ADX-140

NETWORKED AUDIO INTERFACE UNIT

(DANTE VERSION)

Installation and Operation Manual

Firmware 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.

ADX-140 Interface Unit Front Panel View

GENERAL DESCRIPTION

The ADX-140 Interface Unit provides the 'field end' connections for many of the common audio and communications requirements for live sports and other broadcast applications, with all transmission to and from the mobile unit or studio control room taking place via standard Ethernet.

It is intended to be used with a Lance Design ADX-2400 providing the 'truck end' interface. All configuration of the ADX-140 hardware is done via remote control from the ADX-2400 front panel. Other third-party Dante-compatible hardware may also be used with the ADX-140.

INPUTS

The ADX-140 provides four XLR female connectors for inputting microphone or line-level signals. Each input is equipped with a very high quality microphone preamp with remote gain control. Phantom power is also available. An LED indicator adjacent to each XLR indicates phantom power or line-in mode.

IFB OUTPUTS

The ADX-140 provides two IFB outputs on male XLR connectors. These can be configured to be 2-channel wet (RTS-format) outputs, or +4 dBv balanced dry outputs. In the dry output mode, either the ifb signal or the program (non-interrupt) signal may be selected. In these modes these outputs may be used for SA speakers, or other line-level transmission functions. The audio quality is extremely high, making them suitable for on-air, program quality transmission.

An additional special option is to output a line-level direct output of the Mic 1 and Mic 2 preamps. This could be useful in special circumstances where an analog backup of a microphone signal is desired.

PL (INTERCOM) CONNECTIONS

The ADX-140 provides a high-quality interface for two channels of RTS-format TW (wet) intercom. The ADX-140 provides power supplies and four-wire to two-wire conversion internally, so no additional hardware is required. The PL connections are available on three male XLR connectors. The first combines PL channel 1 and PL channel 2 in the traditional RTS two-channel configuration. The other two channels provide one channel of wet PL and one channel of program (non-interrupt) audio. This prevents having to use a PL channel just to provide program audio on the second channel of the beltpacks.

Each IFB and PL power supply is individually protected for shorts and overloads, with a front panel indication of these conditions. The PL supplies can supply current for up to three beltpacks on PL 1 or PL 2. The IFB supplies can supply current for two beltpacks each. ***The total number of beltpacks (PL and IFB combined) should not exceed 6 per ADX-140.***

Special care has been taken in the design of the PL sections. The hybrids (two-wire to four-wire conversion) are carefully designed to provide good bandwidth and noise performance, as well as a high level of trans-hybrid loss. In addition there are noise gates implemented in the dsp to provide additional quieting. Because the long-distance portions of the intercom are transmitted via a digital path and in four-wire format, the PL performance far exceeds what is typically achieved with two-wire systems in terms of response, noise, distortion, headroom, etc.

TALKBACK OPERATION

The ADX-140 provides the option of using external talent talkback switches (handheld switches or foot switches). These may be connected via the remote connector, and enabled via menu item 15 (GPI enable). When talkback GPI 1 is activated, MIC 1 is muted, and the mic 1 audio is routed to the MIC 3 (TB1) path. GPI 2 provides the same function for MIC 2 via the MIC 4 (TB2) path.

See the REMOTE pinout on page 17 for connection information.

POWER

The ADX-140 may be powered in either of two ways: There is a wide-range AC input on the rear panel (95-250 Volts, 50/60 Hz), or the unit may be powered via the Cat5 Ethernet cable from an ADX-8000 switch/power supply.

Both methods may be used simultaneously if desired to provide redundancy.

System Overview

The ADX announce system consists of the following elements:

- One or more ADX-2400 frames which serve as the 'head end' or truck end of the system, and provide all inputs and and outputs for the truck or control room. These units are available with analog, AES, or MADI I/O.

- One or more ADX-120 Announce Boxes or ADX-140 Interface Frames which function as the remote units in the booth or other remote location.

- ADX-8000 or other 48-volt power supplies as required to power the ADX-120 units. The ADX-140 and the ADX-2400 have internal AC-operated supplies, although the ADX-140 may also be powered over the CAT5 cable from an external 48-volt supply (such as the ADX-8000).

