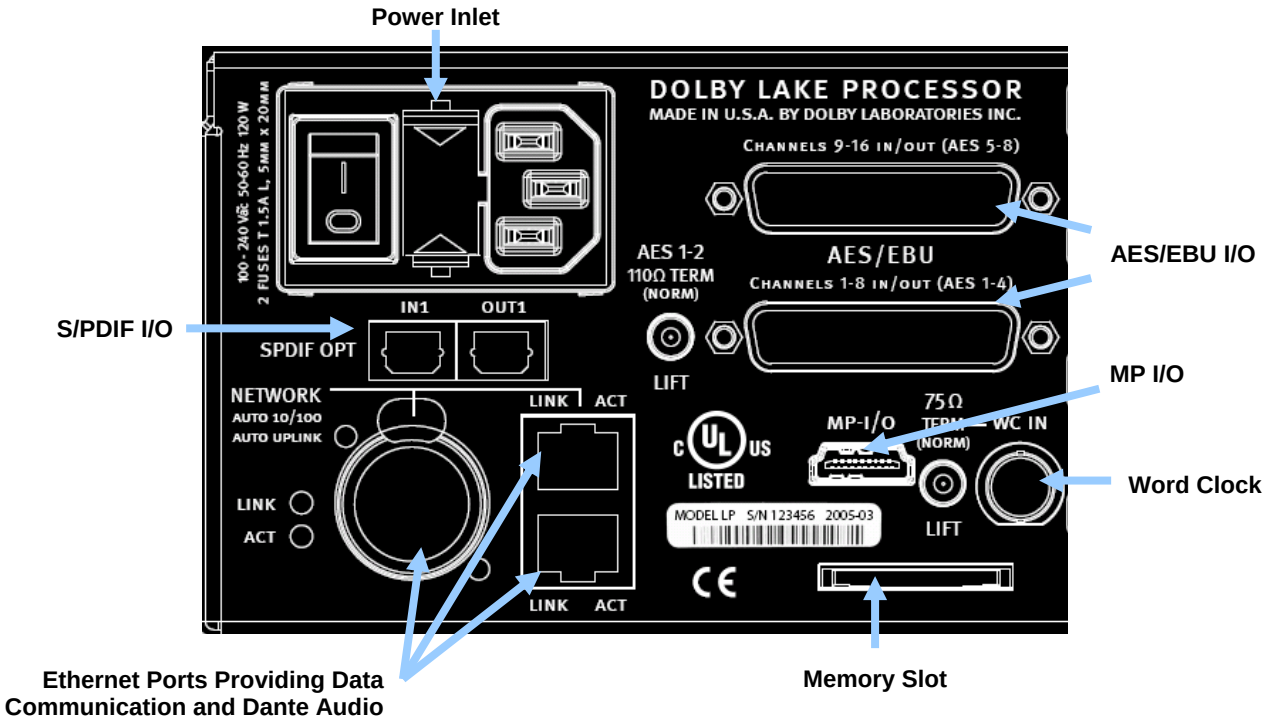

Figure 5-2 Base Platform

5.2.1 Power Inlet

The Dolby Lake Processor has an auto-ranging power supply, operating from 100–240 VAC, 50–60 Hz. The maximum power consumption of the Processor is 120 watts. Two fuses T 1.5A L, in a 5 × 20 mm package, are also contained, along with the power switch for the unit.

5.2.2 AES/EBU I/O

AES/EBU inputs and outputs are provided on two 25-pin D-connectors.

These connectors use the following pinout for interfacing eight channels of professional digital input and output in a compact connector package.

Table 5-1 AES/EBU Pin List

Pin	Signal Description	Pin	Signal Description
1	Channel 1 & 2 in (+)	14	Channel 1 & 2 in (–)
2	Channel 3 & 4 in (+)	15	Channel 3 & 4 in (–)
3	Channel 5 & 6 in (+)	16	Channel 5 & 6 in (–)
4	Channel 7 & 8 in (+)	17	Channel 7 & 8 in (–)
5	Channel 1 & 2 out (+)	18	Channel 1 & 2 out (–)
6	Channel 3 & 4 out (+)	19	Channel 3 & 4 out (–)
7	Channel 5 & 6 out (+)	20	Channel 5 & 6 out (–)
8	Channel 7 & 8 out (+)	21	Channel 7 & 8 out (–)
9	No connection	22	Ground
10	Ground	23	Ground
11	No connection	24	Ground
12	Ground	25	Ground
13	Ground		

Figure 5-3 AES/EBU Pinout

The first two pairs (four channels) of AES/EBU inputs have a lift switch so that you can remove the termination for cascading the same AES signal to other units. When cascading AES signals, ensure that the last device on the chain remains terminated.

5.2.3 MP I/O

Not currently in use.

5.2.4 Word Clock

A female BNC connector is used for interfacing with standard professional external word clock signals for synchronizing the Dolby Lake Processor to other audio devices, such as professional digital audio consoles. A termination switch is provided to lift the termination for allowing a cascade of the word clock to multiple devices using a T-node connector.

5.2.5 Memory Slot

Not currently in use.

5.2.6 Ethernet—Communication and Dante Audio

Three Ethernet connections are provided on two RJ-45 connectors and one EtherCon® connector that provides a robust locking connection.

For details about Dante, please refer to the *Dolby Lake Controller Manual*.

5.2.7 S/PDIF I/O

Optical Toslink™ connectors provide input and output interface to two-channel audio devices such as CD players and portable recorders.

5.3 Analog Cards

5.3.1 Analog Input Card

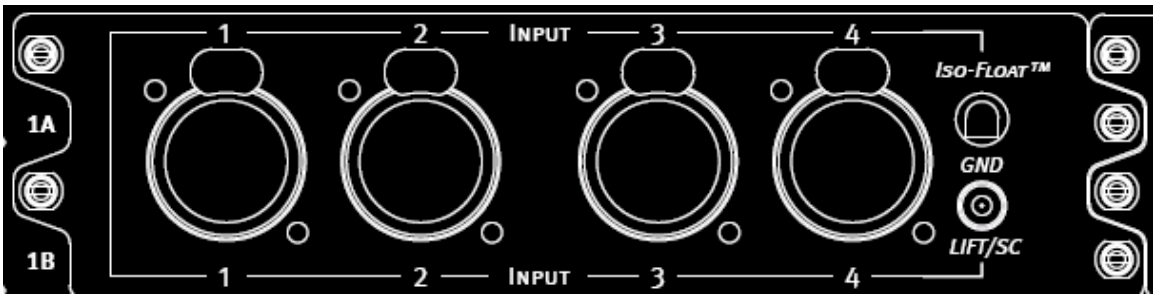

Figure 5-4 Input Card

Each input card provides balanced analog audio input connections using female XLR connectors.

