WHEATSTONE COMMERCIAL AUDIO

iXO SYSTEM

TECHNICAL MANUAL

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Wheatstone Commercial Audio iXO System Technical Manual

Wheatstone
COMMERCIAL AUDIO

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Attention!

Federal Communications Commission (FCC) Compliance Notice:
Radio Frequency Notice

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

This is a Class A product. In a domestic environment, this product may cause radio interference, in which case, the user may be required to take appropriate measures.

This equipment must be installed and wired properly in order to assure compliance with FCC regulations.

Caution! ***Any modifications not expressly approved in writing by Wheatstone could void the user's authority to operate this equipment.***

Wheatstone Commercial Audio iXO System

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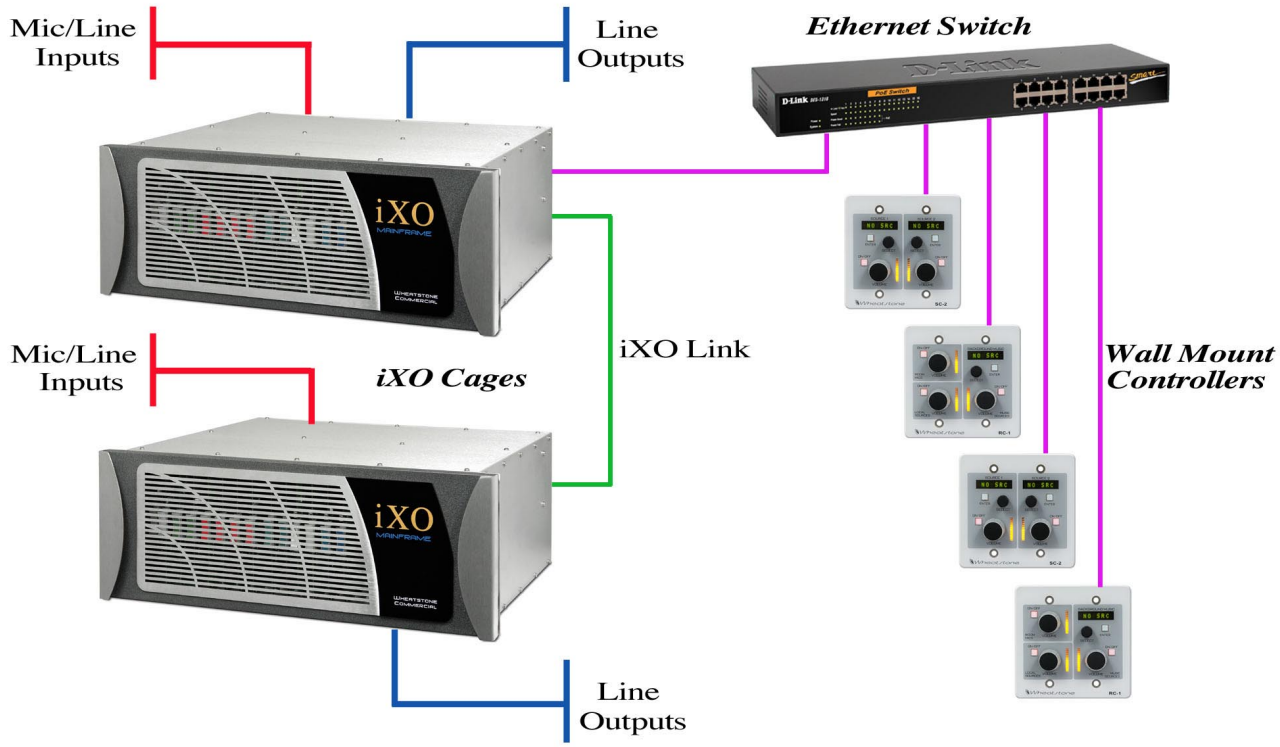


General Information

Introduction

The Wheatstone Commercial Audio iXO is an audio routing, mixing, processing, and control system comprised of a number of components that are interconnected via CAT-5e or fiber optic links. System components include iXO-MF cages, iXOverture application software, and various versions of wall mount controllers.

Start your system with a single iXO-MF cage loaded with your choice of mic/line and/or digital input cards, analog and/or digital output cards, and DSP cards for the desired processing/mixing. Add logic I/O cards for external control and signaling of microphones or other items. Each iXO-MF cage can be configured for up to 32 inputs and 32 outputs. If more channels are required, simply link two cages together via CAT-5e cabling to create a single system up to 64 x 64 in size.

You can also link up to three systems (six cages) together to create even larger systems, with up to 192 inputs and 192 outputs. Any input source, mix, and processed output signal can be shared amongst the systems. If you need even more inputs and outputs, add one of Wheatstone Corporation's Wheatnet switches to create systems with thousands of inputs and outputs.

System configuration and control is done with Wheatstone's iXOverture software. It is an extremely intuitive GUI that allows you to quickly configure a system and have audio working in minutes. For additional control you can add Wheatstone's Ethernet based SC-1, SC-2, and RC-1 wall mount controllers which will provide the end user with a powerful, yet simple to understand, method of controlling the system remotely.

iXO Mainframe

The iXO Mainframe rack mount unit occupies four 19" wide rack spaces (total height 7"), with a 17 5/8" depth.

The unit's backplane can handle 512 discrete audio signals carried via 32 16xTDM busses. Various input sources place the signals onto the TDM busses, and various DSP cards process and mix these signals, while output cards can select any combination of signals to take off the TDMs to drive their output channels.

All audio input and output signal, LIO, audio network, and Ethernet connections are made via various I/O panels that plug into the rear of the chassis to match their respective cards. System-to-system network connections can be made by CAT-5e or optical fiber links.

Front View

Viewed from the front the card slots are numbered 1 through 16 (left to right) with the following assignments:

Card Slot Assignments

Slots 1 - 4: These slots are reserved for analog or digital input cards.

Slots 5 - 8: These slots are reserved for analog or digital output cards.

Slots 9 & 10: These slots are reserved for logic input/output cards.

Slots 11 - 14: These slots are reserved for DSP cards.

Slot 15: This slot is reserved for future use.

Slot 16: This slot is reserved for the Host CPU card.

Power Supply

The iXO Mainframe power supply is a self contained unit which is removable from the front, after removal of AC power and the securing nut located on the rear of the unit.

The unit is an auto ranging switched mode power supply design. This power supply contains high voltage circuits that are hazardous and potentially harmful. Under no circumstances should the metal cover be removed. If you have a problem with the power supply, the unit must be returned to Wheatstone Corporation for repair.

Rear View

Viewed from the rear the card slots are numbered 1 through 16 (right to left) with the following assignments:

Rear Connector Card Slot Assignments

Slots 1 - 8: These slots use the Phoenix connector card (if an audio card is present in the front).

Slots 9 & 10: These slots use the dual DB-25 connector card.

Slots 11 - 15: These slots use blank filler panels.

Slot 16: This slot uses the CAT-5e or optical version of the host connector card.

AC Mains Connection

The power supply is fitted with a 3-wire grounded AC cord that should be plugged into a “clean” AC power source. This source should be a separate feed from those powering lighting, air conditioning, or any other non-audio machinery. The third pin ground wire of the AC source should be tied to the central system ground point.

Installation

The iXO Mainframe is built for mission critical applications and is easy to install. Since it is a front loaded card cage with ventilation provided by air entering the front of the unit and exiting via the rear mounted fan, you must take this into consideration when locating the iXO cage in the equipment rack.

Rack Mounting

The iXO Mainframe is designed to be installed in a 19" equipment rack. The equipment rack location should be free of dust and debris, and nothing should obstruct the front ventilation slots of the iXO Mainframe faceplate. Likewise, nothing should block air flow from the rear mounted fan.

Energizing

Assuming the iXO Mainframe has all desired cards loaded in their respective card slots and the cage is correctly rack mounted, you may now energize the power supply by plugging in the AC mains.

Note: To de-energize the iXO Mainframe, unplug the power supply’s AC cord from the AC mains.

Once you have verified proper power-up, unplug the power supply to de-energize the system. You may now proceed to wire up audio and control connections.

Audio I/O Connections

All audio connections are made using 3-terminal Phoenix-type connectors which are located on the 2PH-2001-RP rear connector card. There are eight connectors per card.

Balanced Analog Audio Connections

CABLE – All analog input and output audio connections are balanced and should be made using a high quality shielded twisted-pair audio cable such as Belden 9451 or equivalent.

WIRING – The 3-terminals of each Phoenix connector are wired as follows:

- Terminal 1: SH (Shield)
- Terminal 2: LO (-)
- Terminal 3: HI (+)

Unbalanced Analog Audio Connections

ANALOG INPUTS – Wire to the iXO Mainframe input end with typical shielded twisted pair audio cable (like Belden 9541), just as you were connecting to a balanced source. At the unbalanced source equipment's output, connect the + output to the HI input wire and connect the source equipment GND wire to LO; connect the shield at one end only.

Note: Unbalanced analog sources typically have -10dbv (316mV RMS) signal levels and will not match the iXO systems nominal operating level of +4dbu (1.23 V RMS). We highly recommend that you externally balance any unbalanced sources you plan on connecting to the iXO. Many third party "match boxes" are commercially available for this.

ANALOG OUTPUTS – Use a balanced output circuit which behaves exactly like the secondary of a high-quality transformer, without center tap; this output is both balanced and floating. For unbalanced operation, either the HI *or* LO side of the analog output must be strapped to ground of the unbalanced input, with the output taken from the other side. (Normally you would strap LO to ground, and use HI to feed your unbalanced equipment input.) Leave the SH floating at one end.

Digital Audio Connections

CABLE – All AES/EBU input and output digital audio connections are balanced and should be made using a high quality digital audio cable. Typical AES/EBU digital audio cable has a very low characteristic capacitance per ft (pF/ft), and a nominal impedance of 110 ohms. High quality digital audio cable offers better signal transmission performance versus typical analog audio cable, especially over long cable runs. Check the cable manufacturer's data sheet to be sure the cable you plan to use will work in your application.

WIRING – The 3-terminals of each Phoenix connector are wired as follows:

- Terminal 1: SH (Shield)
- Terminal 2: LO (-)
- Terminal 3: HI (+)

Host Card Connections

HCC-2007 CAT5 Rear Card (Standard)

The iXO Mainframe ships with the HCC-2007 card, which uses RJ-45 connectors for interconnectivity on the Audio Transport links, Ethernet, and iXO-Link. There is also a single DB-9 female connector which is used for factory diagnostics.

A brief description of each of the RJ-45 connectors is listed below:

Link A: This RJ-45 connector is AT (Audio Transport) link A, which is used for communicating to other iXO systems or Wheatnet switches for system expansion. There are 64 channels available in each direction, along with control and metering. A CAT-5e crossover cable is used for connection with a maximum distance of 100 meters.

Link B: This RJ-45 connector is AT link B, which is used for communicating to other iXO systems or Wheatnet switches for system expansion. There are 64 channels available in each direction, along with control and metering. A CAT-5e crossover cable is used for connection with a maximum distance of 100 meters.

Link C: This RJ-45 connector is AT link C, which is presently reserved for future use.

E-Net: This RJ-45 connector is used to connect the iXO to a PC for configuration and/or control via standard Ethernet. A CAT-5e crossover cable is used to connect directly to the iXO, or it can be connected to an Ethernet switch and used on a wide area network.

iXO-Link: This RJ-45 connector is used to connect two iXO cages together when the system size exceeds 32 input or outputs. A single CAT-5e crossover cable is used for connection, with a maximum distance of 100 meters.

HCOC-2007 Optical Card (Optional)

For applications where the distance exceeds 100 meters between iXO systems that are to be linked together, you can order the optional HCOC-2007 optical card. This card is similar to the HCC-2007 card, but replaces the RJ-45 connectors on AT-Links A and B with SFP optical ports. A brief description of each of the connectors is listed below:

Link A: This SFP port is AT (Audio Transport) link A, which is used for communicating to other iXO systems or Wheatnet switches for system expansion. There are 64 channels available in each direction, along with control and metering. A fiber crossover cable is used for connection.

Link B: This SFP port is AT link B, which is used for communicating to other iXO systems or Wheatnet switches for system expansion. There are 64 channels available in each direction, along with control and metering. A fiber cable is used for connection. If a second fiber link is not needed, Link C (below) can be used.

Link C: This RJ-45 connector is AT link C, which can be used instead of Link B (above) if an additional external link is desired but fiber is not required for this link. There are 64 channels available in each direction, along with control and metering. A CAT-5e crossover cable is used for connection with a maximum distance of 100 meters. You can use Link B or Link C, but not both.

E-Net: This RJ-45 connector is used to connect the iXO to a PC for configuration and/or control via standard Ethernet. A CAT-5e crossover cable is used to connect directly to the iXO, or it can be connected to an Ethernet switch and used on a local area network.

iXO-Link: This RJ-45 connector is used to connect two iXO cages together when the system size exceeds 32 input or outputs. A single CAT-5e crossover cable is used for connection, with a maximum distance of 100 meters.

Wall Mount Controllers

The Wheatstone line of Wall Mount Controllers allows remote control of various system parameters, such as source selection, level control, and muting. Presently there are three models of controller to choose from: the SC-1, SC-2, and RC-1.

For programming of these controllers see the iXOverture chapter of this manual.

Hardware

Chapter Contents

Hardware

Chassis / Backplane Overview

The iXO chassis may be configured to suit a variety of I/O card complements, including analog or digital audio input and output cards, chassis expansion and audio network cards, DSP mix engine cards, and logic I/O cards. A system may include one or two cages, or multiple one or two cage systems connected to a Wheatnet switch in a star configuration. All audio input and output signal connections are made via a family of I/O connector modules that plug into the rear of the chassis. Power supply, serial control, audio network, and Ethernet connections are also made on the rear of the chassis.

The backplane itself is entirely connectorized and contains a minimal number of passive components. Further, the backplane assembly may be removed rather easily in the rare case that service is required.

Chassis Configuration Guidelines

The iXO is a card-cage based signal processing platform with a chassis that can accommodate a wide variety of cards. Each type of card has specific card slot locations where it can be located.

Chassis Card Slots

The iXO chassis has 16 card slots whose card assignments will be automatically generated by the iXOverture software System Wizard. The slots are grouped by function to allow ease of configuration. Viewed from the front, slot 1 is on the extreme left of the unit with slot 16 located on the right hand side adjacent to the power supply. Slots 1 - 4 are reserved for analog and/or digital input cards. Slots 5 - 8 are reserved for analog and/or digital output cards. Slots 9 and 10 are reserved for logic I/O cards. Slots 11 - 14 are reserved for DSP mix engine cards. Slot 15 is reserved for future use. Slot 16 is reserved for a host CPU card.

Chassis Configuration File

An iXO system is configured to customer specifications by authorized Wheatstone Commercial Audio dealers via the iXOverture software that ships with the unit. The software is also available on our website at www.wheatstone.com. This extremely inuitive software must be used in order to generate the required card slot assignments. An initial “config” file can be created in seconds, allowing you to populate an iXO chassis with cards in their proper slots.

Mic/Line Input Card (MLI-8)

Overview

The Microphone/Line input card accepts eight mono microphone or line audio level inputs. A *Hardware Configuration* form in the supplied iXOverture software allows the user to set attributes for the input sources, including signal name, type, phantom power, etc.

The balanced, mic level input signals are amplified by a remote controlled dual stage preamplifier. The preamplified microphone signal is also converted to the digital domain by 24bit A-D converters operating at the system's master sample rate. Embedded logic routes each channel of audio data into an available time slot of the card's TDM bus. One TDM bus is allocated for each card.

Analog Input Interface

The MLI-8 uses an electronically balanced, monolithic preamplifier capable of a wide range of input signals. While all microphone inputs employ high frequency filtering components, be sure to install a high quality microphone cable to help eliminate unwanted EMI and RFI artifacts.

Preamp specifications:

Nominal Mic Level = - 50dBm (2mV RMS), 150 ohms

Max input level = -10dBu

Headroom = 20dB

Gain Max = 84dB

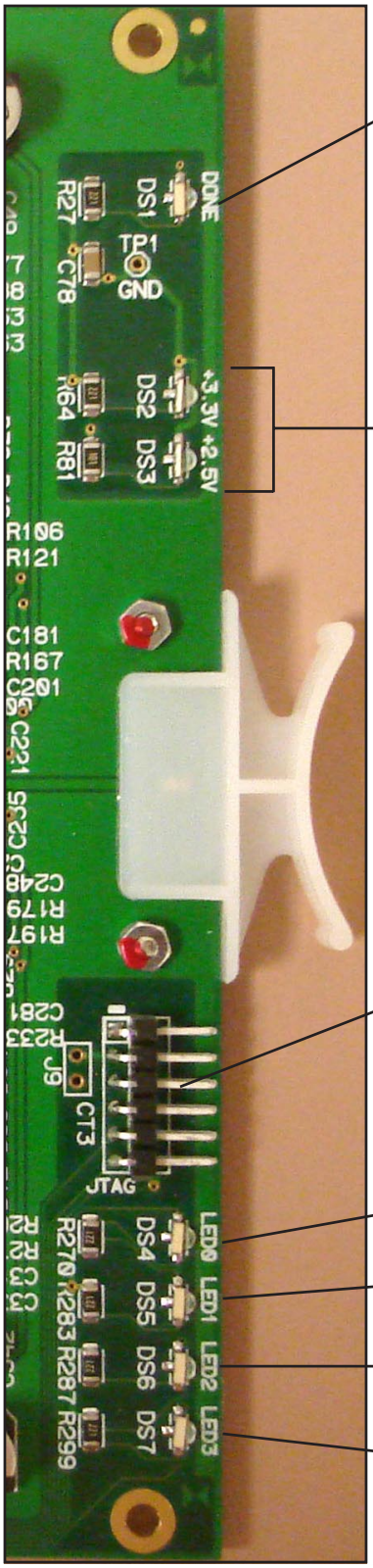
Gain Range = +20 to +80dB

Phantom Power = 32V

Internal Programming Options

There are no internal programming options on the MLI-8 card.

Mic/Line Input Card Status LED's



DONE LED (DS1) - Normally OFF;
ON when programming the FPGA,
Flashes when system clock is missing.

POWER SUPPLY STATUS (DS2, DS3) - ON indicates power supply is OK.

JTAG HEADER - FPGA programming - factory use only.

AUXILIARY STATUS LED's

ACTIVITY LED (DS4) - Flashes on messages.

DS5 - Not Used

MUTE STATUS (DS6) - ON when the input channels are muted.

CFG STATUS (DS7) - ON when card is not configured.

Hook-Ups

All user wiring to the MLI-8 card takes place at the rear I/O connector module. There are eight three-position Phoenix connectors for audio input connections. These include eight mic or line input sources. The Phoenix connector is wired with position 1 being used to connect the shield, position 2 to connect the low (-), and position 3 to connect the high (+).

Upper Phoenix Connectors—Analog Audio Connections

These include four (1-4) mic/line input sources. Pinout drawing on page 2-9 shows all wiring connections at a glance.

Pin 1-1 – Mic/Line 1 In SH
Pin 1-2 – Mic/Line 1 In LO
Pin 1-3 – Mic/Line 1 In HI

Pin 2-1 – Mic/Line 2 In SH
Pin 2-2 – Mic/Line 2 In LO
Pin 2-3 – Mic/Line 2 In HI

Pin 3-1 – Mic/Line 3 In SH
Pin 3-2 – Mic/Line 3 In LO
Pin 3-3 – Mic/Line 3 In HI

Pin 4-1 – Mic/Line 4 In SH
Pin 4-2 – Mic/Line 4 In LO
Pin 4-3 – Mic/Line 4 In HI

Lower Phoenix Connectors—Analog Audio Connections

These include four (5-8) mic/line input sources. Pinout drawing on page 2-9 shows all wiring connections at a glance.

Pin 5-1 – Mic/Line 5 In SH
Pin 5-2 – Mic/Line 5 In LO
Pin 5-3 – Mic/Line 5 In HI

Pin 6-1 – Mic/Line 6 In SH
Pin 6-2 – Mic/Line 6 In LO
Pin 6-3 – Mic/Line 6 In HI

Pin 7-1 – Mic/Line 7 In SH
Pin 7-2 – Mic/Line 7 In LO
Pin 7-3 – Mic/Line 7 In HI

Pin 8-1 – Mic/Line 8 In SH
Pin 8-2 – Mic/Line 8 In LO
Pin 8-3 – Mic/Line 8 In HI

2PH-2001 Panel
Mic/Line Input Connections

MIC/LINE 1-4 PORTS

1	1	MIC/LINE 1 IN SH
	2	MIC/LINE 1 IN LO
	3	MIC/LINE 1 IN HI
2	1	MIC/LINE 2 IN SH
	2	MIC/LINE 2 IN LO
	3	MIC/LINE 2 IN HI
3	1	MIC/LINE 3 IN SH
	2	MIC/LINE 3 IN LO
	3	MIC/LINE 3 IN HI
4	1	MIC/LINE 4 IN SH
	2	MIC/LINE 4 IN LO
	3	MIC/LINE 4 IN HI

MIC/LINE 5-8 PORTS

5	1	MIC/LINE 5 IN SH
	2	MIC/LINE 5 IN LC
	3	MIC/LINE 5 IN HI
6	1	MIC/LINE 6 IN SH
	2	MIC/LINE 6 IN LO
	3	MIC/LINE 6 IN HI
7	1	MIC/LINE 7 IN SH
	2	MIC/LINE 7 IN LO
	3	MIC/LINE 7 IN HI
8	1	MIC/LINE 8 IN SH
	2	MIC/LINE 8 IN LO
	3	MIC/LINE 8 IN HI

Analog Line Output Card (LO-8)

Overview

Each Analog Line Output card provides eight physical monaural *output channels*. A *Hardware Configuration* form in the supplied iXOverture software allows the user to set attributes for the output channels including signal name, type, and preset. For example, the card may be configured as two standard and six speaker processor outputs, or four stereo outputs, or eight mono outputs.

Each output card listens for connection commands from the CPU card and then uses this information to connect the appropriate sources to their selected output channels. The selected audio data is fed to 24 bit, two-channel digital-to-analog converters. The D-A converter outputs are buffered by integrated differential output drivers.

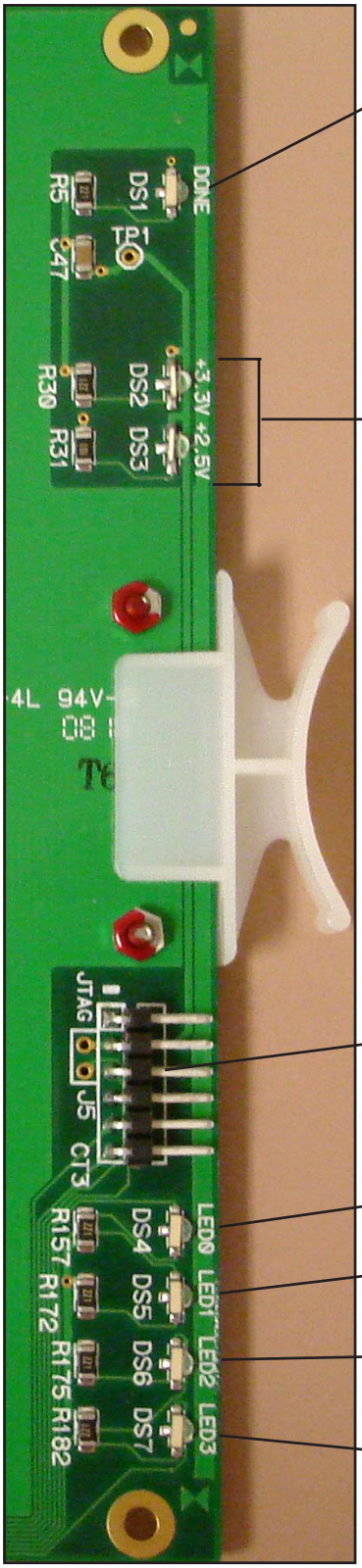
Analog Output Interface

Each balanced unity gain output will drive loads up to 600 ohms and behaves much like a transformer in that either side of the balanced output may be grounded. The analog outputs are direct coupled with an output impedance of 50 ohms and a nominal output signal level of +4dBu yielded from an analog input signal of +4dBu (-20dBFs digital).

Internal Programming Options

There are no internal programming options on the LO-8 card.

Analog Line Output Card Status LED's



DONE LED (DS1) - Normally OFF;
ON when programming the FPGA,
Flashes when system clock is missing.

POWER SUPPLY STATUS (DS2,DS3) - ON indicates power supply is OK.

JTAG HEADER - FPGA programming - factory use only.

AUXILIARY STATUS LED's

ACTIVITY LED (DS4) - Flashes on messages.

DS5 - Not Used

MUTE STATUS (DS6) - ON when the output channels are muted.

CFG STATUS (DS7) - ON when card is not configured.

Hook-Ups

All user wiring to the LO-8 card takes place at the rear I/O connector module. There are eight three-position Phoenix connectors for audio output connections. Each Phoenix connector is wired with position1 being used to connect the shield, position 2 to connect the low (-), and position 3 to connect the high (+).

Upper Phoenix Connectors—Analog Audio Connections

These include four (1-4) outputs. Pinout drawing on page 2-13 shows all wiring connections at a glance.

Pin 1-1 – Line 1 Out SH
Pin 1-2 – Line 1 Out LO
Pin 1-3 – Line 1 Out HI

Pin 2-1 – Line 2 Out SH
Pin 2-2 – Line 2 Out LO
Pin 2-3 – Line 2 Out HI

Pin 3-1 – Line 3 Out SH
Pin 3-2 – Line 3 Out LO
Pin 3-3 – Line 3 Out HI

Pin 4-1 – Line 4 Out SH
Pin 4-2 – Line 4 Out LO
Pin 4-3 – Line 4 Out HI

Lower Phoenix Connectors—Analog Audio Connections

These include four (5-8) output. Pinout drawing on page 2-13 shows all wiring connections at a glance.

Pin 5-1 – Line 5 Out SH
Pin 5-2 – Line 5 Out LO
Pin 5-3 – Line 5 Out HI

Pin 6-1 – Line 6 Out SH
Pin 6-2 – Line 6 Out LO
Pin 6-3 – Line 6 Out HI

Pin 7-1 – Line 7 Out SH
Pin 7-2 – Line 7 Out LO
Pin 7-3 – Line 7 Out HI

Pin 8-1 – Line 8 Out SH
Pin 8-2 – Line 8 Out LO
Pin 8-3 – Line 8 Out HI

2PH-2001 Panel
Analog Line Output Connections

LINE 1-4 PORTS

1	1	LINE 1 OUT SH
	2	LINE 1 OUT LO
	3	LINE 1 OUT HI
2	1	LINE 2 OUT SH
	2	LINE 2 OUT LO
	3	LINE 2 OUT HI
3	1	LINE 3 OUT SH
	2	LINE 3 OUT LO
	3	LINE 3 OUT HI
4	1	LINE 4 OUT SH
	2	LINE 4 OUT LO
	3	LINE 4 OUT HI

LINE 5-8 PORTS

5	1	LINE 5 OUT SH
	2	LINE 5 OUT LO
	3	LINE 5 OUT HI
6	1	LINE 6 OUT SH
	2	LINE 6 OUT LO
	3	LINE 6 OUT HI
7	1	LINE 7 OUT SH
	2	LINE 7 OUT LO
	3	LINE 7 OUT HI
8	1	LINE 8 OUT SH
	2	LINE 8 OUT LO
	3	LINE 8 OUT HI

Digital Input Card (DI-8)

Overview

Each DI-8 card will accept up to four AES-3 formatted stereo sources (i.e. eight mono *channels*). A *Hardware Configuration* form in the supplied iXOverture software allows the user to set attributes for the input channels, including signal name and preset.

A dedicated sample rate converter for each input re-clocks the incoming audio data and phase locks it to the system's master sample rate clock. Embedded logic routes each channel of audio data into an available time slot of the input card's TDM bus. One TDM bus is allocated for each 8 input card.

AES Input Interface

The balanced digital audio inputs on the DI-8 card are transformer coupled. AES receivers strip off the received sample rate clock and audio data for further processing by sample rate converters. The balanced interface operates at a nominal peak-to-peak input voltage of +5V with an input impedance of 110 ohms and conforms to the AES-3 1992 electrical specification. Note that Channel Status data is not forwarded.

While unbalanced SPDIF formatted input signals may be connected to the HI and LO inputs of an AES input channel (leave the shield floating), it is recommended that a BALUN or other external matching device be inserted to convert the SPDIF impedance to 110 ohms and signal level to at least 1V p-p.

Internal Programming Options

There are no internal programming options on the DI-8 input card.

Digital Input Card Status LED's

DONE LED (DS1) - Normally OFF;
ON when programming the FPGA,
Flashes when system clock is missing.

POWER SUPPLY STATUS (DS2-DS4) - ON indicates power supply is OK.

JTAG HEADER - FPGA programming - factory use only.

AUXILIARY STATUS LED's

ACTIVITY LED (DS5) - Flashes on messages.

DS6 - Not Used

MUTE STATUS (DS7) - ON when the input channels are muted.

CFG STATUS (DS8) - ON when card is not configured.

Hook-Ups

All user wiring to the DI-8 card takes place at the rear I/O connector module. The Phoenix connector module has eight three-position Phoenix connectors. The upper four connectors are used for digital input connections; the lower four connectors are reserved for future use. Each Phoenix connector is wired with position1 being used to connect the shield, position 2 to connect the low (-), and position 3 to connect the high (+).

Upper Phoenix Connectors—Digital Audio Connections

These include four (1-4) AES input sources. Pinout drawing on page 2-17 shows all wiring connections at a glance.

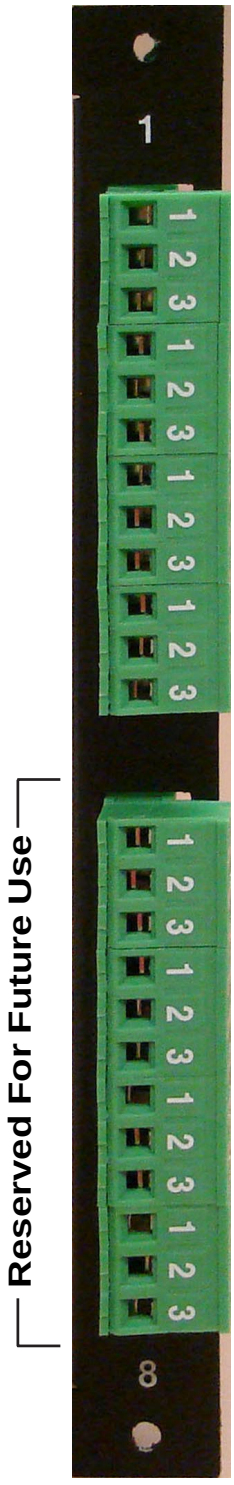
Pin 1-1 – AES 1 In SH
Pin 1-2 – AES 1 In LO
Pin 1-3 – AES 1 In HI

Pin 2-1 – AES 2 In SH
Pin 2-2 – AES 2 In LO
Pin 2-3 – AES 2 In HI

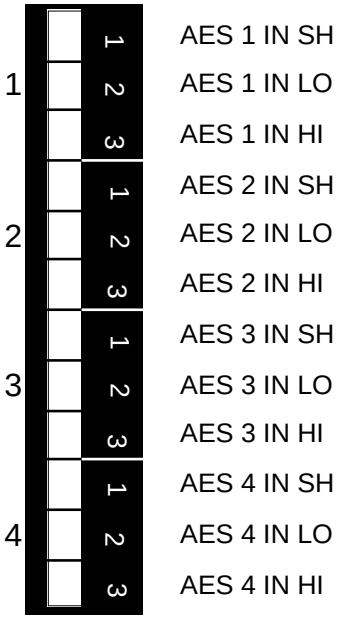
Pin 3-1 – AES 3 In SH
Pin 3-2 – AES 3 In LO
Pin 3-3 – AES 3 In HI

Pin 4-1 – AES 4 In SH
Pin 4-2 – AES 4 In LO
Pin 4-3 – AES 4 In HI

2PH-2001 Panel
Digital Input Connections



AES 1-4 PORTS



Digital Output Card (DO-8)

Overview

Each DO-8 card provides four physical AES-3 formatted outputs (i.e. eight mono channels). A *Hardware Configurations* form in the supplied iXOverture software allows the user to set attributes for the output channels, including signal name, type, and presets.

Each output card listens for connection commands from the CPU card, and then uses this information to connect the appropriate sources to their selected output channels. The selected audio data is fed to AES transmitters which format the 24 bit audio data according to the AES-3 standard.

AES Output Interface

The balanced digital audio outputs on the DO-8 card are transformer coupled and exhibit a nominal output impedance of 110 ohms. This interface operates at a nominal output voltage of +5V p-p and conforms to the AES-3 1992 electrical specification. The DO-8 output cards operate at unity gain and transmit 24bit audio data word lengths at the system sample rate. Output sample rate is set to 44.1kHz or 48kHz via certain settings on the HC-2007 card.

The digital output signal reference level is -20dBFS. A +4dBu analog input signal yields a -20dBFS digital output signal. Channel Status implementation complies with rules for “standard implementation” as described in the AES-3 1992 specification.

AES Channel Status Implementation

The following embedded channel status information is transmitted at the AES digital outputs along with the audio data.

Note: Channel Status bits are identically set for channels 1 and 2.

CHANNEL STATUS:	PROFESSIONAL
DATA USE:	AUDIO (normal mode)
EMPHASIS:	NO EMPHASIS
SOURCE Fs LOCK:	LOCKED
SAMPLE FREQUENCY:	44.1 kHz or 48 kHz*
CHANNEL MODE:	STEREO
USER BITS MODE:	NONE
AUX BITS USE:	24 BIT - main audio
AUDIO WORD LENGTH:	24 BIT
REFERENCE SIGNAL:	NOT A REFERENCE SIGNAL
ORIGIN:	NOT INDICATED
DESTINATION:	NOT INDICATED
SAMPLE #:	Ø
TIME OF DAY:	ØØ : ØØ : ØØ
BLOCK CRC:	IS VALID

* The Sample Rate frequency reported in the channel status block depends upon a dipswitch setting on the DO-8 circuit board. DipSW2 - pos.3: OFF = 48 kHz, ON = 44.1 kHz.

NOTE: When changing the audio sample rate of the iXO System, changes must be made in the DO-8 Digital Output Card and HC-2007 Host CPU Card. All such cards in the system must be set to the same sample rate. Additionally, any attached Wheatnet system must also employ the same sample rate. See the appropriate manual sections for details.

Internal Programming Options

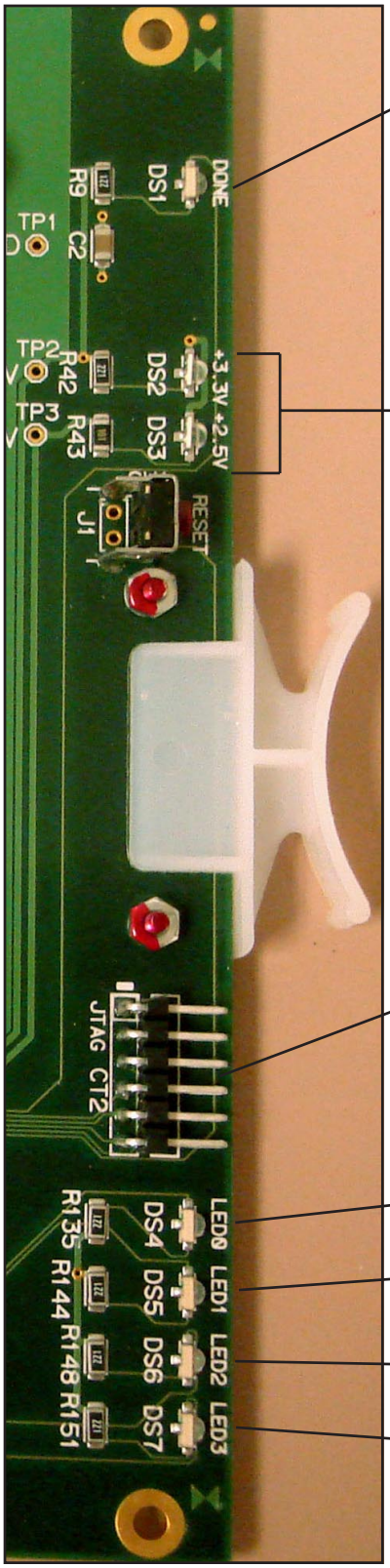
Internal programming is made via PCB mounted dipswitch SW2.

DO-8 PCB SW2

POSITION	FUNCTION	ON	OFF
1	UNUSED	N/A	N/A
2	UNUSED	N/A	N/A
3	CHANNEL STATUS Fs	44.1 kHz	48 kHz
4	UNUSED	N/A	N/A

Note: Dipswitch SW2 position 3 sets the <u>reported</u> output sample rate frequency transmitted in a channel status block. This dipswitch does <u>not</u> change the physical sample rate.

Digital Output Card Status LED's



DONE LED (DS1) - Normally OFF;
ON when programming the FPGA,
Flashes when system clock is missing.

POWER SUPPLY STATUS (DS2, DS3) - ON indicates power supply is OK.

JTAG HEADER - FPGA programming - factory use only.

AUXILIARY STATUS LED's

ACTIVITY LED (DS4) - Flashes on messages.

DS5 - Not Used

MUTE STATUS (DS6) - ON when the output channels are muted.

CFG STATUS (DS7) - ON when card is not configured.

Hook-Ups

All user wiring to the DO-8 card takes place at the rear I/O connector module. The Phoenix connector module has eight three-position Phoenix connectors. The upper four connectors are used for digital output connections; the lower four connectors are reserved for future use. Each Phoenix connector is wired with position1 being used to connect the shield, position 2 to connect the low (-), and position 3 to connect the high (+).

Upper Phoenix Connectors—Digital Audio Connections

These include four (1-4) AES outputs. Pinout drawing on page 2-22 shows all wiring connections at a glance.

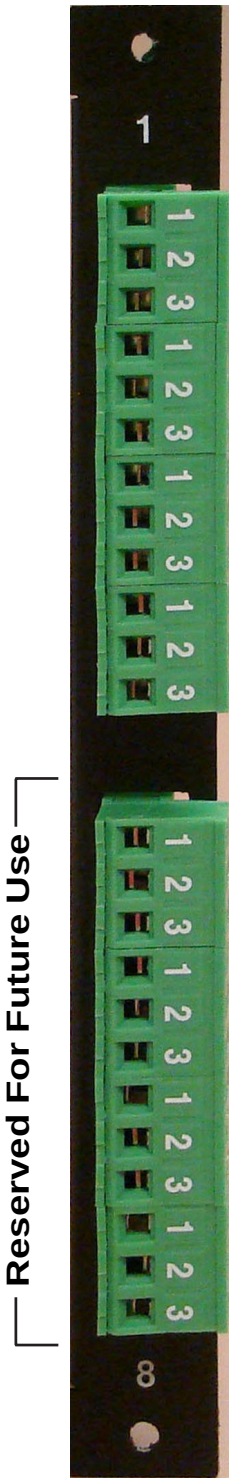
Pin 1-1 – AES 1 Out SH
Pin 1-2 – AES 1 Out LO
Pin 1-3 – AES 1 Out HI

Pin 2-1 – AES 2 Out SH
Pin 2-2 – AES 2 Out LO
Pin 2-3 – AES 2 Out HI

Pin 3-1 – AES 3 Out SH
Pin 3-2 – AES 3 Out LO
Pin 3-3 – AES 3 Out HI

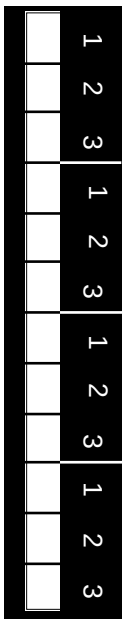
Pin 4-1 – AES 4 Out SH
Pin 4-2 – AES 4 Out LO
Pin 4-3 – AES 4 Out HI

2PH-2001 Panel
Digital Output Connections



Reserved For Future Use

AES 1-4 PORTS



1	1	AES 1 OUT SH
	2	AES 1 OUT LO
	3	AES 1 OUT HI
2	1	AES 2 OUT SH
	2	AES 2 OUT LO
	3	AES 2 OUT HI
3	1	AES 3 OUT SH
	2	AES 3 OUT LO
	3	AES 3 OUT HI
4	1	AES 4 OUT SH
	2	AES 4 OUT LO
	3	AES 4 OUT HI

Logic Input/Output Card (LIO-2032)

Overview

The LIO-2032 is a programmable hardware GPI with a feature set designed for commercial installation control applications. Sixteen independent, opto-isolated solid state relay inputs and outputs may be programmed through the iXOverture GUI software to function as routable logic or trigger ports.

Input and output ports may be configured as logic I/O only or logic inputs may be "attached" to an audio input signal. Routable logic signals may be included as part of a Salvo.

Input ports allow the user to program a logic *input* to fire a predefined Event or to make a temporary audio connection.

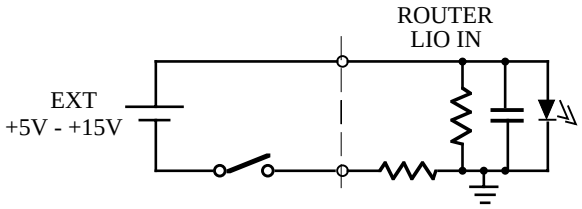
See the Slot 09/Slot 10 configuration notes in the "iXO Hardware Configuration Window" section of the "iXOverture GUI" chapter.

Input Ports

Each of the sixteen LH1522AB solid state relay input ports are configured as a floating photodiode, (i.e. + input is the opto's anode, - input is the opto's cathode). A 475 ohm current limiting resistor in series with each negative input supports an external supply voltage range of +5Vdc to +15Vdc. For external supply voltages between +15Vdc and +24Vdc, install a current limiting resistor of 220 ohms in series with each + input connection. Maximum forward photodiode current is 50mA.

When interfacing to a logic input port, we recommend the positive side be connected to a fixed, positive dc voltage and the negative side switched to ground to activate the logic input.

SIMPLE INPUT EXAMPLE



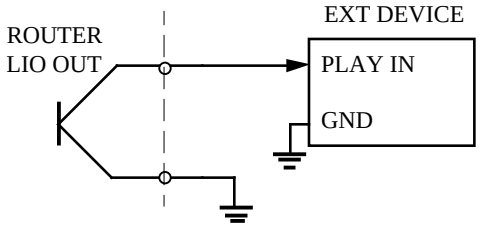
Output Ports

Each of the sixteen LH1522AB solid state relay outputs may be configured in software to function as normally open or normally closed circuits. Output ports can be programmed to reflect the CURRENT state of any mute, event or preset.

All outputs feature linear ac/dc operation, current limiting, and a low on resistance, typically 10 ohms.

Normal Operating Load Limits: 120mA, ±100V

SIMPLE OUTPUT EXAMPLE



Safety Note: *The LIO-2032 is **NOT** designed to safely switch AC mains power.*

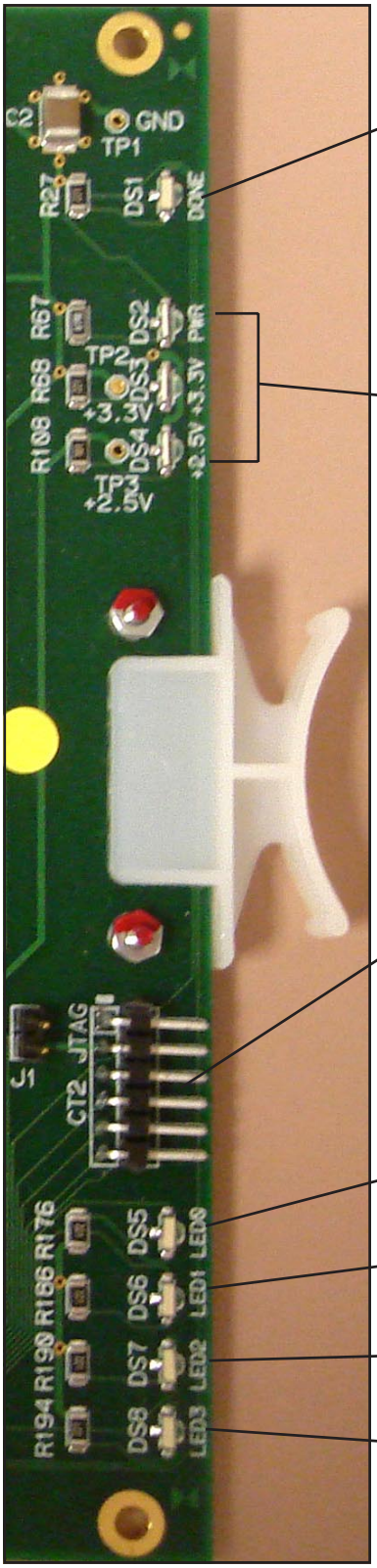
Software Programming

For details on programming the LIO-2032, please refer to the Slot 09/Slot 10 configuration notes in the “iXO Hardware Configuration Window” section of the “iXOverture GUI” chapter.

Internal Programming Options

There are no user programming options on the LIO-2032 card.

Logic Input/Output Card Status LED's



DONE LED (DS1) - Normally OFF;
ON when programming the FPGA,
Flashes when system clock is missing.

POWER SUPPLY STATUS (DS2-DS4) - ON indicates power supply is OK.

JTAG HEADER - FPGA programming - factory use only.

AUXILIARY STATUS LED's

SYS ACTIVITY LED (DS5) - Flashes on config messages.

INPUT PORT ACTIVITY (DS6) - Flashes on logic input message.

OUTPUT PORT ACTIVITY (DS7) - Flashes on logic output message.

CFG STATUS (DS8) - ON when card is not configured.

Hook-Ups

All user wiring to the LIO-2032 card takes place at the rear I/O connector module. This has two female DB-25 connectors labeled "A" and "B" for logic input and output connections.

Upper DB-25—1 - 8 Logic I/O Connections

This includes eight (1-8) input/output sources. Pinout drawing on page 2-28 shows all wiring connections at a glance.

Pin 12 – Logic 1 Input (+)
Pin 13 – Logic 1 Common (-)
Pin 24 – Logic 1 Output (+)

Pin 23 – Logic 2 Input (+)
Pin 11 – Logic 2 Common (-)
Pin 10 – Logic 2 Output (+)

Pin 9 – Logic 3 Input (+)
Pin 22 – Logic 3 Common (-)
Pin 21 – Logic 3 Output (+)

Pin 20 – Logic 4 Input (+)
Pin 8 – Logic 4 Common (-)
Pin 7 – Logic 4 Output (+)

Pin 6 – Logic 5 Input (+)
Pin 19 – Logic 5 Common (-)
Pin 18 – Logic 5 Output (+)

Pin 17 – Logic 6 Input (+)
Pin 5 – Logic 6 Common (-)
Pin 4 – Logic 6 Output (+)

Pin 3 – Logic 7 Input (+)
Pin 16 – Logic 7 Common (-)
Pin 15 – Logic 7 Output (+)

Pin 14 – Logic 8 Input (+)
Pin 1 – Logic 8 Common (-)
Pin 2 – Logic 8 Output (+)

Pin 25 – Ground

Lower DB-25—9 - 16 Logic I/O Connections

This includes eight (9-16) input/output sources. Pinout drawing on page 2-28 shows all wiring connections at a glance.

Pin 12 – Logic 9 Input (+)
Pin 13 – Logic 9 Common (-)
Pin 24 – Logic 9 Output (+)

Pin 23 – Logic 10 Input (+)
Pin 11 – Logic 10 Common (-)
Pin 10 – Logic 10 Output (+)

Pin 9 – Logic 11 Input (+)
Pin 22 – Logic 11 Common (-)
Pin 21 – Logic 11 Output (+)

Pin 20 – Logic 12 Input (+)
Pin 8 – Logic 12 Common (-)
Pin 7 – Logic 12 Output (+)

Pin 6 – Logic 13 Input (+)
Pin 19 – Logic 13 Common (-)
Pin 18 – Logic 13 Output (+)

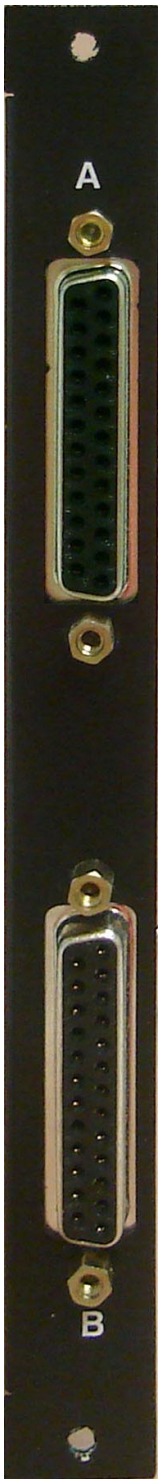
Pin 17 – Logic 14 Input (+)
Pin 5 – Logic 14 Common (-)
Pin 4 – Logic 14 Output (+)

Pin 3 – Logic 15 Input (+)
Pin 16 – Logic 15 Common (-)
Pin 15 – Logic 15 Output (+)

Pin 14 – Logic 16 Input (+)
Pin 1 – Logic 16 Common (-)
Pin 2 – Logic 16 Output (+)

Pin 25 – Ground

2DB-2032 Panel
Logic I/O Connections



1-8
LOGIC PORTS
(Upper "A" DB-25)

GROUND	25	13
LOGIC 1 OUTPUT (+)	24	12
LOGIC 2 INPUT (+)	23	11
LOGIC 3 COMMON (-)	22	10
LOGIC 3 OUTPUT (+)	21	9
LOGIC 4 INPUT (+)	20	8
LOGIC 5 COMMON (-)	19	7
LOGIC 5 OUTPUT (+)	18	6
LOGIC 6 INPUT (+)	17	5
LOGIC 7 COMMON (-)	16	4
LOGIC 7 OUTPUT (+)	15	3
LOGIC 8 INPUT (+)	14	2
		1

	13	LOGIC 1 COMMON (-)
	12	LOGIC 1 INPUT (+)
	11	LOGIC 2 COMMON (-)
	10	LOGIC 2 OUTPUT (+)
	9	LOGIC 3 INPUT (+)
	8	LOGIC 4 COMMON (-)
	7	LOGIC 4 OUTPUT (+)
	6	LOGIC 5 INPUT (+)
	5	LOGIC 6 COMMON (-)
	4	LOGIC 6 OUTPUT (+)
	3	LOGIC 7 INPUT (+)
	2	LOGIC 8 OUTPUT (+)
	1	LOGIC 8 COMMON (-)

GROUND	25	13
LOGIC 9 OUTPUT (+)	24	12
LOGIC 10 INPUT (+)	23	11
LOGIC 11 COMMON (-)	22	10
LOGIC 11 OUTPUT (+)	21	9
LOGIC 12 INPUT (+)	20	8
LOGIC 13 COMMON (-)	19	7
LOGIC 13 OUTPUT (+)	18	6
LOGIC 14 INPUT (+)	17	5
LOGIC 15 COMMON (-)	16	4
LOGIC 15 OUTPUT (+)	15	3
LOGIC 16 INPUT (+)	14	2
		1

	13	LOGIC 9 COMMON (-)
	12	LOGIC 9 INPUT (+)
	11	LOGIC 10 COMMON (-)
	10	LOGIC 10 OUTPUT (+)
	9	LOGIC 11 INPUT (+)
	8	LOGIC 12 COMMON (-)
	7	LOGIC 12 OUTPUT (+)
	6	LOGIC 13 INPUT (+)
	5	LOGIC 14 COMMON (-)
	4	LOGIC 14 OUTPUT (+)
	3	LOGIC 15 INPUT (+)
	2	LOGIC 16 OUTPUT (+)
	1	LOGIC 16 COMMON (-)

9-16
LOGIC PORTS
(Lower "B" DB-25)

Host CPU (HC-2007)

Overview

The host CPU card used in the iXO incorporates a Texas Instruments TMS320C67x floating point digital signal processor. The HC-2007 card utilizes RAM, an SD memory card for preset and event file storage, several AT (Audio Transport) ports, an iXO link port, and an Ethernet port. The host CPU board is used in all iXO system cages.

The purpose of the CPU card is to provide control of the iXO system master chassis and any other chassis connected via the iXO link. The CPU communicates to the iXOverture PC and Wall Controllers via TCP/IP over Ethernet. The CPU also phase locks the crosspoint switch and attached remote racks to an on-board crystal oscillator.

Hardware and software configuration, as well as real time crosspoint information, is saved in non-volatile storage on the CPU card and is restored at power up or reset. This configuration information provides details to the host application running on the CPU, such as the specific audio hardware available, serial port allocation, I/O signal names, etc., and may be modified via the iXOverture GUI. Switching information is dynamically controlled via both hardware based XY Controllers and PC based XY GUI's. Network IP address configuration of the CPU is handled by the iXOverture software application. System configuration is discussed in detail in the following sections.

Ethernet IP Addressing

Wheatstone Commercial Audio iXO systems ship with the host CPU IP address set for 192.168.1.230. Stand-alone systems (not interfaced to an end user's existing network) require no IP address changes.

Before the switch will be recognized on your network, you will most likely need to re-configure the host CPU. To change the host CPU IP address, you must use the iXOverture application running on a PC which is connected to the iXO directly via a crossover cable, or connected to the iXO via the network. The PC must be on the same subnet as the iXO system.

Ethernet Interface Wiring

Stand-alone systems are defined as iXO systems connected to an iXOverture configuration PC, and not interfaced to an end user's existing network. Stand-alone systems are "point to point" configurations and are connected by a CAT-5e crossover cable.

Networked systems are defined as an iXO system connected directly to an existing Ethernet network hub. Networked systems are connected to the network hub via a straight (pin-to-pin) CAT-5e cable. Typical CAT-5e cable pinouts are included in the "Hook-Ups" section near the end of this chapter.

Memory Card

A removable 1 gigabyte SD memory card ships with each HC-2007. The memory card is located toward the top center of the circuit board and is accessible only when the HC-2007 is removed from the cage. This card will store hundreds of presets and/or events, depending on the system configuration and the types of presets and events that are stored. If more storage is desired, you can purchase, format, and install an SD card with a larger memory capacity.

Serial Interface Port

The serial port is used for factory debug and test applications. For interfacing of third party control systems such as Crestron and AMX, please use the Ethernet port and refer to the Automation Interface section of this manual.

Internal Programming Options

All internal programming options are made via PCB mounted dipswitches and jumpers. All switch settings are only read at power up. Dipswitches and jumpers settings are shown in the table below:

Switch Settings

SW1 - AT Link A CAT–5e/Fiber

This slide switch sets the physical connection of the AT Link A to be used with the standard "copper" CAT-5e link or the fiber optic rear connector. This switch is used in conjunction with dipswitch SW10, C-0.

SW2 - AT Link B CAT–5e/Fiber

This slide switch sets the physical connection of the AT Link B to be used with the standard "copper" CAT-5e link or the fiber optic rear connector. This switch is used in conjunction with dipswitch SW10, C-1.

SW3 - AT Link C CAT–5e/Fiber

This slide switch sets the physical connection of the AT Link C to be used with the standard "copper" CAT-5e link or the fiber optic rear connector. This switch is used in conjunction with dipswitch SW10, C-2

SW4 - Ethernet CAT–5e/Fiber

This slide switch sets the physical connection of the Ethernet port to be used with the standard "copper" CAT-5e link or the fiber optic rear connector. This switch is used in conjunction with dipswitch SW10, C-3

SW5 - CPU Reset

This momentary pushbutton switch allows the CPU to be reset without powering down the system. Holding the button for two seconds will also cause the FPGA program to be reloaded, and will reset the iXO system.

SW6 – Sample Rate Frequency

This slide switch allows the selection of either 44.1kHz or 48kHz sample rate for the system.

NOTE: When changing the audio sample rate of the iXO System, changes must be made in the DO-8 Digital Output Card and HC-2007 Host CPU Card. All such cards in the system must be set to the same sample rate. Additionally, any attached Wheatnet system must also employ the same sample rate.See the appropriate manual sections for details.

SW7 - Not Used

SW8 (D-SW A) – Local or Remote

This dipswitch will set the host card to be used in a local rack (a single iXO cage), or in a remote rack (the second cage in a 2 cage iXO system). Presently only Position 1 of the dipswitch is used. The default is "local rack" with the switch in the "On" position.

Pos.1 (A-0) – Local Rack: On (default) Remote Rack: Off

Pos.2 (A-1) - not used

Pos.3 (A-2) - not used

Pos.4 (A-3) - not used

SW9 (D-SW B) - PLL Slave to AT Links Enable/Disable

This dipswitch will enable or disable the AT Links A, or B, rather then its internal clock. This setting is required on any "sister" iXO systems which connect to the main iXO system via the AT-Links. The setting is mutually exclusive, meaning that you will have the system's PLL Slave to the A or B AT Link (not both). The default for both is "OFF" with the PLL slaving disabled.

Pos.1 (B-0) – Enable PLL Slave AT Link A: On Disable PLL Slave AT Link A: Off (default)

Pos.2 (B-1) - Enable PLL Slave AT Link B: On Disable PLL Slave AT Link B: Off (default)

Pos.3 (B-2) - not used

Pos.4 (B-3) - not used

SW10 (D-SW C) – AT-Links CAT-5e or Fiber

This dipswitch will set the AT Links A and B to use either the standard CAT-5e ("copper") AT link rear connectors or the optional fiber optic rear connector card. Presently only Positions 1 & 2 of the dipswitch are used. The default for both is "On" which is for the standard CAT-5e connection.