- Other network infrastructure as required, consisting of standard Ethernet switches, fiber optic elements, media converters, fiber and copper interconnects, etc.

Each ADX-2400 unit provides 24 receive channels and 24 transmit channels. These channels may be used in any way desired by the user, and routing is controlled by the Audinate "Dante Controller" application running on Windows or Mac. This application may be obtained from the Audinate website:

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

Once the application is installed, connect the computer to the Dante network and run the application. All of the Dante devices on the network should be visable, and can be routed as desired. Routing configurations are stored in each unit, and overall system configurations may be stored as files using Dante Controller.

The remote devices are identified by the ADX-2400s by a **SYSTEM ID** number, which is set by a two-digit rotary switch on the remote device (rear panel of the ADX-120, front panel of the ADX-140). **Each remote device must be set to a unique system ID (01-99)**.

This system ID number allows the ADX-2400 to identify and communicate with each remote device (ADX-120 or ADX-140). This provides a positive identity regardless of any user-friendly Dante name which might be assigned to the unit.

The ADX-2400 allows remote control of all remote device setup functions from its front panel. These include things like preamp gains, IFB configurations and button colors, as well as return of several status items such as temperature, PL voltage and current, etc. The descriptions of the menu items later in this manual describe these remote control functions in more detail.

ADX-140 Network (Dante) Input and Output Channels

These are the signal names which will appear in the Dante Controller application. There are six network inputs and six network outputs.

Network Outputs (Transmitted to the Network)

- **INPUT 1** - XLR Mic/Line Input 1
- **INPUT 2** - XLR Mic/Line Input 2
- **INPUT 3** - XLR Mic/Line Input 3
- **INPUT 4** - XLR Mic/Line Input 4
- **PL 1 TX** - The talk side of the wet PL, channel 1
- **PL 2 TX** - The talk side of the wet PL, channel 2

Network Inputs (Received from the network)

- **IFB 1** - The interrupt side of the XLR labled IFB 1
- **PGM 1** - The non-interrupt side of the IFB 1 XLR, and Ch2 of PL1/PGM1
- **IFB 2** - The interrupt side of the XLR labled IFB 2
- **PGM 2** - The non-interrupt side of the IFB 2 XLR, and Ch2 of PL2/PGM2
- **PL 1 RX** - The listen side of the wet PL, channel 1
- **PL 2 RX** - The listen side of the wet PL, channel 2

Note that any of the inputs or outputs may be left unused. Only the signals required for a particular application need be routed.

Use the 'Dante Controller' application from Audinate to route the audio signals to and from other Dante devices as desired. Dante Controller is available from:

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

Front Panel Indicators

There are several LED indicators on the front panel, which indicate various conditions, listed below.

Mic/Line Input LEDs

Off	Mic Input, No Phantom
Green	Mic Input, Phantom Power On
Yellow	Line Input (Phantom Pwr Disabled)

IFB and PL LEDs

Off	No DC Present (IFB set for dry output)
Green	Normal Condition - DC present
Flashing Yellow	DC Overload Condition

Sys (System) LED

Green	Normal, No Faults
Flashing Green	Menu item changed, Flash write pending
Yellow	Test Mode (Internal Dipswitch)
Flashing Yellow	Bootup Sequence underway, or Fault Condition* *Faults are either DC overload on any of the IFB or PL ports.

Audio Link LED

Off	No network connection to ADX-2400 headend.
Green	Connected to ADX-2400. (This does not necessarily indicate that any audio channels are routed.)

Power LED

Off	ADX-140 is not powered
Green	Normal, Power OK
Yellow	Boot-up in progress ('standby')

The Mobile Unit End

ADX-2400 Front Panel

The ADX-140 Commentator Units typically connect via fiber to an ethernet switch in the mobile unit, and via that path to an ADX-2400 Network Interface, which provides the headend for the system. Other Dante devices such as mixing consoles may also be connected to this switch.

The ADX-2400s provide a Dante interface to the mobile unit, as well as remote control of the ADX-120s and ADX-140s in the field.

Each ADX-2400 provides 24 network receive channels and 24 network transmit channels. When the ADX-2400 option dip switch section #3 is turned on, the ADX-2400 is in the 'announce booth mode', which provides some mixing options on network receive channels 9-16, and a PL matrix on network receive and transmit channels 17-24. The delay function is also disabled.