5.3.2 Analog Output Card

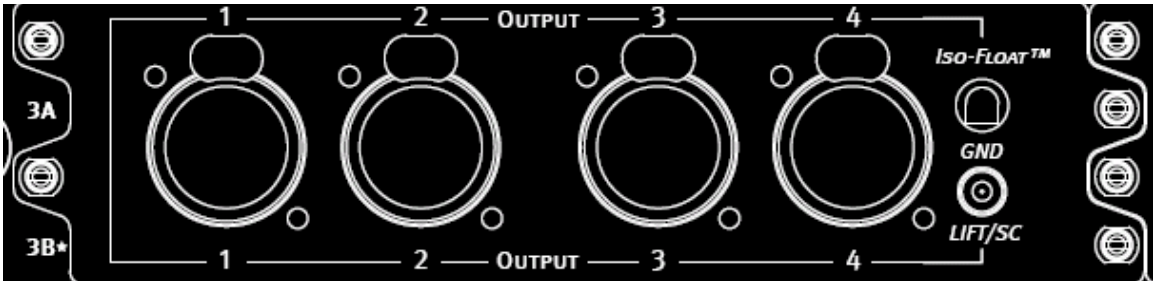

Figure 5-5 Output Card

Each output card provides balanced analog audio input connections using male XLR connectors.

5.3.3 Iso-Float Ground Isolation System

Analog input and output cards both feature the Iso-Float™ ground isolation system. The Iso-Float technology combines the benefits of transformer-coupled isolation with the advantages of clean, direct-coupled inputs and outputs. Iso-Float provides a unique, cost-effective, and audibly superior alternative to isolation transformers for avoiding ground loops in audio systems. While isolation transformers are typically an expensive option for many processors, Iso-Float is standard on all converter cards for the Dolby Lake Processor.

The audio converters are galvanically isolated, and not connected to the main ground. High-speed transformers and opto-isolators create a barrier between the Processor and possible grounding aberrations from the outside electrical environment.

Additionally, you can change the grounding of any input or output card remotely through the Dolby Lake Controller software interface.

As shown in Figure 5-6, Iso-Float control is provided by a switch on the back panel of A/D and D/A converter cards.

Figure 5-6 Iso-Float Control on Analog Converter Cards

Iso-Float Operation

As shown in the figure above, the Iso-Float two-position switch is labeled **GND** and **Lift/SC**. An LED above the switch indicates Iso-Float status. When the switch is in the **GND** position, all four channels on the converter card will be grounded. When the switch is in the **Lift/SC** position, all four channels on the converter card will be lifted.

When the Iso-Float switch is in the software control position, **Lift/SC**, the Dolby Lake Controller can remotely control the ground state. The LED indicates Iso-Float operations as described in Table 5-2.

Table 5-2 Iso-Float Status LED

Iso-Float Status	LED Illumination
Switch in grounded (GND) position	Green
Switch in lifted (Lift/SC) position	Red
Switch in lifted position and software control changes back to grounded state	Flashing green

If software control changes Iso-Float back to the grounded state, the LED will flash green, indicating that the converter card is grounded. The flashing green LED will return to full green illumination when the hardware switch is restored to the grounded (**GND**) position.

5.4 CobraNet Card

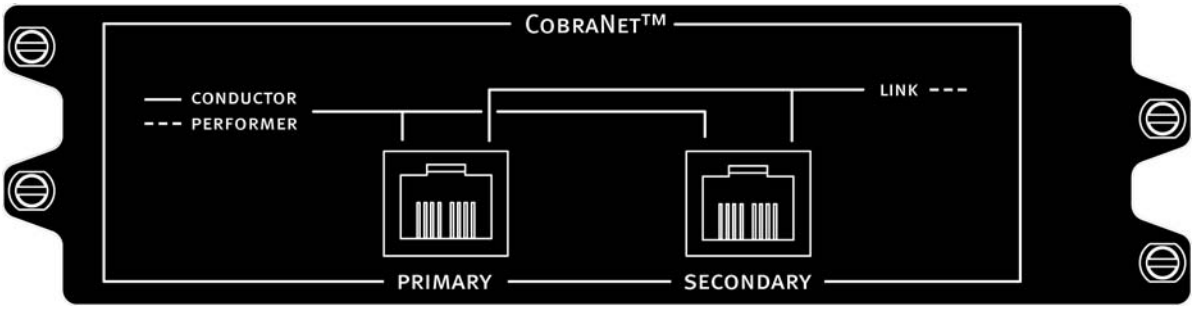

Figure 5-7 CobraNet Card

The CobraNet card enables CobraNet audio networking between Dolby Lake Processors and other CobraNet devices.

The Dolby Lake Processor software supports the following CobraNet functionality:

- Eight channels of 20-bit/48 kHz audio per CobraNet bundle
- One input bundle per Dolby Lake Processor (up to eight channels)
- Two output bundles per Dolby Lake Processor (up to 16 channels)

A redundant audio network provides a backup from the primary to secondary networks in the event of a communication problem using the primary CobraNet network.

5.5 System Interconnection Example

In a typical sound system application, the Dolby Lake Processor will be connected between the mixing console and the power amplifiers. Both digital and analog audio connections will be made, and a master word clock input may be provided if a digital console is being used in the system.

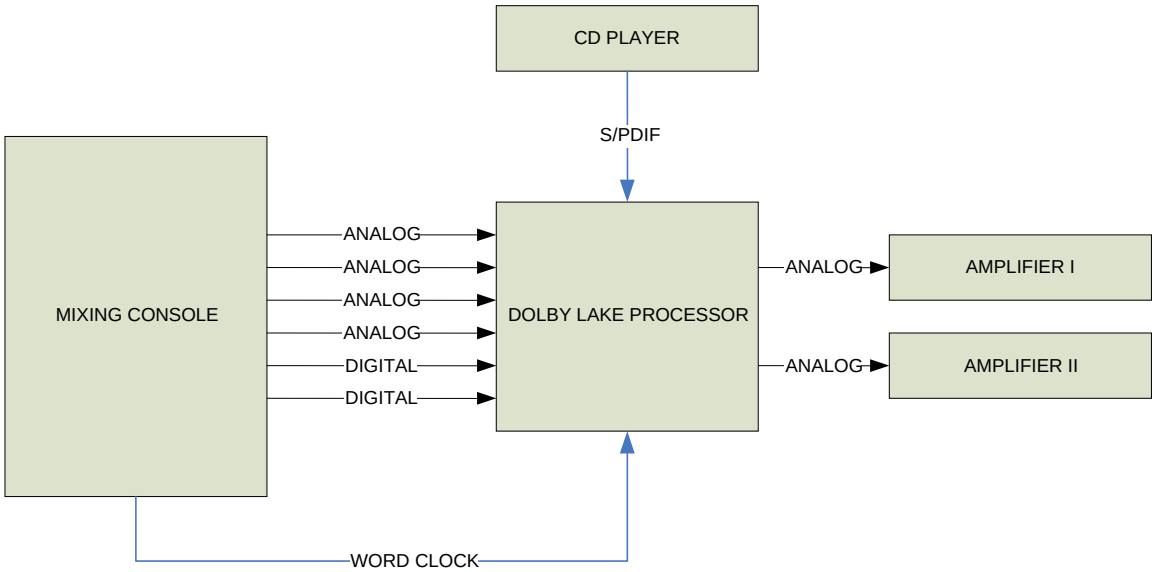

Figure 5-8 Typical Sound System Application

Additionally, Ethernet connections will be made between each Processor. These connections will be performed using physical wire connections, and in many applications, a wireless Ethernet access point will be used to provide a connection to a tablet PC operating the Dolby Lake Controller software.

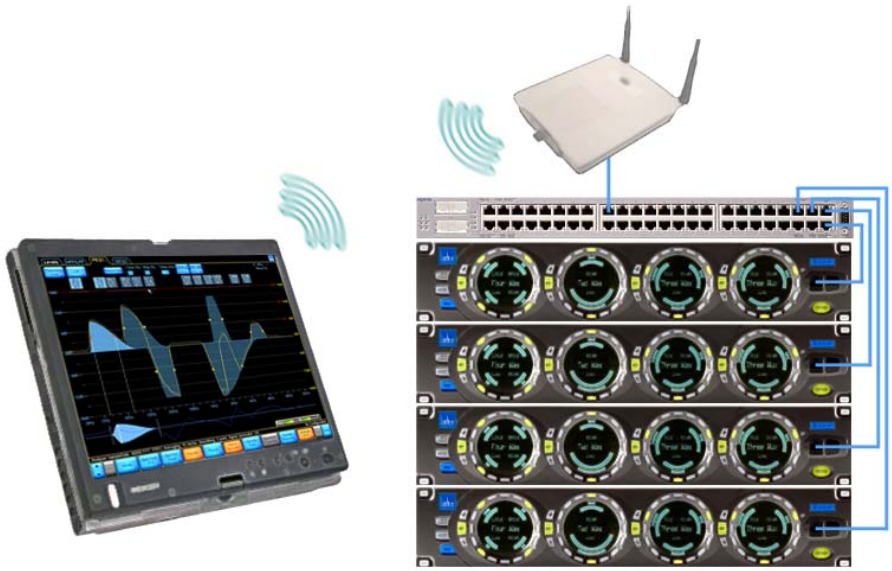

Figure 5-9 Wireless Connectivity with Tablet PC

Note: The Processors must be rack mounted to comply with safety agency requirements.

Networking

The Dolby® Lake® Processor must be connected to a network in order to communicate with the Dolby Lake Controller software. Both wired and wireless network configurations are presented in this chapter. Additionally, networking configurations containing Processors and Lake Contour™ and Mesa Quad EQ™ processors are presented.

6.1 Dolby Lake Processor Networking Features

The Dolby Lake Processor has four Ethernet ports for creating free-topology Ethernet-based networking systems. One of the four ports is provided on the front panel for easy access to processor systems installed in a rack. The other three ports are located on the back panel. All four ports use a standard RJ-45 connector that allows for connection of standard RJ-45 Ethernet cables.

One of the back-panel Ethernet connections is an EtherCon® connector that provides an RJ-45 housed within an XLR connector assembly for a robust locking connection. If a system configuration requires a long point-to-point Ethernet cable run in an exposed location, we recommend using the EtherCon port for strong connection during accidental cable movement.

All four Ethernet ports are 10/100 auto sensing and auto uplink. The 10/100 auto-sensing function automatically configures the Ethernet port to operate at either 10 MHz (10Base-T) or 100 MHz (100Base-T) speed. The auto-crossover feature automatically senses the cable type, allowing for either a straight-through or crossover Ethernet cable to be used.

The Processor implements a full Ethernet stack, providing all the standard features and benefits of an Ethernet device. As with all Ethernet-based devices, there are some cable requirements and inherent limitations to the extent of network nodes and cable lengths supported. An overview of basic Ethernet system requirements is presented in the next section.

6.2 Cable Specification

The Ethernet standards require that cabling meets or exceeds a cabling specification category. Table 6-1 lists Ethernet cable categories.

Table 6-1 Common Ethernet Cable Categories

Category	Spectral B/W	Length	LAN
Cat3	16 MHz	100 m	10Base-T
Cat4	20 MHz	100 m	16 Mbps
Cat5e	100 MHz	100 m	100Base-T
Cat6	250 MHz	100 m	Emerging

Cat5e cabling meets the requirements for the Dolby Lake Processor Ethernet network, and Cat6 cabling exceeds the requirements. Use either cable.

Note: Existing infrastructure cabling in installations may be Cat3 or Cat4. Neither of those satisfies the bandwidth requirements of 100Base-T networking.

6.3 Connecting Multiple Processors on Wired Ethernet Networks

Due to the auto-sense and auto-crossover features of the Ethernet ports, connecting multiple units is a simple task. A free-topology network can be implemented, including external switches.

The simplest network is to connect multiple Dolby Lake Processors together, and then connect a PC to any available port on one of the processors on the network, as shown in Figure 6-1.

Note: The setup shown below is not recommended for large numbers of processors, and is not suitable for more that two processors when using Dante digital audio networking.

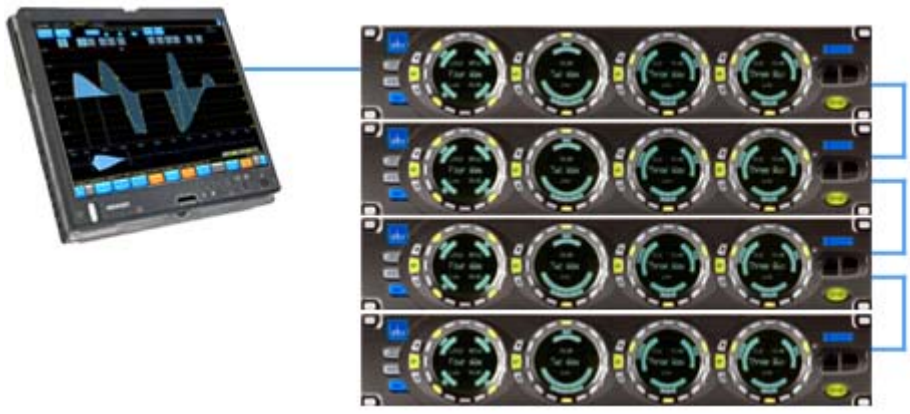

Figure 6-1 Simple Wired Network Connection

More complex networks are possible, which may be required due to physical placement of the processors. Standard Ethernet repeaters and switches may be a part of the network, as illustrated in Figure 6-2.

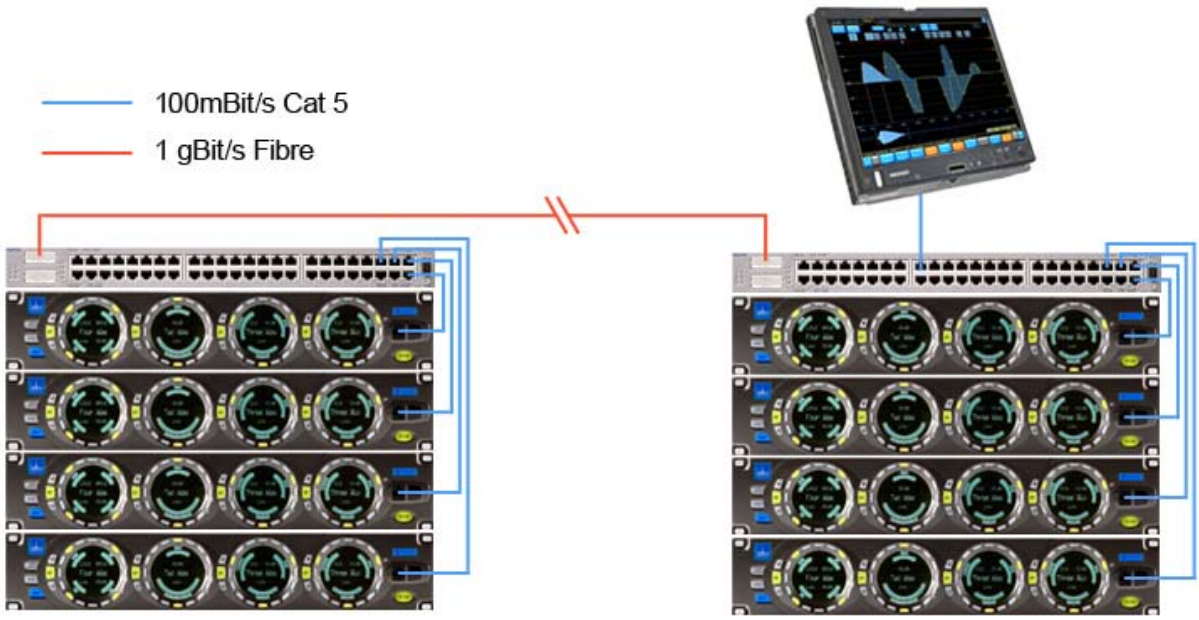

Figure 6-2 Complex Wired Network Connection

Gateways to other Ethernet transport layers, such as fiber optics, can also be incorporated into the system.

6.4 Wireless Network Operation

Adding wireless networking to the system provides portable centralized control to a distributed network of processors. A wireless access point simply works as a gateway between the wired network and wireless devices. Figure 6-3 shows a complex wired network connected to a wireless tablet PC via a wireless access point.

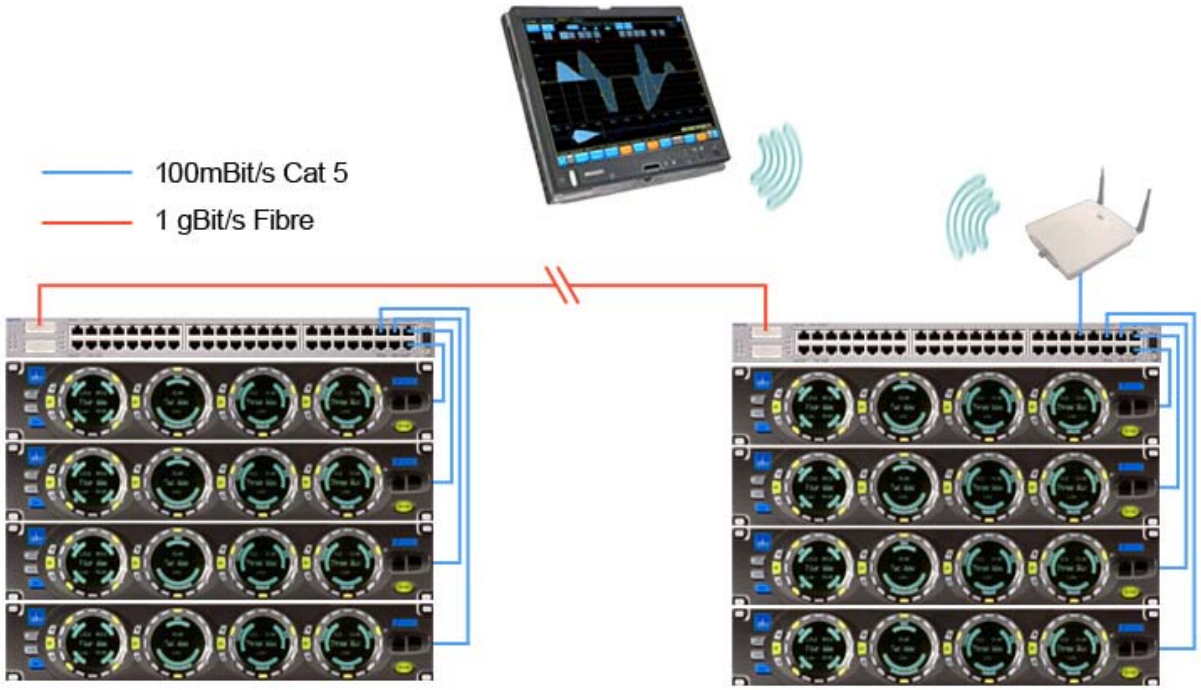

Figure 6-3 Example Wireless Network Configuration

6.5 Networking with Lake Contour and Mesa Quad EQ Processors

Lake Contour and Mesa Quad EQ processors both utilize a 10Base-T Ethernet network. Because these processors have a lower-bandwidth network connection, care should be taken when connecting these processors to a network containing Dolby Lake Processors that utilize 100Base-T, a 100 MHz Ethernet network.

A network containing both 10Base-T and 100Base-T network nodes is known as a mixed-mode network. To ensure that a network bandwidth bottleneck does not occur, an external Ethernet switch should be correctly set up to filter the different devices on the nodes to which they are connected.

In the complex scenario shown in Figure 6-4, the red segment on the switch has had various filtering configuration applied to ensure that 100 Mbps traffic does not clog these 10 Mbps devices.

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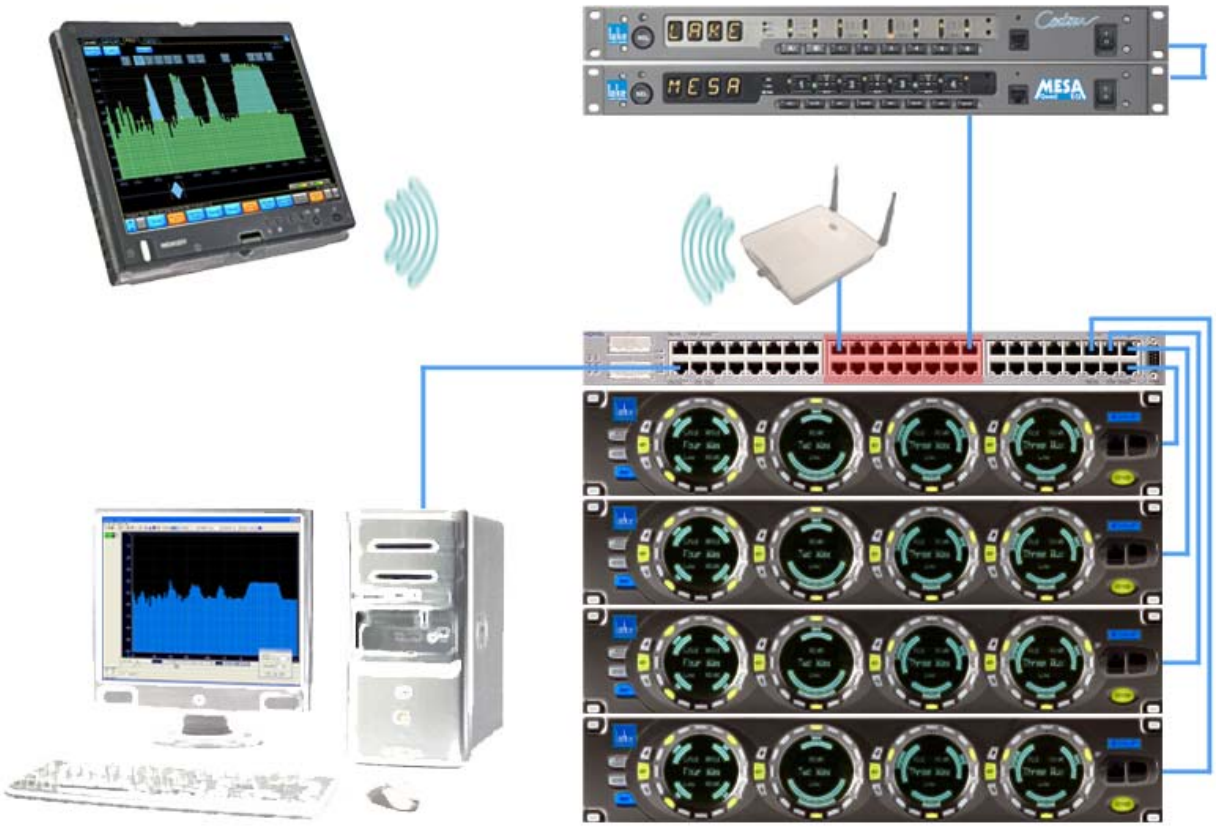

Figure 6-4 Mixed-Mode Network Connection

For further detailed information regarding filtering and the use of Dante digital audio in conjunction with a mixed control and measurement network such as that shown above, please refer to the Audinate document AUD-ANO-ACL_Filtering_SRW224G4-V2.4.pdf, located in the Literature section of the Dolby Lake Controller software installer, or from our software download request page at http://www.dolby.com/professional/live_sound/support_download/lsdr_form.aspx.

Further Dante support information can be found on the support forum at http://livesoundforum.dolby.com/.

Connecting Digital Audio Devices

The Dolby® Lake® Processor introduces a new sample-rate conversion technique that significantly reduces the latency, regardless of the sample rate. In addition to low-latency conversion, the Processor prioritizes and synchronizes incoming and outgoing signals at different sample rates on every individual digital input and output.

This chapter describes how to connect the Processor to other digital audio devices.

7.1 Internal and External Clocks

The Dolby Lake Processor provides two independent digital clocks.

The Primary Clock Source and Sample Rate Converter Clock Source work together to provide a digital audio system capable of receiving and transmitting 44.1, 48, 88.2, 96, 176.4, and 192 kHz sample rates. The user can configure the Processor to provide a different sample rate for each digital channel.

Figure 7-1 shows a simplified block diagram of the Processor clock system.

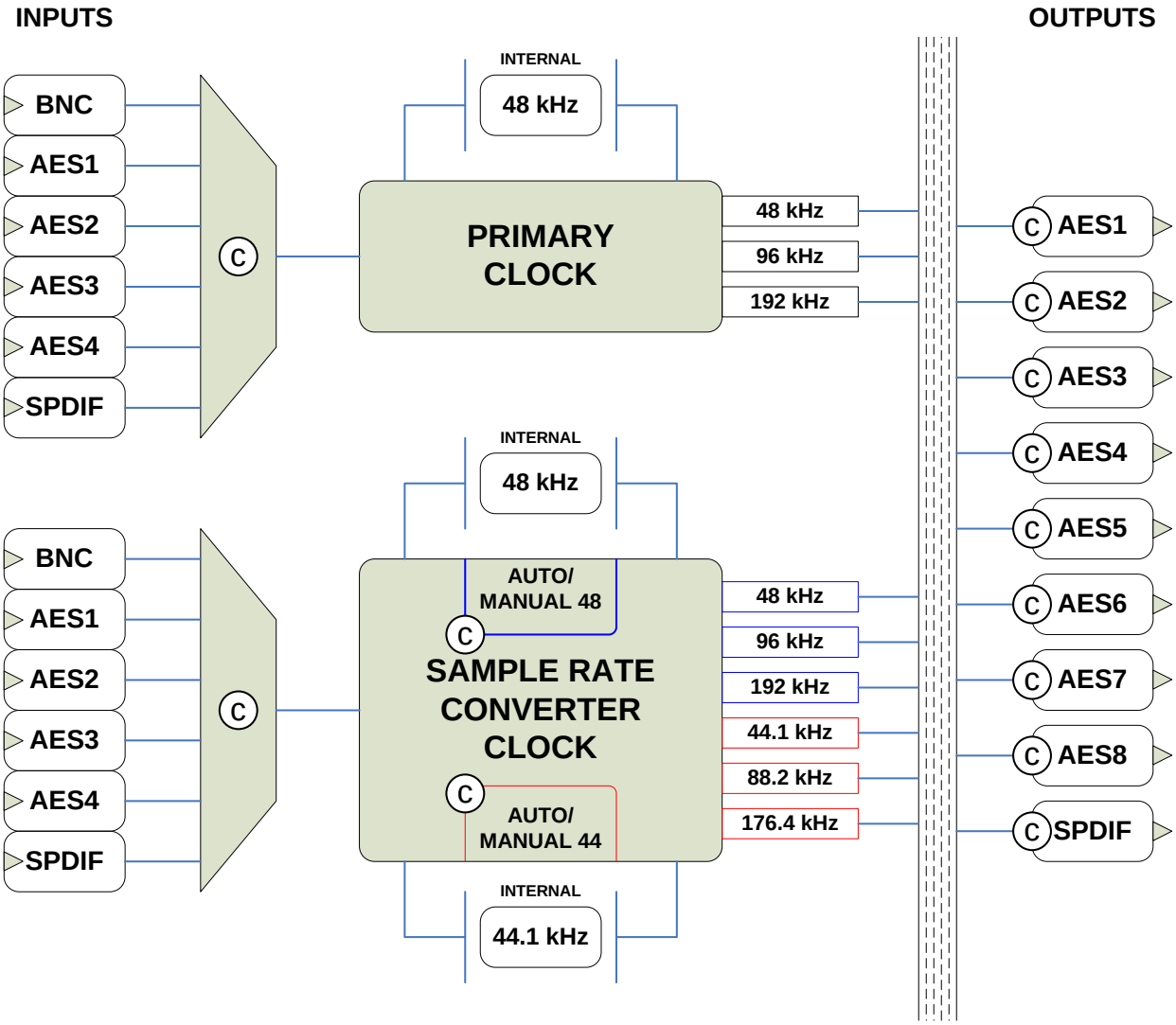

Figure 7-1 Dolby Lake Processor Clock System

In Figure 7-1, each circled *C* represents a choice point. A choice point is a user-interface control that can be configured using the Dolby Lake Controller software. For further information on the software user interface, please refer to the *Dolby Lake Controller Manual*.

Both the Primary and Sample Rate Converter clocks can either derive their own internal clock signal, or synchronize to an external input clock source. The available input clock sources, shown in Figure 7-1, are BNC word clock input, AES pair 1, AES pair 2, AES pair 3, AES pair 4, and S/PDIF. The end user can choose which input clock source is desired.

Both Primary and Sample Rate Converter clocks produce multiple audio clocks derived from a base sample rate. The Primary Clock's base rate is 48 kHz, which also derives the 96 and 192 kHz clocks.

The Sample Rate Converter Clock's base rate can either be 44.1 or 48 kHz. If the Sample Rate Converter Clock's base rate is chosen to be 44.1 kHz, 88.2 and 176.4 kHz clocks are also derived. If the Sample Rate Converter Clock's base rate is chosen to be 48 kHz, 96 and 192 kHz clocks are also derived.

In most typical applications, the Sample Rate Converter Clock will be set at a base rate of 44.1 kHz. A base rate of 48 kHz is provided as an enhancement to allow for both synchronous (from Primary Clock) and asynchronous (from Sample Rate Converter Clock) digital audio outputs.

All clocks derived from the Primary and Sample Rate Converter clocks are available to drive digital audio outputs. The end user can independently choose the desired sample rate for each digital audio output, as shown on the right side of Figure 7-1.

For example, you can configure AES1, AES2, AES3, and AES4 to provide 96 kHz AES/EBU outputs to drive digital amplifiers in the sound system, and configure AES5 to provide a 44.1 kHz output to an onsite video facility for press or broadcast use.

7.2 Clock Source Priorities

By default, the most appropriate digital clocks are automatically detected. The first valid clock in the order of the following list is chosen to configure the Primary Clock as 48/96/192 kHz, and the Sample Rate Converter Clock as 44.1/88.2/176.4 kHz.

1. BNC Word Clock
2. AES1 (In 1+2)
3. AES2 (In 3+4)
4. AES3 (In 5+6)
5. AES4 (In 7+8)
6. S/PDIF
7. Internal Clock (88.2 or 96 kHz; also includes conductor/performer negotiation for CobraNet™ at 48 kHz)

If a clock signal is unavailable, or temporarily lost, the automatic detection process reverts to the internal clock using the same sample-rate multiples as that selected for each clock (either 44.1 or 48 kHz). This will ensure that digital I/O continues at the expected clock sample rate.

Note: If Dante, digital audio networking over Ethernet, is being used, the Primary Clock on each processor that has Dante enabled will become either the Dante Master (using any external or internal clock as a locking source); or a Dante Slave (locking to Dante's network clock, which is driven by the Dante master).

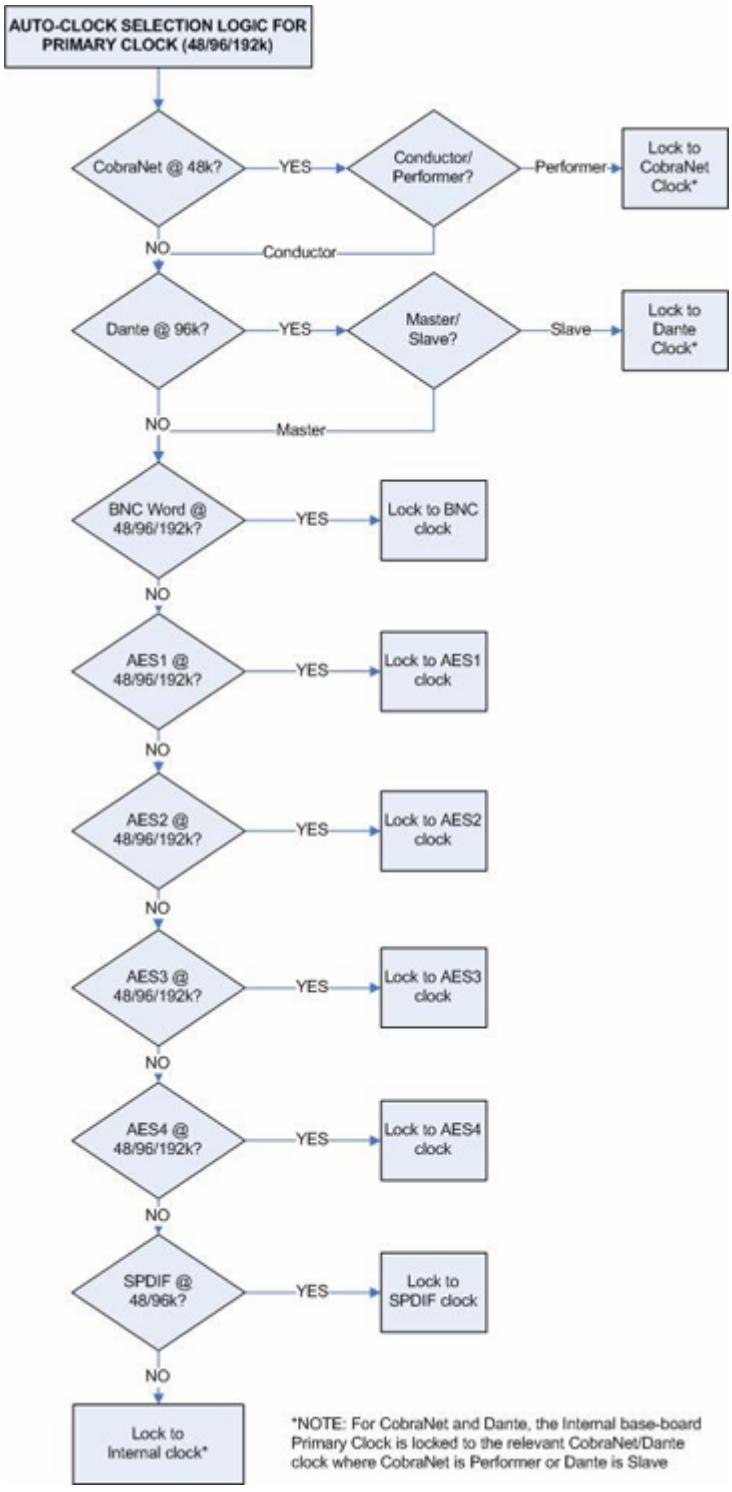

Figure 7-2 Primary Clock [Auto] Clock Logic

7.3 Cascading AES and Word Clock Input Signals

Cascading AES and word clock input signals are additional features of the Dolby Lake Processor. A termination lift switch is provided next to the corresponding input connectors.

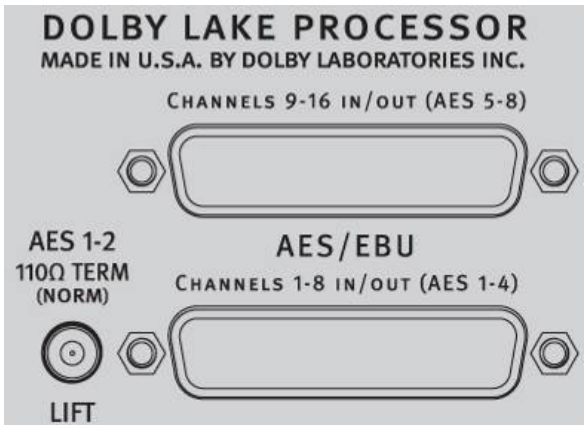

Figure 7-3 Connectors and Termination Lift Switch

Figure 7-4 Termination Lift Switch

For AES connections, the termination lift switch affects the termination state of AES pairs 1 and 2 only (audio channels 1, 2, 3, and 4). When using this feature, ensure that the last processor in the AES chain provides 110Ω termination.

Word clock can be cascaded by lifting termination and using a BNC T-connector, as shown in Figure 7-5.

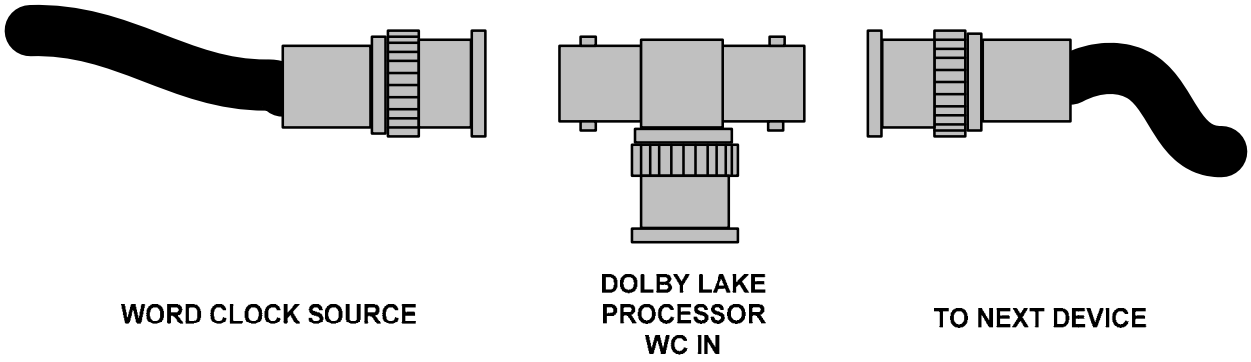

Figure 7-5 Cascading Word Clock Connection

When using this feature, ensure that the last processor in the word clock chain provides 75Ω termination.

7.4 Signal Processing Latency

The latency through the Dolby Lake processor is always less than 1.5 ms, regardless of the audio input and output configuration (with the exception of user-definable latency required

for certain CobraNet/Dante configurations). Figure 7-6 shows the latencies for each processing component of the Processor system.

Note: Dante's user selectable latency is between 0.8 ms (shown below) and 4 ms. CobraNet audio networking adds an additional, user-selectable latency of between 1.333 and 5.333 ms.

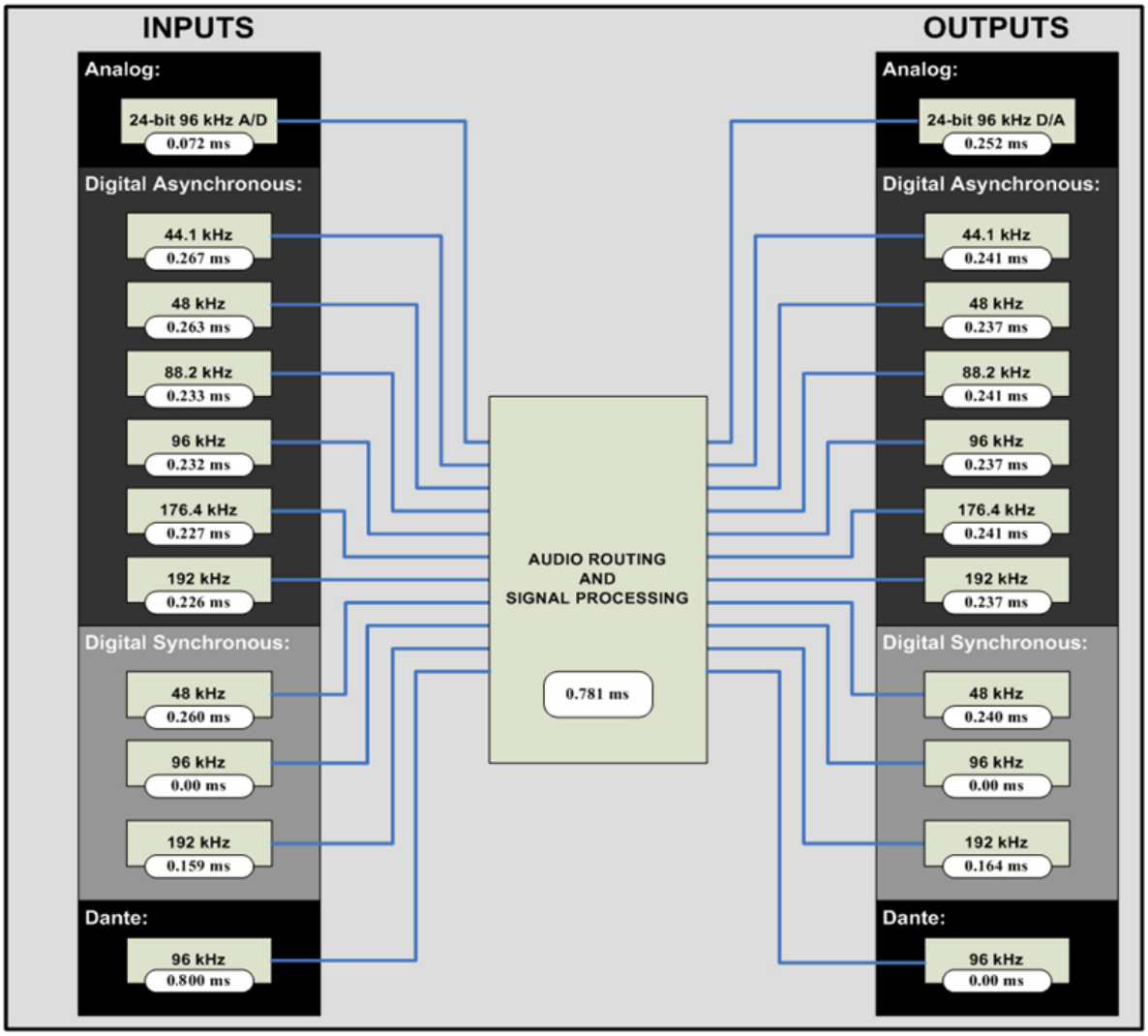

Figure 7-6 Dolby Lake Processor Latencies

In Figure 7-6, digital synchronous connections use the Primary Clock source, and Digital Asynchronous connections use the Sample Rate Converter Clock source.

Table 7-1 provides a list of latencies for common input-output relationships.

Table 7-1 Common Input-Output Latencies

Common Input-Output Latencies					
Input Configuration	**Input Latency**	**Processing Latency**	**Output Configuration**	**Output Latency**	**Total Latency**
Analog	0.072 ms	0.781 ms	Analog	0.252 ms	1.105 ms
48 kHz sync	0.26 ms	0.781 ms	48 kHz sync	0.24 ms	1.281 ms
96 kHz sync	0 ms	0.781 ms	96 kHz sync	0 ms	0.781 ms
192 kHz sync	0.159 ms	0.781 ms	192 kHz sync	0.164 ms	1.104 ms
44.1 kHz async	0.267 ms	0.781 ms	44.1 kHz async	0.241 ms	1.289 ms
88.2 kHz async	0.233 ms	0.781 ms	88.2 kHz async	0.241 ms	1.255 ms
176.4 kHz async	0.227 ms	0.781 ms	176.4 kHz async	0.241 ms	1.249 ms
Analog	0.072 ms	0.781 ms	Dante 96 kHz	0 ms	0.853 ms
96 kHz sync	0 ms	0.781 ms	Dante 96 kHz	0 ms	0.781 ms
Dante 96 kHz	0.8 ms	0.781 ms	Dante 96 kHz	0 ms	1.581 ms
Dante 96 kHz	0.8 ms	0.781 ms	Analog	0.252 ms	1.833 ms

Note: The default Dante latency is 0.8 ms. This can be changed to 1.3 ms or 4 ms, depending on network complexity, to improve network robustness.

Index

access control menu 29
AES 51
AES/EBU I/O 36
ambient light sensor 13
analog I/O 38–39
analog input card 38
analog output card 39
back-panel interface 35–42
button
  menu 15
  meter view 15
  mute enable 15
Cable Specification 43
cards
  analog 38–40
  CobraNet 41
cascading input signals 51
clock source priorities 49
clocks
  internal and external 47
CobraNet Card 41
configuration
  loudspeaker processor 10
  system equalizer 11
Configuration
  loudspeaker processor or system equalizer 12
configuration naming conventions 5
configurations
  factory 5
  supported 7
connecting multiple processors 44
conventions
  configuration naming 5
Dante 38
edit menu 20–25
Ethernet activity indicators 14
Ethernet connections 38
Ethernet connector 14
front panel
  ambient light sensor 13
  connectivity and power 13
  Ethernet activity indicators 14
  Ethernet port 14
  infrared transceivers 14
  interface 13–33
  reference 31
front panel configuration menu 29
front-panel functions
  Lake Contour 32
  Mesa Quad EQ 33
GEQ edit menu 23
ground isolation system 39
I/O
  AES/EBU 36
  analog 38–39
  MP 37
  S/PDIF 38
interface
  back-panel 35–42
  front panel 13–33
Iso-Float 39
latency 52
Levels menu 24
loudspeaker processor
  configuration 10
Loudspeaker Processor or System Equalizer
  configuration 12
LP4D12 7
LP4D4 6
LP4D8 6
LP8D8 6
LPD 5
main menu 20–31, 20–31
memory slot 38

menu
  access control 29
  edit 20–25
  front-panel configuration 29
  GEQ edit 23
  level edits 24
  PEQ edit 21
  presets 25
  reset processor 26–28
  technical information 28
menu mode 15, 19
meter display 16
meter view 15
metering mode 18
MP I/O 37
mute enable 15
networking 43–46
  features 43
  Lake Contour and Mesa Quad EQ 45
  multiple processors 44
  wireless 45
password entry keyboard 30
PEQ edit menu 21
Portal 16
  display and functionality 16–18
presets menu 25
product specifications 3
reset processor menu 26–28
S/PDIF I/O 38
signal processing
  latency 52
specifications
  A/D inputs 3
  audio performance\t 3
  back panel interface 3
  cable 43
  combined A/D and D/A 3
  D/A outputs 3
  sample rate converters \t 3
standby power button 14
System Equalizer 11
system interconnection example 41
technical information menu 28
wireless network operation 45
word clock 51
word clock connector 37