



ADX-2400M

AUDIO  
DISTRIBUTION AND DELAY  
SYSTEM

(MADI Digital I/O)

Installation and Operation Manual

**Software Version 1.1**

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WARRANTY STATEMENT

This equipment is warranted to be free of defects in materials and workmanship for a period of two years from date of delivery. Any necessary repairs resulting from defects in materials or in manufacture will be made free of charge provided that the equipment has not been subjected to mechanical or electrical abuse, or modification, as determined by Lance Design, and also that the equipment is returned to Lance Design with prior authorization.

No liability whatsoever is assumed for consequential damages resulting from the use or failure of this equipment. This warranty is in lieu of all other warranties, expressed or implied, including any implied warranty of fitness for purpose.

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**CAUTION! HAZARDOUS VOLTAGES ARE EXPOSED WHEN THE TOP COVER OF THE UNIT IS REMOVED. DO NOT APPLY POWER WITH THE UNIT DISASSEMBLED.**

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Front Panel View



Rear Panel View

## SELECTING OPERATING MODE

The ADX-2400M can operate in two distinct modes:

The **NORMAL** mode is used for general-purpose transmission and distribution applications. In this mode the units offer 24 channels of transmission in both directions, using standard-latency Cobranet format transmission. The ADX-2400M in this mode transmits three bundles of eight channels each, and receives three bundles of eight channels each.

Bundle numbers are set manually from the front panel menus.

The DSPs in the unit are used for level control, source selection, and delay.

Transmission latency is approximately 7 milliseconds in each direction (standard mode - see next page for low-latency information).

**To select NORMAL mode, turn section 3 of the options dipswitch on the sub-panel (OFF and press the Reset button.**

The **ANNOUNCE BOOTH** mode is selected when the ADX-2400 is used to provide the 'head end' or truck end of an ethernet-based announce booth system, using either ADX-120 Announce Units, or ADX-140 XLR Interface Frames (or both) to provide a fully self-contained announce booth system using copper or fiber ethernet as the transmission medium.

In this mode, the ADX-2400 can support up to four ADX-120s or ADX-140s, in any combination. The ADX-2400 transmits and receives four bundles of six channels each. The transmission utilizes the Cobranet 'low-latency' mode, and results in a path latency of 2.5 milliseconds.

The DSPs are reconfigured to provide routing matrices for IFB source selection, PGM source selection, Talkback output configuration, and 4-wire port assignments for the PL channels.

Bundle numbers are set automatically depending on the assigned system ID numbers for the remote devices (ADX-120, ADX-140).

**To select ANNOUNCE BOOTH mode, turn section 3 of the options dipswitch on the sub-panel (ON and press the Reset button.**



Options Dipsw ^

^ System ID Switch

^ Reset Button

## **LOW-LATENCY OPERATION IN NORMAL MODE**

It is possible to operate the ADX-2400M in normal mode, but with low-latency transmission. Low-latency transmission reduces the path delay from one ADX-2400M to another ADX-2400M from approximately 7 milliseconds (standard mode) to approximately 2.5 milliseconds (low-latency mode).

This mode is useful if using ADX-2400's for IFB returns or some other delay-critical application.

***Note that the ADX-2400s on both ends must operate in the same mode (either low-latency or standard) for audio transmission to occur.***

Low-latency operation requires that the ADX-2400M be equipped with a revision J or later Cobranet interface module. If an earlier version module is installed, and fault message will be displayed, and low-latency operation is not possible.

Also, note that low-latency operation puts more demands on the network performance. Ethernet switches which operate comfortably with standard-latency operation may not be satisfactory with low-latency operation. Gigabit ethernet switches are recommended to insure satisfactory operation.

***To configure the ADX-2400M for low-latency operation, turn on Options Dipswitch #4, and press Reset.***

An '**LL**' indicator will be present in the upper right corner of the display, indicating low-latency operation is selected.

Note that low-latency operation is automatically selected when in Announce Booth mode, and switch 4 will have no effect.

## **QUICK OPERATION GUIDE - NORMAL MODE**

- **To Select Output Channel (or Channels) to Adjust**  
Press 'OUTPUT SELECT' button, and turn knob until desired channel is selected. Repeated presses of the 'OUTPUT SELECT' button will advance the selection to the first channel of the next group of eight individual channels, or to the next group selection. The order of the channel selection is as follows:

**Madi Output 1 through 24** (Individual Outputs)

**Madi Outputs 1-8** (Group)

**Madi Outputs 9-16** (Group)

**Madi Outputs 17-24** (Group)

**All Madi Outputs** (Group)

**Net** (Transmitted to Ethernet) **Output 1 through 24** (Individual Outputs)

**Net Outputs 1-8** (Group)

**Net Outputs 9-16** (Group)

**Net Outputs 17-24** (Group)

**All Net Outputs** (Group)

*If the high madi channel range is selected in the menu, the madi channels will be 33-56 instead of 1-24, and the display will change accordingly.*

Note that if a group of outputs is selected, any setup adjustments (source, level, delay) will be applied to all output channels within that group.

- **To Select Source** (for current output or group of outputs)  
Press 'SOURCE' button. It will light, and the currently-selected source for the selected output will be displayed. The sources available for each output are as follows, and can be selected by turning the knob.

**SILENCE**                      The output will be muted

**MADI INPUT**                The output will be fed by the corresponding Madi input

**NET INPUT**                 The output will be fed by the corresponding network receiver

**888HZ TONE**                The output will be fed by the internal 888 Hz tone generator

**560 HZ TONE**                The output will be fed by the internal 560 Hz tone generator

You may enable a 'stereo summing' mode by selecting any of the following choices, which follow the above sources in the menu list. In these modes, the selected source will be combined with the selected source for the other channel in the even/odd pair; e.g., channels 1 and 2, channels 3 and 4, etc. When a 'something + mix' source is selected, the mixed signal is reduced by 6 dB.

**SILENCE + MIX**              The output will be silence and the other channel mixed

**MADI INPUT + MIX**        The Madi input mixed with the other channel of the pair

**NET INPUT + MIX**         The network receiver mixed with the other channel of the pair

**888HZ TONE + MIX**        888Hz tone mixed with the other channel of the pair

**560 HZ TONE +MIX**        560Hz tone mixed with the other channel of the pair

- **To Adjust Level** (for current output or group of outputs)  
The output level can be adjusted in 0.25 dB increments. Maximum gain is +12 dB. To adjust, press the 'LEVEL' button, and turn the knob.
- **To Adjust Delay** (for current output or group of outputs)  
The delay of each output can be independently adjusted from zero delay through 680 milliseconds, which corresponds to more than 20 frames at 30 frames/sec. The delay is adjusted by first pressing the 'DELAY' button, then turning the knob to adjust. Note that the displayed units (milliseconds or frames) is selected in the menu.
- **To Adjust Headphone Volume**  
Press the 'HP VOLUME' button, and turn the knob. The bar graph display will show the knob 'position'.
- **To Configure Menu Items**  
The system has several configuration items which may be set by using the menu function. Press the 'MENU SELECT' button to enable the menu function. Turn the knob to select the desired menu item, then press the 'MENU SET' button. Turning the knob will now change the parameter for this item. When the desired selection is made, you can exit the MENU SET mode by pressing any other button. (See section on menu items below).