Each output, whether a local output or a network output may have its source chosen from the selections available when the SOURCE button is pressed. Note that this is not Dante network routing, but selection of internal local sources (local input, net receiver, tones, silence, perhaps mixers, etc.)

The channel 9-16 mixer options allow any or all of these channels to be mixed down to one or more outputs. This may be useful for mixing talkback signals without using an external mixer.

The PL Matrix functions somewhat like the familiar 'Thumbwheel' panels for two-wire intercoms, in that it allows each pair of of TX/RX channels in the range 17-24 to be assigned to a particular local (four-wire) channel. These selections are made by selecting an output in the range NET 17 to NET 24 and pressing the SOURCE button. The desired PL channel selection may then be made. This selection automatically assigns both the talk (TX) and listen (RX) sides of the PL.

All outputs and levels may be reset to a standard configuration by pressing the MENU button, selecting 'Recall Standard Config', and pressing the MENU SET button.

Front panel metering and headphone monitoring is available for all outputs.

See the appropriate ADX-2400 manual for more detailed information.

Remote Control

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.

- Microphone preamp gains for all mic preamps.
- Selection of mic or line input mode for all four inputs
- Selection of phantom power for each mic
- Selection of wet or dry mode and source for IFB 1 and IFB 2
- Status reporting of PL and IFB currents and voltages, temperature, and ethernet port status.

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.

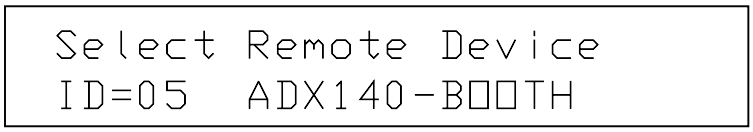
Status of many of the remote configuration items is displayed by LEDs on the remote devices (rear panel on the ADX-120s, front panel on the ADX-140s).

Accessing Remote Menus from the ADX-2400

The configuration items for the ADX-120 and ADX-140 units are accessable from the front panel of the ADX-2400.

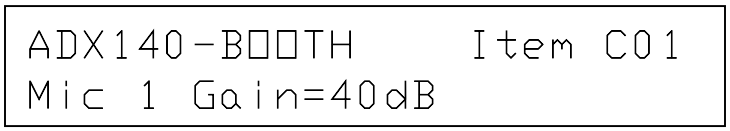
To access these remote unit menus, double-click the **MENU** button on the ADX2400. The display will say: SELECT REMOTE DEVICE. The **MENU** button will be flashing to indicate that a remote device is being accessed.

The menu display will look similar to this:



Use the knob to select the desired remote device. If there is no name displayed to the right of the ID number, then there is no active device at this ID. The name displayed will be the user-friendly Dante name (see page 14).

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):



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.

ADX-140 Remote Menu Items

The ADX-140 menu items for firmware version 1.0 are listed below.

Config Item 01 – Mic 1 Gain (25-70dB)

Config Item 02 – Mic 2 Gain (25-70dB)

Config Item 03 – Mic 3 Gain (25-70dB)

Config Item 04 – Mic 4 Gain (25-70dB)

These are the preamp gains for microphone inputs 1-4. They would typically run around 40 or 45 dB for normal sports use. Note that if the channel is in the 'line in' mode, the preamp gain will not be displayed. Instead there will be a message indicating that the channel is in 'line in'. The gain will be fixed for unity-level transmission.

Config Item 05 – Channel 1 Input (Mic or Line)

Config Item 06 – Channel 2 Input (Mic or Line)

Config Item 07 – Channel 3 Input (Mic or Line)

Config Item 08 – Channel 4 Input (Mic or Line)

These select either mic or line input mode for the input channel. The nominal 0VU level is +4dBm. Line input mode is indicated by a yellow LED adjacent to the XLR input connector.

Config Item 09 – Mic 1 Phantom (On / Off)

Config Item 10 – Mic 2 Phantom (On / Off)

Config Item 11 – Mic 3 Phantom (On / Off)

Config Item 12 – Mic 4 Phantom (On / Off)

Turn on phantom power for Mics 1-4. Indicated by a green LED adjacent to the XLR. Phantom power is automatically turned off if line in mode is selected.