Pos.1 (C-0) - AT Link A - CAT-5e: On (default) AT Link A - Fiber: Off

Pos.2 (C-1) - AT Link B - CAT-5e: On (default) AT Link B - Fiber: Off

Pos.3 (C-2) - AT Link C - CAT-5e: On (default) AT Link C - Fiber: Off

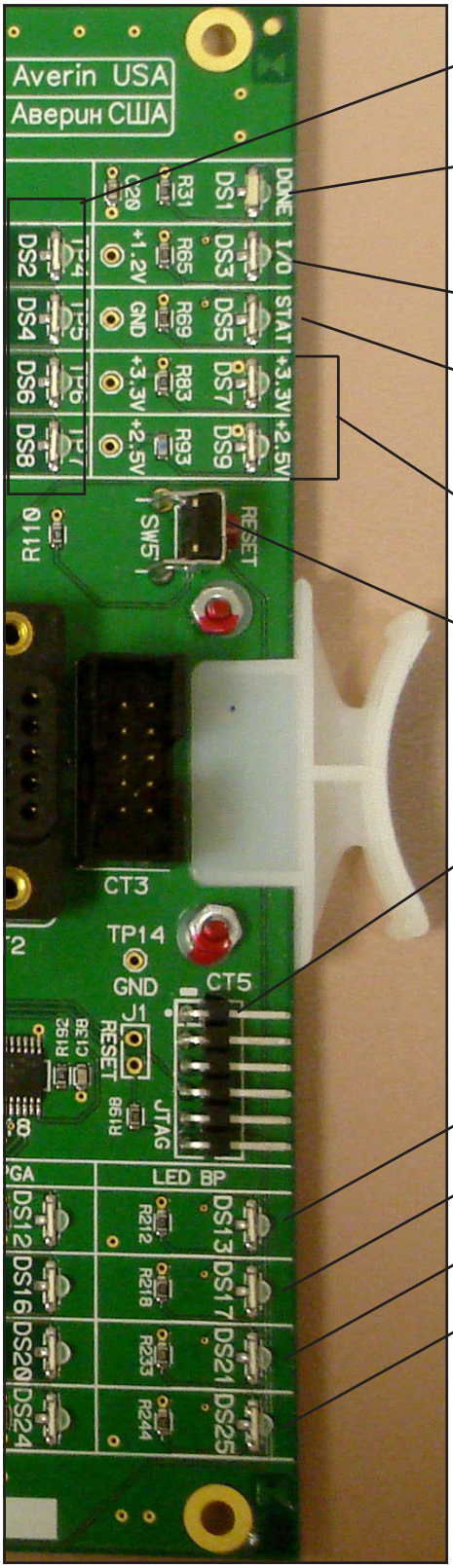
Pos.4 (C-3) - Ethernet - CAT-5e: On (default) Ethernet - Fiber: Off

SW11 – Not Used

Jumper Settings

Jumper settings for J1 through J7 are for factory use only. There are no user jumper settings on the host card.

Host CPU Card Status LED's



(DS2, DS4, DS6, DS8 - For future use.

DONE LED (DS1) - Normally OFF;
ON when programming the FPGA,
Flashes when system clock is missing.

I/O (DS3) - For future use.

STATUS (DS5) - For future use.

POWER SUPPLY STATUS (DS7, DS9) - ON indicates power supply is OK.

RESET SWITCH (SW5) - Momentary pushbutton. Hold for 2 seconds for complete reset of CPU and FPGA. Quick TAP for soft reboot.

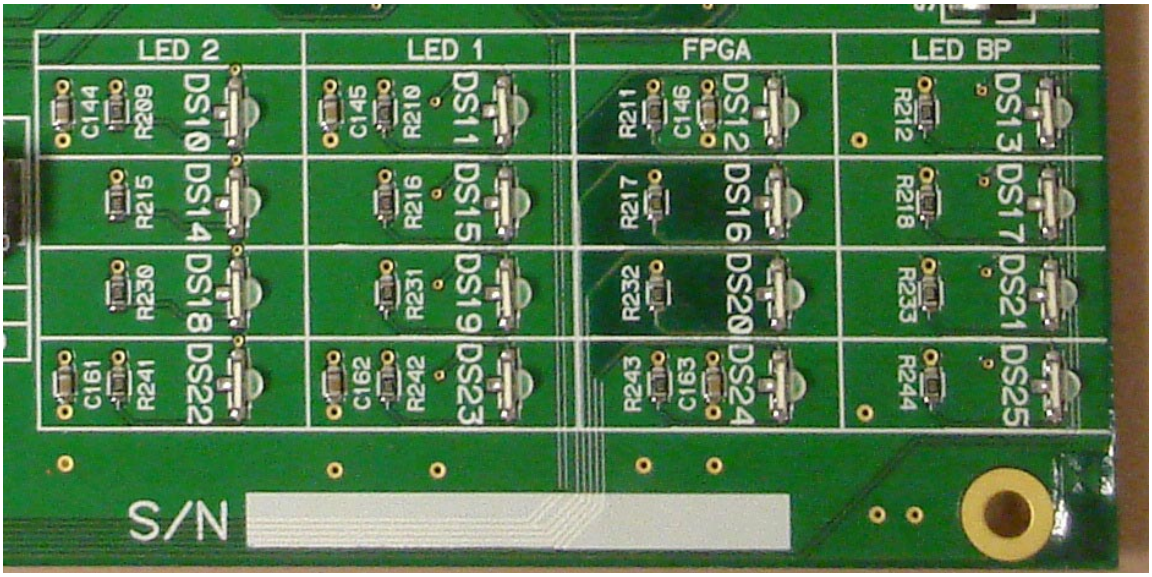
JTAG HEADER - FPGA programming - factory use only.

DS13 - FPGA controlled and always OFF.

DS17- Factory diagnostic use.

DS21 - Factory diagnostic use, normally ON.

DS25 - FPGA controlled, reflects an image of the CMD bus.



LINK STATUS LED's

DS12, DS16 - Factory diagnostic use, normally ON.

DS20 - Matches the setting of DIPSW A-0.

DS24 - ON when the"E" (iXO Link) port hardware is working.

DS10, DS11 - ON and flashing respectively when "A" (AT Link A) port hardware thinks it is connected.

DS14, DS15 - ON and flashing respectively when "B" (AT Link B) port hardware thinks it is connected.

DS18, DS19 - ON and flashing respectively when "C" (AT Link C) port hardware thinks it is connected.

DS22, DS23 - ON and flashing respectively when "D" (Ethernet) port hardware thinks it is connected.

Hook-Ups

All user wiring to and from the CPU card takes place at the rear I/O connector module (HCC-2007 or HCOC-2007) that plugs into the extreme left-hand slot (if you are looking at the rear of the cage). There is one DB-9 female serial interface connector and one RJ-45 Ethernet connector. CAT-5 or multi-mode optical fiber Mixer Link connections are made via RJ-45 or SC type optical connectors. Pinouts drawings on pages 2-39 and 2-40 show all wiring connections at a glance.

HCC-2007 Rear Module Connections

DB-9—Serial Interface Connections

Pin 3 – RX1 HI (RS-485)
Pin 8 – RX1 LO (RS-485) / GND (RS-232)
Pin 2 – TX (RS-232)
Pin 7 – RX (RS-232)
Pin 1 – TX1 HI (RS-485)
Pin 6 – TX1 LO (RS-485)

RJ-45—AT Links A, B, C Connections

Pin 1 – TX +
Pin 2 – TX -
Pin 3 – RX +
Pin 4 – N/C
Pin 5 – N/C
Pin 6 – RX -
Pin 7 – N/C
Pin 8 – N/C

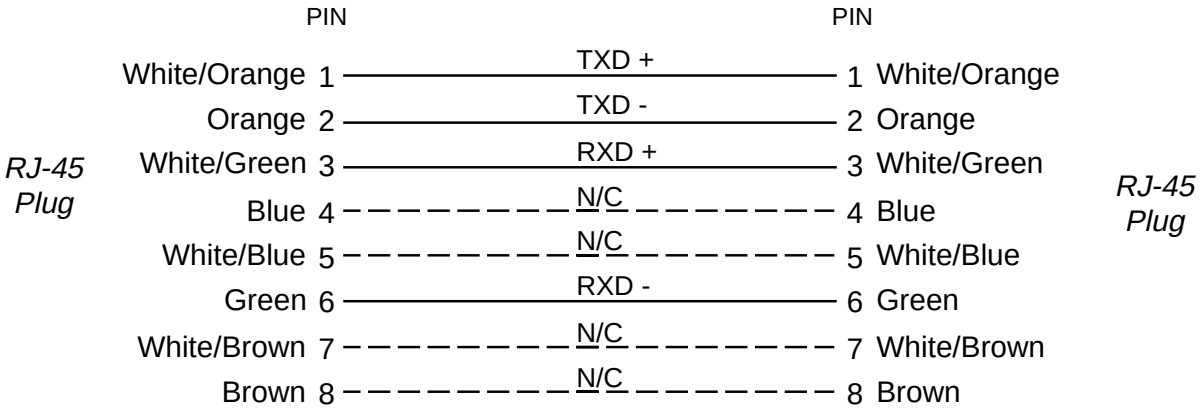
RJ-45—Ethernet Connections

Pin 1 – TX +
Pin 2 – TX -
Pin 3 – RX +
Pin 4 – N/C
Pin 5 – N/C
Pin 6 – RX -
Pin 7 – N/C
Pin 8 – N/C

RJ-45—iXO Link Connections

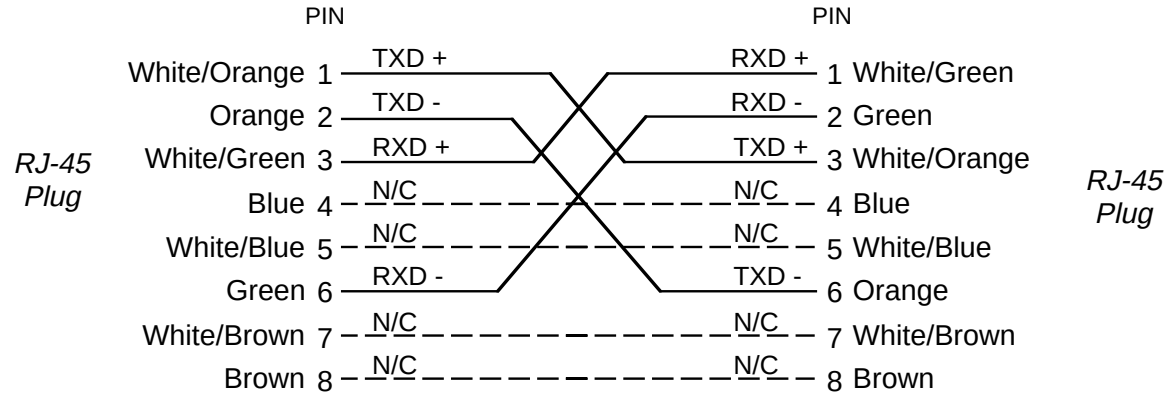
Pin 1 – TRD0 +
Pin 2 – TRD0 -
Pin 3 – TRD1 +
Pin 4 – TRD2 +
Pin 5 – TRD2 -
Pin 6 – TRD1 -
Pin 7 – TRD3 +
Pin 8 – TRD3 -

TYPICAL ETHERNET CABLE



Used for connecting the Host CPU module to your network hub.

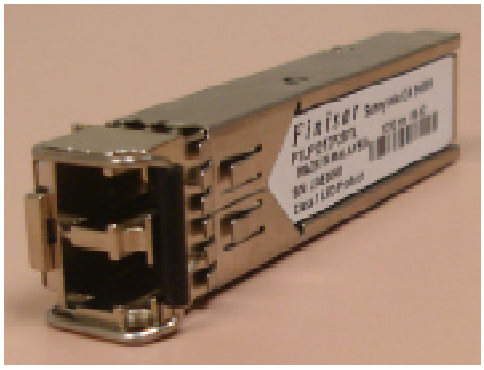
TYPICAL CROSSOVER CABLE



Used for simple “point to point” connections between a PC’s NIC card and the HOST CPU module, for the IXO-LINK connection, and AT LINK connections between iXO systems.

Optical Fiber Interface

Optical Transceiver



The optional fiber optic card allows you to utilize SFP (Small Form factor Pluggable) fiber transceivers for the AT-Link ports A and B, allowing you to go well beyond the 100 meter distance limitation of CAT-5e cable. Optical transceivers convert physical signals from electrical to optical (and vice-versa) in a network and couple the optical signals into (and out of) optical fiber. SFP transceivers are designed to be hot-swappable in industry standard cages and connectors (for easy field repair), and offer high speed and physical compactness.

Connector Type

The high-density LC Duplex connector has a tabbed locking mechanism similar to what you would find on a phone jack. This enables secure connectivity and easy removal.

Optical Fiber Cable

The typical optical fiber cable required in this application is a multi-mode, glass core cable, with a core/cladding size of 62.5/125 µm, suitable for low-to-moderate-speed data links (≤100Mbps). The full-duplex nature of the audio network interface requires one fiber for transmit, and one for receive; hence dual zip cables are recommended.

Optical fiber cables are manufactured with a variety of jacket material which directly affects cable cost, including Thermoplastic Elastomer (TPE), Kynar®, and Teflon® FEP. Physical properties of the jacket material determine a cable's resistance to abrasions, flame retardancy, etc. *Check local codes to be sure the cable you plan on using is compliant in your application.*

HCOC-2007 Rear Module Connections

The connections of the fiber optic card are similar to the standard copper card with the exception of AT links A and B. You can also utilize AT-Link C with a CAT-5e cable in lieu of the optical AT-Link B on this card by setting the associated DIP and slide switches mentioned earlier in this host card section. The rear connector details are as follows:

DB-9—Serial Interface Connections

Pin 3 – RX1 HI (RS-485)
Pin 8 – RX1 LO (RS-485) / GND (RS-232)
Pin 2 – TX (RS-232)
Pin 7 – RX (RS-232)
Pin 1 – TX1 HI (RS-485)
Pin 6 – TX1 LO (RS-485)

SFP Port—AT Optical Link A Connection

SFP Port—AT Optical Link B Connection

RJ-45—AT Link C Connections

Pin 1 – TX +
Pin 2 – TX -
Pin 3 – RX +
Pin 4 – N/C
Pin 5 – N/C
Pin 6 – RX -
Pin 7 – N/C
Pin 8 – N/C

RJ-45—Ethernet Connections

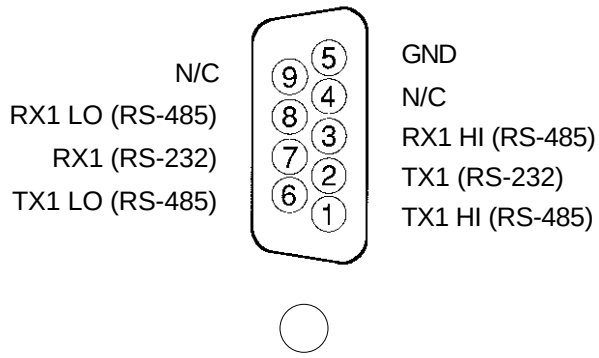
Pin 1 – TX +
Pin 2 – TX -
Pin 3 – RX +
Pin 4 – N/C
Pin 5 – N/C
Pin 6 – RX -
Pin 7 – N/C
Pin 8 – N/C

RJ-45—iXO Link Connections

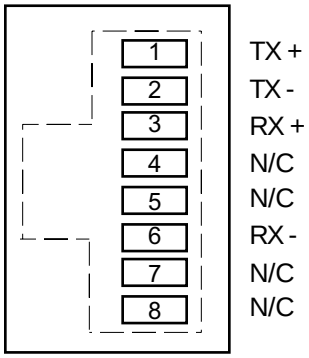
Pin 1 – TRD0 +
Pin 2 – TRD0 -
Pin 3 – TRD1 +
Pin 4 – TRD2 +
Pin 5 – TRD2 -
Pin 6 – TRD1 -
Pin 7 – TRD3 +
Pin 8 – TRD3 -

HCC-2007 Panel I/O Connections

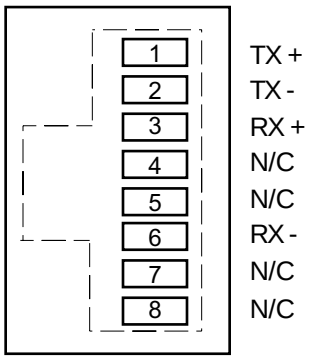
Serial Port
(DB-9 Connector)



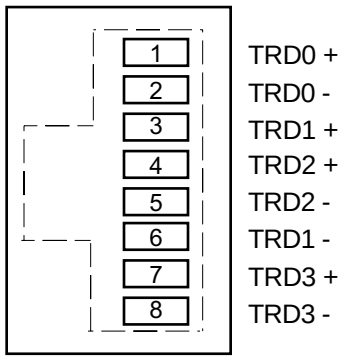
Audio Network - CAT5
(RJ-45 Connector
"LINK A," "LINK B," "LINK C")



Ethernet
(RJ-45 Connector "ETH")

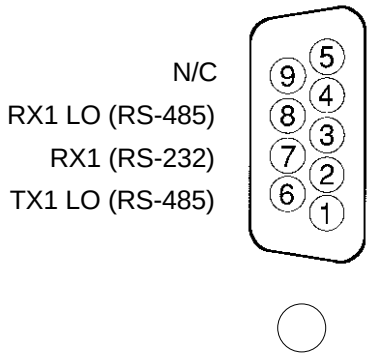


G-BIT Ethernet
(RJ-45 Connector "IXO-LINK")

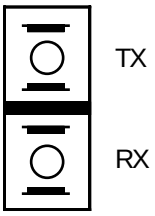


HCOC-2007 Panel I/O Connections

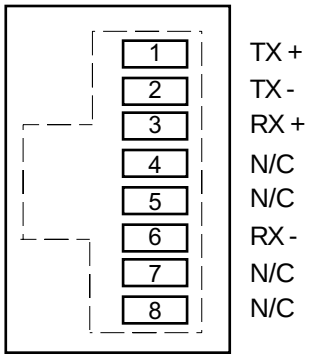
Serial Port
(DB-9 Connector)



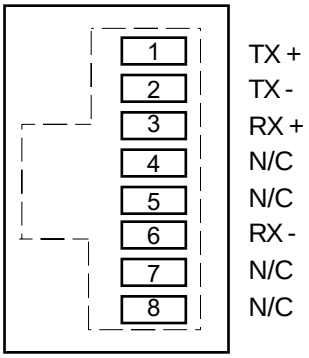
Audio Network - Opto
(SFP Transceiver
"LINK A" & "LINK B")



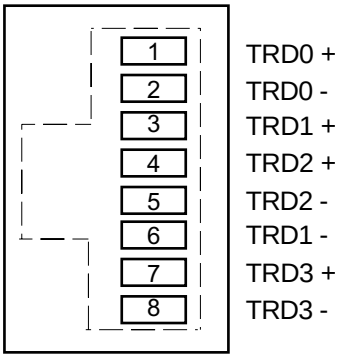
Audio Network - CAT5
(RJ-45 Connector "LINK C")



Ethernet
(RJ-45 Connector "ETH")



G-BIT Ethernet
(RJ-45 Connector "IXO-LINK")



Digital Signal Processor Card (DSP-2001)

Overview

The DSP-2001 card is the digital signal processing card used by the iXO System to mix and condition input signals. DSP cards in a given system are physically identical. Their fuctionality is determined by input and mix software which is loaded into each DSP card's memory on *surface* powerup. Wheatstone's iXOverture software is used to map each DSP card to specific control surfaces and audio racks.

There are three iXO DSP card variations:

- DSP-IP Input Processing Card
- DSP-MIX Mixing Card
- DSP-OP Output Processing Card

All iXO DSP card variations can accommodate up to 32 channels audio.

See the iXOverture GUI chapter for details.

Internal Programming Options

All internal programming is done via PCB mounted switches and jumpers.

Switch Settings

SW1 - DSP Reset Switch

Momentarily pressing and holding this switch resets the DSP and reloads software from the surface.

SW2 - Not used

Jumper Settings

J1 - Factory Use Only - Watchdog Reset

Momentary shorting does a complete reset.

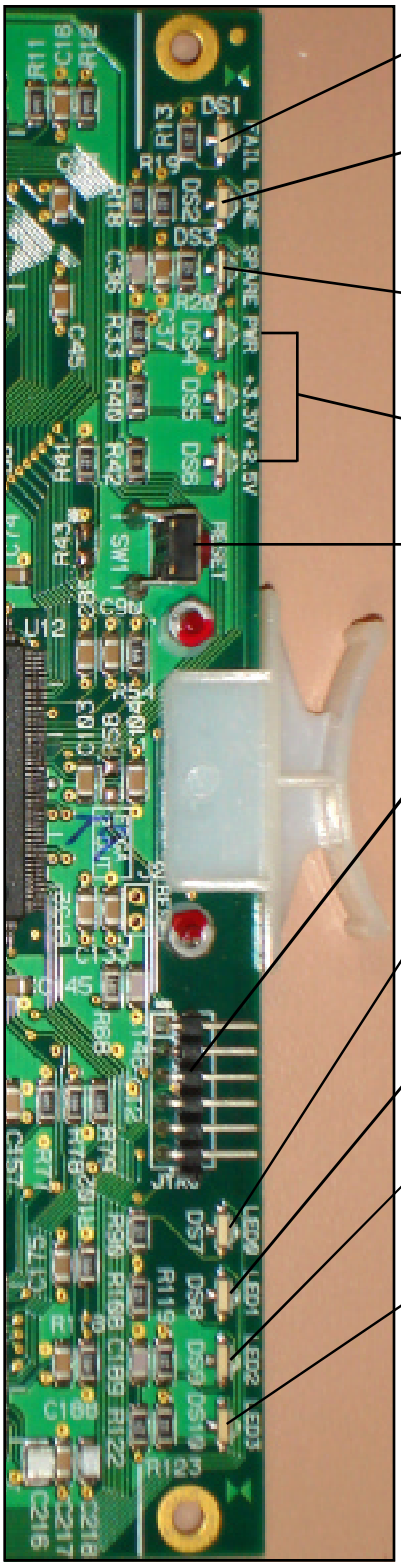
J2 - Factory Use Only - Watchdog Reset

Momentary shorting does a complete reset.

J3 - Factory Use Only- Watchdog Disable

Normally installed; remove to disable watchdog reset.

DSP Card Status LED's



FAIL (DS1) - Normally OFF;
Lights to indicate card failure.

DONE LED (DS2) - Normally OFF;
ON when programming the FPGA,
Flashes when system clock is missing.

ERROR (DS3) - Normally OFF;
Lights to indicate clock error.

POWER SUPPLY STATUS (DS4-DS6) - ON indicates power supply is OK.

RESET SWITCH (SW1) - Momentary pushbutton. Hold for 2 seconds for complete reset of CPU and FPGA.

JTAG HEADER - FPGA programming - factory use only.

BACKPLANE RESPONSE (DS7) - Lights as the card responds to backplane messages.

MESSAGE (DS8) - ON indicates that messages are being received from control surface.

SYNC (DS9) - ON indicates clock SYNC signal.

CONFIGURATION (DS10) - ON indicates card needs configuration from HOST.

NOTE: Normal operation is (3) power status LEDs always ON, all other LEDs OFF, except DS7 lights once every ≈ 40 seconds and DS8 flickers in response to control changes on the control surface.

iXO System Design & Configuration

Chapter Contents

iXO System Design & Configuration

There are two major steps involved in creating a fully functional iXO system, regardless of the system size. The first is the design, or more specifically the various hardware components and software applications that are required to make the system have the functionality required by the client. Knowing the right hardware and software to incorporate into your projects is a key factor in making complex systems cost effective and easy to configure.

This leads us to the second step, configuration. The iXO is an audio router/processor that is card cage based, where up to two cages can form a single stand-alone system, and multiple systems can be linked together to share sources, mixes, and processed outputs. With multiple methods of linking systems together, you need to understand the various methods so you can choose the best one for your particular application. Being able to properly configure an iXO system is not difficult. And once you have taken some time to learn the system's configuration capabilities, you will find that you spend less total engineering time on an iXO system than other competing DSP platforms.

Probably the most important part of the configuration process is how to get audio into and out of the system with the desired results with regards to mixes, levels, processing, etc. This section will explain in greater detail how to best use all of the DSP tools that are available to you in the iXO.

System Architecture

The iXO system architecture is based upon Wheatstone Corporation's Bridge Router, which was developed for the radio and television broadcast market back in 2001. The basic premise of the system is that it is a high capacity, scalable, digital audio router with processing and mixing. It uses a high speed TDM backplane to get the signals to their respective cards and to link to other cages. This system can link multiple master bridge cages together to achieve thousands and thousands of input/output ports; you can create a custom system that includes multiple smaller remote satellite cages, with everything interconnected via CAT-5e or fiber optic links.

Wheatstone Commercial Audio iXO systems use this same TDM technology to structure and control audio transmission. Each rack has 32 signal conduits, or busses, common to all card slots. Each one of these busses is clocked at 100MHz, fast enough to contain 16 channels of 24 bit audio data within one audio sample period. These busses create an audio infrastructure of 16 x 32 = 512 available channels of audio per rack. Each audio channel brought into the rack can be mapped to any one of these 512 available signal positions. Wheatstone uses embedded control to coordinate the mapping of audio onto the 512 signal slots. At system start

up the system CPU assigns each audio input to a unique position in the 512 signal structure. It does this by assigning each input card to one of the 32 busses. Once this assignment has been made, the input cards continue to synchronously place their channels of audio data in order on their assigned bus for as long as power is applied to the rack.

Likewise on the output side, anytime an input-to-output connection is made, the affected output channel is told which of the channels on a particular bus to capture and send on to the output. Similarly it will continue to do this for as long as power is applied to the rack unless instructed otherwise, i.e., told to "make a different connection". The entire process of mapping the audio structure and connecting inputs to outputs is called "configuring the cards" and takes place for a couple of seconds while the system is powering up. The system CPU retains a complete system description or "configuration" in its solid state flash memory, and conveys this configuration to all system cards and components at start up time. Anytime the system is changed in any way, the system CPU updates its configuration information in flash memory, so anytime the system is powered up it will be configured with the latest information. This system of embedded control makes the Wheatstone system extremely robust because once audio connections are established no intervention by the system CPU is needed to maintain the flow of audio. In fact, the CPU can be frozen, switched, or restarted—all without interfering with the flow of audio.

In order to utilize this TDM audio infrastructure, all input signals must first be digitized (if analog) and then up converted to the high-speed format required for the TDM busses.

This is done for analog signals via A/D converters on analog input cards. Each card has circuits for eight mono analog channels. Each analog channel is digitized and up converted at a very low latency, and then directed to the appropriate time slot on the particular bus as determined by the system configuration. Analog input cards are available with eight mono mic/line level inputs.

For digital input signals the process is the same, except that the digital inputs use sample rate converters in lieu of A/D converters. A digital input card is available with four stereo (eight mono) AES digital inputs.

Once the input signals are available on the TDM busses, they can be picked up by output cards, DSP cards, AoIP cards, or network cards for transmission to other places in the system.

For the output, or destination side of the Wheatstone system, the process is reversed. Any output channel that has been "connected" (by software, hardware controllers, control surfaces, events, etc.) to an input channel simply pulls in the high speed TDM data from the correct time slot on the correct TDM bus and down converts it to data at the system master sample rate. For analog outputs a D/A converter produces the analog output. Analog output cards are available with eight mono analog line level outputs.

Likewise for digital outputs the process is similar except that AES transmitters format the audio data into AES streams at the system master sample rate. A digital output card is available with four stereo (eight mono) AES digital outputs.

This TDM structure is the basis of the entire mixing system as well. In the iXO-MF, DSP cards have been designed to connect to the TDM structure such that

their mixes become available as sources (available to output channels) and their mixer inputs become available as destinations (to input channels assigned via the crosspoint matrix). In the iXO system, all DSP functions are always fully enabled; the system always has enough DSP resources available to fully provide all possible mixes and signal processing on all channels simultaneously. In this manner, any audio that is present in the TDM structure can be assigned to a mix, even other mixes! And because every mix is available as a source, it can be routed to any and all destinations where it is needed. System wiring remains simple: source devices are wired to input cards and audio destinations are wired to output cards.

Hot Swappable Cards

On the Wheatstone Bridge Router, a front loading card cage design was implemented because the ability to add cards to expand the system, or quickly swap a card in the rare event of a failure, was required by broadcasters. The iXO platform takes the same technology and applies it to a commercial audio application.

One of the key features that an iXO system has is the hot swap capability of all cards in the system. This feature greatly minimizes downtime and simplifies servicing of the system. Depending on the type card being swapped, interruption of audio may be as little as one second for input & output cards (analog and digital), approximately 10 seconds for DSP cards, or approximately 35 seconds for the Host CPU. The amount of audio affected by the hot swapping of cards will also vary, with the swapping of input cards only affecting those destinations where the sources are assigned. An output card hot swap will only affect the audio outputs for the individual card. A DSP card swap will affect a greater portion of the audio in the system, but again it is dependent upon the card's use in the system and if there are any interconnects between other iXO systems via AT links or Wheatnet. Swapping a Host CPU card is the same as doing a system reboot, provided that you have preconfigured your backup card.

AT (Audio Transport) Links

Wheatstone uses a proprietary protocol for distributing audio signals between card racks to create audio networks. Similar to the TDM architecture used on the backplane of the card racks themselves, Wheatstone uses a TDM structure with embedded control over CAT-5/6 cables (or optionally optical fibers) to connect card racks together. Each one of these connections, or links between cages, is capable of 64 simultaneous bi-directional (64 channels out and 64 channels back) audio signals, as well as logic and control information. Each iXO system in a networked configuration has a Wheatstone network interface (part of the Host CPU card) whose function is to pick up the 512 signal audio architecture from the rack it is resident in and make the 512 signals available via these link or branch connections to other card racks in the networked system, and vice versa.

iXO Link

The iXO Link is a proprietary protocol for distributing audio signals between the first iXO cage and the second cage to create a single system greater than 32 inputs and/or outputs, up to a maximum size of 64 x 64. It is similar to the previously mentioned AT Link and could best be described as a Gigabit version of an AT Link. It also uses a TDM structure with embedded control over CAT-5/6 cables (or optionally optical fibers) to connect the two cages together. There are no user definable iXO Link settings, with the configuration file automatically making the correct assignments whenever a two cage configuration file is created using the iXOverture software application.

The iXO in 10 Sentences

Repeat the following ten sentences five times and you will have a much clearer understanding of the iXO:

- I have input sources.
- I have input channels.
- Input sources can be assigned to any or all input channels.
- Input channels can be mixed together and sent to any output for processing.
- Any mix can go to any or all outputs.
- I can export any local input source, mix output, or processed output to other iXO systems via AT Links A and B.
- I can import any input source, mix output, or processed output from other iXO systems via AT links A and B
- There are 64 bidirectional channels per AT Link, plus control and metering.
- An AT Link can be 100m in length using CAT-5e cable.
- An optional fiber optic AT-Link output is available for longer distances.

System Designs (up to 64 x 64)

When designing any audio system, proper planning is required to ensure satisfactory results. When planning a design of an iXO system that is not going to exceed 64 x 64 in I/O size, there are a few things that you need to keep in mind so as to come up with the best possible solution for the project. For those projects whose I/O requirements exceed 64 x 64, please refer to the section "Expanding Beyond 64 x 64" located further along in this manual.

System Design and Configuration Considerations

Using the iXOverture software application and creating a system is the best way to quickly see your hardware requirements for any system design. It allows you to create iXO configurations quickly offline, and gives you an opportunity to see the many ways in which to address your project's requirements.

When you launch the application the System Wizard is launched and allows you to choose to create a new system file. Selecting this option will open up the iXO Configuration Wizard, which then asks you to first select the number of inputs of the system, followed by the number of outputs.

It will then prompt you a third time to ask if there are any logic I/O requirements, and if there are, it allows you to select the number that will meet your needs.

A fourth prompt will ask you how many input channel processing paths are required, to which you choose between single or dual path processing.

Single or Dual Path Input Channel Processing

The decision to use a single input channel processing path or dual paths really comes down to your project's requirements. A single processing path needs little explanation to those who are familiar with most mixing consoles. On an input channel strip you have your input source, which then goes through a processing section with filter settings for EQ, dynamics settings, and gate settings to tailor the audio signal. The signal then moves to the fader section. What a dual processing path offers you is a second independent processing path on the same input channel strip along with a second independent fader section. One may think of it as akin to having a single input channel strip with both main PA and monitor/record input channel controls on the same strip. This allows you to have separate EQ, dynamics, and gating settings for the particular output mixes or destinations you assign them to. You can also have the individual channel's B path processing blocks "mirror" or track the A path to speed system adjustment. You can also apply this mirror feature to the input channel faders as well.

Certain applications such as large paging, background/foreground music systems, are candidates for single path input processing. Systems where speech reinforcement is minimal and/or the acoustical environment is favorable may find that a single input processing path is also sufficient.

Applications with significant voice and music reproduction with a main loudspeaker system and any or all of the following - monitor systems (speaker and in-ear), conferencing, broadcasting, and recording - are where the dual input processing path option should be considered.

Input Channels: Analog or Digital

There are two input cards available for the iXO: the MLI-8 mic/line input card with eight input channels, and the DI-8 digital input card with eight input channels (four AES-3 pairs). When using the System Wizard it assumes that all inputs will be analog. You are able to change any slot that is initially assigned an MLI-8 card to a DI-8, or add DI-8 cards to any open input slots in the iXO Hardware Configuration window once you've completed the System Wizard.

Note: It is important to remember that in certain cases where you are using both analog and digital inputs that you may need to use a second cage to accommodate your input channel requirements. For example, if you need 28 analog and four digital inputs (32 total), this would require a total four MLI-8 cards and one DI-8 card, which necessitates the need for a second iXO-MF cage.

Output Channels: Analog or Digital

There are two output cards available for the iXO: the LO-8 analog line output card with eight balanced line output channels, and the DO-8 digital output card with eight output channels (four AES-3 pairs). When using the System Wizard it assumes that all outputs will be analog. You are able to change any slot that is initially assigned an LO-8 card to a DO-8, or add DO-8 cards to any open output slots in the iXO Hardware Configuration window once you've completed the System Wizard.

Note: It is important to remember that in certain cases where you are using both analog and digital outputs that you may need to use a second cage to accommodate your output channel requirements. For example, if you need 28 analog and four digital outputs (32 total), this would require a total four LO-8 cards and one DO-8 card which necessitates the need for a second iXO-MF cage.

Logic Input and Output

An iXO-MF cage can have two LIO-32 cards installed in slots 9 and 10, which provide up to 32 logic inputs and 32 logic outputs per cage. If your system design has less than 32 audio inputs and/or outputs, but requires more LIO, a second iXO-MF is required to house the additional LIO-32 cards.

Mixing and Output Processing

One of the great features of the iXO is that all mixing and output channel processing is available on every output.

Being router based, the system provides some additional advantages. By default Mix Output 1 is assigned to Output Channel 1, Mix Output 2 to Output 2, and so on. Unique to the iXO is the ability to assign a mix to any output in the system. This is handy when you need to send the same mix to multiple outputs and want to retain one level control.

The output processing of the iXO provides you with ability to configure any output channel to be either a standard output channel (default) with a 31 band graphic equalizer, delay, and dynamics, or a speaker processor with parametric equalization, crossover filters, dynamics, and two delays.

iXO Gain Structure

As with any audio system, proper gain structure is paramount to optimal system performance. All incoming and outgoing signals connected to the iXO system should be checked and adjusted for proper level in order to maintain optimum headroom and signal-to-noise ratio.

Input Source Gain

Every input source connected to the iXO should be adjusted for proper gain structure. Microphone level settings can be handled by the iXO input channel. For adjusting speech or vocal microphone gain settings it is recommended that you have someone speak/sing into the microphone in accordance with the design intent of the microphone. Using the default input channel's meter (do not forget to check the box to enable metering), you should adjust the input source gain setting located toward the top of the input channel in order to achieve an average meter reading of 0dB. The same holds true for any instrument microphone applications as well.

Attention needs to be paid to various line level sources such as wireless mic receivers, CD's, MP-3 players, and other source devices, to make sure that they are all properly set up with regards to gain structure. The proverbial "garbage in, garbage out" saying is definitely valid here.

Output Gain

Once proper input gain settings have been achieved you can now proceed to adjust the output channels for proper gain settings. All output channels are set to 0dB by default. For any output channel which is to feed a power amplifier to drive loudspeakers, it is recommended that the amplifier's input sensitivity control(s) be turned down all of the way. You can either use an external noise source or the internal signal generator available on the iXO for assisting in setting the gain. With the noise source signal reading 0db on an input channel's meter, and with the input channel fader set to 0db, route the input channel to the desired output(s). Verify that the signal is present on the output channels by right clicking on the channel and selecting Switched Meter. Once signal presence is confirmed, you can now slowly turn up the input level control on the amplifier(s) to achieve the SPL level desired for the system.

Crosspoint and Mix Gain Settings

By default all crosspoint faders and mix output faders are set for 0dB. These should only be adjusted after input and output gain settings have been achieved.

Routing, Mixing, and Signal Processing

This section covers a wide variety of subjects which are important to comprehend if you want to minimize your configuration time and maximize your system's performance.

The Importance of Labeling when using the iXOverture GUI

Since the iXO is a router first and foremost, it is extremely important for you to label your system's input sources and outputs before attempting to do any matrix assignments. The iXOverture software allows you to create eight character labels for each input source (one for the source itself, another for the location of the source). The same is true for output channels (one for the destination, another for the location). Labels can also be created for DCAs, Output Groups, Presets, Events, and Wall Controllers. A properly labeled system is much easier to configure, commission, and troubleshoot if necessary.

Routing

In an iXO system there are various types of routing which enable you to get the proper signals to their destination easily. Some of these methods allow you to think of new ways to approach system designs, especially when used in room combining or campus wide applications.

Input Source Routing

Input source routing is available on every input channel of an iXO. By default, input source one (port 1, slot 1, cage 1) is assigned to input channel 1, input source two (port 2, slot 1, cage 1) is assigned to input channel 2, and so on. With input source routing you are not reswitched in assigning sources to channels. Some systems designers may choose to not use this routing ability, and can hide the input channel's select and take controls to eliminate any unintentional assignments.

Upon first creating a configuration, all input sources are available to all input channels. You can limit the visibility of the input sources on a per channel basis. This enables you to create an input channel which has a specific function for a given system. For example, you could have an input channel assigned to an output, with the input channel being used for background music selection and level control for that particular room in the system. All of the available (or desired) background music sources can be included in the channel's visibilities setting. Using this functionality along with a Wheatstone wall controller or Crestron or AMX system allows tremendous flexibility in many hotel ballroom combining systems.

Another example where input source routing is extremely powerful is in emergency situations where you need the ability to have a particular microphone or message repeater feeding select, or all, rooms in the system.

Input Channel Routing

Input channel routing utilizes the crosspoint mixing matrix and lets you decide to what output(s) an input channel will go to. To make a route, you double click on the desired crosspoint cell and then choose the desired type of mix setting that you want to apply (Normal or Automix). You have a fader and a mute button which you can use to create the desired mix when multiple input channels are assigned to the same output.

A handy feature is the ability to copy and paste crosspoint settings by single clicking on a cell that you wish copy, right clicking and selecting copy, and then selecting a new cell by single clicking on it, right clicking and selecting paste. You can also select groups of crosspoint cells by a single click and hold on a cell and then moving your mouse to highlight the group that you want to paste to. Release the click, right click on one of the selected cells, and select paste. You can use the same method of selecting groups of cells to utilize the clear function, which returns the cell to a factory default state.

Mix Output Routing and A/B Path Assignment

Mix output routing lets you quickly assign any mix's output to any or all output channels in the system. Room combining applications with overflow capabilities are easily accomplished with this feature.

It is also a great feature to use when you have a high performance two, three, or four-way loudspeaker system and are using the speaker processing capability of the output channel for the associated crossover networks and related DSP.

The Mix Output window is also where you determine which input processing path gets assigned to the mix, the A or B path (provided that the system is configured with this option).

Mixing

There are two types of mixing available to use on the iXO. The individual matrix crosspoint cells are where this decision is made. These mixing types and their unique settings allow you to create custom mixing solutions for a majority of the audio systems you will encounter.

Normal Mix

A Normal mix is similar to mixing on a traditional mixing console. Selecting this on a matrix crosspoint cell assigns the associated input channel to the mix for the specific output that you have chosen. The crosspoint cell fader gives you the ability to adjust the level on the input to the desired level in the mix. The Normal mix setting is recommended for use on all music or program audio crosspoint settings.

Automix – Gain Share

Automix is an automatic microphone mixer function, which like all "automixers" is designed to manage multiple microphones automatically, activating the microphones when someone speaks into them while attenuating the other microphones in the mix which are not in use at the time, which helps to mitigate room noise and reverberation. And if more than one microphone is being spoken into by multiple people at the same time, the mixer will change the mix bus gain to achieve a consistent output level.

Wheatstone's automixer utilizes a proprietary algorithm which allows you to use the crosspoint Gain Share setting without the associated input channel's Gate settings enabled. But the best overall results can be achieved by using the input channel's gate. This hybrid approach yields the best automixing performance, and allows control over how many microphones can be active at one time. Using the input channel gate also allows use of the Priority and Override features of the mixer.

Automixer Settings

To enable the Automix feature on any matrix crosspoint cell, double click on the desired crosspoint and set the Mix Type to the Gain Share setting.

You also have additional automixer settings located in the Output Mix window. Click on the Output Mix cell of the column where you have inputs set to the Gain Share setting. Located at the bottom of the window are two settings: Max Open and LM Mode.

Max Open limits the maximum number of open or "active" microphones that can be "on" or in use.

LM Mode allows you to select a particular microphone input channel or use the last microphone that was active to remain on, after the speech has ceased. This is primarily used in teleconferencing applications where it is desired to have the far end caller hear some background room noise so that they know they still are connected to the system.

Using Input Channel Gating and Automix

You do have the option of using input channel gating in conjunction with the Gain Share setting on the crosspoint cells. This is a very handy feature when dealing with a large number of microphones or difficult acoustic environments.

Automix – Priority

The Priority setting of an Automix will give the associated input source a priority over sources in the same mix which are set to the Gain Share setting. To enable the priority feature you must set the desired matrix crosspoint cell to the Priority Mix Type setting and enable and adjust the respective input channel gate.

When a microphone with the Priority setting becomes active (someone speaks into it), all of the sources with the Gain Share setting are prohibited from activating until the person with the Priority microphone is finished speaking. You can have multiple microphones in a mix set to the Priority setting.

Automix – Override

The Override setting of an Automix will give the associated input source the highest priority over sources in the same mix which are set to the Gain Share or Priority setting. To enable the Override feature you must set the desired matrix crosspoint cell to the Override Mix Type setting and enable and adjust the respective input channel gate.

When a microphone or source with the Override setting becomes active (someone speaks into it or signal is present), all of the sources with the Gain Share and/or Priority setting are prohibited from activating until the person/source with the Override is finished speaking or when signal is no longer present. You can have multiple microphone/sources in a mix set to the Override setting.

Using Automix – Priority and Override to Duck Signals

With careful adjustment it is possible to use the Automix settings as a ducker for paging and message repeating applications where you want the background music to attenuate whenever a page/message is made.

This is accomplished by setting the music source crosspoint to the Gain Share setting, enabling the Gate on the respective input channel. The threshold should be set low enough to allow all music through without interruption. The Depth control should be set for the desired attenuation when a page/message is occurring. The attack, release, and hold times should be adjusted for optimum performance with the source material and interaction with the Override signal.

The paging/messaging crosspoint should be set to Priority or Override and also have it's respective input channel Gate enabled. The Gate threshold should be adjusted to allow all acceptable signal levels through. The attack, release, and hold times should be adjusted for optimum performance with the source material and any interaction with the background music signal.

Connecting to an iXO System

Each iXO Mainframe is shipped with all Host, Input, Output, Logic I/O, and DSP cards loaded in their associated card slots, with the Host card loaded with a default system configuration and IP address. Please refer to the following steps for connecting to various iXO systems.

Initial System Connection – First Use

1. Assign an IP address to the PC.

Each iXO-Mainframe ships from the factory with a default IP address of 192.168.1.230. The PC must have a unique IP address before it can communicate with the iXO. The PC's IP address should be 192.168.1.x (x = 1 through 254 except 230 because that is what the iXO is set at). The Subnet mask should be 255.255.255.0.

2. Launch the application

Double click on the iXO desktop icon or use the start menu to navigate to the program.

3. Energize the iXO device.

Connect the supplied power cord to a grounded AC mains voltage of 100-240VAC @ 50/60Hz. Connect the other end of the power cord to the power entrance located on the rear of the iXO. The device will begin a power up sequence where the LED's on the various cards will light up and the ventilation fan will start. After approximately 30 seconds the power up sequence is completed which is indicated by the lighted green LED's on the cards.

4. Connect the PC to the iXO.

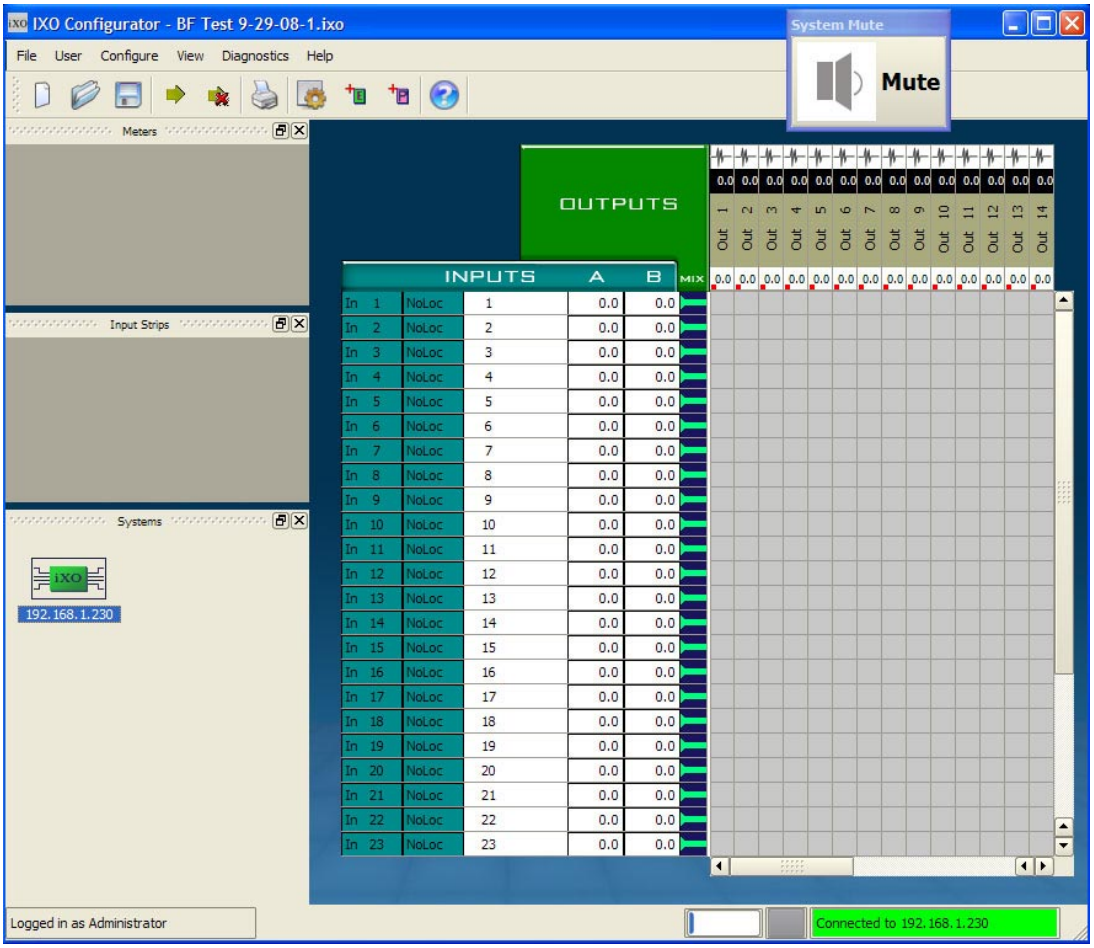
Connect a "crossover" Ethernet cable from the PC's Ethernet jack to port D (Ethernet) on the rear connector card of slot 16 of the iXO.

5. Connect to the iXO.

With the iXOverture application already open, you will see an iXO icon appear in the “Systems” dock. The icon is gray in color and will have the default IP address (192.168.1.230) listed directly below it. Right click on the iXO System icon and select Connect. A Connect Options window will appear; click on download. The default configuration will download to the PC and the status bar will provide indication when the download is complete. Once successfully connected, the iXO system icon will turn green, indicating that you are connected to that particular system. A large system mute button will also appear upon successful connection. This button will mute the entire iXO system and is intended to be used during system commissioning.

6. Disconnect the PC from the iXO.

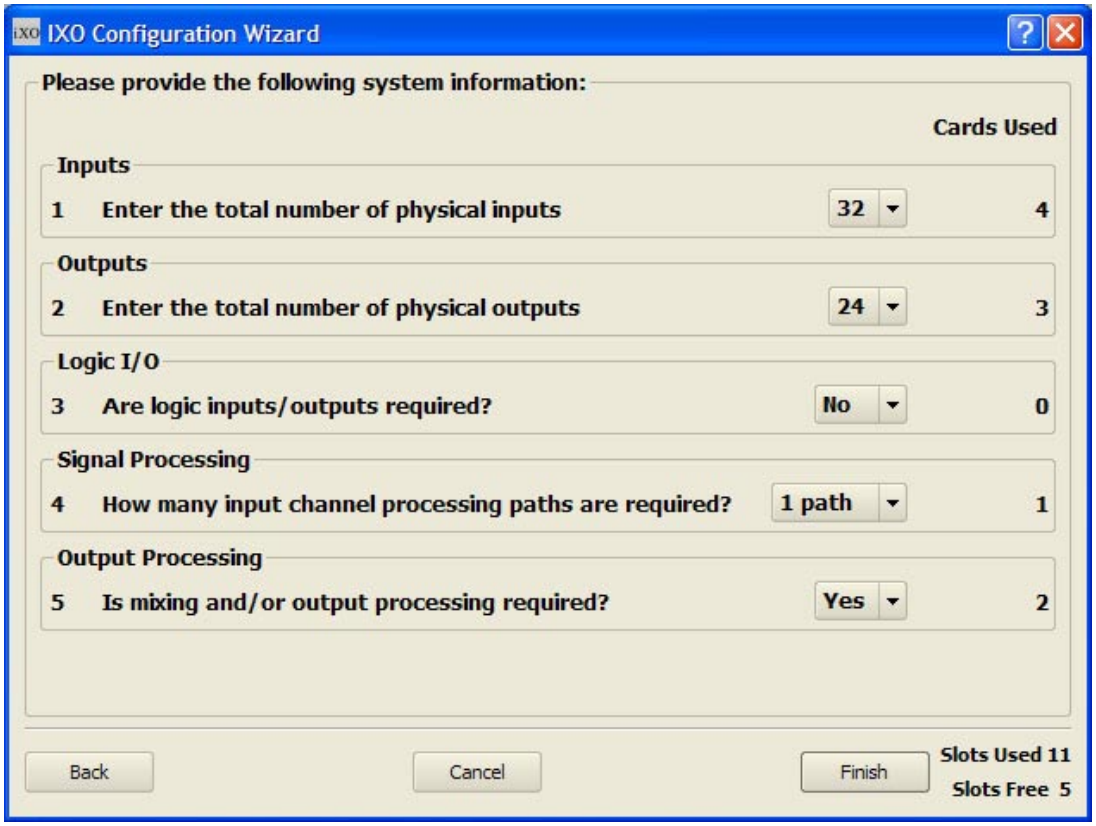
To disconnect, mouse over the system icon in the Systems dock, right click, and select disconnect. You can also disconnect by using the disconnect icon on the Toolbar.



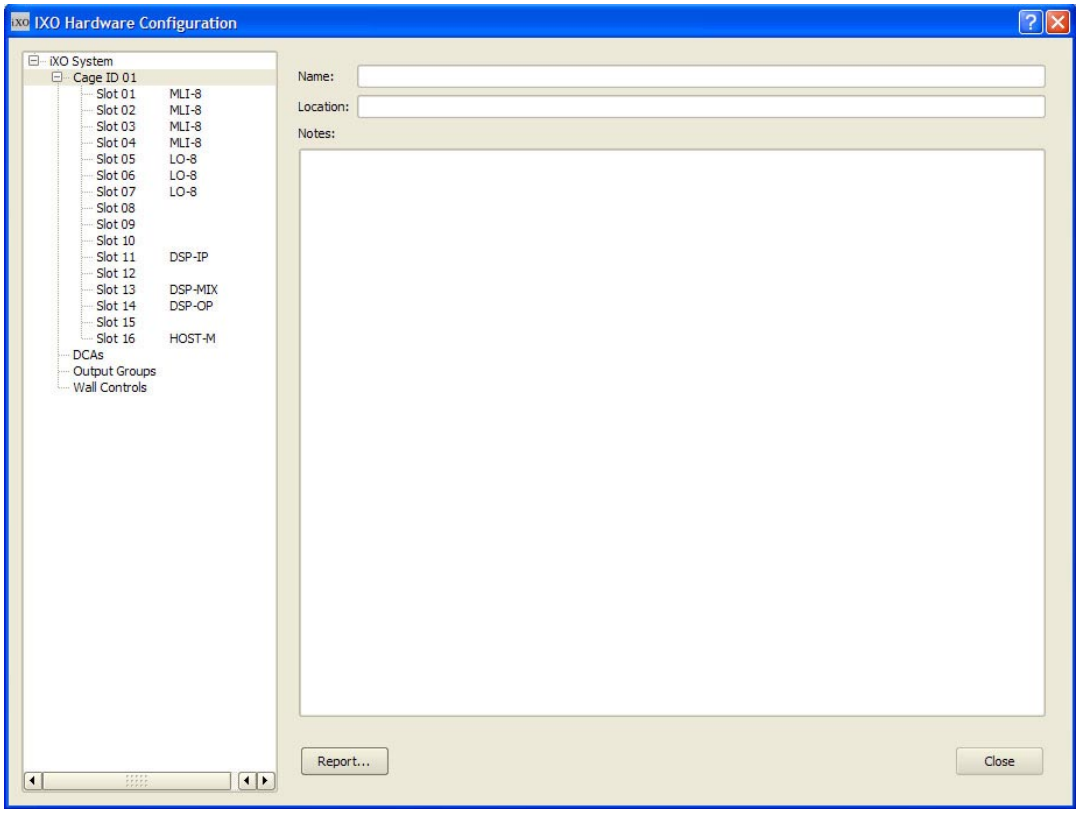
Since the default system configuration for a single iXO-Mainframe is for a fully loaded 32 x 32 system (4 mic/line input, 4 analog line output, 2 LIO, 4 DSP and a Host card) you will need to create and upload a custom configuration file which reflects the correct card slot assignments for your system. Follow steps 7 - 9 below.

7. Create a new system (up to 32 x 32).

Select *File>New* from the file menu, which will launch the iXO Configuration Wizard. Answer the system requirement questions 1 through 5, using the Next button to navigate to the next question. Once question 5 is completed click "Finish".



This will open up the Hardware Configuration window, which will display the card slot assignments in a system tree format.



Make sure that the iXO Mainframe hardware matches the slot assignments in the file. Once this is corrected and/or confirmed, click “Close”.

A “Save Config File” window will appear. Assign a name to the system and click Save.

8. Upload the new configuration file to the iXO.

Click on the Connect icon from the Toolbar. This will open the Connect Options window. The default IP address (192.168.1.230) will be displayed. Click Upload. A dialog box will then appear asking if you wish to send the presently open file to the iXO hardware. Click “Yes” to begin the upload. The status bar will reflect the upload progress, and upon completion you will see the iXO System icon in the System dock and the Status bar turn green, indicating a successful connection.

9. Adjust audio parameters.

Once a configuration file is uploaded to the appropriately loaded iXO Mainframe you can now use the GUI to route, process, and mix audio.

Optional:

10. Saving changes made to the iXO system configuration file.

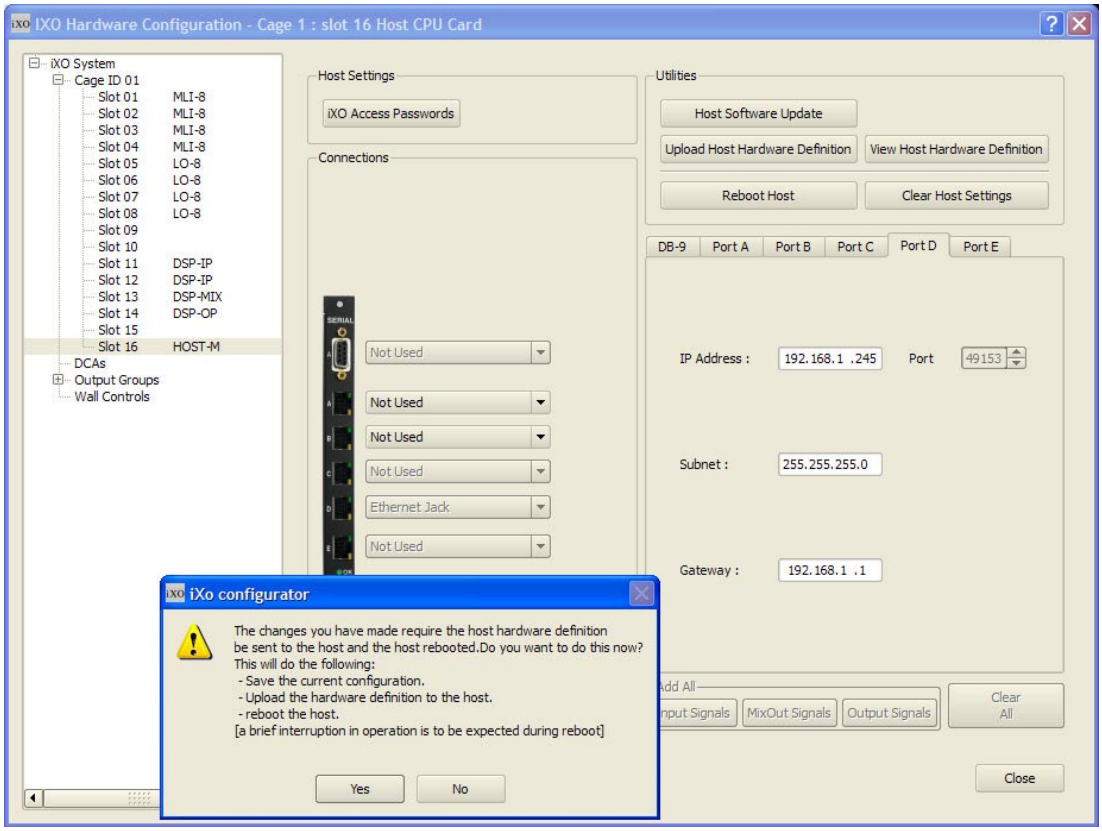
Click on "Save," which will save any adjustments and/or changes that were made after the original upload to the system. This saves the configuration of the system to your PC.