## **MENU ITEMS - NORMAL MODE**

### **Item 01 – RX 1-8 Bundle (000-999)**

Packet assignment for network receiver 1, which corresponds to audio channels (net inputs) 1-8. This number should be set to match the bundle number of the transmitter in another unit which is sending audio to this receiver. Note that bundle 000 is inactive (off). Bundles 001-255 are broadcast bundles, and should only be used if one transmitter is sending to more than one receiver. Bundles 256-999 are unicast bundles, and should be used for normal point-to-point, one transmitter/one receiver operation.

### **Item 02 – RX 9-16 Bundle (000-999)**

Packet assignment for network receiver 2, which corresponds to audio channels (net inputs) 9-16.

### **Item 03 – RX 17-24 Bundle (000-999)**

Packet assignment for network receiver 3, which corresponds to audio channels (net inputs) 17-24.

**Item 04 – TX 1-8 Bundle (000-999)**

Packet assignment for network transmitter 1, which corresponds to audio outputs NET 01 – NET 08.

**Item 05 – TX 9-16 Bundle (000-999)**

Packet assignment for network transmitter 2, which corresponds to audio outputs NET 09-NET 16.

**Item 06 – TX 17-24 Bundle (000-999)**

Packet assignment for network transmitter 3, which corresponds to audio outputs NET 17 – NET 24.

**Item 07 – Conductor Priority (Low – Normal – High)**

This item determines the priority of this unit to operate as the 'sync generator' for the Ethernet audio network. It should normally be set to 'Normal' unless you specifically want this unit to be the conductor, in which case it could be set to high. If set to high, this unit will be the conductor unless another is also set high. In the case where more than one unit has equal priority, the first unit active will assume the conductor role. This selection isn't too important, since the network will quickly re-negotiate a new conductor if the current conductor were to fail or be turned off.

**Item 08 – Delay Units (Milliseconds – Frames (30) – Frames (25))**

This item selects the units used to display the delay values. It only affects the display, and if set to Frames, saves the user having to do the arithmetic in his head. It assumes 33 milliseconds for 30 Frames/sec, and 40 milliseconds for 25 Frames/sec.

**Item 09 - Madi Channel Range (1-24, 33-56)**

This item selects the madi channels which will be seen as inputs to the ADX-2400M, and the madi channels which will be output by the ADX-2400M. All other madi channels in the input stream will be passed through the unit to the output stream unaltered. Two ADX-2400Ms may be connected in series to use 48 madi channels.

**Item 10 - Madi Input (Coax, Optical)**

Selects which physical madi input will be enabled. Both optical and coax outputs are always active regardless of this menu setting.



**Item 11 - GPI Mode = (Off, Master)**

For future or special application use. Should be set to 'Off' normally.

**Item 12 - GPI 1/3 Device ID = (00-99)**

**Item 13 - GPI 2/4 Device ID = (00-99)**

For future or special application use. Should be set to 'Off' normally.

**Item 14 - Save To User Config 1**

**Item 15 - Save To User Config 2**

**Item 16 - Save To User Config 3**

There are three user setup files, and these three menu items allow the current configuration to be saved to these user config files. To save configuration settings, select the appropriate item number and press 'MENU SET'. The configuration will be saved to the selected file.

Note that 20 seconds after any configuration change, the current settings are automatically saved to a default configuration, which will be automatically loaded at power-up. This is separate from the User Configuration files above.

**Item 17 - Recall User Config 1**

**Item 18 - Recall User Config 2**

**Item 19 - Recall User Config 3**

Selecting one of these three items and pressing 'MENU SET' will cause the settings previously saved in the selected User Config file to be recalled.

**Item 20 - Recall Standard Config**

Pressing the 'MENU SET' button will recall a 'standard configuration'. All levels will be set to unity, all delays will be set to zero, all local outputs will have their sources set to NET, and all network outputs will have their sources set to MADI. All bundle numbers will be set to 000.

**The following items are STATUS items, and are only to display status information. They may not be directly changed by the user.**

**Status Item 01 – NET RX 1 Status (Active or Idle)**

Displays ACTIVE status if data is being received by network receiver 1. This receiver corresponds to net inputs 1-8. Note that the data could be silence; an active receiver doesn't necessarily mean that there is audio present.

**Status Item 02 – NET RX 2 Status (Active or Idle)**

Same for receiver 2, which corresponds to net inputs 9-16.

**Status Item 03 – NET RX 3 Status (Active or Idle)**

Same for receiver 3, which corresponds to net inputs 17-24.

**Status Item 04 – NET TX 1 Status (Idle or Number of Receivers)**

If this transmitter is turned off (bundle = 000), or if it is set to a unicast bundle (bundle = 256-999) with no corresponding receiver present, this status item will indicate IDLE status. The transmitter is not putting any data on the network.

Otherwise, it will indicate the number of receivers listening to this transmitter. The network only counts receivers up to four, so if there are more than three receivers present, the status item will report ">3 Rcvrs".

Note that unless the status is IDLE, the transmitter is putting data on the network. If assigned as a broadcast bundle (001-255), the status could be " 0 Rcvrs ", if no receivers were listening to this bundle number. The data is still present on the network.

Net TX 1 corresponds to net outputs 1-8.

**Status Item 05 – NET TX 2 Status (Idle or Number of Receivers)**

Same as above for net outputs 9-16.

**Status Item 06 – NET TX 3 Status (Idle or Number of Receivers)**

Same as above for net outputs 17-24.

**Status Item 07 – Conductor Status (Another Unit or This Unit)**

Indicates if the network conductor ('sync generator') is this unit or not.

**Status Item 08 – Ext AES Ref Status (None or OK)**

Indicates status of the external (AES) reference signal. External reference must be applied for proper operation of the ADX-2400M.

**Status Item 09 – Madi Input Status (None or OK)**

Indicates the status of the selected Madi input (coax or optical).

**Status Item 10 – PCB Temperature ( degrees Celsius)**

Indicates temperature of sensors on main PCB. Normal temperature is in the 40-46 degree range. A high temperature indication might indicate blocked vents or a high ambient temperature, and will cause a fault message to be displayed if the temperature exceeds 55 degrees C.