Config Item 13 – IFB 1 Mode

Controls the signal routing for the IFB 1 XLR output. The selections are as follows:

Wet 2 Ch - Configured as 2-ch RTS-format. IFB1 on Ch1, PGM1 on Ch2.
Dry - IFB - Configured as dry balanced +4 output of IFB 1.
Dry - PGM - Configured as dry balanced +4 output of PGM 1.
Dry - Mic 1 - Configured as dry balanced +4 output of Mic 1

Config Item 14 – IFB 2 Mode

Configures the IFB 2 output. The selections are as follows:

Wet 2 Ch	-	Configured as 2-ch RTS-format. IFB2 on Ch1, PGM2 on Ch2.
Dry - IFB	-	Configured as dry balanced +4 output of IFB 2.
Dry - PGM	-	Configured as dry balanced +4 output of PGM 2.
Dry - Mic 2	-	Configured as dry balanced +4 output of Mic 2

Config Item 15 – GPI Inputs (Disabled / Enabled)

Enables operation of the three GPI inputs on the remote connector (D9 connector). GPI 1 enables a talkback function from Mic 1, using the Mic 3 path. GPI 2 enables a talkback function from Mic 2, using the Mic 4 path. GPI 3 has no function at this time.

The remaining menu items are status items

Status Item 01 – PCB Temperature

This item displays internal temperature of the ADX-140 in degrees Centigrade. Nominal temperature is in the 35 - 45 degree range, depending on ambient and PL and IFB loading. Temperatures above 55 degrees are cause for concern and operating conditions should be investigated.

Status Item 02 – PL1 Current

DC Current drawn by the external PL beltpacks powered by PL1. This load represents beltpacks plugged into the "PL1/PL2" connector or the "PL1/PGM1" connector.

Status Item 03 – PL1 Voltage

DC Voltage of PL1 power supply. Nominally 25 volts.

Status Item 04 – PL2 Current

DC Current drawn by the external PL beltpacks powered by PL2. This load represents beltpacks plugged into the "PL2/PGM2" connector.

Status Item 05 – PL2 Voltage

DC Voltage of PL2 power supply. Nominally 25 volts.

Status Item 06 – IFB1 Current

DC Current drawn by the external IFB beltpacks powered by the 'IFB1' connector. This should be less than 100 milliamps. The IFB power supply will go into a shutdown condition if current is greater than 140 ma.

Status Item 07 – IFB1 Voltage

DC Voltage of IFB 1 power supply. Nominally 25 volts. Note that if a dry mode is selected for IFB 1, the power supply will be turned off and voltage and current will read zero.

Status Item 08 – IFB2 Current

DC Current drawn by the external IFB beltpacks powered by the 'IFB2' connector. This should be less than 100 milliamps. The IFB power supply will go into a shutdown condition if current is greater than 140 ma.

Status Item 09 – IFB2 Voltage

DC Voltage of IFB 2 power supply. Nominally 25 volts. Note that if a dry mode is selected for IFB 2, the power supply will be turned off and voltage and current will read zero.

Status Item 10 – Dflt Name (Default Name)

This name is the default Dante name if the device is reset to default configuration via the Dante Controller. The six-digit hexidecimal number at the end of the name is a portion of the MAC address, and is unique to each device.

Status Item 11 – Firmware Version

Display of the version number of the firmware installed in the ADX-140.

Naming the ADX-140 (User-friendly Dante Name)

The Dante Name is a user-friendly name which appears in the Dante Controller application. This name may be entered for each device using the Device View of the Dante Controller application.

The first 15 characters will be displayed on the ADX-2400 when accessing the remote device menus, and the full name will be displayed in Dante Controller.

Note that audio routing is defined based on these names. If you change names, you may have to re-route some of your signal paths using the new name. It's best to set all names first, then do routing.

To enter user-friendly names from Dante Controller, do the following steps:

1. Identify the unit that you wish to rename. From the ADX-2400 you can access the remote device number for which the System ID switches are set on the desired device. The current name will be displayed on the ADX-2400. This device can then be selected in the Dante Controller application, and a new name entered.

