Max Air

· · · · · · · · · ·

Installation Guide

Document Revision: 3.0
Part Number: 840-08472-05
Release Date: April 2008

Euphonix

d i g i t a l   e m o t i o n

In the interest of continued product development, Euphonix reserves the right to make improvements to this manual and the product it describes at any time, without notice or obligation.

System 5, S5, PatchNet, eMix, EuCon, R1, Studio Hub, Audio Deck, Max Air, Reel Feel, Clear Displays, Track Panner, SnapShot Recall, DSC (Digital Studio Controller), Hyper-Surround, Total Automation and Mix View are trademarks of Euphonix, Inc.

Manual written by Storm Staley, Martin Lucas, Chris Konovaliv, Edward Jones, Rob Wenig, and Duane Takahashi.

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 the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.*

Caution: *Any changes or modifications made by the user that are not expressly approved by Euphonix could void the user's right to operate the equipment.*

IMPORTANT SAFETY INSTRUCTIONS

The lighting flash with arrowhead symbol within an equilateral triangle, is intended 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 electrical shock to persons.

The exclamation point within an equilateral triangle, is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the product.

1) Read these instructions.

2) Keep these instructions.

3) Heed all warnings.

4) Follow all instructions.

5) Do not use this apparatus near water.

6) Clean only with a dry cloth.

7) Do not block any ventilation openings. Install in accordance with the manufacturer's instructions.

8) Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.

9) Do not defeat the safety purpose of the polarized or grounding-type plug. A polarized plug has two blades with one wider than the other. A grounding type plug has two blades and a third grounding prong. The wider 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.

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) Use only with the cart, stand, tripod, bracket, or table specified by the manufacturer, or sold with the apparatus. When a cart is used, use caution when moving the cart/apparatus combination to avoid injury from tip-over.

13) Unplug this apparatus during lightning storms or when unused for long periods of time.

14) Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.

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

16) Do not expose this equipment to dripping or splashing and ensure that no objects filled with liquids, such as vases, are placed on the equipment.

17) To completely disconnect this equipment from the AC Mains, disconnect the power supply cord plug from the AC receptacle.

18) The mains plug of the power supply cord shall remain readily operable.

19) This unit is provided with a power supply cord set suitable for 120V AC input only (for U.S.A. and Canada). For other than U.S.A. and Canada, a qualified person must provide for use with this unit, an appropriate, approved power supply cord set which is in compliance with the end use country requirements and has a minimum cross-sectional area of 1.0mm2.

20) For units with more than one power cord:

Caution: This unit has more than one power supply cord. Disconnect two power supply cords before servicing to avoid electrical shock.

Attention: Cet appareil comporte plus d'un cordon d'alimentation. Afin de prévenir les chocs électriques, débrancher les deux cordons d'alimentation avant de faire le dépannage.

21) Operator Accessible Fuse:

Caution: For continued protection against risk of fire, replace only with same type and rating of fuse.

Attention: Pour ne pas compromettre la protection contre les risques d'incendie, remplacer par un fusible de même type et de même caractéristiques nominales.

Table of Contents

List of Figures

List of Tables

Chapter 1: Max Air Overview

This chapter explains the basic elements of any digital audio mixing system and introduces the components of Max Air. It concludes with a section explaining how to estimate your system's requirements.

Chapter 2: *Interconnecting System Components* illustrates how to connect the components, where to locate them, and lists technical information about the components.

Chapter 3: *Max Air Components* presents relevant details about each component's connectors and cables.

1.1 Introduction to Max Air

The Max Air Console

The Max Air console must contain a CM404 center section module and can have up to three fully loaded CM416 16-channel Modules, each providing 16 physical faders. The system can have up to 48 faders, not including the eight faders in the CM404 master section. The 416HL and 416HR, which are half-loaded (left or right) 8-fader modules, can be used to expand your system.

The following sections discuss important concepts necessary to specify a console layout.
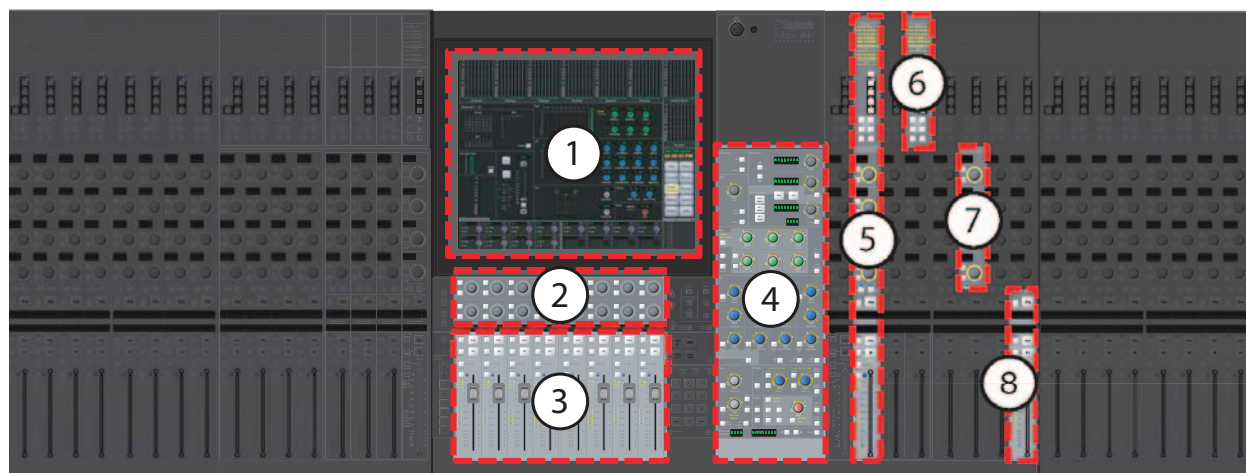
Figure 1-1 Typical Console Layout

Channels

Max Air can have up to 200 channels. Mono channels may be grouped as stereo or any format up to 7.1, which means that one fader may use one to eight logical channels.

Strips

Each fully loaded CM416 16-channel Module contains 16 physical faders or strips. Each fader can control two inputs using a **Swap** button that switches between the Swap and Main channels.

Layouts

Channels are assigned to strips by using *Layouts*. Numerous Layouts can be easily stored and recalled to remap the console surface. To understand Layouts, consider the following examples:

- A console fitted with one CM416 has 16 physical faders that can control up to 32 channels (Swap and Main per strip). One Layout can assign 32 stereo inputs to the faders for a total of 64 logical channels.

- The first 32-channels can be assigned and left connected to the mix buses while a second Layout is recalled. If none of the channels between the Layouts are the same, there are now 64 logical channels feeding the mix buses at the same time, although they cannot be controlled simultaneously from the console surface.

Layouts may also be used to place the inputs most often used on the top fader layer, or inputs that should be grouped together (i.e., microphones or VTRs).

1.2   Digital Signal Processing

The DF66 SuperCore is a rack-mounted unit that performs all Max Air audio processing: dynamics and EQ, mix buses, record buses, aux sends, and monitor buses. The DF66 DSP can be allocated, using factory-supplied *Mixer Model* files, to provide different numbers of buses and channels for each studio. The number of DF66 DSP cards required in a system depends on the number of *logical channels* desired: a mono input uses one logical channel, a stereo input uses two, and a 7.1 input uses eight.

1.3   Analog and Digital I/O

All audio signals are converted to and from the MADI format through analog and digital converters, and HD/SD embedders/de-embedders. Up to twenty-four input and twenty-four output MADI devices are connected to the CO600 Changeover System, which connects to the DF66 cores.

Analog I/O

All analog signals are converted between analog and MADI formats via the AM713 Analog to MADI Converter, the MA703 MADI to Analog Converter, Modular I/O cards AD920 4ch Analog Line Input, DA921 4ch Analog Line Output, and AD924 4ch Mic Input. The

The AM713 and MA703 are 24 channel I/O devices with four additional auxilliary channels. The first two Aux channels are always analog and the remaining two comprise a digital pair in AES3 and S/PDIF format. Note that one or the other format can be used, but not both simulataneously. The Modular I/O frame can handle up to 64 signals.

Digital I/O

All digital signals are converted to and from MADI format via the DM714 AES/EBU to MADI Converter, the MD704 MADI to AES/EBU Converter, and the Modular I/O DD9xx series AES I/O, input, and output cards. The DM714 and MD704 converters handle 12 AES/EBU pairs (24 channels) of digital audio and four additional auxilliary channels. The first two Aux channels are always analog and the remaining two comprise a digital pair in AES3 and S/PDIF format. Note that one or the other format can be used, but not both simultaneously. All digital inputs of the DM714 have built in Sample Rate Converters. The Modular I/O frame can handle up to 64 signals. All its digital input cards have built in Sample Rate Conversion.

Format Conversion

The FC726 is a bidirectional device with 56 channels of sample-rate-converted I/O. In addition to AES/EBU I/O, the FC726 allows direct connection to several third-party digital formats. Formats supported by the unit are TDIF, SDIF-2, and ADAT Optical. AES/EBU outputs are alwasy active even when using third-party formats.

Embedders/De-embedders

The Modular I/O frame can be fitted with cards that can embed or de-embed 4 or 8 channels of audio to/from a single SD or HD video signal as per the SMPTE272M standard. Audio from MADI can be embedded to an SD or HD video signal, and audio from an SD or HD video signal can be de-embedded to MADI. Each Modular I/O frame can handle up to 64 audio channels. An Embedder/De-embedder card *cannot* embed and de-embed audio simultaneously.

1.4   Microphone Inputs

Microphone inputs are handled by the ML530 Mic/Line Interfaces and Modular I/O re-preamps. Each ML530 unit contains 24 remote-controlled mic preamps, and is connected to a deditcated AM713 Analog to MADI Converter. Up to seven ML530s may be connected in a system.

Each Modular I/O frame can contain from 4 to 32 remote-controlled mic preamps. Up to seven Modular I/O frames can be deployed in a system.

1.5   Modular I/O

Modular I/O configurations consist of one or more 3RU double-sided frames that can be fitted with a variety of I/O modules. For interface to the console, all signals are converted to MADI. Depending on the configuration, a maximum signal density of 64 inputs and 64 outputs can be achieved on a single MADI I/O. Audio formats supported are remote-controlled preamp, line level analog, AES/EBU, and HD/SD embedder/de-embedder. These formats can be used simultaeously in the same frame. Refer to the Euphonix Modular Configuration Guide for more details and configuration possibilities.

1.6   Monitoring

The MC524 Monitor Controller provides analog monitor outputs. This unit provides Main (7.1), Alt 1 (5.1), and Alt 2 (stereo) control room monitoring, SLS (7.1), and Cues 1–3 (each stereo) studio monitoring, two talkback preamps, and four listen microphone preamps. The MC524 is connected to a dedicated MA703 MADI to Analog Converter.

1.7   Power

Some of the Max Air console components have dual power entry connectors for redundant power supplies. We recommend deriving the two power supplies from different sources to maximize the failsafe capabilities of the system. The best case is to connect one power supply to a UPS (Uninturuptable Power Supply) and the other to a clean technical power source. If a UPS is not used, the power supplies should be connected to seperately protected clean technical power circuits.

1.8   Digital Sync

A high quality digital sync source is required for the Max Air console. Some facilities may already have a digital master clock or house reference in place but others may require one. Euphonix has tested several digital sync generators and distribution amplifiers and can supply these devices with the console. Contact a Euphonix sales representative for further information.

We recommend following these guidelines:

- It is important to minimize the timing differences between signal paths to avoid cumulative timing errors. It is good system engineering practice to send sync signals to all system components from one source.
- Sync signals should not be looped and each distribution amplifier should be fed directly from the master clock source.
- Drawings in this installation guide show the use of Word Clock. The user may use either AES/EBU sync (DARS) or Word Clock.

1.9   System Control Connections

Ethernet

Several intelligent system components are connected via RJ45 Ethernet through a EuCon Ethernet switch. These devices include:

- SC263 System Computer
- CM404 Center Section Module
- CM416 16-channel Modules
- DF66 SuperCores
- CO600 Changeover Switch
- Modular I/O Remote Preamps/Embedder/De-embedders (optional)

KVM Extender

The KVM Extender cable is a Category 5 UTP cable, however it does not carry Ethernet data like the system components. The KVM Extender requires its own dedicated cable. Its maximum length is 400 ft (120 m).

Monitor, trackball, and keyboard

The Max Air System Computer is displayed on the CM404 touchscreen. A keyboard and mouse are connected to the CM404. Additionally, a connection for a "local" keyboard, mouse, video and serial (touchscreen) port is provided at the KVM's transmitter side (closest to the SC263) to facilitate local control, i.e., from the Central Equipment Room.

TCC Control

The SC263 System Computer connects to the MC524 Monitor Interface and up to seven Monitor Interface ML530 Mic/Line Interfaces via a TCC connection.

GPIO Control

The TT002 provides GPIO control for the system. This interface is installed in the SC263 System Computer.

1.10   Estimating System Requirements

This section helps estimate the system requirements for a particular installation. Contact a Euphonix representative for an exact specification. Use the following categories to determine the Max Air components necessary for your studio. Most of the studio details considered here are relevant to any digital mixing system.

1.10.1   Number of DF66 DSP Line Cards

Some examples of Mixer Models and their relationship to the number of DF66 cards are shown below.

Table 1-1 DF66 Requirements

Number of cards	Sample Rate	Logical Channels	Record Buses	Mix Buses	Aux Sends	Bus Processors
2	48 kHz	68	16	16	8	8
3	48 kHz	86	24	24	16	12
3	48 kHz	96	24	24	16	0
4	48 kHz	130	24	24	16	12
5	48 kHz	150	24	32	24	16
6	48 kHz	194	24	32	24	16

> **NOTE:**   *Table 1-2 refers to logical audio channels not inputs. See Inputs on page xx to see how to count logical channels based on the number and type of inputs.*

1.10.2   Number of CM416 16-channel Sections

One application may require a small, powerful console to control many inputs from a small number of faders. Other applications may trade console size for the power of accessing each input quickly without having to swap the fader or recall a Layout. Specify enough physical faders to conveniently control the required number of inputs, remembering that multi-channel sources (Stereo, 5.1) can be controlled with a single fader on the Max Air and do not require 2 or 6 individual faders. There can be up to three fully loaded CM416s yielding 48 faders, which gives you 96 locations (Main and Swap layer) to place sources without having to change layouts.

1.10.3   I/O Specification

The following tables summarize the I/O capabilities of the Euphonix MADI converters. The number of available MADI I/O ports on the DF66 depends on the number of SP662 DSP cards. Each SP662 provides four MADI I/O ports for a maximum of 24 MADI in-

puts and 23 MADI outputs (note: MADI out 1 is reserved for the MA703/MC524 monitor connection).

In the case of Modular I/O, only mic, analog, AES, and embedder/de-embedder modules are shown. Refer to the Euphonix Modular I/O Configuration Guide for more details on sync, MADI I/O, and remote control modules as well as general requirements.

Table 1-2 Summary of Euphonix "Classic" MADI Converters

part#	device	size	mic ins	anlg ins	AES ins	anlg outs	AES outs	mon outs
AM713	Analog to MADI Converter	19" / 3RU	-	26	1	-	-	-
MA703	MADI to Analog Converter	19" / 3RU	-	-	-	26	1	-
DM714	AES to MADI Converter	19" / 3RU	-	2	13	-	-	-
MD704	MADI to AES Converter	19" / 3RU	-	-	-	2	13	-
FC726	Format Converter	19" / 3RU	-	-	28	-	28	-
ML530	Mic-Line Interface	19" / 3RU	24	-	-	-	-	-
MC524	Monitor-Comms Interface	19" / 3RU	6	-	-	-	-	24
	Note: All AES shown as pairs (2 channels per in/out)							

Table 1-3 Summary of Euphonix Modular I/O

part #	device	width (slots)	mic in	anlg in	anlg out	AES in	AES out	video in	video out	video thru
AD914	4ch Mic Input	1	4	-	-	-	-	-	-	-
AD920	4ch Analog Input	2	-	4	-	-	-	-	-	-
DA921	4ch Analog Output	2	-	-	4	-	-	-	-	-
AD922	4ch Analog Input	1	-	4	-	-	-	-	-	-
DA923	4ch Analog Output	1	-	-	4	-	-	-	-	-
AD924	4ch Mic Input	2	4	-	-	-	-	-	-	-
DD908	4ch AES I/O (110Ω)	2	-	-	-	2	2	-	-	-
DD909	8ch AES Input (110Ω)	2	-	-	-	4	-	-	-	-
DD910	8ch AES Output (110Ω)	2	-	-	-	-	4	-	-	-
DD911	4ch AES I/O (75Ω)	1	-	-	-	2	2	-	-	-
DD912	8ch AES Input (75Ω)	1	-	-	-	4	-	-	-	-
DD913	8ch AES Output (75Ω)	1	-	-	-	-	4	-	-	-
SD941	4ch SD De/Embedder	1	1	-	-	-	-	1	1	1
SD942	8ch SD De/Embedder	1	1	-	-	-	-	1	1	1
HD943	8ch HD/SD De/Embedder	1	1	-	-	-	-	1	1	1
Note: All AES shown as pairs (2 channels per in/out)										

The following chart summarizes this section:

Table 1-4 Summary of Max Air Components

Component	Function	Number	Notes
CM404	Contains 8 faders for masters, 17-inch Touch-screen, and Superchannel controls.	1 required (max)	Ethernet device
CM416	Contains 16 physical faders that control two layers of 16 inputs.	3 full max	Ethernet device
SC263 System Computer	Master system computer. Configures DF66, controls MC524, ML530, and Modular I/O components.	1 required	Ethernet device. Connects to MC524 and up to 7 ML530s via TCC. Houses GPIO card.
TT002 GP Input/Output System	Provides up to 32 buffered TTL inputs and 32 open-collector outputs	1 required	Housed in the SC263 System Computer.
MC524 Monitor Interface	Analog monitor output controller	1 required	TCC connection to SC263. 1 MA703 is required (included).
ML530 Mic/Line Interface	24 remote-control microphone preamps	7 max	TCC connection to SC263. 1 AM713 is required per ML530 (included).
DF66 SuperCore	Performs all system DSP	1 required (2 max in redundant system)	Ethernet device. Requires digital sync reference.
CO600 Changeover Switch	MADI routing hub for failover system.	1 max	Ethernet device.
AM713 Analog to MADI Converter	Provides 24 Analog to MADI Converters, dual-channel Aux Digital Input (AES/EBU or S/PDIF available), and Aux dual-channel Analog Input.	Paired with ML530 for Mic level inputs.	Requires digital sync reference.
MA703 MADI to Analog Converter	Provides 24 MADI to Analog Converters, dual-channel Aux Digital Output (AES/EBU or S/PDIF available), and Aux dual-channel Analog Output.	Paired with MC524 for Monitor outputs.	Requires digital sync reference.
DM714 AES/EBU to MADI Converter	Provides 12 pairs (24 channels) of AES/EBU to MADI conversion, dual-channel Aux Digital Input (AES/EBU or S/PDIF available), and Aux dual-channel Analog Input.	Optional	Requires digital sync reference. Optional 75-ohm BNC AES/EBU connectors.
MD704 MADI to AES/EBU Converter	Provides 12 pairs (24 channels) of MADI to AES/EBU conversion, dual-channel Aux Digital Output (AES/EBU or S/PDIF available), and Aux dual-channel Analog Output.	Optional	Requires digital sync reference. Optional 75-ohm BNC AES/EBU connectors.
FC726 Digital Format Converter	Provides 28 pairs (56 channels) of input format conversion and 28 pairs (56 channels) of output format conversion. Supports MADI, AES/EBU, T-DIF, ADAT Optical, and S-DIF2.	Optional	Requires digital sync reference.
Modular I/O	Provides 64 channels of format converted inputs and outputs. Supports MADI, AES/EBU, Analog, remote-control mic preamps, HD/SD embedders/de-embedders.	Optional	Requires digital sync reference and ethernet connection for remote mic preamps and 8 ch embedder/de-embedder.

Chapter 2: Interconnecting System Components

This chapter summarizes technical information for Max Air's components, including size, weight, power consumption, cooling, and shows their interconnections. To plan an installaion, examine Figure 2-1 to learn about suggested equipment locations. The Sync, MADI, and Control hookup diagrams (Figure 2-7 through Figure 2-11) all show maximum cable distances.

2.1   Component Specifications

Table 2-1 Max Air Components: Dimensions, Power Consumption, Heat Dissipation

Component	Height	Width	Depth	Weight	Typical Power Consumption	Heat Dissipation
CM404	8.4 in 21 cm	22.3 in 57 cm	35.4 in 90 cm	69 lb 32 kg	PSU 1: 50 W PSU 2: 50 W	520 BTU/hr
CM416	8.4 in 21 cm	24.3 in 62 cm	33.5 in 84 cm	82 lb 37 kg	PSU 1: 50 W PSU 2: 50 W	600 BTU/hr
CM416HL	8.4 in 21 cm	24.3 in 62 cm	33.5 in 84 cm	71 lb 33 kg	PSU 1: 50 W PSU 2: 50 W	520 BTU/hr
CM416HR	8.4 in 21 cm	24.3 in 62 cm	33.5 in 84 cm	71 lb 33 kg	PSU 1: 50 W PSU 2: 50 W	520 BTU/hr
MC524 Monitor Interface	3.5 in 89 mm 2RU	17 in/432 mm (19 in/483 mm faceplate)	18.5 in 470 mm	17 lb 7.7 kg	97 W	240 BTU/hr
ML530 Mic/Line Interface	3.5 in 89 mm 2RU	17 in/432 mm (19 in/483 mm faceplate)	18.5 in 470 mm	17 lb 7.7 kg	86 W	345 BTU/hr
SC263 System Computer	7 in 177 mm 4RU	(19 in/483 mm	19 in 483 mm	4 lb 20 kg	200 W	685 BTU/hr
DF66 SuperCore	7 in 177 mm 4RU	(19 in/483 mm	19 in 483 mm	4 lb 20 kg	500 W	1025 BTU/hr
CO600 Changeover Switch	3.5 in 89 mm 2RU	17 in432 mm (19 in/483 mm faceplate)	11.7 in 296 mm	18.7 lb 8.5 kg	100 W	345BTU/hr
AM713 Analog to MADI Converter	3.5 in 89 mm 2RU	17 in/432 mm (19 in/483 mm faceplate)	18.5 in 470 mm	17 lb 7.7 kg	54 W	175 BTU/hr
MA703 MADI to Analog Converter	2RU 3.5 in 89 mm	17 in/432 mm (19 in/483 mm faceplate)	18.5 in 470 mm	17 lb 7.7 kg	50 W	175 BTU/hr
DM714 AES/EBU to MADI Converter	2RU 3.5 in 89 mm	17 in/432 mm (19 in/483 mm faceplate)	18.5 in 470 mm	17 lb 7.7 kg	25 W	90 BTU/hr
MD704 MADI to AES/EBU Converter	2RU 3.5 in 89 mm	17 in/432 mm (19 in/483 mm faceplate)	18.5 in 470 mm	17 lb 7.7 kg	18 W	90 BTU/hr
FC726 Digital Format Converter	2RU 3.5 in 89 mm	17 in/432 mm (19 in/483 mm faceplate)	18.5 in 470 mm	13.5 lb 6 kg	50 W	175 BTU/hr
Modular I/O frame Various Formats Converter	5.25 in 133.5 mm 3RU	17 in/432 mm (19 in/483 mm faceplate)	16.5 in 420 mm	~12 lb ~5.3 kg	80 W (see page 75 for individual card specs)	275 BTU/hr

Table 2-2 Maximum Cable Lengths

Cable Type	Maximum Length
MADI	164 ft / 50 m
Ethernet	300 ft / 91.4 m
TCC	750 ft / 225 m
Sync (WC)	164 ft / 50 m
Sync (AES)	328 ft / 100 m
KVM	500 ft / 150 m

NOTE: If your installation requires a longer cable, contact Euphonix Sales for selecting a variety of fiber-optic solutions.

NOTE: It is the responsibility of the system designers, system integrators, and end users to assure that the choice of cabling, termination, equalizations, etc. conform to the recommended practice. Although maximum recommended distances over copper can be extended with the use of high performance components (including cables), it is not Euphonix's intention to endorse any particular brand or method of achieving the end result.

Facility Power Quality Recommendations

Although a detailed exploration into the types of power quality issues is beyond the scope of this manual, we'd like to briefly touch on a few of the most important mechanisms that determine your facility's power quality. The following is a list of facility power standards/specifications that is recommended for optimal and reliable performance of your Euphonix console:

Harmonic Distortion

IEEE Standard 519, *Recommended Practices and Requirements for Harmonic Control In Electrical Power Systems*, establishes harmonic limits on voltages for computers and computer-based equipment. AC power sources shall have no more than a 5% harmonic voltage distortion factor, with the largest single harmonic being no more than 3% of the fundamental voltage. Higher levels of harmonics can result in erratic behavior and unpredictable performance.

Ground resistance is the resistance due to the resistivity of the soil in the vicinity of the grounding electrode. Most computer equipment manufacturers recommend a maximum ground resistance of two ohms.

Transients

A two-year study by the IEEE of 200 locations found that over 80% of the equipment interruptions were due to transients on the power lines. A transient impulse is a sharp, sudden rise in voltage. The power can jump up to a few thousand volts. The spikes may contain enough energy to damage sensitive electronic equipment. Transient disturbances may also cause computers to reset and/or breakers to trip. Spike durations usually last between 4 microseconds and 1 cycle (17mS at 60Hz) and exceed 50% or greater than the nominal voltage level.

Euphonix's products have been tested and found to comply with the performance limits of EN55103:2, E-4 Environment. Should the product be operated in a degraded power environment, care should be taken to insure that the EN55102 electronic limits are not exceeded.

Voltage Fluctuation

Voltage fluctuation is a sudden and noticeable change in rms voltage level. It is usually caused by changing, complex system loads. It is recognized that certain types of electical and electronic equipment are susceptible to voltage fluctuations. "Flicker", or "light flicker" is a type of voltage fluctuation. The typical duration is from 3 to 10 cycles, or 50 to 167 milliseconds at 60Hz.

Euphonix's products have been tested and found to comply with the performance limits of EN55103:2, E-4 Environment. Should the product be operated in a degraded power environment, care should be taken to insure that the EN55102 EFT limits are not exceeded.

Voltage Sag

Short-duration undervoltages are called "voltage sags" or "voltage dips". A voltage sag below 90% of the equipment rating exceeds the minimum allowable standard.

Euphonix's products have been tested and found to comply with the performance limits of EN55103:2, E-4 Environment. Should the product be operated in a degraded power environment, care should be taken to insure that the EN55102 Voltage Dips and Interrupt limits are not exceeded.

Grounding

Ground leakage currents should be 0.0035A or less.

There should only be one neutral-ground bond, at the main service entrance (except in the case of a separately derived system, i.e., an isolation transformer). The neutral-to-ground voltage in a 120V, single phase system, is recommended to be less than 3 Vrms. In high-availability systems, a neutral-to-ground voltage above 0.5 volts has been identified as a possible source of disturbances.

Uninterruptible Power Supply

These devices are designed to provide continuous power to a load, even with an interruption or loss of utility supply power. Since the power on an on-line UPS flows through a rectifier and inverter before reaching the load, most power disturbances are eliminated through constant filtering. Therefore, an on-line UPS is a good idea for all High-Availability Systems that cannot guarantee high-quality power. Many UPS' have a voltage regulator to compensate for voltage variances.

NOTE: *If it is determined that your facility is below standard in any of the specifications described above, contacting an experienced electrician (or engineering consultant for large facilities) with expertise in power quality issues is recommended.*

2.2 Typical Max Air Room and Equipment Layout

Figure 2-1 Typical Max Air Room and Equipment Layout

2.3   Console Dimensions
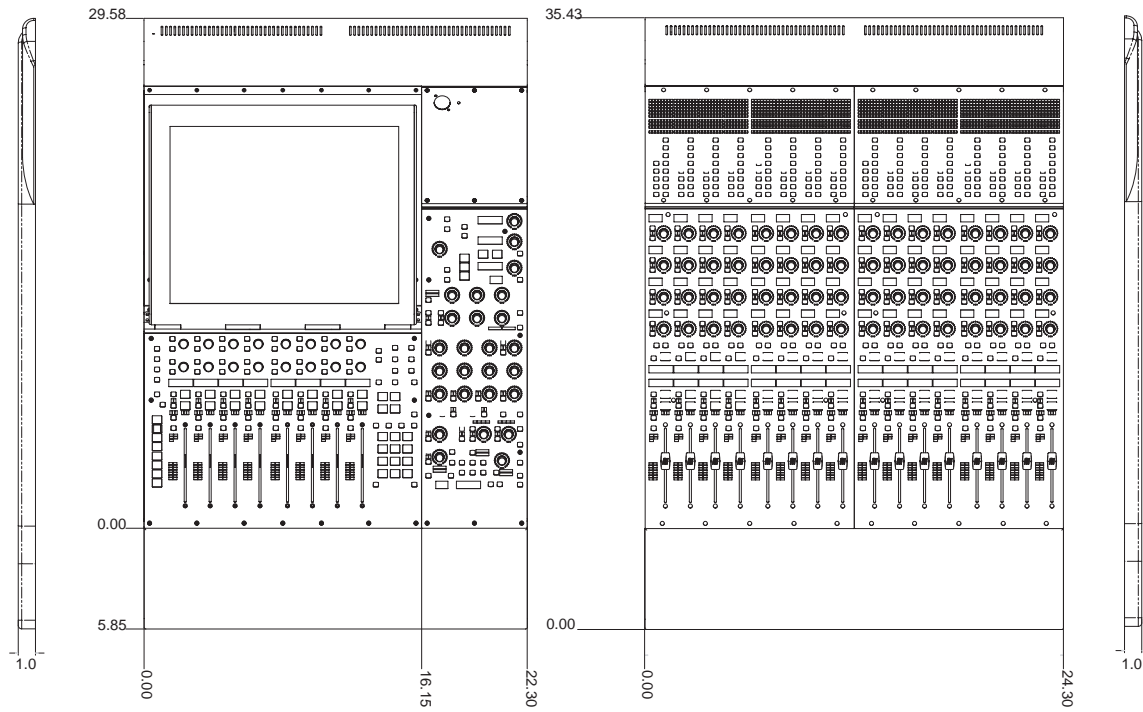
Figure 2-2 Max Air Top Dimensions
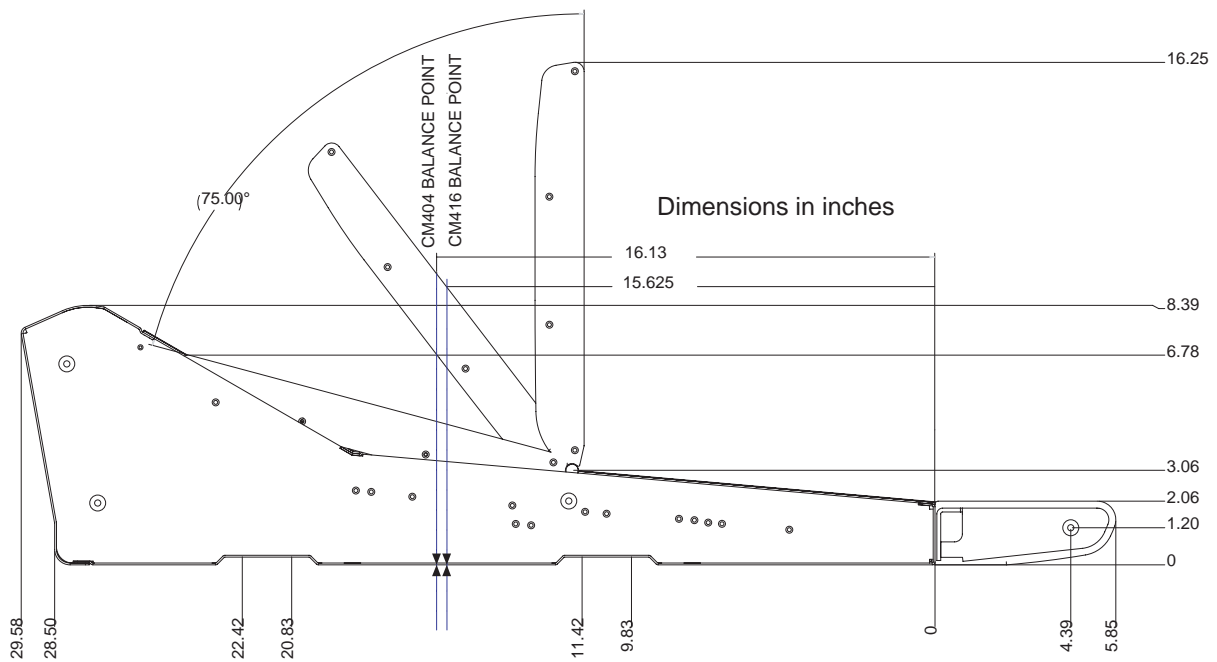
Figure 2-3 Max Air Side Dimensions
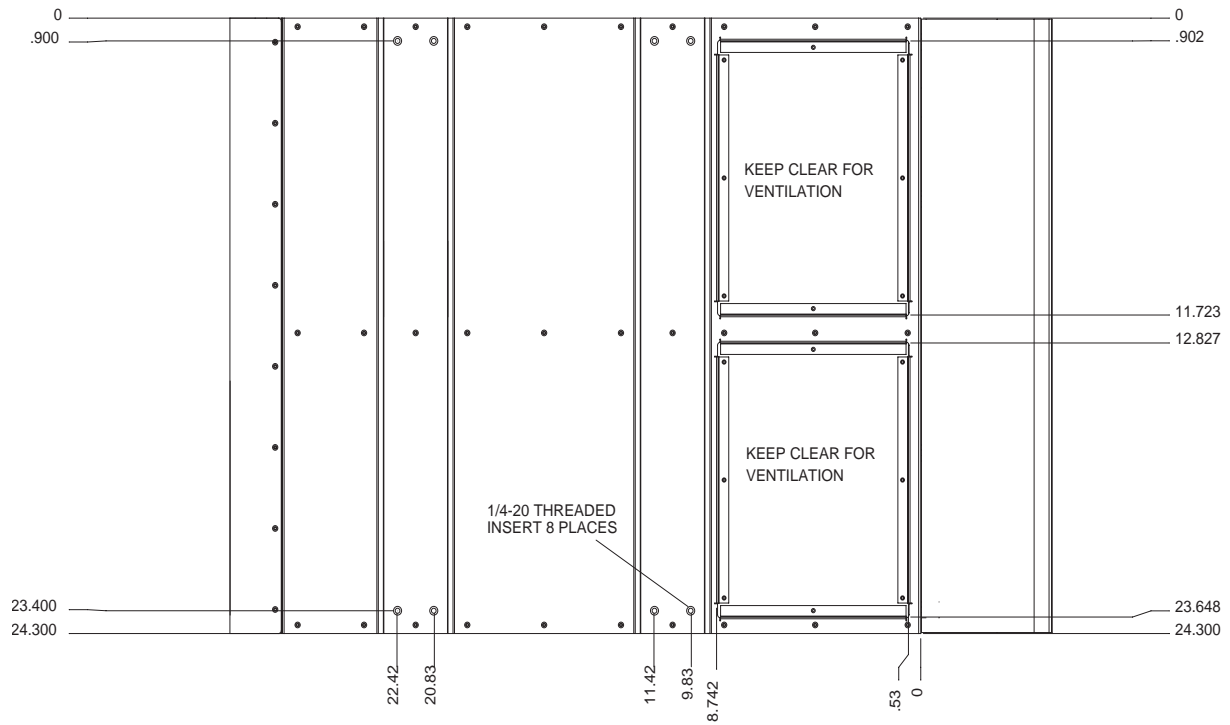
Figure 2-4 CM416 Bottom Dimensions
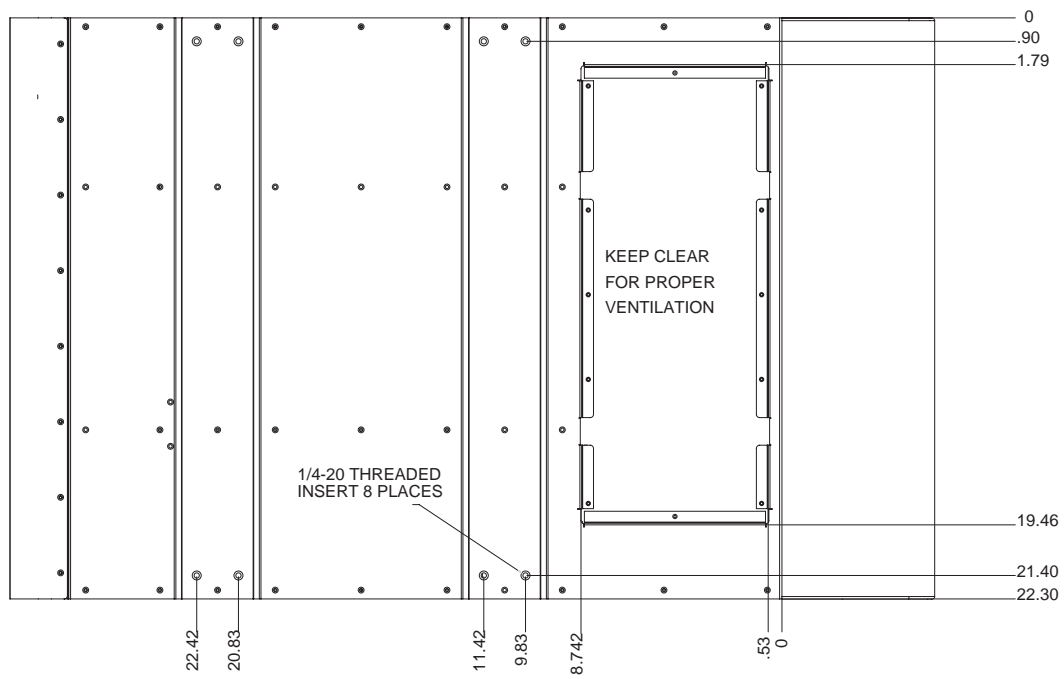
Figure 2-5 CM404 Bottom Dimensions

2.4 Audio Hookup
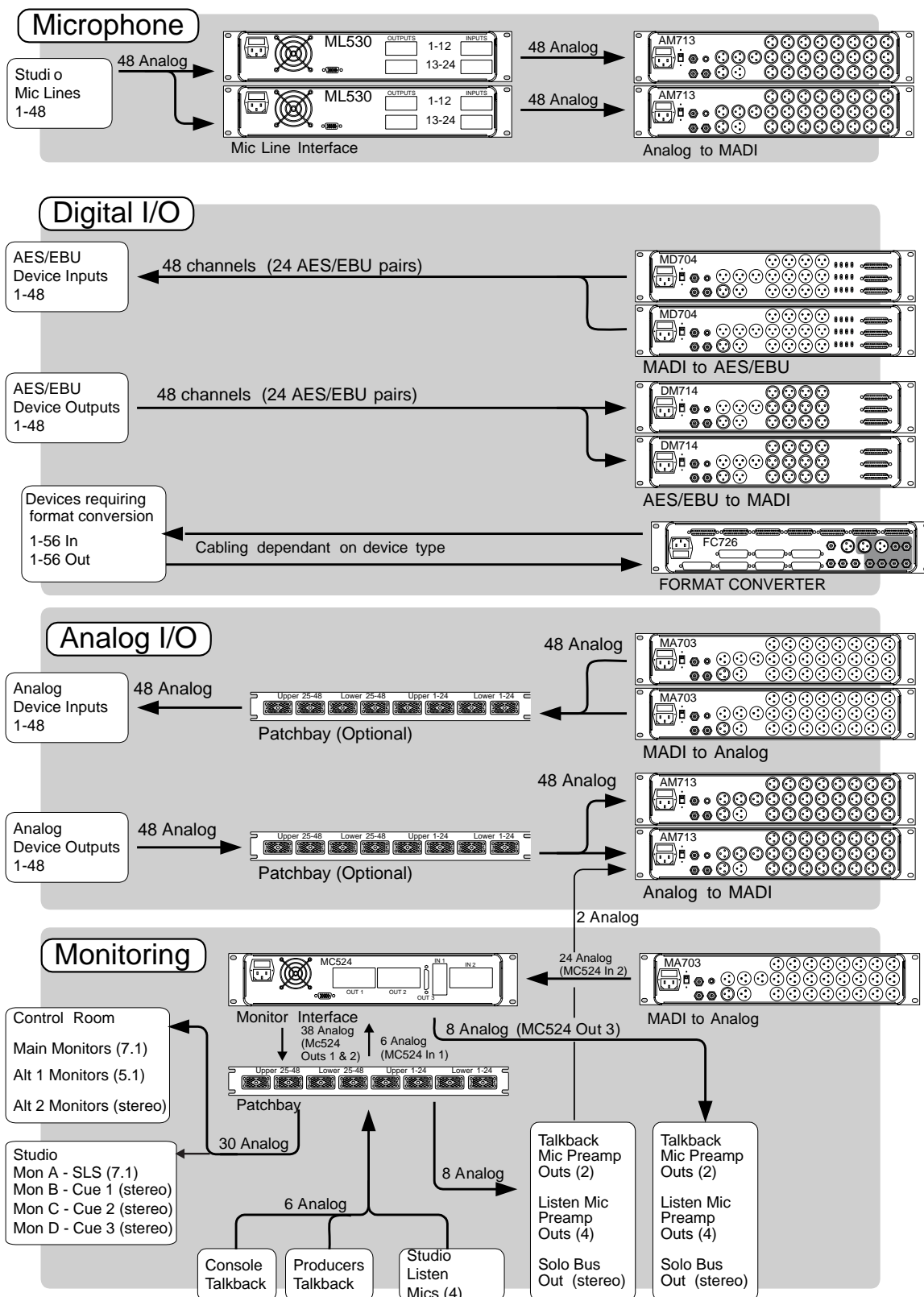
Figure 2-6 Audio Hookup

NOTE: *MA703, MD704, AM713, and DM714 converters have extra pairs of auxilliary*
AES/EBU and analog channels available. See page 51.

2.5 Audio Hookup for Modular I/O
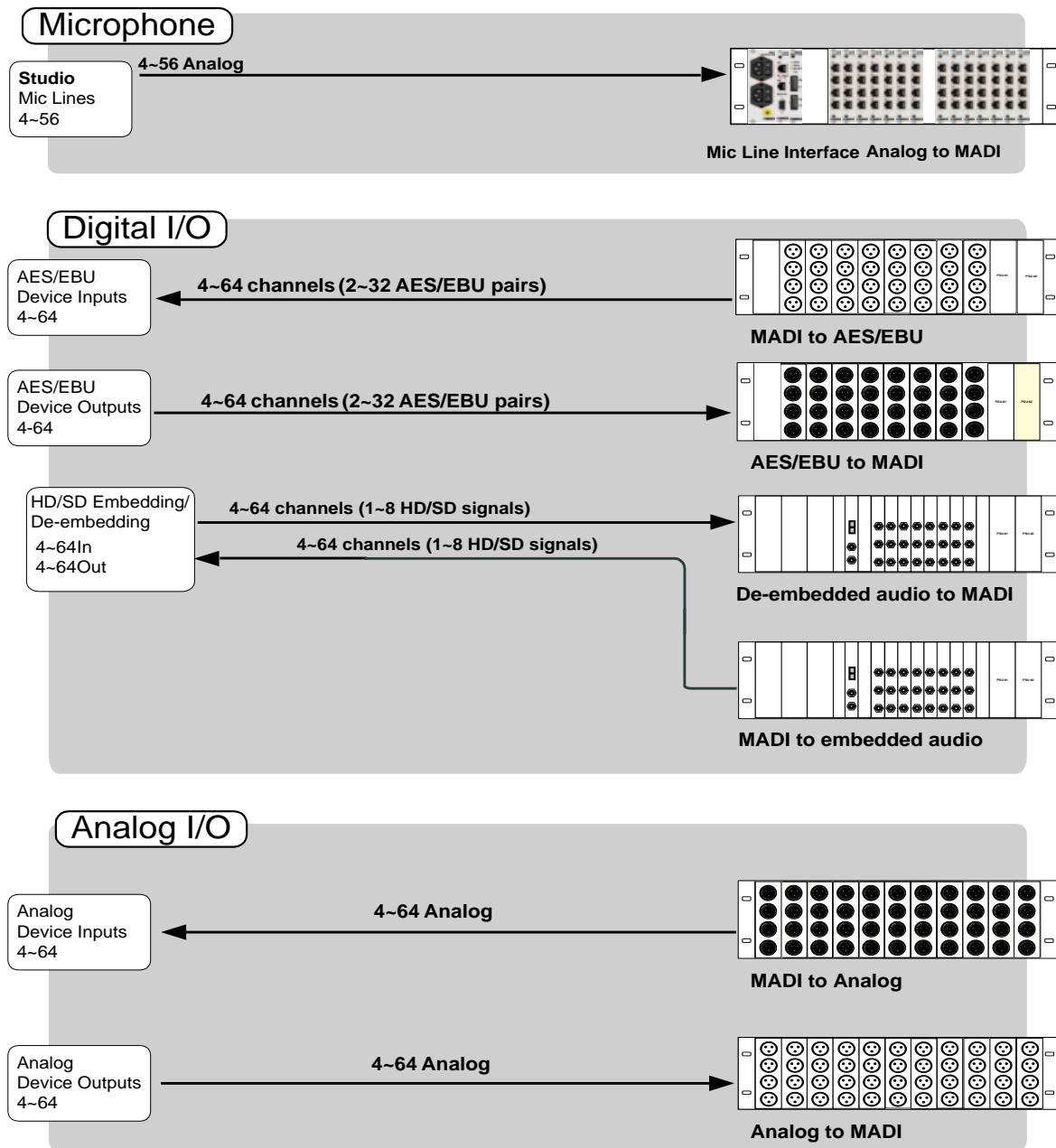
Figure 2-7   Audio Hookup for Modular I/O

NOTE: *Different Modular I/O audio formats can share the same frame.*

2.6   Synchronization Hookup

Figure 2-8   Synchronization Hookup

2.7   Synchronization Details

It is important to minimize the timing differences between signal paths to avoid cumulative timing errors. It is good system engineering practice to send all system components their sync signals from one source. Sync signals should not be looped and each distribution amplifier should be fed directly from the master clock source. The following guidelines are provided to illustrate the correct sync distribution. Word clock or AES/EBU sync may be used but word clock is preferred due to its lower cabling and labor costs.

Studios with Existing Digital Master Clock and Sync Distribution

- Clock jitter should be less than 0.025 UI (AES3-1992 (r1997)).
- One additional D/A output is required for each system component.
- Cable runs from the master clock to the distribution amps should be equal in length (AES11-1997, 5.4).

Installations Without an Existing Digital Master Clock

- Use one of the Euphonix recommended sync generators (see next page).
- These sync generators may be set to internal or gen-locked to a video reference.
- Use a Euphonix recommended distribution amp (see next page) to feed all system components and additional studio devices directly.
- Cable runs from the master clock to the distribution amps should be equal in length (AES11-1997, 5.4)
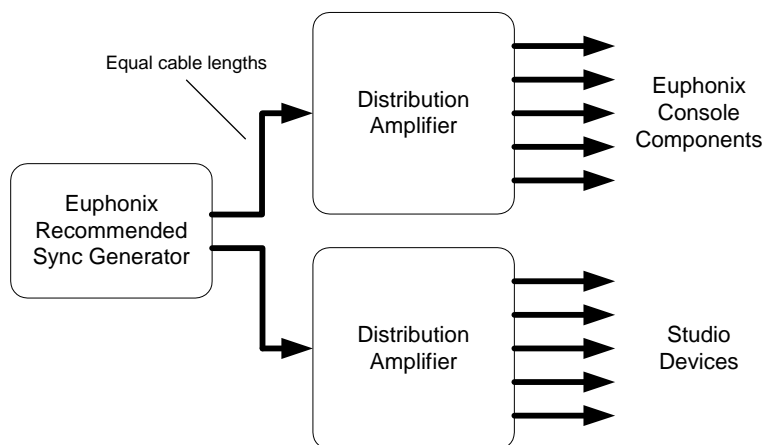
Figure 2-9   Recommended Sync Distribution Method

System Components That Require Digital Sync

- DF66 Supercores

- AM713 Analog to MADI Converters

- MA703 MADI to Analog Converters

- DM714 AES to MADI Converters

- MD704 MADI to AES Converters

- FC726 Format Converters

- Modular I/O

2.8   Recommended Digital Sync Generators

Lucid

- **SSG192**:   Greatest number of features, most user friendly

NVision

- **SG4410**:   Convenient modular design, no pull up/down rates

Apogee

- **Big Ben:**   Convenient modular design, six word clock outputs

2.9   Recommended Distribution Amplifiers

NVision

- **DA4010:**   AES/EBU
- **DA4023:**   Word Clock (48kHz only)

Lucid

- **AESx4**   AES/EBU
- **CLKx6**   Word Clock

2.10   MADI Hookup
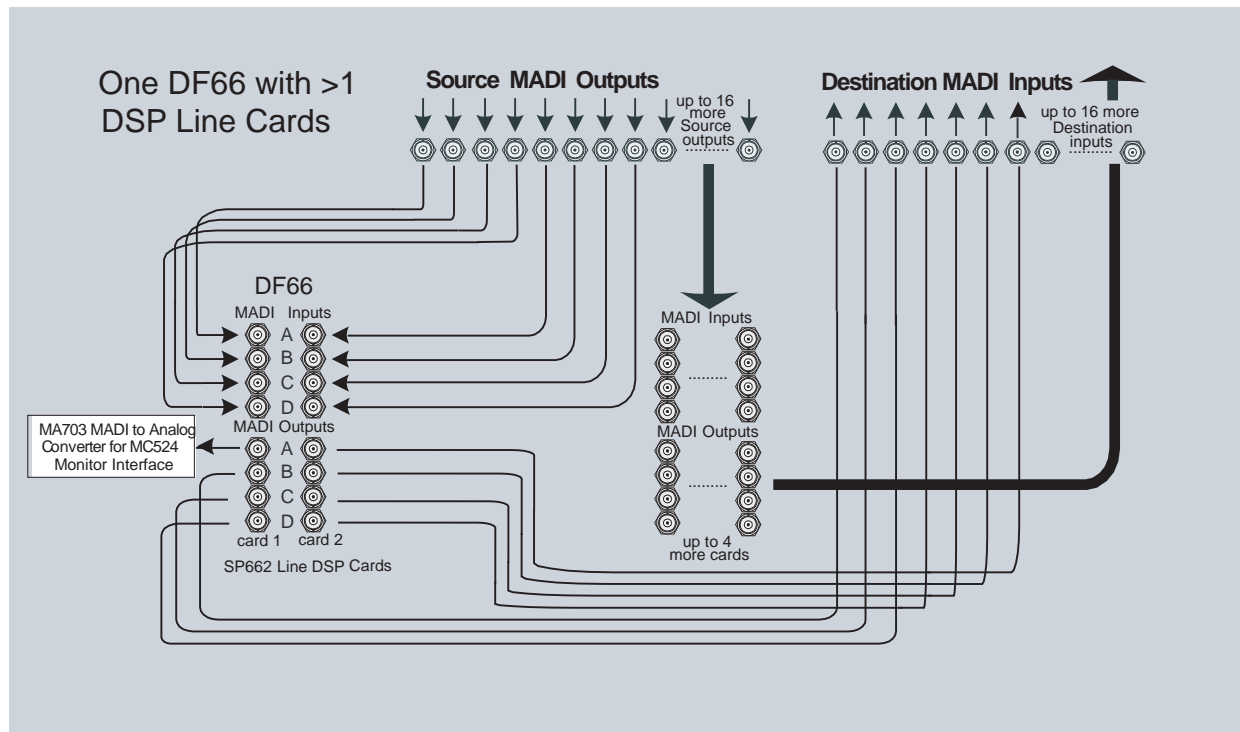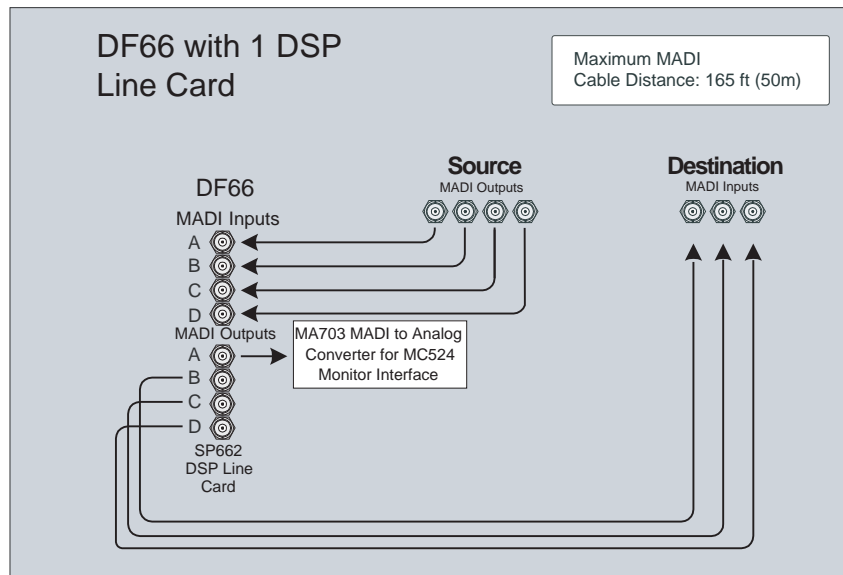
Figure 2-10: MADI hookup: one DF66 core, 1 or >1 DSP Line Cards.

MADI Hookup
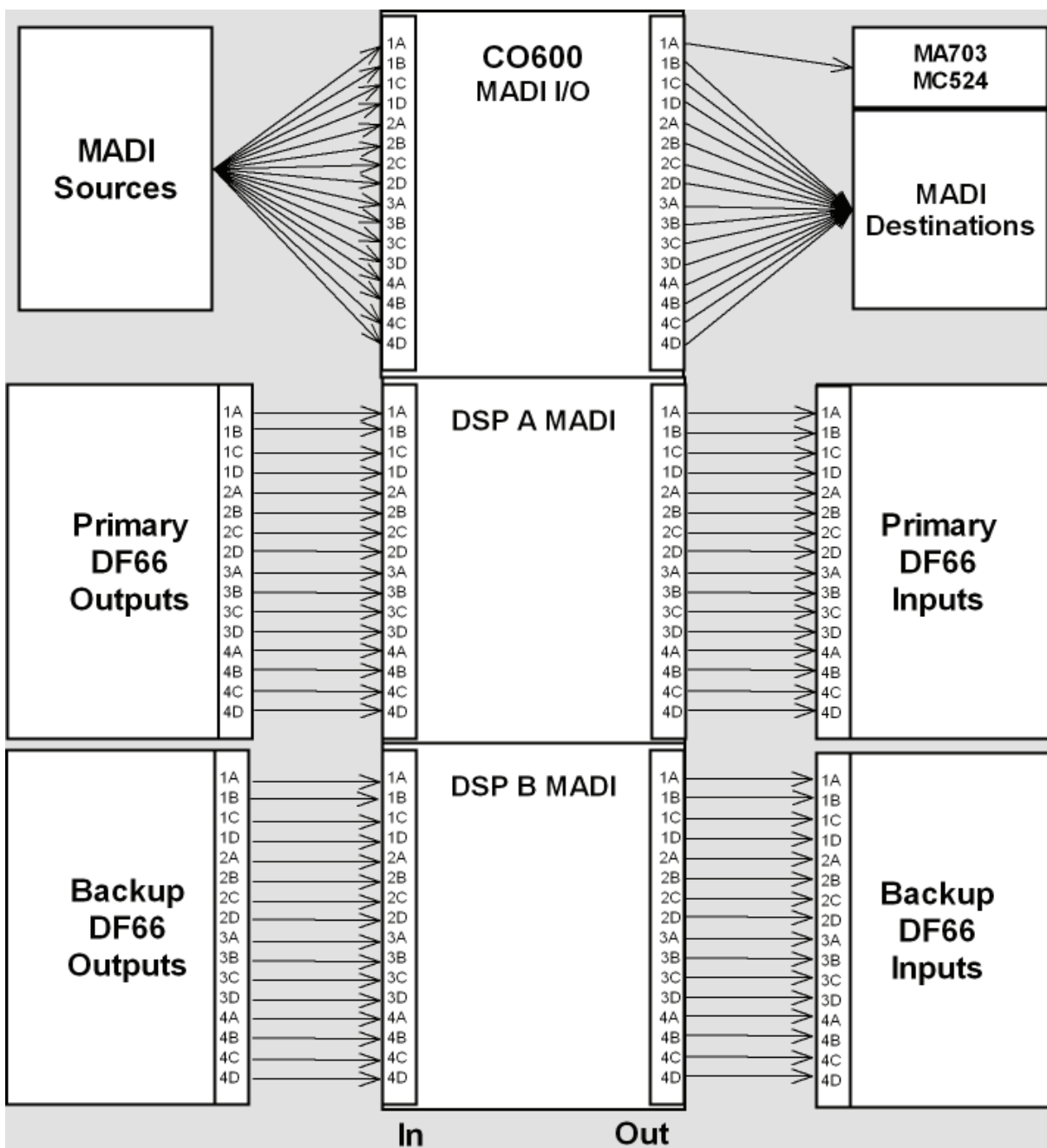
Figure 2-11: MADI hookup: primary DF66 SuperCore, CO600 Changeover Switch, backup DF66 SuperCore

---

NOTE: *It is the responsibility of the system designers, system integrators, and end users to assure that the choice of cabling, terminations, equalizations, etc. conform to the recommended practice. Although maximum recommended distances over copper can be exceeded with the use of high performance components (including cables), it is not Euphonix's intention to endorse any particular brand or method of achieving the end result.*

2.11   Control Hookup

Up to six additional Mic/Line Interfaces

TCC Extension

System Computer

SC264

ML530

OUTPUTS 1-12
INPUTS 13-24

Mic/Line Interface

Maximum Distances
Ethernet: 91.4m (300ft)
TCC Control: 228.6 m (750ft)
KVM: 152.4m (500ft)

TCC Main Port

DF66 #1

KVM Switch

Changeover Switch

Ethernet

Machine Room

DF66 #1-A

Ethernet Switch

MC524

IN 1   IN 2
OUT 1   OUT 2   OUT 3

Modular I/O

Monitor Interface

Max Air Ethernet Cable Harness

Control Room

Ethernet

KVM

Figure 2-12 Control Hookup

Chapter 3: Max Air Components

This chapter discusses the Max Air components and all connectors necessary for operation. Pinouts for user-wired connections are shown for each component, along with the cables and connectors provided by Euphonix.

3.1 DF66 SuperCore

The DF66 contains three main types of cards: SP662 DSP Line Card, Bridge Card (there are five types of Bridge Cards) and Sync Card (all cards shown in Figure 3-2).

Power Connectors (IEC): Accepts standard IEC power cords (provided). Two autoranging switching supplies accept voltages between 100–240 VAC, 50–60 Hz.

Please see the DF66 Super Core Service Manual for an overview of its components.
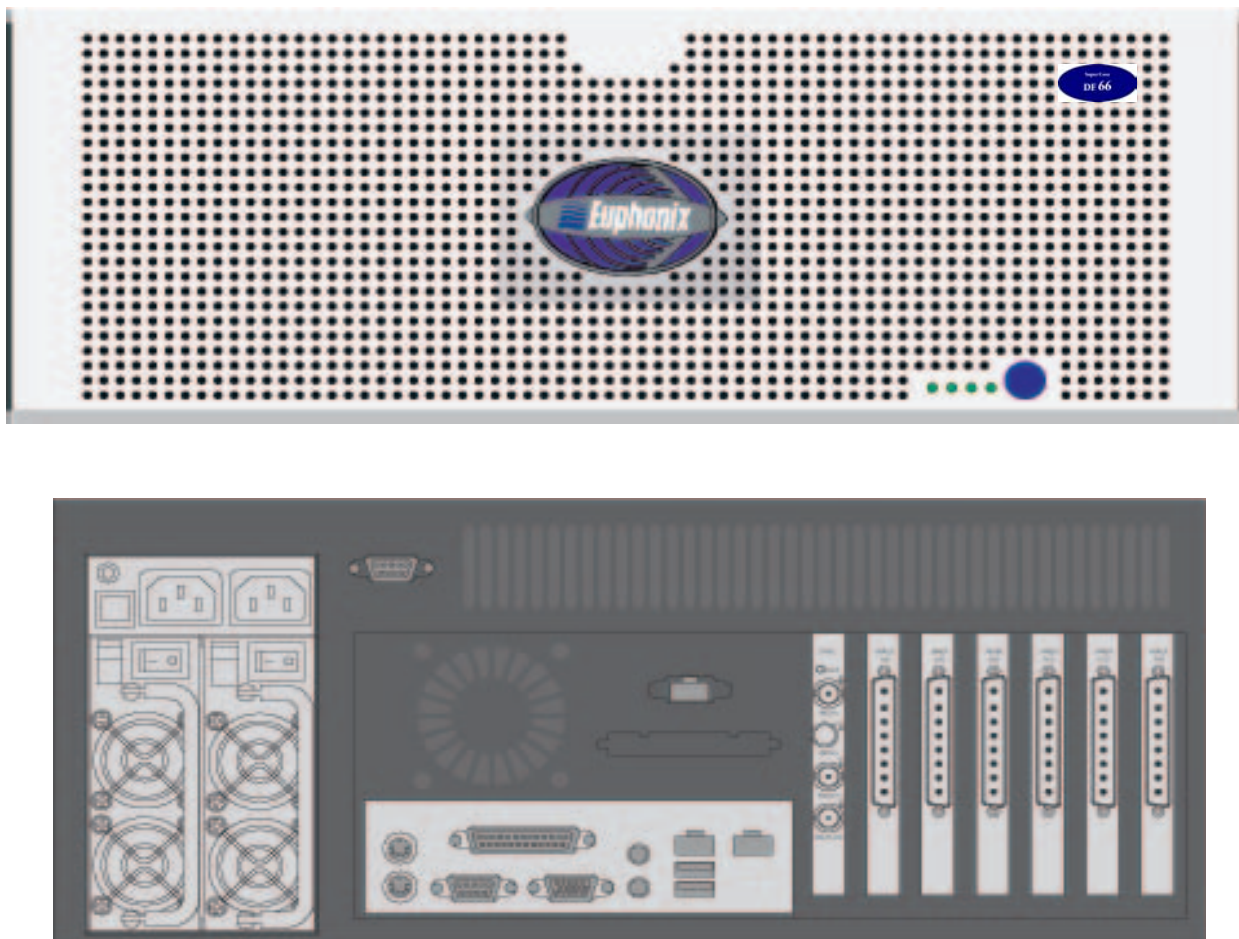
Figure 3-1 DF66 Super Core Front and Rear Panels
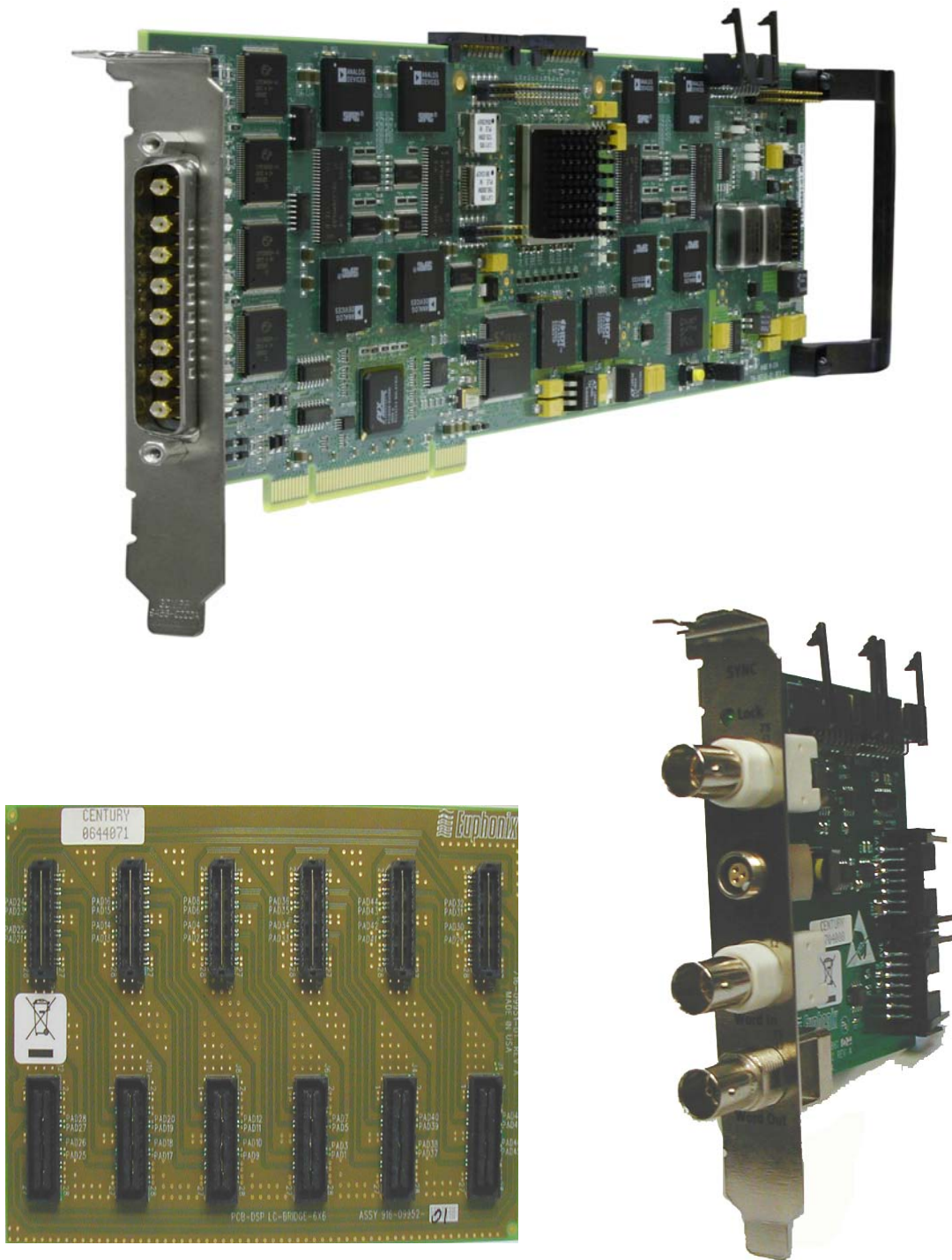
Figure 3-2 SP662, 6x6 Bridge, and Sync Cards

3.1.1 Sync Card

AES Sync In (BNC): The DF66 SuperCore clocks to the signal at this port when the sync source is set to AES Sync. Connect this port to a digital sync reference.

AES Sync In (3-pin Lemo Female): The DF66 SuperCore clocks to the signal at this port when the sync source is set to AES Sync. Connect this port to a digital sync reference.

Word In (BNC): The DF66 clocks to the signal at this port when the sync source is set to Word Clock. Connect this port to a digital sync reference.

Word Out (BNC): This signal is active regardless of selected sync source.

3.1.2 Bridge Card

Bridge Cards are used to connect (or bridge) multiple SP662 DSP Line Cards in a DF66. They mount on top of the SP662 cards. The Bridge Card shown in Figure 3.2 is a 6x6 (for bridging six SP662 cards). Other types of Bridge Cards are 2x2, 3x3, 4x4, and 5x5.

3.1.3 SP662 DSP Line Card

MADI In (4) and MADI Out (4) digital audio ins and outs on a Combination D (Combo D) Subminiature connector. A MADI I/O DSP Line Card Cable connects to this Combo D connector and transports the MADI I/O to eight BNC connectors. See the MADI Hookup diagram (figure 2-9) and the MADI I/O DSP Line Card Cable diagram (figure 3-3) for details on these connections.

WIRING CHART	
P1	BNCs
A1	OUT D
A2	OUT C
A3	OUT B
A4	OUT A
A5	IN D
A6	IN C
A7	IN B
A8	IN A
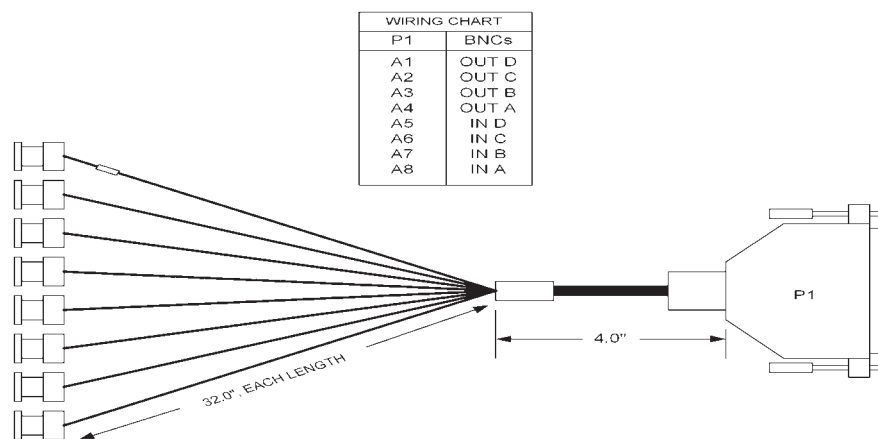
Figure 3-3   MADI I/O DSP Line Card Cable

An optional 16-port BNC Bulkhead Panel (see figure 3-4) allows BNC panel access to the DSP cards' MADI ports.

Figure 3-4   16-port BNC Bulkhead Panel

3.1.4 SNMP Card

An SNMP (Simple Network Management Protocol) card is installed in each DF66 and System Computer. The SNMP card is a platform-independent server and PC-system management controller that can detect basic system operating conditions and notify the user when the conditions fall outside the defined limits. It supports multiple communication protocols via an RJ-45 ethernet port and an RS232 serial port.

3.2 Max Air Console
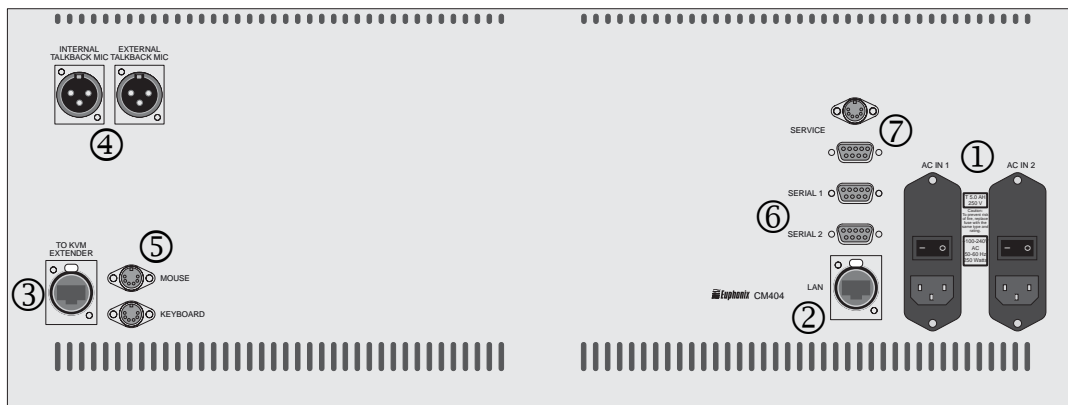
Figure 3-5 CM404 Rear Panel
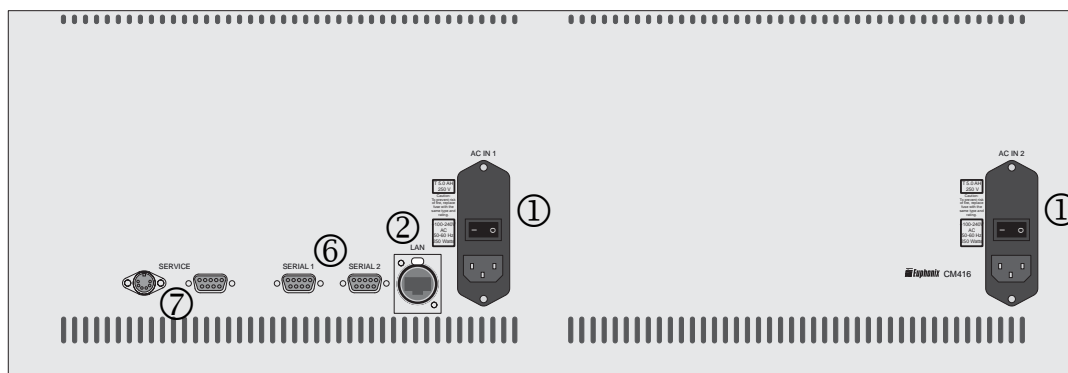
Figure 3-6 CM416 Rear Panel

The Max Air Console consists of several modular components: the CM416 with 16 physical faders and controls, and the CM404 center section. Each component has the following connections:

① **Power Connectors** (IEC): Accepts two standard IEC power cords (provided). Two autoranging switching supplies accept voltages between 100–240 VAC, 50–60 Hz.

② **LAN Port** (RJ45): Connect to EuCon Network Switch via RJ45 through the console Ethernet harness (provided).

If the provided cable harness is not used, install a ferrite at the console end of the cable at each RJ45 connector. Pass the cable through ferrite three times with two loops. Cover with heat shrink tubing to protect the cable.

Ferrite is available from FerriShield Inc., 212-268-4020, www.ferrishield.com.

Part number: 28B1020-1
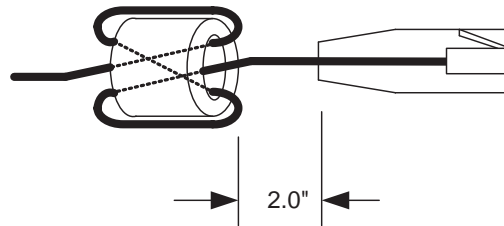
Figure 3-7   Ferrite

③ **To KVM Extender** (RJ45): Connect to KVM extender (CM404 only).

④ **Talkback** (XLR): Connect to the internal and external talkback microphones.

⑤ **Keyboard and Mouse** (PS2): Connect to the keyboard and mouse or trackball.

⑥ **Serial 1, 2** (DB9): RS232 serial ports (for service only).

⑦ **Service** (DB15HD, PS2): VGA video and keyboard connection (for service only).

3.3 SC263 System Computer
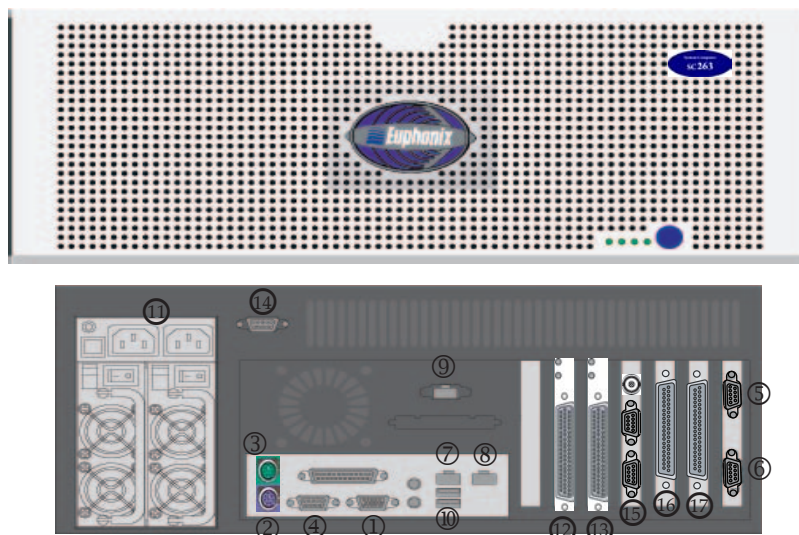
Figure 3-8 SC263 Front and Rear Panels

① **VGA Connector** (DA-15): Main video monitor connection.

② **Keyboard** (PS/2): Main keyboard connection.

③ **Mouse** (PS/2): Main trackball connection.

④ **Serial Port 1** (DE-9): Com1; touchscreen control connection. (Com2 is wired internally to the SNMP board's Com port.)

⑤ **Serial Port 2** (DE-9): Com3; currently not used.

⑥ **Serial Port 3** (DE-9): Com4; can be used to connect to external router/control systems.

⑦ **LAN Port 1** (Onboard RJ45): Connect to EuCon Network Switch via RJ45 (provided).

⑧ **LAN Port 2** (Auxilary RJ45): Optional connection for external network.

⑨ **SNMP LAN Port** (RJ45): Connect this port to a network with SNMP monitoring or e-mail services to enable the hardware monitoring system to report errors.

⑩ **USB Ports:** Connect the USB MIDI Interface to one of these ports. Connect a USB memory device to one of these ports for file backup, application installations or updates.

⑪ **Power Connectors** (IEC): Accepts two standard IEC power cords (provided). Two auto-ranging switching supplies accept voltages between 100–240 VAC, 50–60 Hz.

⑫ **TCC Main Port** (DC-62): Connect TCC breakout cable (provided) to this port. This cable breaks out to four DA-15 connectors that provide control hookup for the MC524 Monitor Interface and three ML530 Mic/Line Interfaces.

⑬**TCC Extension Port** (DC-62, optional): Connect a second TCC breakout cable to this port to connect up to four additional ML530 Mic/Line Interfaces.

⑭ **SNMP Serial Port** (DE-9): This port is used to configure the SNMP card via another computer.

⑮**TT002** (75-ohm BNC, DE-9 female, DE-9 male): BNC port is for Bi/Tri-Level Video input; DE-9 female is for RS422 (Sony 9-pin); DE-9 male is for Midi Machine Control and Time Code I/O (via breakout cable).

⑯**GPIO Port 1** (DC-37): GP Inputs and Outputs 1 to 16.

⑰**GPIO Port 2** (DC-37): GP Inputs and Outputs 17 to 32.

Connect the machine room KVM extender (transmitter end) to the VGA, keyboard, and mouse connectors to the rear panel of the SC263. A second KVM extender (receiver end) should be installed at the control surface, close to where the Emix monitor, keyboard and mouse are to be located. The KVM extenders are connected by a single CAT5 cable built into the console ethernet harness (provided).

NOTE: *SC263 rear connector configurations are subject to change.*

3.4   MC524 Monitor Interface
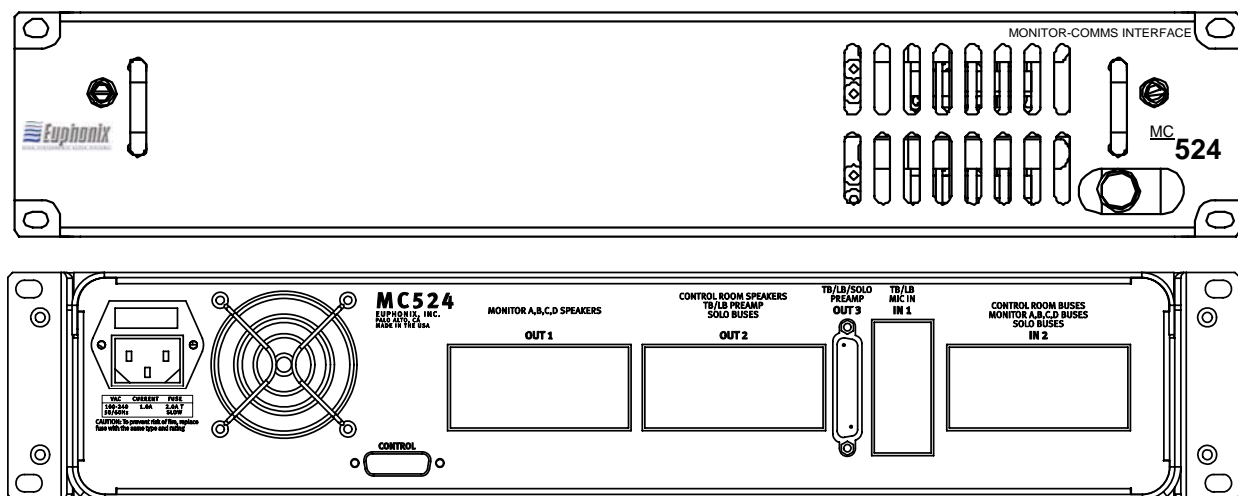
Figure 3-9 MC524 Front and Rear Panels

Power Switch: Powers the unit off/on.

In 1 (38-pin ELCO): Talk Back, Listen Back and Mic inputs. This connector receives four stereo listen channels and two stereo talk mic inputs. Signals can be boosted or attenuated. In a standard patch configuration, input cable fans out to 12 female XLRs, of which 6 are used.

In 2 (90-pin ELCO): Control Room Buses, Monitor A, B, C, D, and Solo buses inputs. This connector receives eight Monitor A channels, and two channels each for Monitor B, C, D. These signals can be attenuated only and are typically fed from the AM713 with an included cable.

Out 1 (90-pin ELCO): Monitor A, B, C, D Speaker outputs. This connector outputs eight Control Room channels, eight Monitor A channels, and two channels each for Monitor B, C, D, and Solo. The output cable fans out to two 38-pin ELCO/Edak connectors for the Euphonix Patchbay.

Out 2 (90 pin ELCO): Control Room Speakers, Talk Back and Listen Back Preamp, and Solo Buses outputs. This connector outputs eight Control Room Main channels, six Control Room Alt 1 channels, two Control Room Alt 2 channels, four Listen pre, two talk pre and two Solo channels. The output cable fans out to two 38-pin ELCO/Edak connectors for the Euphonix Patchbay.

Out 3 (female DB25): Talk Back, Listen Back, and Solo Preamp outputs. This connector outputs four Listen pre, two Talk Back pre and two Solo channels . Output cable fans out to eight male XLRs.

Control (DB15): Input for digital control signal from System Computer (Euphonix TCC bi-directional serial protocol). All patching, switching, and gain controls are communicated via this connection as well as MC524 IP address.

AC Line In (IEC) and **Fuse Tray**: Accepts standard IEC power cord (provided). An autoranging switching supply accepts voltages between 90–250 VAC, 50–60 Hz.

3.4.1 Input/Output Connections

Table 3-1 In 1 Elco 38 Pinout

Crk #	Designator	24 X 32	High	Low	Gnd
1	M1	Talk 1	A	E	L
2	M2	Talk 2	B	F	M
3	M3	Listen 1	C	H	N
4	M4	Listen 2	D	J	P
5	M5	Listen 3	DD	JJ	PP
6	M6	Listen 4	EE	KK	RR
7			FF	LL	SS
8			HH	MM	TT
9			R	S	V
10			T	U	W
11			X	Z	AA
12			Y	BB	CC
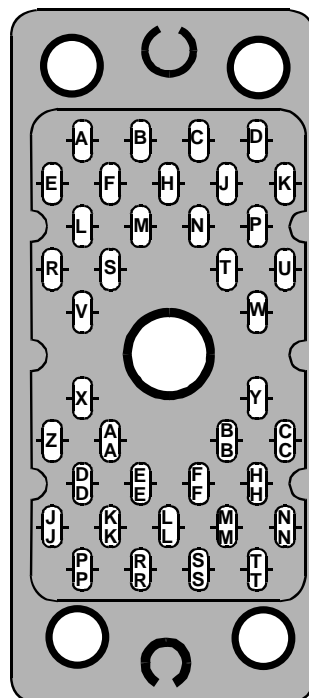
Figure 3-10 Elco 38 Connector, rear view

Table 3-2 In 2 Elco 90 Pinout

Crk #	Designator	24 X 32	High	Low	Gnd
1	L3	Cntrl Rm (L)	A	H	R
2	L4	Cntrl Rm (C)	B	J	S
3	L5	Cntrl Rm (R)	C	K	T
4	L6	Cntrl Rm (Sl)	D	L	U
5	L7	Cntrl Rm (Sr)	E	M	V
6	L8	Cntrl Rm (B)	F	N	W
7	L9	Cntrl Rm (Li)	X	AE	AM
8	L10	Cntrl Rm (Ri)	Y	AF	AN
9	L11	Mon A (L)	Z	AH	AP
10	L12	Mon A (C)	AA	AJ	AR
11	L13	Mon A (R)	AB	AK	AS
12	L14	Mon A (Sl)	AC	AL	AT
13	L15	Mon A (Sr)	BJ	BS	BY
14	L16	Mon A (B)	BK	BT	BZ
15	L17	Mon A (Li)	BL	BU	CA
16	L18	Mon A (Ri)	BM	BV	CB
17	L19	Mon B (L)	BN	BW	CC
18	L20	Mon B (R)	BP	BX	CD
19	L21	Mon C (L)	CF	CN	CW
20	L22	Mon C (R)	CH	CP	CX
21	L23	Mon D (L)	CJ	CR	CY
22	L24	Mon D (R)	CK	CS	CZ
23	L1	Solo (L)	CL	CT	DA
24	L2	Solo (R)	CM	CU	DB
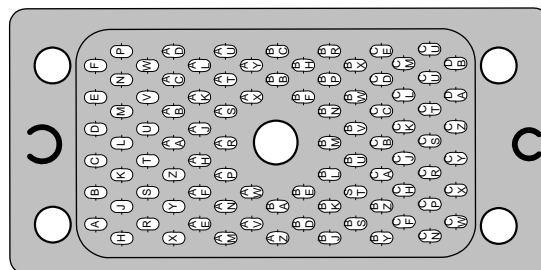
Figure 3-11 Elco 90 Connector, rear view

Table 3-3 Out 1 Elco 90 Pinout

Crk #	Designator	24 X 32	High	Low	Gnd
1	BO11	Mon A (L)	A	H	R
2	BO12	Mon A (C)	B	J	S
3	BO17	Mon A (R)	C	K	T
4	BO18	Mon A (Sl)	D	L	U
5	BO19	Mon A (Sr)	E	M	V
6	BO20	Mon A (B)	F	N	W
7	BO21	Mon A (Li)	X	AE	AM
8	BO22	Mon A (Ri)	Y	AF	AN
9	BO23	Mon B (L)	Z	AH	AP
10	BO24	Mon B (R)	AA	AJ	AR
11	BO25	Mon C (L)	AB	AK	AS
12	BO26	Mon C (R)	AC	AL	AT
13	BO27	Mon D (L)	BJ	BS	BY
14	BO28	Mon D (R)	BK	BT	BZ
15			BL	BU	CA
16			BM	BV	CB
17			BN	BW	CC
18			BP	BX	CD
19			CF	CN	CW
20			CH	CP	CX
21			CJ	CR	CY
22			CK	CS	CZ
23			CL	CT	DA
24			CM	CU	DB
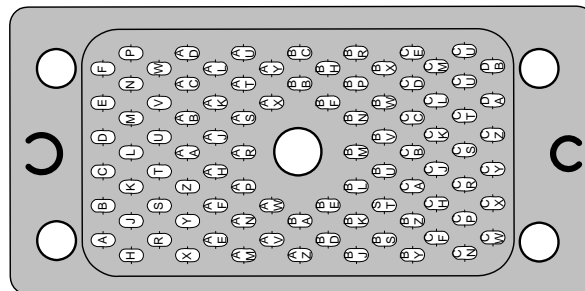
Figure 3-12 Elco 90 Connector, rear view

Table 3-4 Out 2 Elco 90 Pinout

Crk #	Designator	24 X 32	High	Low	Gnd
1	BO31	Solo L	A	H	R
2	BO32	Solo R	B	J	S
3	TL1	Talk 1	C	K	T
4	TL2	Talk 2	D	L	U
5	TL3	Listen 1	E	M	V
6	TL4	Listen 2	F	N	W
7	TL5	Listen 3	X	AE	AM
8	TL6	Listen 4	Y	AF	AN
9	BO3	CR main (L)	Z	AH	AP
10	BO4	CR main (C)	AA	AJ	AR
11	BO5	CR main (R)	AB	AK	AS
12	BO6	Cntrl Rm (Sl)	AC	AL	AT
13	BO7	Cntrl Rm (Sr)	BJ	BS	BY
14	BO8	CR main (B)	BK	BT	BZ
15	BO9	CR main (Li)	BL	BU	CA
16	BO10	CR main (Ri)	BM	BV	CB
17	BO13	CR Alt 1 (L)	BN	BW	CC
18	BO14	CR Alt 1 (C)	BP	BX	CD
19	BO15	CR Alt 1 (R)	CF	CN	CW
20	BO16	CR Alt 1 (Sl)	CH	CP	CX
21	BO29	CR Alt 1 (Sr)	CJ	CR	CY
22	BO30	CR Alt 1 (B)	CK	CS	CZ
23	BO1	CR Alt 2 (L)	CL	CT	DA
24	BO2	CR Alt 2(R)	CM	CU	DB
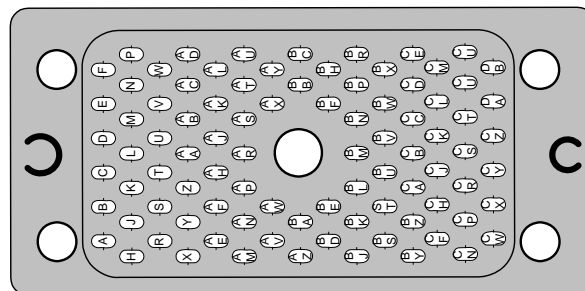
Figure 3-13 Elco 90 Connector, rear view

Table 3-5 Out 3 DB-25 Pinout

Crk #	Designator	24 X 32	High	Low	Gnd
1		T1	24	12	25
2		T2	10	23	11
3		L1	21	9	22
4		L2	7	20	8
5		L3	18	6	19
6		L4	4	17	5
7		Solo L	15	3	16
8		Solo R	1	14	2
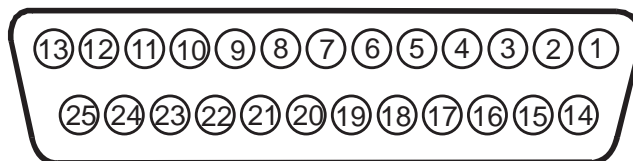
Figure 3-14 DB-25 Connector

3.5 ML530 Mic/Line Interface
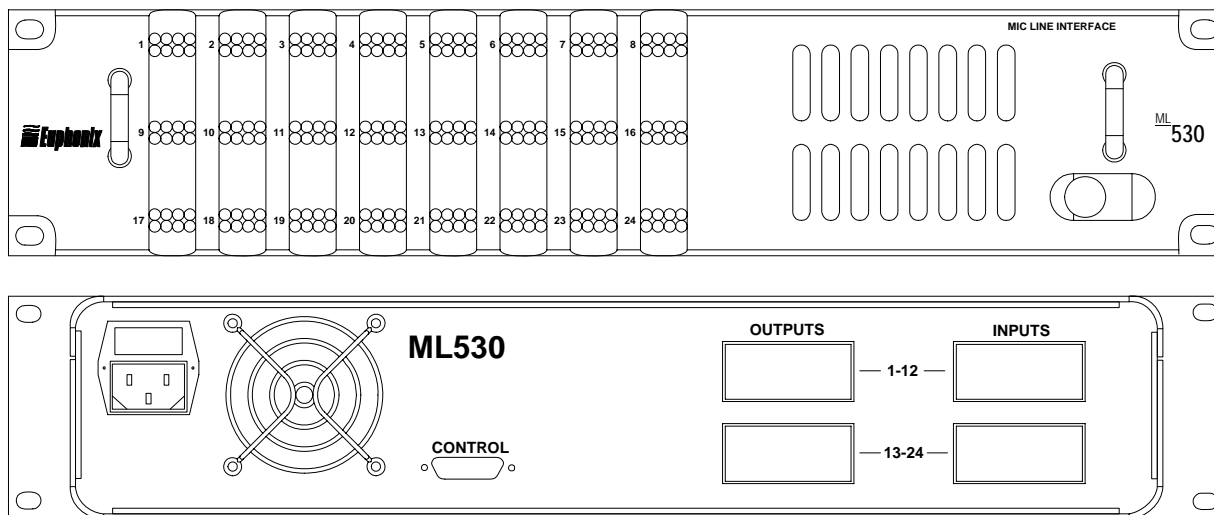
Figure 3-15 ML530 Front and Rear Panels

Inputs (two 38-pin ELCO sockets): A total of 24 microphone inputs are received on two 38-pin ELCO connectors (connectors and pins provided).

Outputs (two 38-pin ELCO sockets): A total of 24 outputs are provided on two 38-pin ELCO connectors. These outputs feed an AM713 Analog to MADI Converter (a 24 male XLR to 38-pin ELCO cable is provided).

Control (DA-15): Connect to SC263 System Computer via TCC breakout cable (provided). All patching, switching and gain controls are communicated via this connection.

AC Line In (IEC) and **Fuse Tray**: Accepts standard IEC power cord (provided). An autoranging switching supply accepts voltages between 90–250 VAC, 50–60 Hz.
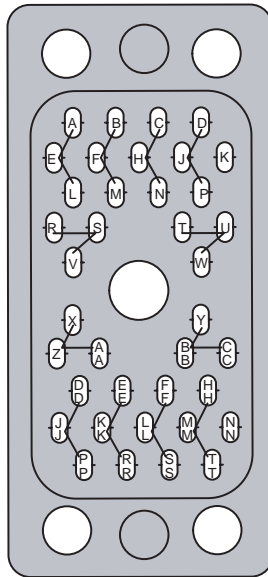
Num	Signal	Wiring Instruction & Description	+	-	G
1	Mic In 1 / Mic In 13	From studio Mic 1 / 13	A	E	L
2	Mic In 2 / Mic In 14	From studio Mic 2 / 14	B	F	M
3	Mic In 3 / Mic In 15	From studio Mic 3 / 15	C	H	N
4	Mic In 4 / Mic In 16	From studio Mic 4 / 16	D	J	P
5	Mic In 5 / Mic In 17	From studio Mic 5 / 17	DD	JJ	PP
6	Mic In 6 / Mic In 18	From studio Mic 6 / 18	EE	KK	RR
7	Mic In 7 / Mic In 19	From studio Mic 7 / 19	FF	LL	SS
8	Mic In 8 / Mic In 20	From studio Mic 8 / 20	HH	MM	TT
9	Mic In 9 / Mic In 21	From studio Mic 9 / 21	R	S	V
10	Mic In 10 / Mic In 22	From studio Mic 10 / 22	T	U	W
11	Mic In 11 / Mic In 23	From studio Mic 11 / 23	X	Z	AA
12	Mic In 12 / Mic In 24	From studio Mic 12 / 24	Y	BB	CC

Figure 3-16 ML530 In 1/In 2 Pinout: Elco 38 Socket, rear view
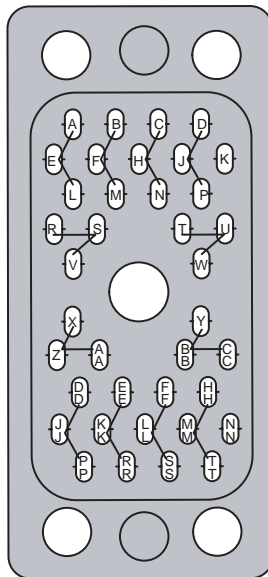
Num	Signal	Wiring Instruction & Description	+	-	G
1	Mic Pre Out 1 / Out 13	To AM713 Analog In 1 / In 13	A	E	L
2	Mic Pre Out 2 / Out 14	To AM713 Analog In 2 / In 14	B	F	M
3	Mic Pre Out 3 / Out 15	To AM713 Analog In 3 / In 15	C	H	N
4	Mic Pre Out 4 / Out 16	To AM713 Analog In 4 / In 16	D	J	P
5	Mic Pre Out 5 / Out 17	To AM713 Analog In 5 / In 17	DD	JJ	PP
6	Mic Pre Out 6 / Out 18	To AM713 Analog In 6 / In 18	EE	KK	RR
7	Mic Pre Out 7 / Out 19	To AM713 Analog In 7 / In 19	FF	LL	SS
8	Mic Pre Out 8 / Out 20	To AM713 Analog In 8 / In 20	HH	MM	TT
9	Mic Pre Out 9 / Out 21	To AM713 Analog In 9 / In 21	R	S	V
10	Mic Pre Out 10 / Out 22	To AM713 Analog In 10 / In 22	T	U	W
11	Mic Pre Out 11 / Out 23	To AM713 Analog In 11 / In 23	X	Z	AA
12	Mic Pre Out 12 / Out 24	To AM713 Analog In 12 / In 24	Y	BB	CC

Figure 3-17 ML530 Out 1/Out 2 Pinout: Elco 38 Socket, rear view

3.6 CO600 Changeover Switch
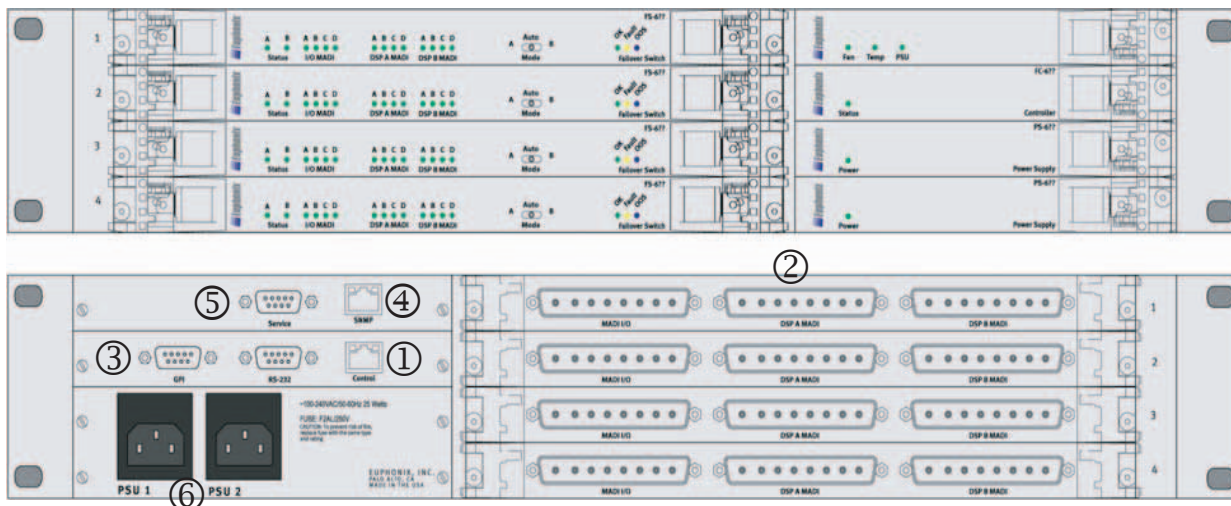
Figure 3-18 CO600 Changeover Switch

①**Network Port** (RJ45): Connect to the Eucon Network Switch via the RJ-45 cable provided.

②**MADI In / Out Ports** (96 Combo D): Digital audio in and outs. See the MADI Hookup diagram (Figure 2-11) for details on these connections.

③**GP Inputs** (DE-9): Can be configured using internal jumpers to accept momentary or closed control inputs.

④ **SNMP Network Port** (RJ45): Connection for external network.

⑤ **SNMP Service Port** (DE-9): Connection for SNMP management.

⑥ **Power Connectors** (IEC): Accepts two standard IEC power cords (provided). Two autoranging switching supplies accept voltages between 100–240 VAC, 50–60 Hz.

SNMP Monitoring
The SNMP System Management Controller monitors operating condtions and notifies the user to take action to avert system failure. It provides a simple way to manage remote devices and adds a dimension of security to critical applications. The system management controller is web-enabled and supports mulitple communication protocols.

3.7   AM713 Analog to MADI Converter

Front Panel

Figure 3-19 AM713 Front Panel

Signal Strength LEDs: Each of the 28 channels has a four-segment LED that represents the following signal levels: -42 dB, -18 dB, -6 dB (green), -0.05 dB (red).

Input Trim Access: Three detented trim rotary switches adjust the maximum analog input level of channels 1-8, 9–16, and 17–24 in 2-dB steps between +12 and +26 dBu.

SR Conv: This indicates sample-rate conversion activity on the auxiliary digital inputs.

Sample Rate LEDs: These LEDs indicate the sample rate to which the converter is currently locked. Sample rates are auto-sensed but can be manually selected on the AM713. Supported sample rates are 96 kHz, 88.2 kHz, 48 kHz, 44.1 kHz, and Custom rates from external sources.

Sample Rate Source LEDs: These LEDs indicate the format of the Sample Rate Source to which the converter is currently locked. Sample Rate Source can be auto-sensed or manually selected. If an external source is not detected, the AM713 reverts to Internal sync. If a manually selected source is not present, the Sample Rate Source indicator blinks.

- **AES**:   Sample Rate locked to AES Input.
- **Word**:   Sample Rate locked to Word Clock Input.
- **Internal**: Sample Rate locked to its own internal crystal.
- **Auto:**   Sample Rate Source has been auto-sensed.

These LEDs appear in the same order in which signals are tested for their presence. This detection procedure occurs when the converters are powered on. The Sample Rate and Sample Rate Source can also be selected manually.

Manual Selection Buttons: The button below each Sample Rate LED row manually selects the sample rate. Also allows manual selection of the Sample Rate Source.

Power Switch: On/Off switch.

Rear Panel

Figure 3-20 AM713 Rear Panel

Input Voltage Selector: This red switch allows operation in either 100/110/115 VAC or 220/230/240 VAC environments. A fuse must also be changed for 220/230/240 VAC operation. Units are shipped set and fused for 100/110/115 VAC.

Power Connector (IEC) and Fuse Tray: The IEC power connector accepts standard IEC power cords. The fuse tray contains both the active fuse and a spare for 220/230/240 VAC operation.

Analog Inputs (female XLR): 24 balanced, analog inputs on XLR connectors. Input sensitivity is set from the front panel.

Auxiliary Analog Inputs (female XLR): Two balanced analog inputs on XLR connectors. Input sensitivity is set from the front panel.

AES/EBU Digital Input (female XLR): Stereo AES/EBU digital input on one XLR connector. Functions in parallel with the auxiliary S/PDIF input and the two inputs should not be used simultaneously.

S/PDIF Digital Input (RCA): Stereo S/PDIF digital input on one RCA connector. Functions in parallel with the auxiliary AES/EBU input and the two inputs should not be used simultaneously.

AES Sync In (female XLR): Master clock input for the converter when using AES as Sample Rate Source.

AES Sync Thru (male XLR): Outputs the same signal connected to AES Sync In.

Word In (BNC): Master clock input for the converter when using Word Clock as Sample Rate Source.

Word Out (BNC): Outputs a Word clock signal synchronized to the Sample Rate Source. In the presence of an external Word clock input, this connector provides a regenerated version of that input signal. Without an external sample rate source, this connector outputs the internally generated clock signal.

MADI Out (BNC): Outputs the digital audio signal.

- **1–24:**   Analog inputs
- **25–26:**   Aux analog inputs
- **27–28:**   Aux digital inputs

NOTE: *28 channels are always transmitted; dual channels are not used.*

Trim Switches : Four detented trim rotary switches, accessed from the front panel, adjust the analog input level of channels 1–8, 9–16, 17–24, and auxiliary analog in 2 dB steps between +12 and +26 dBU.

3.8   MA703 MADI to Analog Converter

Front Panel

Figure 3-21 MA703 Front Panel

Signal Strength LEDs: Each of the 28 channels has a four-segment LED that represents the following signal levels: -42 dB, -18 dB, -6 dB (green), -0.05 dB (red).

Output Trim Access: Three detented trim rotary switches adjust the maximum analog output level of channels 1-8, 9–16, and 17–24 in 2-dB steps between +12 and +26 dBu.

Sample Rate LEDs: These LEDs indicate the sample rate to which the converter is currently locked. Sample rates are auto-sensed. Supported sample rates are 96 kHz, 88.2 kHz, 48 kHz, 44.1 kHz, and Custom rates from external sources.

Sample Rate Source LEDs: These LEDs indicate the format of the Sample Rate Source to which the converter is currently locked. Sample Rate Source can be auto-sensed or manually selected. If an external source is not detected, the MA703 mutes its outputs. If a manually selected source is not present, the Sample Rate Source indicator blinks.

- **AES**:   Sample Rate locked to AES Input.
- **Word**:   Sample Rate locked to Word Clock Input.
- **MADI**:   Sample Rate locked to MADI.
- **Auto:**   Sample Rate Source has been auto-sensed.

These LEDs appear in the same order in which signals are tested for their presence. This detection procedure occurs when the converters are powered on. The Sample Rate Source can also be selected manually.

Manual Selection Buttons: The button below each Sample Rate LED row manually selects the sample rate.

Power Switch: On/Off switch.
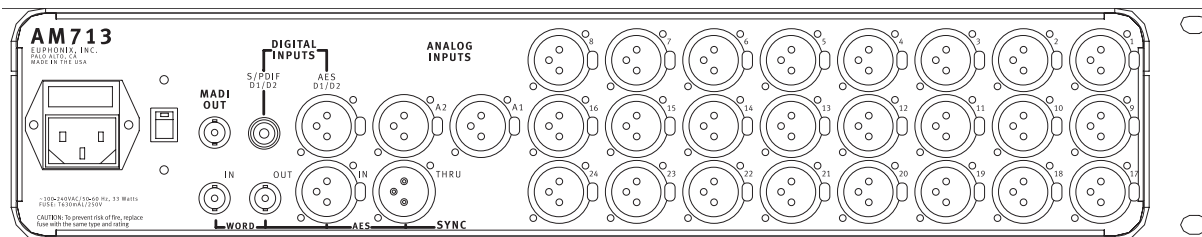
Rear Panel

Figure 3-22 MA703 Rear Panel

Input Voltage Selector: This red switch allows the unit to operate in either 100/110/ 115 VAC or 220/230/240 VAC environments. A fuse must also be changed for 220/ 230/240 VAC operation. Units are shipped set and fused for 100/110/115 VAC.

Power Connector (IEC) and **Fuse Tray**: The IEC power connector accepts standard IEC power cords. The fuse tray contains both the active and spare fuses.

Analog Outputs (male XLR): 24 balanced analog outputs on XLR connectors. Output level is set from the front panel.

Auxiliary Analog Outputs (male XLR): Two balanced analog outputs on XLR connectors. Output level can is set from the front panel.

AES/EBU Digital Outputs (male XLR): Stereo AES/EBU digital outputs on one XLR connector. Functions in parallel with the auxiliary S/PDIF output and the two inputs should not be used simultaneously.

S/PDIF Digital Outputs (RCA): Stereo S/PDIF digital output on one RCA connector. Functions in parallel with the auxiliary AES/EBU output and the two inputs should not be used simultaneously.

AES Sync In (female XLR): Master clock input for the converter when using AES as the Sample Rate Source.

AES Sync Thru (male XLR): Outputs the same signal connected to AES Sync In.

Word In (BNC): Master clock input for the converter when using Word Clock as Sample Rate Source.

Word Out (BNC): Outputs a Word Clock signal synchronized to the Sample Rate Source. In the presence of an external Word clock input, this connector provides a regenerated version of the input signal. Without an external sample rate source, this connector outputs an internally generated clock signal.

MADI In (BNC): Digital audio signal input.

- **1–24:**   analog outputs
- **25–26:** aux analog outputs
- **27–28:** aux digital outputs.

3.9   DM714 AES/EBU to MADI Converter

Front Panel

Figure 3-23 DM714 Front Panel

Signal Strength LEDs: Each of the 28 channels has a four-segment LED that represents the following signal levels: -42 dB, -18 dB, -6 dB (green), -.05 dB (red).

Trim Rotary Switch: A trim rotary switch adjusts the analog input level of channels A1 and A2 between +12 and +26 dBu in 2-dB steps.

SR Conv: The sample rate of all digital inputs is automatically detected and, if asynchronous, converted to the system Sample Rate. This process is independently applied to each stereo pair such that a combination of synchronous and asynchronous signals can be connected to the DM714. Sample-rate conversion is switched off when synchronous signals are detected. The range of sample-rate conversion is 32–56 kHz. 88.2 or 96 kHz signals cannot be sample-rate converted and are passed through if synchronous. If non-synchronous 88.2 or 96 kHz signals are detected, the upper signal strength LED flashes red to warn the user that the sample rate for those channels is not in sync with the system settings. Sample-rate conversion reduces the bit depth in a 24-bit signal to 20 bits.

Sample Rate LEDs: These LEDs indicate the Sample Rate to which the converter is currently locked. Sample Rates are auto-sensed but can be manually selected. Supported Sample Rates are 96 kHz, 88.2 kHz (not shown), 48 kHz, 44.1 kHz and Custom Rates from external sources.

Sample Rate Source LEDs: These LEDs indicate the format of the Sample Rate Source to which the converter is currently locked. Sample Rate Source can be auto-sensed or manually selected. If an external source is not detected, the DM714 reverts to Internal sync. If a manually selected source is not present, the Sample Rate Source indicator blinks.

- • **AES**:   Sample Rate locked to AES Input.
- • **Word**:   Sample Rate locked to Word Clock Input.
- • **Internal**:   Sample Rate locked to its own internal crystal.
- • **Auto:**   Sample Rate Source has been auto-sensed.

These LEDs appear in the same order in which signals are tested for presence. This detection procedure occurs when the converters are powered on. The Sample Rate and Sample Rate Source can also be selected manually.

Manual Selection Buttons: The button below each Sample Rate LED row manually selects the Sample Rate Source. The DM714 also allows manual selection of the Sample Rate.

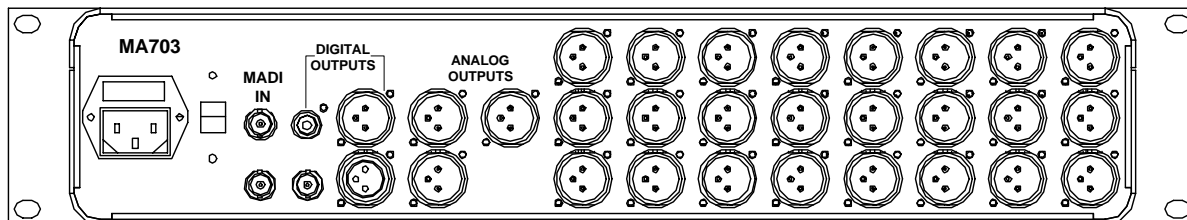**Power Switch:** On/Off switch.
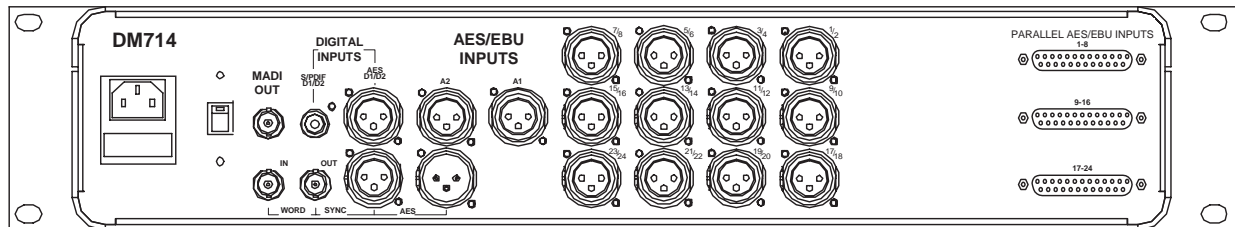
Rear Panel

Figure 3-24 DM714 Rear Panel

Input Voltage Selector: This red switch allows the unit to operate in either 100/110/115 VAC or 220/230/240 VAC environments. A fuse must also be changed for 220/230/240 VAC operation. Units are shipped set and fused for 100/110/115 VAC.

Power Connector (IEC) and Fuse Tray: The IEC power connector accepts standard IEC power cords. The fuse tray contains both the active fuse and a spare fuse for 220/230/240 VAC operation.

AES/EBU Digital Inputs (female XLR): 12 AES/EBU dual-channel inputs. Optional 75-ohm BNC AES/EBU dual-channel inputs are available.

Parallel AES/EBU Digital Inputs (female DB25): Three 8-channel digital connectors function in parallel with XLR digital inputs, and should not be used simultaneously with the XLR inputs. See Figure 3-24 on page 57 for pinout diagram.

Auxiliary Analog Inputs (female XLR): Two balanced analog inputs on XLR connectors. Input sensitivity is set from the front panel.

Auxiliary AES/EBU Digital Input (female XLR): Stereo AES/EBU digital input on one XLR connector. Functions in parallel with the auxiliary S/PDIF input and the two inputs should not be used simultaneously.

Auxiliary S/PDIF Digital Input (RCA): Dual-channel S/PDIF digital input on one RCA connector. Functions in parallel with the auxiliary AES/EBU input and the two inputs should not be used simultaneously.

AES Sync In (female XLR): Master clock input for the converter when using AES as Sample Rate Source.

AES Sync Thru (male XLR): Outputs the same signal connected to AES Sync In.

Word In (BNC): Master clock input for the converter when using Word Clock as Sample Rate Source.

Word Out (BNC): Outputs a Word clock signal synchronized to the Sample Rate Source. In the presence of an external Word clock input, this connector provides a regenerated version of that input signal. Without an external sample rate source, this connector outputs the internally generated clock signal.

MADI Out (BNC): Outputs the digital audio signal.

- **1–24:**   Main digital inputs
- **25–26:**   Aux analog inputs
- **27–28:**   Aux digital inputs

NOTE: 28 channels are always transmitted; dual channels are not used.
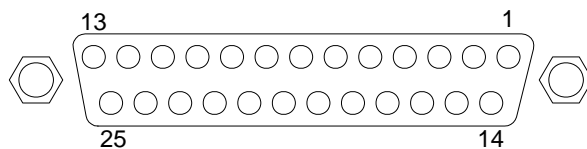
Pin #	Connector 1	Connector 2	Connector 3
1	N/C	N/C	N/C
2	N/C	N/C	N/C
3	N/C	N/C	N/C
4	N/C	N/C	N/C
5	N/C	N/C	N/C
6	N/C	N/C	N/C
7	Digital In 7/8+	Digital In 15/16+	Digital In 23/24+
8	GND	GND	GND
9	Digital In 5/6-	Digital In 13/14-	Digital In 21/22-
10	Digital In 3/4+	Digital In 11/12+	Digital In 19/20+
11	GND	GND	GND
12	Digital In 1/2-	Digital In 9/10-	Digital In 17/18-
13	N/C	N/C	N/C
14	N/C	N/C	N/C
15	N/C	N/C	N/C
16	N/C	N/C	N/C
17	N/C	N/C	N/C
18	N/C	N/C	N/C
19	N/C	N/C	N/C
20	Digital In 7/8-	Digital In 15/16-	Digital In 23/24-
21	Digital In 5/6+	Digital In 13/14+	Digital In 21/22+
22	GND	GND	GND
23	Digital In 3/4-	Digital In 11/12-	Digital In 19/20-
24	Digital In 1/2+	Digital In 9/10+	Digital In 17/18+
25	GND	GND	GND

Figure 3-25 DM714 Parallel AES/EBU Digital Inputs: Female DB-25

3.10 MD704 MADI to AES/EBU Converter

Front Panel
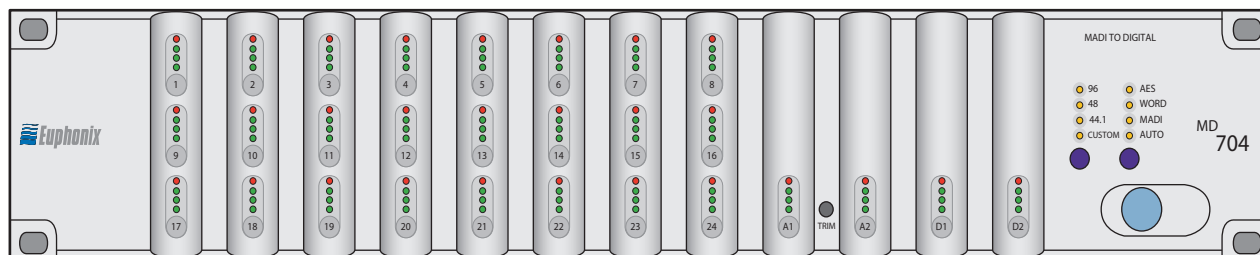
Figure 3-26 MD704 Front Panel

Signal Strength LEDs: Each of the 28 channels has a four-segment LED that represents the following signal levels: -42 dB, -18 dB, -6 dB (green), -.05 dB (red).

Trim Rotary Switch: A trim rotary switch adjusts the analog output level of channels A1 and A2 between +12 and +26 dBu in 2-dB steps.

Sample Rate LEDs: These LEDs indicate the Sample Rate to which the converter is currently locked. Sample Rates are auto-sensed but can be manually selected on the DM714. Supported Sample Rates are 96 kHz, 88.2 kHz (not shown), 48 kHz, 44.1 kHz and Custom Rates from external sources.

Sample Rate Source LEDs: These LEDs indicate the format of the Sample Rate Source to which the converter is currently locked. Sample Rate Source can be auto-sensed or manually selected. If an external source is not detected, the MD704 mutes its outputs. If a manually selected source is not present, the Sample Rate Source indicator blinks.

- • **AES**: Sample Rate locked to AES Input.
- • **Word**: Sample Rate locked to Word Clock Input.
- • **MADI**: Sample Rate locked to MADI.
- • **Auto:** Sample Rate Source has been auto-sensed.

These LEDs appear in the same order in which signals are tested for presence. This detection procedure occurs when the converters are powered on. The Sample Rate (DM714 only) and Sample Rate Source can also be selected manually.

Manual Selection Buttons: The button below each Sample Rate LED row manually selects the Sample Rate Source.

Power Switch: On/Off switch.
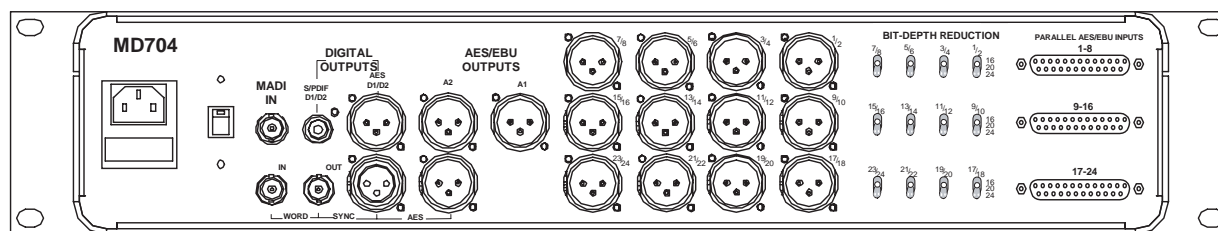
Rear Panel

Figure 3-27 MD704 Rear Panel

Input Voltage Selector: This red switch allows the unit to operate in either 100/110/115 VAC or 220/230/240 VAC environments. A fuse must also be changed for 220/230/240 VAC operation. Units are shipped set and fused for 100/110/115 VAC.

Power Connector (IEC) and **Fuse Tray**: The IEC power connector accepts standard IEC power cords. The fuse tray contains both the active and spare fuses.

AES/EBU Digital Outputs (female XLR): 12 AES/EBU dual-channel outputs. Optional 75-ohm BNC dual-channel AES/EBU stereo inputs are available.

Parallel AES/EBU Digital Outputs (female DB25): Three 8-channel digital connectors function in parallel with XLR digital outputs and the two outputs should not be used simultaneously. See Figure 3-27 on page 60 for pinout diagram.

Auxiliary Analog Outputs (male XLR): Two balanced analog outputs on XLR connectors. Output level can is set from the front panel.

AES/EBU Digital Outputs (male XLR): Dual-channel AES/EBU digital outputs on one XLR connector. Functions in parallel with the auxiliary S/PDIF output and the two outputs should not be used simultaneously.

S/PDIF Digital Outputs (RCA): Dual-channel S/PDIF digital output on one RCA connector. Functions in parallel with the auxiliary AES/EBU output and the two outputs should not be used simultaneously.

AES Sync In (female XLR): Master clock input for the converter when using AES as the Sample Rate Source.

AES Sync Thru (male XLR): Outputs the same signal connected to AES Sync In.

Word In (BNC): Master clock input for the converter when using Word Clock as Sample Rate Source.

Word Out (BNC): Outputs a Word Clock signal synchronized to the Sample Rate Source. In the presence of an external Word clock input, this connector provides a regenerated version of the input signal. Without an external sample rate source, this connector outputs an internally generated clock signal.

MADI In (BNC): Digital audio signal input.

- **1–24:** main digital outputs
- **25–26:** aux analog outputs
- **27–28:** aux digital outputs

Bit-Depth Reduction: Sets the resolution to 16, 20, or 24 bits for the main AES/EBU channels.
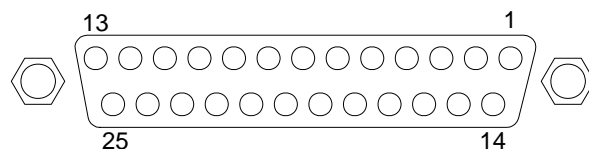
Pin#	Connector 1	Connector 2	Connector 3
1	Digital out 7/8+	Digital Out 15/16+	Digital Out 23/24+
2	GND	GND	GND
3	Digital out 5/6-	Digital Out 13/14-	Digital Out 21/22-
4	Digital out 3/4+	Digital Out 11/12+	Digital Out 19/20+
5	GND	GND	GND
6	Digital out 1/2-	Digital Out 9/10-	Digital Out 17/18-
7	N/C	N/C	N/C
8	N/C	N/C	N/C
9	N/C	N/C	N/C
10	N/C	N/C	N/C
11	N/C	N/C	N/C
12	N/C	N/C	N/C
13	N/C	N/C	N/C
14	Digital out 7/8-	Digital Out 15/16-	Digital Out 23/24-
15	Digital out 5/6+	Digital Out 13/14+	Digital Out 21/22+
16	GND	GND	GND
17	Digital out 3/4-	Digital Out 11/12-	Digital Out 19/20-
18	Digital out 1/2+	Digital Out 9/10+	Digital Out 17/18+
19	GND	GND	GND
20	N/C	N/C	N/C
21	N/C	N/C	N/C
22	N/C	N/C	N/C
23	N/C	N/C	N/C
24	N/C	N/C	N/C
25	N/C	N/C	N/C

Figure 3-28 DM704 Parallel AES/EBU Digital Outputs: Female DB-25

3.11 FC726 Format Converter

NOTE: *FC726 is the same as FC727 but does not support Pro Tools.*
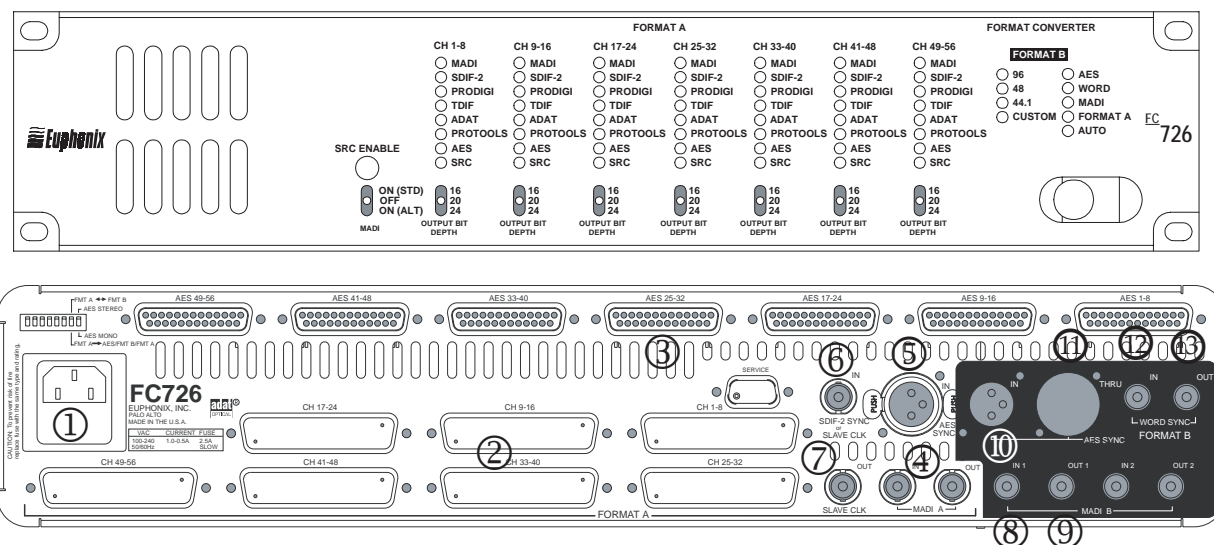
Figure 3-29 FC726 Front and Rear Panels

The FC726 Format Converter provides 56 sample-rate selectable, AES/EBU inputs and outputs. It also allows direct connection to the following third-party digital formats: TDIF, ProDigi, SDIF-2, and ADAT Optical.

① **Power Connector** (IEC): Accepts standard IEC power cord (provided). An autoranging switching supply accepts voltages between 100–240 VAC 50–60 Hz.

② **Format A Common Connectors** (seven DD-50): Connects to third-party devices. Each connector provides eight bidirectional channels. Appropriate adapters must be used for each format to connect the third-party devices. Specify cable requirements at time of order. See Table 3-8 through Table 3-11 for pinout specifications.

③ **Format A AES Connectors** (seven DB-25): Connects to AES devices. Each connector provides eight bidirectional channels (four AES pairs). Specify cable requirements at time of order.

④ **MADI A In 1 / MADI A Out 1** (two BNC): The MADI A In/Out Ports interface with non-Euphonix MADI devices. At 48 kHz, MADI A provides 56 channels of 24-bit audio; at 96kHz, 28 channels of 24-bit audio channels (cable not provided).

⑤ **Format A AES Sync In** (female XLR): Connect an AES Sync signal to this XLR connector to synchronize the Format A MADI signal. According to the AES specification, to operate correctly the AES sync signal must use the same sample rate as the incoming MADI (cable not provided).

⑥ **SDIF-2** or **Slave Clock In** (BNC): This connector can receive either an SDIF or Slave Clock Sync signal (the FC726 automatically detects the signal type). An SDIF device must send a Word Sync signal to this connector to interface properly. Slave Clock is a sync signal (commonly implemented in Pro Tools systems and referred to as a *super-clock*) that runs at 256 times the sample rate. Pro Tools users may optionally connect the Slave Clock output from another Digidesign audio interface or synchronization unit (i.e., 888-24) to the Slave Clk In connector to synchronize both devices. Cable not provided.

⑦ **Slave Clock Out** (BNC): Pro Tools users may optionally connect the Slave Clk Out to another Digidesign audio interface or synchronization unit (i.e., 888-24) to synchronize both devices. This allows both a Digidesign I/O unit and the FC726 to be connected to the same Pro Tools computer. If Slave Clk In has a valid sync signal, it is passed through to Slave Clk Out. If Slave Clk In does not have a valid sync signal, the lowest numbered bank of eight inputs that is locked and in use is selected as the clock source (cable not provided).

⑧ **MADI B In 1 / MADI B Out 1** (two BNC): Connect these MADI Ports to the DF66 or optional Failover Switch (cable provided).

⑨ **MADI B In 2 / MADI B Out 2** (two BNC): Connect these MADI Ports to the DF66 or optional Failover Switch (cable provided).

⑩ **Format B AES Sync In** (female XLR): Connect this port to a digital sync reference.

⑪ **Format B AES Sync Thru** (male XLR): This signal is active regardless of selected sync source.

⑫ **Format B Word In** (BNC): Connect this port to a digital sync reference.

⑬ **Format B Word Out** (BNC): This signal is active regardless of selected sync source.

Table 3-6 AES/EBU DB-25 Pinout

Pin	Description
Pin 1	N/C
Pin 2	Channel 1 / 2 In (COLD)
Pin 3	Channel 3 / 4 In (GND)
Pin 4	Channel 3 / 4 In (HOT)
Pin 5	Channel 5 / 6 In (COLD)
Pin 6	Channel 7 / 8 In (GND)
Pin 7	Channel 7 / 8 In (HOT)
Pin 8	Channel 1 / 2 Out (COLD)
Pin 9	Channel 3 / 4 Out (GND)
Pin 10	Channel 3 / 4 Out (HOT)
Pin 11	Channel 5 / 6 Out (COLD)
Pin 12	Channel 7 / 8 Out (GND)
Pin 13	Channel 7 / 8 Out (HOT)
Pin 14	Channel 1 / 2 In (GND)
Pin 15	Channel 1 / 2 In (HOT)
Pin 16	Channel 3/ 4 In (COLD)
Pin 17	Channel 5 / 6 In (GND)
Pin 18	Channel 5 / 6 In (HOT)
Pin 19	Channel 7 / 8 In (COLD)
Pin 20	Channel 1 / 2 Out (GND)
Pin 21	Channel 1 / 2 Out (HOT)
Pin 22	Channel 3 / 4 Out (COLD)
Pin 23	Channel 5 / 6 Out (GND)
Pin 24	Channel 5 / 6 Out (HOT)
Pin 25	Channel 7 / 8 Out (COLD)

NOTE: *In and Out are from the FC726's perspective.*

Table 3-7 Common DD-50 Connector Pinout and Usage With Third-party Devices

Pin #	Common Connector (DB50 Female)	SDIF usage	TDIF usage	ProDigi usage	ADAT usage
1	In 1+	In 1+	NC	In 1+	In 1/2
2	In 1-	In 1-	In 1/2	In 1-	NC
3	In 2+	In 3+	NC	In 3+	In 3/4
4	In 2-	In 3-	In 3/4	In 3-	NC
5	In 3+	In 5+	NC	In 5+	In 5/6
6	In 3-	In 5-	In 5/6	In 5-	NC
7	In 4+	In 7+	NC	In 7+	In 7/8
8	In 4-	In 7-	In 7/8	In 7-	NC
9	GND	GND	GND	GND	GND
10	In 5+/GP In A	In 2+	NC	In 2+	Error In
11	In 5-	In 2-	NC	In 2-	NC
12	In 6+/GP In B	In 4+	NC	In 4+	User0 In
13	In 6-	In 4-	NC	In 4-	NC
14	In 7+/GP In C	In 6+	NC	In 6+	User1 In
15	In 7-	In 6-	NC	In 6-	NC
16	In 8+/GP In D	In 8+	NC	In 8+	Mstr/Slv IN
17	In 8-	In 8-	NC	In 8-	NC
18	Cable ID2	0 (tie to pin 23)	0 (tie to pin 23)	0 (tie to pin 23)	1 (NC)
19	Cable ID1	0 (tie to pin 23)	1 (NC)	1 (NC)	0 (tie to pin 23)
20	Cable ID0	1 (NC)	0 (tie to pin 23)	1 (NC)	0 (tie to pin 23)
21	Bit Clk In+	NC	NC	Bit Clk In+	Bit Clk In
22	Bit Clk In-	NC	NC	Bit Clk In-	NC
23	GND	GND	GND	GND	GND
24	Word Clk In+	NC	In LR Clk	Word Clk In+	Word Clk In
25	Word Clk In-	NC	NC	Word Clk In-	GND
26	Out 1+	Out 1+	NC	Out 1+	Out 1/2
27	Out 1-	Out 1-	Out 1/2	Out 1-	NC
28	Out 2+	Out 3+	NC	Out 3+	Out 3/4
29	Out 2-	Out 3-	Out 3/4	Out 3-	NC
30	Out 3+	Out 5+	NC	Out 5+	Out 5/6
31	Out 3-	Out 5-	Out 5/6	Out 5-	NC
32	Out 4+	Out 7+	NC	Out 7+	Out 7/8
33	Out 4-	Out 7-	Out 7/8	Out 7-	NC
34	Out 5+/GP Out A	Out 2+	FS0 out	Out 2+	Mute Out
35	Out 5-	Out 2-	NC	Out 2-	NC
36	Out 6+/GP Out B	Out 4+	FS1 out	Out 4+	NC
37	Out 6-	Out 4-	NC	Out 4-	NC
38	Out 7+/GP Out C	Out 6+	Emph Out	Out 6+	NC
39	Out 7-	Out 6-	NC	Out 6-	NC
40	Out 8+/GP Out D	Out 8+	NC	Out 8+	NC
41	Out 8-	Out 8-	NC	Out 8-	NC
42	Bit Clk Out+	NC	NC	Bit Clk Out+	Bit Clk Out
43	Bit Clk Out-	NC	NC	Bit Clk Out-	GND
44	GND	GND	GND	GND	GND
45	Word Clk Out+	NC	Out LR Clk	Word Clk Out+	Word Clk Out
46	Word Clk Out-	NC	NC	Word Clk Out-	GND
47	Extra In/GP In E+	NC	NC	NC	DVCO In
48	Extra In/GP In E-	NC	NC	NC	NC
49	NC	NC	NC	NC	Vcc
50	GND	GND	GND	GND	GND

Table 3-8 FC726 TDIF Cable Wiring Specification

Connector	Pin	Connection	Description
J1	1	NC	
J1	2	J2-1	In 1/2
J1	3	NC	
J1	4	J2-2	In 3/4
J1	5	NC	
J1	6	J2-3	In 5/6
J1	7	NC	
J1	8	J2-4	In 7/8
J1	9	J2-7,24,25	GND
J1	10	NC	
J1	11	NC	
J1	12	NC	
J1	13	NC	
J1	14	NC	
J1	15	NC	
J1	16	NC	
J1	17	NC	
J1	18	J1-23	Cable ID
J1	19	NC	Cable ID
J1	20	J1-23	Cable ID
J1	21	NC	
J1	22	NC	
J1	23	J2-17,J1-18,J1-20	GND
J1	24	J2-5	Word Clock In
J1	25	NC	
J1	26	NC	
J1	27	J2-13	Out 1/2
J1	28	NC	
J1	29	J2-12	Out 3/4
J1	30	NC	
J1	31	J2-11	Out 5/6
J1	32	NC	
J1	33	J2-10	Out 7/8
J1	34	J2-8	FS0 Out
J1	35	NC	
J1	36	J2-20	FS1 Out
J1	37	NC	
J1	38	J2-21	Emph Out
J1	39	NC	
J1	40	NC	
J1	41	NC	
J1	42	NC	
J1	43	NC	
J1	44	J2-22,23	GND
J1	45	J2-9	Word Clock Out
J1	46	NC	
J1	47	NC	
J1	48	NC	
J1	49	NC	
J1	50	J2-14,15,16	GND

Notes:
J1 = DD-50 male
J2 = DD-25 male

Twisted pairs:
J2-1/14
J2-2/15
J2-3/16
J2-4/17
J2-5/7
J2-9/22
J2-11/23
J2-12/24
J2-13/25
The rest don't matter

In and Out are from the FC726's perspective.

Table 3-9 FC726 SDIF Cable Wiring Specification

Connector	Pin	Connection	Description
J1	1	J4-2	In 1+
J1	2	J4-1	In 1-
J1	3	J4-6	In 3+
J1	4	J4-5	In 3-
J1	5	J4-10	In 5+
J1	6	J4-9	In 5-
J1	7	J4-14	In 7+
J1	8	J4-13	In 7-
J1	9	NC (GND)	
J1	10	J4-4	In 2+
J1	11	J4-3	In 2-
J1	12	J4-8	In 4+
J1	13	J4-7	In 4-
J1	14	J4-12	In 6+
J1	15	J4-11	In 6-
J1	16	J4-16	In 8+
J1	17	J4-15	In 8-
J1	18	J1-23	Cable ID
J1	19	J1-23	Cable ID
J1	20	NC	Cable ID
J1	21	NC	
J1	22	NC	
J1	23	J1-18,19	GND
J1	24	NC	
J1	25	NC	
J1	26	J5-2	Out 1+
J1	27	J5-1	Out 1-
J1	28	J5-6	Out 3+
J1	29	J5-5	Out 3-
J1	30	J5-10	Out 5+
J1	31	J5-9	Out 5-
J1	32	J5-14	Out 7+
J1	33	J5-13	Out 7-
J1	34	J5-4	Out 2+
J1	35	J5-3	Out 2-
J1	36	J5-8	Out 4+
J1	37	J5-7	Out 4-
J1	38	J5-12	Out 6+
J1	39	J5-11	Out 6-
J1	40	J5-16	Out 8+
J1	41	J5-15	Out 8-
J1	42	NC	
J1	43	NC	
J1	44	NC	
J1	45	NC	
J1	46	NC	
J1	47	NC	
J1	48	NC	
J1	49	NC	
J1	50	NC	

Notes:

J1,J2,J3 = DD-50 male

J4 = DD-50 male

J5 = DD-50 female

Jx-x	*denotes twisted pair*
Jx-x	

In and Out are from the FC726's perspective.
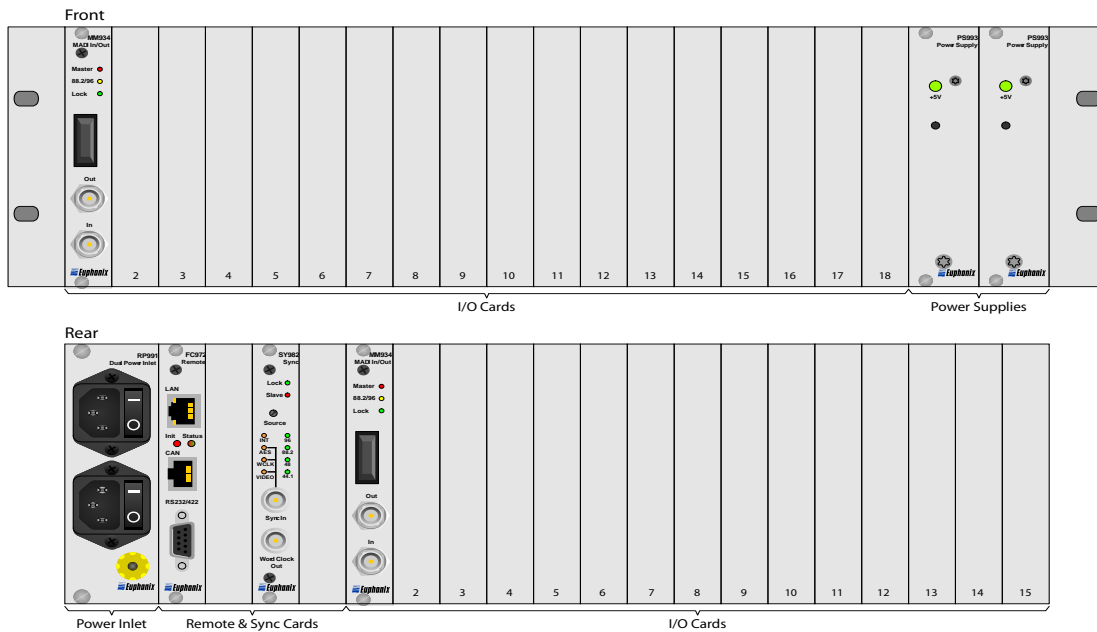
3.1.2 Modular I/O

Figure 3-30 IO93 Modular I/O Frame Front and Rear Panels

The Euphonix Modular I/O system allows I/O configuration flexibility. Several frame types can be fitted with a variety of I/O and control modules. All audio signals are converted to/from MADI for interfacing to the console. Depending on the configuration, a maximum signal density of 64 inputs and 64 outputs on a single MADI I/O is possible. Compact stagebox configurations are also available.

Audio formats supported are remote-controlled preamp, line level analog I/O, AES/EBU, and HD/SD embedder/de-embedder. These formats can be used simultaneously in the same frame. Additional modules include sync, MADI I/O, and remote control interface. Audio connections can be on both front and rear.

Configuration is done using the following guidelines:

- Each frame type contains redundant PSU, control buss, sync buss, and 32 stereo audio busses per backplane. Frames differ in the number of slots, PSU capability, the number of backplanes (1 or 2), and how the audio busses are separated on those backplanes. These differences determine the maximum number of modules that can be fitted in a given frame.

- Each backplane supplies 32 stereo audio busses. Module audio resources are connected to audio busses either with on-board jumpers or an on-board audio matrix configured via a web browser interface.

- Each audio buss can have only one source (audio/MADI input). However, it may feed one or more destinations (audio/MADI output).

- Any frame fitted with modules requiring remote control must be fitted with an FC972 Remote module for TCP/IP interfacing to the console network.

- A frame must have a master sync module. This may be a dedicated sync module or a MADI I/O module set to "sync-to-MADI". Master sync modules must be installed in any of the four red "reserved" slots located on the rear-plane adjacent to the power inlets. Reserved slots may also be used for other modules.
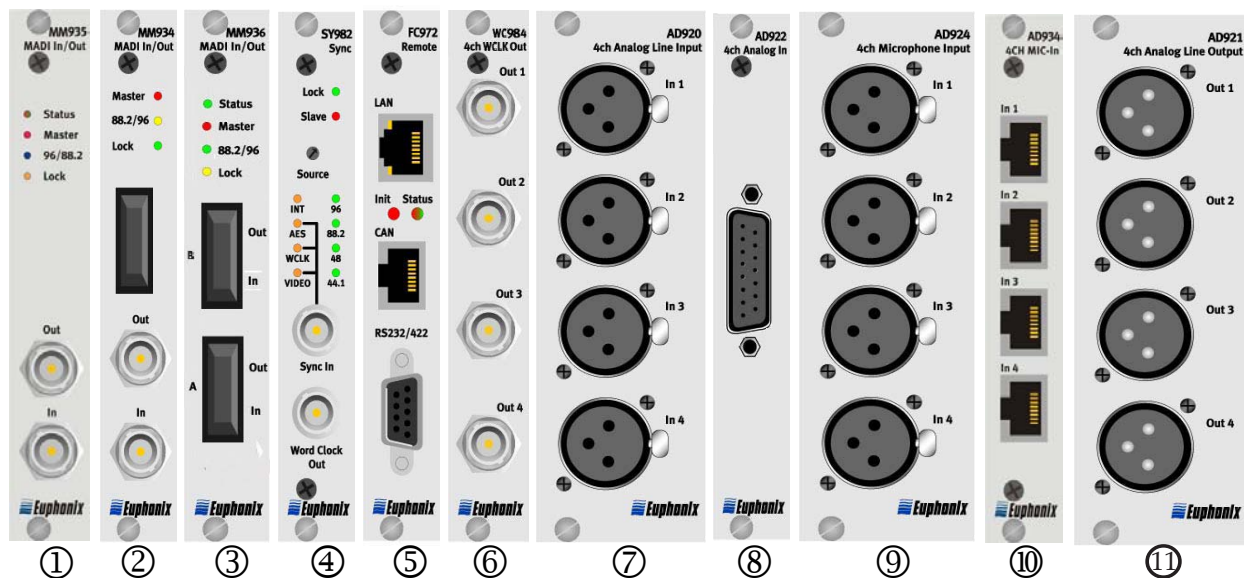
3.12.1   Modules

Figure 3-31 Modular I/O modules

① **MM935 MADI In/Out** (two BNC): The MM935 contains a single MADI I/O. MADI I/O configuration is done through a crosspoint matrix with preset capability. The matrix is configured via a web browser interface. In Master mode, it can provide sync to the frame from the MADI input. In this mode, it must be installed in one of the four "reserved" slots on the rear-plane.

② **MM934 MADI In/Out** (two BNC, SC Duplex 62.5/125µm multimode fiber): The MM934 contains a single MADI I/O and multimode fiber transceiver. MADI I/O configuration is accomplished through preset MADI "working modes", selected via on-board switches. In Master mode, the MM934 can provide sync to the frame from the MADI input. In this mode, it must be installed in one of the four "reserved" slots on the rear-plane.

③ **MM936 MADI In/Out** (two SC Duplex 62.5/125µm multimode fiber): The MM936 provides redundant MADI-over-fiber connections. MADI output is muted to two fibers. MADI input is received on two fibers with the priority on fiber 1. In the event of loss of MADI on fiber 1, the module automatically selects fiber 2 as the MADI input. If MADI is restored on fiber 1, the module switches to fiber 1 as MADI input. MADI I/O configuration

is accomplished through a crosspoint matrix with preset capability. The matrix is configured via a web browser interface. In Master mode, the MM934 can provide sync to the frame from the MADI input. In this mode, it must be installed in one of the four "reserved" slots on the rear-plane.

④ **SY982 Sync** (two BNC): The SY982 provides sync for Modular I/O frames. It generates an internal clock and can lock to external AES Sync, Word Clock, or Video signal. Internal sample rates are 44.1k, 48k, 88.2k, and 96k. A redundant sync configuration is possible using two SY982s. This module must be installed in one of the four "reserved" slots on the rear-plane.

⑤ **FC972 Remote** (two RJ45, one DE-9): The FC972 provides a TCP/IP over Ethernet interface. The Eucon/Web browser interface is used for setup of modules. An RS232 modem interface is provided for direct access to the controller's terminal interface.

⑥ **WC984 4ch WCLK Out** (four BNC): The WC984 is a sync output module for the Modular I/O system. It provides four buffered Word Clock outputs. Word clock is derived from the frame's sync buss.

⑦ **AD920 4ch Analog Line Input** (four female XLR): The AD920 is a 4ch 24-bit A/D converter with four balanced analog inputs.

⑧ **AD922 4ch Analog Line Input** (DA-15 female): The AD922 is a 4ch 24-bit D/A converter with four balanced analog inputs.

⑨ **AD924 4ch Microphone Input** (four female XLR): The AD920 is a 4ch high-performance mic preamp with 24-bit sigma-delta A/D converters. Remote operation is via Eucon or web browser interface. Up to 256 microphone inputs (64 devices) can be controlled in a system. Includes phantom power and filter.

⑩ **AD914 4ch Microphone Input** (four RJ-45): The AD914 is a 4ch high-performance mic preamp with 24-bit sigma-delta A/D converters. Remote opertation is via Eucon or web browser interface. Up to 256 microphone inputs (64 devices) can be controlled in a system. Includes phantom power and filter. See page 73 for the RJ-45 pinout.

⑪ **DA921 4ch Analog Line Output** (four male XLR): The AD920 is a 4ch 24-bit D/A converter with four balanced analog outputs.
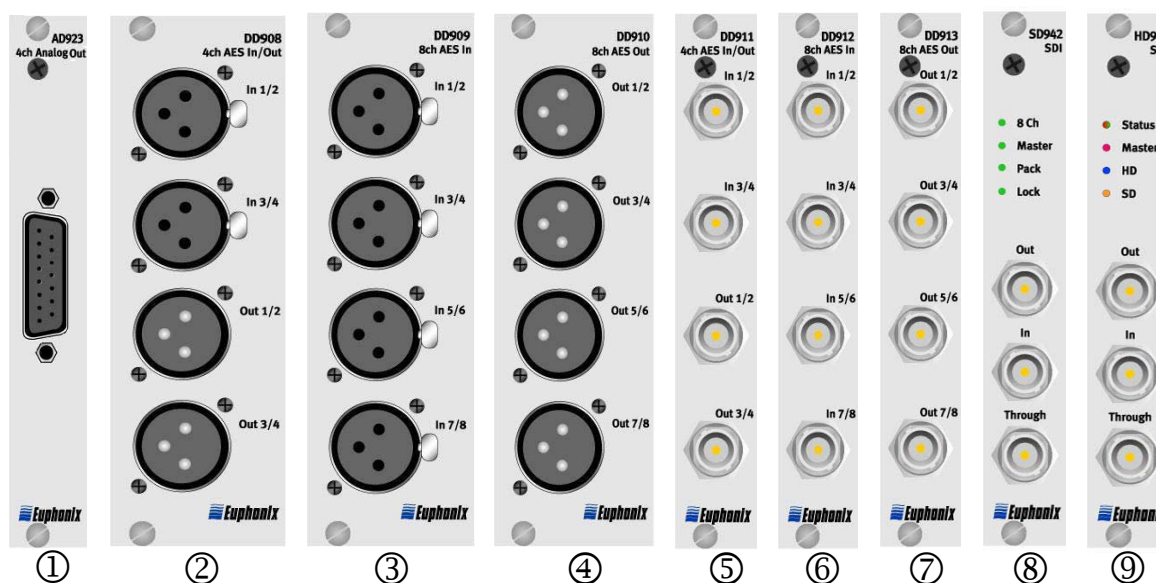
Figure 3-32 More Modular I/O modules

① **DA923 4ch Analog Line Output** (DA-15 female): The AD923 is a 4ch 24-bit D/A converter with four balanced analog outputs.

② **DD908 4ch AES In/Out** (two female XLR, two male XLR): The DD908 is a 4ch AES/EBU input/output interface. XLR inputs and outputs are at 110 ohms, with sample rate converters on the inputs.

③ **DD909 8ch AES In** (four female XLR): The DD908 is an 8ch AES/EBU input interface. XLR inputs are at 110 ohms, with sample rate converters.

④ **DD910 8ch AES Out** (four male XLR): The DD910 is an 8ch AES/EBU output interface. XLR outputs are at 110 ohms.

⑤ **DD911 4ch AES In/Out** (four BNC): The DD911 is a 4ch AES/EBU input/output interface. Coaxial inputs and outputs are at 75 ohms, with sample rate converters on the inputs. Relays connect related inputs and outputs if power fails (hardware bypass).

⑥ **DD912 8ch AES In** (four BNC): The DD912 is an 8ch AES/EBU input interface. Coaxial inputs are at 75 ohms, with sample rate converters on the inputs.

⑦ **DD913 8ch AES Out** (four BNC): The DD912 is an 8ch AES/EBU output interface. Coaxial outputs are at 75 ohms.

⑧ **SD942 8ch SD De/Embedder** (three BNC): The SD941 is an interace for embedded audio in SDI signals (270Mb/s). It can simultaneously de-embed and embed up to eight channels of audio from/to a single SD video stream (SMPTE272M standard). Video In, Out, and Thru are provided. Setup is via the web browser interface.

⑨ **HD943 8ch HD/SD De/Embedder** (three BNC): The HD943 is an interface for embedded audio in SDI signals (1.485Gbs/270Mbs). It can simultaneously de-embed and embed up to eight channels of audio from/to a single HD/SD video stream (SMPTE299M/272M standards).
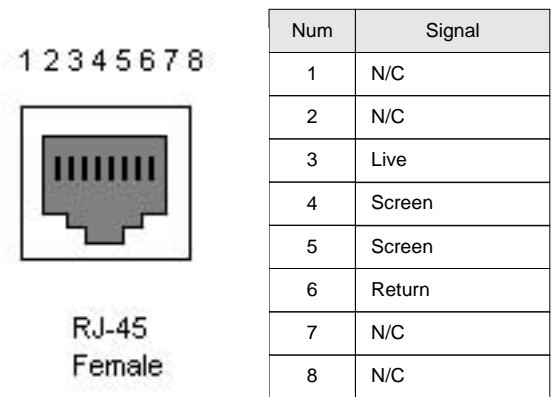
1 2 3 4 5 6 7 8

RJ-45
Female

Num	Signal
1	N/C
2	N/C
3	Live
4	Screen
5	Screen
6	Return
7	N/C
8	N/C

Figure 3-33 AD914 RJ-45 Pinout

Refer to the Euphonix Modular I/O Configuration Guide for more details and configuration possibilities.

3.12.2 Frames

Power Connectors (IEC): The frame comes standard with an auto-sensing (100~240vAC, 50/60Hz), dual redundant PSU.

IO93 Modular I/O Frame: The IO93 frame is a double-sided 3RU frame with 18 "slots" (4HP each) for modules on the front-plane and 19 slots on the rear plane. Rear-plane slots 1~4 are "reserved" for the master sync module, however they may be used for other modules as well. Control and sync busses are linked between the two backplanes. Rear and front-plane audio busses may be linked ("linked mode") or separated ("discrete mode") via switches on an internal interconnect PCB. The frame PSUs provide 12 amps@5vDC.

IO94 Stagebox Frame: The IO94 Stagebox frame is a single-sided 3RU frame with 19 for modules. A typical configuration consists of 48 remote preamps (12x AD914 4ch Mic Input) and 16 analog outputs (4x DA922 4ch Analog Output). An MM936 MADI In/Out provides a redundant MADI-over-Fiber connection to the local-side interface (IO93M frame) and also provides the frame's sync reference (set for sync-to-MADI and fit into a reserved slot). An FC972 Remote provides a TCP/IP interface for remote preamp control and MM936 configuration. The frame PSUs provide 20 amps@5vDC. See Figure 3-34.
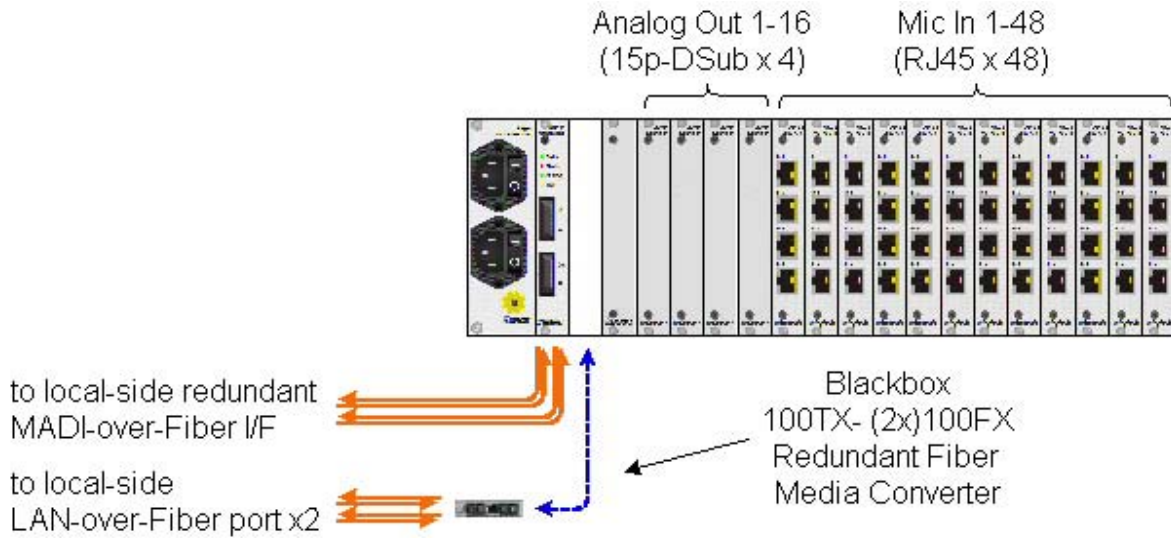
Figure 3-34 Stagebox configuration #1

IO95 Modular I/O Frame: The IO95 frame is a double-sided 3RU frame identical to the IO93 frame, except for an audio buss modification. This modification consists of separating audio busses on the rear-plane to provide four "positions" to be used as local-side interfaces for redundant MADI-over-fiber stageboxes. Each of these positions may be fitted with an MM936 MADI In/Out (redundant fiber) and an MM934 MADI In/Out (coax) to act as redundant MADI-over-fiber-to-MADI coax converters. The MM936 configuration is done via the FC972 Remote also installed in the frame. Sync is handled by the SY983 Sync module. Other slots may be used for additional I/O as these audio busses have no interaction with the four interface positions. Sync and remote modules are shared thoughout the entire frame. The frame PSUs provide 12 amps@5vDC. See figure 3-35.
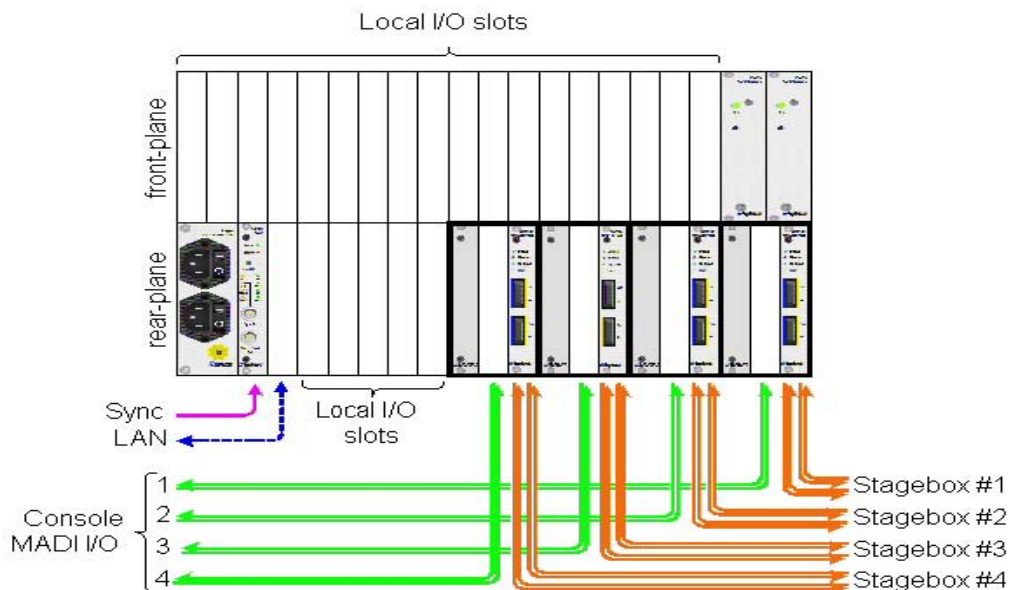

Figure 3-35 Local-Side Interface configuration #1

Table 3-10   I/O Module Summary

Module	Connectors	width (4HP slots)	Remote required	Power (5vDC)	Weight
Mic					
AD914 4Ch Mic In	RJ45 x4	1	yes	~1300mA	~300g
AD924 4ch Mic In	MXLR x4	2	yes	~1100mA	~300g
Analog Line					
AD920 4ch Analog In	FXLR x4	2	---	~850mA	~200g
DA921 4ch Analog Out	MXLR x4	2	---	~650mA	~200g
AD922 4ch Analog In	15 pin Dsub x1	1	---	~850mA	~200g
DA923 4ch Analog Out	15 pin Dsub x1	1	---	~650mA	~200g
Digital					
DD908 4ch AES I/O (110Ω)	MXLR x2, FXLR x2	2	---	~100mA	~200g
DD909 8ch AES Input (110Ω)	MXLR x4	2	---	~100mA	~200g
DD910 8ch AES Output (110Ω)	FXLR x4	2	---	~100mA	~200g
DD911 4ch AES I/O (75Ω)	BNC x4	1	---	~100mA	~150g
DD912 8ch AES Input (75Ω)	BNC x4	1	---	~100mA	~150g
DD913 8ch AES Output (75Ω)	BNC x4	1	---	~100mA	~150g
Embedder/De-embedder					
SD941 4ch SD Embedder/De-embedder	BNC (In, Out, Thru)	1	---	~800mA	~300g
SD942 8ch SD Embedder/De-embedder	BNC (In, Out, Thru)	1	yes	~1000mA	~300g
HD943 8ch HD/SD Embedder/De-embedder	BNC (In, Out, Thru)	1	yes	~1000mA	~300g

Table 3-11   Control Module Summary

Module	Description	Connector	Width (4HP slots)	Remote Required	Power (5vDC)	Weight
MADI						
MM934 MADI I/O	coax MADI I/O	BNC x2	1	---	~350mA	~150g
MM934opt MADI I/O	coax/fiber MADI I/O	BNC x2, SC Duplex	1	---	~500mA	~150g
MM935 MADI I/O	coax MADI I/O	BNC x2	1	yes	~300mA	~150g
MM936 MADI I/O	redundant fiber I/O	SC Duplex x2	1	yes	~350mA	~200g
Remote						
FC972 Remote	remote control module	RJ45 (LAN)	1	---	~300mA	~200g
Sync						
SY982 Sync	single sync input	BNC (Sync In, WC Out)	1	---	~300mA	~200g
SY983 Sync	add Tri-Level Sync support	BNC (Sync In, WC Out)	1	---	~300mA	~200g
WC984 4x Word Clock Out	word clock output x4	BNC x4	1	---	~100mA	~150g
Note: All fiber transceivers 62.5/125µm multmode. 1310 nm wavelength.						

Table 3-12   Frame Summary

| Frame	Description	PSU	Front-plane slots (4HP) for local I/O	Rear-plane slots (4HP) for local I/O	Front/rear backplane link switch	Redundant MADI local-side I/F positions	Power	Dimensions
IO93	standard double-sided frame	dual redundant hot-swappable	18	19	yes	---	~12 amps @5vDC	3RU, 123cm x 42cm ~1111g
IO94	single-sided frame for stagebox use	dual redundant built-in	---	19	---	---	~20amps @5vDC	3RU, 123cm x 30cm ~1111g
IO95	double-sided frame for local-side MADI interface	dual redundant hot-swappable	18	7	yes	4 typical (up to 6 using local I/O slots)	~12 amps @5vDC	3RU, 123cm x 42cm ~1111g

-

3.13 TT002
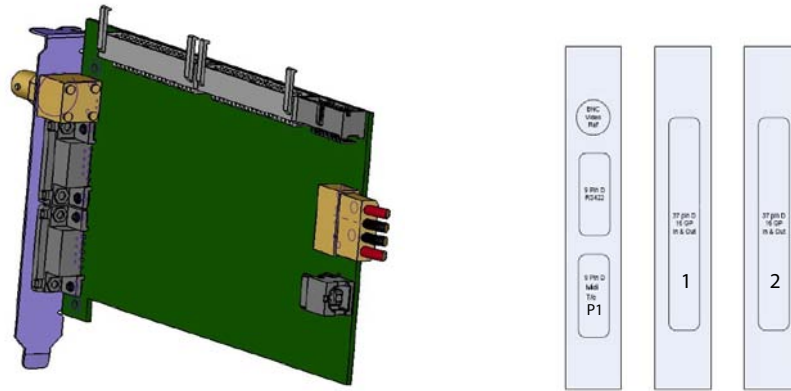
Figure 3-36 TT002 card and panels

The TT002 is a single-port RS422 (Sony 9-pin) machine controller that is installed in the System Computer. It also supports Midi Machine Control (MMC), and can read and generate timecode over MIDI, RS422, and LTC. A BNC input connector accepts Bi/Tri-Level video reference signals.

General-purpose inputs and outputs are handled by the TT002. Thirty-two buffered TTL inputs and open-collector outputs are available on two 37-pin D-subminiature connectors on the rear panel of the System Computer. Two TT002's may be used for a total of 64 GPIO.
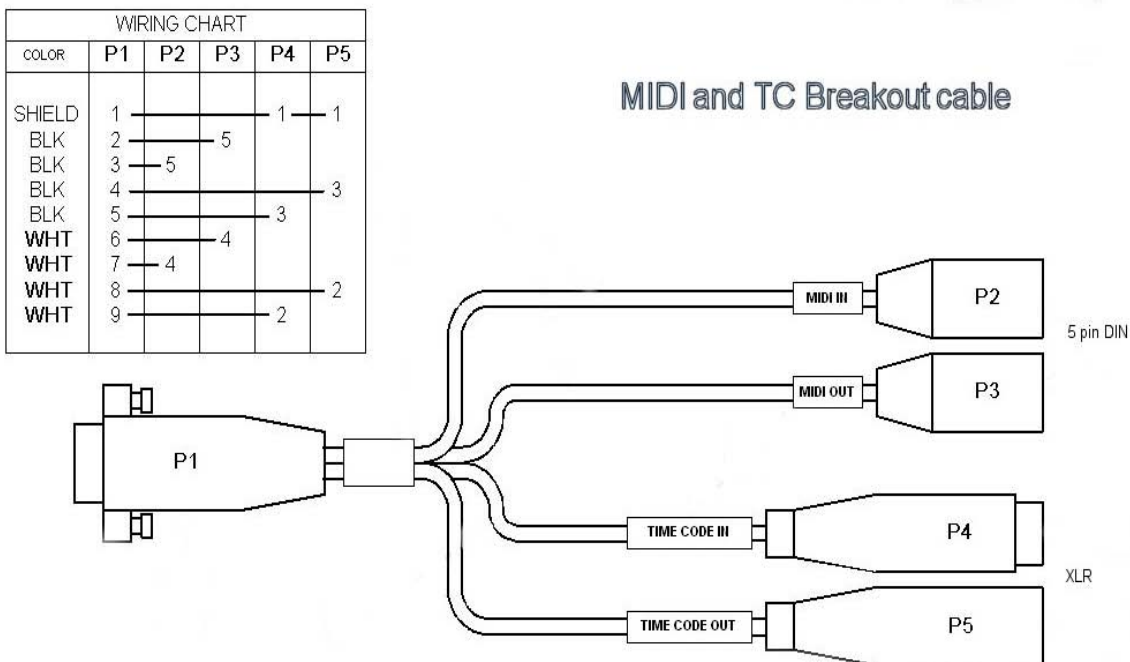
3.13.1 Input and Output Connections

Figure 3-37 TT002 P1 connections and pinouts

3.13.2 Connector Pinouts (DC-37 GP1–GP2)

Table 3-13 GP1 Inputs and Outputs

Pin	Description	Pin	Description	Pin	Description	Pin	Description
1	GPI 1	11	GPI 11	21	GPO 2	31	GPO 12
2	GPI 2	12	GPI 12	22	GPO 3	32	GPO 13
3	GPI 3	13	GPI 13	23	GPO 4	33	GPO 14
4	GPI 4	14	GPI 14	24	GPO 5	34	GPO 15
5	GPI 5	15	GPI 15	25	GPO 6	35	GPO 16
6	GPI 6	16	GPI 16	26	GPO 7	36	GND
7	GPI 7	17	Clamp	27	GPO 8	37	VCC
8	GPI 8	18	GND	28	GPO 9		
9	GPI 9	19	VCC	29	GPO 10		
10	GPI 10	20	GPO 1	30	GPO 11		

Table 3-14 GP2 Inputs and Outputs

Pin	Description	Pin	Description	Pin	Description	Pin	Description
1	GPI 17	11	GPI 27	21	GPO 18	31	GPO 28
2	GPI 18	12	GPI 28	22	GPO 19	32	GPO 29
3	GPI 19	13	GPI 29	23	GPO 20	33	GPO 30
4	GPI 20	14	GPI 30	24	GPO 21	34	GPO 31
5	GPI 21	15	GPI 31	25	GPO 22	35	GPO 32
6	GPI 22	16	GPI 32	26	GPO 23	36	GND
7	GPI 23	17	Clamp	27	GPO 24	37	VCC
8	GPI 24	18	GND	28	GPO 25		
9	GPI 25	19	VCC	29	GPO 26		
10	GPI 26	20	GPO 17	30	GPO 27		

3.13.3   Simplified Diagram of TT002 GPIO Circuit
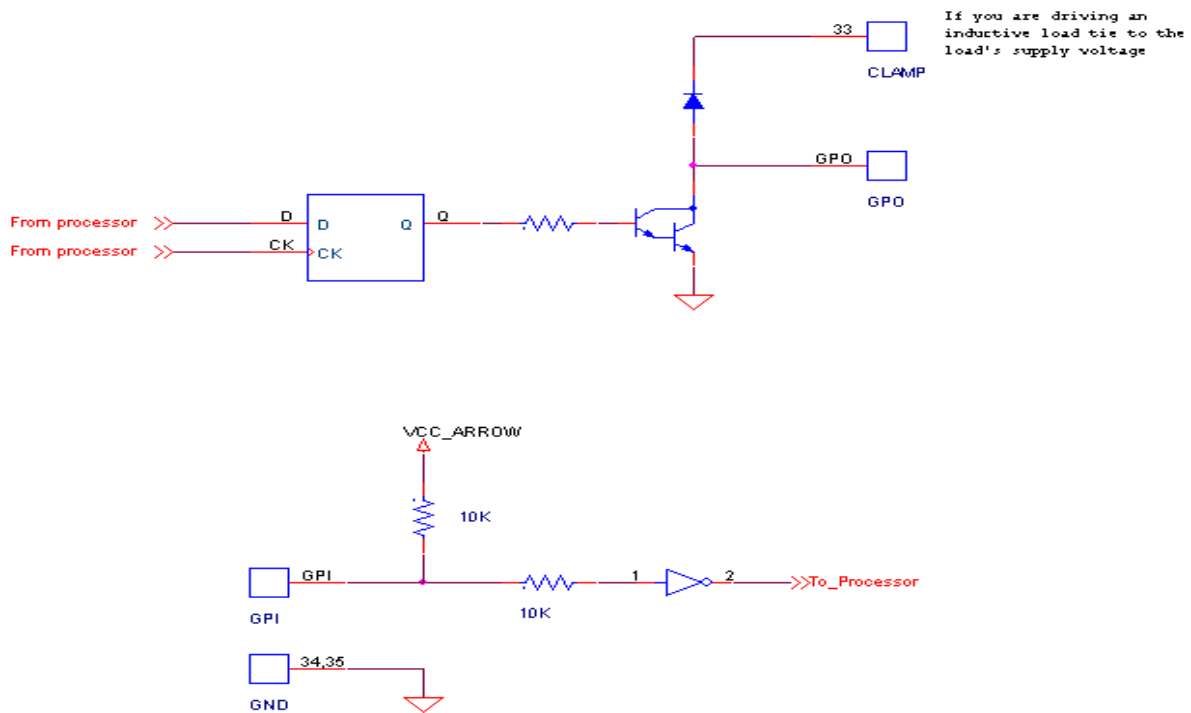

Figure 3-38 Simplified TT002 GPO and GPI circuits

The voltage input range for the TT002 GPI is 0 to 2.5 volts DC for a valid logic "low", and 2.5 volts to 5 volts DC for a valid logic "high". Input pins can be grounded via an open collector, relay, open drain, etc. to change from a high to low logic state.

3.14 FT730 FiberTran Fiberoptic Extender

Front Panel

Figure 3-39 FT730 Front Panel

The Euphonix FT730 FiberTran Fiberoptic Extender allows an ML530 Microphone/
Line preamplifier or MC524 Monitor Controller to be placed up to 1 km away from the
processing core of a Euphonix digital console. The FT730 is always used in pairs with
one local unit at the control end and one remote unit at the far end connected by up to
1 km of fiberoptic cable. Normally four fibers are used:

• One pair sends audio sync and control information to the remote end and re-
ceives status information back.

• The second pair sends and receives MADI.

The same device is used at both ends but their functionality differs: If a a sync source
is connected (AES or word clock), it is a local unit; otherwise, the device looks for sync
on the sync fiber and, if found, behaves as a remote unit.

The front panel has LEDs that indicate the status of the power supplies, synchronization
activity, and the status of several other functions. Each group is discussed in the follow-
ing sections.

Figure 3-40 FT730 Front Panel Status Leds

Power ①

The system has two power supplies for redundancy. A simple monitoring circuit checks
whether each supply is functioning within allowable limits. This is displayed via the
PSU 1 and PSU 2 LEDs on the front panel. The information is also sent over the fiber
link to the remote end.

•   *Solid* - indicates power supply is functioning normally.

•   *Flashing* - indicates the remote power supply has failed.

•   *Off* - indicates the local power supply has failed.

Sync ②

Remote - The unit is locked to sync coming from the local unit over the fiber link.

Word - The unit is locked to sync on the word clock sync input.

AES - the unit is locked to sync on the AES sync input.

If the unit is locked to Word or AES sync, it is designated as the local unit and sends digital sync to the remote unit over the fiber link.

Status ③

TCC - Indicates TCC data activity.

Loop - Indicates that the TCC/Sync fiber loop is complete and the time of flight has been calculated.

MADI IN - Indicates that a MADI signal is present on the 75-Ω BNC **MADI In** and also on the **Fiber TX** connector.

MADI OUT - Indicates that a MADI signal is present on the 75-Ω BNC **MADI Out** and also on the **Fiber RX** connector.
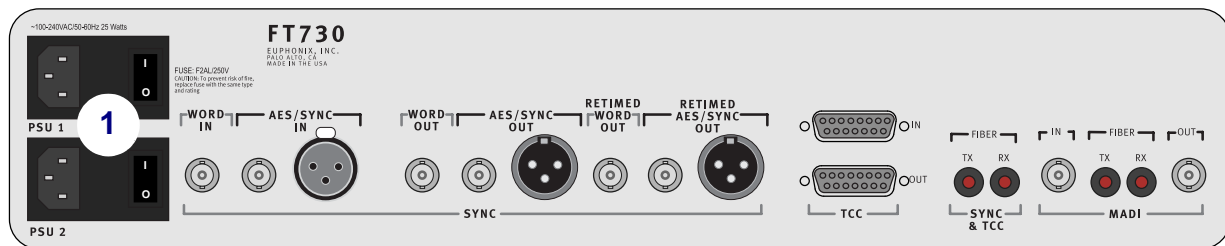
3.14.1   Rear Panel

Figure 3-41   FT730 Rear Panel

① **Power Connectors** (IEC): Accepts two standard IEC power cords (provided). Two autoranging switching supplies accept voltages in the range 100–240 VAC, 50–60 Hz.
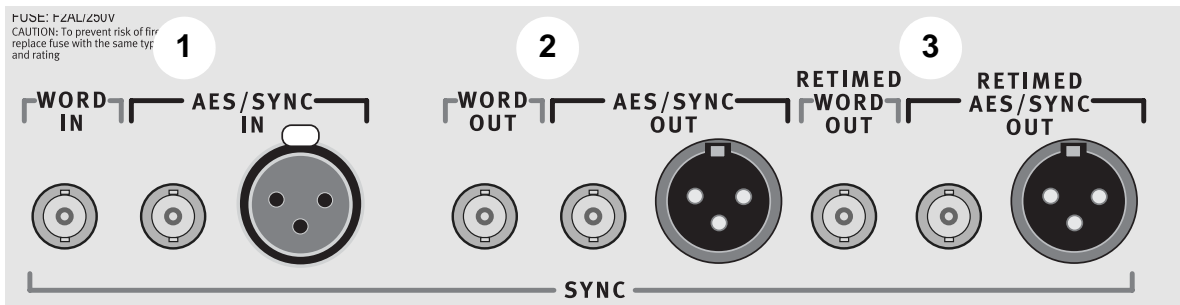
Figure 3-42 Rear Panel Sync Connectors

(1) **AES/SYNC IN** (female XLR or BNC), **WORD IN** (BNC): Connect this port to a digital sync reference (local unit only). Selection for XLR or BNC input is done using two internal jumpers shown in Figure 3-39 *Internal Sync Input Jumper.* The unit is shipped from the factory with the jumpers set for the XLR input.

(2) **AES/SYNC OUT** (male XLR or BNC), **WORD OUT** (BNC): Connect one of these ports to the digital sync reference input of any device receiving MADI at the remote unit. Only one output connection (XLR or BNC) should be used at a time.

(3) **RETIMED AES/SYNC OUT** (male XLR), **RETIMED WORD OUT** (BNC): Connect one of these ports to the digital sync reference input of any device sending MADI from the remote unit back to the local unit.
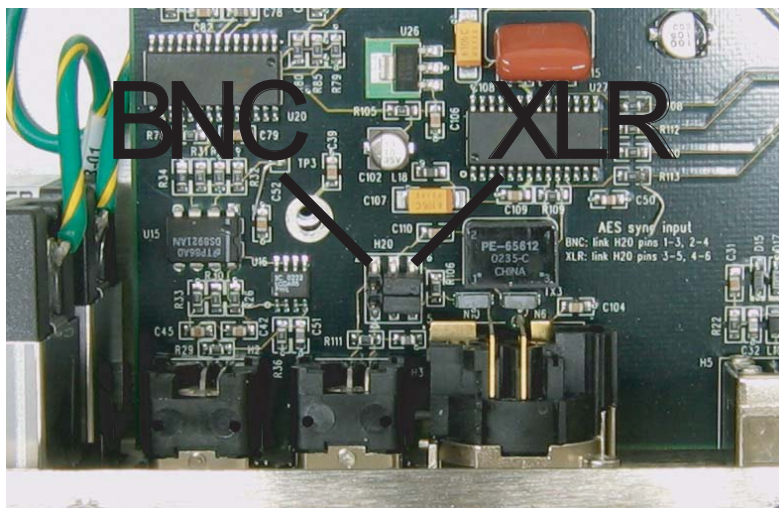

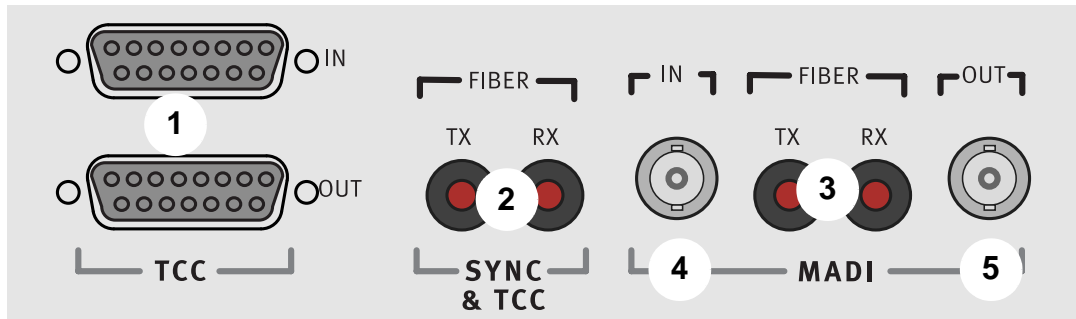**Figure 3-43** Internal Sync Input Jumper

Figure 3-44 Rear Panel TCC, MADI, and Fiber Connectors

（1） **TCC IN/Out** (DB15): Connect **TCC IN** to TCC control port at local unit.
Connect **TCC OUT** to TCC control port at remote unit.

Because the same unit is used at both ends, each has a **TCC IN** and a **TCC OUT** connector. However, only the **TCC IN** is intended to be used at the local end and the **TCC OUT** at the remote end.

（2） **FIBER SYNC/TCC TX/RX** (ST Optical Connector): Connects local and remote units. Connect local **RX** and **TX** to remote **TX** and **RX**, respectively. Both connections are required for proper operation.

（3） **FIBER MADI TX/RX** (ST Optical Connector): Connects local and remote units. Connect local **RX** and **TX** to remote **TX** and **RX**, respectively. A single connection can be used if MADI signals are only required for one direction.

（4） **MADI IN** (BNC): MADI connection for signal being transmitted over fiber.

（5） **MADI OUT** (BNC): MADI connection for signal being received from fiber.