11. Disconnect the PC from the iXO.

To disconnect, mouse over the system icon in the Systems dock, right click and select disconnect. You can also disconnect by using the disconnect icon on the Toolbar.

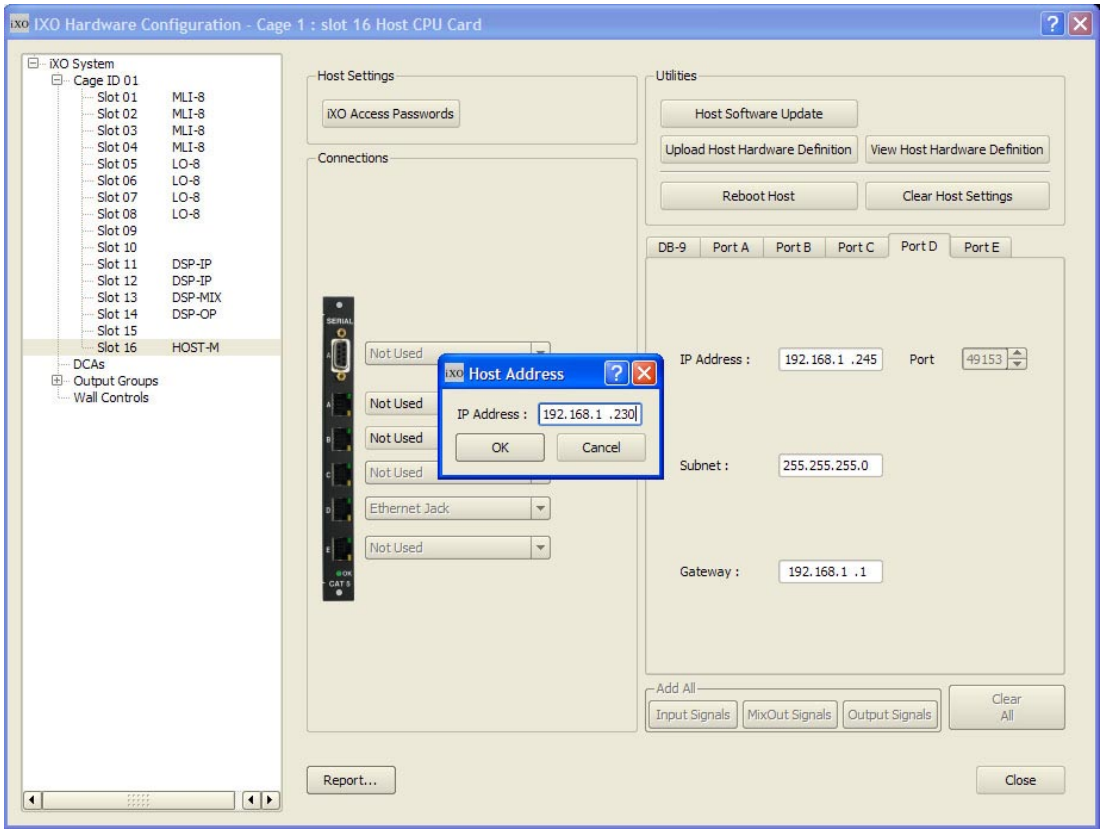
12. Changing the IP address.

Click on *Configure>System Editor>Hardware Config*. On the Hardware Configuration window system tree click on Slot 16 (Host M), enter the new IP address, and click "Close".



A dialog box informs you that the changes you made will require the host hardware definitions to be sent to the host and rebooted. Click "Yes".

A pop up window will appear which prompts you to enter the present IP address of the system.



Confirm or enter the address and click "OK." A Download Success window appears to inform you that the changes were sent to the hardware; click "OK." A Reboot System window will appear and asks you if you would like to reboot the system now for the changes to take affect. Click "Yes" to reboot the system. After approximately 30 seconds a new iXO System icon will appear in the system dock with the new IP address displayed directly below. The icon with the old IP address will turn red and will then disappear from the dock.

For configuration of systems above 32 inputs and/or outputs, two iXO-Mainframes are required. To link the cages together, use a CAT-5e crossover cable (up to 100m in length) to connect Port D (iXO Link) of the first cage to Port D of the second cage. Remove the Host card from slot 16 of the second cage and set DIP switch 8 (D-SW A, Pos. 1, A0) to OFF. Insert the card back into the card frame. Since the default system configuration is for a single, fully loaded iXO-Mainframe you will need to create and upload a custom configuration file which reflects the correct card slot assignments for your two cage system. Follow steps 13 - 15 below.

13. Create a new system (up to 64 x 64).

Select *File>New* from the file menu, which will launch the iXO Configuration Wizard. Answer the system requirement questions 1 through 5, using the Next button to navigate to the next question. Once question 5 is completed click

"Finish." This will open up the Hardware Configuration window, which will display the card slot assignments in a system tree format. Make sure that the iXO Mainframe hardware matches the slot assignments in the file. Once this is corrected and/or confirmed, click "Close."

A "Save Config File" window will appear. Assign a name to the system and click "Save."

14. Upload the new configuration file to the iXO.

Click on the Connect icon from the Toolbar. This will open the Connect Options window. The default IP address (192.168.1.230) will be displayed. Click Upload. A dialog box will then appear asking if you wish to send the presently open file to the iXO hardware. Click "Yes" to begin the upload. The status bar will reflect the upload progress, and upon completion you will see the iXO System icon in the System dock and the Status bar turn green, indicating a successful connection.

15. Adjust audio parameters.

Once a configuration file is uploaded to the appropriately loaded iXO Mainframe you can now use the GUI to route, process, and mix audio.

Optional:

16. Saving changes made to the iXO system configuration file.

Click on "Save," which will save any adjustments and/or changes that were made after the original upload to the system. This saves the configuration of the system to your PC.

17. Disconnect the PC from the iXO.

To disconnect, mouse over the system icon in the Systems dock, right click, and select disconnect. You can also disconnect by using the disconnect icon on the Toolbar.

18. Changing the IP address.

Click on *Configure>System Editor>Hardware Config*. On the Hardware Configuration window system tree click on Slot 16 (Host M), enter the new IP address, and click "Close." A dialog box informs you that the changes you made will require the host hardware definitions to be sent to the host and rebooted. Click "Yes." A pop up window will appear, which prompts you to enter the present IP address of the system. Confirm or enter the address and click "Yes." A Download Success window appears to inform you that the changes were sent to the hardware; click "OK." A Reboot System window will appear and asks you if you would like to reboot the system now for the changes to take affect. Click "Yes" to reboot the system. After approximately 30 seconds a new iXO System icon will appear in the system dock with the new IP address displayed directly below. The icon with the old IP address will turn red and will then disappear from the dock.

Expanding Beyond 64 x 64

You can link multiple iXO systems together to create larger system by using the two AT Links located on the rear of the unit. These bidirectional links allow 64 channels in each direction, along with control and metering information. You can assign any input source, mix output, or processed output to a channel on the AT Link, making it available for use by any "sister" iXO system.

Connecting Multiple Systems Together via the AT Links

Linking several iXO systems together using the A and/or B AT Links is a fairly straightforward task that is accomplished in a few steps on the software and hardware.

1. First create and save a configuration file for each system.

You should label all inputs and outputs in each configuration so that you can easily keep track of the signals.

2. Open the first system's configuration file, open the Hardware Configuration screen, and click on Slot 16 Host-M.

On the image of the rear connector card you will see the A and B AT Link ports. Click on the drop down menu adjacent to the image of the A port and change it from "Not Used" to "AT Link to external system."

3. Click on the Port A tab.

The tab has a table which lists the 64 channels that are available to send or export the signals from the system, making them available to others. The channels are all unassigned at this point. The headings on the columns of the table are Type, Offset, Name, and Location.

- **Type** is the type of signal; None, Input Card, Mix Output, or Post Processing Output.
- **Offset** is the channel or mix number of the signal.
- **Name** is the input signal source label, mix number, or processed output label.
- **Location** is the input signal source label, mix number, or processed output location label.

4. Assign signals to export.

There are two ways in which you can assign signals to export. The quickest way is to use the "Add All" buttons located directly underneath the table. You can use these buttons to add all input signals, mix outputs, and output signals to the 64 channels. For example, clicking on Input Signals will open a pop-up window asking you what output "wire" (AT-Link channel) you would like to start on (the default is 1 for the first assignment). Click "OK." If you have a 32x32 system (32 input signals), then they will be automatically assigned to the AT-Link locations 1 through 32. Clicking on "Add All Mix Outputs" will bring up the same pop-up window, this time offering you to begin assignments on the AT-Link output "wire" 33. Click "OK" and your 32 mix outputs will be assigned to locations 33 through 64.

You can also double click individual cells in the Table column and select assign signals from the drop down menu. You can also change the signal name and location labels if you so desire by double clicking on those respective cells and entering your text.

5. Close the Hardware Configuration window and save the file.

6. Repeat steps 2 through 5 on the second iXO systems configuration file and then proceed to step 7.

7. Configure the AT-Link for the first system.

Now that you have two files which have signals which they are exporting on the AT-Links, you can now perform the final steps. Open the first systems configuration file and go back to the Hardware Configuration>Slot 16 Host-M window and click on the Configure button adjacent to the AT Link drop down menu. This will open a Link Settings window where you will enter the peer IP address of the "sister" system that is going to be connected via the AT-Link. Enter the IP address, and then click on "Load Signals from Config." This opens a drop down menu listing of all the iXO configurations which you have stored on your PC. Select the configuration of the second system to be linked. The signals from the second system will appear in a list. Click "OK" to accept these and to close the window. Close the Hardware Configuration window and Save the file.

8. Repeat step 7 for the second system and proceed to step 9.

9. Connect the AT-Links of the two systems together.

To link the cages together, use a CAT-5e crossover cable (up to 100m in length) to connect Port A (iXO Link) of the first cage to Port A of the second cage. Remove the Host card from slot 16 of the second system (note: this would be cage one of the second system if the second system consisted of two iXO Mainframes) and set DIP switch 9 (D-SW B, Pos. 1, B0) to ON. Insert the card back into the card frame. This step causes the second system's clock to slave to the first system's via AT-Link A.

10. Upload the completed configuration files to each system.

Connect and upload the new configuration files to each system. You should now have the exported signals available for use on both systems.

Connecting Multiple Systems With a Wheatnet Switch

For even larger systems you can utilize an 8, 16, 24, 32, or 48 port Wheatnet switch, allowing you to create a system with over 3000 input sources and output destinations (using the Wheatnet 4864).

Configuring each iXO for use with a Wheatnet is identical to configuring the AT-Links for use with multiple iXO systems.

The Wheatnet hardware is configured with Wheatstone's X-Point software which comes with the unit. The software is a large crosspoint matrix which manages the various signals to and from the iXO AT-Links. The Wheatnet is also used as an interface to the Wheatstone Bridge routing system, which allows integration of Wheatstone's mixing console/control surfaces with an iXO system.

For more information on the hardware, software, and programming of a Wheatnet please refer to the Wheatnet manual.

iXOverture GUI

Chapter Contents

iXOverture GUI

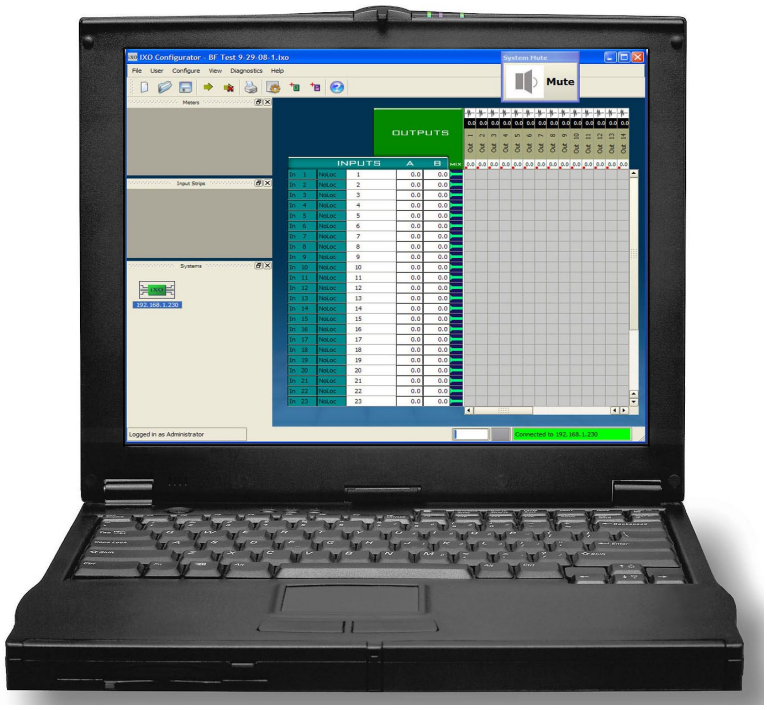
Introduction

The Wheatstone Commercial Audio iXO is a powerful DSP audio platform which takes a completely new approach to audio. The system is a router first and foremost - a router with extensive mixing and signal processing capabilities. This design approach allows the iXO to provide complex signal routing, processing, and mixing solutions with a significantly reduced amount of programming when compared to other manufacturers' offerings. The programming of the iXO hardware is accomplished by using the iXOverture software application.

Overview

The underlying idea of the entire iXO platform is "input x output". More specifically: How many inputs and outputs do I need in order to successfully fulfill the needs of a given project's audio requirements? This is typically one of the first decisions made when designing any audio system. It may be over-simplifying the design process a bit, but regardless of what your processing and mixing intentions are, you still need to know how many inputs and how many outputs are needed for the job at hand.

And when it does come time to start thinking about processing and mixing, another iXO product feature is that all the DSP resources are there at all times. This is where the iXO's aforementioned design differs from other DSP products you may have used. There is no dragging, dropping, wiring, and compiling required in order for you to get audio going. A level of processing unmatched in the industry is available at your command. The iXOverture software allows you



to create a system configuration in minutes. Our goal is to enable the audio system designer/programmer the ability to go from design concept to completion as quickly as possible.

The iXOverture application features a "system wizard" which asks you some questions regarding the total number of inputs, outputs, and logic I/O requirements, as well as processing and mixing needs. Once you answer these questions the application builds the system for you.

The iXOverture program is intended to be used as an "off line" system design and configuration tool and as an "on line" control and operations application. Since the iXO is based on a card cage platform (16 card slots in a single iXO main frame), the software has been engineered to guide you through the card selection and card slot placement process. And because extremely large audio systems can be created by linking individual iXO systems together, this manual will address creating systems in separate sections. One describes how to create stand alone iXO system sizes with up to 64 inputs and 64 outputs. Another explains how to create system sizes greater than 64 x 64 by utilizing multiple iXO systems.

But before we delve into the details of system creation, let us first install the software and become familiar with the layout of the iXOverture GUI.

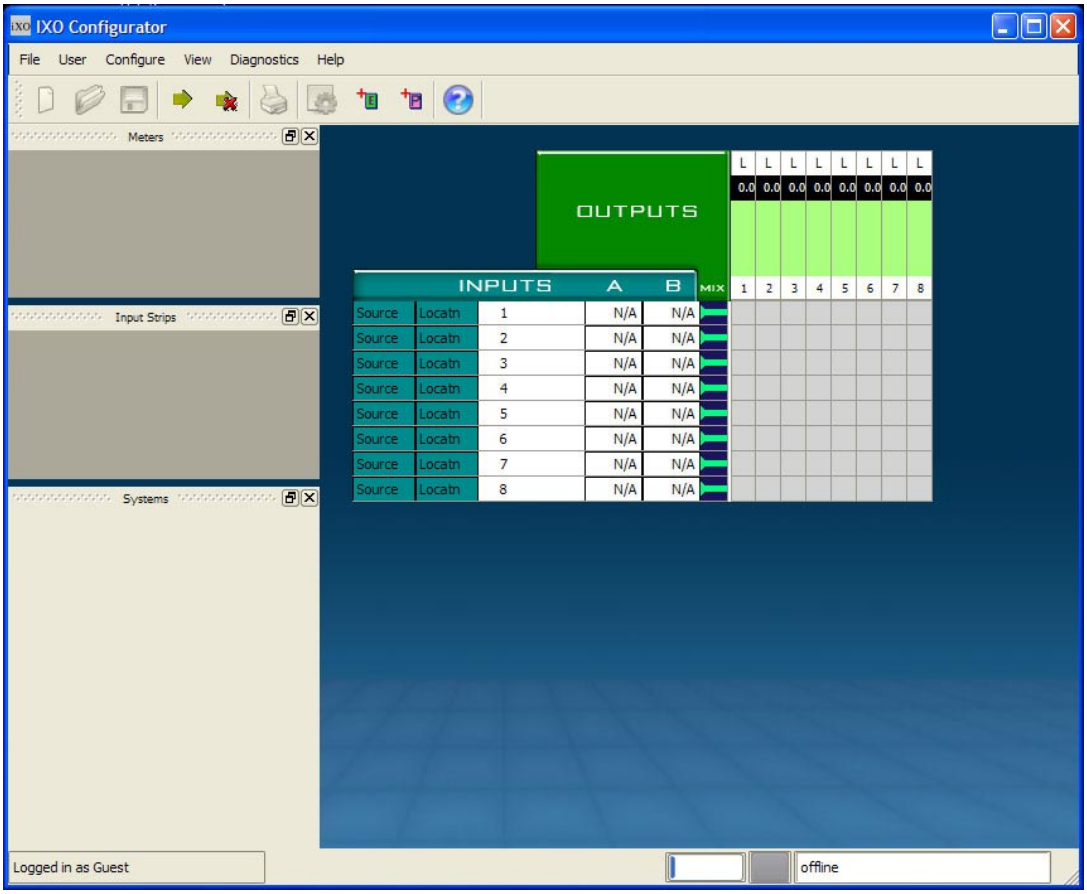
Installing the Software

A PC application program to control one or many iXO systems is supplied with the unit and is available on our website, www.wheatstone.com. It is a Windows™ Graphical User Interface (GUI) program, intended to be straightforward in use, controlling and displaying the powerful features of the iXO to best effect. It is supplied as a self-installing program which may be executed from any directory on the computer, the resulting files being installed under "Program Files\Wheatstone\ixo". The program may be started from the Windows Start menu, or by the iXO icon on the desktop of your PC.

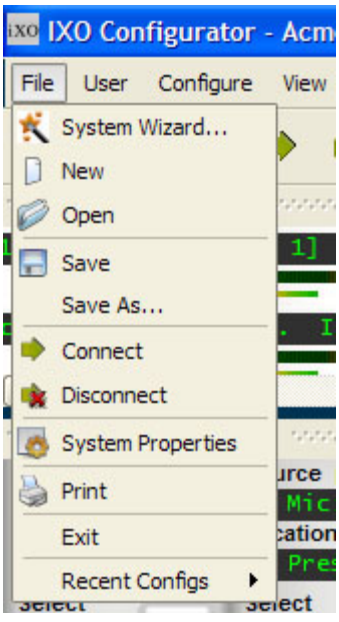
Constraints for the system are not extraordinary, in that the PC should be preferably at least 1GHz in speed, and that the screen be at least 1024 x 768 pixels in size. The LAN should be 100baseT (100MHz) capable. It is indeed possible for the GUI to be run on a portable computer connected to the LAN by wireless (802.11b as a minimum) as long as the iXO itself "sees" a 100baseT network. The dodgier the radio link, though, the more may be the impact on smoothness of the GUI's real-time graphics.

iXOverture - First Use and GUI Layout

After launching the application from the desktop icon or Windows Start menu, the program opens and you are presented with the following screen.



iXOverture software has been programmed to come up in a Guest user mode by default, which allows you to view the software, but not create systems. Also, not all of the menu items discussed below are available in Guest mode, Changing user modes to allow system creation and control will be covered immediately after this topic.



Towards the top of the screen you will find the Menu Bar, which has various drop down menus from which you can select.

The **File** drop down menu has the following selections:

Clicking on...

System Wizard...: Launches the System Wizard.

New: Launches the iXO Configuration Wizard.

Open: Allows you to open an existing system configuration.

Save: Saves the current configuration.

Save as...: Saves the current configuration under a different file name.

Connect: Allows you to connect to a new or existing iXO system.

Disconnect: Disconnects you from the system that you are presently connected to.

System Properties: Future use.

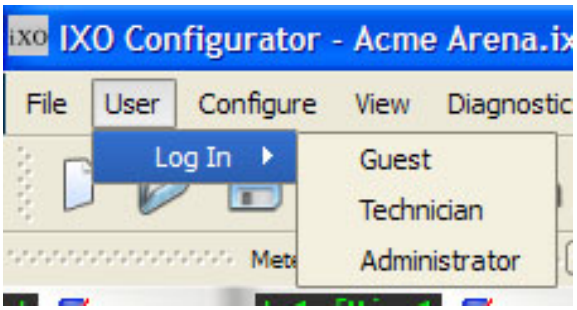
Print: Prints a screen capture of the GUI as presently displayed.

Exit: Exits the application.

Recent Configs: Lists the four most recently opened configurations.

The **User** drop down menu has the following selections:

Clicking on...



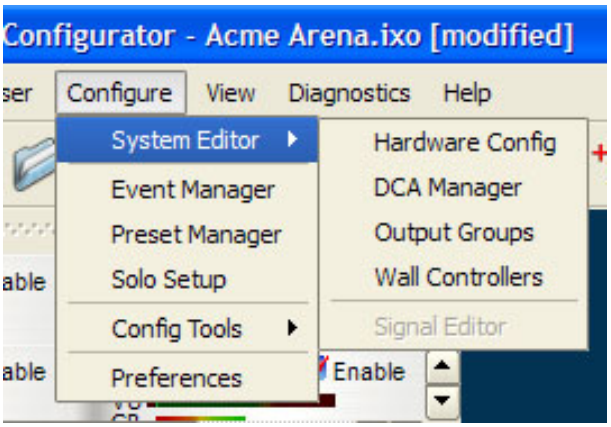
Log In; Guest: Allows you to log in to the system as a Guest (password protected). You will only be able to access the system resources allowed by the Administrator.

Log In; Technician: Allows you to log into the system as a Technician (password protected). You will only be able to access the system resources allowed by the Administrator.

Log In; Administrator: Allows you to log into the system as an Administrator (password protected).

The **Configure** drop down menu has the following selections:

Clicking on...



System Editor; Hardware Config: Opens the Hardware Configuration window which allows you to edit the system hardware configuration.

System Editor; DCA Manager: Opens the DCA (Digitally Controlled Attenuator) Manager section of the Hardware Configuration window for creating and managing the 256 DCAs available in the system.

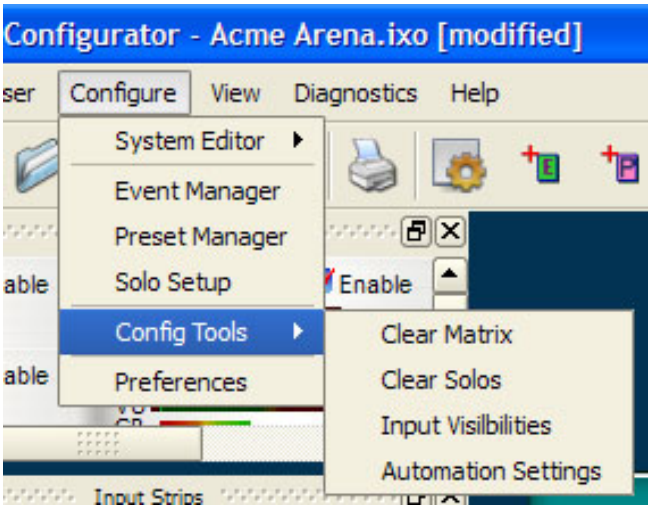
System Editor; Output Groups: Opens the Output Group section of the Hardware Configuration window for creating associations and managing the outputs available in the system.

System Editor; Wall Controllers: Opens the Wall Controllers section of the Hardware Configuration window for creating and managing the wall controllers that can be used in a system.

Event Manager: Opens the Event Manager Window which is used create, edit, and recall events (system snapshots).

Preset Manager: Opens the Preset Manager window which is used to create, edit, and recall presets for input channels, crosspoints, mix outputs, and output channels.

Solo Setup: Opens the Solo Setup window which is used to define and select the solo output channel and solo type (pre/post fader) for input channels, crosspoints, and mix outputs.



Config Tools; Clear Matrix: Clears the entire matrix. Reverts all crosspoint settings to "None" and resets fader to 0dB.

Config Tools; Clear Solos: Clears all enabled solos in the system.

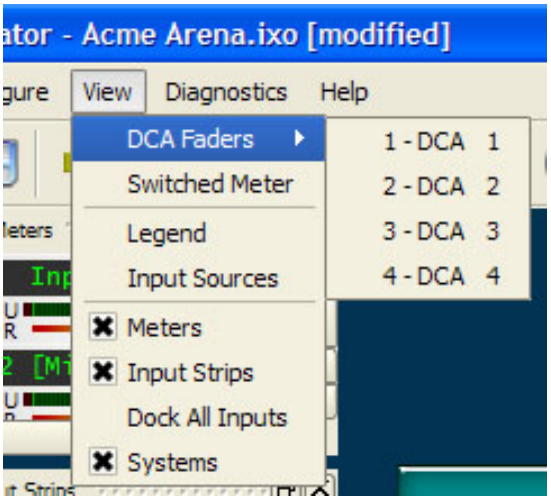
Config Tools; Input Visibilities: Opens the Input Visibilities window which is used to assign any input source(s) to any input channel(s).

Config Tools; Automation Settings: Allows you to set the maximum and minimum fader limits for wall controls and third party automation systems.

Preferences: Opens the iXO General Preferences window which is used to customize various features of the application on an individual basis.

The **View** drop down menu has the following selections:

Clicking on...



DCA Faders: Will list any DCA faders that you created. Click on the DCA name to view.

Switched Meter: Opens a Switched Meter window on the work space.

Legend: Shows or hides the legend for the crosspoint matrix.

Input Sources: Shows or hides the "select" and "take" buttons on input channels.

Meters: A checkbox which allows you to view the meters dock.

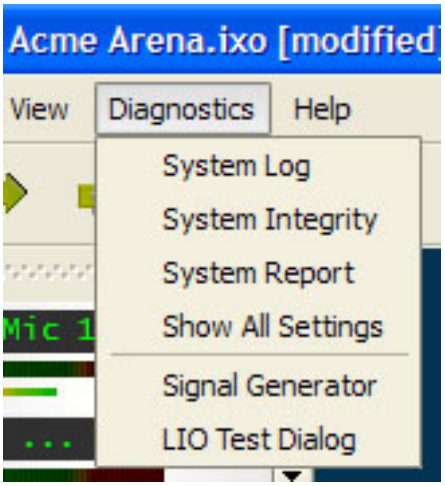
Input Strips: A checkbox which allows you to view the input channel strips dock.

Dock All Inputs: A command which will dock any system input channel that has been, or is presently opened.

Systems: A checkbox which allows you to view the systems dock.

The **Diagnostics** drop down menu has the following selections:

Clicking on...



System Log: Opens the iXO Log Viewer which shows Errors, Warnings, Information, and Journals

System Integrity: Performs a system integrity check and generates a report of its findings.

System Report: Displays a report on the systems configuration.

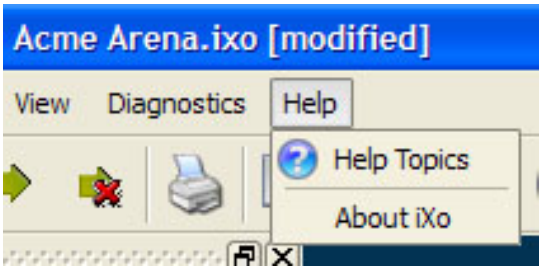
Show All Settings: Displays a report of all settings in the system.

Signal Generator: Opens the Signal Generator window which allows configuring input channels to generate tones and noise.

LIO Test Dialog: Opens the LIO Test Dialog window which allows you to test and troubleshoot logic inputs in the system.

The **Help** drop down menu has the following selections:

Clicking on...



Help Topics: Displays a list of help topics.

About iXO: Displays the version of the software.

Below the File Menu is the **Toolbar** whose icons perform the following actions:

Click on...


To start the iXO Configuration Wizard to create a New file.


To Open an existing configuration file.


To Save the file you have open.


To Connect to a system.


To Disconnect from a system.


To Print a screen capture of the GUI as presently displayed.


To View the System Properties.

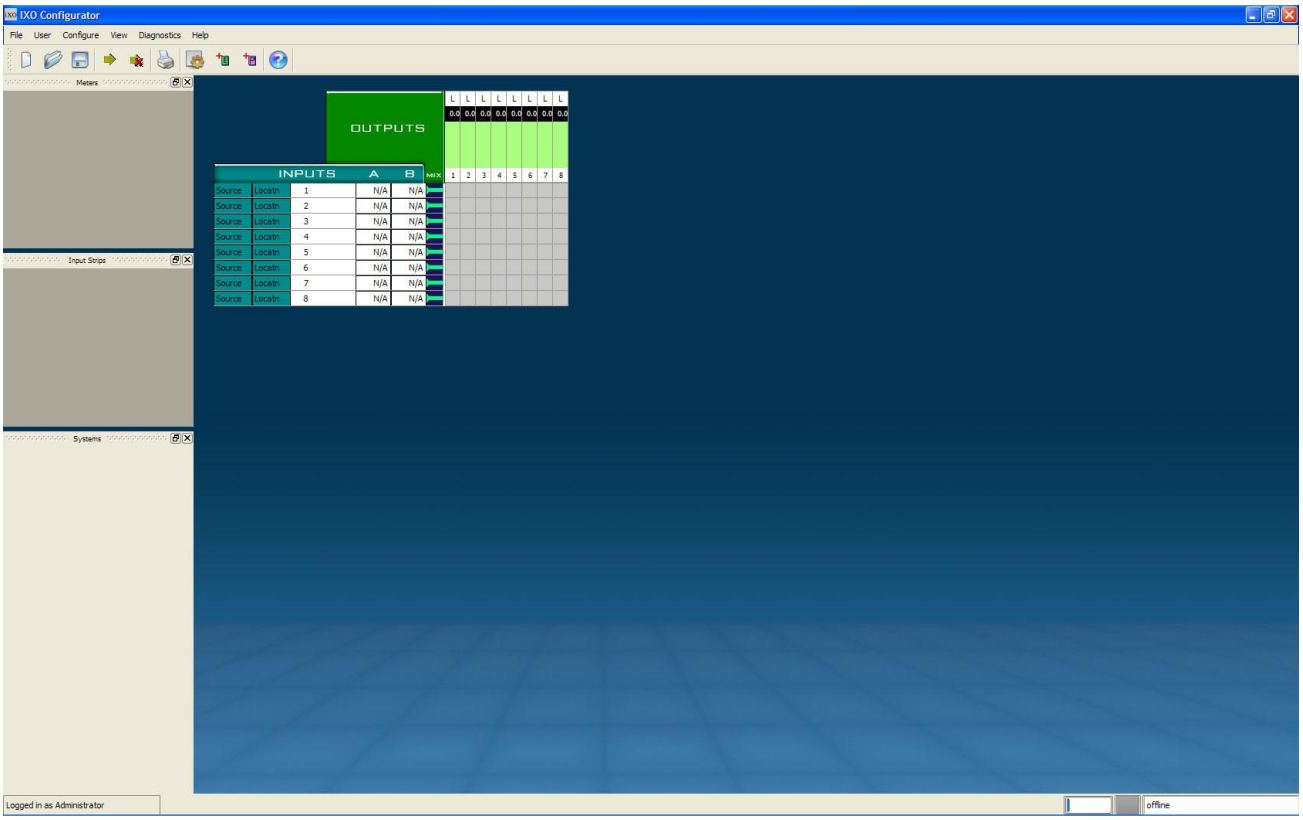

To Open the Event Manager.


To Open the Preset Manager.


To Open the Help file.

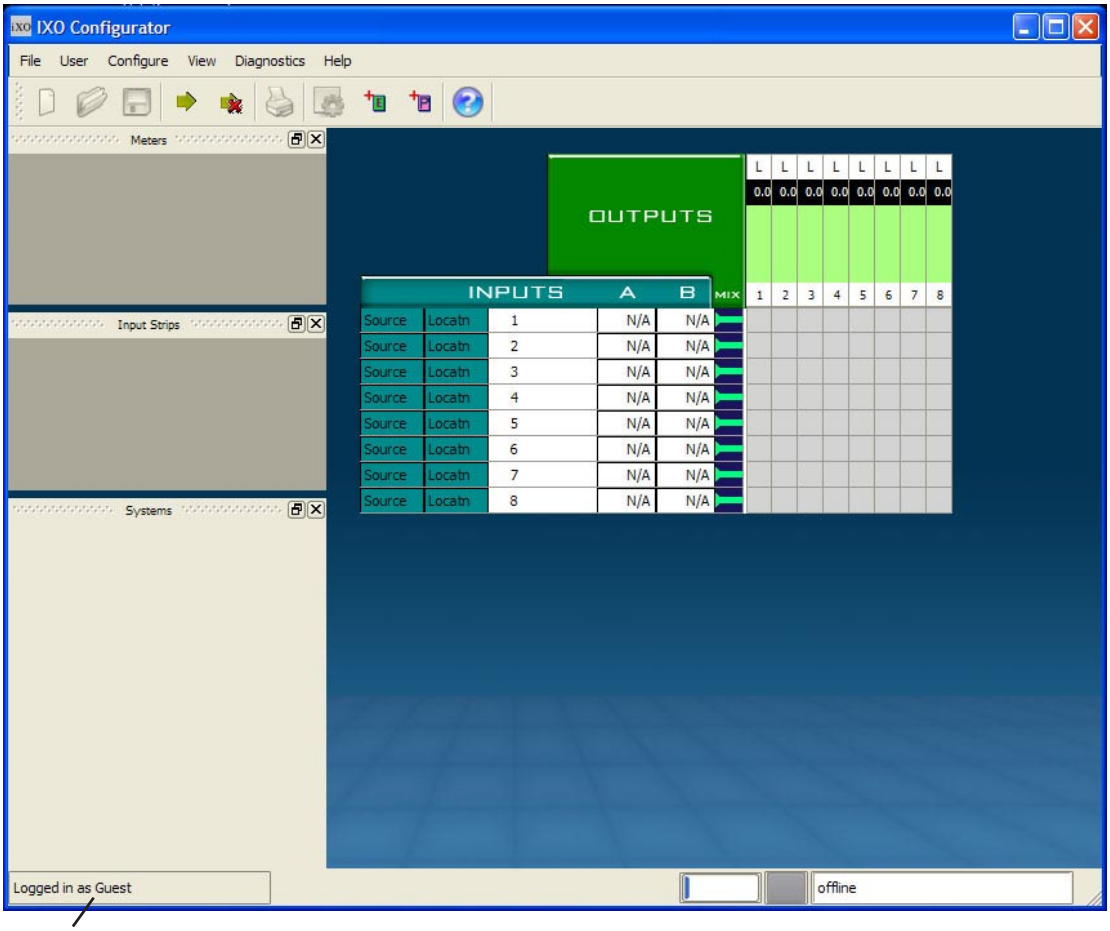
Taking up a majority of the screen is the work space. The work space is where the iXO matrix screen is displayed. A default 8x8 matrix is shown upon launching the software since this is the smallest iXO system size that can be created. On the left hand side there is an adjustable “docking” work area which is simply a space where you can set various control windows for reference or organizational purposes. Taking a closer look at the matrix and you will see the inputs channels are located on the left hand side of the matrix, with the output channels across the top.

At the very bottom of the screen is the Status Bar, which shows the connection status and user log in level.



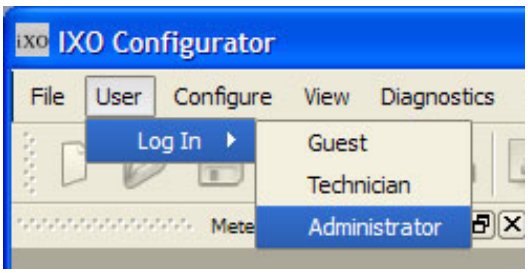
Launching the Application

First Use, Changing User Modes

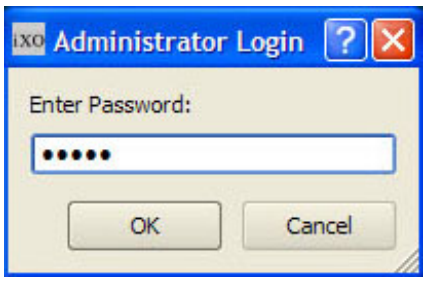


LOGIN MODE

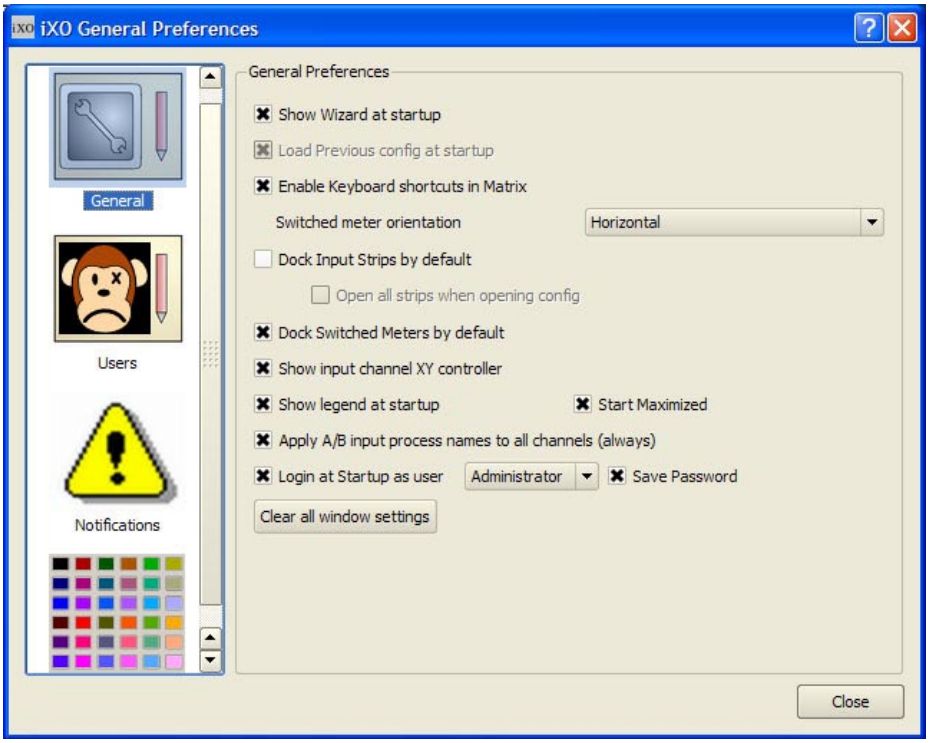
When using the software for the first time, it will start up in "Guest" user mode by default. This mode is indicated by the text located in the lower left hand corner of the screen on the Status Bar.



In order for you to create a system you must login as an Administrator. This is accomplished by clicking on User located on the menu bar, then mousing over Login and then clicking on Administrator. You will then be prompted to enter a password. The default password is admin (all lowercase). Note: All passwords are case sensitive, and the default passwords for Guest and Technician modes are guest and technician respectively.



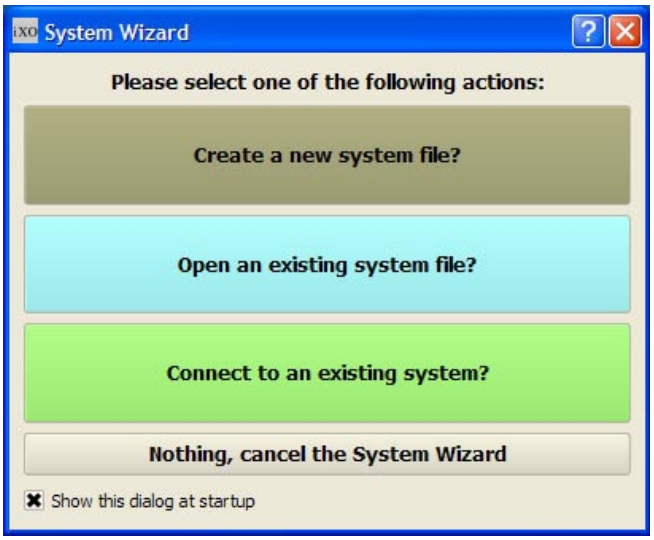
If you would like to always launch the application logged in as the Administrator, you can accomplish this by clicking on Configure (also located on the menu bar) and then clicking on Preferences. Check the "Login at Start-up as user" check box and then set the drop down menu to Administrator, and check the "Save Password" checkbox as well. Click "Close," and then exit the application. The next time you launch the application you will be logged in as the Administrator.



Administrator Mode

Open the iXOverture software by either clicking on the iXO icon on your desktop, or by using the Start button menu, All Programs/ Wheatstone/iXO icon. The iXO System Wizard will appear and prompt you to make one of the following choices:

1. Create a new system file?
2. Open an existing system file?
3. Connect to an existing system?
4. Nothing, cancel the System Wizard?

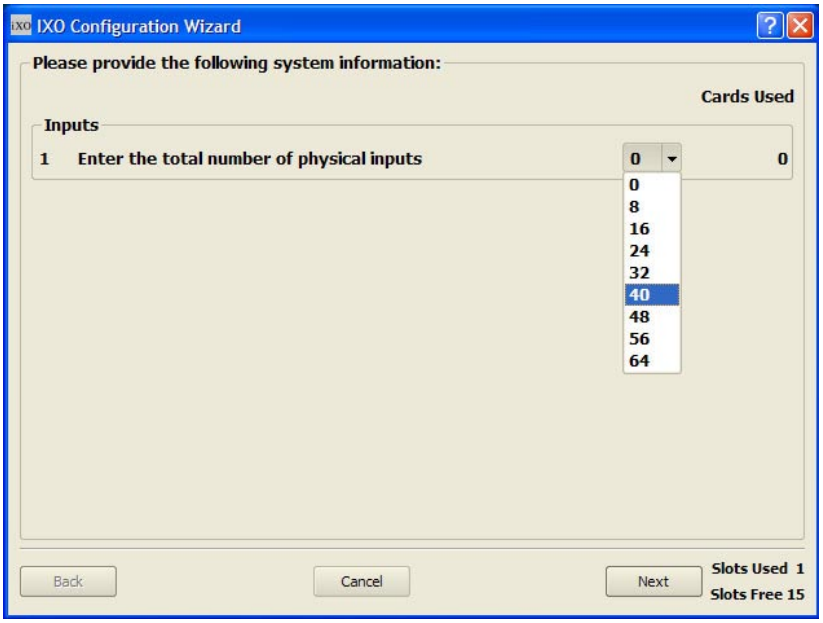


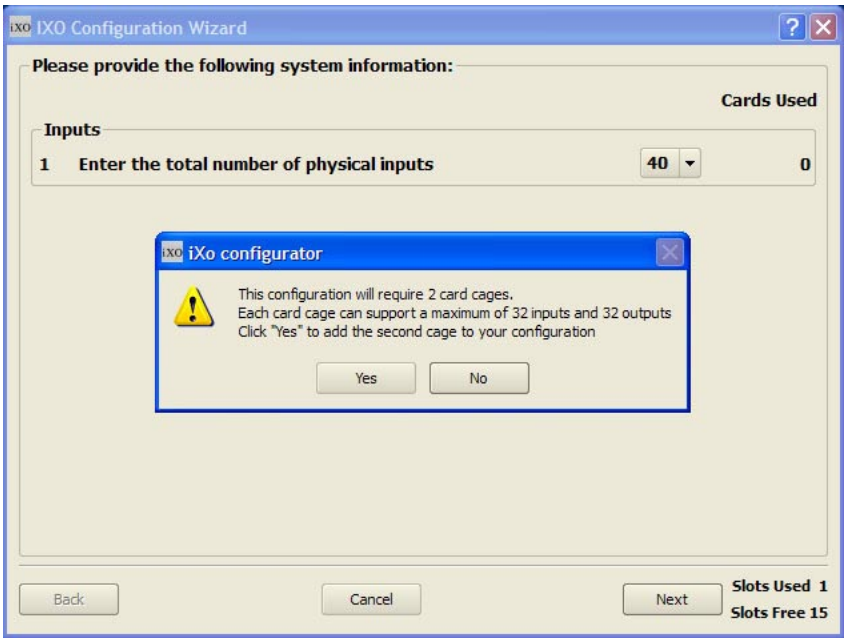
Creating a New System File

Selecting "Create a new system file?" launches the iXO Configuration Wizard. This window asks you a number of questions concerning the system that you are about to create. At anytime during this process you can Cancel the Wizard, or go Back to modify you answers.

Question 1: Enter the total number of physical inputs.

You then select from the drop down menu the number of inputs that will fulfill your projects requirements. Since there are eight mono channels per input card, the choices are multiples of eight, with a range from eight to 64. When selecting eight, 16, 24, or 32 inputs, the wizard will add up to four input cards to the system. If your selection is higher than 32, you will be prompted that your configuration will require two card cages, and you must select "Yes" to add a second cage to the system. The wizard will then add the appropriate number of input cards to the system, with the maximum being eight.

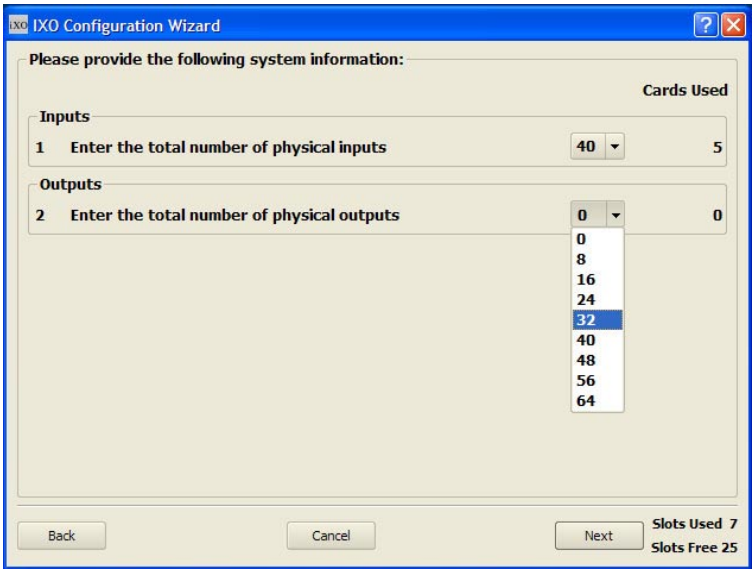




Click "Next."

Question 2: Enter the total number of physical outputs.

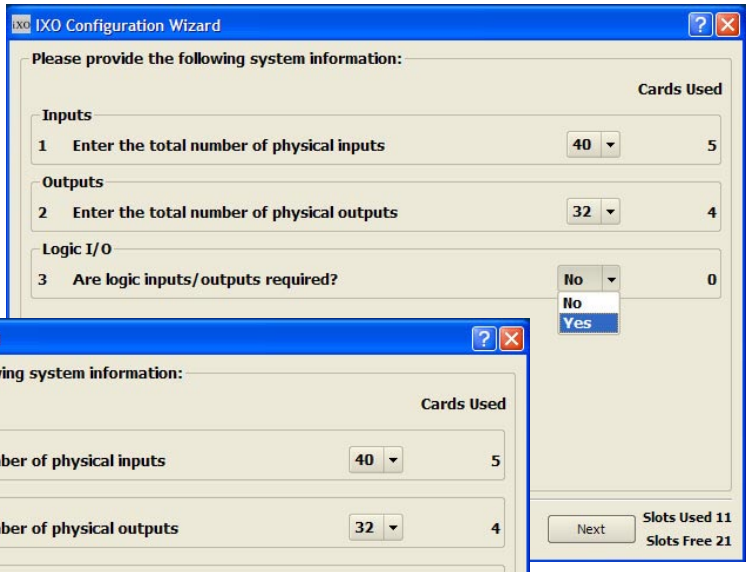
Select from the drop down menu the number of outputs that will fulfill your projects requirements. Since there are eight channels per output card, the choices are multiples of eight, with a range from eight to 64. When selecting either eight, 16, 24, or 32 outputs, the wizard will add up to four output cards to the system. If you selection is higher than 32, you will be prompted that your configuration will require two card cages, and you must select "Yes" to add a second cage to the system (unless you previously responded to his question when answering question 1). The wizard will then add the appropriate number of output cards to the system, with the maximum being eight.

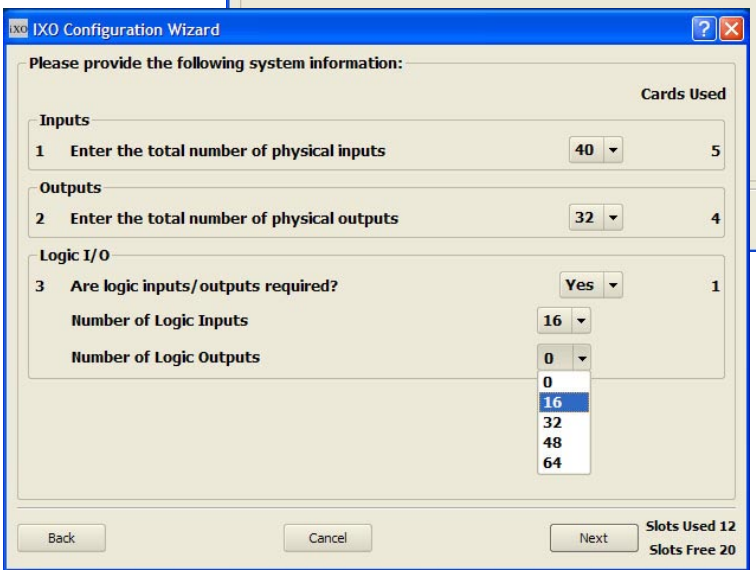


Click "Next."

Question 3: Are Logic Inputs/Outputs Required?

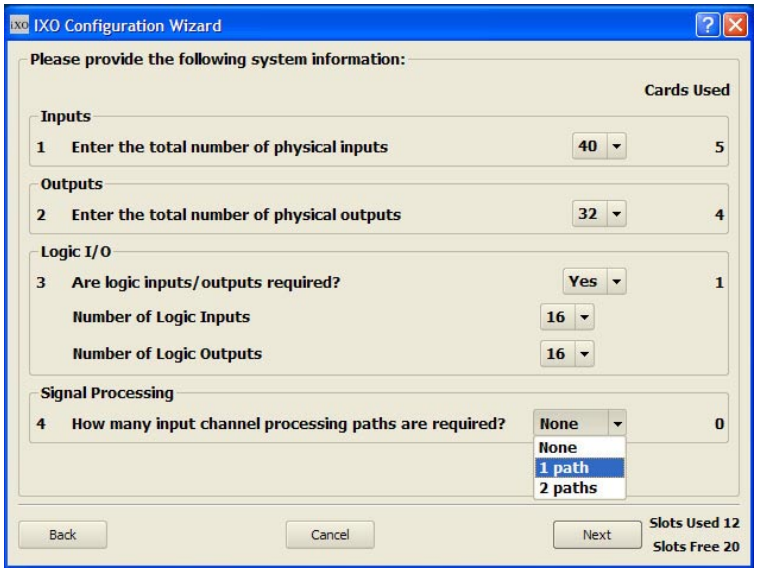
Select either "Yes" or "No" from the drop down menu. If "Yes" is chosen, you will be asked to select the number of logic inputs and/or outputs that are required for you project. Since there are 16 logic inputs and 16 logic outputs per LIO card, with a maximum of four per iXO system (two per cage), the choices are multiples of 16, with a range 16 to 64.





Click "Next."

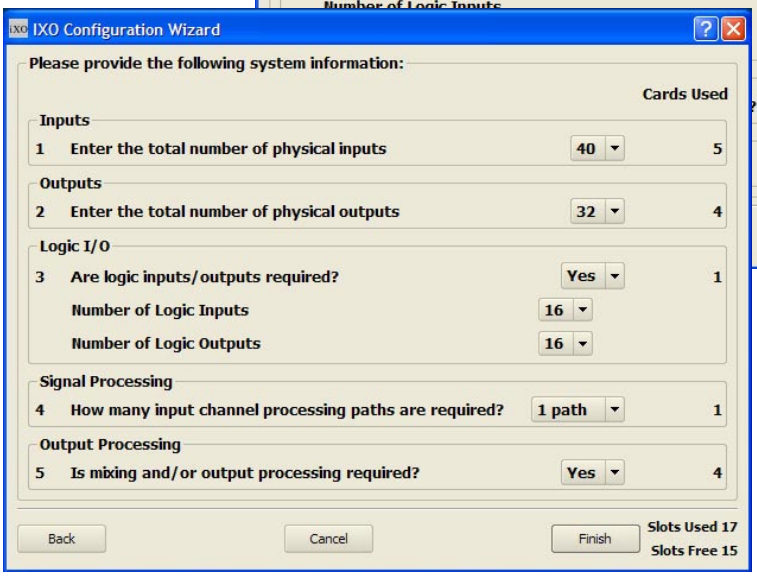
Question 4: How many input channel processing paths are required?



Select either one or two paths from the drop down menu. If one path is chosen either one or two DSP cards are added to the system (one card if below 32 inputs, two cards if above 32). A single input processing path (A) provides Filters, Gating, and Dynamics for up to 32 individual input channels. If two paths are chosen, either two or four DSP cards are added to the system (again, depending on the number of input channels). The second processing path (B) provides an additional path on each of the 32 channel strips, allowing you to have separate EQ, gating, dynamics, and level settings for the input source on each channel. For example, processing path A could be used for the house PA, path B for the monitoring system.

Click "Next."

Question 5: Is mixing and/or output processing required?

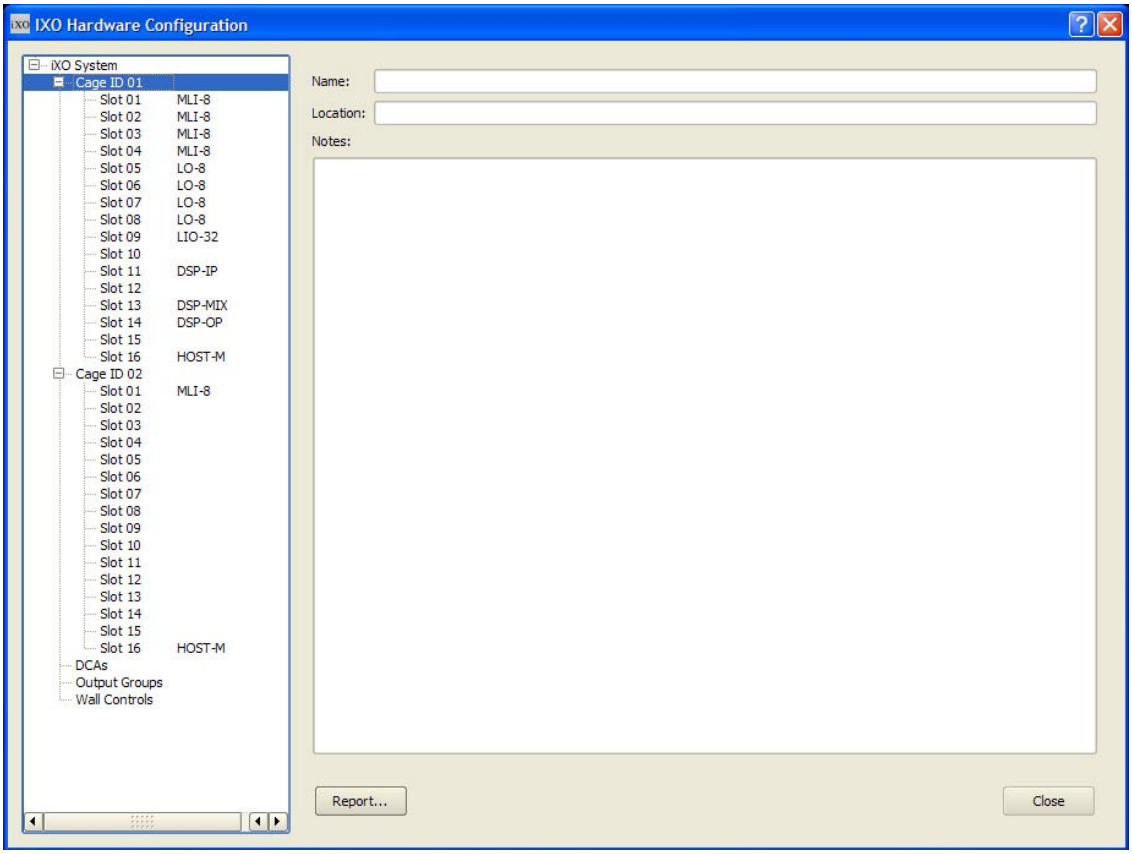


Click "Finish" to complete this first phase. The system matrix will be created and the iXO Hardware Configuration window will automatically open up.

iXO Hardware Configuration Window

Cage ID and Card Slots

The iXO Hardware Configuration is the second phase of creating a system. On the left hand side of the window there is a section which contains a collapsible "system tree" type display in which to navigate and configure the various cards and components of the system. Any item which is highlighted in the system tree will display all of its user definable attributes on the main section of the window.

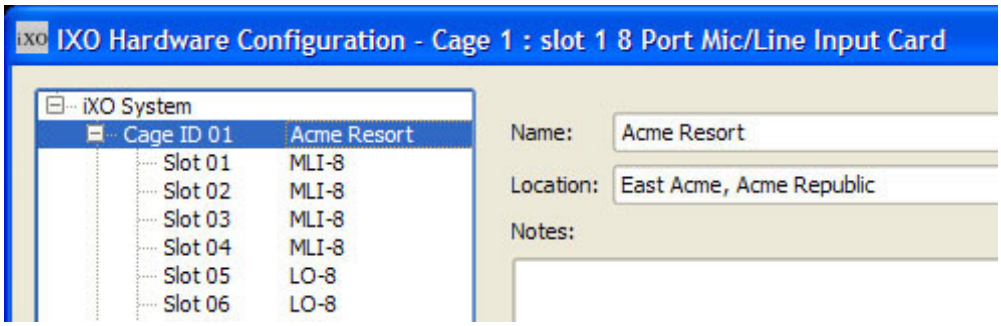


iXO System

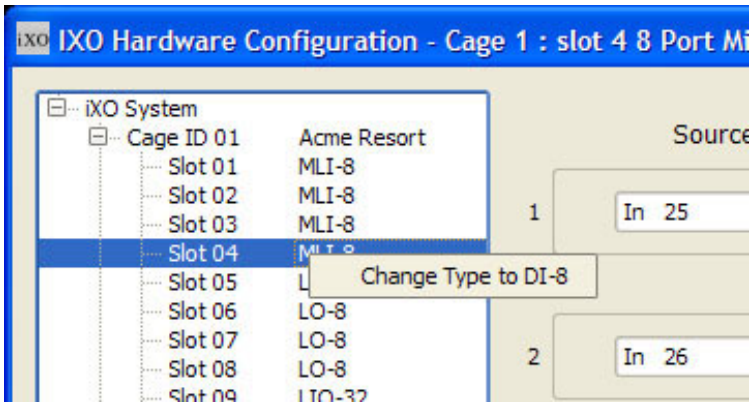
This is the default starting point of the Hardware Configuration window, any time that it is opened. In the main display there are three text boxes which allow you to assign a Name, Location, and write several paragraphs of Notes regarding the system. The iXO System is expandable/collapsible main branch of the tree, with branches for Cage ID 01, Cage ID 02, DCAs, Output Groups, and Wall Controls.

Cage ID 01

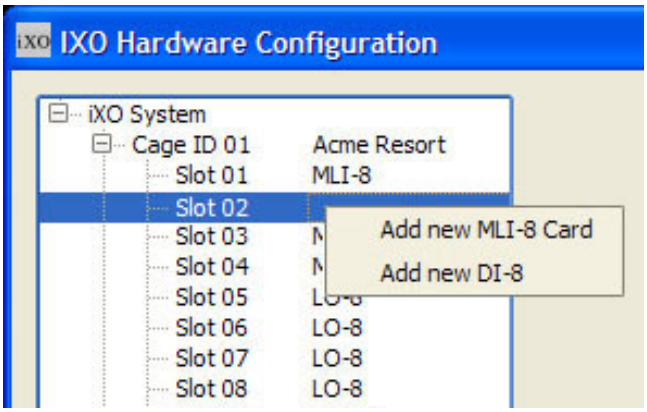
Clicking on this branch will bring up three text boxes which allow you assign a Name, Location, and write several paragraphs of Notes regarding this cage and its use in the system. You can collapse and expand this branch to view the 16 card slots associated with this cage.



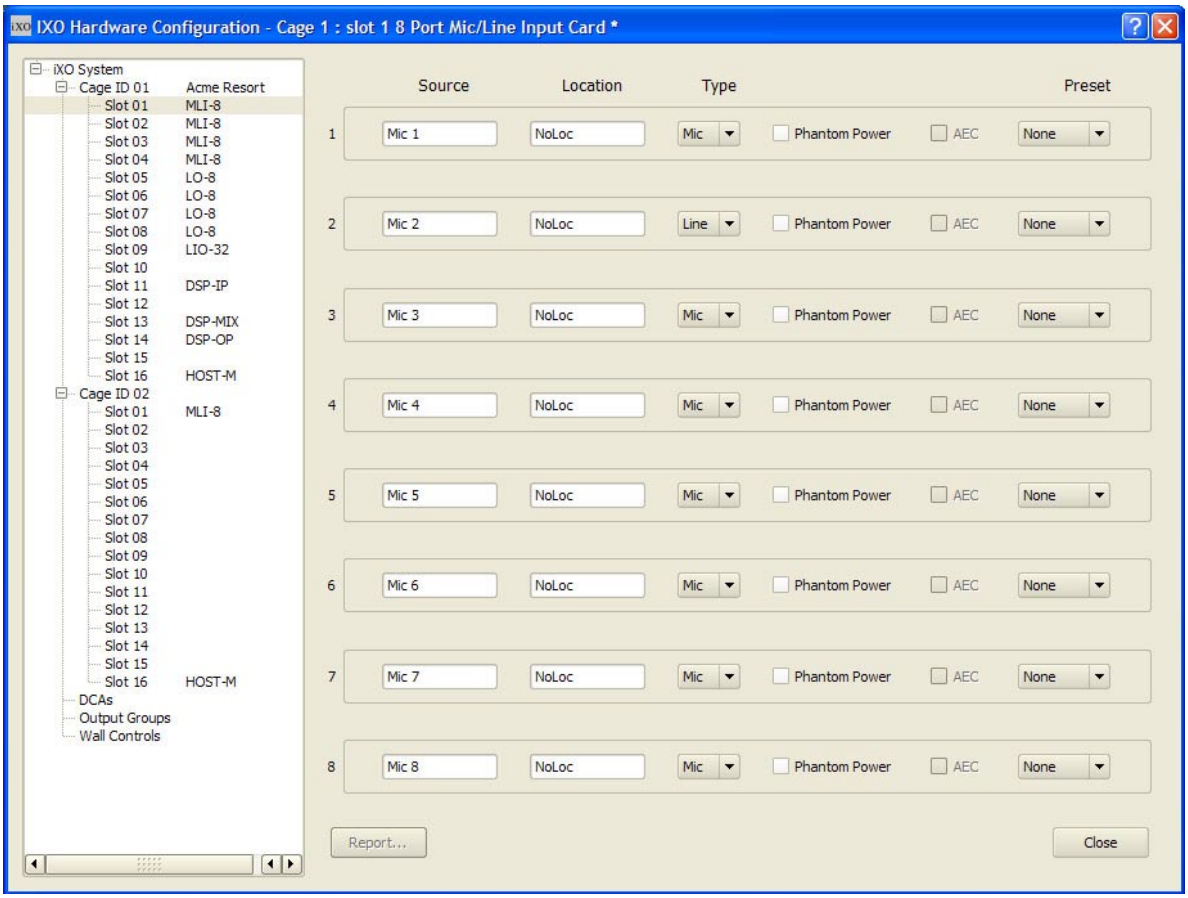
Slot 01 through Slot 04: These card slots are reserved for input cards, and are populated with MLI-8 analog mic/ line input cards by default. If you project requires the use of digital inputs, you can change any occupied input card slot from an analog MLI-8 to an AES-3 digital input card by right clicking over the card slot and selecting "Change Type to DI-8" (digital input card). Note: All input cards slots are populated in ascending order 1 - 4.



Right clicking on any unoccupied Slot 1 - 4 will allow you to add either an MLI-8 or a DI-8 to the system for future expansion.



Clicking on an occupied Slot 01 - 04 will bring up the card's settings in the display.

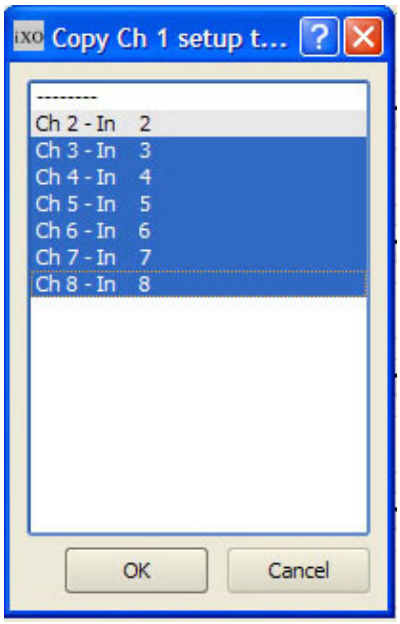


There are eight mono channels on a card, with each channel allowing you to:

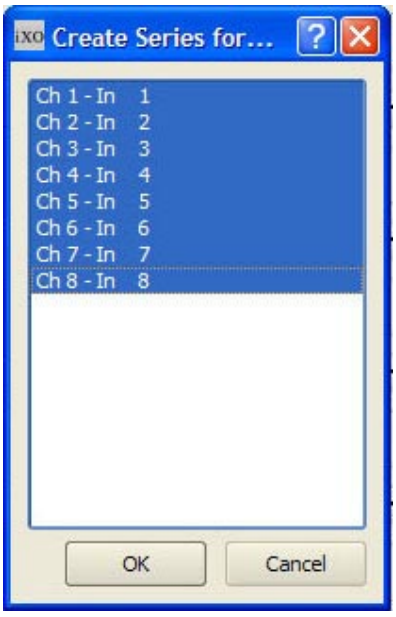
- Assign an eight character Source name (Tip: Ctrl C, Ctrl V, or right click to copy and paste text).
- Assign an eight character Location.
- Configure it to be a Mic or Line input Type (MLI-8 only).
- If it is a Mic, allow it to have Phantom Power (Note: if Line, Phantom Power is grayed out) - (MLI-8 only).
- Assign a Preset to the source's default input channel (Note: See section on creating and importing Presets).

You can copy an input source's settings to one or more channels on the same input card. Do this by right clicking on any open area within the borderline of the channel to be copied and selecting "Copy To". The "Copy Ch X setup to..." window will appear and you can click on the desired channel.

Select multiple channels by holding down the Ctrl key while clicking on your selections.

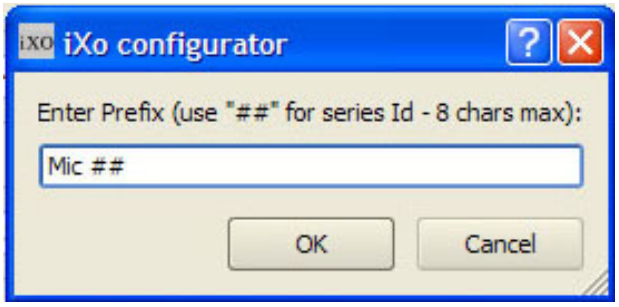


You can also create a "Series" of source labels by right clicking on any open area within the borderline a channel and selecting "Series".

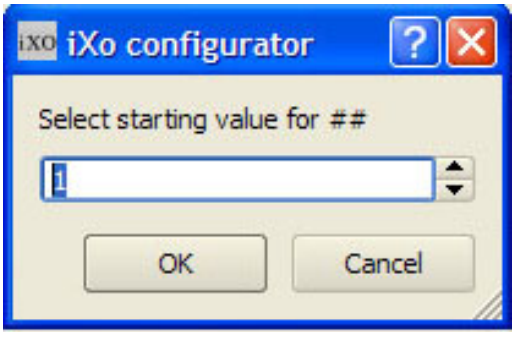


A window (see left) will appear where you choose the channels to be included in the series (1 - 8).

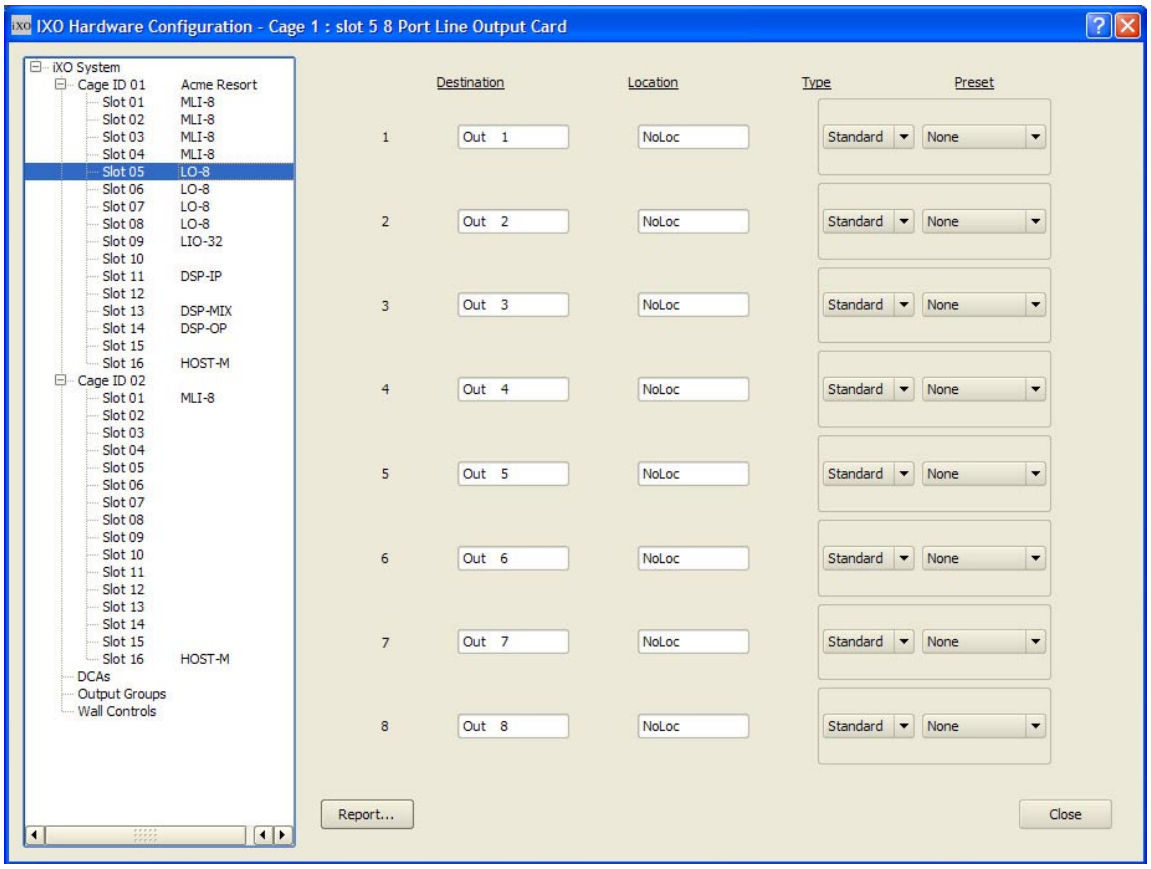
Select "OK." Another window will appear asking for the prefix text (name of source) along with "##" (for numbering).

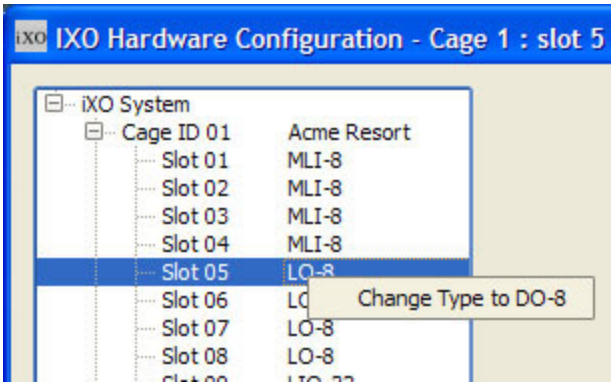


Click "OK" and a final window will appear asking you to enter the starting value for "##". Enter the number and click "OK."



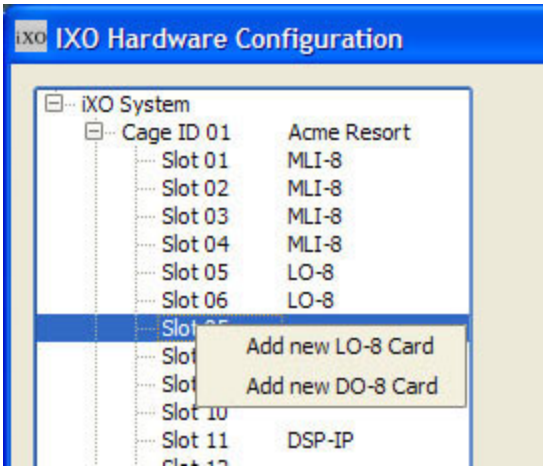
Slot 05 through Slot 08: These card slots are reserved for output cards and are populated with LO-8 analog line output cards by default.



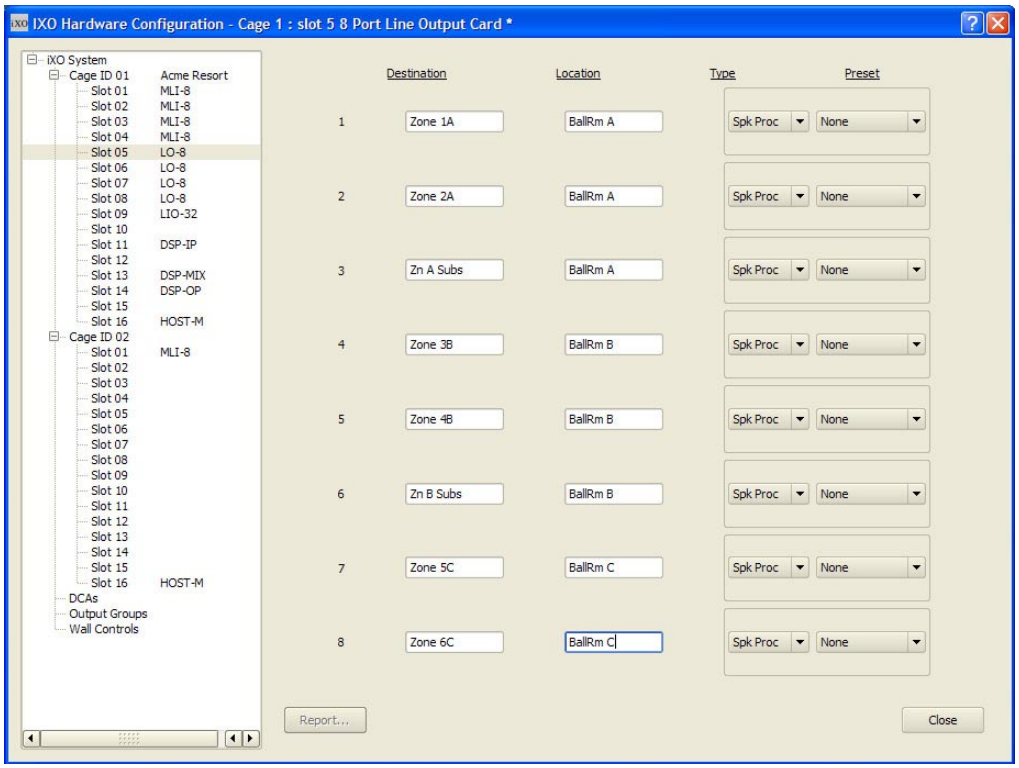


Note: All output cards slots are populated in ascending order 5 - 8. Right clicking on any unoccupied Slot 5 - 8 will allow you to add either an LO-8 or a DI-8 to the system for future expansion.

If your project requires the use of digital outputs, you can change any occupied output card slot from an analog LO-8 to an AES digital output card by right clicking over the card slot and selecting "Change Type to DO-8" (digital output card).

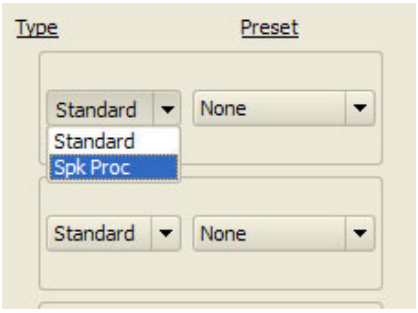


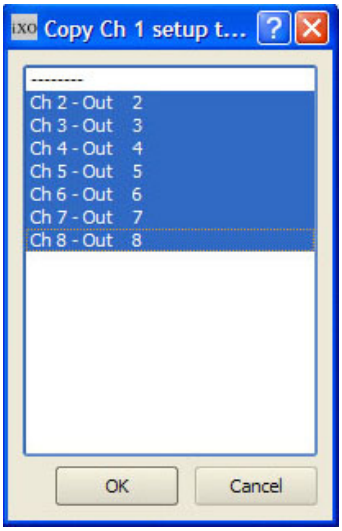
Clicking on an occupied Slot 05 - 08 will bring up the cards settings in the display.



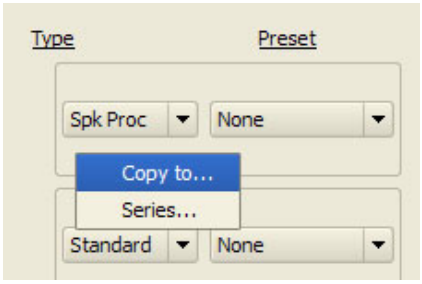
There are eight mono channels on a card, with each channel allowing you to:

- Assign an eight character Destination name (Tip: Ctrl C, Ctrl V, or right click to copy and paste text).
- Assign an 8 character Location.
- Configure the output channel Type to be Standard (31 Band GEQ, Delay, and Dynamics) or Spk Proc, a speaker processor configured with a four band PEQ, Delay-1, Filters (with four band PEQ and crossover filters), Dynamics, and Delay-2.



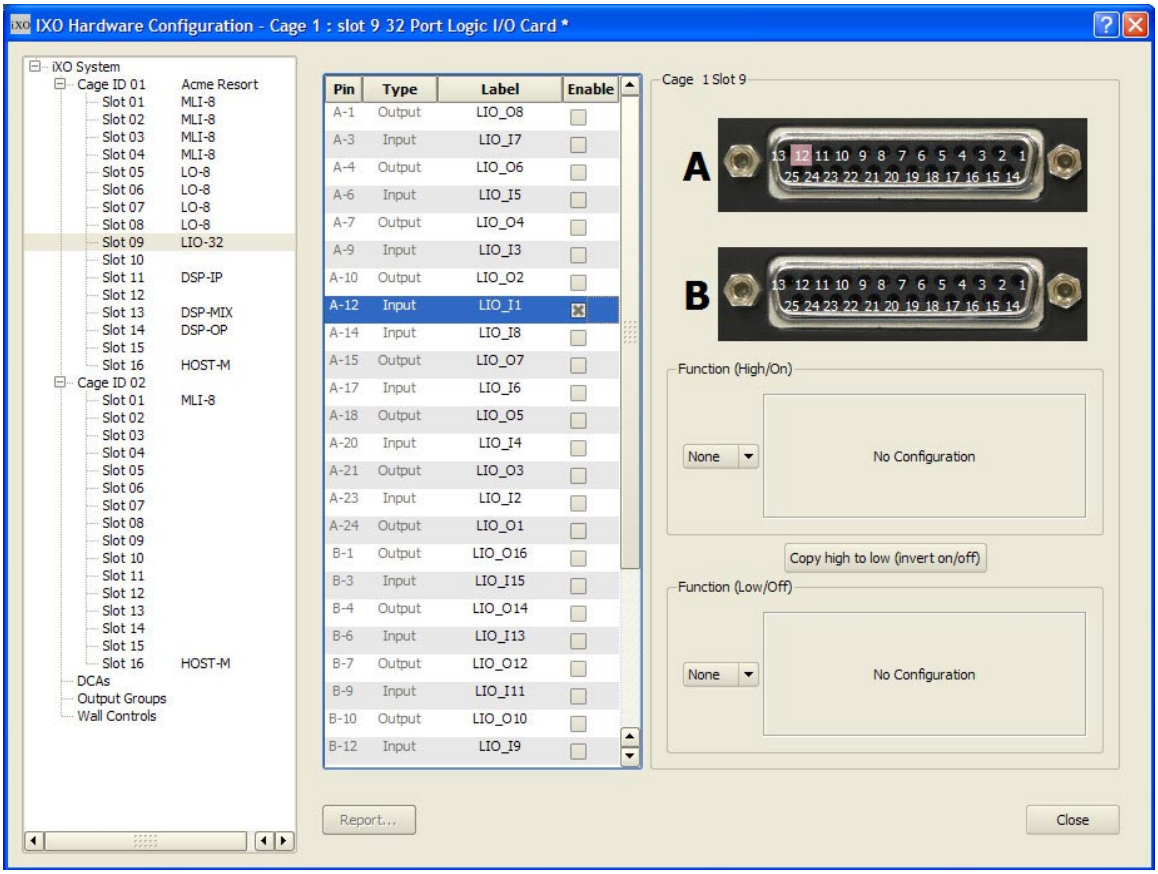


- Assign a Preset to the output channel (Note: See section on creating and importing Presets).



Note: You can copy an output channel's type to one or more channels on the same output card. Do this by right clicking on any open area within the borderline of the channel to be copied and selecting "Copy To." The "Copy Ch X setup to..." window on the left will appear and you can click on the desired channel. Select multiple channels by holding down the Ctrl key while clicking on your selections. Click "OK" to complete the process. All highlighted channels on that card will be confined as the original "copied" channel.

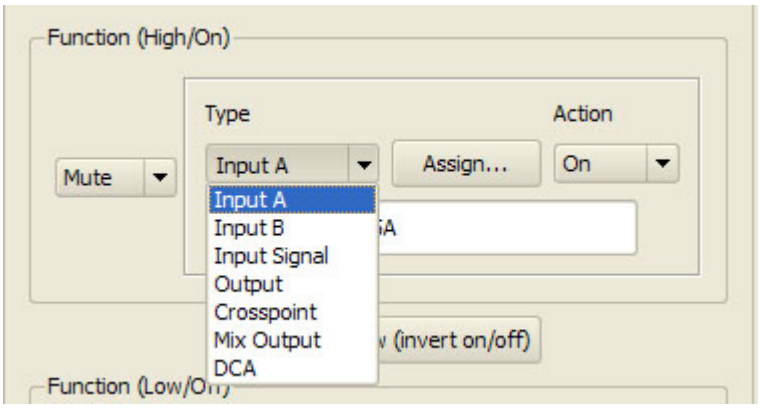
Slot 09 & Slot 10: These card slots are reserved for Logic I/O cards, and are populated in ascending order with the LIO-32 card. Right clicking on any unoccupied Slot 9 - 10 will allow you to add a LIO-32 to the system for future expansion. Clicking on an occupied Slot 09 or 10 will bring up the cards settings in the display. There 16 logic inputs and 16 logic outputs per card, with logic inputs and outputs 1 - 8 assigned to DB-25 Connector A and 9 - 16 assigned to DB-25 Connector B.



Selecting a logic input or output to program is accomplished by either clicking on a pin on the respective DB-25 graphic, or by clicking on the desired input/output shown in the table. The table indicates the input or output number, Type, Label, and has a check box to Enable it. The Function (High/On) and Function (Low/Off) sections are used to program these actions. There is a drop down menu located in each section which allows you to make the following selections for a logic input or output, and a configuration area which will display the necessary tools for configuring your selection. From the drop down menu you can select from the following:

None: This is the default setting for all logic ports. No action will occur and no data is displayed in the configuration area.

Mute: Selecting this will cause the following menus and choices to display:



Type: You then choose the type of mute from a drop down menu consisting of the following selections:

Input A: Mutes an input channels "A" processing path.

Input B: Mutes an input channels "B" processing path.

Input Signal: Mutes an input signal at the input card.

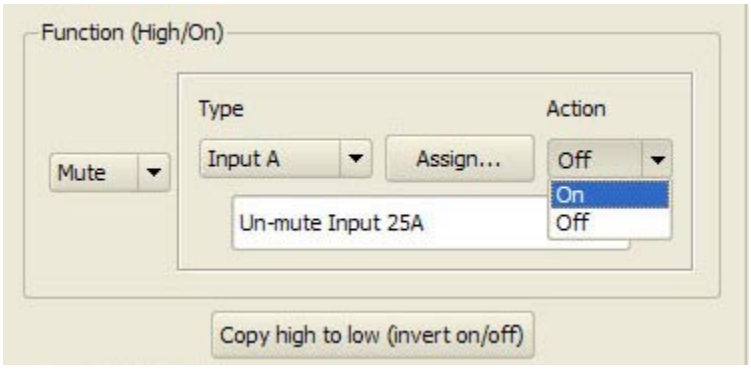
Output: Mutes an output channel.

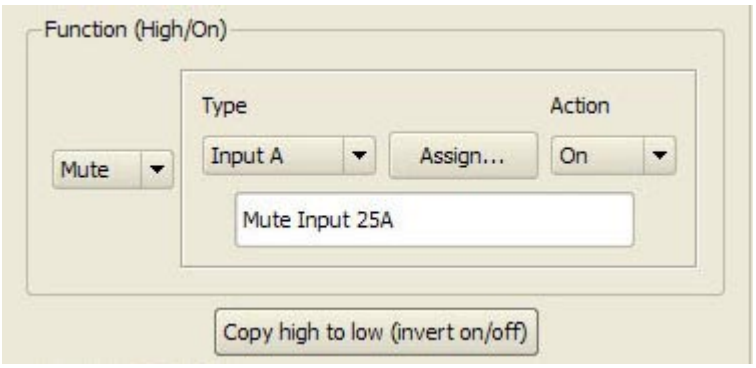
Crosspoint: Mutes a matrix crosspoint cell.

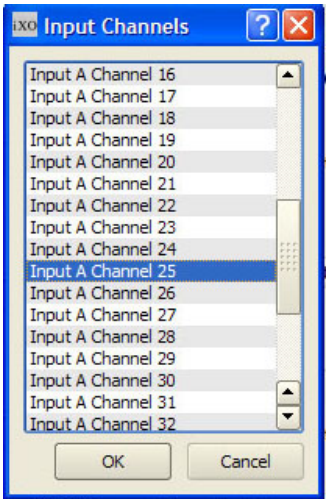
Mix Output: Mutes a mix output.

DCA: Mutes a DCA fader.

Once you have made a selection, you then click the "Assign" button, which will display a list of all the available resources of the "type" that you have selected. Once you make an assignment selection, use the Action drop down menu and select either "Off" or "On" to set the state of the mute with regards to the Function section that you are working in. The data window informs you of your progress and final programming actions.





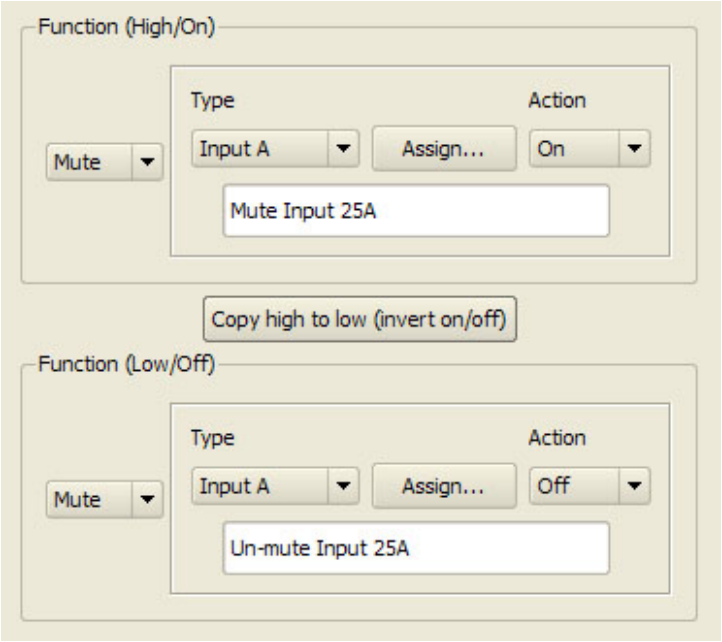


Event: Selecting this will display the "Assign" button and a data window. Clicking on "Assign" will display a pop-up window which lists all of the available events which you can recall. Make your selection and click "OK."

Preset: Selecting this will display the "Assign" button and a data window. Clicking on "Assign" will display a pop-up assignment window where you can select the type of preset, then choose the channel, matrix crosspoint, or mix output that you wish to recall it on. Make your selection and click "OK." A new pop-up window appears which lists all of the available presets that you can recall. Make your selection and click "OK."

Map To: *(Input Pins Only)* Map to allows you to assign an input pin to directly control an output pin. Selecting this will display a Cage selection window where you can select from either Cage 1 or Cage 2 in the system. You then can choose which LIO card you wish to map to by selecting the appropriate slot number in the drop down menu. Then you select the output pin that you wish to map to and choose the action you want. The data window informs you of your progress and final programming actions.

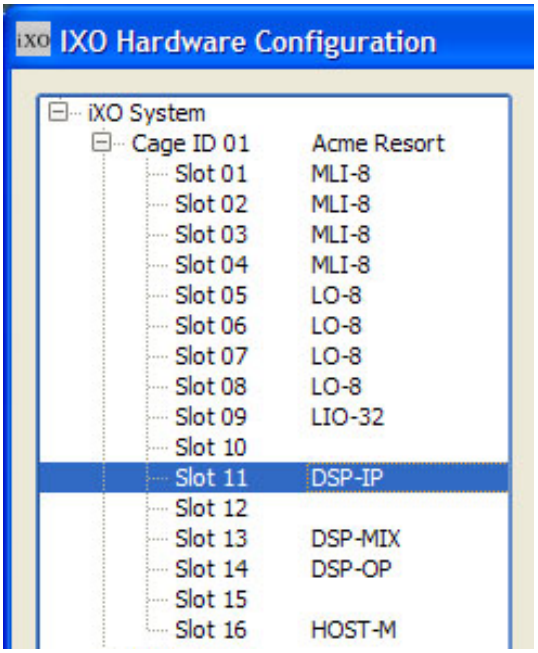
To aid in programming between the "Function High/On" and the "Function Low/Off" sections, there is a "Copy high to low (invert on/off)" button which takes the data you enter in the Function (High/On) section and creates the inverted or opposite function in the Function (Low/Off) section.



Once you are done programming the LIO, you can click "Close," select another LIO card to program, or navigate elsewhere in the Hardware Configuration system tree. Please see the "Hardware Configuration Close" section later in this chapter regarding what you might see happen when clicking "Close."

Since programming logic inputs and outputs is typically done after the system configuration is further along (routing, mixes, presets, and events have been created), you may want to create some presets and/or events first and then revisit this section. For more details on the on the LIO card and its connections, please refer to the Hardware section of this manual.

Slot 11: This card slot is reserved for the DSP card to be used for input channel processing path A. There is no user configuration necessary.



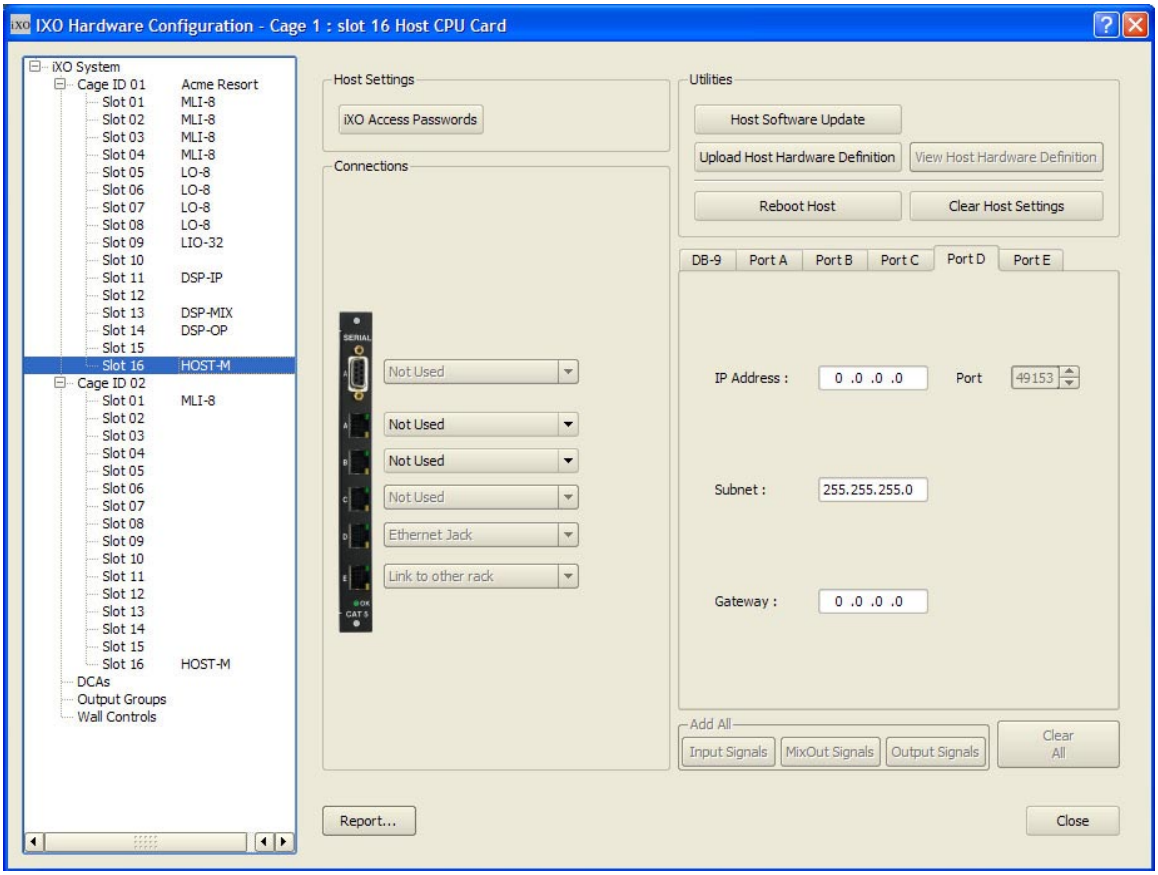
Slot 12: This card slot is reserved for the DSP card to be used for input channel processing path B. There is no user configuration necessary.

Slot 13: This card slot is reserved for the DSP card to be used for mixing. There is no user configuration necessary.

Slot 14: This card slot is reserved for the DSP card to be used for output channel processing. There is no user configuration necessary.

Slot 15: This card slot is reserved for future use.

Slot 16: This card slot is reserved for the Host-M card. Clicking on this slot will bring up the card's settings in the display.



The settings are grouped into three sections; Host Settings, Utilities, and Connections. The Connections section is by far the most important of these three, and Port D is the default starting point of the Host card settings, any time that it is opened. Port D is the Ethernet connection to which you will eventually connect your PC to the system (via crossover cable or network switch) to upload the completed configuration file and control the system. The default Port D settings are:

IP Address: 192.168.1.230

Subnet: 255.255.255.0

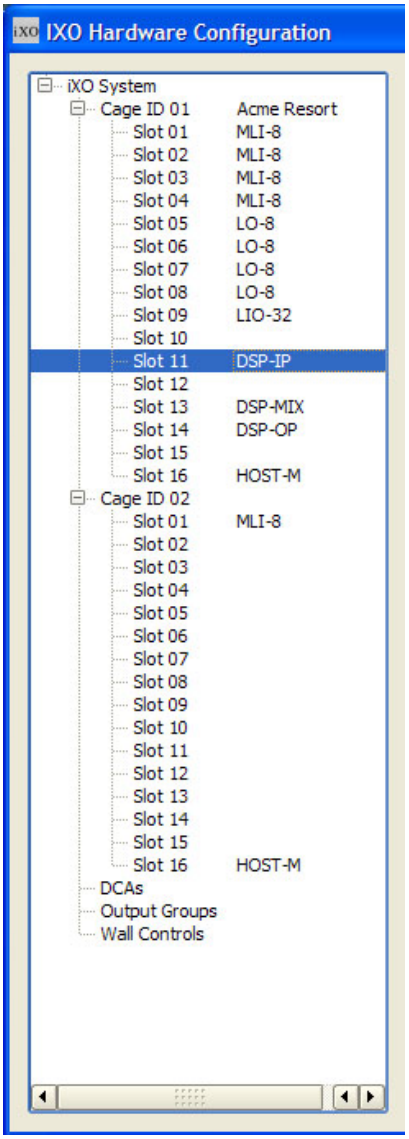
Gateway: 192.168.1.1

The other Port you need to be made aware of initially is Port E, the iXO Link. This is the connection from the first cage to the second cage.

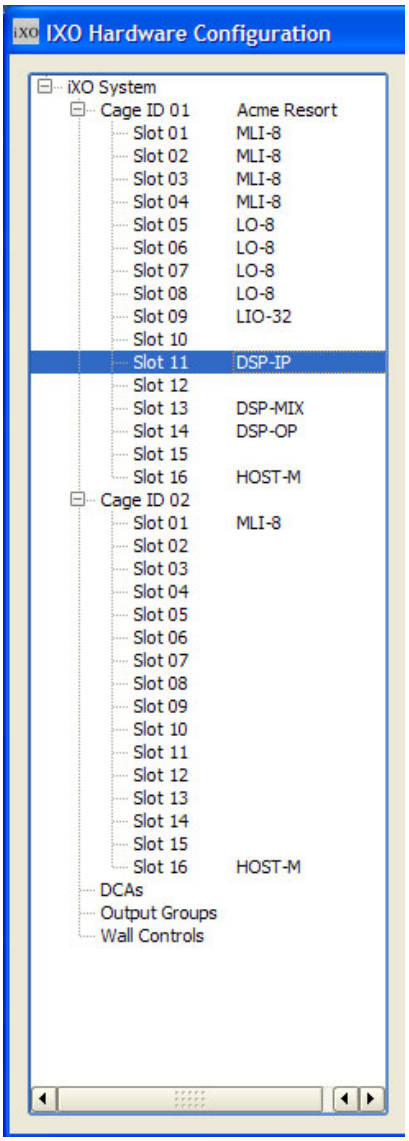
For more detailed information on connections, and Host Settings please refer to the Host Card section located in Chapter 2 of this manual.

Cage ID 02 (if present)

This branch is identical to Cage ID 01 in its operation and settings, with the only exception being Slot 16. Whenever a second cage is utilized in an iXO system, the Host Card residing in Cage ID 02 does not require any configuration of settings. Clicking on this branch will bring up three text boxes which allow you assign a Name, Location, and write several paragraphs of Notes regarding this cage and its use in the system. You can collapse and expand this branch to view the 16 card slots associated with this cage to configure the Input, Output, and Logic I/O cards as you did in Cage ID 01.



DCAs, Output Groups, and Wall Controls



These are branches of the system tree that allow you to customize your system for greater flexibility and control.

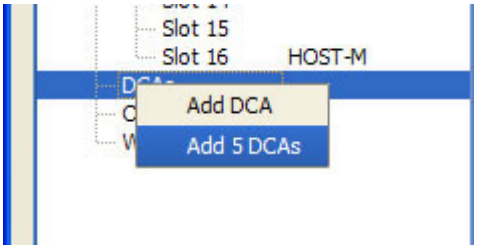
Since incorporating any or all of these features into a system typically occurs after the system configuration and programming is further along, you may find it easier to come back to the Hardware Configuration Screen after you have spent some time defining your system's functionality.

DCA - Digitally Controlled Attenuator

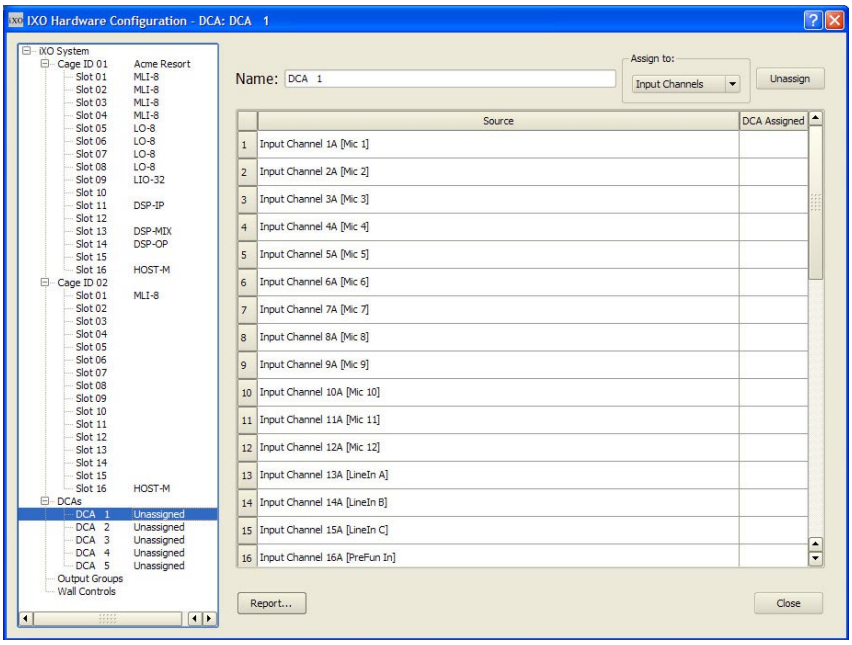
A DCA is simply a fader (attenuation only) with a mute button where you can assign any number of the same type of faders (input channels, crosspoints, mix outputs, and output channels) in an iXO system to it, with the DCA acting as a master level control for them. There are 255 of these available to use in a single iXO system. You create DCAs on an as need basis using the DCA Manager, which is part of the iXO Hardware Configuration screen. For example you can assign a group of microphone input channels which share a common room to a single DCA and then have that DCA act as a master microphone level control. You can create another DCA and assign multiple output channel faders to it to provide a single level control which can then be manipulated from the GUI, Wheatstone wall controller, or third party control system.

DCA Manager

The DCA Manager is part of the iXO Hardware Configuration window and is located towards the bottom of the iXO System Tree. Any time a new system is created, the DCA branch is empty. To add a DCA to the system, simply mouse over the DCAs branch, right click and select Add DCA or Add 5 DCAs.

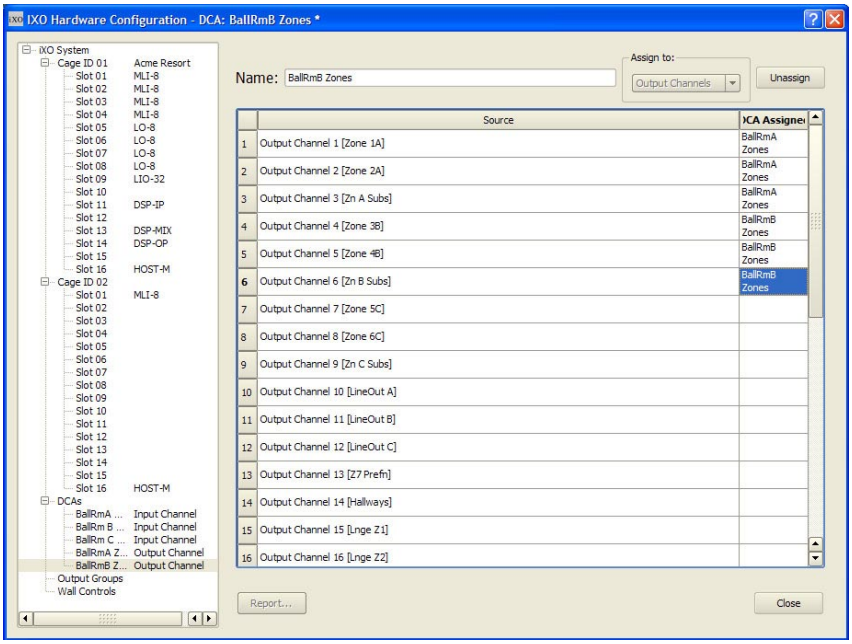


Selecting either one will add the appropriate number of new DCAs to the branch and will automatically bring up the DCA Manager Assignment screen.



The assignment screen is fairly straightforward to understand. It has a text box at the top to display and change the name of the DCA, an Assign to: drop down menu which, when a choice is made, will bring up a list of either all Input Channels (default), Output Channels, Crosspoint Faders, or Mix Output Faders. There is an Unassign button which is used to clear any assignments made.

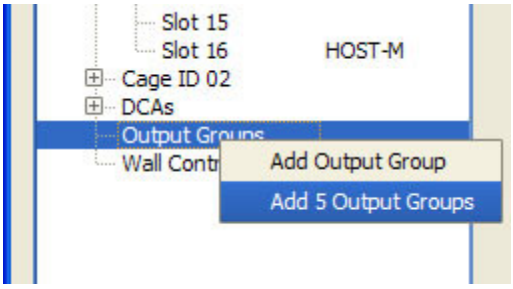
To assign a DCA, you click on the DCA in the system tree that you want to assign. That DCA's default name will appear at the top of window. You can change the name to match its function (for example, "Ballroom A Output Zones"), and then choose from the Assign to: drop down menu which type of faders that you wish to assign (in this case, Output Channels). You then click on the desired faders that you want to be controlled by the DCA.



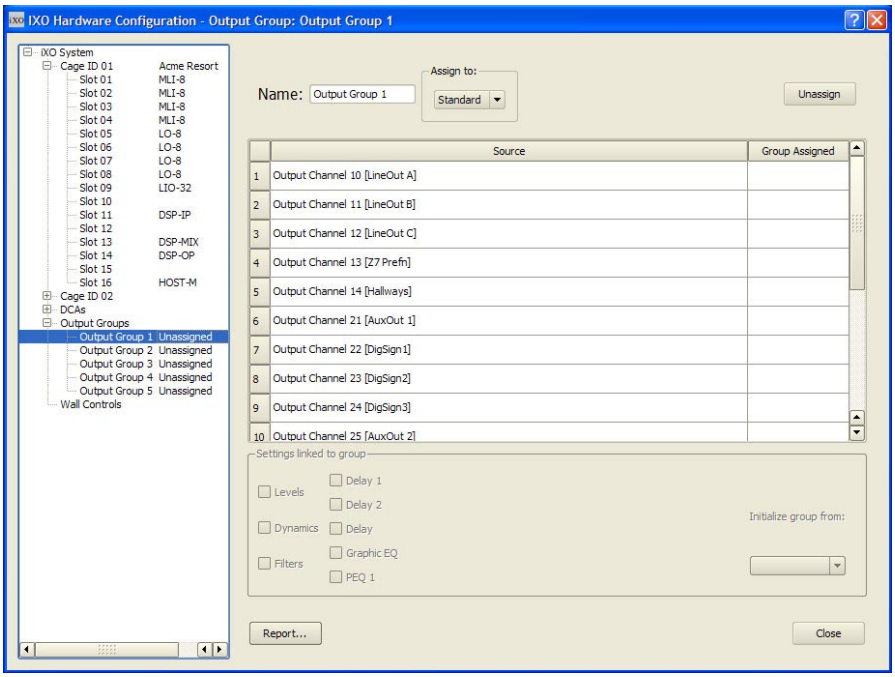
When creating DCAs you will notice that the input, mix output, and output DCAs will display the amount of faders consistent with the system configuration. Crosspoint DCA creation does require that you have crosspoints assigned to control before it will display any crosspoint information.

Once completed, you can either mouse over to the system tree and create or click on another DCA to configure, or choose to close the window. Upon closing the DCAs are created and are available to use. To show the DCA faders on the workspace, click “View” on the menu bar and select DCA Faders and then select the DCA fader you wish to open. You can open as many DCA faders as you wish on the workspace. To delete a DCA you must mouse over the DCA to be deleted on the system tree, then right click and select delete.

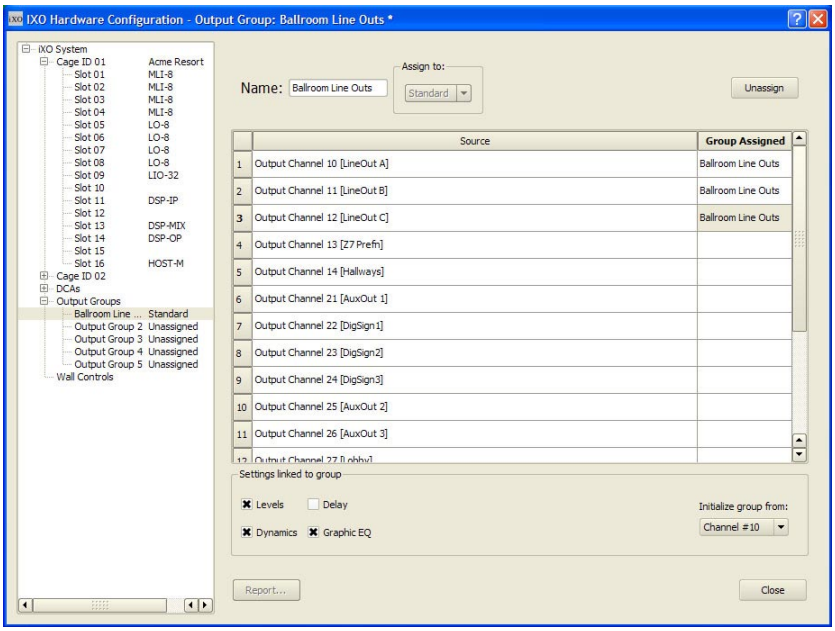
Output Groups



Output Groups enables you to create groups of the same type of output channels (Standard or Speaker Processor) and allow linking of the various processing, delay, and levels on the output channels that are a member of the group. This feature is also part of the iXO Hardware Configuration window and is also located towards the bottom of the iXO System Tree. Any time a new system is created, the Output Groups branch is empty. To add an Output Group to the system, simply mouse over the Output Groups branch, right click and select Add Output Group or Add 5 Output Groups. Selecting either will add the appropriate number of new Output Groups to the branch and will automatically bring up the Output Groups assignment screen.

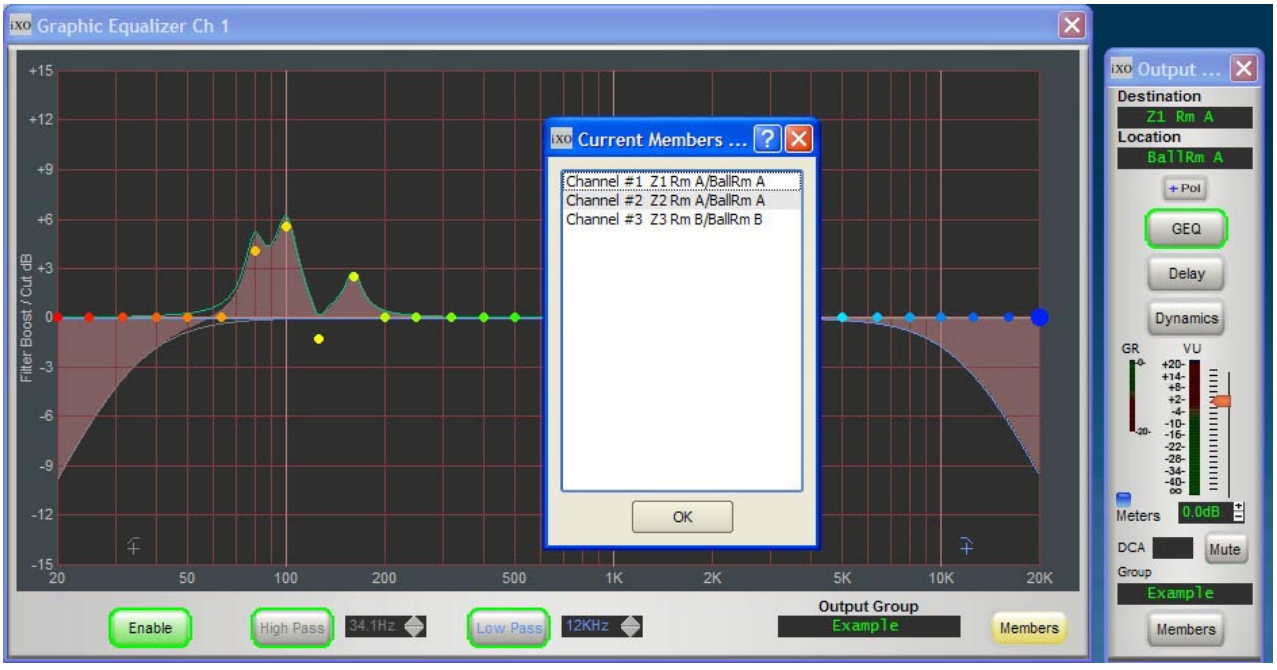


The assignment screen is fairly straightforward to understand. It has a text box at the top for which to display and change the name of the group, an Assign to: drop down menu in which you can choose to view the two types of output channels; Standard or Speaker Processor. Once a choice is made a complete list of all of the selected output channel types is displayed.



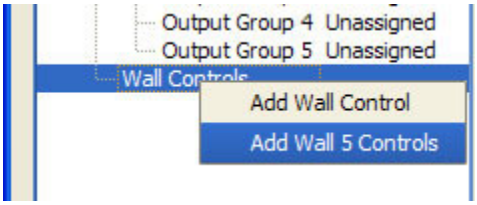
To assign an output to the group, you click on the output channels which you want to be members of the group. Use the checkboxes located in the lower left hand corner of the screen to link the various processing, levels, and delay you desire.

You can specify which output channel group member will initialize the linked settings. Once linked, changing any setting in an output group's linked processing or levels will affect all members of the group. After finishing with the creation and configuration of the groups and closing the Hardware Configuration window, any output channel that is in a group will display the group name and members on the channels control windows which are linked. For example if outputs 1, 2, and 3 are of the standard output type and have the graphic equalizers and faders linked, you will see the group name on the corresponding channels graphic EQ windows, and also underneath the output channel faders. A "Members" button allows you to quickly view the members of any linked group.

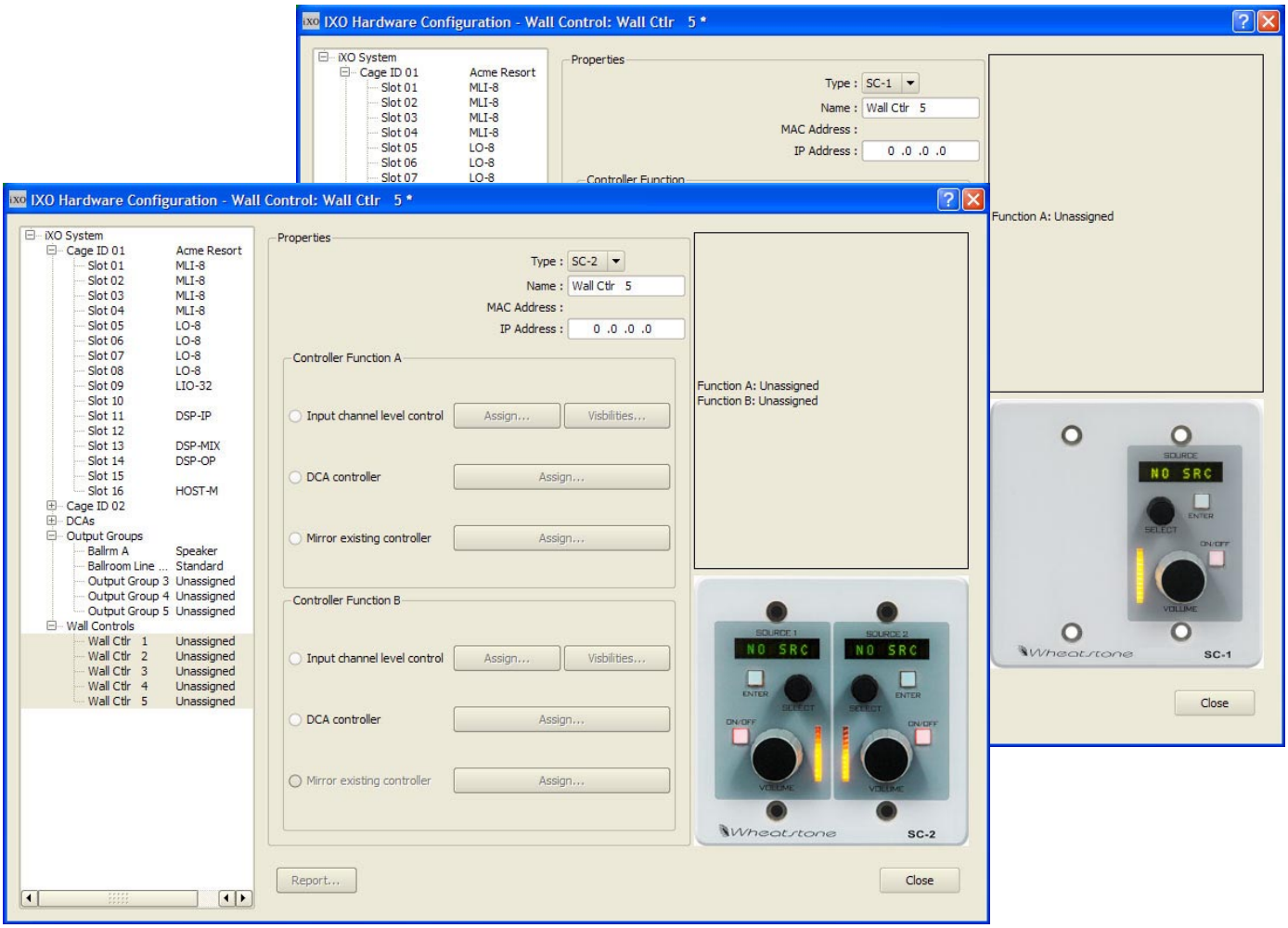


Wall Controls

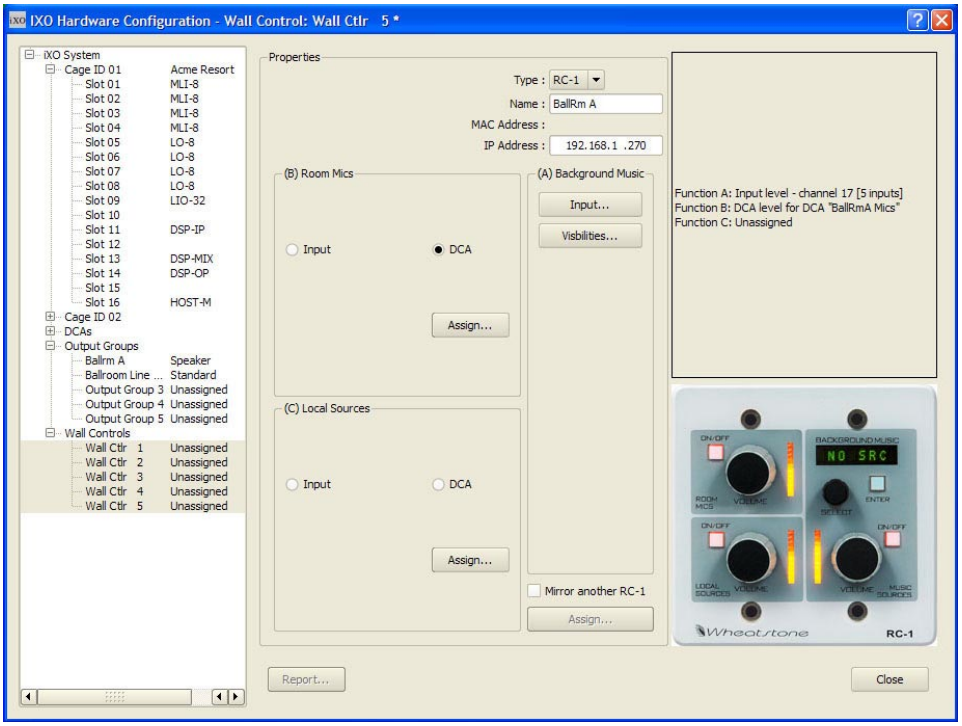
The Wall Controls section enables you to add various models of Wheatstone's line of wall mount controllers for use with the system. These allow remote control of various system parameters such as source selection, level control, and muting. This feature is also part of the iXO Hardware Configuration window and is also located at the bottom of the iXO System Tree. Any time a new system is created, the Wall Controls branch is empty. To add them to the system, simply mouse over the Wall Controls branch, right click and select Add Wall Control or Add 5 Wall Controls. Selecting either will add the appropriate number of new Wall Controls to the branch and will automatically bring up the Wall Controls assignment screen.



To add a controller to the system you must first select the Type from the drop down menu located toward the top of the screen. Presently there are three models of controllers to choose from; the SC-1, SC-2, and RC-1. For the remainder of this section we will discuss programming the RC-1.



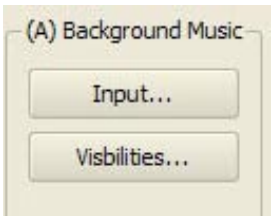
After selecting the RC-1 from the drop down menu, the assignment screen updates and displays a picture of the controller in the lower right hand corner of the screen for reference.

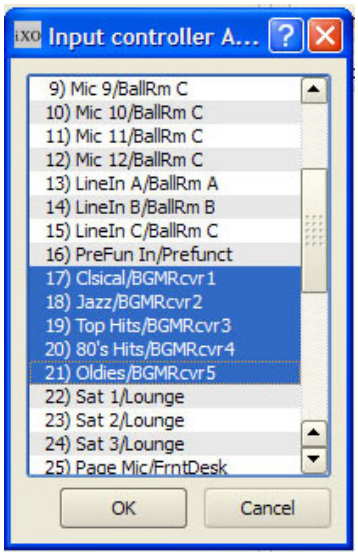


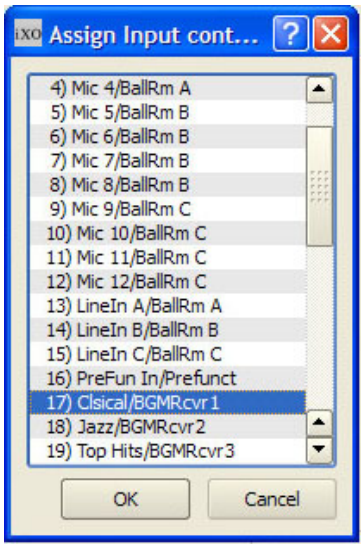
Directly underneath the drop down menu is a text box where you can assign a name to the controller. Next is the IP address entry text boxes where you enter the addresses for the wall controller. The MAC address, if needed, is located on an adhesive sticker on the rear of the wall controller. The default address for the wall controller is 192.168.1.170. You can reconfigure the IP address of the controller to another address by using the WSNetServer software application (please refer to the WSNetServer instructions located in the appendix of this manual). The upper right hand section of the screen shows the number of controllers available on the unit which can be programmed. For the RC-1 there are a total of three which are labeled A, B and C with A being the “Background Music” controller, B being the “Room Mics” controller, and C being the “Local Sources” controller. The A “Background Music” controller consists of an eight character display which indicates the source name, a “Select” rotary encoder and an “Enter” button which are used in conjunction with the display to view the various sources available and choose the desired audio, and a larger “Volume” rotary encoder with a vertical LED level indicator display and an illuminated “On/Off” button which will mute or unmute the audio. The B and C controllers each consist of a large “Volume” rotary encoder and the associated “On/Off” button.

The basic premise of the type “A” controller on the RC-1 is that it can be assigned to a specific input channel on the iXO system with the “Select” and “Enter” buttons on the wall controller having the same functionality as the “Select” up/down buttons and “Take” button on the input channel. The rotary “Volume” encoder and the “On/Off” button on the controller have the same functionality as

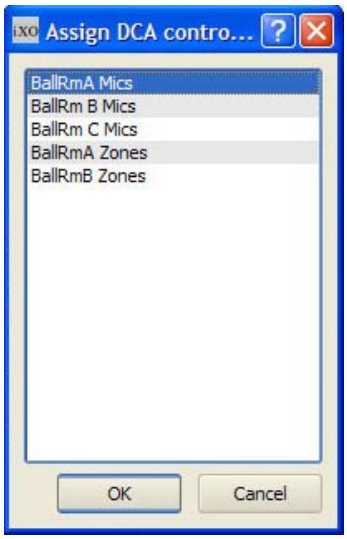
the input channel fader and Mute button. You assign the controller to an input channel by clicking on the "Input" button and selecting the desired channel from the pop-up window. You can then choose which input sources can be made available to the controller by clicking the "Visibilities" button and selecting a source by clicking on it, or select multiple sources by holding the "Ctrl" key down and click on your desired sources.

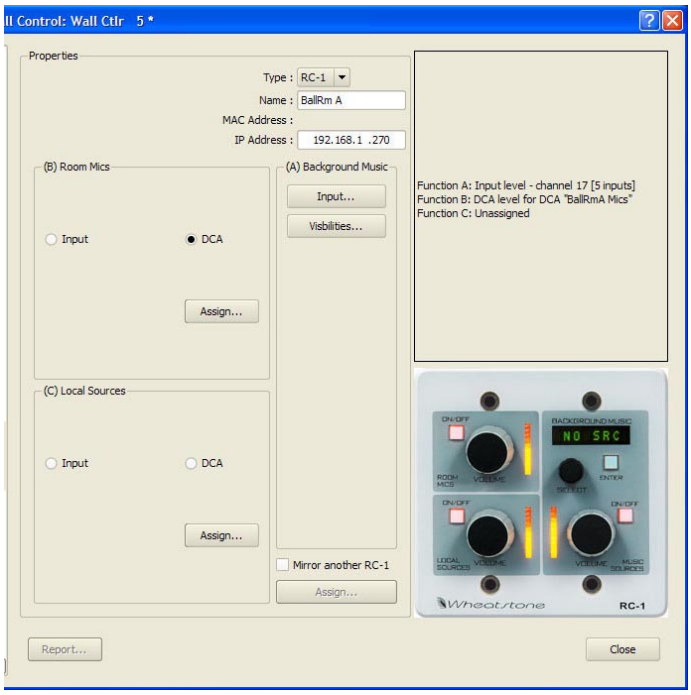




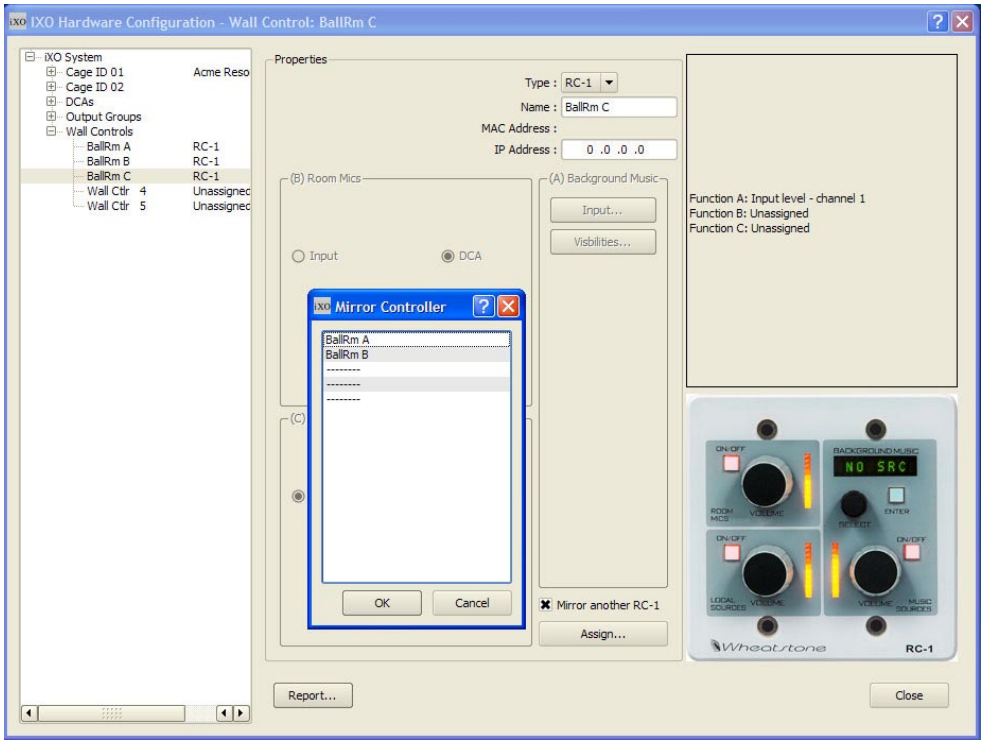


The B and C type controllers on the RC-1 allow the "Volume" encoder and "On/Off" button to be assigned to either an input channel, where they have the same functionality as the channel fader and mute, or they can be assigned to a DCA where they again have the same functionality as the DCA fader and mute button. You first choose to assign the controllers to an input channel or a DCA by clicking on the associated radio button, and then selecting the desired input channel or DCA fader from the pop-up window.





You can also choose to have the RC-1 wall controller "mirror" or track another existing controller by checking the "Mirror another RC-1" check box and clicking on the "Assign" button. This will bring up a pop-up window from where you can select the specific wall controller you want to mirror.



When you are finished with the configuring of the wall controller, you can mouse over to the system tree and create and configure additional controllers, or you can select “Close” or “X” which will close the Hardware Configuration window and apply the settings.

Programming the model SC-1 and SC-2 controllers is done in a similar fashion as the RC-1 “Background Music” type A controller.

Hardware Configuration Report

Report is a utility which will organize certain system data for printing or saving as a text (txt) file. Report will generate a list of the card cage slot assignments which you can save as a .txt file or print out and as a reference for properly installing the cards in the correct slots before you attempt to upload the configuration to the system. To use, you must have one of the following highlighted; iXO System, Cage ID 01, Cage ID 02, or any occupied card slot in any cage. It will also generate a list of all logic port assignments and programming if you highlight any LIO-32 card in the system and click Report. If you are using any DCAs, Output Groups, and/or Wall Controls clicking on Report with the associated branch highlighted will generate a report listing the details of each item. A DCA report will show the DCAs assignments in the system. An Output Group report will list the groups created, their type and any processing links. The Wall Control report will list each wall control used in the system along with its respective data (IP address, channel assignments, etc.).

Hardware Configuration Close

Close is used to close the Hardware Configuration window. If this is the first time that the Hardware Configuration window was opened (as is the case when first creating a configuration) it will close the window and will automatically bring up the Save Config File window asking you to provide a file name. Enter a file name and click Save to close. You now have created a configuration file which can be immediately uploaded to the iXO system hardware, which matches the card slot assignments and connection settings in your config.

It is important to note that the close button will also initiate the any modifications that you have made to any part of a previously configured system. This is extremely important to remember whenever you are connected to a live system. Please use caution when opening the Hardware Configuration window and changing certain output parameters such as the output channel processing type (Standard or Speaker Processor) or when initiating output presets. Inappropriate use can result in you inadvertently sending full frequency signals to delicate high frequency components possibly, resulting in driver damage.

Audio Control Windows

This section will describe the iXOverture audio control windows. There are four categories of control windows; Input Channels, Crosspoints, Mix Outputs, and Output Channels. To access the various windows you double click on the channel, cell, or mix output you wish to control.

- Double click on a row in this area to open an Input Channel control window.
- Double click on a column in this are to open an Output Channel control window.
- Double click on a "Mix" cell in this area to open the Mix Output control window.
- Double click on a cell in this area to open the Crosspoint control window.

Input Channels

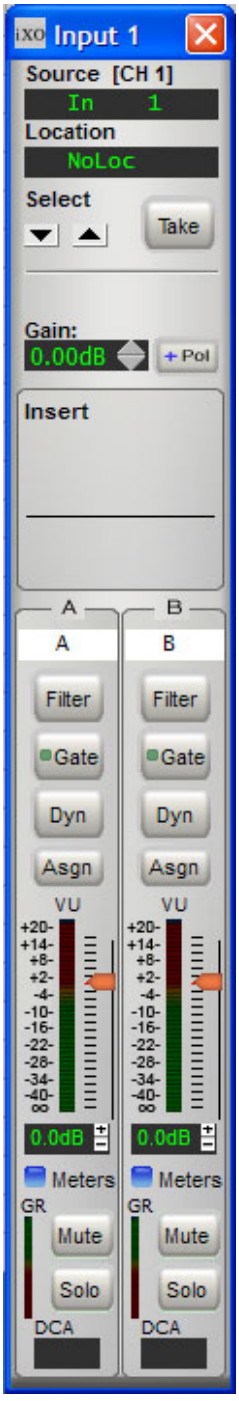
The iXO input channel shown is not so different from a channel strip that you might find on a traditional mixing console.

At the top you have an eight character display for the **Source** and **Location** names**.** This indicates the current *input source* that has been assigned to the channel. Directly below are **source selection arrows** and the **Take** button. These controls allow you to select any input source in the system and assign it to the input channel by clicking on the **Take** button. By default input sources are assigned according to their input card slot and port order; input card 1, port 1 is assigned to input channel 1, likewise for ports 2 through 8 on the card. The selection arrows and the Take button can be hidden from the channel strip, for systems where input source routing is not required (please refer to the section on Preferences).

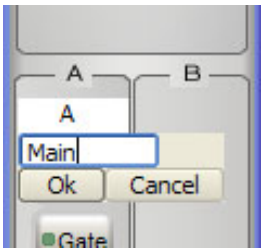
The next section displays the input sources initial **Gain**, **Polarity**, and **Phantom Power** settings. When an input source is configured during the hardware setup, you decide if the input is a microphone or line level source. For a line level input, the phantom power graphics are not present and the gain range is +/-12dB. For a microphone input, you have the option of utilizing phantom power and the gain range is 0 - 60dB. You can lock or unlock these settings to prevent unauthorized adjustment. A lock icon will appear if these parameters have been locked by the system administrator.

The **Insert** section has the same functionality as an insert point on a mixing console. The insert point is post A/D conversion and pre channel input processing and fader. The insert point is part of the input channel and has no relation to the source at all. If insert processing such as **Acoustic Echo Cancellation** and **Noise Cancellation** is used with an iXO system, the associated controls are displayed here.

The area below the **Insert** section contains the signal processing for the input channel strip. You will notice that there are two sections to this part, labeled A and B. The intent here is to provide you with the option of having single or dual channel processing paths. In some audio system design applications a single processing path per channel will suffice. Other system



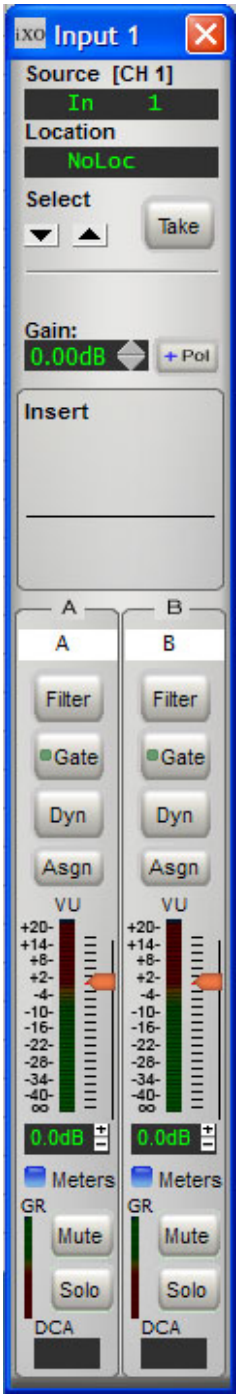
designs will benefit by having independent processing; perhaps using the A path for the main PA and the B path for the in-ear monitoring system. The single or dual input processing feature is configured in the System Wizard during initial setup. The B processing section is identical to the A in layout. At the top of the processing section is a label area where you can double-click and enter in a six character name for the processing path. There are three buttons labeled **Filter**, **Gate**, and **Dynamics**. Clicking on any of these buttons will open their respective control windows to allow you to enable or adjust the processing.



The lower section of the channel strip is where you will find a channel Assign button (Asgn), VU and Gain Reduction Meters, Fader, Mute and Solo buttons, and a DCA information window. An identical set of controls populates the B side of the channel strip if dual input processing is utilized.

Clicking on the Assign button brings up a list of the available outputs that you can assign that particular channel to. Simply check the desired output on the list and the matrix crosspoint control window will appear allowing you to complete the channel assignment.

Note: The Assign button on the B channel is a mirror of the Assign button on the A channel. You can make a crosspoint assignment from either button.



There is 12dB of gain and 60dB of attenuation on the channel Fader. The Fader and Level display window allow several ways to adjust the channel level. You can click on the fader and drag it up or down to the desired setting, you can click on the "+" or "-" jog buttons adjacent to the display window for more precise adjustments, or you can double click on the level display window and directly enter your desired level setting. When using dual processing you have the ability to have the B channel fader mirror the A channel by right clicking and selecting this option in the pop up window.

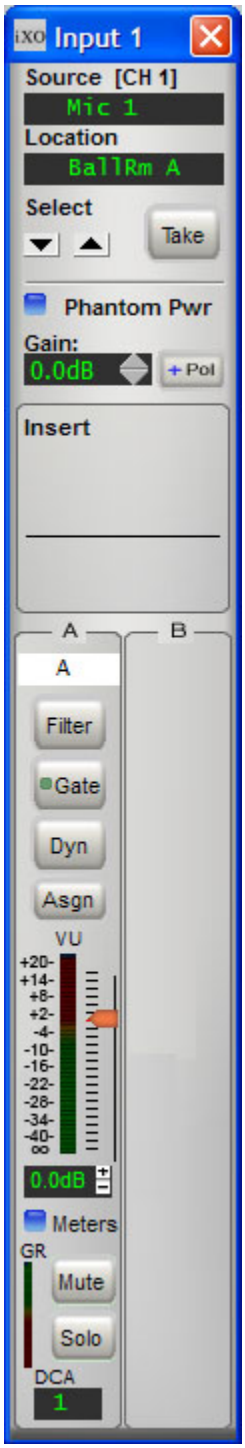
The VU and Gain Reduction meters are activated by checking the Meters checkbox located directly above the GR meter. The meters are peak-over-average, with peaks riding as a lone "dot" over a solid bar-graphed average.

Clicking on Mute will mute the respective A or B side of the input channel, or will mute both channels if the B fader is mirrored to the A. Click once to mute, click again to unmute.

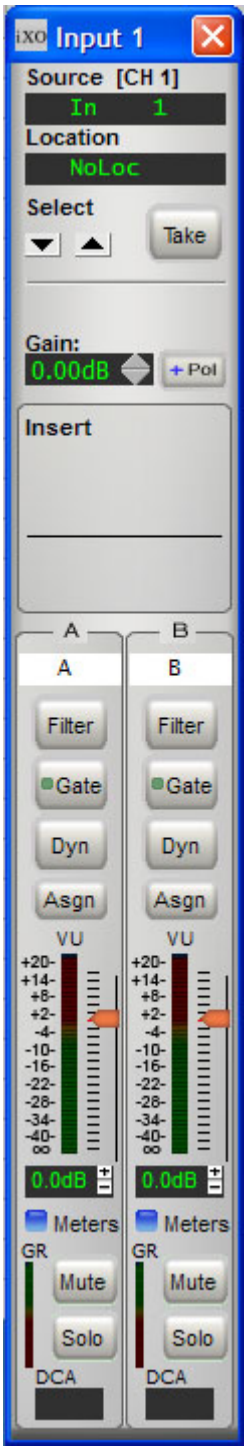
The Solo button will, when clicked, route the channel's audio to the predefined Solo output channel for monitoring purposes. All of the Solo parameters are configured using the Solo Setup window located on the menu bar in the "Configure" drop down menu. See the later section on Solo Setup.

At the very bottom of the channel is the DCA display window, which indicates if a DCA is assigned to the A and/or B fader on the input channel. If a DCA is assigned a number (1 - 256) will appear in the display.

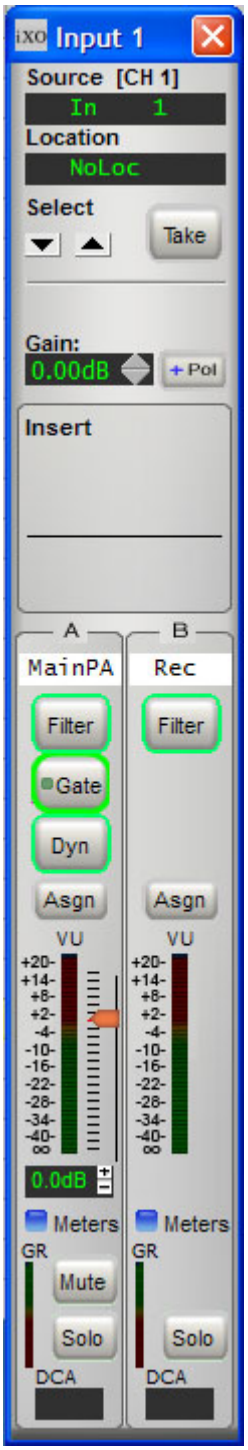
On the following page there are several input channels displayed for your reference, one with single channel processing, one with dual, and one with dual with mirrored Gating, Dynamics, and Faders.



Single Channel Processing



Dual Channel Processing



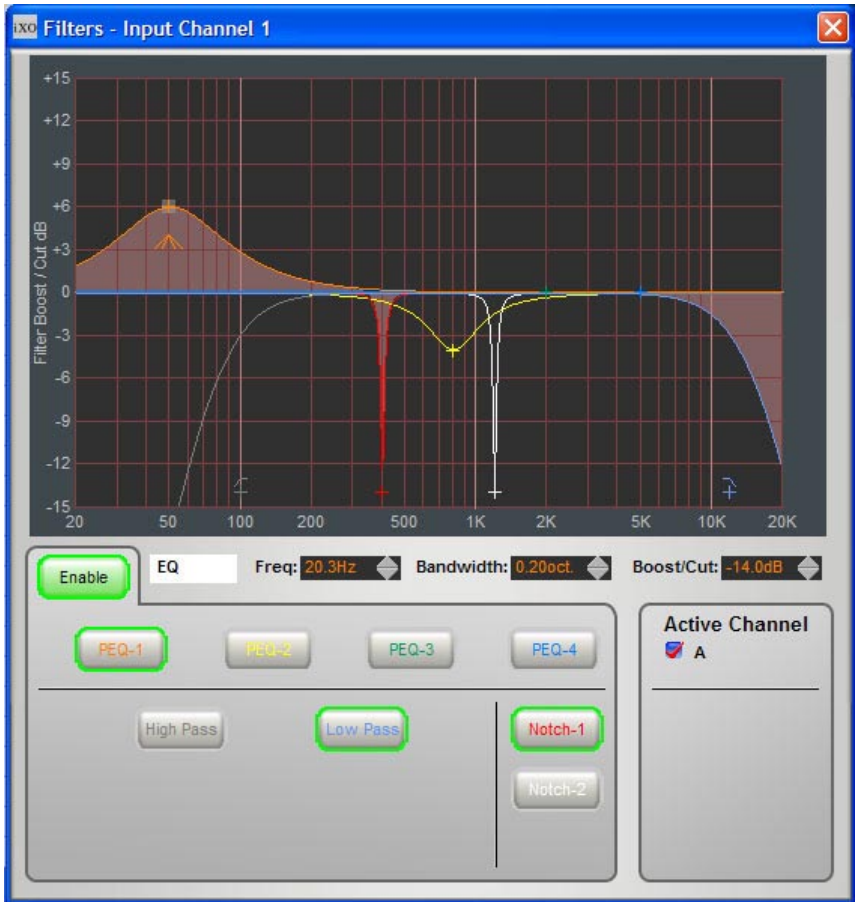
Dual Channel Processing with Mirrored Gating, Dynamics & Faders

Input Channel Processing

The signal processing on an input channel is available in single (A) or dual (A & B) modes. This section consists of Filters, Gating, and Dynamics, with each one having a corresponding button on the channel strip. When dual (A & B) processing is used the control windows will display either the A or B processing settings for the corresponding input channel. You can quickly jump between the A & B channel settings via the Active Channel checkbox in the processing control window. The Mirror button will enable the A and B channels to "mirror" or track each other; the Overlay button will display the non-active channel's graph information on the active channel's graph. You can have an input channel's Filter, Gate, and Dynamics control windows open at the same time for ease of setup. Keep in mind that the three types of windows (Filter, Gate, & Dynamics) are independent of the input channel. They are control windows that will display any input channel's processing information. For example; if Input Channel 1 is open along with the corresponding Filters window and you then open Input Channel 5 and click on the Filters button, the Filters control window will switch from displaying Channel 1 to Channel 5. You can also directly access these processing control windows on the matrix screen by placing your cursor over the input channel, right clicking, and select the desired processing control window.

FILTERS

Clicking on the Filter button will open the filters control window which allows you tailor the frequency response of the incoming signal.



There are eight filters total, consisting of four parametric, two notch, high pass, and low pass. To use the filters, first click on Enable. This activates the entire filter section for use. Then right click anywhere on the frequency-domain graph and select the filter that you wish to adjust. Select and adjust the filters settings by clicking and dragging the filters 'handles" on the frequency-domain graph, or you can also make adjustments by using the filter data windows; Frequency, Bandwidth, and Boost/Cut. Use the up and down arrows to adjust the data, or double-click on the display window and directly enter the data. You can enable or disable individual filters by clicking on the any of the eight filter buttons, or by double clicking on the "+" handle of the filter located on the graph.

Proper equalization is paramount to achieving optimal audio system performance. Understanding the various types of equalization tools available for your use, as well as when and how to use them is important. In any situation where a microphone is your input source proper consideration must be given to microphone selection and placement, for no amount of equalization can overcome the laws of physics. That being said, below there are some descriptions and tips regarding the types of filters available to you on the input channel.

High Pass

In most applications it is usually desirable to limit the low frequency response of the microphone to minimize signals which are not related to the desired signal. The iXO provides a sweepable high pass filter to enable roll-off of the low frequency response as desired by the user. The lowest frequency of the control is 20.3Hz, while the highest possible setting is 1kHz.

Many typical voice applications will have the HPF set somewhere around 100Hz or perhaps slightly lower. Special applications or special effects will have the control set at other settings.

The High Pass Filter is an 18dB/octave linear phase design.

Low Pass

Some intentional roll-off of the upper extremes of the audio spectrum is usually desirable in voice applications in order to reduce out of band noise. Since reduced bandwidth results in reduced noise levels, the microphone source can sound 'cleaner' than it otherwise would if low pass filtering were not employed. Depending on the setting of other controls, low pass filtering may also be effective at reducing or avoiding high frequency feedback when microphones are operated near speakers carrying the microphone's signal.

Typical applications will see the LPF set somewhere below 15.5kHz, sometimes as low as 10kHz or perhaps even lower depending on the application, the microphone being used, or the artistic desires of the talent or engineer. The minimum frequency setting is 1kHz and the upper limit is 20kHz.

The Low Pass Filter is an 18dB/octave linear phase design.

Parametric Equalizer (PEQ 1 - 4)

The input channel Filter section has four identical fully parametric equalizers.

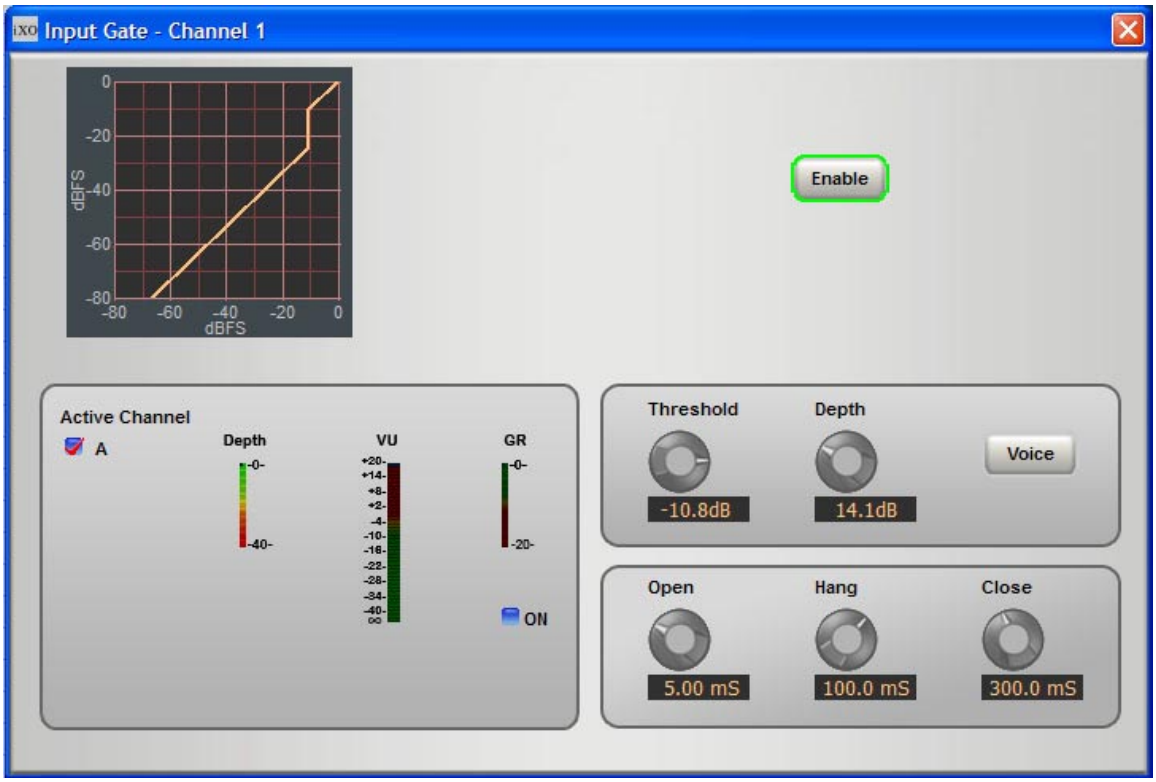
The four parametric sections are fully adjustable in three ways – center frequency (20Hz-20kHz), bandwidth (0.2 to 3 octaves), and boost/cut (plus or minus 14dB).

Notch (1 & 2)

The notch is tunable over the entire audio range of 20Hz – 20kHz and has a maximum depth of 14dB.

GATE

Clicking on the **Gate** button will open the control window which allows you to utilize gating to enhance the performance of the incoming signal.



A gate such as the one in the input channel is a useful tool for reducing unwanted background noises. These could be variously air-conditioning rumble or noise, background conversation, phone-line noises, recording hiss, etc. It is also useful for reducing the inevitable general increase in background noise of some recorded material when subject to heavy compression. A common usage in live sound is to effectively turn a microphone off when not being talked/sung into, so as to reduce corruption of a mix or reduce the chances of feedback with an unwanted open microphone.

The gate is slightly counter-intuitive when first encountered, in that unlike nearly any other processing element it is active - i.e. working, attenuating away the input signal - when the input signal is at its quietest, at or below the threshold. If the gate is on, there will be gain reduction when no signal is present. The gain-reduction reduces as the threshold is approached, and there is none above the threshold.

The controls are of the gate are as follows:

Threshold

This control adjusts signal level below which the automatic attenuation starts to take effect. The range of adjustment is from 0dB to -60dB.

Depth

This sets the maximum amount that the gate is permitted to attenuate the input signal level. The range of adjustment is from 0db to 40dB.

Open

This sets the time-constant of the rate at which the gate un-attenuates, or opens; sometimes this is called “attack”. The range of adjustment is from 0.4ms to 100ms.

Hang

This is an adjustable period of time the gate remains open without attenuating, before starting to close. The range of adjustment is from 0.00ms to 1000ms. Handy to keep the gate open during, say, speech inter-syllables or other short pauses, without having to resort to excessively long...

Close

... close times. This being the rate at which the gate attenuates away the input signal once below the threshold. The range of adjustment is from 50ms to 3000ms.

Voice

This is a sidechain high pass filter which rolls off the lower frequencies at 150Hz to prevent false gating when used for vocal applications. It has no affect on the audio signal.

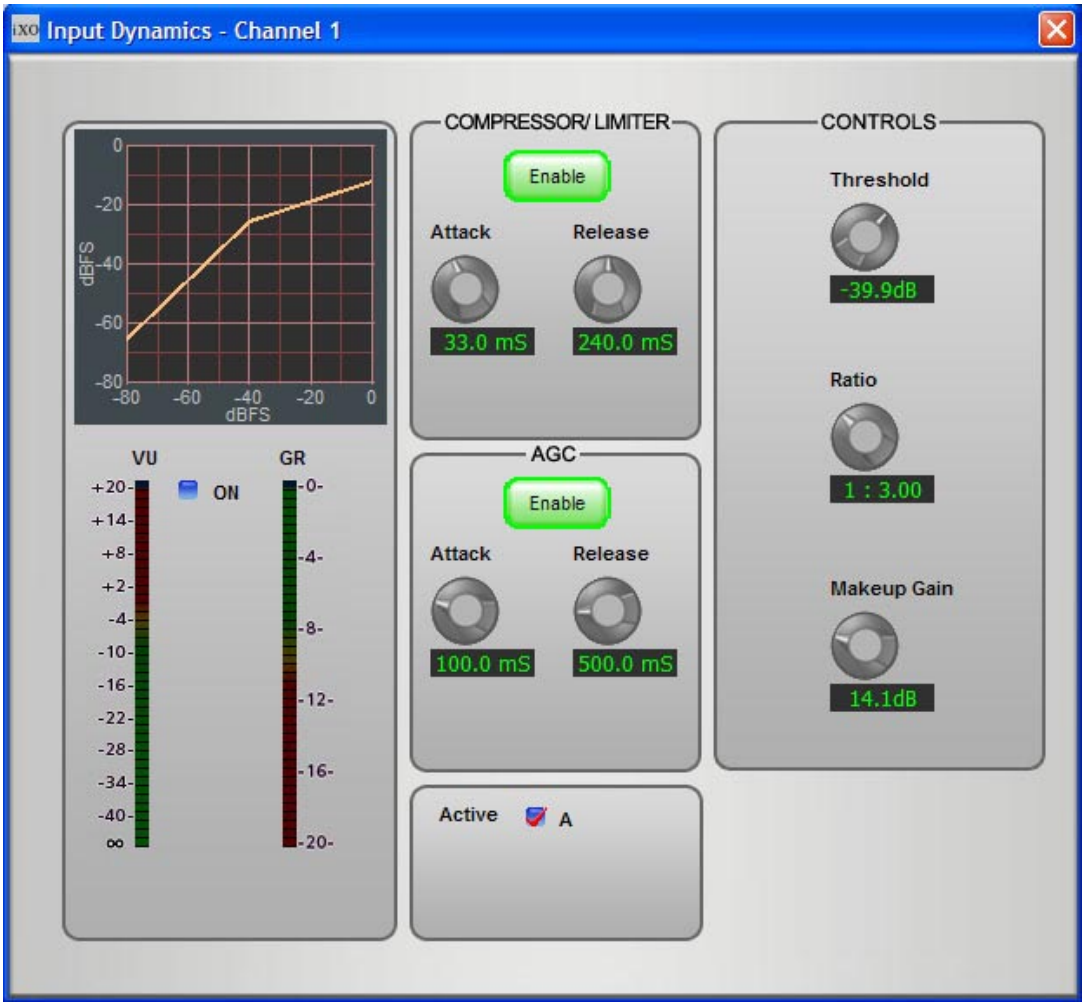
An input/output plot, a graphical representation of the relationships between threshold, and depth, is on the gate Control screen of the GUI; it is a handy visual aid.

Almost always, the trick is to set the threshold of the gate - below which it starts to attenuate away the input signal - high enough to capture the noise, but not too high as to snatch at the lower levels of the desired parts of the program material. That can sound really irritating.

It is still best not to go overboard with depth - even just 14dB, 20dB tops, is enough to make a signal “disappear” in the context of a mix; the whole gating sound, especially surprisingly its opening, is less obvious with shallower depth.

DYNAMICS

Clicking on the Dynamics button will open the Dynamics control window where you are able to use the Compressor/Limiter and/or AGC to enhance the performance of the incoming signal.



The compressor/limiter is an envelope dynamics modifier that controls the overall signal energy from the input channel source. This stage compresses the dynamic range of signals, making soft sounds louder and loud sounds softer. With proper adjustment it can create a consistent output level from a talent's voice and can do it subtly - or - it can do it with a lot of "energy" if that is the sound desired. Basically the compressor allows the overall volume of the sound to be tailored to taste when the input level naturally varies as the talent speaks or source material changes.

The iXO compressor is a broadband feed forward architecture utilizing special program-related dynamics control algorithms specially designed by Wheatstone.

Compressor/Limiter & AGC: Common Controls

Threshold

Threshold is the signal level at which the compressor begins to constrain the output level. A signal exceeding this level will have its gain reduced in a manner determined by the Ratio control (see below). The threshold is adjustable over the range of -80dBFS to -20dBFS (decibels Full Scale). More negative settings cause gain reduction to begin at lower audio levels, while higher (less negative) settings cause gain reduction to begin at higher audio levels.

Ratio

Ratio controls the steepness of gain reduction once the audio has reached the Threshold. A ratio of 1 (or 1:1) results in no compression at all, and at the other extreme a ratio of 20 (or 20:1) makes it operate more like a limiter. In the latter case, once the threshold is reached the output level of the compressor will only increase 1dB when the input level increases 20dB. The ratio control, while adjusted to taste, will typically be set somewhere between 3:1 and 6:1 for most voices. Special effects, of course, may call for radically different settings.

Makeup Gain

Makeup Gain is used to bring the dynamically reduced signal up to the original unprocessed level. A range from 0 to 48dB of gain is available to use. The default setting is 14dB.

Metering

To activate the meters, click on the ON checkbox.

The VU meter is a peak-rms meter which indicates the incoming signal with a range of infinity to 20dB.

This GR meter indicates gain-reduction being applied to the signal by compressor, from 0dB to -20dB.

Display

The GUI also displays an input/output transfer function plot to visually represent the settings of Ratio, Threshold, and Makeup Gain.

Compressor/Limiter Controls

Enable

Click on Enable to activate the Compressor/Limiter. The outer band of the Enable button will glow green, indicating that it is in use. Click again to turn off or bypass.

Attack

This control determines how quickly the compressor responds to a signal exceeding the threshold. The control is adjustable between 5.00 milliseconds and 330.0 milliseconds and is adjusted to personal preference. Faster attack times catch signal peaks more quickly but may make the sound ‘mushy’ and without detail. Operation at faster attack, below approximately 10 milliseconds, causes the compressor to operate more like a peak limiter than an average responding compressor. Conversely, slower attack times allow more peaks to escape uncontrolled, making the sound more relaxed. The caveat is that slower attack times allow peaks to escape that might cause problems further downstream.

Release

Release determines how fast the compressor returns the gain back to normal after chasing an audio peak. Faster release times increase the average audio energy but might sound 'busy' if too fast. Slower release times make the sound more natural and relaxed, but lower the average sound level. Release time is adjustable between 33.0 milliseconds and 1 second.

Compressor Release Time Operating Hint

While the compressor's attack time and ratio are typically adjusted to provide peak protection for equipment following the iXO, the setting of the release time control is largely an artistic decision. Please allow us to offer three of the most common caveats of operating a compressor with extremely fast release times.

- *A very fast release time increases the amount of intermodulation distortion, or IM. This is because when the compressor release time is set fast enough to 'follow' every cycle of a low frequency signal, the lower amplitude higher frequency signals 'go along for the ride'. This results in modulation of the high frequencies by the low frequencies, or intermodulation.**
- *A very fast release time exaggerates reverb, whether artificially created by electronic or electromechanical means, or due to the natural early sound reflections from the hard surfaces of the room where the microphone and voice talent are located.*
- *A very fast release time accentuates the speaker's breath sounds or other unwanted background sounds that would otherwise be inaudible.*

Note: The sound of intermodulation distortion ranges from a subtle "thickening" of the sound, to downright muddy or even "gurgling" at the extreme.

AGC (Automatic Gain Control)

The AGC is an additional sidechain operating in conjunction with the compressor; generally the AGC has much slower integration times for attack and release, so that it responds more to the medium or long-term energy of the program material in a given band, rather than the more typically energetic actions of the compressor. Its time-constants are controlled by "AGC Attack" and "AGC Release," in the second row of controls on the GUI's Dynamics screen.

The AGC may be used alone (by enabling it and turning off the compressor) for gentle control of inconsistent input signals. It can also be used in conjunction with the compressor; in this case, the AGC action rides "underneath" the compressor; depending on the time-constant settings and character of the program material, the AGC can follow the average long term level changes and create a gain-reduction "bed" some 12dB to 6dB under the compression gain-reduction peaks. The AGC rides the general level; the compressor processing for effect takes place on a consistently controlled signal.

On sudden application of an input signal, the faster compressor's attack captures the onslaught, with the AGC eventually catching up. On release, the effect is identical to the much-vaunted "two-slope release" of classic compressor units such as the Audio and Design F760xrs and Joemeek SC2. On departure or reduction of the input signal the usually faster compressor release predominates until its gain-reduction contribution falls below that of the AGC, whose much slower release rate takes over.

A big advantage of the compounded processes is that on normal program material, the compressor does not have to “move as far” to capture signal peaks, so reducing the “snatching” which can occur at deep compression onset.

AGC Controls

Enable

Click on Enable to activate the AGC. The outer band of the Enable button will glow green, indicating that it is in use. Click again to turn off or bypass.

Attack

This control determines how quickly the AGC responds to a signal exceeding the threshold. The control is adjustable between 50 milliseconds and 1 second and is adjusted to personal preference. Faster attack times catch signal peaks more quickly but may make the sound ‘mushy’ and without detail.

Release

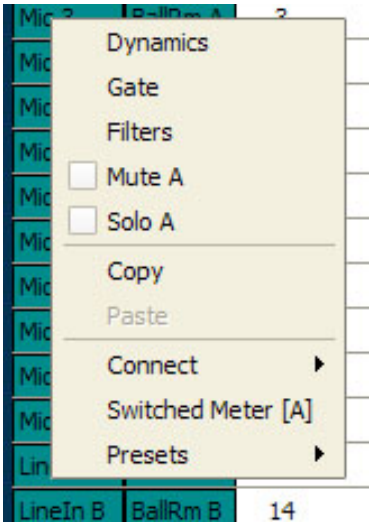
Release determines how fast the compressor returns the gain back to normal after chasing an audio peak. Faster release times increase the average audio energy but might sound ‘busy’ if too fast. Slower release times make the sound more natural and relaxed, but lower the average sound level. Release time is adjustable between 330.0 milliseconds and 4 seconds.

Right Clicking and Input Channels

There are some handy right click options for input channels that you can utilize to quickly access key features of the system. One is available to you on the matrix view of the system by simply mousing over the desired input channel and right clicking. The other is only available to you when the input channel is open.

Right Clicking Over a Closed Input Channel

When you mouse over any input channel on the matrix and right click a menu appears with the following selections and functions:



Dynamics: Selecting this will open the channel’s Dynamics window.

Gate: Selecting this will open the channel’s Gate window.

Filters: Selecting this will open the channel’s Filters window.

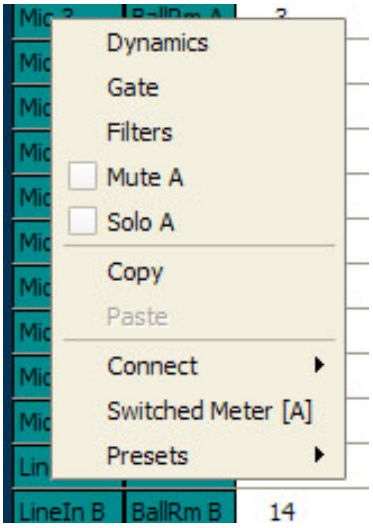
Mute A: Checking this will mute the audio in the A path (default path).

Solo A: Checking this will solo the audio in the A path (default path).

Copy: Selecting this will copy the channel’s settings (excluding source and insert information).

Paste: Selecting this will paste the previously copied channel information to any desired input channel.

Connect: Selecting this will open a sub menu which lists all of the input sources available in the system with the current source selection checked. Checking a different source will assign the selection to the input channel.



Mute B: Checking this will mute the audio in the B path (if configured with this option).

Solo B: Checking this will solo the audio in the B path (if configured with this option).

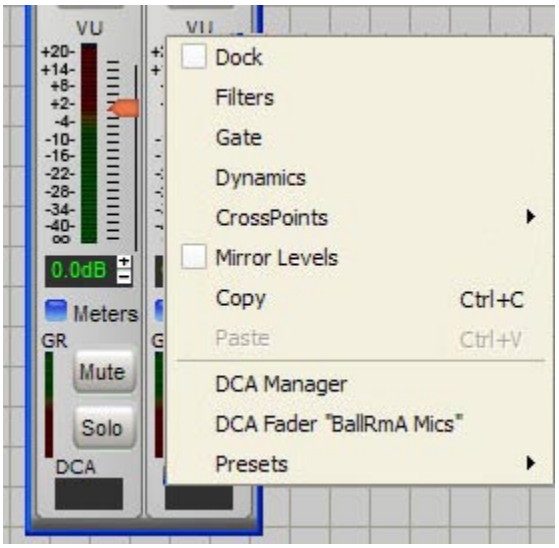
Switched Meter A: Selecting this will open a switched meter for the channel's A input path (default).

Switched Meter B: Selecting this will open a switched meter for the channel's B input path (if configured with this option).

Presets: Selecting this will open then a sub menu which allows you to open the Preset Manager to create a new preset. If there are existing input presets, they will also be listed here for you to select and execute.

Right Clicking Over an Open Input Channel

When you mouse over any open input channel and right click a menu appears with the following selections and functions:



Dock: Check this will dock the input channel in the respective dock located on the left hand side of the workspace. Once a channel is docked, it must be accessed via the dock. Uncheck to remove this feature.

Filters: Selecting this will open the channel's Filters window.

Gate: Selecting this will open the channel's Gate window.

Dynamics: Selecting this will open the channel's Dynamics window.

Crosspoints: Selecting this will open a sub menu which lists all the crosspoints to which the input can be assigned. Checking on a crosspoint will automatically open the corresponding crosspoint cell window to which you can make the desired assignments and adjustments.

Mirror Levels: Checking this will cause the B path fader and mute to disappear from the input channel and the B path audio will mirror (track) the A path fader and mute settings (if configured with this option).

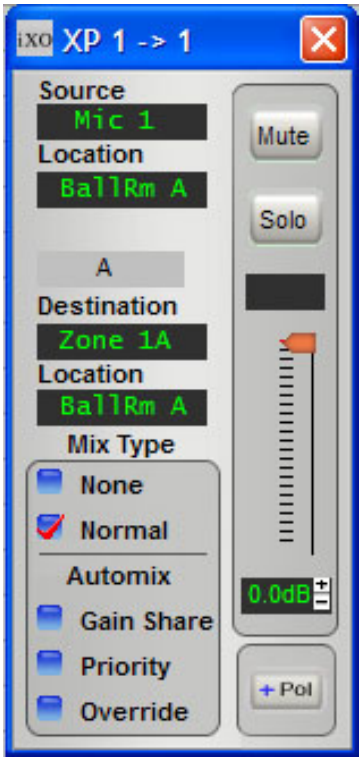
Copy: Selecting this will copy the channel's settings (excluding source and insert information).

Paste: Selecting this will paste the previously copied channel information to any desired input channel.

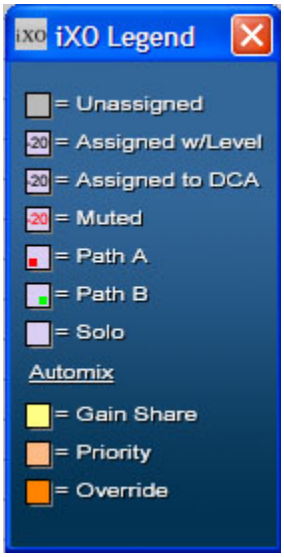
DCA Manager: Selecting this will open the iXO Hardware Configuration to the DCA Manager window.

Presets: Selecting this will open a sub menu which allows you to open the Preset Manager to create a new preset. If there are existing input presets, they will also be listed here for you to select and execute.

Matrix Crosspoint Control Window



The Crosspoint control window is used to assign an input channel to a specific output mix. It is accessed either by double clicking on an individual crosspoint cell on the matrix, or by clicking the "Asgn" (Assign) button on an input channel and selecting the crosspoint that you wish to open. A matrix Legend is available for viewing which illustrates the various conditions of the crosspoint cells. The Legend is accessed via the View drop down menu.



The control screen is fairly straightforward to understand. On the window title bar you will see the specific crosspoint location displayed in a manner such as "XP 1->1" which indicates that the control window is for input 1 to output 1. On the upper left hand side of the screen you see the Source and Location information displayed. Directly below that is the Proc. Ch. text box which displays the name of the assigned input channel path when a Mix Type is selected, or "None" when the Mix Type is unassigned. Below that you will see the Destination and Location labels displayed. Once a crosspoint control window is opened, the procedure is to select the Mix Type you desire for the input source, selecting either Normal or one of the Automix types (Gain Share, Priority, or Override). You can also un-assign the input channel by selecting "None." When automatic microphone mixing is desired the Gain Share checkbox is selected, which allows the input source to be part of an automix for that specific output.

The Priority checkbox will give the input signal a level of priority in the automatic mixer; that is when a single (or multiple) Priority designated microphone becomes active, all non-Priority Automix microphones in the mix will not be permitted to become active until the Priority microphone(s) deactivate. An additional priority level is also available by selecting the Over-Ride checkbox. This setting will allow a signal to take precedence over all other automixer microphones (Priority mics included) that are in the same mix. Only one Over-Ride microphone can be assigned in an automixer. Located on the right hand side of the Crosspoint control window is the Fader (attenuation only), Mute button, Solo button, Polarity button, and the DCA display window.

Right Clicking and Matrix Crosspoint Cells

There are some handy right click options for matrix crosspoint cells that you can utilize to quickly access key features of the system. One is available to you on an unassigned crosspoint cell by simply mousing over the desired cell and right clicking. The other is available to you if the crosspoint is assigned.

Right Clicking Over an Unassigned Matrix Crosspoint Cell

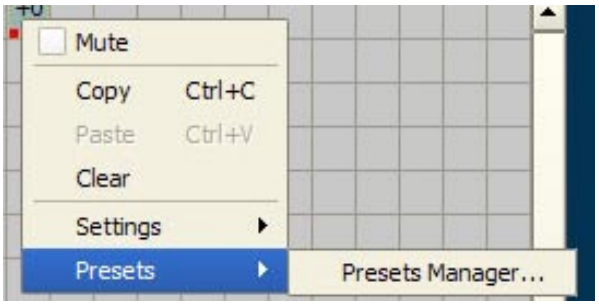
When you mouse over any unassigned crosspoint cell on the matrix and right click, a menu appears with the following selections and functions:

Paste: Selecting this will paste any previously copied crosspoint settings to the cell.

Presets: Selecting this will open then a sub menu which allows you to open the Preset Manager to execute an existing crosspoint preset.

Right Clicking Over an Assigned Matrix Crosspoint Cell

When you mouse over any assigned crosspoint cell and right click a menu appears with the following selections and functions:



Mute: Checking this will mute the crosspoint.

Copy: Selecting this will copy the crosspoint cell's settings.

Paste: Selecting this will paste the copied data to the cell.

Clear: Selecting this will clear the cell (reset to factory default settings).

Settings: Selecting this will cause a sub menu to appear with the following:

Open Settings Window: Selecting this will open the crosspoint cell's window.

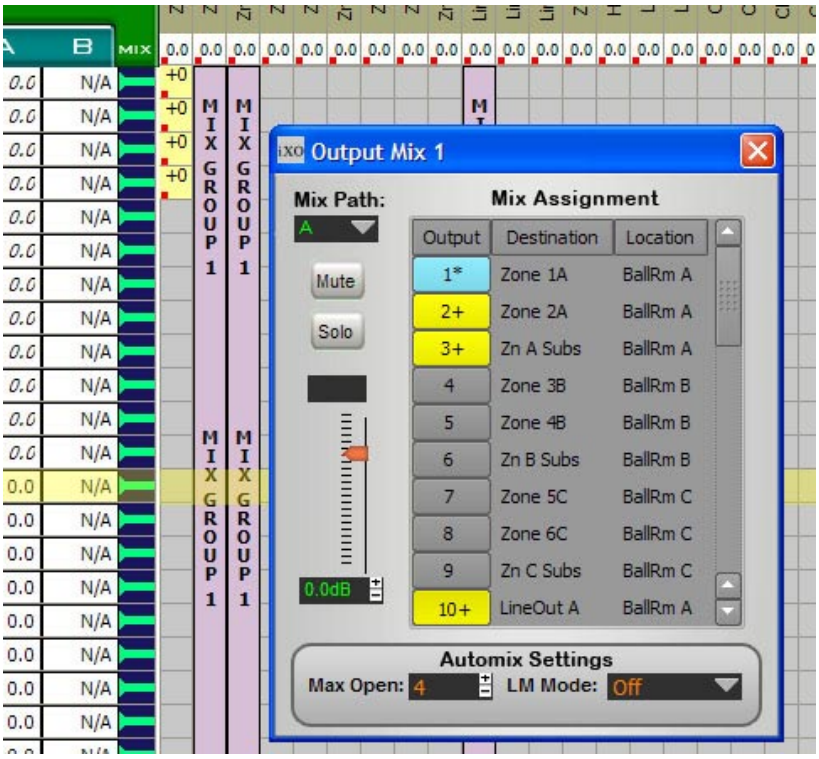
Mix Type: Selecting this will open another sub menu with the following choices:

- **None:** Selecting this unassigns the crosspoint.
- **Normal:** Selecting this sets the mix type to normal.
- **Auto - Gain Share:** Selecting this sets the mix type to automix – gain share.
- **Auto - Priority:** Selecting this will set the mix type to automix – priority.
- **Auto - Override:** Selecting this will set the mix type to automix – override.

Solo: Selecting this will cause the crosspoint cell to be soloed.

Presets: Selecting this will open a sub menu which allows you to open the Preset Manager to create a new preset. You can also select any existing crosspoint preset(s) to execute.

Mix Output Control Window



Located at the top of the crosspoint matrix is a single row of cells which are the Mix Outputs. Double clicking on a Mix Output control window will open the control window which allows you to adjust the overall mix level, assign the mix path (A or B), mute, solo, view any DCA assignment, and set Automix parameters such as the maximum number of open mics and last mic mode. But the best feature is the ability to assign the mix to additional output channel destinations.

By default, Mix Output 1 is assigned to Output Ch. 1, Mix Output 2 to Output Ch. 2, and so on all the way through output channel 64. The Mix Assignment table allows you to assign the mix to as many additional output channels as you wish. The default mix output button (highlighted in green) will change to color to light blue when an additional output destination is selected.

These additional outputs assignments are yellow in color. Upon closing the Mix Output window the additional output assignments column of crosspoint cells will display the "Mix Group" label on the matrix.

The Mix Path drop down menu allows you to select either the input channel processing A Path (default) or the B Path (if configured) for the entire "mix column".

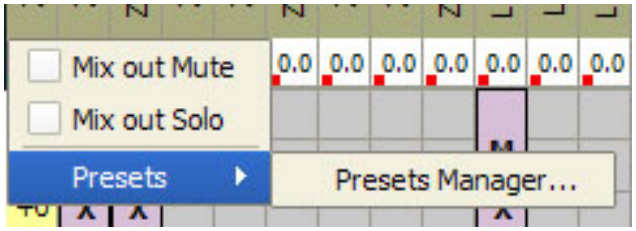
The Automix Settings section has two drop down windows, Max Open and LM Mode. Max Open determines the maximum number of automixed microphones that will be allowed to be active (open or on) at the same time. The default setting is 4, with a range from 1 to 8 mics. The LM Mode allows you to configure the last microphone mode of operation; Off, Last Active, or any individual microphone in the system. This feature is typically used in conferencing applications to allow the far end caller to still hear some room noise, (instead of near silence, which can cause the far end to think the call has been dropped). The default is off. For more detailed information on proper automatic mixer setup, please refer to the Automix chapter of this manual.

Right Clicking and Mix Outputs

There are some handy right click options for mix outputs that you can utilize to quickly access key features of the system. One is available to you on a mix output cell by simply mousing over the desired cell and right clicking. The second is available to you when you mouse over an open mix output window and right click.

Right Clicking Over a Mix Output Cell

When you mouse over any mix output cell on the matrix and right click a menu appears with the following selections and functions:



Mix Out Mute: Checking this will mute the mix output. Uncheck to unmute.

Mix Out Solo: Checking this will solo the mix output. Uncheck to disable.

Presets: Selecting this will open then a sub menu which allows you to open the Preset Manager to create a new preset. You can also select any existing mix output preset(s) to execute.

Right Clicking Over a Mix Output Window

When you mouse over any open mix output window and right click a menu appears with the following selections and functions:

Show Mix Out: Selecting this will open a sub menu which displays all of the available mix outputs and allows you to select another mix output channel to view and/or modify.

Presets: Selecting this will open then a sub menu which allows you to open the Preset Manager to create a new preset. You can also select to execute any existing mix output preset(s).

Automix Settings: Selecting this will open the Automix Settings window. *(Factory Use Only).*

Output Channels

The iXO output channel is designed to satisfy a majority of signal processing requirements that you may encounter in many audio system designs. That is why we offer two ways in which you can configure and utilize output channels. You can assign each output channel to be a standard or "speaker processing" type of output channel.

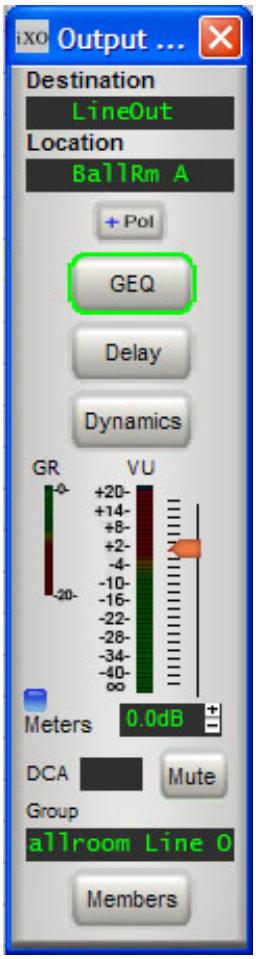
Unlike the input channels where you can open multiple input channel strips to view, you can only open one output channel strip at a time. You open an output channel strip by simply double clicking on the desired output channel on the matrix screen. You can access any output processing control windows by clicking on the associated button. Keep in mind that the five types of processing control windows (GEQ, PEQ, Dynamics, Delay, and Spkr Proc.) are independent of the output channel. They are control windows that will display any output channel's processing information. For example; if Output Channel 1 is open along with the Graphic Equalizer Ch 1 window and you then open Output Channel 5 and click on the GEQ button, the GEQ control window will switch from displaying Channel 1 to Channel 5. You can also access these processing control windows on the matrix screen by placing your cursor over the output channel, right clicking, and select the desired processing control window.

The standard output channel strip contains a polarity reversal button, 31-band graphic equalizer, delay, and dynamics (compressor/limiter). You do have the option of substituting a 10-band parametric equalizer in place of the 31-band GEQ if you so desire. The fader, mute, VU and GR meters, and DCA assignment window complete the standard output channel strip.

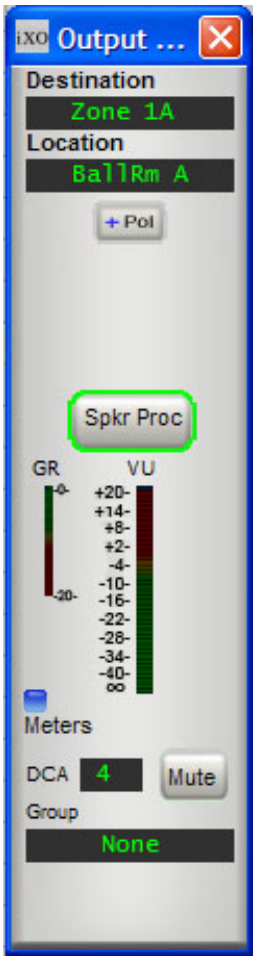
The speaker processor output channel strip contains a polarity reversal button and a single Spkr Proc button which, when clicked, will open a special processing block control window which consists of the following: four parametric filters (PEQ-1), Delay-1 (up to 670ms), Filters section with high and low pass crossover filters and an additional four parametric filters, Dynamics section with compressor and peak limiter, and second Delay (up to 10ms for driver alignment).

There is 12dB of gain and 120dB of attenuation on the channel Fader. The Fader and Level display window allow several ways to adjust the channel level. You can click on the fader and drag it up or down to the desired setting, you can click on the "+" or "-" buttons adjacent to the display window for more precise adjustments, or you can double click on the level display window and directly enter your desired level setting.

Note: When an Output Channel is configured as a speaker processor, the output channel fader is not used. The output level is adjusted with the Output Trim control located in the Comp/Lim control screen of the Speaker Processor window.



Standard Output Channel



Speaker Processor Output Channel

The VU and Gain Reduction meters are activated by checking the Meters checkbox located directly above the GR meter. The meters are peak-over-average, with peaks riding as a lone “dot” over a solid bar-graphed average.

Clicking on Mute will mute the output channel. Click once to mute, click again to unmute.

At the very bottom of the channel is the DCA display window. This informs of any DCA being assigned to the output channel. If a DCA is assigned, a number (1 - 256) will appear in the display.

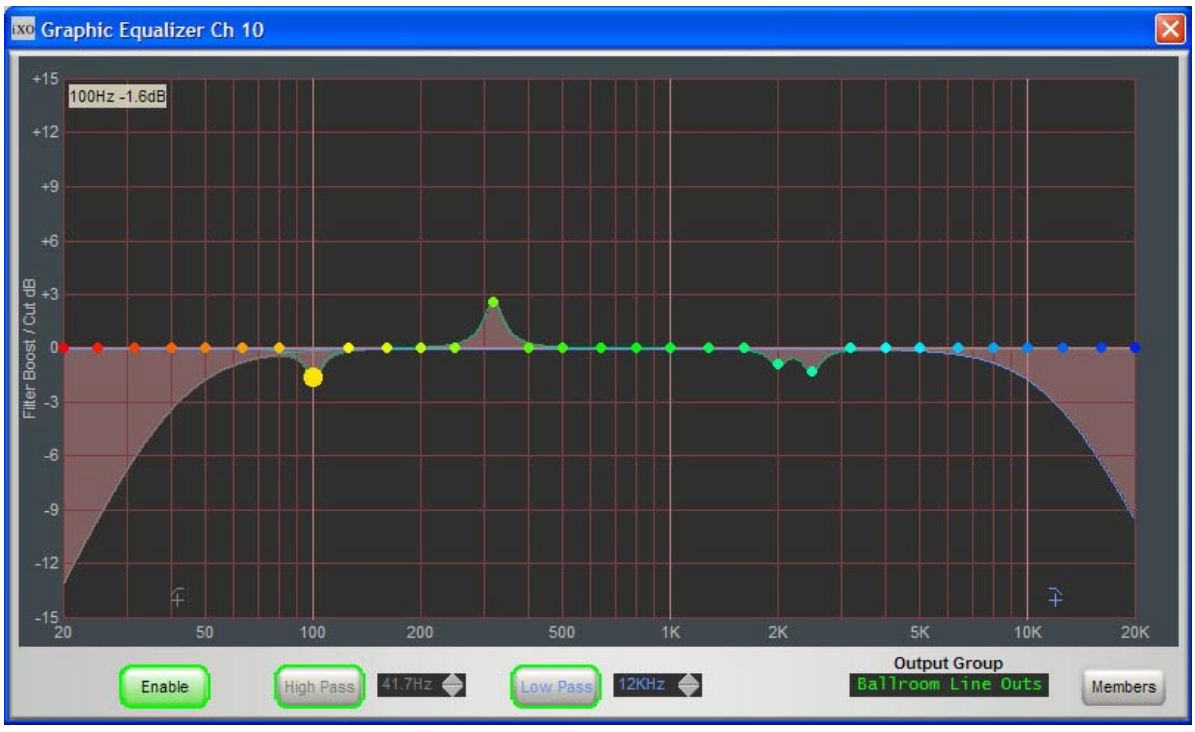
Standard Output Channel Processing

The standard output channel is designed to give you the all the processing power you need to achieve satisfactory results when used with outputs not requiring any crossover filtering networks. The standard output channel processing is described in the following sections.

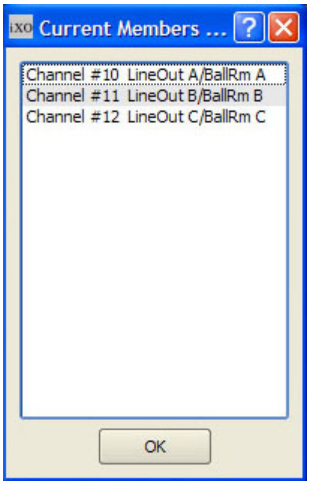
GEQ (31-BAND GRAPHIC EQUALIZER)

The Output Channel GEQ control window has 31 filters that allow you tailor the frequency response of the incoming signal. There is 14dB of boost and cut per filter.

To use the filters, first click on Enable. This activates the entire filter section for use. Then click on the any of the 31 filter buttons and mouse up or down in a vertical direction to make adjustments. To view settings, you can mouse over each button and the frequency and any boost or cut will be displayed in a pop up window. Right clicking on a filter button allows you to choose to Flatten the filter, Flatten All filters, and to “Show Bands” on the frequency-domain display. The Output Group box will display the name of any group that is linked to the GEQ.



Click on the Members button to view the channels that are a part of the group.



High Pass

In most applications it is usually desirable to limit the low frequency response of the system to minimize signals which are not related to the desired signal. The iXO provides a sweepable high pass filter to enable roll-off of the low frequency response as desired by the user. The lowest frequency of the control is 20.3Hz, while the highest possible setting is 1kHz. Although shown on the same screen as the GEQ, the High Pass is independent of the GEQ Enable button. To adjust, either click on the handle and drag to the desired frequency, use the up and down arrows on the frequency display box, or double click on the frequency display box and directly enter the desired frequency in Hz.

The High Pass Filter is an 18dB/octave linear phase design.

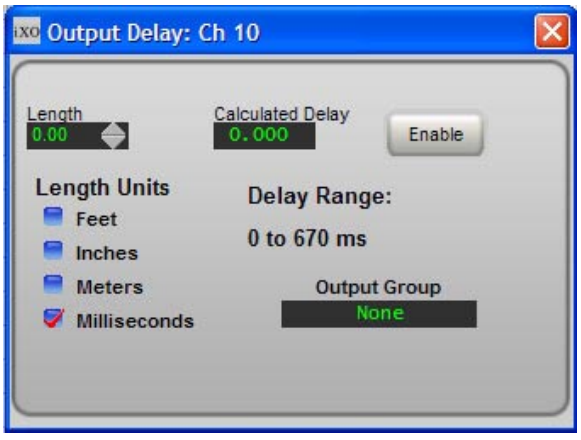
Low Pass

Some intentional roll-off of the upper extremes of the audio spectrum may be desirable in certain applications in order to reduce out of band noise. Since reduced bandwidth results in reduced noise levels, the microphone source can sound 'cleaner' than it otherwise would if low pass filtering were not employed. The minimum frequency setting is 1kHz and the upper limit is 19.6kHz. Although shown on the same screen as the GEQ, the Low Pass is independent of the GEQ Enable button. To adjust, either click on the handle and drag to the desired frequency, use the up and down arrows on the frequency display box, or double click on the frequency display box and directly enter the desired frequency in Hz.

The Low Pass Filter is an 18dB/octave linear phase design.

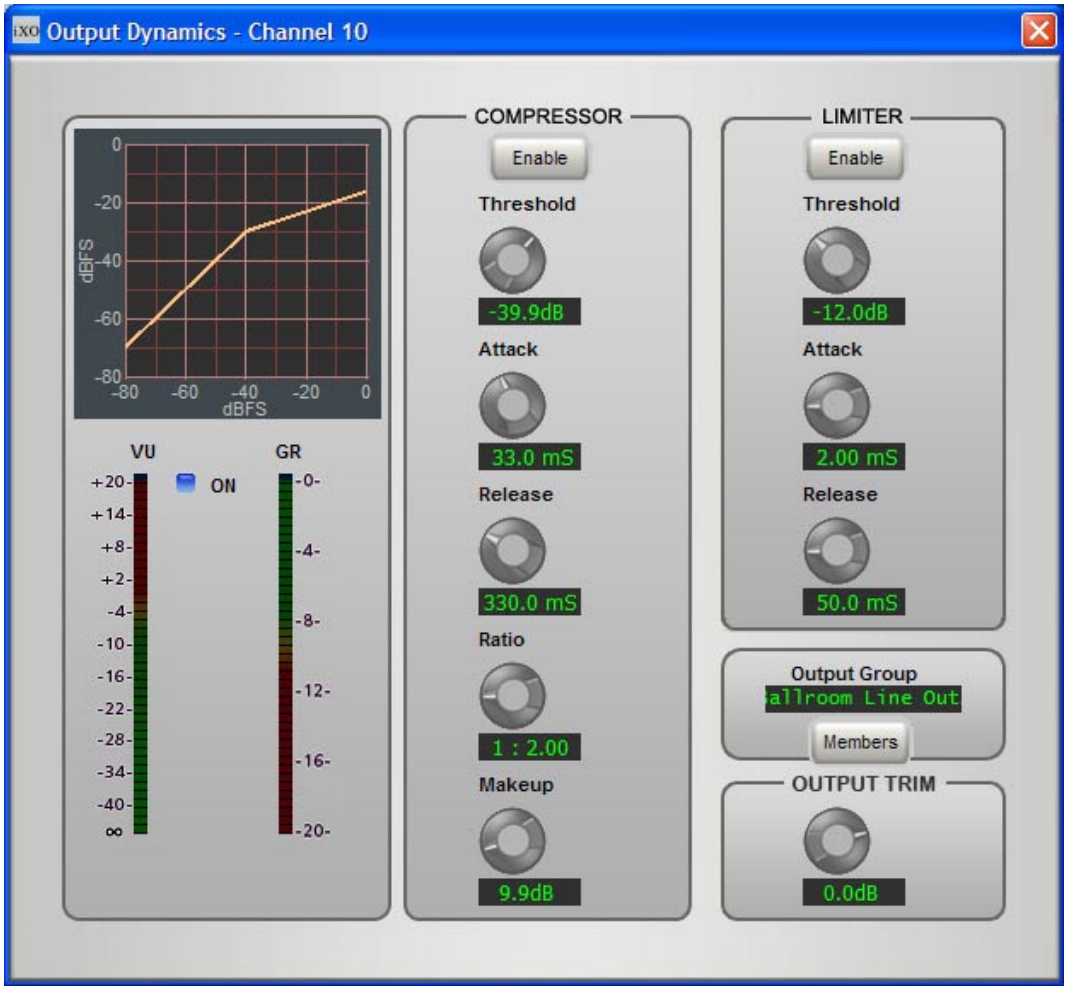
DELAY

The Delay has up to 670ms of delay. You can enter the Length of delay in milliseconds, either by clicking on and holding the up and down arrows on the Length display box, or by double clicking the box and directly entering the amount. You can also select the different types of measurement units in which to enter the delay, including Feet, Inches, and Meters. If you choose one of these units of measure, the Calculated Delay will display the actual delay in milliseconds. Click on Enable to activate the delay. The Output Group display will indicate if the delay is part of any linked group.



DYNAMICS

Clicking on the Dynamics button will open the Dynamics control window where you are able to use the Compressor and/or Limiter to enhance the performance of the incoming signal.



The compressor and limiter each are an envelope dynamics modifier that controls the overall signal energy from the mix output source.

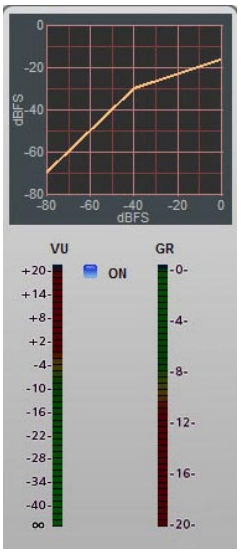
The compressor stage compresses the dynamic range of signals, making soft sounds louder and loud sounds softer. With proper adjustment it can create a consistent output level from a mix and can do it subtly - or - it can do it with a lot of “energy” if that is the sound desired. Basically the compressor allows the overall volume of the sound to be tailored to taste when the input level naturally varies as the overall mix changes.

The Output Group display will indicate if the Dynamics is part of any linked group. Clicking on Members will bring up a window which displays the members of the group.

The iXO compressor is a broadband feed forward architecture utilizing special program-related dynamics control algorithms specially designed by Wheatstone.

The limiter stage is used to limit the overall output level of a signal, preventing signal clipping and protecting amplifier and speaker components.

Metering



To activate the meters, click on the ON checkbox.

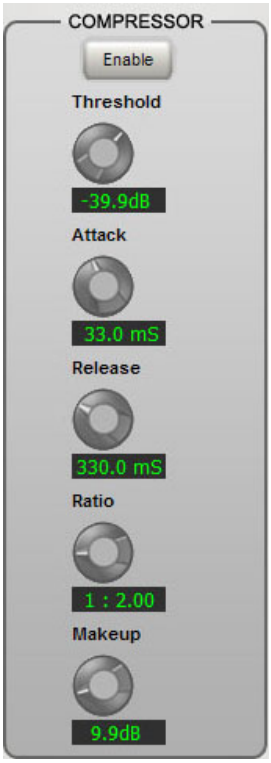
The VU meter is a peak-rms meter which indicates the incoming signal with a range of infinity to 20dB.

This GR meter indicates gain-reduction being applied to the signal by compressor, from 0dB to -20dB.

Display

The GUI also displays an input/output transfer function plot to visually represent the settings of Ratio, Threshold (Compressor and Limiter), and Makeup Gain.

Compressor Controls



Enable

When the Enable button of the Compressor section is illuminated the compressor is in the audio path. When this button is not illuminated, the compressor is not in the signal path. The button toggles this function.

Threshold

Threshold is the signal level at which the compressor begins to constrain the output level. A signal exceeding this level will have its gain reduced in a manner determined by the Ratio control (see below). The threshold is adjustable over the range of -80dBFS to -20dBFS (decibels Full Scale). More negative setting cause gain reduction to begin at lower audio levels, while higher (less negative) settings cause gain reduction to begin at higher audio levels.

Attack

This control determines how quickly the compressor responds to a signal exceeding the threshold. The control is adjustable between 5 milliseconds and 330 milliseconds and is adjusted to personal preference. Faster attack times catch signal peaks more quickly but may make the sound ‘mushy’ and without detail. Operation at faster attack, below approximately 10 milliseconds, causes the compressor to operate more like a peak limiter than an average responding compressor. Conversely, slower attack times allow more peaks to escape uncontrolled, making the sound more relaxed. The caveat is that slower attack times allow peaks to escape that might cause problems further downstream.

Release

Release determines how fast the compressor returns the gain back to normal after chasing an audio peak. Faster release times increase the average audio energy but might sound ‘busy’ if too fast. Slower release times make the sound more natural and relaxed, but lower the average sound level. Release time is adjustable between 100 milliseconds and 1 second.

Ratio

Ratio controls the steepness of gain reduction once the audio has reached the Threshold. A ratio of 1 (or 1:1) results in no compression at all, and at the other extreme

a ratio of 20 (or 20:1) makes it operate more like a limiter. In the latter case, once the threshold is reached the output level of the compressor will only increase 1dB when the input level increases 20dB. The ratio control, while adjusted to taste, will typically be set somewhere between 3:1 and 6:1 for most voices. Special effects of course may call for radically different settings.

Makeup Gain

Makeup Gain is used to bring the dynamically reduced signal up to the original unprocessed level. A range from 0 to 48dB of gain is available to use. The default setting is 14dB.

Peak Limiter Controls

The Peak Limiter is an additional sidechain operating in conjunction with the compressor; generally the limiter has much faster integration times for attack and release, so that it responds more to the short term energy of the program material in a given band, rather than more typically energetic actions of the compressor. Its time-constants are controlled by "Threshold," "Attack," and "Release," in the second row of controls on the GUI's Dynamics screen.

Threshold

Threshold is the signal level at which the limiter constrains the output level. The threshold is adjustable over the range of -20dBFS to 0dBFS (decibels Full Scale). More negative setting causes limiting to begin at lower audio levels, while higher (less negative) settings cause limiting to begin at higher audio levels.

Attack

This control determines how quickly the limiter responds to a signal exceeding the threshold. The control is adjustable between 0.5 milliseconds and 10 milliseconds and is adjusted to personal preference.

Release

Release determines how fast the limiter returns the gain back to normal after chasing an audio peak. Faster release times increase the average audio energy but might sound 'busy' if too fast. Slower release times make the sound more natural and relaxed, but lower the average sound level. Release time is adjustable between 33.0 milliseconds and 330 milliseconds.

Output Trim

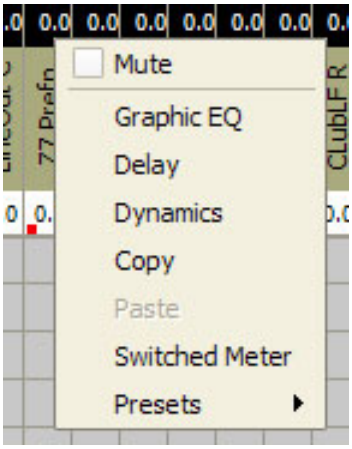
Output Trim provides final output level adjustment to the signal leaving the iXO output channel and is linked to the output channel fader. It provides up to 12dB of gain and up to 60dB of attenuation. The default setting is 0dB.

Right Clicking and Standard Output Channels

There are some handy right clicking options for standard output channels that you can utilize to quickly access key features of the system. One is available to you on the matrix view of the system by simply mousing over the desired output channel and right clicking. The other is only available to you when the output channel is open.

Right Clicking Over a Closed Standard Output Channel

When you mouse over any standard output channel on the matrix and right click a menu appears with the following selections and functions:



Mute: Checking this will mute the output channel.

Graphic EQ: Selecting this will open the channel's graphic equalizer window.

Delay: Selecting this will open the channel's delay window.

Dynamics: Selecting this will open the channel's Dynamics window.

Copy: Selecting this will copy the channel's settings.

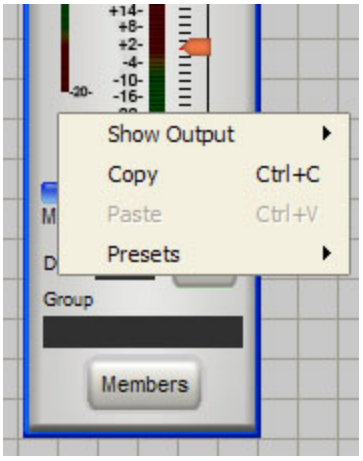
Paste: Selecting this will paste the copied channel's data to the output channel.

Switched Meter: Selecting this will open the channels switched meter.

Presets: Selecting this will open then a sub menu which allows you to open the Preset Manager to create a new preset. You can also select to execute any existing standard output channel preset(s). *Extreme caution should be taken to verify that the preset settings shown correspond to the requirements of any amplifiers and loudspeakers connected to the output!*

Right Clicking Over an Open Standard Output Channel

When you mouse over any open standard output channel and right click a menu appears with the following selections and functions:



Show Output: Selecting this will open a sub menu which displays all of the available outputs and allows you to select another output channel to view and/or modify.

Copy: Selecting this will copy the channel's settings.

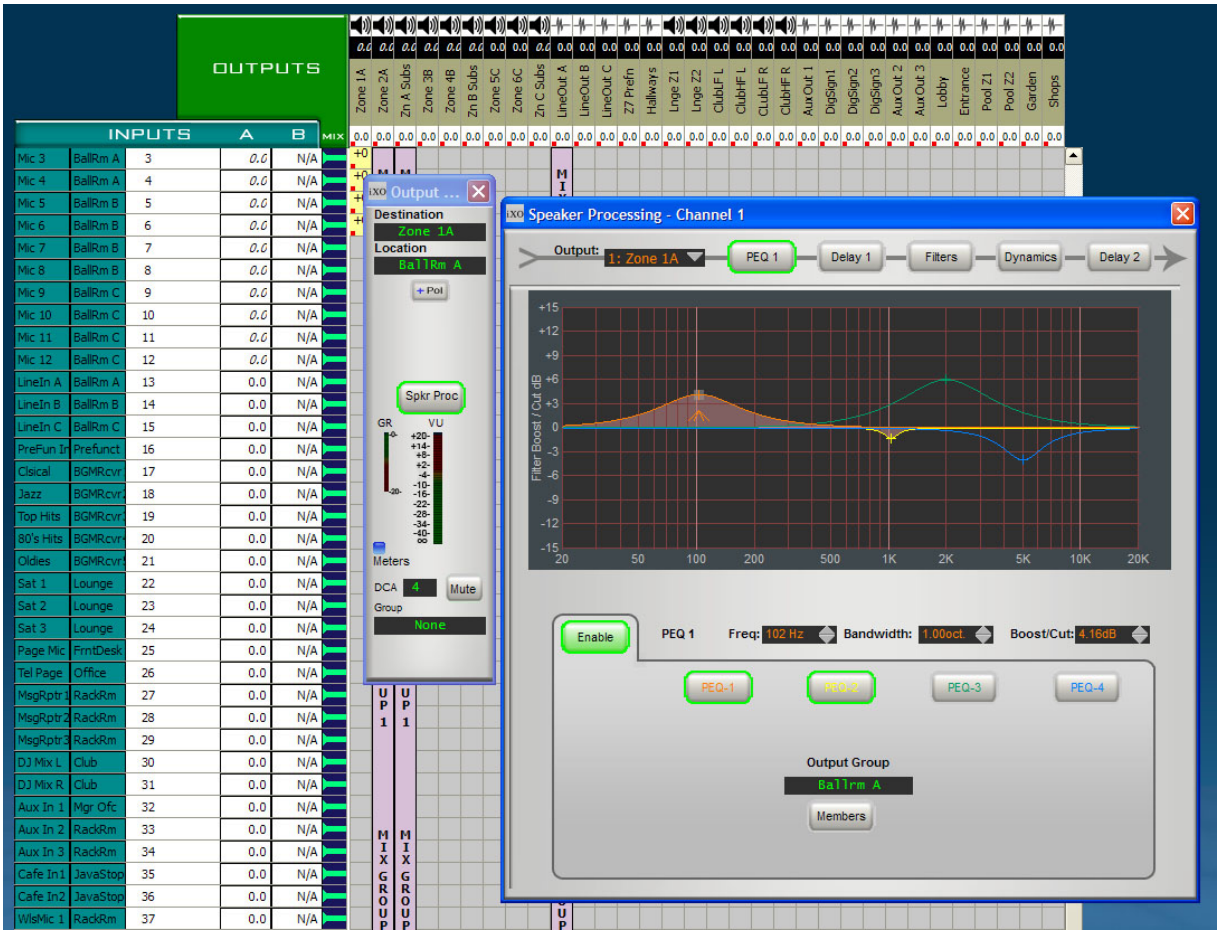
Paste: Selecting this will paste the copied channel's data to the output channel.

Presets: Selecting this will open then a sub menu which allows you to open the Preset Manager to create a new preset. You can also select to execute any existing standard output preset(s). *Extreme caution should be taken to verify that the preset settings shown correspond to the requirements of any amplifiers and loudspeakers connected to the output!*

Speaker Processor Output Channel Processing

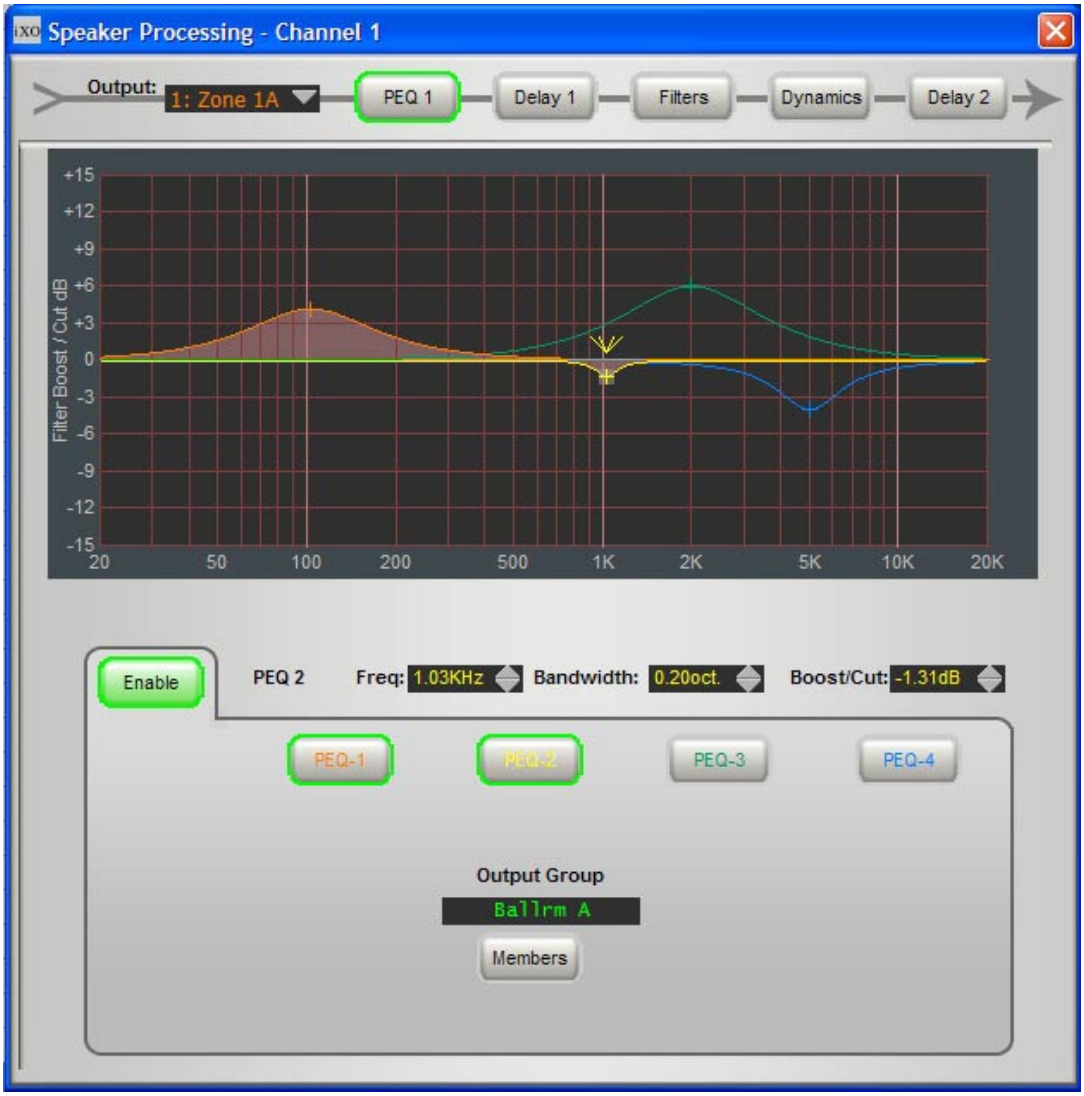
The Speaker Processor output channel is designed to give you the all the processing power you need to achieve satisfactory results when designing more complex loudspeaker systems. With this channel you will be able to create special “driver dependent” frequency response curves, delay settings, crossover networks, house EQ curves, compressor settings, and peak limiter settings for each individual output. As previously mentioned, there is a single button on which to click to open up the control window. The control window has five buttons located across the top which are arranged in the order of processing. There is also a drop down window located at the far left of these buttons which allows you quick access to all other output channels which are configured as speaker processors. Clicking on any one of the five buttons will bring up its associated control window.

The speaker processor channel layout is shown below along with the control window opened.



PEQ 1 (Four Band Parametric Equalizer)

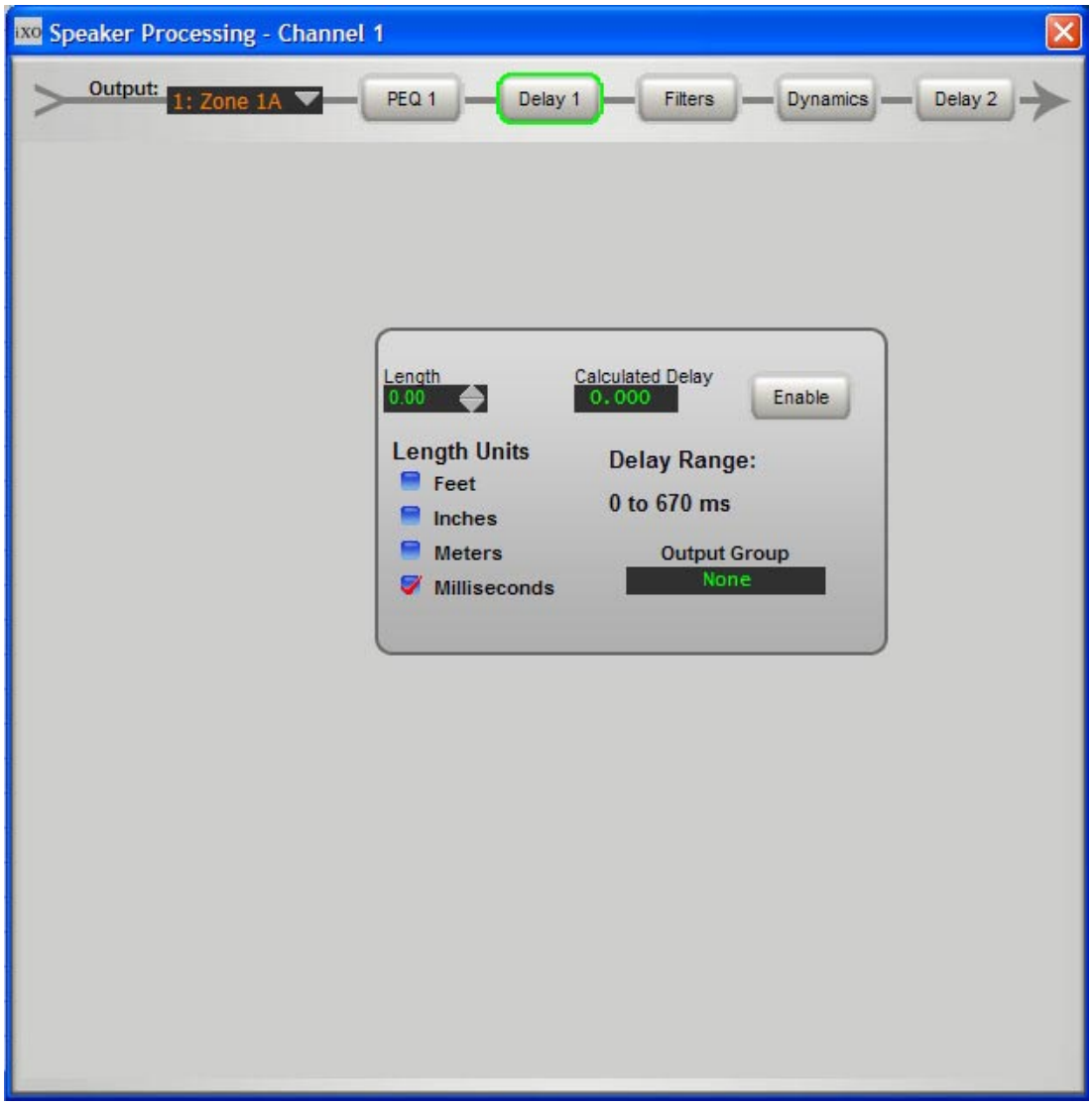
The PEQ 1 control window has four parametric in which to shape the audio.



Click on Enable to activate the entire filter section for use. Then click on the any of the four filter buttons to enable or disable the individual filter. Select and adjust the filters settings by clicking and dragging the filters 'handles" on the frequency-domain graph, or you can also make adjustments by using the filter data windows; Frequency, Bandwidth, and Boost/Cut. Use the up and down arrows to adjust the data, or double-click on the display window and directly enter the data.

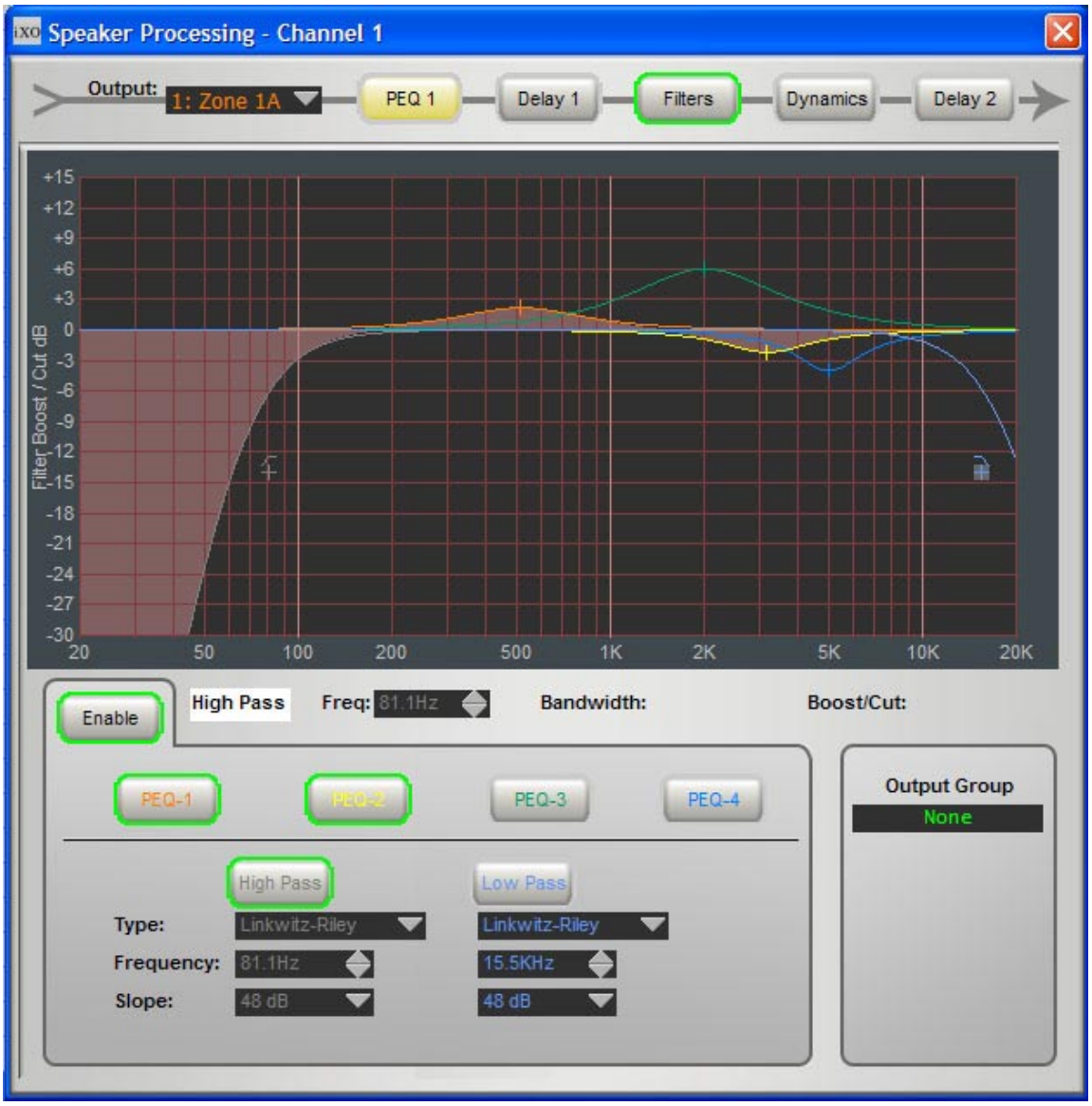
The four parametric sections are fully adjustable in three ways – center frequency (20.3Hz-15.5kHz), bandwidth (0.2 to 3 octaves), and boost/cut (plus or minus 14dB). The graphic below shows how PEQ-1 settings are depicted in the Dynamic Display region of the GUI.

DELAY 1



Delay 1 has up to 670ms of delay. You can enter the Length of delay in milliseconds, either by clicking on and holding the up and down arrows on the Length display box, or by double clicking the box and directly entering the amount. You can also select different types of distance measurement units in which to enter the delay, including Feet, Inches, and Meters. If you choose one of these units of measure, the Calculated Delay will display the actual delay in milliseconds. Click on Enable to activate the delay. The Output Group display will indicate if the delay is part of any linked group.

FILTERS (Four Band Parametric Equalizer with High and Low Pass Crossover)



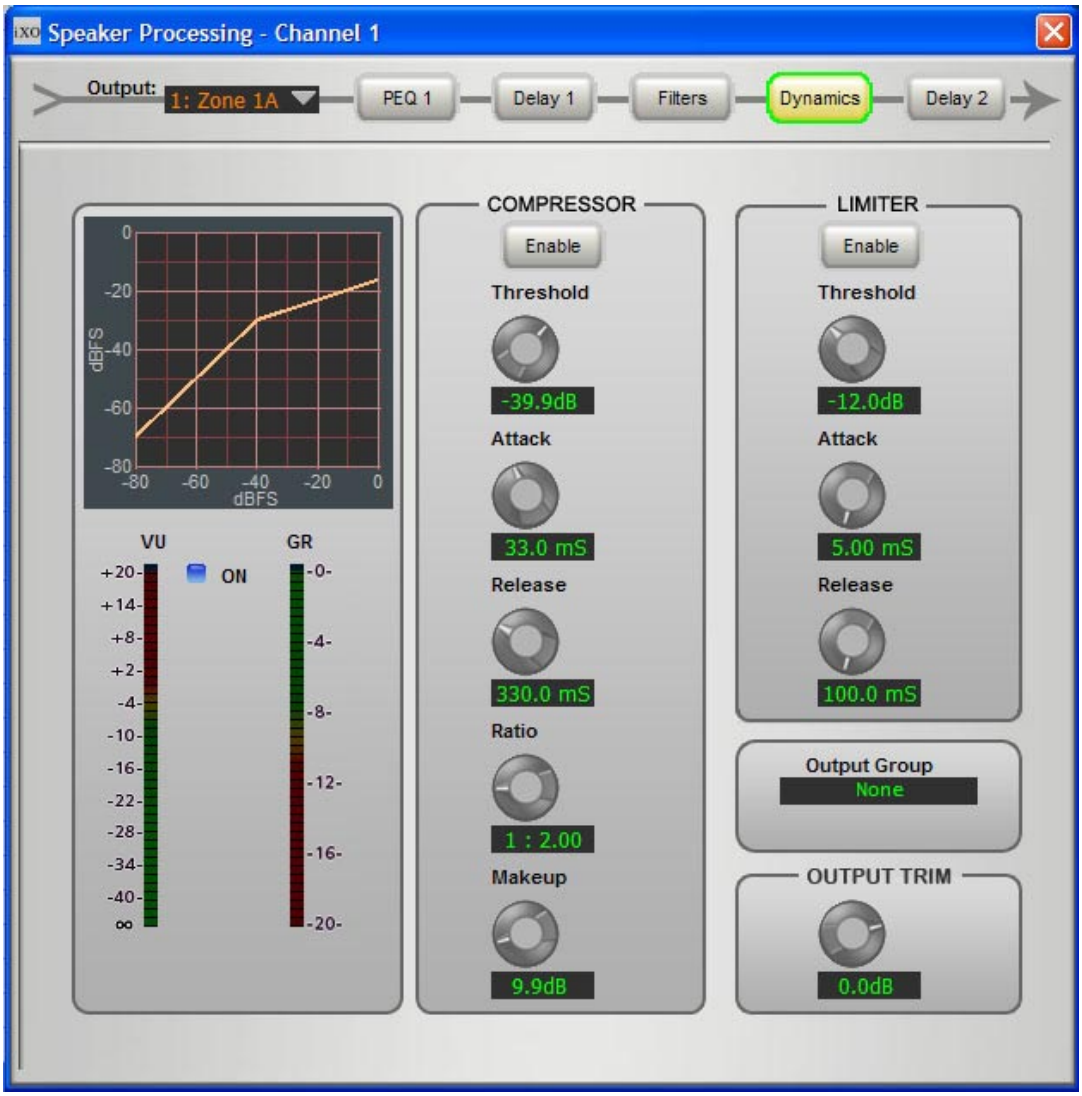
The Filters control window has six filters; four parametric, a high pass, and a low pass, that allow you tailor the frequency response of the incoming signal. The four band parametric is similar in operation to the PEQ-1 control screen. Click on Enable to activate the PEQ section for use. Then click on the any of the four filter buttons to enable or disable the individual filter. Select and adjust the filters settings by clicking and dragging the filters 'handles" on the frequency-domain graph, or you can also make adjustments by using the filter data windows; Frequency, Bandwidth, and Boost/Cut. Use the up and down arrows to adjust the data, or double-click on the display window and directly enter the data.

The four parametric sections are fully adjustable in three ways – center frequency (20.3Hz-15.5kHz), bandwidth (0.2 to 3 octaves), and boost/cut (plus or minus 14dB). The graphic below shows how PEQ-1 settings are depicted in the Dynamic Display region of the GUI.

The High Pass and Low Pass can be enabled or disabled independently of each other and the parametric filters. You can also individually select the Type of filer using the drop down menu. Select from Linkwitz-Riley, Bessel, or Butterworth. The Frequency can be entered by either clicking on the up and down arrows, double clicking on the text box and directly entering the frequency, or by dragging the handles on the frequency-domain graph. The Slope of the filter can be adjusted by using the drop down menu. Depending on the filter type, you can select from 12, 24, or 48dB per octave.

DYNAMICS

Clicking on the Dynamics button will open the Dynamics control window where you are able to use the Compressor and/or Limiter to enhance the performance of the incoming signal.

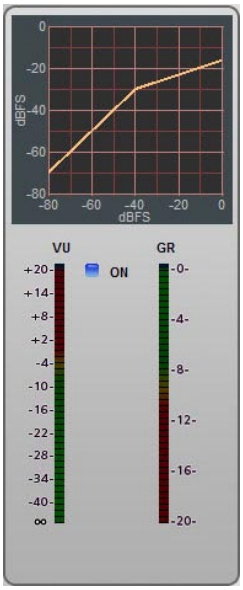


The compressor and limiter each are an envelope dynamics modifier that controls the overall signal energy from the mix output source.

The compressor stage compresses the dynamic range of signals, making soft sounds louder and loud sounds softer. With proper adjustment it can create a consistent output level from a mix and can do it subtly - or - it can do it with a lot of "energy" if that is the sound desired. Basically the compressor allows the overall volume of the sound to be tailored to taste when the input level naturally varies as the overall mix changes.

The iXO compressor is a broadband feed forward architecture utilizing special program-related dynamics control algorithms specially designed by Wheatstone.

The limiter stage is used to limit the overall output level of a signal, preventing signal clipping and protecting amplifier and speaker components.



Metering

To activate the meters, click on the Meters checkbox.

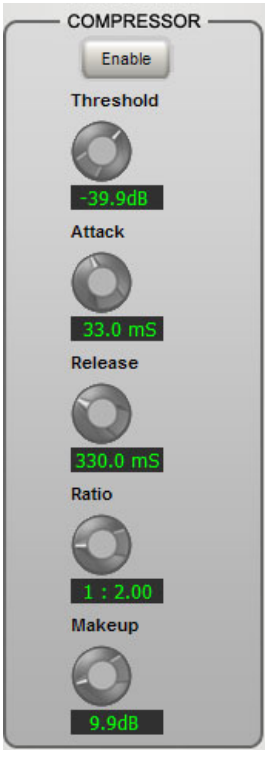
The VU meter is a peak-rms meter which indicates the incoming signal with a range of infinity to 20dB.

This GR meter indicates gain-reduction being applied to the signal by compressor, from 0dB to -20dB.

Display

The GUI also displays an input/output transfer function plot to visually represent the settings of Ratio, Threshold (Compressor & Limiter), and Makeup Gain.

Compressor Controls



Enable

When the Enable button of the COMPRESSOR section is illuminated the compressor is in the audio path. When this button is not illuminated, the compressor is not in the signal path. The button toggles this function.

Threshold

Threshold is the signal level at which the compressor begins to constrain the output level. A signal exceeding this level will have its gain reduced in a manner determined by the Ratio control (see below). The threshold is adjustable over the range of -80dBFS to -20dBFS (decibels Full Scale). More negative setting cause gain reduction to begin at lower audio levels, while higher (less negative) settings cause gain reduction to begin at higher audio levels.

Attack

This control determines how quickly the compressor responds to a signal exceeding the threshold. The control is adjustable between 5 milliseconds and 330 milliseconds and is adjusted to personal preference. Faster attack times catch signal peaks more quickly but may make the sound 'mushy' and without detail. Operation at faster attack, below approximately 10 milliseconds, causes the compressor to operate more like a peak limiter than an average responding compressor. Conversely, slower attack times allow more peaks to escape uncontrolled, making the sound more relaxed. The caveat is that slower attack times allow peaks to escape that might cause problems further downstream.

Release

Release determines how fast the compressor returns the gain back to normal after chasing an audio peak. Faster release times increase the average audio energy but might sound 'busy' if too fast. Slower release times make the sound more natural and relaxed, but lower the average sound level. Release time is adjustable between 100 milliseconds and 1 second.

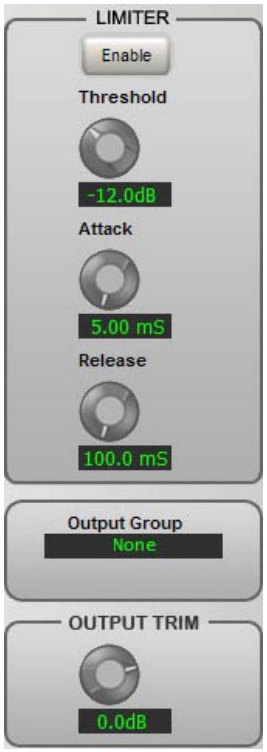
Ratio

Ratio controls the steepness of gain reduction once the audio has reached the Threshold. A ratio of 1 (or 1:1) results in no compression at all, and at the other extreme a ratio of 20 (or 20:1) makes it operate more like a limiter. In the latter case, once the threshold is reached the output level of the compressor will only increase 1dB when the input level increases 20dB. The ratio control, while adjusted to taste, will typically be set somewhere between 3:1 and 6:1 for most voices. Special effects of course may call for radically different settings.

Makeup Gain

Makeup Gain is used to bring the dynamically reduced signal up to the original unprocessed level. A range from 0dB to 48dB of gain is available to use.

Peak Limiter Controls



The Peak Limiter is an additional sidechain operating in conjunction with the compressor; generally the limiter has much faster integration times for attack and release, so that it responds more to the short term energy of the program material in a given band, rather than more typically energetic actions of the compressor. Its time-constants are controlled by "Threshold," "Attack," and "Release," in the second row of controls on the GUI's Dynamics screen.

Threshold

Threshold is the signal level at which the limiter constrains the output level. The threshold is adjustable over the range of -20dBFS to 0dBFS (decibels Full Scale). More negative setting causes limiting to begin at lower audio levels, while higher (less negative) settings cause limiting to begin at higher audio levels.

Attack

This control determines how quickly the limiter responds to a signal exceeding the threshold. The control is adjustable between 5 milliseconds and 330 milliseconds and is adjusted to personal preference. Faster attack times between 5 - 10ms catch signal peaks more quickly but may make the sound 'mushy' and without detail. Conversely, slower attack times allow more peaks to escape uncontrolled, making the sound more relaxed. The caveat is that slower attack times allow peaks to escape that might cause problems further downstream.

Release

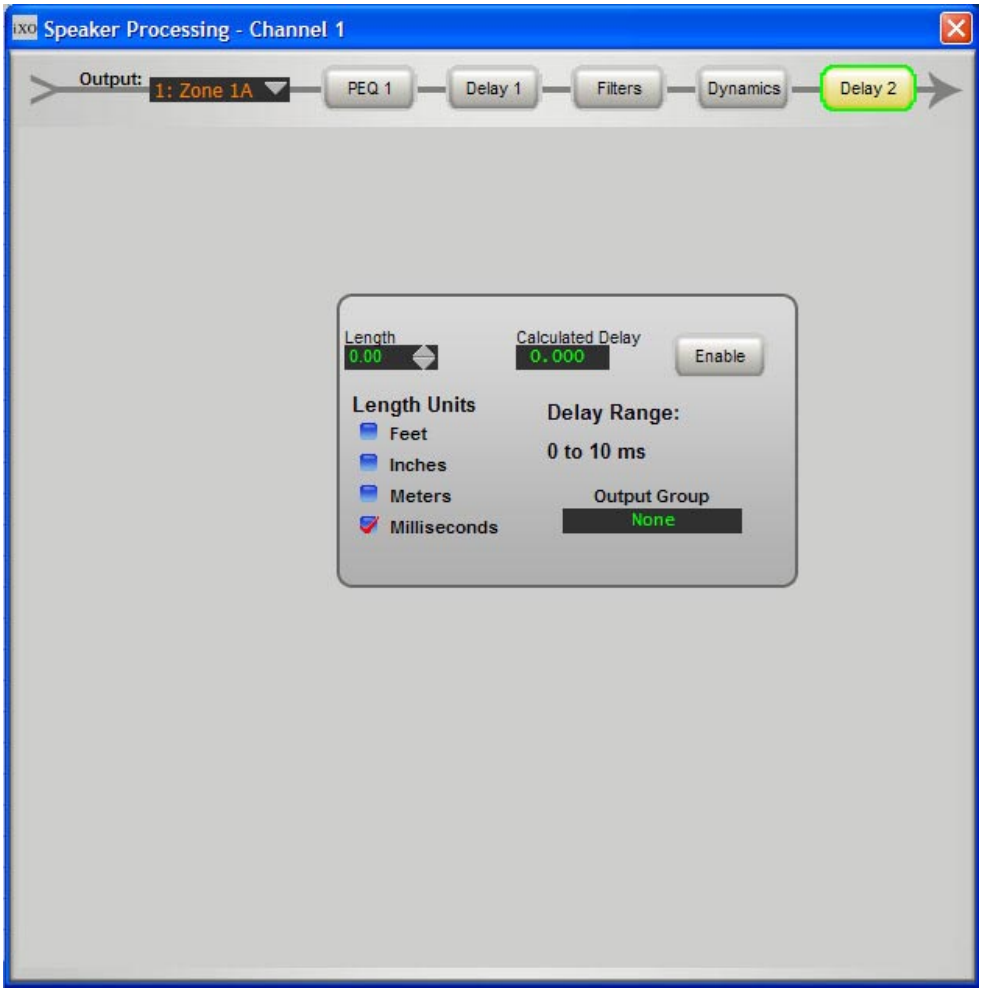
Release determines how fast the limiter returns the gain back to normal after chasing an audio peak. Faster release times increase the average audio energy but

might sound 'busy' if too fast. Slower release times make the sound more natural and relaxed, but lower the average sound level. Release time is adjustable between 100 milliseconds and 1 second.

Output Trim

Output Trim provides final output level adjustment to the signal leaving the iXO output channel and is linked to the output channel fader. It provides up to 12dB of gain and up to -120dB of attenuation. The default setting is 0dB.

DELAY 2



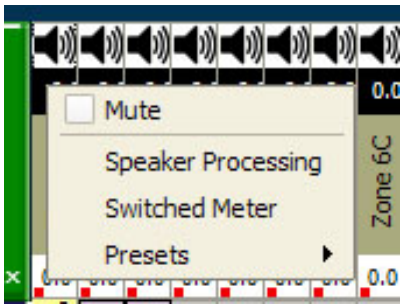
Delay 2 has up to 10ms of delay and is primarily intended to be used for driver alignment. You can enter the Length of delay in milliseconds, either by clicking on and holding the up and down arrows on the Length display box, or by double clicking the box and directly entering the amount. You can also select the different types of distance measurement units in which to enter the delay, including Feet, Inches, and Meters. If you choose one of these units of measure, the Calculated Delay will display the actual delay in milliseconds. Click on Enable to activate the delay. The Output Group display will indicate if the delay is part of any link group.

Right Clicking and Speaker Processing Output Channels

There are some handy right click options for input channels that you can utilize to quickly access key features of the system. One is available to you on the matrix view of the system by simply mousing over the desired input channel and right clicking. The other is only available to you when the input channel is open.

Right Clicking Over a Closed Speaker Processing Output Channel

When you mouse over any speaker processor output channel on the matrix and right click a menu appears with the following selections and functions:



Mute: Checking this will mute the output channel.

Speaker Processing: Selecting this will open the channel's speaker processor window.

Switched Meter: Selecting this will open the channel's switched meter.

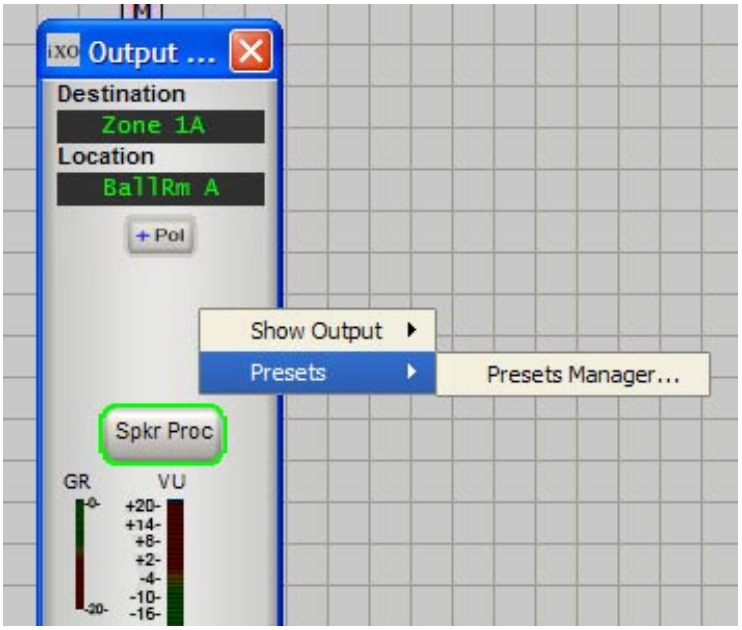
Presets: Selecting this will open then a sub menu which allows you to open the Preset Manager to create a new preset. You can also select to execute any existing speaker processing output preset(s). *Extreme caution should be taken to verify that the preset settings shown correspond to the requirements of any amplifiers and loudspeakers connected to the output!*

Right Clicking Over an Open Speaker Processing Output Channel

When you mouse over any open speaker processor output channel and right click a menu appears with the following selections and functions:

Show Output: Selecting this will open a sub menu which displays all of the available outputs and allows you to select another output channel to view and/or modify.

Presets: Selecting this will open then a sub menu which allows you to open the Preset Manager to create a new preset. You can also select to execute any existing speaker processing output preset(s). *Extreme caution should be taken to verify that the preset settings shown correspond to the requirements of any amplifiers and loudspeakers connected to the output!*



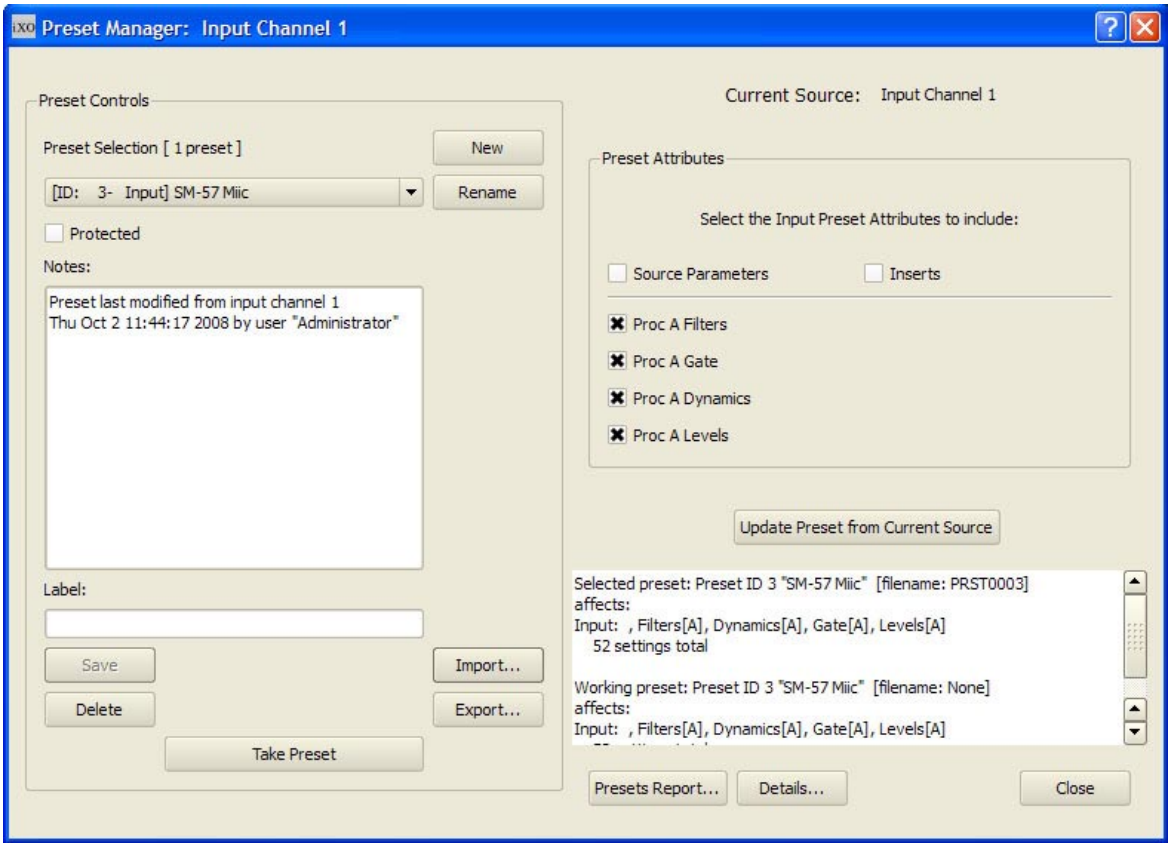
Presets and Events

The iXO allows you to store various system settings for recall later by either logic input and/or by a third party control systems such as AMX and Crestron. You are able to create Presets and Events.

Presets

Presets are component specific user definable settings which can be created, stored, and recalled for the following iXO components: Input Channels, Crosspoints, Mix Outputs, and Output Channels. You have the ability run an input preset on any input channel in the system; any output channel preset can be recalled on any output channel of the same type. The same methodology is used for the crosspoint and mix output presets.

Depending on the type of preset, you are able to customize or "drill down" to save specific attributes of the channel, crosspoint, or mix output that you are working on. This allows you to create presets which may only affect the EQ and dynamics of an input channel, and be able to run this preset on any input channel in the system. You can create presets which may contain your optimum settings for various models of microphones and loudspeakers. The number of presets that you can create and save is only limited by the amount of memory available on the removable SD card located on the host CPU card. You create, save, and recall presets using the Preset Manager.



Preset Manager

The Preset Manager is best accessed by opening the system component; input channel, crosspoint, mix output, or output channel (after you have the desired settings that you want). Then move the cursor over the opened window. Right click and then move your cursor over "Preset" which will bring up a sub-menu with "Preset Manager" on it. Selecting Preset Manager will open the window. This Preset Manager window has two main sections, Preset Controls and Preset Attributes. To create a preset based upon the channel, mix, or crosspoint that you are working on, click on "New". The "Current Source" will then updated to reflect the type of component you are creating a preset for, and the components attributes will be displayed in the "Preset Attributes" section. Use the checkboxes in the section to select the desired settings you wish to save. Click "Rename" to assign a name to the preset (SM-57 EQ & Dynamics for example, provided those are the attributes you selected to save) and then click on "Save" to save the preset and "Close" to exit the Preset Manager.

Recalling a preset can be accomplished by two methods. The quickest is to simply mouse over the input channel, crosspoint, mix output, or output channel that you desire to execute the preset on. Then right click, move the cursor down to "Presets" and the sub-window will display the available presets for the type of component that you are presently over. In other words, if you have created five input presets, mousing over any input channel and right clicking and selecting "Presets" will list all five of the presets underneath the Preset Manager. Select the preset you would like to recall. A pop-up window will then appear asking you if are sure that you want to execute the preset on the specific channel. Clicking yes will then execute the preset.

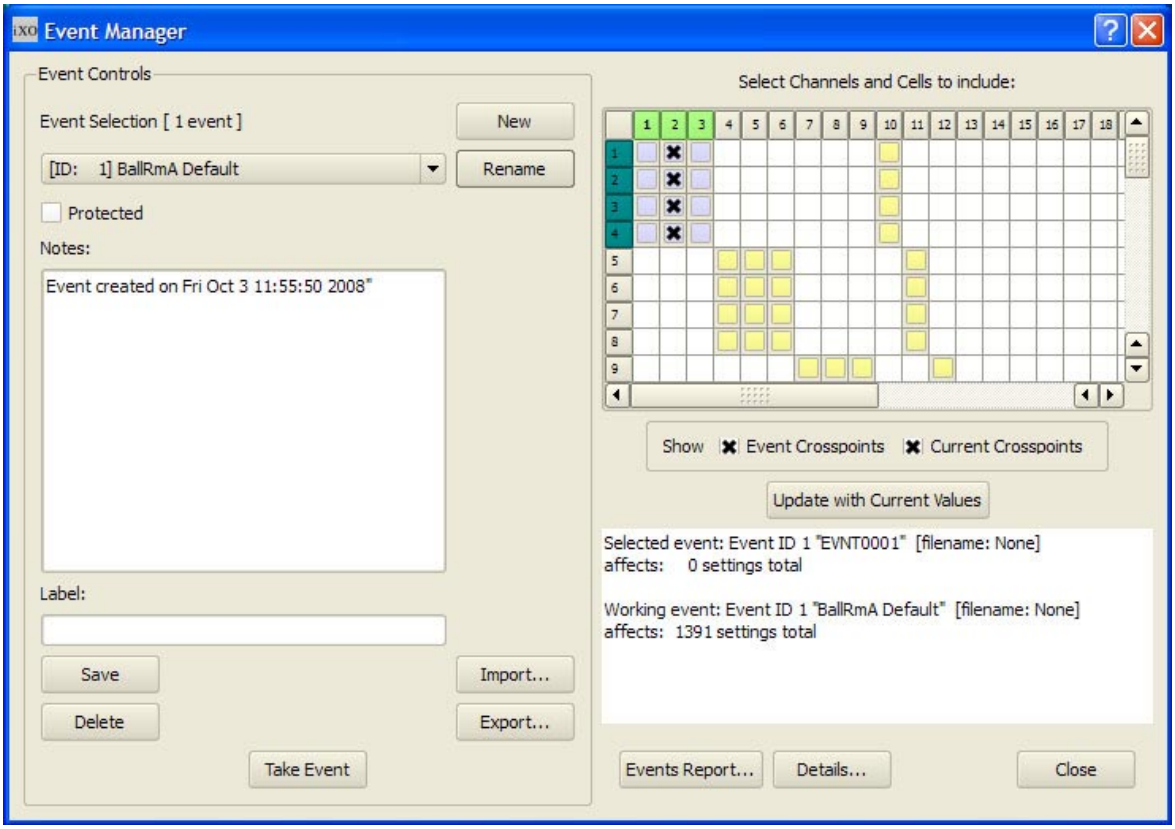
The other way to execute a preset is to click on the Preset Manager icon on the tool bar menu towards the top of the screen. This will also open the Preset Manager window. Use the drop down menu to select the preset that you wish to recall. Each saved preset has an ID number, a designation as to what type it is (input, crosspoint, mix, or output), followed by the name. Once you have selected the preset, click on the "Take" button towards the bottom of the window. This will bring up a crosspoint, or mix that the preset will apply to.

The Preset Manager window has some additional buttons; some need little explanation (such as "Delete"). Others have some very useful abilities. The "Update Preset from Current Source" button will allow you to update a previously saved preset by simply mousing over the desired component and right clicking to open the Preset Manager. You then select the preset which you would like to update from the source that you have selected and click the update button. The preset will then updated with the current sources settings. You can also use the "Select" button located in the upper right hand corner to navigate to the various components that you wish to create or update a preset for. Clicking this will open a pop up window allowing you to choose the component. Clicking on the "Import" button will open a browser window which will allow you to navigate to specific preset folders in previously created projects. You can then select the specific presets and import them into the system that you are presently working on. The "Export" feature is coming soon. The "Notes" dialog box displays information such as when the preset was created/modified along with the user. You can also type in any notes pertaining to the preset in this box. The dialog box located in the lower right hand corner displays the currently selected preset's data for you to view. The "Details" button will display the

current presets data in a pop up window and will allow you to save the information in a text file, or print the report. The “Presets Report” button will display all of the system’s preset data in a pop up window where you can also save and/or print the report. The “Label” text box allows you to create an eight character label for use by other Wheatstone equipment such as control surfaces and XY controllers. The “protected” check box located underneath the drop down menu allows you to protect the preset from accidental deletion.

Events

Events are user definable system “snapshots” which can be created, stored, and recalled. You have the ability to capture a snapshot of the entire system, and then can select the specific input channels, output channels (with mix output and crosspoint matrix assignments), and assigned crosspoint parameters that you wish to save. This powerful feature allows you to create events which only affect their intended destinations, with no interruptions in audio to other destinations in the system. The number of events that you can create and save is only limited by the amount of memory available on the removable SD card located on the host CPU card. You create, save, and recall events using the Event Manager.



Event Manager

The Event Manager is accessed by either clicking on the Event Manager icon on the tool bar menu towards the top of the screen, or by clicking on the Configure on the menu bar and selecting Event Manager. The Event Manager window has two main sections, Event Controls on the left hand side of the window and a simplified, compact version of the system matrix on the right. There is also a dialog box located on the lower right hand side of the screen. To create an event based upon any of the systems present settings click on "New". A snapshot of the entire systems settings is captured and the current system matrix assignments are shown in the display on the right. Each matrix cell is highlighted with the associated color of their crosspoint mix setting. You then choose which input and output channels you wish to save in the event. Simply click on any input channel you wish to include. All of the highlighted input channel parameters will be saved to the event. For the output channels; clicking on an output channel not only saves the output channel's settings, it also saves the mix settings along with the matrix crosspoint assignments for that output. You can also click on each assigned matrix crosspoint cell to save the crosspoint parameters to the event. Once you have made your selections on the data you wish to save to the event, click "Rename" to assign a name to the event and then click on "Save" to save the event and "Close" to exit the Event Manager.

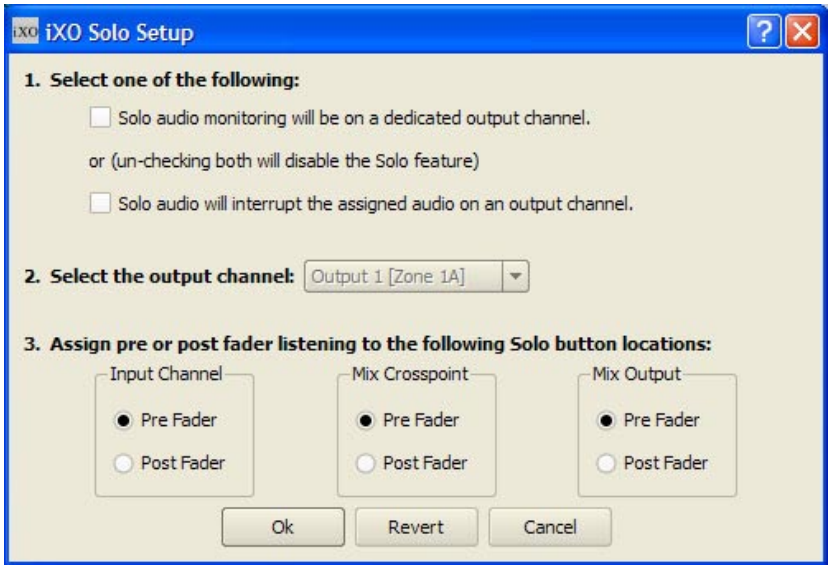
Recalling an event can be accomplished by clicking on the Event Manager icon on the tool bar menu towards the top of the screen. This will also open the Event Manager window. Use the drop down menu to select the event that you wish to recall. Each saved event has an ID number followed by the name. Once you have selected the event, click on the "Take" button towards the bottom of the window. A pop-up window will then appear asking you if are sure that you want to execute the settings of the event. Clicking yes will then execute the event.

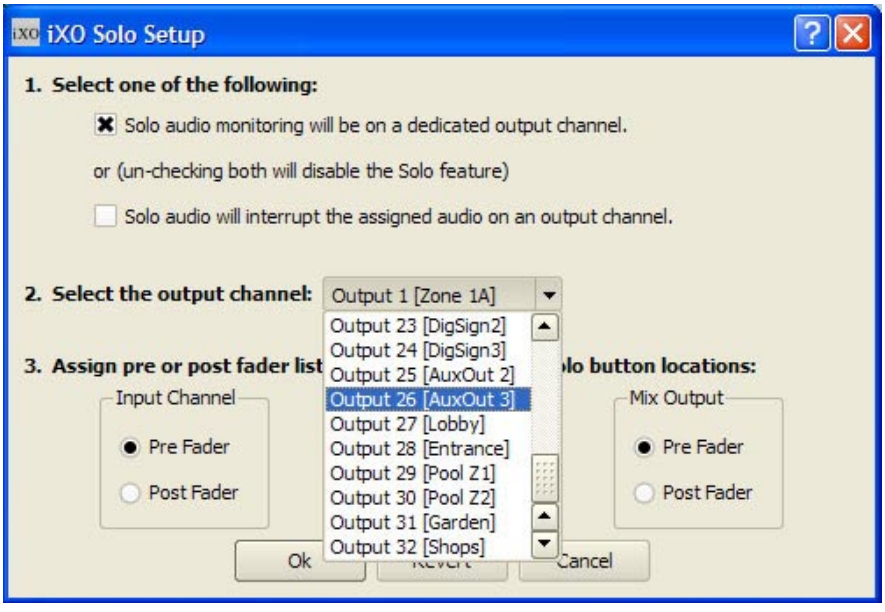
The Event Manager window has some additional buttons; some need little explanation (such as "Delete"). Others have some very useful abilities. Directly below the matrix selection area there are two checkboxes which determine what the matrix will show. Both the "Show: Event Crosspoints" and "Show: Current Crosspoints" boxes will automatically be checked anytime a new event is created, since a new event is a current system snapshot and you are creating an event. Once an event has been created you can check or uncheck these boxes to alter the view of the matrix to allow you to view the crosspoints that are actually saved in the event. You can also use the current crosspoints to aid in updating an existing event. The "Update with Current Values" button will allow you to update a previously saved event by simply clicking the button, you then can still modify which components will be in the event by clicking on the desired items. Click "Save" to complete the process. Clicking on the "Import" button will open a browser window which will allow you to navigate to specific event folders in previously created projects. You can then select the specific events and import them into the system that you are presently working on. The "Export" feature is coming soon. The "Notes" dialog box displays information such as when the event was created/ modified along with the user. You can also type in any notes pertaining to the event in this box. The dialog box located in the lower right hand corner displays the currently selected events data for you to view. The "Details" button will display the current events data in a pop up window and will allow you to save the information in a text file, or print a report. The "Events Report" button will display all of the

system's event data in a pop up window where you can also save and/or print the report. The "Label" text box allows you to create an eight character label for use by other Wheatstone equipment such as control surfaces and XY controllers. The "protected" check box located underneath the drop down menu allows you to protect the preset from accidental deletion.

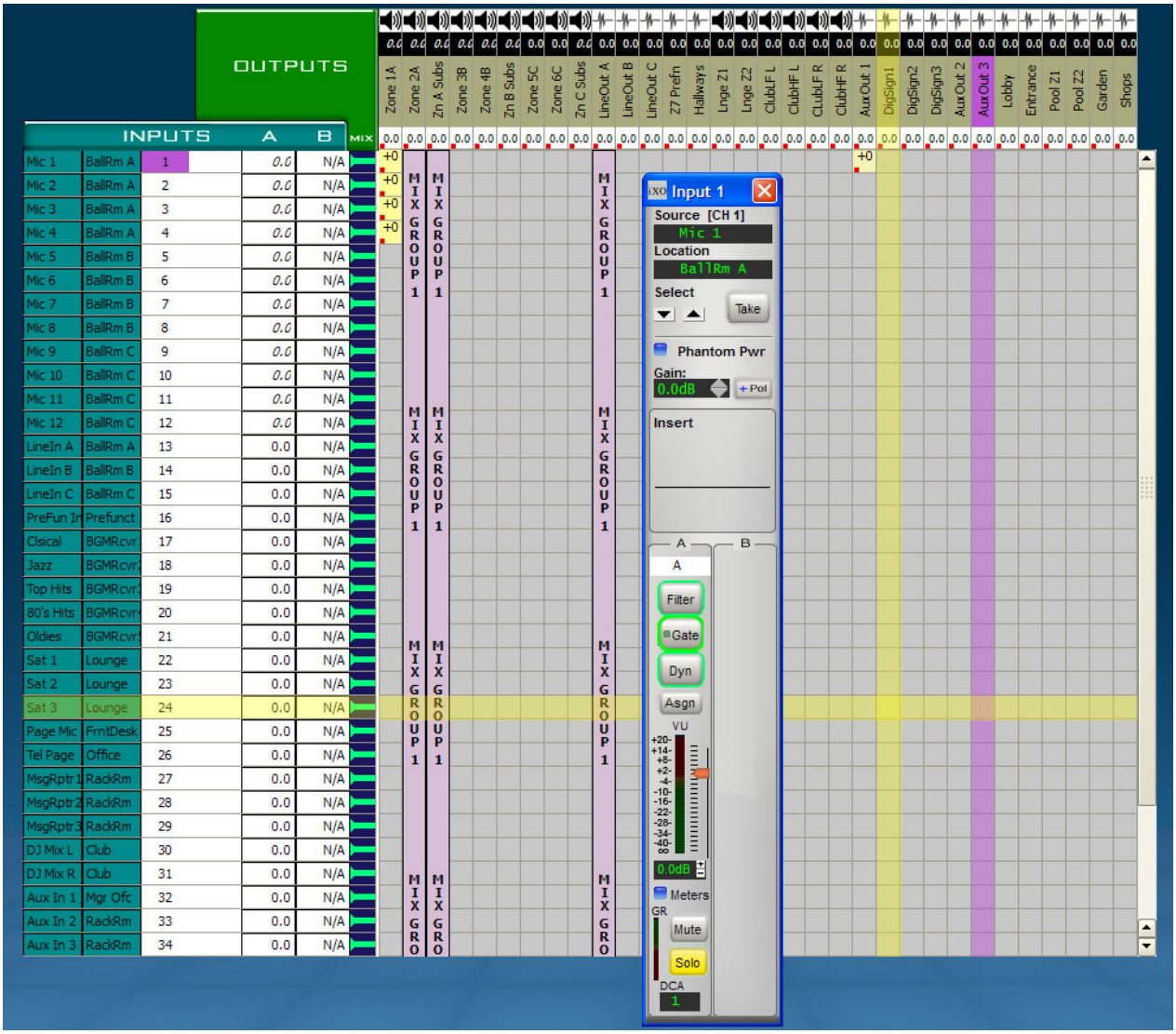
Solo Setup

On the menu bar, clicking Configure and Solo Setup will open the iXO Solo Setup window where you can define your systems solo capabilities. There are three steps involved in configuring the solo function. Step 1 is to choose if you want to have a dedicated output channel used for your solo output, or if you want the solo audio to interrupt the assigned audio on an output channel. Check the box adjacent to your choice and then proceed to Step 2. This is where you select the output channel to use for solo. Step 3 involves assigning the three available fader types (input channel, matrix crosspoint, and mix output) to be either pre fader or post fader. Use the radio button to select for each of the three fader types. Click "OK" to accept and close the window. "Revert" will clear the settings and allow you to start over. "Cancel" will cancel the operation and close the window.





Once you have setup the solo feature you will notice that the output channel that you have selected your solo output is highlighted in purple. You will also notice that if you solo any input channel, matrix crosspoint, or mix output, they will also display a purple highlight to make you aware that they are being soloed.



Config Tools

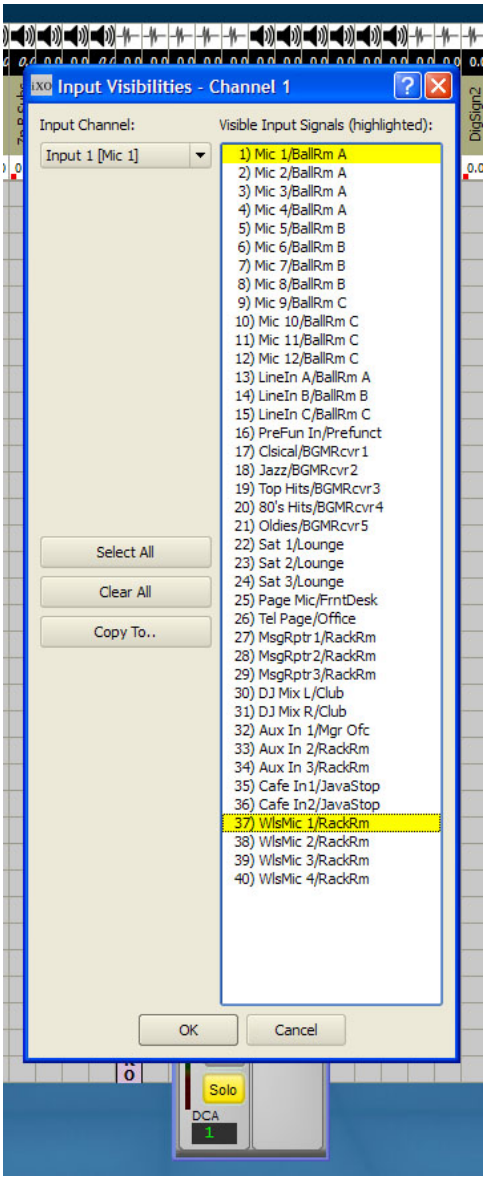
On the menu bar, clicking Configure and Config Tools will allow you to select from three handy utilities which aid in the set up of your iXO system: Clear Matrix, Input Visibilities, Automation Settings.

Clear Matrix

The Clear Matrix is simple and straightforward to use. Selecting it will ask you in a pop up window if you would like to clear all of the matrix settings. This will clear all matrix mix assignment types, resetting them to "None", reset all of the faders to 0dB, and set the crosspoint mutes to the default off state. This is handy tool to use when creating events.

Input Visibilities

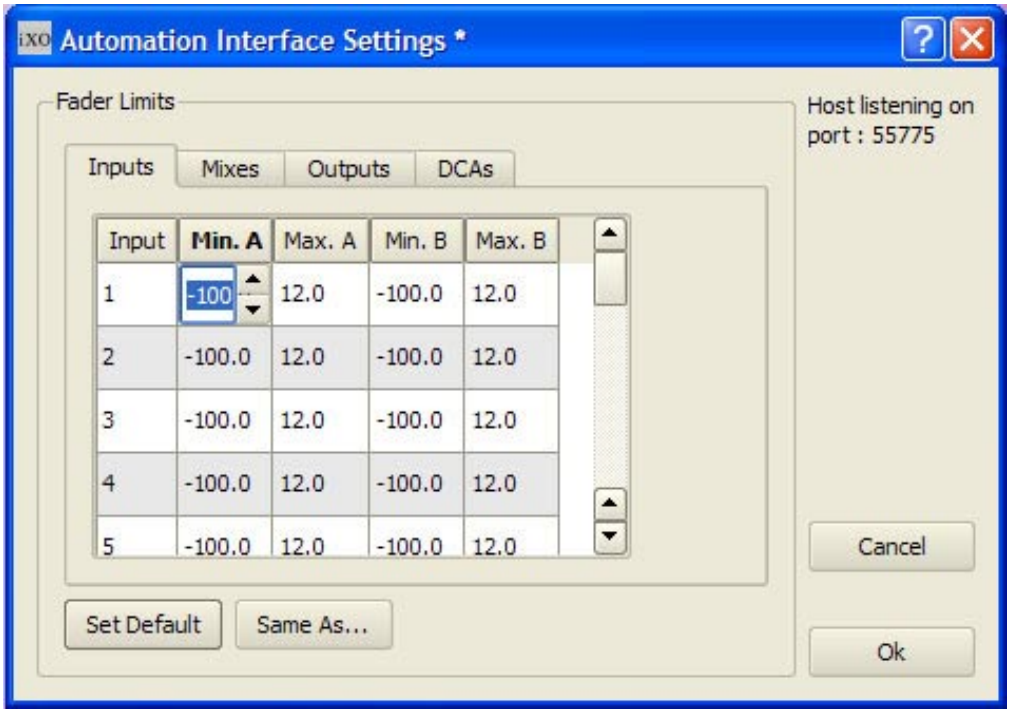
The Input Visibilities window is an extremely powerful function which allows you to assign which input sources are available to use with each input channel in the system. You have up to 64 sources available locally, with an additional 128 available from AT links A and B (64 channels per link). The window consists of a drop down menu where you select the input channel you want to configure. A large scrollable list of all the input signals is also displayed with the visible signals highlighted in yellow. By default, all input sources are available to all input channels. To make signals unavailable for the channel, click on the signals you want to remove from the list. You can also use the "Clear All" to quickly clear the list and then add the desired channels. "Select All" will select all available input sources. "Copy To" allows you to copy the channels visibility settings to another channel in the system. Click "OK" to accept the changes and close the window. "Cancel" will close the window if you inadvertently open it.



Automation Settings

The Automation Interface Settings window is a programmer's best friend when it comes to interfacing with Wheatstone wall controllers or control systems such as AMX and Crestron. This window allows you to set minimum and maximum levels for all input channel faders, mix output faders, output channel faders, and DCA faders.

This allows you to precisely control how much gain adjustment you want to allow the end user to have control over. The window has four tabs for each of the four fader types. The channel number is indicated along with the level settings which are shown in the Min and Max columns. Double-click on the fader's minimum and/or maximum level setting and use the up and down arrows to the levels you want. You can also directly enter the levels as well. The "Set Default" button will reset all automation fader min/max settings to the default level (-100.0 and 12.0 respectively). The "Same As..." button allows you to set all faders in the associated column to the same level setting as the one you specify in the drop down menu. Click "OK" to accept and close the window. "Cancel" will close the window and ignore any settings you have made.



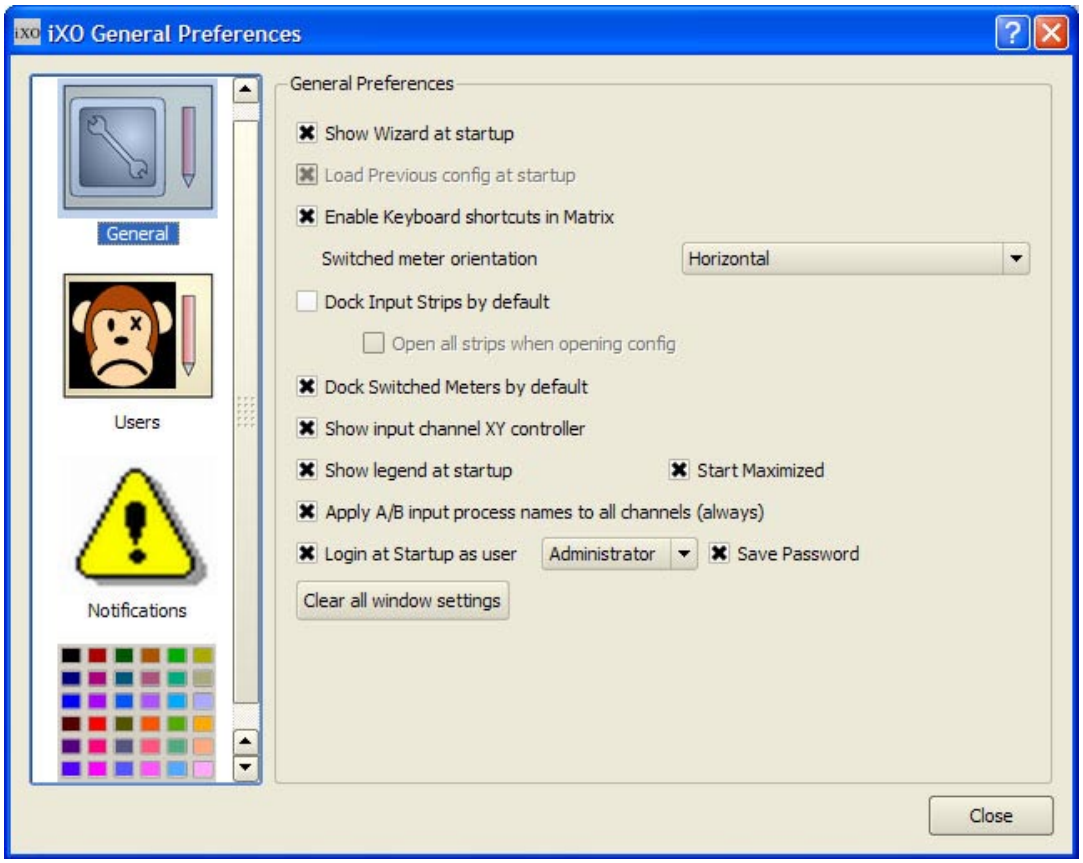
Preferences

On the menu bar, clicking Configure and Preferences will open the iXO General Preferences window. This window allows the user to customize the application for a variety of users or personal preferences.

There are four icons on the left hand side of the screen which when clicked will bring up the associated controls. They are: General Preferences, User Permissions, Notifications Preferences, and Colors. The General Preferences screen comes up first by default.

General Preferences

This screen is where you are able to customize the following application settings:



Show Wizard at startup: Checking this box will make the iXO Configuration Wizard appear whenever the application is launched.

Load Previous config at startup: Checking this box will make the last configuration created load automatically at startup.

Enable Keyboard shortcuts in Matrix: Checking this box will allow keyboard shortcuts such as Ctrl C (copy) and Ctrl V (paste) to be used in the crosspoint matrix configuration.

Switched meter orientation: Selecting either Horizontal or Vertical will change the switched meter appearance accordingly.

Dock Input Strips by default: Checking this box will automatically dock the input strips when they are first opened.

Dock Switched Meters by default: Checking this box will automatically dock the switched meters when they are first opened.

Show input channel XY controller: Checking this box will allow the input channel XY controller to be visible on the input channel.

Show legend at startup: Checking this box will show the matrix legend upon launch of the application.

Start Maximized: Checking this box will maximize the application upon startup.

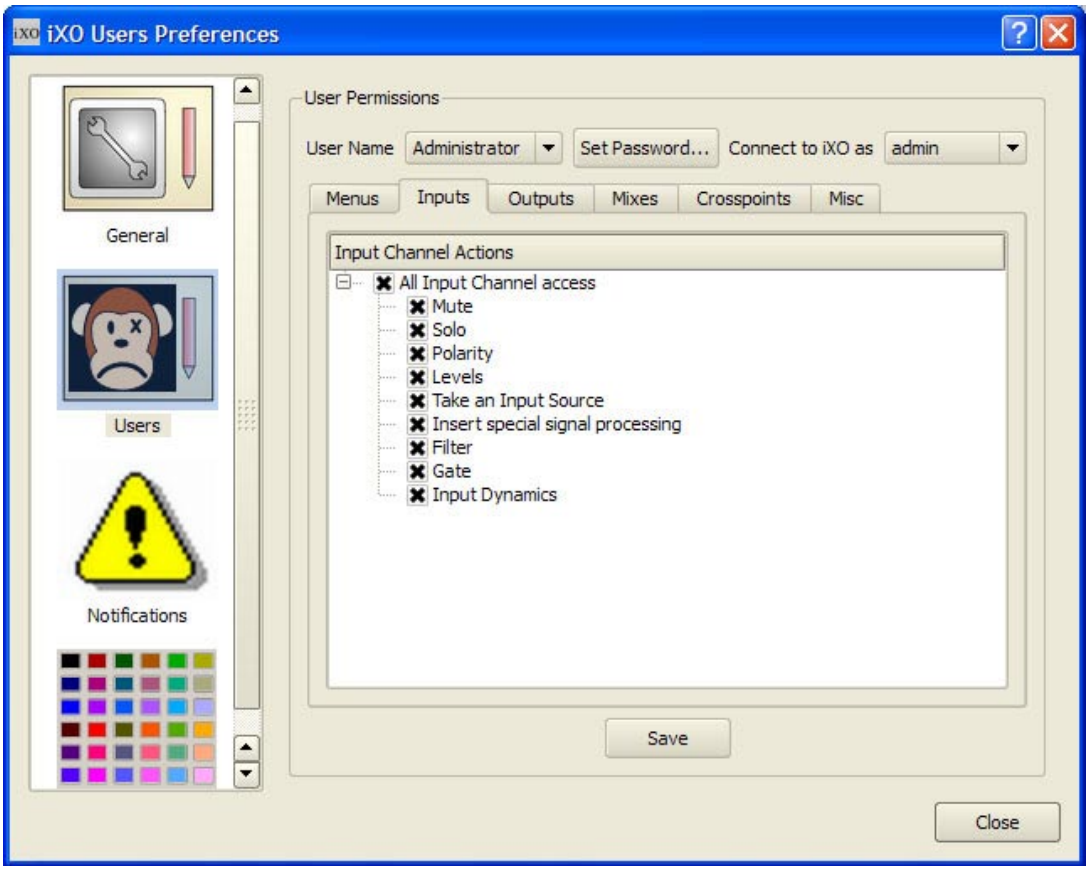
Apply A/B input process names to all channels (always): Checking this box will automatically apply the A and B input channel processing path names to be applied to all respective channels in the system.

Login at Startup as user: Selecting one of the three user levels will allow you to automatically login as a specified user at startup. The default user login is Guest, until changed by an administrator.

Save Password: Checking this box will automatically enter your password at the startup login.

Clear all window settings: This resets all windows to their default location.

User Preferences



This screen is where you are able to customize the application for the three different user types, Guest, Technician, and Administrator. There is a drop down menu to select

from the three User Names. Click on Set Password to change the password for the selected user. There is also a drop down menu which allows you to specify how the selected user can connect to an iXO system. The "Connect to iXO as" choices are Unspecified (not allowed to connect), User (can connect/disconnect), and Admin.

There are also six tabs labeled Menus, Inputs, Outputs, Mixes, Crosspoints, and Misc. Directly below is an expandable tree which is used to navigate through the available selections. There are check boxes on each branch and sub branch which when checked, allow the described item to be available for use by the selected user.

The Menus tab allows you to add or remove the various menu actions listed, allowing creation of custom menu access and window settings for the user selected.

The Inputs tab allows you to add or remove the various input channel functions listed, allowing no access or creating a customized input channel for the user selected.

The Outputs tab allows you to add or remove the various output channel functions listed, allowing no access or creating a customized output channel for the user selected.

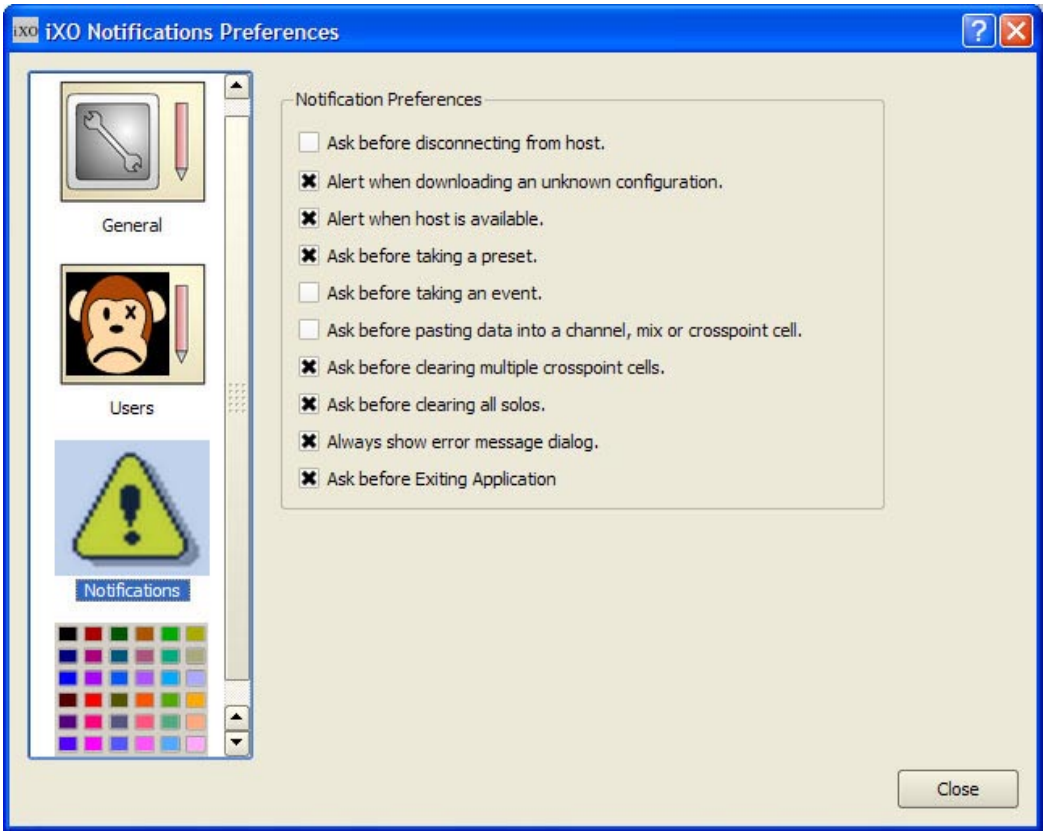
The Mixes tab allows you to add or remove the various mix output settings and adjustments listed, allowing no access or creating a customized mix output window for the user selected.

The Crosspoints tab allows you to add or remove the various crosspoint functions listed, allowing no access or creating a customized crosspoint for the user selected.

The Misc tab allows you to add or remove the various features and functions listed, creating a customized GUI the user selected.

Clicking on "Save" will save the modified user permissions. Clicking on "Close" or another icon will cause a pop up window to appear asking you if you want to save the modified user permissions. You can choose to "Save," "Discard," or "Cancel."

Notification Preferences



This screen is where you are able to customize the following notification settings:

Ask before disconnecting from host: Checking this box will cause the software to ask you if you want to disconnect before disconnecting from the host CPU.

Alert when downloading an unknown configuration: Checking this box will cause the software to ask you if you want to be alerted when downloading an unknown configuration.

Alert when host is available: Checking this box will cause the software to alert you whenever a host CPU is available.

Ask before taking a preset: Checking this box will cause the software to ask you if you are sure you want to run a preset on a specific channel, crosspoint, or mix.

Ask before taking an event: Checking this box will cause the software to ask you if you are sure you want to run an event.

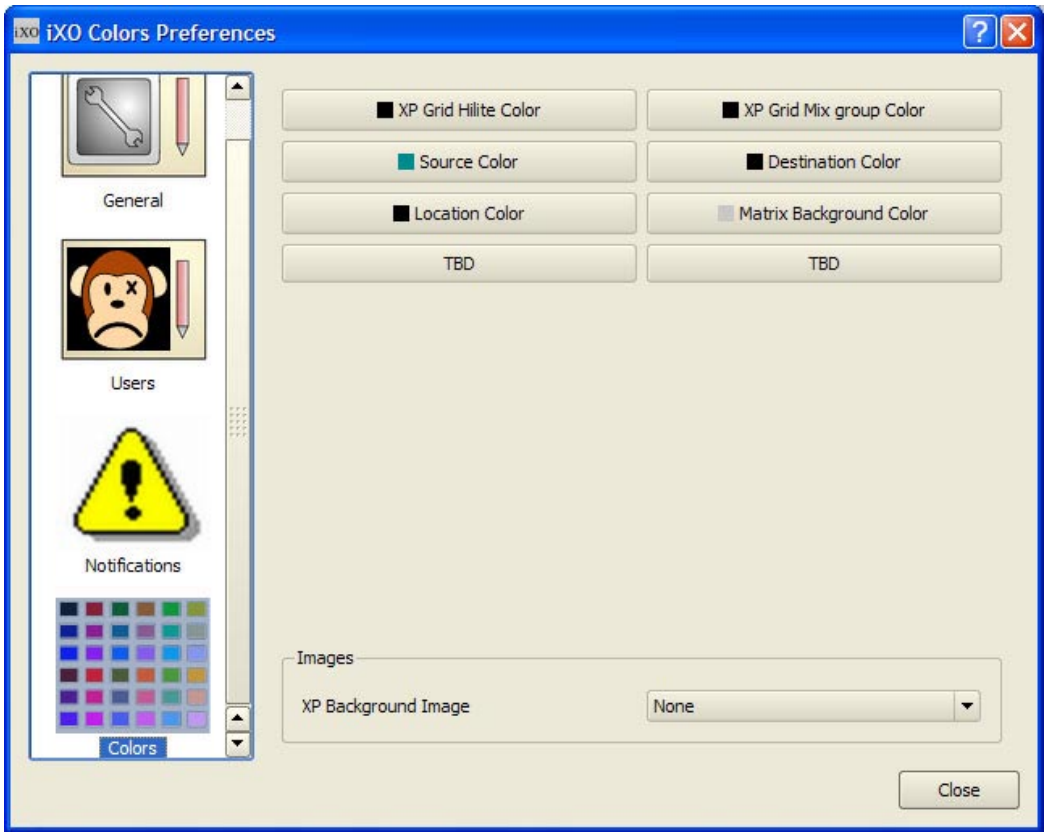
Ask before pasting data into a channel, mix or crosspoint cell: Checking this box will cause the software to ask you if you are sure you want to paste data into a channel, mix or crosspoint cell.

Ask before clearing multiple crosspoint cells: Checking this box will cause the software to ask you if you are sure that you want to clear multiple crosspoint cells.

Always show error message dialog: Checking this box will cause the software to show an error message dialog whenever an error occurs.

Ask before exiting application: Checking this box will cause the software to ask you if you are sure you want to exit the application.

Colors



This screen is where you are able to customize the following application colors using the color selection window and select background images for the crosspoint matrix using a browser. The available selections are:

XP Grid Hilite Color: Click this button to select the crosspoint grid highlight color. This is the XY "crosshair" that you see whenever you mouse over the matrix crosspoint cells.

Source Color: Changes the color of the Source background on the matrix.

Location Color: Changes the color of the Location background on the matrix.

XP Grid Mix Group Color: Click this button to select the mix group highlight color.

Destination Color: Changes the color of the Destination background on the matrix.

Matrix Background Color: Click this button to select the matrix background color.

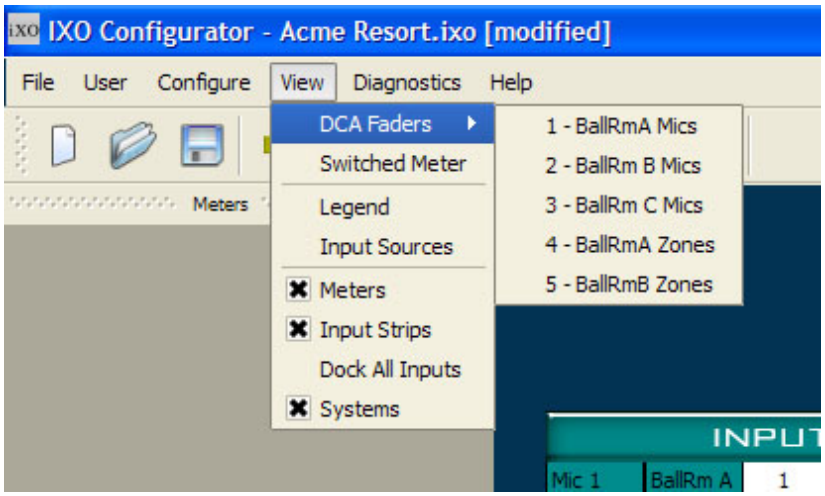
XP Background Image: Click the drop down menu and select from the Default "Wheatstone wheat" emblem, none, or custom. Selecting custom will open a browser window up and let you navigate to any image file on your computer.

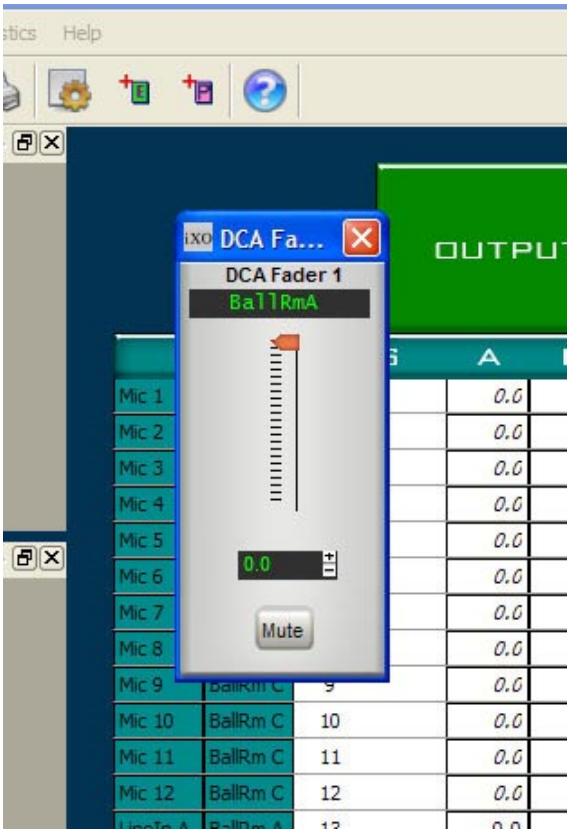
View

On the menu bar, clicking View will present a drop down menu where you can choose to view the following selections.

DCA Faders

Clicking DCA Faders will open a sub menu which will list all of the DCA faders that have been created in the system. If no DCA faders have been created, the sub menu does not appear. If they do exist, you then click on the DCA fader that you wish to view. The fader window will open on the workspace. You can open as many DCA fader windows as you like.





Switched Meter

Clicking on Switched Meter will open a metering window where you can then assign the specific input or output channel you would like to view. Mousing over the switched meter window and right clicking will bring up a menu where you can make the following selections:

Dock: Checking this will move the meter into the Meters dock located on the left hand side off the workspace. To undock, mouse over the meter, right click and uncheck the Dock check box.

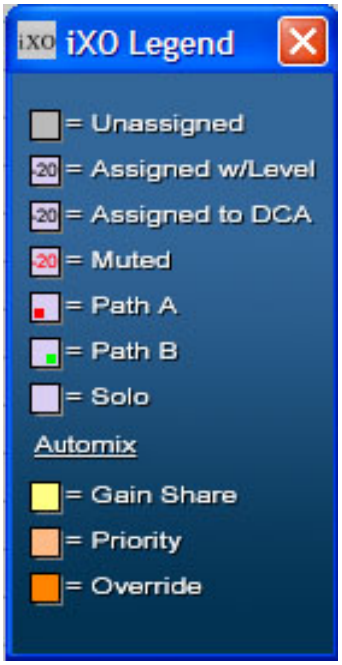
None: Removes the meter assignment.

Inputs: Clicking this will open a sub menu which lists all of the available input channels available. Select and click on the desired input channel to assign the meter.

Note: If the configuration of the system utilizes dual input channel processing paths A and B, the sub menu will allow you to select from the A and B path on every input channel.

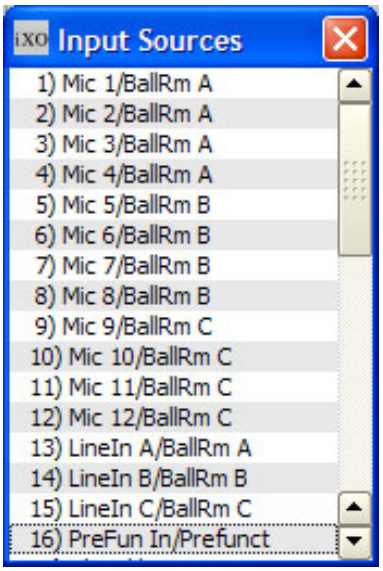
Outputs: Clicking this will open a sub menu which lists all of the available output channels available. Select and click on the desired output channel to assign the meter.

Legend



Clicking on Legend will open up a window which displays a legend of the various matrix crosspoint cell colors and indicators as a reference.

Input Sources



Clicking on Input Sources will open up a window which displays a list which informs you of how the input sources are physically connected to the iXO input cards. Since any input source can be routed to any or all input channels, this window is how you keep track of the input sources you have to work with. Input sources 1 through 8 are always physically connected to input card 1, ports 1 – 8. Sources 9 – 16 are connected to input card 2, ports 1 – 8, and so on. This screen is to be used as a reference. Click on the familiar "X" in the upper right hand corner to close the window.

Meters

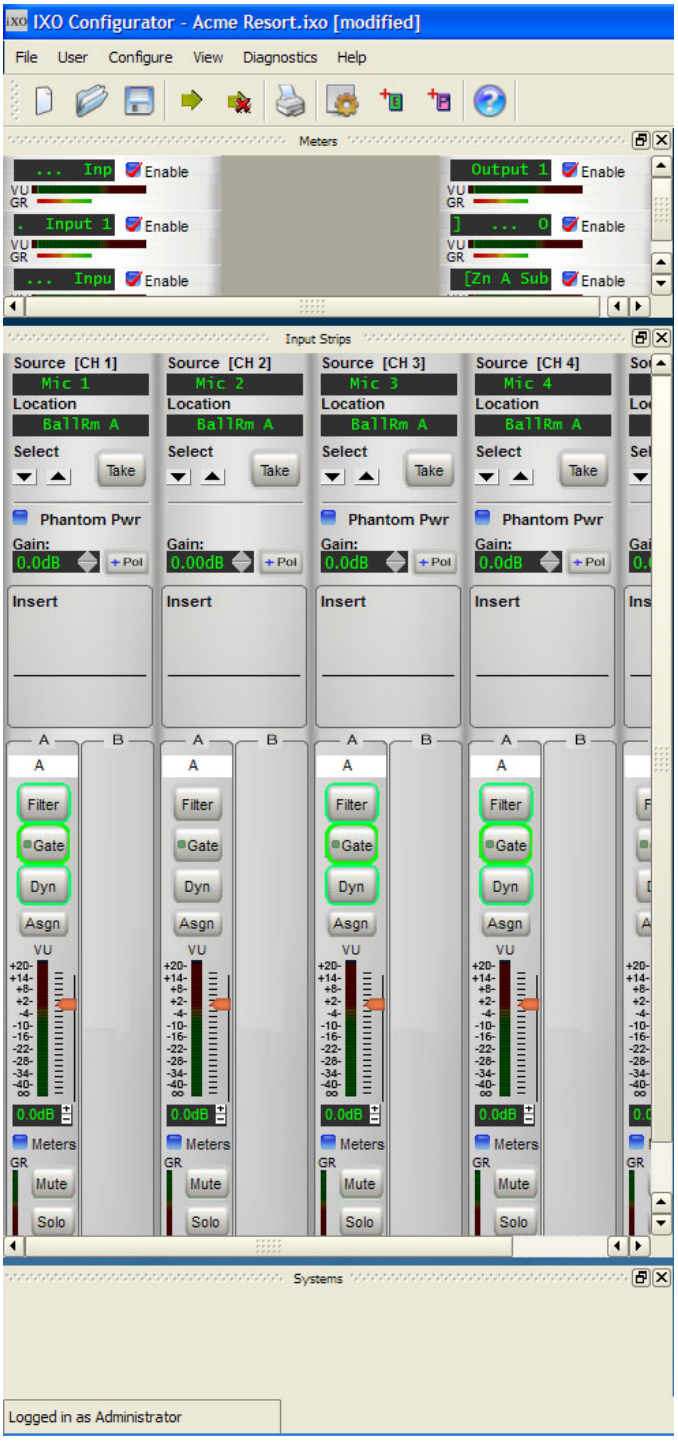
Checking the Meters check box will display the Meters dock located on the left hand side of the workspace (it is on by default). The Meters dock is a placeholder for any switched meters you would like to have quick access to. Uncheck to hide the Meters dock from view.

Input Strips

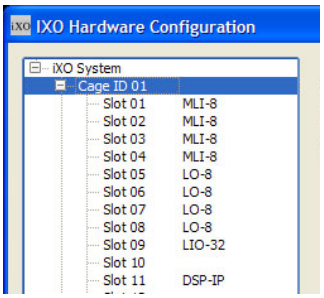
Checking the Input Strips check box will display the Input Strips dock located on the left hand side of the workspace (it is on by default). This dock is a placeholder for any input channels that you would like to have quick access to. An unlimited number of input strips can be added to the dock. Uncheck to hide the Input Strips dock from view.

Dock All Inputs

Selecting Dock All Inputs will automatically place any open input channels to the dock. This feature is useful as quick way to organize the workspace.



Systems



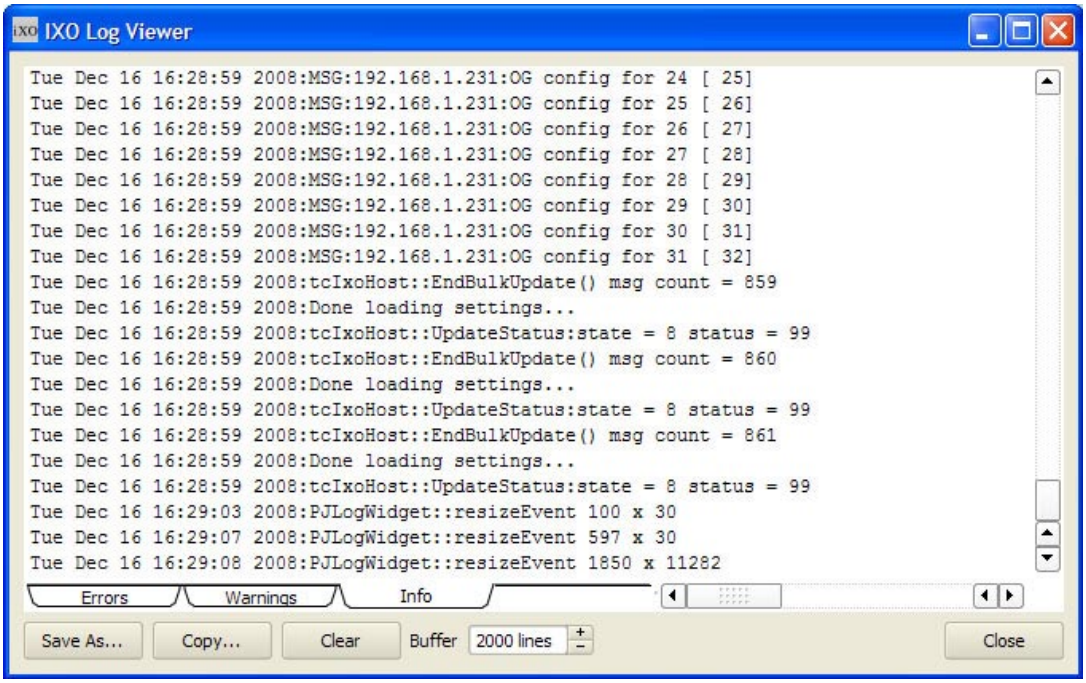
Checking the Systems check box will display the Systems dock located on the left hand side of the workspace (it is on by default). The Systems dock is displays all iXO systems that are available on the network. Uncheck to hide the Systems dock from view.