   Alternatively, from Device View in Dante Controller, a device may be identified by clicking on the 'eye' identify icon. This will cause all four of the LEDs on RJ45 connectors of the device to blink at about a 1Hz rate.

   (Note that you can enter Device View mode by pressing the Cntl-D shortcut, selecting 'Device View' from the Device menu at the top of the screen, or by simply double-clicking on one of the device names from the Routing or other screen.)

2. From the Device View in Dante Controller, select the Device Config tab and the desired device. You can then enter a new name in the box provided.

Reliability Considerations

Since the commentary microphones and communications are typically provided by this system, 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 to provide power for the ADX-120s. This unit contains redundant power supplies and will provide highly-reliable power, even in the event of the failure of one of the supplies. The dual supplies also supply redundant power to the switch itself.

- 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 an hour or more of 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 SFP ports available. If the switches support this type of operation (trunking), and most do, two fiber runs could be connected between switches, thus protecting against fiber and SFP failure. The ADX-8000 switches support trunking and are compatible with most generic layer 2 switches.

- Although the Dante audio data may share a network with other Ethernet traffic, we suggest keeping the critical audio data on its own separate network in order to avoid unexpected and unpredictable data loads and possible bandwidth loss.

ADX-140 Specifications

Microphone Inputs	4 low-impedence balanced. Phantom power available
Preamp Gain (total path)	+25dB to +70dB
Freq Response	20-20KHz, +/- 0.5 dB
Microphone Channel EIN	>125 dB, bandwidth-limited to 25KHz, at 60dB gain
System Signal/Noise	>100 dB below peak level, bandwidth-limited to 25KHz
Distortion	<0.05% for Mic/Line and Dry IFB. <0.12% for PL / Wet IFB
Microphone Preamps	THAT Corporation 1570 / 5171
A-D and D-A Conversion	24-bit
Digital Processing	32-bit fixed-point dsp
Dante Transmission	24-bit uncompressed
Sample Frequency	48 kHz
Path Latency	Approx 1.5 Milliseconds on all paths (analog to analog)
IFB 1 Output	2 channel wet RTS-format or single-channel dry +4dB nom.
IFB 2 Output	2 channel wet RTS-format or single-channel dry +4dB nom.
PL Interface at ADX-140	2 channel wet RTS-format. DC current to support 3 beltpacks
PL Interface (Truck End)	4-wire via ADX-2400 or other Dante interface
PL Trans-hybrid Loss	Greater than 55 dB at 440Hz
Remote Control	From ADX-2400 front panel
Front Panel Switches	System ID two-digit rotary switches
Power Requirements	48 Volts DC, 255 ma. 420 ma with four RTS/Telex beltpacks.
Power Source	48V on Cat5, and/or AC Line (95-250VAC, 50/60Hz)
Ethernet Interface	1000/100baseT Ethernet (redundant RJ45 ports)
Ethernet Bandwidth Req'd	Approximately 5 to 15 mb, depending on routing
Dimensions	19" wide x 9" deep x 1.75" high (1RU) Weight approx. 3.5 lbs

ADX-140 Remote / GPI Connector Pinout (DB9 Female)

Pin #	Function
1	Ground
2	RS232 Data Out (TX)
3	RS232 Data In (RX)
4	(no connection)
5	Ground
6	GPI 1 In (Talkback 1)*
7	GPI 2 In (Talkback 2)*
8	GPI 3 In (Unused)
9	Ground

GPI inputs are TTL-compatible inputs, pulled up to +5 volts with a 5K resistor. They should be pulled to ground with a dry switch closure to activate.

RS232 Remote port is 38.4K Baud, One Stop Bit, No Parity

*GPIs 1 and 2 may be used to implement a talkback function for the first two mic inputs. They may be controlled with a hand-held pushbutton switch, for example.

If GPI 1 is closed to ground (switch between pins 5 and 6 on the connector), Mic 1 is muted on its normal path, and routed to the mic 3 (TB1) path. A rapidly-flashing yellow LED adjacent to the Mic 3 connector indicates that this is happening.

GPI 2 does the same thing for Mic 2 (routed to the Mic 4/TB2 path).

Note that the GPIs must be enabled in the ADX-140 menu.

Notes: