LANCe DESIGN

ADX-2400M-DANTE

DANTE NETWORK INTERFACE

(MADI Digital I/O)

Installation and Operation Manual

Software Version 1.0

January 2017

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

GENERAL DESCRIPTION

The Lance Design ADX-2400M Dante Network Interface provides the interface between a standard MADI input and output stream and a Dante-based Ethernet network.

In addition it contains flexible DSP functionality to provide routing, signal generation, level control, delay and mixing capabilities.

The local inputs and outputs are standard 64-channel MADI, using either optical or coax formats. The 24 channels of the ADX-2400M may be mapped to MADI channels 1-24 or 33-56, allowing two ADX-2400M units to be placed in series on a single MADI stream.

The ADX-2400M provides a Dante interface for 24 channels in each direction, to and from the network. This network interface is compatible with any Dante-enabled devices, and is ideal for providing the head end for ADX-120 Announce Units and ADX-140 XLR Interface Panels.

The ADX-2400M also provides convienent remote control of ADX-120 and ADX-140 units, allowing adjustment of remote device parameters such as preamp gain, IFB configuration, etc.

There is also a very high quality analog (+4dBm, balanced) monitor output, a headphone jack and a front panel VU meter, which all follow the selected output channel. These, along with the built-in tone generators allow fast and convienent testing and confirmation of circuit continuity and routing.

OPERATING MODES

The ADX-2400M may be operated in two different modes, which share many features but have a few differences as outlined below.

	DELAY	MIXERS	PL MATRIX
NORMAL MODE	48 CHANNELS	NONE	NONE
ANNOUNCE BOOTH MODE	NONE	NET RX 9-16	NET RX/TX 17-24

Selection of the operating mode is determined by Options Dipswitch (behind front panel) section 3. Set this switch off for Normal Mode, and on for Announce Booth Mode.

Note that the 'Normal' mode is somewhat of a legacy mode, and unless you require the delay functions we suggest that you use the 'Announce Booth Mode'. This mode is enabled when the ADX-2400M is shipped.

QUICK OPERATION GUIDE - ANNOUNCE BOOTH MODE

- **Selecting Output Channels**

  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.

  There are 48 outputs: the 24 MADI output channels (either 1-24 or 33-56), and the 24 network transmitter channels that place audio on the Dante Network.

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

- **Selecting the Source (for the current output)**

  The selected output may be fed from a variety of sources. The choices for most outputs are:
  - Silence
  - Madi Input (the corresponding MADI input channel)
  - Net RX (the network receiver for this channel)
  - 888 Hz Tone
  - 560 Hz Tone

  In addition, MADI outputs 9-16 (or 41-48) can chose mixes of Net receivers 9-16. The purpose of these mixers is to allow internal mixing of talkback or other signals without relying on an external mixer. Their use is completely optional.

  The source selections for Net Outputs 17-24 are special in that they control the PL matrix. These source selections roughly equate to the familiar two-wire 'thumbwheel' selectors used to assign beltpacks to PL channels. The local madi inputs and outputs 17-24 are four-wire PL channels, and the source selections on Net Outputs 17-24 assign network PL devices to these four-wire ports.

  A standard straight-diagonal configuration may be established by recalling the "Standard Config" from the menu. This routes all net receivers to their corresponding MADI outputs, and all MADI inputs to their corresponding net transmitters.

- **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.

- **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 a few configuration items which may be set by using the menu function. Press the 'MENU' 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 following section on menu items).

    In addition, the MENU and MENU SET buttons are used to control the remote device (ADX-120 and ADX-140) menus for such things as preamp gain, IFB config, etc.

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

    To access these remote device 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
    ID=01  ADX120-01
    ```

    Use the knob to select the desired remote device. If there is no device displayed to the right of the ID number, then there is no active device at this ID.

    When the desired device is selected, 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
    ```

    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 setting. 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.

MENU ITEMS - ANNOUNCE BOOTH MODE

- **Item 01 - 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 02 - 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 03 - GPI Mode = (Off, Master)**
  For future or special application use. Should be set to 'Off' normally.

- **Item 04 - GPI 1/3 Device ID = (00-99)**
  For future or special application use. Should be set to '00' normally.

- **Item 05 - GPI 2/4 Device ID = (00-99)**
  For future or special application use. Should be set to '00' normally.

- **Item 06 - Save To User Config 1**

- **Item 07 - Save To User Config 2**

- **Item 08 - 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 09 - Recall User Config 1**

- **Item 10 - Recall User Config 2**

- **Item 11 - 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 12 - Recall Standard Config**
  Pressing the 'MENU SET' button will recall a 'standard configuration'. This configuration is as follows:

  MADI Channel Range = 1-24
  MADI Input = Coax
  GPI Mode = Off

  All MADI outputs set to corresponding Net receive channels (diagonal)
  All Net Transmitters set to corresponding MADI input channels

  All Levels set to Unity [0.00 dB], and Delays set to 0.

  The following items are status only and may not be changed by the user

- **Status Item 01 – 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 02 –Madi Input Status (None, OK)**
  Indicates the presence of a madi signal at the selected physical input (coax or optical)

- **Status Item 03 – 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 04 – System ID (00-99)**
  Displays two-digit system ID for this ADX-2400, as set by rotary switches on the sub-panel.

- **Status Item 05 – Firmware Version**
  Displays the version of the installed firmware.

ROUTING THE DANTE NETWORK

The Dante network protocol is very flexible in that channel-by-channel routing between devices may be done on the network. Each Dante-enabled device will have a number of inputs from and outputs to the network which may be routed to/from other devices.

This routing is accomplished by using a Windows or Mac based application provided by Audinate/Dante called 'Dante Controller'.

It is available here for various operating systems:

https://www.audinate.com/products/software/dante-controller

Dante Controller allows extensive routing and monitoring of Dante devices, and is quite easy to use and self-explanatory. There are also some tutorials on this website.

The ADX-2400M has 24 network inputs (receivers) and 24 network outputs (transmitters).

The last eight (17-24) transmitters and receivers are routed through the PL matrix in the ADX-2400M, and can combine networked PL devices into up to eight PL 'channels' that appear in the MADI input and output streams. You could, for example, assign eight networked PL channels to a single MADI channel (in and out). The appropriate mix-minus feeds are generated automatically in the ADX-2400M.

This essentially replicates the familiar 'thumbwheel' functionality of two-wire systems.

MADI outputs 9-16 (or 41-48 if high MADI bank is selected) can be fed by mixes of network receivers 9-16. These mixers can be used to mix down multiple talkback feeds without using a separate mixer, for example, or for other purposes.

Both the PL matrix and the mixers may be ignored and the channels used simply as additional network ins and outs if desired.

SYNCRONIZATION CONSIDERATIONS

The ADX-2400M must by syncronized to the local MADI environment by applying a locked AES signal to its reference input.

There is no requirement that this reference be syncronous to the Dante network, as there are sample rate converters on both sides of the Dante interface.

SAVING AND RECALLING ADX-2400 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 06-08. 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 chosing menu item 09-11. 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 12 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.

Note that these memories do not store remote device configurations. They are stored in the remote devices themselves.

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 - Unused
Section 5 - Unused
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

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 'Audio Network' ports (Dante ports) are 1000/100baseT copper Ethernet ports. One of these ports should be connected to a gigabit switch or media converter to provide a gigabit fiber link to the announce booth or other locations.

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 SFPs, 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. Redundant fiber runs may be used by employing trunking (link aggregation) or the ADX-8000 A/B mode. See the ADX-8000 manual for more information.

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, 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.
MADI Coax Output	75 Ohm BNC, AES-10, 800 millivolts p-p nominal
MADI Coax Input	75 Ohms BNC, Adaptive Equalizer to 300 feet. 64-ch/48KHz
MADI Optical I/O	Industry-Standard SFP Module
Dante Transmission	24-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)	1.5 milliseconds typical analog in to MADI out
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 Character VFD
Power Requirements	100 - 240 Volts AC, 50-60 Hz, 10 Watts