Diagnostics

On the menu bar, clicking Diagnostics will allow you to select from the following utilities which aid in the set up and troubleshooting of your iXO system.

System Log

Clicking on System Log will open the iXO Log Viewer.

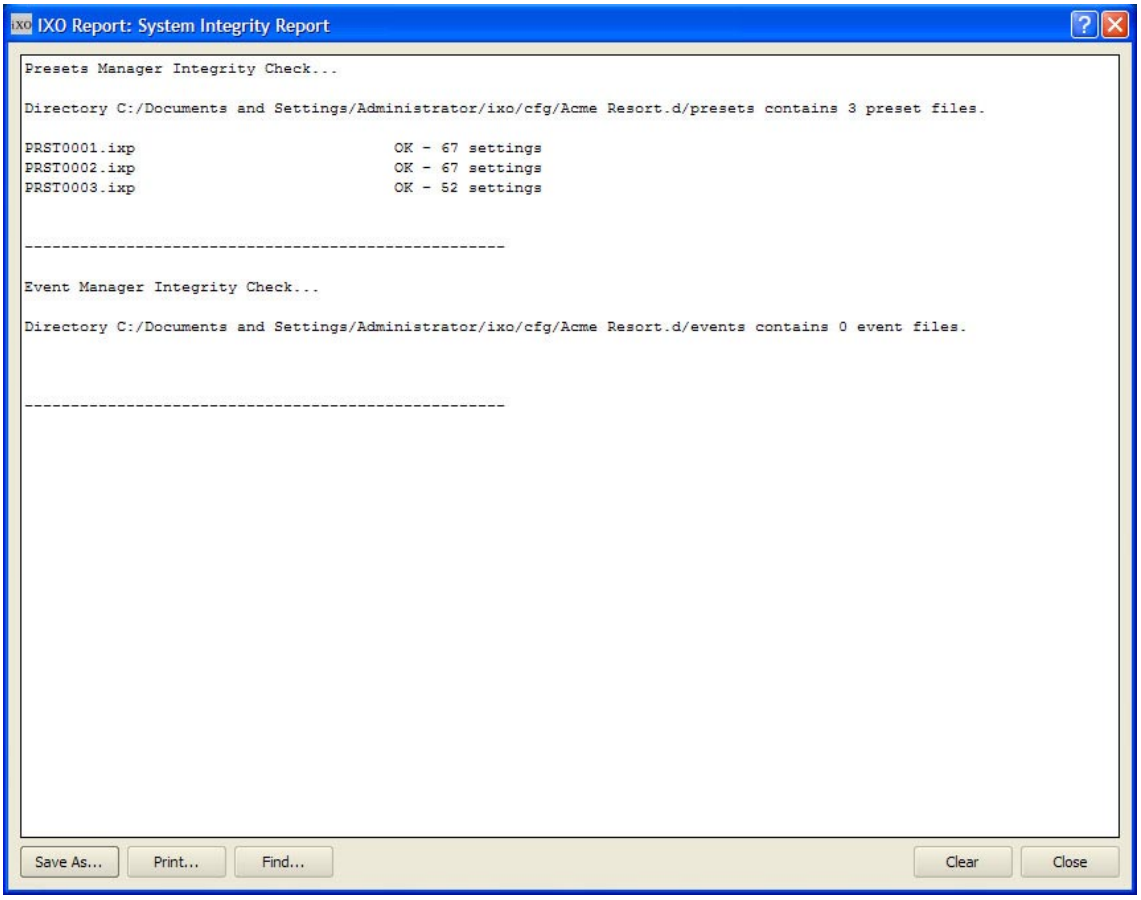


There are three tabs on the display; Errors, Warnings, and Info. The amount of data that can be stored is determined by the buffer size, which can be adjusted to suit your systems requirements. The default size is 1,000 lines. It can be adjusted from none to 10,000. If the buffer is full you can use Clear to empty the buffer.

- The Errors tab lists any system errors that have occurred during the operation of the system. The data is stored in the buffer.
- The Warnings tab will display any iXO system warnings that have occurred during the operation of the system. The data is stored in the buffer.
- The Info tab displays general information about the system. The data is stored in the buffer.

With any of these tabs you can Print a hard copy or Save the list as a text file.

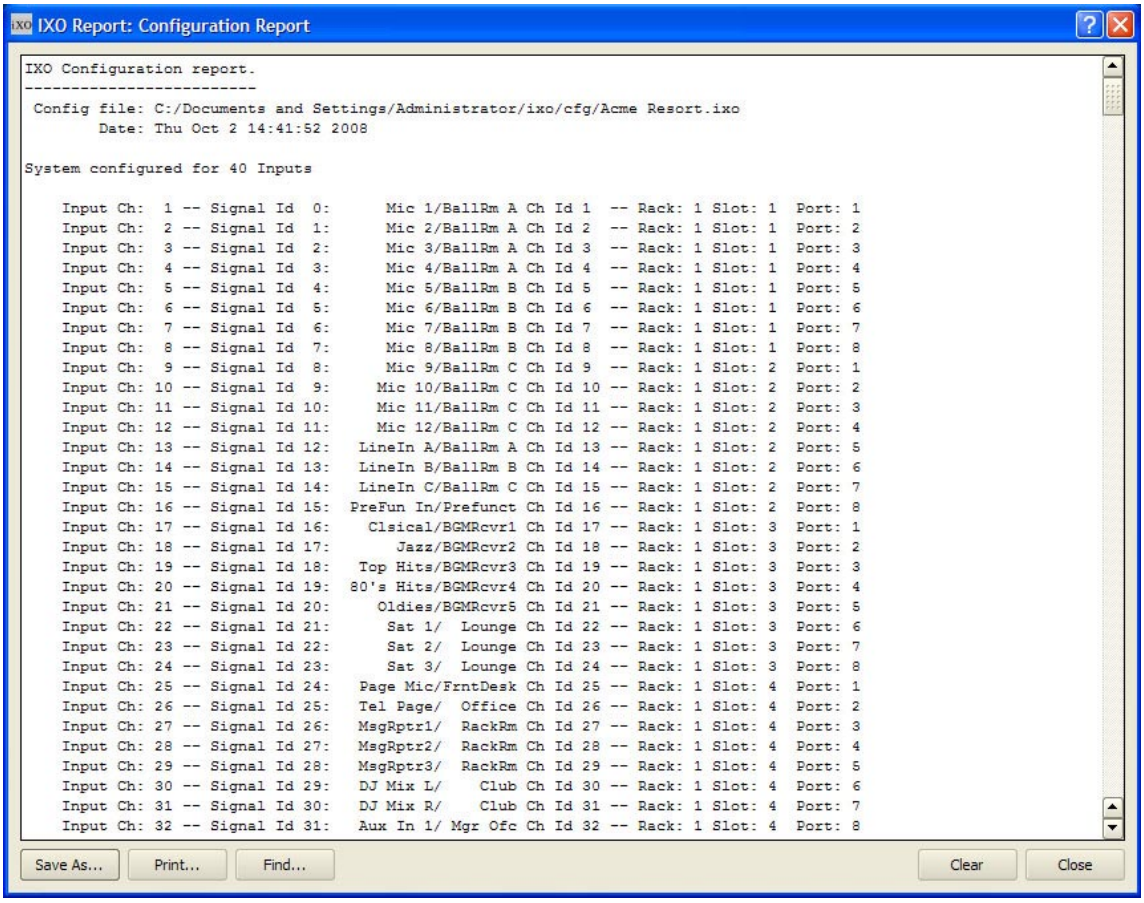
System Integrity



System Integrity is a self diagnostic utility which, when clicked, will ask you if you would like the software to automatically fix any problems it finds. Clicking "Yes" or "No" will start the test, and then a window will appear which displays the results. You can then choose to print a hard copy or save the list as a text file. "Find..." lets you search the list for a specific setting. "Clear" will clear the list.

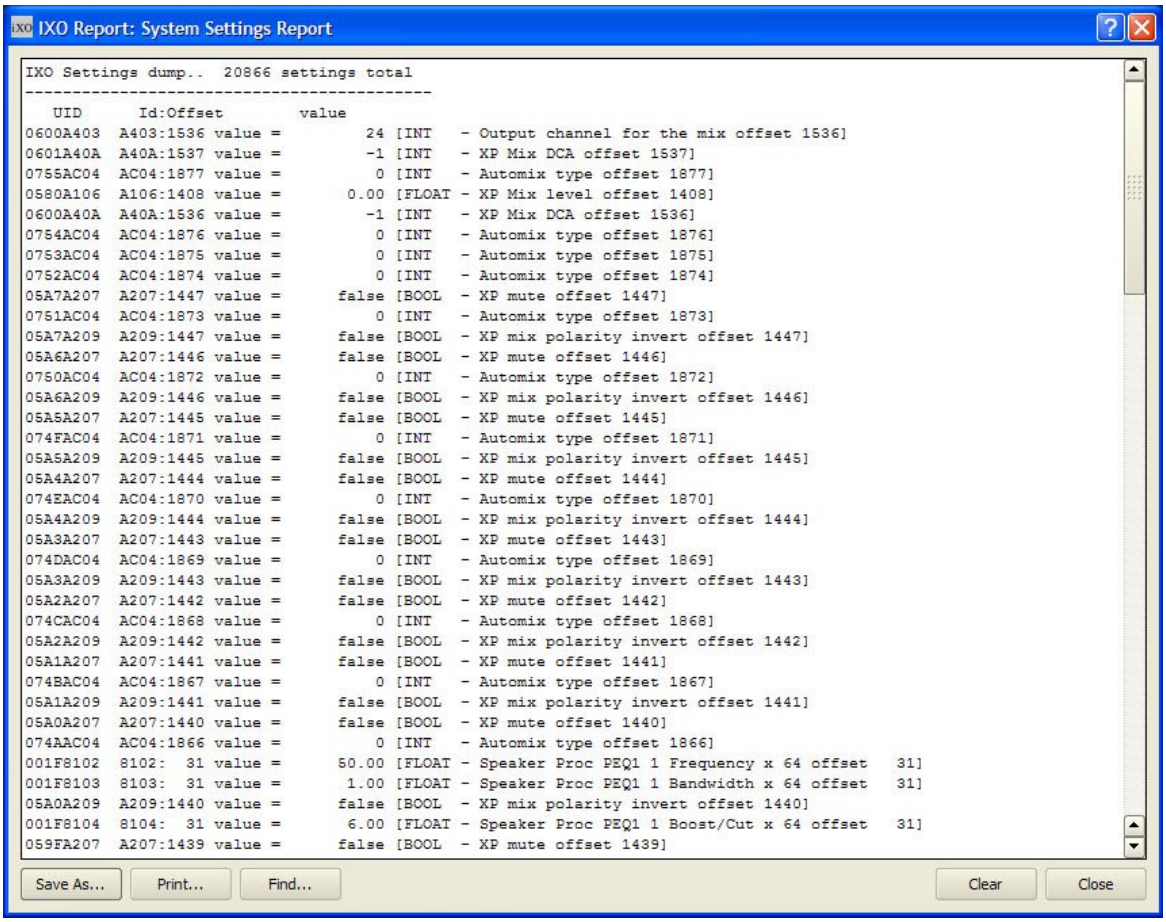
System Report

System Report will open a window which lists the basic information on the system you are working on. It lets you know the input and output channel configurations, the crosspoint settings, AT link settings, LIO settings, DCA and Wall Controller settings, and the user permissions for the system. You can then choose to print a hard copy or save the list as a text file. “Find...” lets you search the list for a specific setting. “Clear” will clear the list.



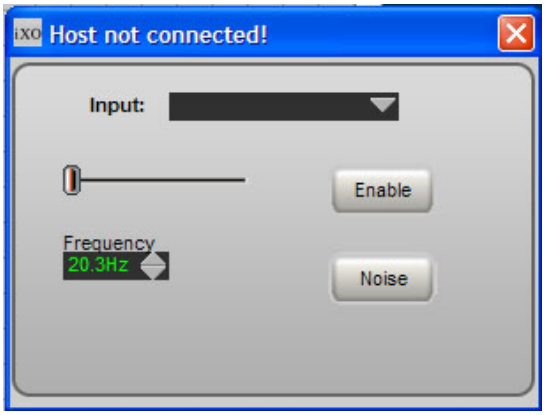
Show All Settings

Selecting Show All Settings will list all of the iXO settings for the entire system. This may be used to create a hard copy back up of the entire systems settings. You can then choose to print or save the list as a text file. “Find...” lets you search the list for a specific setting. “Clear” will clear the list.



Signal Generator

Selecting the Signal Generator opens a window which allows you to assign either tone or noise to any input channel in the system. These signals can be used for testing purposes, or for applications such as sound masking and signaling.

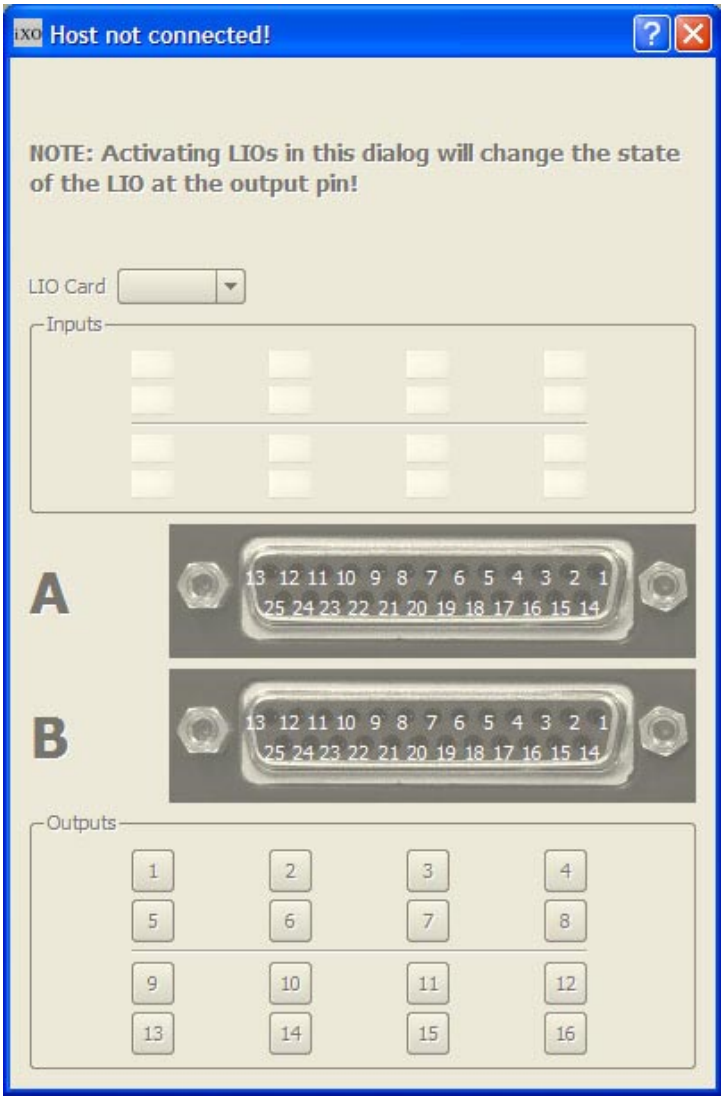


LIO Test Dialog

The LIO Test Dialog is a utility that you can use to test both logic inputs and logic outputs. Selecting it will open a window which has a drop down menu to select the logic card you wish to test.

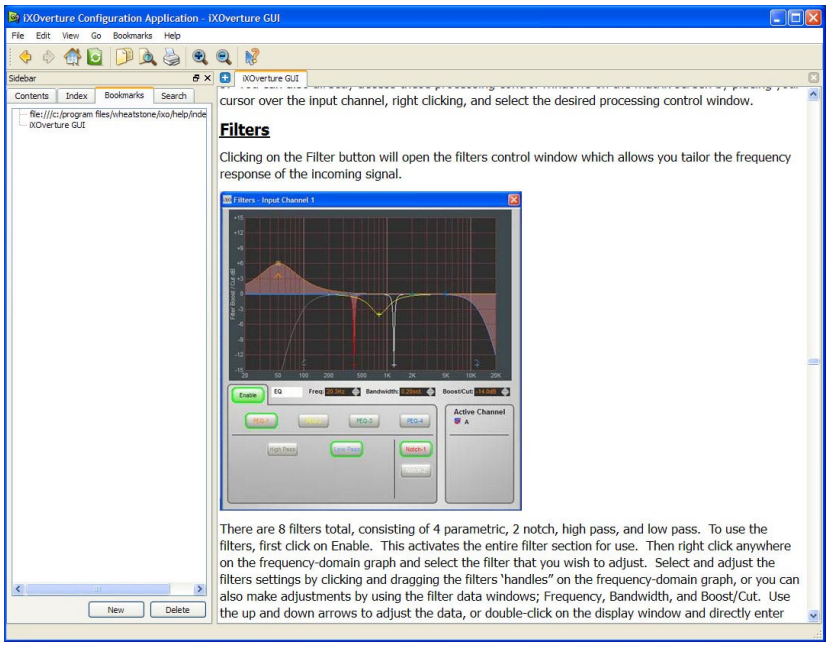
There is a set of indicators to show the status of the logic inputs for the card you are testing, along with graphic of the “A” and “B” DB-25 connectors. The connectors on these pins are also indicators which highlight when the respective logic input or output pin is active.

Located below the connectors are buttons which are used to test the logic outputs of the card. Click on a button and the respective logic output pin will close with respect to ground.



Help

On the menu bar clicking *Help; Help Topics* will open the help application where you are presented with several ways to look for assistance. Located on the left hand side of the screen is the Sidebar which has four tabs: Contents, Index, Bookmarks, and Search. These present four different ways in which to locate the information you are looking for. Each one of these tabs will allow you to select or search from the iXO help manual for the best possible answer(s) for your question(s).



About iXO

Clicking on *Help; About iXO* will open a window and display the software version and date in a scrolling text field located at the bottom of the window. If you are connected to a system and click on About iXO the scrolling text will also inform you of the hardware's firmware and FPGA information.

Appendices

Appendix 1

Appendix 2

Appendix 1

Contents

Wheatstone Commercial Audio
iXO
WSNetServer User Manual

Date: October 22 2008

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Introduction

The Windows application "WSNetServer.EXE" is an address boot server for the Wheatstone iXO SC-1, SC-2, and RC-1 wall mount controllers, Ethernet XY controllers and the D and G Series mixer surfaces. The network address server maintains a table of mappings from device MAC address to device IP address. When one of the previously mentioned devices boots up it will send an Ethernet broadcast to the network server. If the network server has an entry matching the device, the server will assign an IP address to that device. The server will also assign other settings to the device such as device name, subnet mask, cross point broadcast port number, and in the case of an X or Y controller the signals that the controller will switch.

Installation

The WSNetServer.EXE file does not need a windows installer. It may be copied to any directory on a Windows PC, and executed directly from that location or through a shortcut.

Normal Operation

Startup

When the network server is started for the first time you will see the window shown in Figure 1.

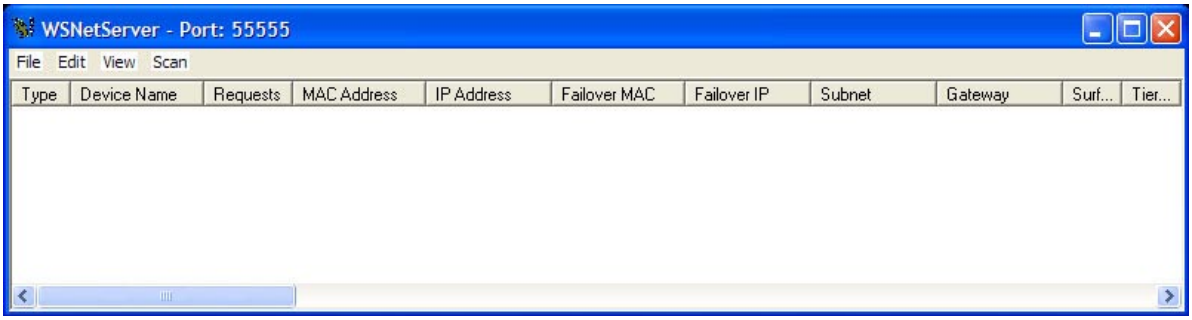

Figure 1: WSNetServer Main Screen

In the future, after you have defined devices and saved the device configuration to a file, the network server will automatically load your most recent device settings upon startup.

About Box

An about box with the server software revision number and build date is available by clicking on the "File / About…" menus (See Figure 2).

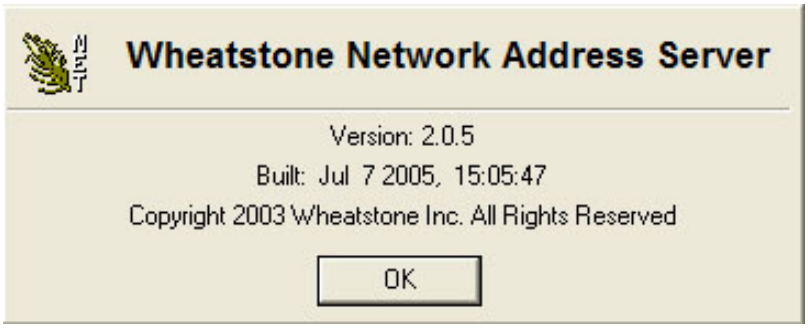

Figure 2: WSNetServer About Box

Specifying The Crosspoint XY Broadcast Port

The network server and the XY controllers look for signal names from a Wheatstone iXO, Bridge, Satellite, and E-Sat routers. The router has an UDP port assigned to it for signal name and connection broadcasts. The network server application must be configured with the same UDP broadcast port. You may make this setting by clicking on the "Edit / Broadcast Port" menus (See Figure 3). The UDP broadcast port number will be shown on the title bar of the network server application (See Figure 1). All of the XY controllers that get their settings from this instance if the network server will be configured to listen to the UDP broadcast port that the network server is configured for.

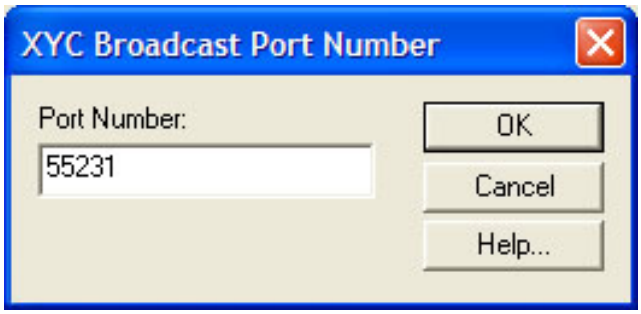

Figure 3: XYC Broadcast Port Dialog Box

Adding A Device

You will add XY controller and/or mixer surface devices by clicking on "Edit / Add Device…" menus. You will see the dialog box shown in Figure 4.

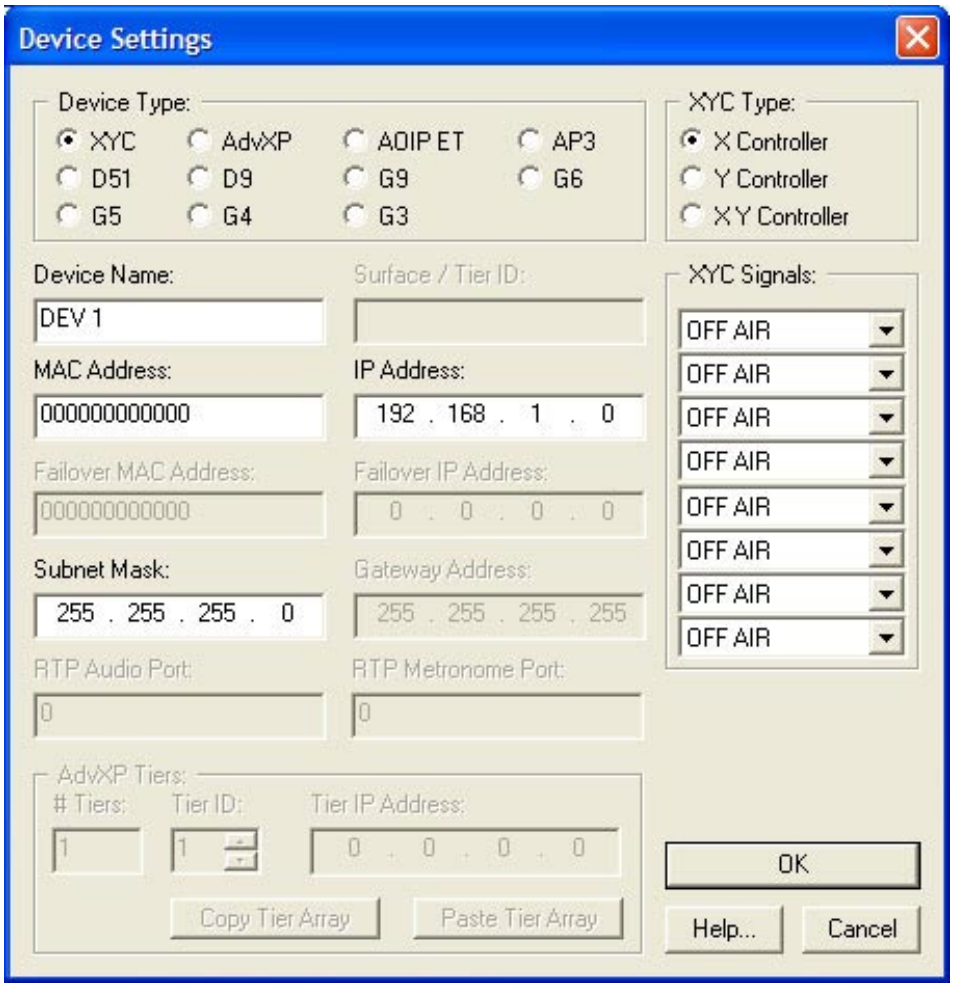

Figure 4: Add (Edit) Device Dialog Box

The "Device Type" setting selects whether we are creating an entry for an XY controller or a mixer surface. To setup an X, a Y, or an XY controller select the "XYC" device type. To setup a mixer surface select the appropriate mixer surface type.

The "Device Name" setting gives a unique name that will identify the device on the network. Each XY controller and surface on the network must have a unique device name. In this example we will use the default "DEV 1".

The "MAC Address" field is the MAC address of the Ethernet chip in the device. This should be marked on the device.

The "IP Address" and "Subnet Mask" fields are the TCP/IP address settings that you would like to assign to the device.

The "XYC Type" setting specifies whether the controller is an X controller, a Y controller or an XY controller. This field is disabled when the Device type is a mixer surface.

There are eight fields labeled “XYC Signals”. In an X controller these fields specify the Y signals that the controller will switch. In a single X controller only the first signal has any effect. In a ganged X controller each signal represents the successive ganged controller Y signals. In a Y controller these fields specify the X signals that the controller will switch. In a single Y controller only the first signal has any effect. In a ganged Y controller each signal represents the successive ganged controller X signals. Up to eight controllers can be ganged off of one controller core.

The “Surface ID” setting specifies the mixer surface ID. This field must match the control surface ID that is defined on the AdvXp GUI for the mixer surface. This field is disabled when the Device type is not a mixer surface.

When you press the “Okay” button the device that you just added will appear in a list on the main screen (See Figure 5).

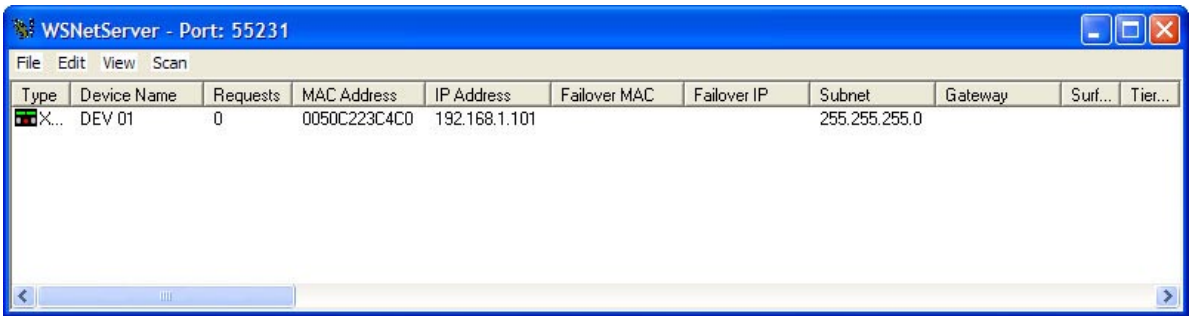

Figure 5: Main Screen With A Device Added

If you add a mixer surface or an SC/RC controller to the device list, the “XYC Type” and “Controller Signals” fields of the device settings dialog box will become inactive since these settings are not applicable to a mixer surface or the SC/RC controllers. As each device is added to the network server the list on the main screen will grow to show each device’s settings (See Figure 6).

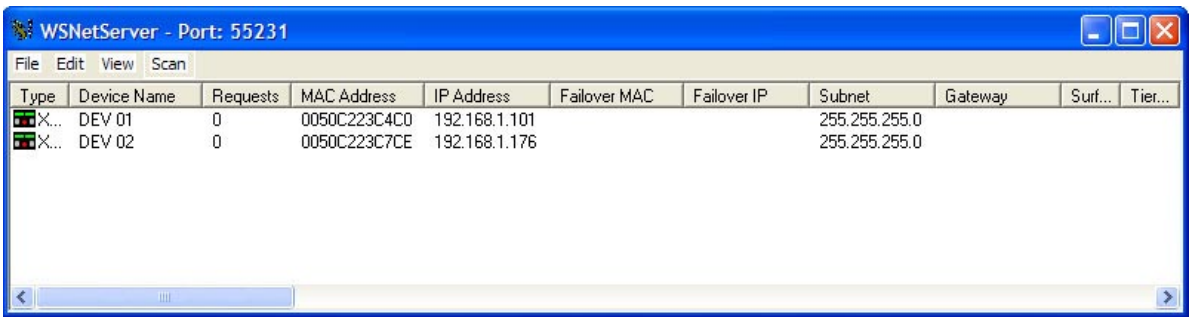

Figure 6: Several Devices Defined

Editing A Device Setting

After you add a device to the device list you may edit the device's settings by selecting on the device in the list in the main screen and then clicking the "Edit / Edit Device" menus. The same dialog box that you used to add the device to the server will appear with the current device settings. If the X controller that we first added is in hotel lobby, you might want to rename the device from the default name "DEV 1" to SC-2 as shown in Figure 7.

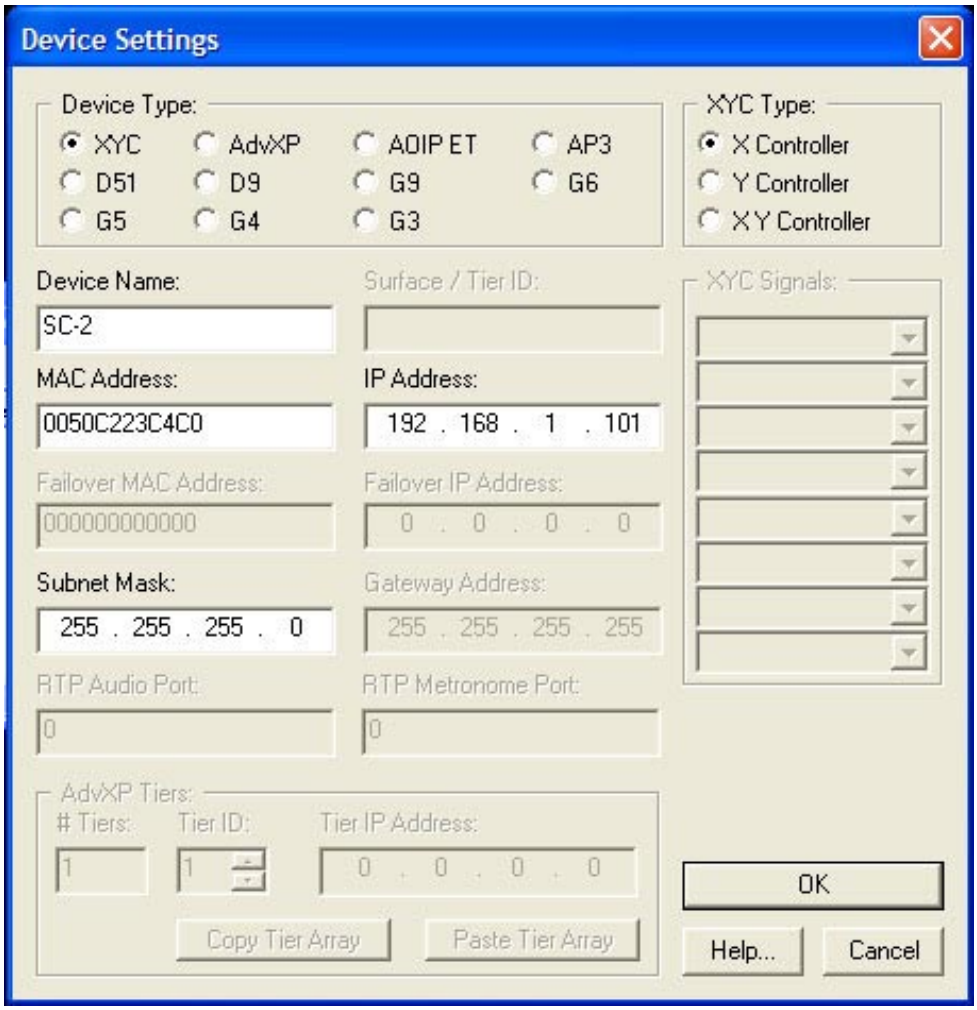

Figure 7: Edit Device Settings

The changes that you make to a device's settings are NOT immediately sent to the device. You must power cycle the device for it to request new settings from the network server. On the main screen of the network server one of the columns is labeled "Requests". This column shows a count of how many setting requests the server has received from the device since the server started running. If you power cycle a device and do not see this number increment by at least one, then the device is not making a good network connection to the server. In the next section I will discuss a way to query a device for it's current settings as a means to verify that the device received setting changes after a power cycle.

Device Name Lookup

The network server can scan the network for a device using the device's name. Select a device from the list on the main screen and then click the "Scan / Name Lookup…" menus. The first dialog box that appears will show the device name that you selected. You may change the name of the device that you wish to scan at this point, or accept the selected name by pressing "Okay" (See Figure 8).

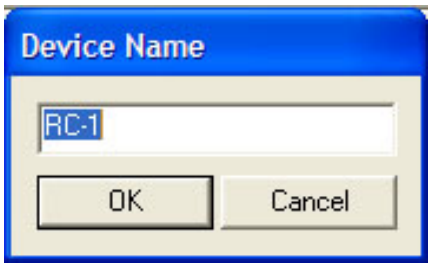

Figure 8: Device Name Dialog Box

After selecting a device name to scan for the dialog box in Figure 9 will appear. If a device with the specified name is located, then the fields of the dialog box will be filled in with the device's settings. If no device with the specified name is found on the network, then an error message will appear (See **Error! Reference source not found.**).

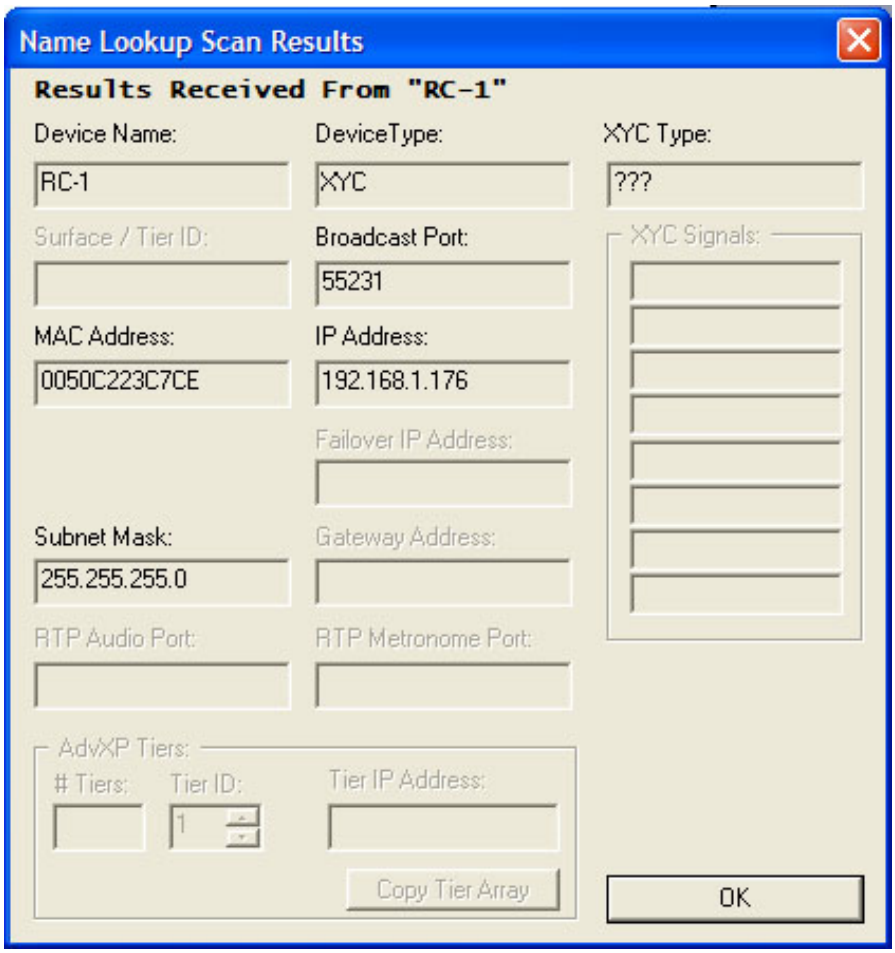

Figure 9: Name Lookup Dialog Box

Network Scan

The network server can scan the network for all devices. Click the "ScanNetwork…" menus. The dialog box shown in Figure 10 will appear with a list of all the devices that are detected on the network.

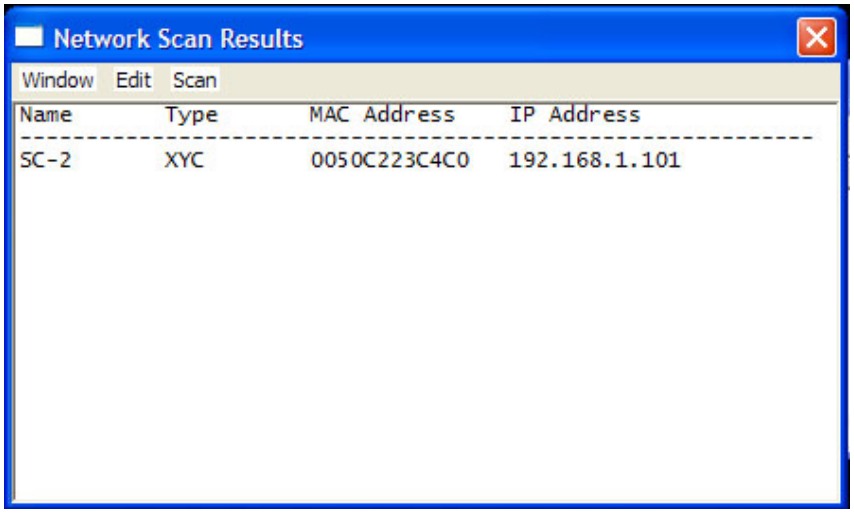

Figure 10: Network Scan Dialog Box

A network scan broadcasts one query packet and all devices on the network that hear the broadcast will respond. Since network broadcasts are an unreliable form of communication, occasionally some of the devices on the network may not generate responses. You can clear the network scan results using the "Window / Clear" menus and rescan the network using the "Scan / Re-Scan" menus on the network scan results dialog box if you think that you have missed a device.

If your network scan shows a device that is not in your device list, then you can add the device to your device list by clicking on the "Edit / Add Device…" menu on the scan results dialog box.

Saving Network Server Configurations

The device settings that we just made can be saved to a settings file by clicking on the "File / Save WSNetServer Settings…" menus (See Figure 11).

The default file type for saving network device settings has a file extension "WSN". You may also save settings into a "TXT" plain ASCII text file or a "CSV" comma separated variable file for archive purposes. A "TXT" file may be viewed in Windows Notepad, Wordpad or any other commonly used word processor. A "CSV" file may viewed in Microsoft Excel (See Figure 13) or any other commonly used spreadsheet program. To save either a "TXT" or "CSV" file.

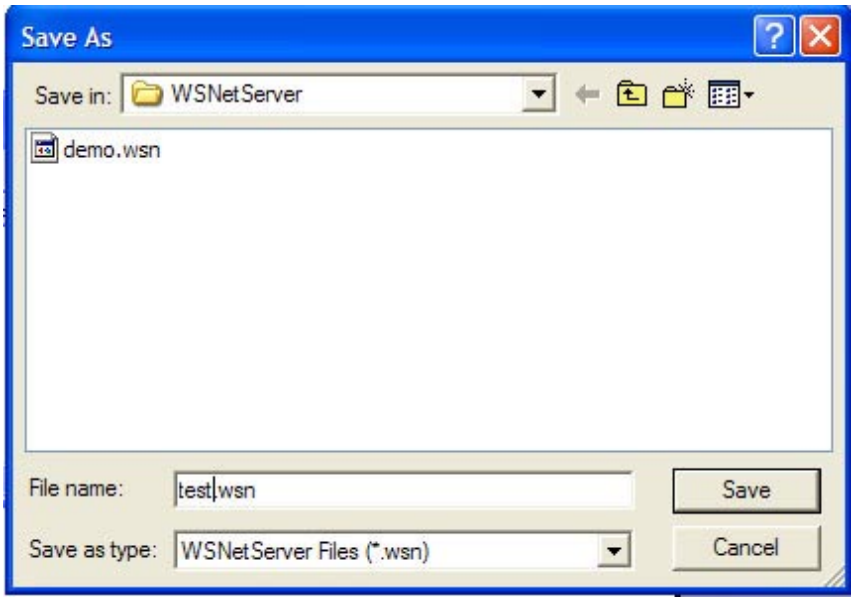

Figure 11: Save Network Server Settings

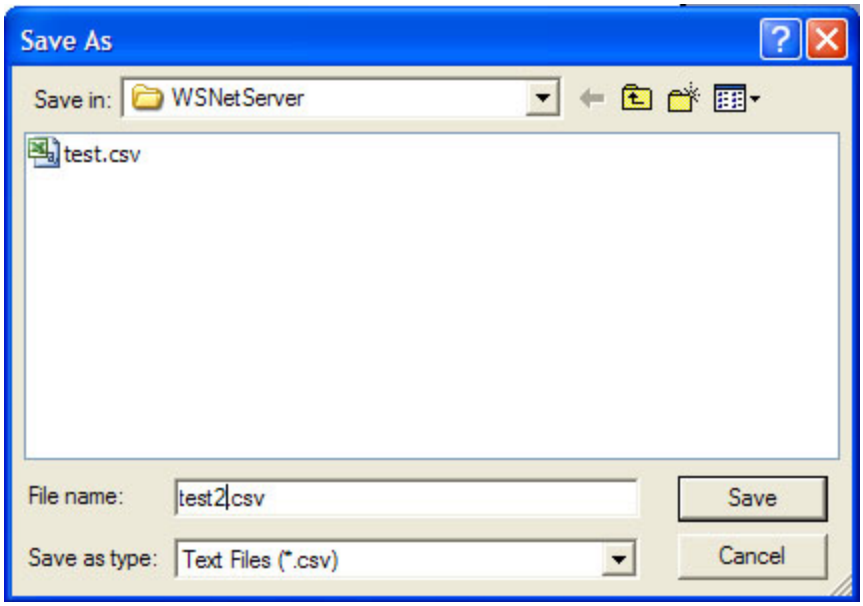

Figure 12: Save Settings In A "CSV" File

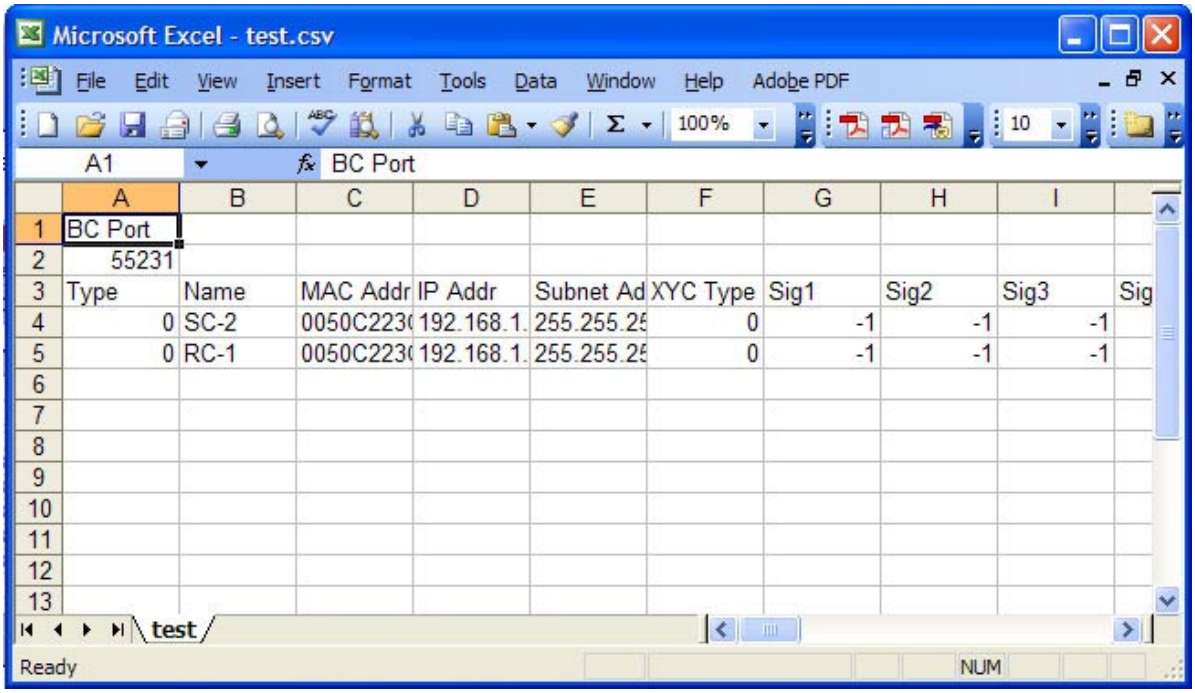

Figure 13: Viewing Network Server Settings In Microsoft Excel

The "Type" column holds a numerical identifier for the device type. The number to device type mapping is shown in Table 1. The "XYC Type" column holds a numerical identifier for the XY controller type. The number to XYC type mapping is shown in Table 2. The "Sig1" through "Sig8" columns hold the **signal numbers** associated with ganged X or Y controllers. A negative one in these columns indicates no signal is selected. Mixer surfaces will always put a negative one in these columns.

Type #	Device Type
0	XY Controller
1	D-5.1 Mixer Surface
2	D-9 Mixer Surface
3	G-9 Mixer Surface
4	G-5 Mixer Surface

Table 1: Device Types In CSV File

XYC Type #	XYC Controller Type
0	X Controller
1	Y Controller
2	XY Controller

Table 2: XYC Types In CSV File

Loading Network Server Configurations

Saved device settings can be loaded from a settings file by clicking on the "File/Load WSNetServer Settings …" menus (See Figure 14).

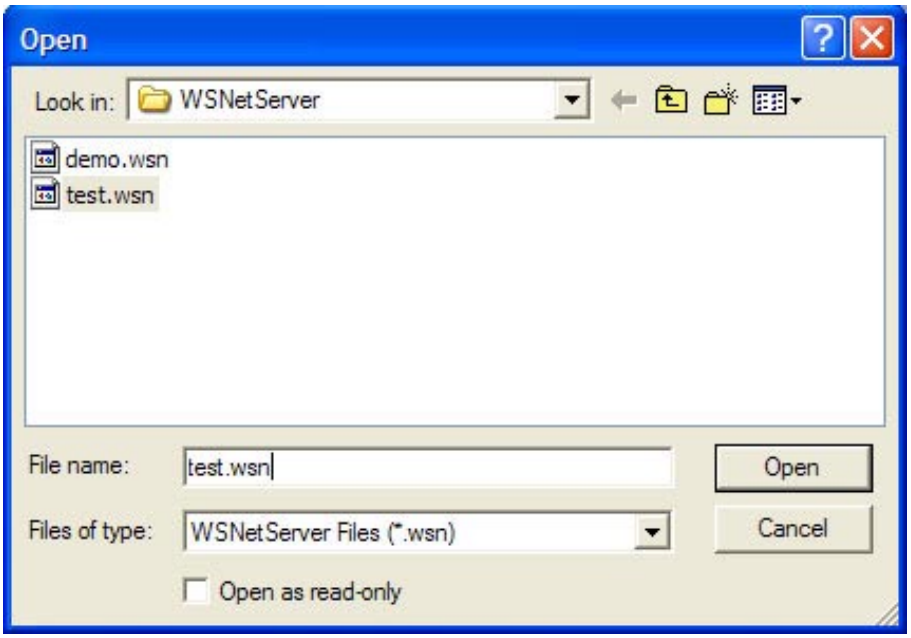

Figure 14: Load Network Server Settings

Upgrading XY Controller Software

Software updates to the XY controllers may be performed through the network server. If a software update ever becomes necessary you will receive a HEX file to update the controller. Click on the "Edit / Software Update…" menu. A file open dialog box will appear (See Figure 15), open the HEX file that contains the software update and press "Open".

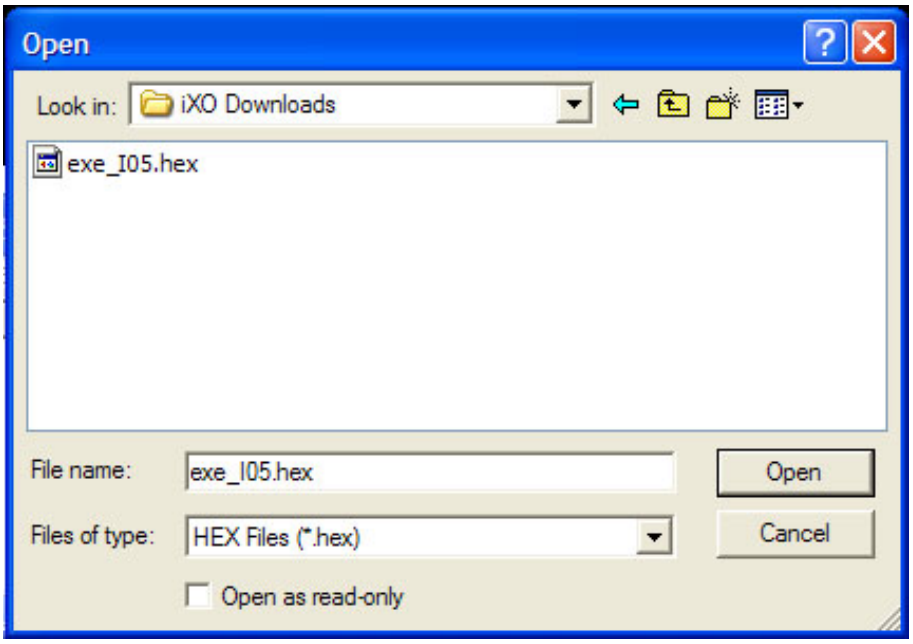

Figure 15: Select A Software Update HEX File

A dialog box with a progress indicator will appear (See Figure 16). When the software upload is complete the "Cancel" button will change to "Done". If an error occurs an error message dialog box will appear.

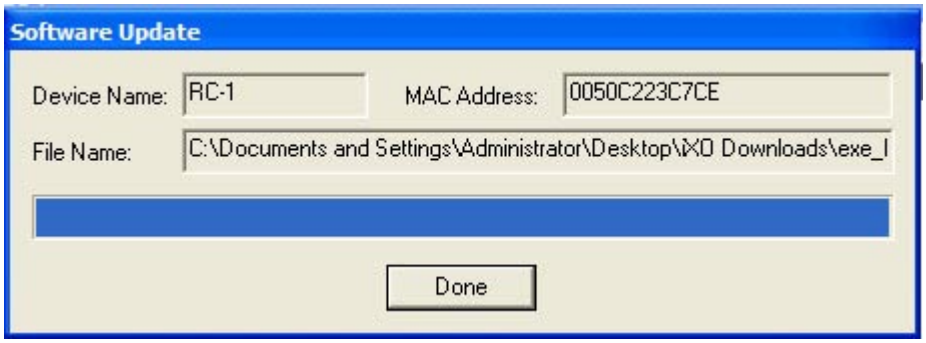

Figure 16: XY Controller Software Update Dialog Box

Determining An Unknown Device MAC Address

If for some reason you loose the documentation that describes your device's MAC address, you can use the network server to determine the device's MAC address. You may be able to determine a device's MAC address using the Network Scan method see section 3.7. The network scan method may not locate a device that has never been configured with an IP address, or a device that has been configured with an IP address that does match the network that you are currently running on. The method described below will help to find the MAC address of a device if these situations occur.

Open the network server activity log window by clicking on the "View / Activity Log Window…" menu. A log message window will appear. Clear the log message window by clicking on the "Clear!" menu. Power cycle the device under question and it will attempt to retrieve a MAC address from the network server. Each attempt will generate a message in the log window with the device's MAC address and device type listed (See Figure 17).

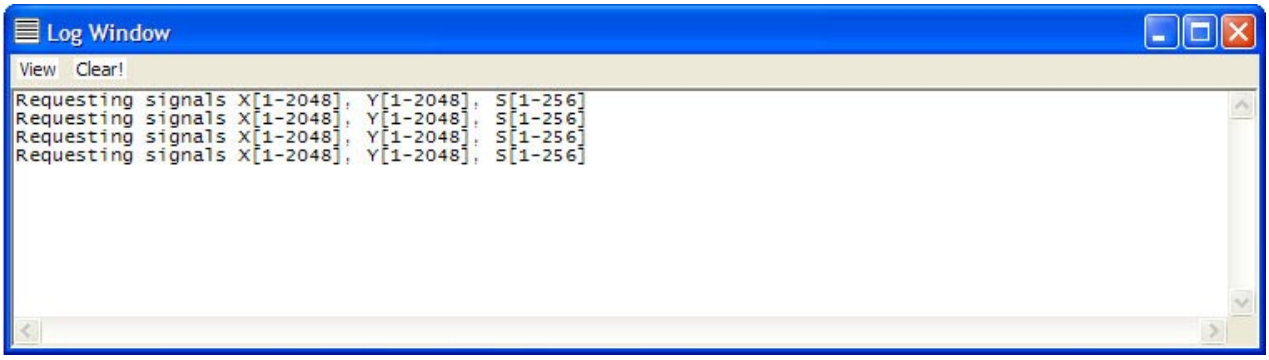

Figure 17: Activity Log Window

Appendix 2

Contents

For the most part there are no user-replaceable parts in the iXO system. A complete list of available components is shown on the next page. Contact Wheatstone technical support for further information.

Wheatstone Corporation (600 Industrial Drive, New Bern, North Carolina, USA 28562) may be reached by phone at 252-638-7000, fax 252-637-1285, electronic mail “techsupport@wheatstone.com”.

REPLACEMENT PARTS — iXO SYSTEM

COMPONENT	DESCRIPTION	*WS P/N*
DI-8	DIGITAL 4-CHANNEL INPUT CARD	***"008683"***
DO-8	DIGITAL 4-CHANNEL OUTPUT CARD	***"008684"***
MLI-8	MIC/LINE 8-CHANNEL INPUT CARD	***"008316"***
LI-8	LINE 8-CHANNEL INPUT CARD	***"008687"***
LO-8	LINE 8-CHANNEL OUTPUT CARD	***"008685"***
LIO-32	LOGIC INPUT/OUTPUT CARD	***"008682"***
DSP-2001	DIGITAL SIGNAL PROCESSOR CARD	***"008310"***
AEC-16	ACOUSTIC ECHO CANCELLATION CARD	***"008686"***
HC-2007	HOST CPU CARD	***"008691"***
BK-2001	BLANK REAR PANEL	***"008339"***
2PH-2001	COMPLETE REAR MODULE WITH TWO PHOENIX CONNECTORS	***"008669"***
2DB-2032	COMPLETE REAR MODULE WITH TWO DB-25 CONNECTORS	***"008340"***
HCC-2007	COMPLETE REAR MODULE FOR SERIAL INTERFACE & CAT5 CONNECTIONS	***"008692"***
HCO-2007	COMPLETE REAR MODULE FOR SERIAL INTERFACE & OPTICAL FIBER CONNECTIONS	***"008694"***
HCOC-2007	COMPLETE REAR MODULE FOR SERIAL INTERFACE, CAT5 & OPTICAL FIBER CONNECTIONS	***"008696"***
TRANSCEIVER	OPTICAL FIBER TRANSCEIVER, SFP, LONG HAUL	***"290001"***
TRANSCEIVER	OPTICAL FIBER TRANSCEIVER, SFP, SHORT HAUL	***"290002"***
SC-2 AUDIO	AUDIO CONTROL WALL PANEL	***"008900"***
SC-1 AUDIO	AUDIO CONTROL WALL PANEL	***"008906"***
RC-1 AUDIO	AUDIO CONTROL WALL PANEL	***"008903"***
SPS-2011i	POWER SUPPLY FOR iXO RACK UNIT	***"007331"***
FAN	DC 12V FAN	***"840027"***
iXOVERTURE SOFTWARE	iXOVERTURE SOFTWARE CD	***"071777"***
MANUAL	OWNER'S MANUAL	***"008699"***