**Status Item 11 – System ID (00-99)**

Displays two-digit system (frame) ID, as determined by the rotary switches on the front edge of the pcb, behind the front panel. These two digits are used as the last octet of the network IP address (192.168.100.xx), and the last part of the Cobranet system name (Lance ADX2400M-xx). This IP address and system name appear when using the Cobranet 'Discovery' application to report network node status.

**Status Item 12 – Firmware Version**

Displays the version of the installed firmware.

## **System Configuration In Normal Mode**

The ADX-2400 is designed to provide delay, level control and distribution for effects or commentary audio. The system can be used for stand-alone delay of 24 audio channels, or can be used to transmit and receive audio signals via a standard Ethernet data network (24 transmit and 24 receive channels simultaneously), or the combination of both functions.

The system is 'output oriented'. It can be thought of as having 48 outputs: 24 madi channel outputs (on the rear panel), and 24 'network' outputs which are sent to the Ethernet network. Each of these 48 outputs can be set up as follows:

### **SELECT SOURCE:**

SILENCE, MADI INPUT, NETWORK INPUT, TONE1 (888HZ), or TONE2 (560Hz), (or the one of the above sources mixed with the source from the other channel of the even-odd pair, for stereo summing)

### **ADJUST LEVEL:**

OFF to +12DB in 0.25DB steps

### **ADJUST DELAY:**

0 milliseconds to 680 milliseconds (20 frames in 30fps), in 1 millisecond steps

The configuration of each output is independent, although you can select groups or all to save setup time if you are setting them all to be the same.

The unit should also be thought of as having 48 inputs: 24 madi channel inputs on the back panel, and 24 inputs from the network receivers.

### **Application Examples:**

For stand-alone delay, all outputs would be set to 'local input', and level and delay adjusted as desired. The network tx/rx would not be used.

For transmitting effects to another truck, and inserting delay in the path: The network outputs would be set to 'madi I inputs', routing the analog audio inputs to the network transmitters. Delay and level adjustment could be done as desired. The madi outputs could also be set to 'madi inputs', providing an independent local delay. Alternatively, the madi outputs could be set to 'network inputs', and these used as network receivers for audio coming back from the network.

Distribution of effects or other audio to multiple trucks could be accomplished by transmitting the audio using broadcast bundles, and receiving at each point of use. Delay and levels could all be adjusted independently at the receivers, or globally at the network transmitters.

All network receivers include SRCs, so all madi synchronization is local and independent.

## Saving and Recalling Configurations

The menu settings and the source, level, and delay settings are stored automatically after 20 seconds of panel inactivity in a 'default' flash memory. This is the memory which is restored automatically when the unit is first powered up.

You may also save configurations in three user memories. Select the desired memory by selecting Menu Item 09-11. When the 'MENU SET' button is pressed, the current configuration will be saved to the selected user memory.

To recall one of these user memories, select the desired memory by choosing menu item 12-14. When the 'MENU SET' button is pressed, all config data saved in that user memory will be recalled and immediately applied to the audio hardware.

Factory default or 'standard' configuration may be recalled by selecting menu item 15 and pressing 'MENU SET'. It may also be recalled on power up or reset by turning on options dipswitch section 1.

The factory default sets all levels to unity, all delays to zero, local output sources to net inputs, and net outputs to local inputs. All bundle numbers are set to zero.

## Dipswitch functions (Ver 1.0 firmware)

There is an Options Dipswitch located behind the front panel, accessible by removing the thumbscrews on either side of the front panel.

**Section 1** - Causes factory defaults to be loaded at power-up. Normally OFF.

**Section 2** - Unused

**Section 3** - Puts ADX2400M into 'Announce Booth Mode' when ON.

**Section 4** - Selects Low-Latency operation in Normal Mode when ON.

**Section 5** - Selects older remote control protocol for use with early ADX120/140s.

**Section 6** - Locks USER CONFIG 3 (inhibits saves to this config memory)

**Section 7** - Locks Channel Setups (level, source, delay) when ON.

**Section 8** - Locks Menu Selections when ON.



Options Dipsw ^

^ System ID Switch

^ Reset Button

## **QUICK OPERATION GUIDE - ANNOUNCE BOOTH MODE**

- **Selecting Output Channels and Assigning Sources**

Press 'OUTPUT SELECT' button, and turn knob until desired channel is selected. Repeated presses of the 'OUTPUT SELECT' button will advance the selection to the first channel of the next group of eight individual channels. The order of the channel selection is as follows:

**Madi Output Channels 1 to 8 - Microphone Outputs (A1, A2, B1, B2, etc.)**

**Madi Output Channels 9 to 16 - Talkback Outputs\***

**Madi Output Channels 17 to 24 - 4-Wire PL Port Outputs**

**Net Outputs 1 to 8 - Selected IFB Feeds to Remote Units\*\***

**Net Outputs 9 to 16 - Selected PGM Feeds to Remote Units\*\*\***

**Net Outputs 17 to 24 - Assigned PLs to Remote Units\*\*\*\***

\* Any of the 8 talkback outputs may be fed by any individual talkback buttons on the remote devices (or inputs 3 and 4 of the ADX-140), or various mixed combinations. Silence or tones may also be selected. These selections are made by selecting the desired output and pressing the 'SOURCE' button, then selecting the source with the knob.

\*\* The IFB feeds going out on the network to the remote units may be fed from any of the 8 physical IFB inputs. The selections are made using the 'SOURCE' button, as above. Any physical input may feed more than one IFB.

\*\*\* The PGM (Non-Interrupt) feeds going out on the network to the remote units may be fed from any of the 8 physical PGM inputs. The selections are made using the 'SOURCE' button, as above. Any physical input may feed more than one PGM.

\*\*\*\* Any of the PL channels at the remote devices may be assigned to any of the 4-wire ports on the back panel of the ADX-2400 by selecting Net Outputs 17 to 24, then pressing 'SOURCE'. The assignments will be made automatically for both 4-wire directions. (That's why there is no source assignment available for madi outputs 17-24). The internal 4-wire matrix takes care of all necessary mix-minus generation for the PLs automatically, so any remote device PLs assigned to the same 4-wire port will be able to talk to each other. This is similar to the 'party-line' function in the Telex Adam system, but it happens automatically.

The VU Meter and Headphone Jack, and the rear panel 'Monitor Output' XLR will follow the output selection.

- **To Adjust Level** (for current output)

The output level can be adjusted in 0.25 dB increments. Maximum gain is +12 dB. To adjust, press the 'LEVEL' button, and turn the knob.

We suggest that output levels only be adjusted in special circumstances. In most cases the levels should all be left in the Unity (0.00dB) settings.

There is no DELAY available in the Announce Booth mode.

- **To Adjust Headphone Volume**

Press the 'HP VOLUME' button, and turn the knob. The bar graph display will show the knob 'position'.

- **To Configure Menu Items**

The system has several configuration items which may be set by using the menu function. Press the 'MENU SELECT' button to enable the menu function. Turn the knob to select the desired menu item, then press the 'MENU SET' button. Turning the knob will now change the parameter for this item. When the desired selection is made, you can exit the MENU SET mode by pressing any other button. (See section on menu items below).

## **MENU ITEMS - ANNOUNCE BOOTH MODE**

### **Item 01 – REMOTE DEVICE A ID = (00-99)**

This item selects which physical remote device will appear as device A in the ADX-2400. The mic outputs of the selected device will appear as Mic A1 and A2, the IFBs will appear as IFB A1 and IFB A2, etc.

The number selected corresponds to the System ID set on the rotary switches of the remote device. 01 through 99 are valid IDs. 00 is off, and selects no remote device for Unit A.

### **Item 02 – REMOTE DEVICE B ID = (00-99)**

### **Item 03 – REMOTE DEVICE C ID = (00-99)**

### **Item 04 – REMOTE DEVICE D ID = (00-99)**

Same as above for devices B, C, and D. Note that each remote device on the network must have a unique ID number, and that a given remote device should only be assigned once; in other words don't assign the same unit to be both Unit A and Unit B.

### **Item 05 - Madi Channel Range (1-24, 33-56)**

This item selects the madi channels which will be seen as inputs to the ADX-2400M, and the madi channels which will be output by the ADX-2400M. All other madi channels in the input stream will be passed through the unit to the output stream unaltered.

### **Item 6 - Madi Input (Coax, Optical)**

Selects which physical madi input will be enabled. Both optical and coax outputs are always active regardless of this menu setting.

**(Menu Items - Continued)**

**Item 07 - GPI Mode = (Off, Master)**

For future or special application use. Should be set to 'Off' normally.

**Item 08 - GPI 1/3 Device ID = (00-99)**

**Item 09 - GPI 2/4 Device ID = (00-99)**

For future or special application use. Should be set to 'Off' normally.

**Item 10 - Save To User Config 1**

**Item 11 - Save To User Config 2**

**Item 12 - Save To User Config 3**

There are three user setup files, and these three menu items allow the current configuration to be saved to these user config files. To save configuration settings, select the appropriate item number and press 'MENU SET'. The configuration will be saved to the selected file. Menu settings and Source assignments are saved.

Note that 20 seconds after any configuration change, the current settings are automatically saved to a default configuration, which will be automatically loaded at power-up. This is separate from the User Configuration files above.

**Item 13 - Recall User Config 1**

**Item 14 - Recall User Config 2**

**Item 15 - Recall User Config 3**

Selecting one of these three items and pressing 'MENU SET' will cause the settings previously saved in the selected User Config file to be recalled.

**Item 16 - Recall Standard Config**

Pressing the 'MENU SET' button will recall a 'standard configuration'. This configuration is as follows:

Unit A ID = 01	Madi Channel Range = 1-24
Unit B ID = 02	Madi Input = Coax
Unit C ID = 03	
Unit D ID = 04	

Talkback Output 1 [Madi Out 9]	= Unit A TB 1
Talkback Output 2 [Madi Out 10]	= Unit A TB 2
Talkback Output 3 [Madi Out 11]	= Unit B TB 1
Talkback Output 4 [Madi Out 12]	= Unit B TB 2
Talkback Output 5 [Madi Out 13]	= Unit C TB 1
Talkback Output 6 [Madi Out 14]	= Unit C TB 2
Talkback Output 7 [Madi Out 15]	= Unit D TB 1
Talkback Output 8 [Madi Out 16]	= Unit D TB 2



IFB A1 = Madi Input 1 [IFB In 1]  
IFB A2 = Madi Input 2 [IFB In 2]  
IFB B1 = Madi Input 3 [IFB In 3]  
IFB B2 = Madi Input 4 [IFB In 4]  
IFB C1 = Madi Input 5 [IFB In 5]  
IFB C2 = Madi Input 6 [IFB In 6]  
IFB D1 = Madi Input 7 [IFB In 7]  
IFB D2 = Madi Input 8 [IFB In 8]

PGM A1 = Madi Input 9 [PGM In 1]  
PGM A2 = Madi Input 10 [PGM In 2]  
PGM B1 = Madi Input 11 [PGM In 3]  
PGM B2 = Madi Input 12 [PGM In 4]  
PGM C1 = Madi Input 13 [PGM In 5]  
PGM C2 = Madi Input 14 [PGM In 6]  
PGM D1 = Madi Input 15 [PGM In 7]  
PGM D2 = Madi Input 16 [PGM In 8]

PL A1 = 4-Wire Port 1 [Madi Input/Output 17]  
PL A2 = 4-Wire Port 2 [Madi Input/Output 18]  
PL B1 = 4-Wire Port 3 [Madi Input/Output 19]  
PL B2 = 4-Wire Port 4 [Madi Input/Output 20]  
PL C1 = 4-Wire Port 5 [Madi Input/Output 21]  
PL C2 = 4-Wire Port 6 [Madi Input/Output 22]  
PL D1 = 4-Wire Port 7 [Madi Input/Output 23]  
PL D2 = 4-Wire Port 8 [Madi Input/Output 24]

All Levels set to Unity [0.00 dB]

Please see the detailed Configuration section of this manual for more information.

**The following items are STATUS items, and are only to display status information. They may not be directly changed by the user.**

**Status Item 01 – Unit A RX Status (Active or Idle)**

Displays ACTIVE status if data is being received by network receiver 1. This receiver is used for audio signals coming from the remote device assigned as A.

**Status Item 02 – Unit B RX Status (Active or Idle)**

Same for receiver 2, audio signals coming from the Unit B remote device.

**Status Item 03 – Unit C RX Status (Active or Idle)**

Same for receiver 3, audio signals coming from the Unit C remote device.

**Status Item 04 – Unit D RX Status (Active or Idle)**

Same for receiver 4, audio signals coming from the Unit D remote device.

**Status Item 05 – Ext AES Reference Status (None, OK)**

Indicates status of the external (AES) reference signal. External reference must be applied for proper operation of the ADX-2400M.

**Status Item 06 –Madi Input Status (None, OK)**

Indicates the presence of a madi signal at the selected physical input (coax or optical)

**Status Item 07 – PCB Temperature ( degrees Celsius)**

Indicates temperature of sensors on main PCB. Normal temperature is in the 40-46 degree range. A high temperature indication might indicate blocked vents or a high ambient temperature, and will cause a fault message to be displayed if the temperature exceeds 55 degrees C.

**Status Item 08 – System ID (00-99)**

Displays two-digit system ID for this ADX-2400, as set by rotary switches on the sub-panel.

**Status Item 09 – Firmware Version**

Displays the version and date of the installed firmware.

## **System Configuraton In Announce Booth Mode**

Configuration of the system takes place both in the ADX-2400 and in the remote devices (ADX-120/140) themselves. This configuration is all done from the ADX-2400 front panel.

There are three catagories of configuration:

### **1. The ADX-2400 Menu Configuration**

This is where the remote devices are assigned to be Devices A, B, C, and D. The other items are to configure the madi interface, GPs, saving and recalling the configurations to/ from user memory files, and status displays.

### **2. The ADX-2400 Channel Setup**

This is where 'truck-end' routing assignments are made for the talkback outputs, IFB and Program paths, and PL ports. These assignments are made using the OUTPUT SELECT and SOURCE buttons on the ADX-2400. The LEVEL button also is available to control output levels to both the rear-panel outputs and the outputs sent to the network and thus to the remote devices. The DELAY function is not available in announce booth mode.

### **3. The Remote Device menus**

Each remote device (ADX-120/140) has an internal menu which may be accessed remotely via the ADX-2400.

These menus configure the hardware of the remote device itself, and are specific to the particular model, i.e. the ADX-120 has different options from the ADX-140 because of differences in their hardware capabilities.

These menus configure such things as preamp gain, phantom power, IFB output configurations, headset impedance (level), button color, etc.

These remote menu settings are saved in the remote devices themselves, and will remain associated with a particular device, even if it is moved or has its system ID reassigned. These settings are not stored in the ADX-2400 at the truck.

Status of many of the remote configuration items is displayed by LEDs on the remote devices (rear panel on the ADX-120s, front panel on the ADX-140s).

## **Setting System ID Switches**

The System ID switches on each unit allow the system to distinguish one unit from another. Cobranet bundle numbers and Ethernet IP addresses are automatically determined based on the System ID Switches.

The System ID switches are two-digit rotary switches on the rear panel of the ADX-120 and on the front panel of the ADX-140. The ADX-2400 also has System ID switches, which are behind the removeable front panel, on the PCB sub-panel.

The range for the switches is from 01 through 99 (00 is not a valid ID). No two devices may have the same ID number.

**Compatibility:** ADX-2400Ms with version 1.0 or later firmware may be used with earlier ADX-120s or ADX-140s by turning on Dipswitch section 5 on the 2400, and using IDs for all devices with the first (tens) digit = 0. This is provided as an emergency or interim operating mode. All remote devices should be upgraded to version 5.x as soon as practical.

The System ID settings for the ADX-120/140 units become the reference for the physical unit, and will be used in assigning those units to be A, B, C, and D designations in the ADX-2400 menus (see next page).

## **Assigning the ADX120 / ADX140 to be Units A, B, C, or D**

The announce units must first be assigned to be devices A, B, C, or D in the ADX2400 menu. To do this, press the **MENU** button once, and select config items 1, 2, 3, and 4 respectively using the knob. When the desired item is selected, press the **MENU SET** button and select the appropriate System ID number for the ADX120 or ADX140 you want to assign. Pressing either SET or MENU will take you back to the item select mode.

## **Accessing Remote Menus from the ADX-2400**

The configuration items for the ADX-120 and ADX-140 units are accessible from the front panel of the ADX-2400. To access these remote unit menus, double-click the **MENU** button on the ADX2400. The display will say: SELECT REMOTE DEVICE. The **MENU** button will be flashing to indicate that a remote device is being accessed.

The menu display will look similar to this:

```
Select Remote Device  
Unit A [01] ADX120-01
```

The number in the brackets is the System ID assigned in the ADX-2400 for Unit A (in this example). If the selected device is present on the network, its model number and System ID number will be displayed (ADX120-01 in this example).

Scroll to the desired assigned device (either A, B, C or D).

Press **MENU** again. This will access the menu of the remote device, and the menu might look like this (depending on the type of device and the selected item):

```
ADX120-01 Config Item 01  
Mic 1 Gain=45dB HR>30dB
```

The configuration and status items may be selected using the knob. Once the desired item is selected, press the **MENU SET** button to allow changing that item's settings. Settings are saved automatically after about 10 seconds of inactivity.

Press either **MENU SET** or **MENU** to go back to the item select mode.

When you're done, the easiest way out of any of the menu modes is to just press the **OUTPUT SELECT** button. This will cancel all menu modes, and you won't have to step backwards out of them.

## **ETHERNET NETWORK INFORMATION**

The Ethernet transmission uses the Cirrus Audio 'Cobranet' protocol, which is an industry standard. It is a professional, highly-reliable system which packs audio data into 'bundles' of 8 (or fewer) channels. The bundles are given numbers from 1 to 999. The first 255 are 'broadcast' bundles which can be received by any number of receivers, so long as the receiver is set to the same bundle number. The rest are 'unicast' bundles, which will only be received by one receiver at a time. More Cobranet info at: <http://www.cobranet.info/en/support/cobranet/>

There are two Audio Network ports on the rear panel of the ADX-2400. These are redundant network connections, and either may be used. If desired, a redundant network connection may be established by using the second port. If both are used, the left-hand connector will be the primary, and the right the backup. If both links are established, and one is lost, audio will continue uninterrupted.

The simplest network is simply connecting two ADX-series devices together. Note that this type of connection requires a Crossover Cable, as the ports are not auto-sensing.

Most networks are established by using standard Ethernet switch(es). The switches must support Layer 2 traffic. Each ADX unit must be connected to the switch on its own port. If multiple switches are used, it is desirable for the switches to connect to each other using gigabit Ethernet. A gigabit Ethernet link allows 700 or more audio channels to be sent in each direction. A 100base/T full duplex link allows 72 channels to be sent in each direction.

Switches with built-in fiber connectivity (SFP/GBIC) are readily available and provide a powerful, inexpensive solution to fiber transmission requirements.

It is recommended that simple hubs not be used, although they will work if total network traffic is limited to 48 channels (6 bundles total)

The **indicators** on the audio network ports provide an indication of port status, as described below:

Yellow Indicator: Steadily-lit if connector is active. (Does not indicate a link or audio transmission). Flashing indicates that this unit is the 'conductor' or sync generator for the entire audio network.

Green Indicator: Steadily-lit indicates an Ethernet link. Flashing indicates packet transmission/reception.

When audio is being transmitted, the normal condition is either:

**Yellow On, Green Flashing** (this unit not conductor)

or

**Yellow Flashing, Green Flashing** (this unit is conductor)

### **Setting Bundle Numbers (Does not apply in Announce Booth Mode)**

The 24 transmit and 24 receive audio channels in the ADX are divided into 8-channel groups. These groups are assigned to network channels or 'bundles'. There are six bundles per ADX unit, three for receive and three for transmit. Each of these bundles can be assigned a three-digit number from 000 – 999. (Note that the Cobranet system allows numbers as high as 65000, but they are limited in the ADX-2400 to 999).

- A bundle assignment of 000 is defined as inactive, and will disable this network transmitter or receiver. Audio outputs from disabled receivers will be silence.
- A bundle assignment in the range 001-255 is a Broadcast Bundle. These numbers should be used when it is desired that one transmitter be received by multiple receivers. Note that broadcast bundle data will appear on all network segments (all switch ports) and can cause network congestion if used when not required. Use broadcast bundles only when required to avoid unnecessary traffic on the network.
- A bundle assignment in the range 256-999 is a Unicast Bundle. These numbers are used for normal transmission from one transmitter to one receiver (point to point). A switch will route this traffic only to the required port and reduce unnecessary traffic on the network.

The audio transmission will usually follow the bundle assignment almost instantly, however on occasion there will be a delay of a second or two as the Cobranet hardware negotiates the connection.

### **Designing the Network (Please read this section!)**

The Cobranet technology is very powerful, and allows for very flexible system design. It is not without limits, however. It is important to have a full understanding of how the system operates to avoid network problems, and therefore to avoid audio problems.

Here are some important things to know:

- There are limits to the number of audio channels which may be present on any given network. The network connection on the rear panel of the ADX-2400 is a 100 Mbit/sec Ethernet connection. As transmitted by the ADX, each audio channel requires approximately 1 Mbit/sec of bandwidth, so each bundle (8 Channels) requires 8 Mbit/sec.
- Because of the additional control and timing data, each 100 Mbit/sec network segment can handle a maximum of 9 bundles.

- Exceeding this bandwidth limit will cause dropouts in the audio, and in severe cases may cause other problems such as sync and control problems.
- An Ethernet switch or switches, which generally form the network, can partition the traffic so that bundles only go to the receivers which are listening to them. Since each ADX frame only has four receivers, this can eliminate network traffic problems if each bundle is a unicast bundle (one transmitter to one receiver). The switch will route the traffic only to the required receiver.
- Broadcast bundles (bundle numbers 001-255) can NOT be isolated by the Ethernet switch. They will appear on ALL network segments, regardless of receivers. You should use broadcast bundles only when required, and be aware that they add to the traffic on all segments of the network.
- The bottleneck for network will usually be the receive side of the network segments connecting the ADX frames. The network segment connecting to an ADX frame will see all unicast bundles being received by that frame, plus ALL broadcast bundles on the network. This total number of bundles can not exceed 9 (8 is better). (This number does not include bundles being transmitted by this frame).

The broadcast bundles are a very powerful feature, in that they allow very convenient and inexpensive distribution of lots of audio signals. Using broadcast bundles can really clog up the network, however, so be aware of the tradeoffs, and use them only when required.

If the network traffic becomes too heavy, and audio packets are being dropped, the ADX front panel buttons will flash, and a "NETWORK ERRORS" warning message will be displayed.

Some other things to know about the network operation:

- Because of the way Ethernet works, the ADX frames can not see their own transmissions. This means that if you dial a transmitter and receiver (in the same ADX unit) up to the same bundle number, the transmitted audio will NOT appear on the receiver outputs. Select 'local' as the source instead.
- Only one ADX receiver can listen to a given unicast bundle. If you assign two receivers to the same unicast bundle, only the first will output audio. Broadcast bundles can be repeated on multiple receivers, either in separate frames or in the same frame (for multiple copies of the same audio).
- All audio on the network is 20-bit uncompressed. It takes a fixed amount of bandwidth, regardless of the audio content.

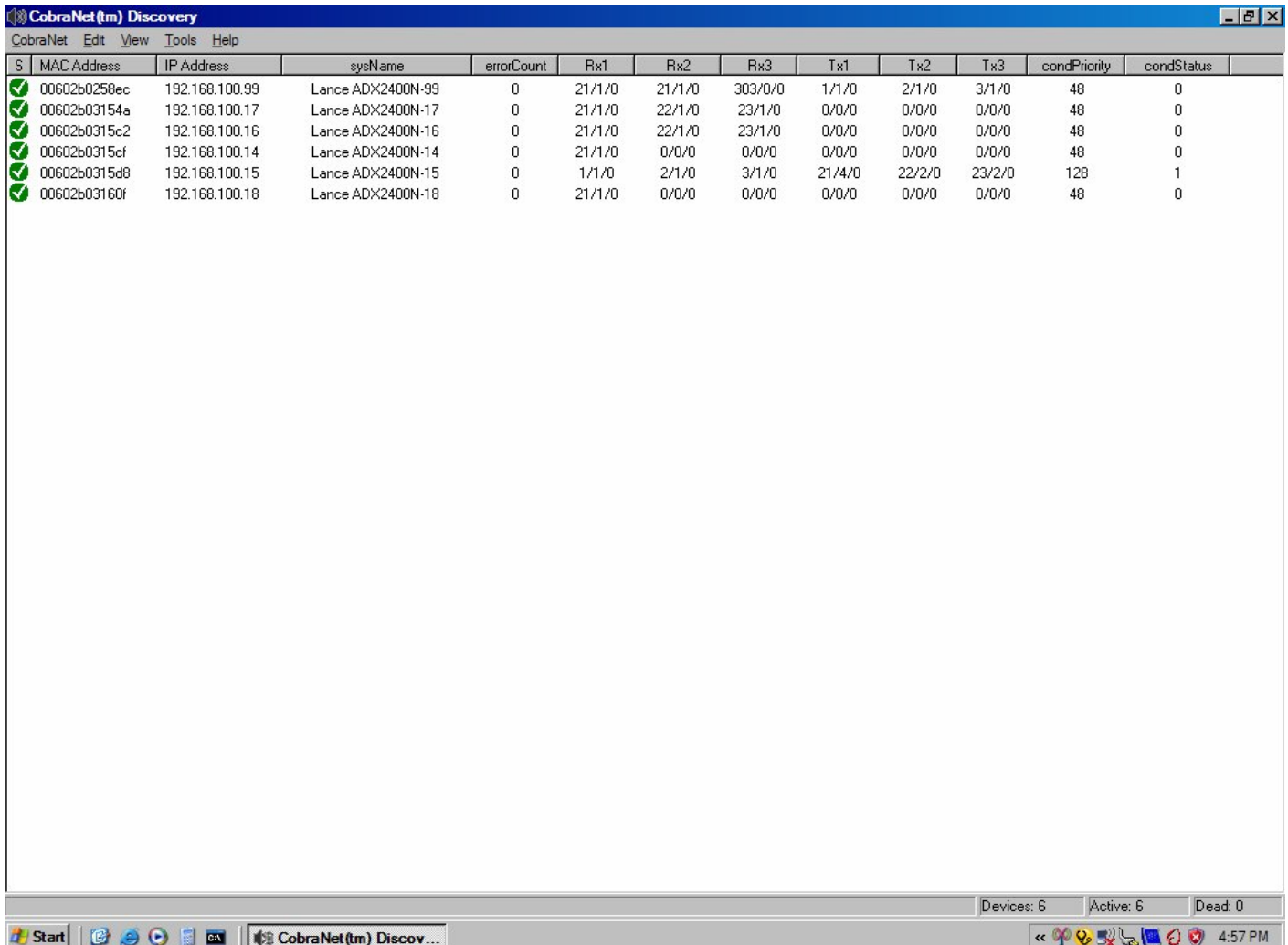


## Cobranet 'Discovery' PC Application

Cirrus Logic, the developers of Cobranet, make available on their website a nice PC application called 'Cobranet Discovery', or 'Disco'. It can be downloaded and installed on any PC running Windows XP. It allows the computer to be attached to the audio network and provides a variety of information about the attached network devices. Documentation is available on their website: [www.cobranet.info](http://www.cobranet.info), or at [www.lancedesign.com](http://www.lancedesign.com).

The PC TCP/IP network properties must be set for a fixed IP address (not DHCP), and a subnet mask. The firmware in the ADX-2400s sets their IP addresses to 192.168.100.xx, where xx is the System ID, set by the rotary switches on the PCB behind the front panel.

I recommend setting the PC IP Address to 192.168.100.200, although any number 001 to 254 is fine for the last octet provided the address doesn't conflict with the addresses of any ADX-2400s on the network. The subnet mask should be set to 255.255.255.0.



The screenshot shows the CobraNet(tm) Discovery application window. The window title is "CobraNet(tm) Discovery" and it has a menu bar with "CobraNet", "Edit", "View", "Tools", and "Help". The main area contains a table with the following columns: S, MAC Address, IP Address, sysName, errorCount, Rx1, Rx2, Rx3, Tx1, Tx2, Tx3, condPriority, and condStatus. There are six rows of data, each with a green checkmark in the 'S' column. The status bar at the bottom right shows "Devices: 6", "Active: 6", and "Dead: 0". The Windows taskbar at the bottom shows the Start button, several icons, and the system clock at 4:57 PM.

S	MAC Address	IP Address	sysName	errorCount	Rx1	Rx2	Rx3	Tx1	Tx2	Tx3	condPriority	condStatus
✓	00602b0258ec	192.168.100.99	Lance ADX2400N-99	0	21/1/0	21/1/0	303/0/0	1/1/0	2/1/0	3/1/0	48	0
✓	00602b03154a	192.168.100.17	Lance ADX2400N-17	0	21/1/0	22/1/0	23/1/0	0/0/0	0/0/0	0/0/0	48	0
✓	00602b0315c2	192.168.100.16	Lance ADX2400N-16	0	21/1/0	22/1/0	23/1/0	0/0/0	0/0/0	0/0/0	48	0
✓	00602b0315cf	192.168.100.14	Lance ADX2400N-14	0	21/1/0	0/0/0	0/0/0	0/0/0	0/0/0	0/0/0	48	0
✓	00602b0315d8	192.168.100.15	Lance ADX2400N-15	0	1/1/0	2/1/0	3/1/0	21/4/0	22/2/0	23/2/0	128	1
✓	00602b03160f	192.168.100.18	Lance ADX2400N-18	0	21/1/0	0/0/0	0/0/0	0/0/0	0/0/0	0/0/0	48	0

## Installation

The ADX-2400M is designed to be installed in a standard 19" equipment rack.

The unit is designed to operate on 100-240 volts AC, 50 or 60 Hz. The power supplies are wide-range switching supplies, so no voltage selection needs to be made.

Power consumption is approximately 10 watts.

The Madi Coax Input is a 75-ohm terminated BNC connector. The madi stream should be 64 channels, 48KHz sampling rate. There is an adaptive equalizer on the coax input which will provide proper equalization for up to 300 feet of standard video cable. This input is active when the madi input is set to 'coax' in the menu.

The Madi Coax Output is a source-terminated 75-ohm BNC output, with a p-p amplitude of approximately 800mv peak-to-peak. It is active regardless of the madi input selected.

The Madi Optical I/O is provided on a standard SFP module. The module can be selected to match system requirements; multi-mode, single-mode, bidirectional, etc. The output is always active, and the input is active when 'Optical' is selected in the menu.

The AES Reference Input is a 75-ohm terminated BNC input, requiring nominally 1 volt p-p. The applied signal should be AES Silence, Tone, or other AES signal. The input is not designed to accept 48-Khz word clock. The madi inputs must be locked to this reference, and the output madi stream will be locked to this reference.

The Ethernet 'Audio Network' ports (one or both) should be connected to the network with standard CAT5 RJ-45 cables, following normal IT practice. The ports are 100/baseT Ethernet. The connectors on the ADX-2400 are wired with the same pinout as normal PC ports, and are not auto direction sensing. If connecting two units together without a switch, a crossover cable must be used.

It is not possible to 'daisy-chain' units together. The two ports do not function as 'loop-through'. Each unit should be connected to a separate switch port.

The maximum length for 100/baseT Ethernet on copper is 100 meters. For longer runs there must be a repeater (switch) or media converter (fiber) in the path. See the Cobranet website ([www.cobranet.info](http://www.cobranet.info)) for more information.

## **Reliability Considerations**

Since on-air audio is often handled by the ADX systems, reliability is of primary concern. The ADX-series products are designed with highest-quality components and conservative ratings so as to be as reliable as possible.

In addition, after manufacture, the ADX products undergo an extensive burn-in process which includes power and thermal cycling to attempt to precipitate out any early-life failures.

Even with these precautions failures are not impossible, and in addition there are other components to the system such as Ethernet switches which must also be considered in evaluating the overall reliability question.

Here are some thoughts on insuring a reliable on-air system:

- Provide a spare announce box and headset. This practice has been going on for decades with analog systems, and it's still a good idea. It protects against failure of the ADX-120 and the headset.
- Use the ADX-8000 Switch with redundant power supplies for both the switch and the ADX-120s and ADX-140s. The ADX-8000 also supports fiber trunking for redundant links.
- Insure a reliable AC power source in the remote location for the ADX units and for the Ethernet switch. If there is any question about the reliability of the AC supply you might consider using a small UPS power supply to provide battery backup. A small 500 watt unit intended for personal computer use will provide a half-hour of typical operation in the event of power failure.
- Use reliable Ethernet hardware such as switches, fiber GBICs, etc. Burn in new switches for a few days before putting them on the air. Keep all Ethernet cables and fiber in good condition.
- Many switches have two or more fiber ports available. If the switches support 'trunking' or 'port aggregation' and most do, two fiber runs could be connected between switches, thus protecting against fiber and GBIC failure.
- Consider using standard IT methods for providing a fault-tolerant network, if practical and warranted. Redundant switches and parallel networks may be used. ADX-120s and ADX-140s with version 5.0 or later firmware include a sophisticated method of selecting the active ethernet connection based on both link status and the presence of audio packets. Contact Lance Design for more information.

## Madi Inputs and Outputs in Announce Booth Mode

<u>Low Range</u>	<u>High-Range</u>		
<b><u>Outputs:</u></b>	<b><u>Outputs:</u></b>		
Out 1	Out 33	Mic A1 Out	(ADX120 Hdst Mic; ADX140 Input 1)
Out 2	Out 34	Mic A2 Out	(ADX120 Rear Panel; ADX140 Input 2)
Out 3	Out 35	Mic B1 Out	
Out 4	Out 36	Mic B2 Out	
Out 5	Out 37	Mic C1 Out	
Out 6	Out 38	Mic C2 Out	
Out 7	Out 39	Mic D1 Out	
Out 8	Out 40	Mic D2 Out	
Out 9	Out 41	Talkback Output 1	(Talkback source or mix may be selected for each talkback output.)
Out 10	Out 42	Talkback Output 2	
Out 11	Out 43	Talkback Output 3	
Out 12	Out 44	Talkback Output 4	
Out 13	Out 45	Talkback Output 5	
Out 14	Out 46	Talkback Output 6	
Out 15	Out 47	Talkback Output 7	
Out 16	Out 48	Talkback Output 8	
Out 17	Out 49	4-Wire PL Port 1 Out	(Each ADX120/140 PL Channel may be assigned to any of the eight 4W ports.)
Out 18	Out 50	4-Wire PL Port 2 Out	
Out 19	Out 51	4-Wire PL Port 3 Out	
Out 20	Out 52	4-Wire PL Port 4 Out	
Out 21	Out 53	4-Wire PL Port 5 Out	
Out 22	Out 54	4-Wire PL Port 6 Out	
Out 23	Out 55	4-Wire PL Port 7 Out	
Out 24	Out 56	4-Wire PL Port 8 Out	
<b><u>Low Range</u></b>	<b><u>High-Range</u></b>		
<b><u>Inputs:</u></b>	<b><u>Inputs:</u></b>		
Input 1	Input 33	IFB In 1	(Each ADX120/140 IFB output may be fed from any of the eight IFB input channels.)
Input 2	Input 34	IFB In 2	
Input 3	Input 35	IFB In 3	
Input 4	Input 36	IFB In 4	
Input 5	Input 37	IFB In 5	
Input 6	Input 38	IFB In 6	
Input 7	Input 39	IFB In 7	
Input 8	Input 40	IFB In 8	
Input 9	Input 41	PGM In 1	(Each ADX120/140 PGM output may be fed from any of the eight PGM input channels.)
Input 10	Input 42	PGM In 2	
Input 11	Input 43	PGM In 3	
Input 12	Input 44	PGM In 4	
Input 13	Input 45	PGM In 5	
Input 14	Input 46	PGM In 6	
Input 15	Input 47	PGM In 7	
Input 16	Input 48	PGM In 8	
Input 17	Input 49	4-Wire PL Port 1 In	(Input side of 4W PL Interface.)
Input 18	Input 50	4-Wire PL Port 2 In	
Input 19	Input 51	4-Wire PL Port 3 In	
Input 20	Input 52	4-Wire PL Port 4 In	
Input 21	Input 53	4-Wire PL Port 5 In	
Input 22	Input 54	4-Wire PL Port 6 In	
Input 23	Input 55	4-Wire PL Port 7 In	
Input 24	Input 56	4-Wire PL Port 8 In	

### **Remote Control Connector Pinout**

#### **Connector is RJ-45 Female**

Pin #	Function
1	GPI 1
2	GPI 2
3	+5 Volts
4	Ground
5	RS232 Data In (RX)
6	RS232 Data Out (TX)
7	GPI 3
8	GPI 4

GPIs used as inputs are TTL-compatible, pulled up to +5 volts with a 5K resistor. They should be pulled to ground with a dry switch closure or O.C. transistor to activate

GPIs used as outputs are open-collector transistors with a 5K pull-up resistor to +5 volts. These transistors pull to ground when the GPI is active. Current should not exceed 200 Ma.

When ADX-2400 is in Master GPI mode, GPIs 1 and 2 are outputs, and GPIs 3 and 4 are inputs.

## **ADX-2400M Specifications**

Local Input Channels	24 channels from 64-channel MADi stream. Coax or Optical
Local Output Channels	24 channels in 64-channel MADi stream. Coax and Optical
AES Reference Input	AES Silence or other AES signal. BNC connector, 75-ohm, 1v p-p
Sample Rate	48 KHz
Input Phase Requirements	None. Madi must be frequency-locked, but in any phase
Sample Rate Converters	Highest-quality AD1895. Converters to and from network.
Coax Output	75 Ohm BNC, AES-10, 800 millivolts p-p nominal
Coax Input	75 Ohms BNC, Adaptive Equalizer to 300 feet. 64-ch/48KHz
Optical I/O	Industry-Standard SFP Module
Cobranet Transmission	20-bit uncompressed
Internal Processing & Madi	48 kHz, 24-bit, Madi is 64 channel AES-10
Adjustable Delay Range	0 milliseconds to 680 milliseconds (>20 frames at 30 fps)
Madi Delay (Input to Output)	nominally 4 sample periods (approx 80 microseconds)
Delay (through Ethernet)	7milliseconds in standard mode, 2.8ms in low-latency mode
Headphone Jack	1/4" TRS (Stereo) follows Output selection, Low impedance
Monitor Output	XLR Male, +4dBm Balanced. 0.006% Distortion
Remote Control	GPI and RS-232 for special applications. Contact Lance Design
VU Meter	Conventional VU ballistics (300ms), -20 to +3.5 dB scale, follows Output selection. Scale mark at 0 VU.
Display	2x24 VFD
Power Requirements	100 - 240 Volts AC, 50-60 Hz, 10 Watts